User Manual

Charger for NiCd/NiMH batteries

(EN) User Manual

Updates and language specific user manuals are available on **www.mascot.no/downloads/usermanuals**

Bruksanvisning
Käyttöohjeet
Bedienungsanleitung
Mode d'emploi
Manual de instrucciones
Istruzioni per l'uso

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IMPORTANT SAFETY INSTRUCTIONS!

TO REDUCE THE RISK OF FIRE AND ELECTRIC SHOCK:

READ THROUGH THESE INSTRUCTIONS PRIOR TO USING THE PRODUCT.

CAREFULLY FOLLOW THESE INSTRUCTIONS WHEN USING THE PRODUCT.

RETAIN THESE INSTRUCTIONS FOR FUTURE REFERENCE.

CAUTION! DOUBLE POLE / NEUTRAL FUSING!

This product is designed for indoor use. (Not applicable to products marked "IP67")

IP41 IP4X IP44 IP67

A version of this product marked "IP41" may be available. This version is protected against ingress of solid objects larger than 1.0 mm and the effects of vertically falling drops of water according to standard EN/IEC 60529.

A version of this product marked "IP4X" or "IP40" may be available. This version is protected against ingress of solid objects larger than 1.0 mm.

A version of this product marked "IP44" may be available. This version is protected against ingress of solid objects larger than 1.0 mm and the effects of water splashed against the enclosure from any direction according to standard EN/IEC 60529.

A version of this product, marked with a symbol with two drops of water and/or "IP67", may be available. This version is filled with a potting compound and is dust-tight and protected against the effects of temporary immersion in water according to standard EN/IEC 60529, but must not be immersed in water for longer periods of time.

Products marked with the “double square symbol” are double insulated (Insulation Class II). Products without this mark are Class I (relies on safety earth for protection).

WARNING: To avoid risk of electric shock, Class I products must only be connected to a supply mains with protective earth.

At the end of their service life electric and electronic equipment and their accessories shall not be discarded with the municipal waste but be disposed of using separate collection, treatment, recovery/recycling and environmentally sound disposal. This also applies to any potentially bio hazardous parts and accessories. If in doubt, contact your local authorities to determine the proper method.

Technical specifications for your product: see tables, the marking on the product or www.mascot.no

Cautions to observe prior to use

- The intended use for this product is to charge a battery or a battery powered electrical accessory (NiCd/NiMH, Lead-Acid, Lithium-Ion or $LiFePO_4$ batteries) or to be used as a Power Supply to power an electrical accessory. Please see the marking on the product you have to verify the type of product you have and read the applicable instructions and technical specifications included with this manual.

- This product may be used by unskilled operators, under the condition that these instructions are followed.

- Unskilled operators may contact the supplier or manufacturer for assistance, if needed, in setting up, using or maintaining this product and to report unexpected operation or events.

- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Do not allow small children to handle this product while unattended as cables may represent a risk for strangulation and small parts may represent a risk for inhalation or swallowing.

- Do not allow animals to come into contact with this product. Some animals are known to cause damage to cables etc which may be a potential for risk of electric shock and excessive temperatures. Also, cables and small parts may represent a strangulation risk for the animal.

- If the product is equipped with a mains cord, please check that the cord is not damaged. If the cord is damaged, the product must not be used until the cord is replaced. Replacement should be carried out by qualified personnel.

- The mains socket outlet used should always be easily accessible to facilitate immediate removal of the products mains supply should an operational error occur during use. If the product has a detachable mains cord the appliance coupler may be used as a disconnect device.

- The product is “switched on” by inserting the mains plug into the mains socket and “switched off” by disconnecting the mains plug from the mains socket.

- The product may be connected to an IT type mains supply.

- For use in U.S.A.:
  - Be sure to use 125V 15A receptacle configuration before plugging in.
  - Use a UL817-standard compliant mains cord (plug type NEMA 1-15, cord type SJT or SVT).

- For use outside U.S.A:
  Use a mains cord compliant with the country specific requirements.

- The time from powering this product until its full function starts may exceed 15 seconds.

- Should an operational error or unexpected change in the performance occur during use, disconnect the product from the mains immediately by disconnecting the mains plug from the mains socket and contact the supplier or manufacturer (see contact details on the front of this document).

- When not in use please think about disconnecting the product from the mains. This will reduce the risk of hazards, reduce the products environmental impact and save electricity costs.

- To avoid overheating make sure there is sufficient room for the circulation of air around the product when in use. Do not cover it up.

- Even though this product complies with relevant safety standards it should not be in contact with human skin for long periods as some people may get allergies or injuries from long-term contact with moderate temperatures and/or plastic materials.

- Prior to using this product with accessories and/ or interconnected equipment please carefully read its respective User Manuals.

- If the product is supplied with exchangeable output plugs, please see separate page for assembly.

- Output cables having a modular plug (similar to a telephone connector) must never be connected to a telephone outlet.

- Products with a welded plastic housing or rated IP 67 are not repairable. For such products the supply cord cannot be replaced. If the cord is damaged the appliance should be scrapped. Please contact your supplier for replacement part.

- This product contains hazardous voltages and there are no user replaceable parts inside the product. Never attempt to remove the cover.

  WARNING: No modification of this equipment is allowed. Any repair/service should be carried out by qualified personnel who may get assistance by contacting the manufacturer or the manufacturer's agent.

- Products specified to have automatic polarity protection must be switched off if a battery is connected with reverse polarity. The protection will be automatically reset when the polarity has been corrected.

- In chargers specified to have a replaceable fuse as polarity protection the fuse must be replaced if the battery has been connected with reverse polarity. When replacing the fuse, a fuse of the same type and rating must be used.

- If the product is specified to comply with the standard for Medical Electrical Equipment (standards based on IEC60601-1) it complies with some of the requirements for medical electrical equipment and may be used in medical applications and hospital environments.

- The product must be kept away from sources of heat and may not be used in the vicinity of flammable anesthetic gases or in other environments with flammable or explosive atmosphere.

- If the product is specified to comply with the standard for Medical Electrical Equipment for Home Healthcare Environment (standard IEC60601-1-11) it may be used in medical applications used in a home healthcare environment.

  NOTE! Products relying on safety earth for protection (Class I) may not be used in home healthcare environment unless they are permanently wired to the building installation: Installation must only be carried out by qualified service personnel, following the below instructions:
  - The protective earth conductor must be min. 0.75 mm^2.
  - Connect the protective earth conductor to the external protective earthing system.
  - Verify that the protective earth terminal used is connected to the external protective earthing system.
  - Verify the integrity of the external protective earthing system.

- This product converts the mains voltage to a safety extra low voltage.
  The output from products applying with 2MOPP insulation (model names followed by "P") may be treated as Applied Part Type B or Type BF according to standard EN/IEC 60601-1 and may come in physical contact with a patient. The housing of the product shall not be allowed to contact the patient.

- This product must be operated in an environment within temperature range +5 to +40°C, humidity 15 - 93 % RH and atmospheric pressure 70 - 106 kPa (700 - 1060 hPa). If the product has recently been stored or transported at conditions outside this range, please wait for 30 minutes before operating the product.

- Expected service life of this product and accessories delivered with this product is three (3) years, if operated as indicated above. However, the guarantee times indicated in document "TERMS OF SALES AND DELIVERY FOR MASCOT AS" apply (available at www.mascot.com).

- Environmental parameters during transport and storage between uses: temperature range -25 to +85 °C, humidity 15 - 93% RH NC and atmospheric pressure 70 - 106 kPa (700 - 1060 hPa).

- If stored for longer periods of time the environmental parameters should be within the temperature range +5 to +35°C, humidity range 10 - 75% RH NC and atmospheric pressure 70 - 106 kPa (700 - 1060 hPa) to maintain the products expected service life.

- Expected shelf life of this product is one (1) year, if stored as indicated above.

- This product complies with the requirements to electromagnetic compatibility for medical electric equipment and for use in residential, office or light industrial environment but all electric products imply a potential for electromagnetic or other interference between the product and other devices. If such interference is suspected please disconnect the product from the mains and consult a qualified technician, your supplier or the manufacturer.

- No special maintenance procedure is required but if the product gets dusty or dirty it should be wiped clean using a dry cloth while the product is disconnected from the mains. No other maintenance should be necessary.

- For products having a plastic casing, please avoid any contact with lotions, oils, grease and solvents as most types of plastic may be degraded by such chemicals. Also make sure to position, operate and store such products away from UV-light and direct sunlight.

- Position, operate and store this product only under reasonable foreseeable environmental conditions with respect to magnetic fields, EM-fields, electrostatic discharges, pressure or variations in pressure, acceleration etc.

- If this product is used with or mounted in a vehicle it may only be used when the vehicle is not in use.

- When in use, position this product so that the label can be read – within 40 cm of the operator.

- Turn the product off and allow it's housing to cool down prior to moving it to another location.

Instructions for charging NiCd and NiMH batteries

Charger functionality

This charger is a fast charger for NiCd/NiMH batteries. The standard version utilizes a method called -dV detection for charge termination when the batteries are fully charged. This method is based on the fact that the voltage drops over the NiCd/NiMH cells when the batteries are fully charged. This voltage drop is detected when the voltage has dropped a certain percentage from the highest value. If this drop does not occur, the charger has a safety timer which will terminate charging after a given time period to avoid overcharging the batteries.

A few cells may have a voltage drop in the first part of the charge cycle. This is especially true for battery cells which have been idle for a longer period of time. Because of this, a timer is built into the charger which prevents -dV detection the first minutes of the charge cycle.
As the charger is programmable, it is possible that the standard parameters, which this user manual is based on, have been changed. See separate user manual or contact supplier for additional information.

Cautions before charging NiCd and NiMH batteries

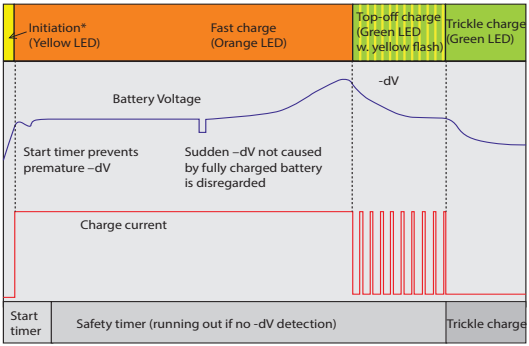
- NiCd/NiMH chargers are designed for charging NiCd and NiMH batteries only.
- Make sure you have the correct battery charger for the battery you wish to charge. The number of cells must correspond to the output indicated on the charger. **Never charge more battery cells than the charger is made for.**
- When charging separate battery cells, avoid charging cells with different rest capacities at the same time.
- Do not attempt to charge batteries that are not rechargeable.
- Please check that the specification for your battery allows for the maximum charge current indicated on the charger. If in doubt, contact the battery manufacturer for details.
- Please check that the specification for your battery allows for the environmental conditions present during charging.
  Do not charge batteries at too high or too low temperatures.
- Please ensure correct polarity when connecting to the battery terminals. Reverse polarity connection may, in some chargers (see the charger's specification), result in a fuse rupturing, leaving the charger useless.
- The charge cycle starts when the charger is connected to the mains.
- If the charger is disconnected from the mains voltage during a charge cycle the charger will start a new charge cycle when it is reconnected to the mains.
- When charging is complete, disconnect the charger from the mains before removing battery connections.

Safety features

The embedded microprocessor & charge program has numerous features for safe battery charging

- The -dV level will adapt to the number of cells and will be approximately equally sensitive for all number of cells.
- The safety timer will protect the batteries if a -dV signal fails to appear during charging. It is normal to have a safety timer that is longer than the max. charge time.
- Some battery cells may give a voltage drop during the initial part of the charge cycle. To avoid interruption of the charge cycle the charger has a timer that prevents -dV detection during the first minutes of the charge cycle.
- The charger is programmed to disregard large voltage fluctuations due to connection of external loads etc. Such false -dV signals will be detected by the software and will be disregarded.
- Top-off charge following –dV detection ensures that all cells in a battery pack reaches full capacity (are balanced) prior to trickle charge.
- The charger output is protected against reverse polarity, in most cases by an automatically resettable fuse.
- The charger is designed for the lowest possible leakage current from the battery when mains is disconnected (<1mA). Even so, it is recommended that the batteries are disconnected from the charger when mains is not connected.
- On request the charger may be supplied with battery temperature monitoring. A built-in temperature change control (+dT/dt) secures optimal charge with a built-in NTC resistor in the battery pack.
- Other functions such as 0dV detection and timer only charge is available upon request. Most charge parameters may be altered using an external programming tool. Contact Mascot for details.

How to use the type A charger (CPM)



Start the charger by connecting the battery pack to the charger and then connecting the charger to the mains.

The LED (light emitting diode) will be yellow before the fast charge starts and the LED changes to orange. When the batteries are fully charged and the voltage drops because of the -dV signal from the batteries, the charger will go into a top-off charge mode before it goes over to trickle charge mode. During top-off charge the LED will be green with a short intermittent yellow light. When the top-off charge is completed, the charger will go into trickle charge mode and the LED will be green. The charge current is now reduced to a safe level, which allows the charger to stay connected to the battery without damaging the cells.

If the safety timer runs out before –dV is detected, the charger will go directly to trickle charge mode (no top-off charge) and LED will be continuously green. If the battery voltage is far below normal, the charger will stop the fast charge current and go to trickle charge mode. The LED will then indicate "error" by flickering green and orange light.

You may manually start a new charge cycle by disconnecting mains input and connecting it again.

To charge another/next battery pack, first pack must be disconnected for approx. 15 sec. When LED is yellow, you may connect the next battery.

LED indications

LED	MODE
YELLOW	Battery not connected
YELLOW	Battery initialisation and analysis
ORANGE	Fast charge
GREEN with intermittent YELLOW flash	Top-Off Charge
GREEN	Trickle Charge
Alternating ORANGE-GREEN	ERROR

When the mains is connected the LED will be orange for the first seconds and then turn to yellow when the initialisation and analysis starts. If a battery is connected, the actual charging will start a few seconds later when the LED changes to orange. After the start-timer period has run out (the first few minutes of the charge cycle when the –dV detection is disabled), the LED will be green for approx. 8 seconds. This is a signal for testing and service only. When -dV has been detected, the start of the top-off charge is indicated with a green LED with intermittent yellow flashes. The LED is green during trickle charge.

Temperature control (optional feature)

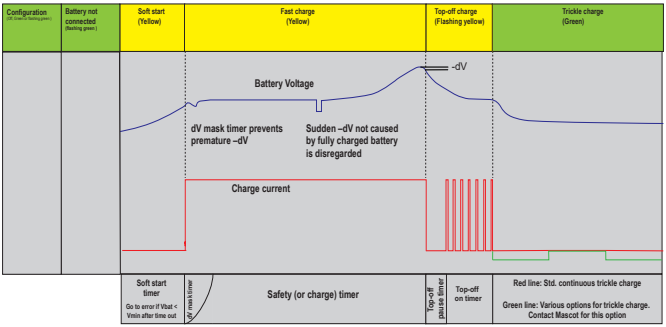
If the charger is used with a temperature sensor (NTC-resistor in the battery) it is possible to add temperature control to the battery charging process. If the battery temperature is too low (< 0°C) at the start of the charge cycle, the charger will charge with low current until the temperature level is safe. This is indicated by an intermittent orange flash while the LED is green. Charger will also enter low current wait mode if battery temperature is above 40 °C. The current will then remain low until the temperature is at a level where fast charge can start. If battery temperature exceeds max. charge temp. (60 °C) charger enters error mode. The LED will show "error" by intermittently flashing orange and green. By using the temperature increase control (+dT/dt), the charger will switch to top-off charge and later to trickle charge the same way as charging with -dV control.

NOTE. The charger may be programmed for other temperature parameters. See a separate user manual or contact supplier for additional information.

Zero dV feature (optional feature)

If zero dV has been activated, the charger will stop the fast charge when the voltage has not increased the last 5 minutes. This feature may be the only sensor, or it may be used in combination with -dV and/or +dT/dt

How to use the type B charger (CBC)



Start the charger by connecting the battery pack to the charger and the charger to the mains.
The LED indicator will be flashing green if no battery is connected. When the battery is connected to the output of the charger the LED will be yellow and remain in this state until battery is fully charged, and fast charge is terminated. Charger apply low current soft start on deeply discharged batteries. If voltage does not reach normal level within a certain time, charger will enter error mode, shown by 4 red flashes in the LED.

When –dV, +dT/dt or other EoC method is detected, the charger enters top-off mode. This is controlled overcharge to make sure all cells are fully charged. LED indication is flashing yellow.

After top-off period is ended the LED indicator will change to green showing that battery is fully charged. The charge current is now reduced to a safe level, which allows the charger to stay connected to the battery without damaging the cells. Several options for trickle charge are available.

If the safety timer run out before -dV (or +dT/dt) is detected, the charger will go directly to trickle charge mode (no top-off charge) and LED will be green.

You may manually start a new charge cycle by disconnecting mains input and connecting it again.

LED indications

CHARGE INDICATIONS

Flashing green: Battery not connected
Yellow: Fast charge (or soft start)
Flashing yellow: Top-off
Green: Trickle

WAIT MODE INDICATIONS

Yellow with 1 red blink: Battery temperature is too low (<0°C)
Yellow with 2 red blinks: Battery temperature is too high (>40°C)

ERROR INDICATIONS

2 red blinks: Battery is connected to charger with wrong polarity!
3 red blinks: Charger output is shorted. Check output cable connection!
4 red blinks: Battery voltage is low. Check battery status or voltage. (ss timer)
5 red blinks: Warm error. Temperature >60°C
6 red blinks: NTC missing or short (if mandatory)

LED off: Battery voltage is too high. Check battery voltage.

Temperature control (optional feature)

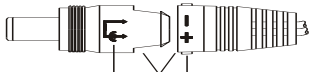
If the charger is used with a temperature sensor (NTC-resistor in the battery) it is possible to add temperature control to the battery charging process. If the battery temperature is too low (< 0°C) at the start of the charge cycle, the charger will enter no current wait mode until the temperature level is safe. This is indicated by yellow LED with 1 red blink. Charger will also enter wait mode if battery temperature is above 40 °C, and this is indicated by yellow LED with 2 red blinks. The charger will be in no current wait mode until the temperature is at a level where the charging can start. If the temperature is too high for safe charging (> 60°C), the LED will show "error" by 5 red blinks. When using the temperature increase control (+dT/dt), the charger will switch to top-off charge and later to trickle charge the same way as charging with -dV control.

NOTE. The charger may be configured for other temperature parameters or contact supplier for additional information.

Zero dV feature (optional feature)

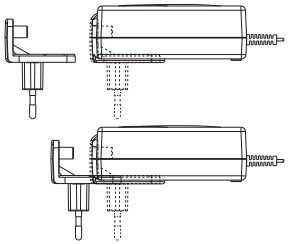
If zero dV has been activated, the charger will stop the fast charge when the voltage has not increased during specified time. You may use 0dV alone or in combination with -dV and/ or +dT/dt. This function is normally only used in special cases.

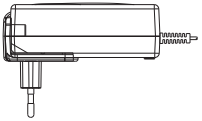
How to connect exchangeable DC-output plugs



1. To connect for desired polarity, both plug ends are clearly marked.
2. When connected, the female plug is also marked on each side to identify plug polarity.
3. Shows the center polarity of the plug.

How to connect exchangeable AC-plugs





The following exchangeable AC plugs are available:

"EURO"	250V 2.5A (EN50075/IEC83 C5 II)
"US"	125V 2.5A (NEMA 1-15 / CSA-C22.2 No.42)
"UK"	250V 2.5A (BS 1363)
"AUS"	250V 2.5A (AS/NZS 3112)

Mains Cord Set is available on request if you wish your product to be "DeskTop"

Mounting and use for bracket Mascot, part no. 205800

Wall mount: Fix the bracket to the wall using screws suitable for the wall material and:
head diameter: 8 - 9.5 mm, head height: max. 3 mm,
thread diameter: 4 - 5.5 mm, thread length: min. 16 mm.
Use one screw for each of the oval openings in the bracket, total four screws.
Place the Power Supply / Charger centred on the bracket so that the slot in the bottom housing is in line with the tabs on the bracket.
Push down on the handle marked "Push" while pushing the product against the wall. Release and the product locks to the wall mount.
Release the product from the wall mount by pushing down on the handle marked "Push" while pulling the product from the wall.
If not fixed to a wall the bracket may be used as a handle, following the same procedure.

Electromagnetic Compatibility

In order to regulate the requirements for EMC (electromagnetic compatibility) with the aim of preventing unsafe product situations, the EMC EN60601-1-2 standard has been implemented. This standard defines the levels of immunity to electromagnetic interference as well as maximum levels of electromagnetic emissions for medical devices. Medical devices manufactured by Mascot have been tested and conform with the requirements of IEC/EN 60601-1-2, 3rd & 4th edition, nevertheless, special precautions may need to be observed:
The Mascot products are suitable for use in Domestic, Residential, Office and Hospital environments, except in special locations where EM Disturbances are known to be high, such as near High Frequency Surgical Equipment or Magnetic Resonance Imaging systems.
When used according to its specification the User can expect the product to fulfil its essential performance, being powering Medical Electrical Devices or charging batteries for Medical Electrical Devices.

WARNING: Use of this equipment adjacent to or stacked with other equipment should be avoided because it may result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.

WARNING: Use of accessories, transducers and cables other than provided by the manufacturer could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.

WARNING: Portable RF communications equipment should be used no closer than 30 cm (12 inches) to any part of the power supply or battery charger, including cables. Otherwise, degradation of the performance of this equipment could result.

GUIDANCE AND MANUFACTURER'S DECLARATION
The Masot products are intended for use in the electromagnetic environment specified below. The customer or user should ensure that it is used in such an environment.

Test / Standard	Compliance level	Guidance
Emission:		
RF emissions, CISPR 11	Group 1, Class B	Suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes. RF emissions not likely to cause any interference in nearby electronic equipment. However, a separation distance of 30 cm shall be maintained.
Harmonic emissions, IEC 61000-3-2	-	
Voltage fluctuations / flicker emissions, IEC 61000-3-3	-	

Test / Standard	Compliance level	Guidance
Immunity:		
Electrostatic discharge (ESD), IEC 61000-4-2	± 8 kV contact ± 15 kV air	Temporary loss of function may be experienced while the product is subject to the phenomena. The product is expected to recover to its normal operation.
Electrostatic fast transient / burst, IEC 61000-4-4	± 2 kV for AC-power lines ± 1 kV for output lines	
Surge, IEC 61000-4-5	± 1 kV line to line ± 2 kV line to earth (if applicable).	
Voltage dips, short interruptions and voltage variations on power supply lines, IEC 61000-4-11	<5% U_T (0.5 cycle) 40% U_T (5 cycles) 70% U_T (25 cycles) <5% U_T for 5 s U_T = AC Input Voltage prior to test.	
Power frequency magnetic field IEC 61000-4-8	3 A/m (50/60 Hz)	Not applicable for non-magnetic field sensitive devices.
Conducted RF, IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	Temporary loss of function may be experienced while the product is subject to the phenomena. The product is expected to recover to its normal operation.
Radiated RF, IEC 61000-4-3	3V/m for Professional healthcare environment. 10 V/m for Home Healthcare environment. 80 MHz to 2.7 GHz	

These guidelines may not apply in all situations.
Electromagnetic propagation is affected by absorption and reflection from structures, objects and people and field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcasts and TV broadcasts cannot be predicted theoretically with accuracy.
To assess the electromagnetic environment due to fixed RF transmitters an EM site survey may be considered. If the measured field strength in the location exceeds the applicable RF compliance level above, the Mascot product should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the product.

Common technical data

NiCd/NiMH versions: (cells in series):	3-6 cell	4-8 cell	5-10 cell	6-12 cell	10-20 cell	12-25 cell	15-30 cell
No-Load Voltage	12.8 V ± 0.7 V	16.5 V ± 1.0 V	21.0 V ± 1.2 V	24.7 V ± 1.5 V	41.0 V ± 2.0 V	51 V ± 2 V	55 V ± 3 V
Min. output voltage for -ΔV detection	3.7 V	5.0 V	6.2 V	7.5 V	12.5 V	15 V	19 V
Max. output voltage for -ΔV detection	10.8 V	14.4 V	18.0 V	21.6 V	36.0 V	45 V	49.5 V

TYPE A CHARGER

Specific technical data

	2115/2116	2015	2215/2216	2415	2515	3015
Input voltage : current : frequency:	100 - 240 VAC max.0.35 A 50 - 60 Hz	230 - 240 VAC max.0.5 A 50 - 60 Hz	100 - 240 VAC max.0.9 A 50 - 60 Hz	100 - 240 VAC max. 1.3 A 50 - 60 Hz	10 – 30 VDC max 4A	10-30 VDC max 8A
Max. Output Power	16 W	40 W	35 W	67 W	32 W	67 W
Protection at input	Fuse: T1.0 AH 250 V, 5 x 20 mm	Fusible resistor	Fuse: T1.6 AH 250 V, 5 x 20 mm	Fuse: T2.5 AH 250 V, 5 x 20 mm	5 A fuse on input cable.	10A fuse on input cable
Protection against ingress of water (IEC 60529)	IP4X (IP67 available)	IP3X	IP4X (IP67 available)	IP4X (IP67 available)	IP4X (IP67 available)	IP4X (IP67 available)
Insulation Class	Class II	Class II	Class II	Class II	Class III, common minus	Class III, common minus
Dimensions (LxWxH)	90x45x32mm (2115) 103,5x46,8x38,7mm (2116)	100x63x47mm	107x67x36,5mm (2215) 117x75x44mm (2216)	135x80x44mm	107x67x36,5mm	135x80x44mm
Weight	125g / 150g	220g	250g	350g	250g	350g
Input terminals	- Non-detachable mains cord or 2-pin connector (IEC 60320/C8) for detachable mains cord set (2115, 2215, 2116, 2216 and 2415 only) - Exchangeable AC adapters (model 2116 and 2216 only). 2015 has fixed plug-in connector. - DC/DC chargers 2515 and 3015 has cable in and out.					

Fast charge current/ Top-off current/ Trickle current, std. models*

		2115/2116	2015	2215/2216	2415	2515	3015
2-cell	Fast charge: Top-off charge: Trickle charge:	1.3 A ± 100 mA 160 mA ± 30 mA 30 mA ± 15 mA					
3-6 cell	Fast charge: Top-off charge: Trickle charge:	1.3 A ± 100 mA 160 mA ± 30 mA 30 mA ± 15 mA	3.5 A ± 250 mA 480 mA ± 100 mA 150 mA ± 50 mA	3.0 A ± 250 mA 390 mA ± 80 mA 100 mA ± 50 mA	4.5 A ± 350 mA 630 mA ± 100 mA 150 mA ± 50 mA	2.5 A ± 250 mA 390 mA ± 80 mA 100 mA ± 50 mA	
4-8 cell	Fast charge: Top-off charge: Trickle charge:	1.0 A ± 100 mA 130 mA ± 30 mA 30 mA ± 15 mA	2.8 A ± 200 mA 400 mA ± 80 mA 150 mA ± 50 mA	2.2 A ± 150 mA 310 mA ± 80 mA 100 mA ± 50 mA	4.0 A ± 300 mA 560 mA ± 100 mA 130 mA ± 50 mA	2.2 A ± 150 mA 310 mA ± 80 mA 100 mA ± 50 mA	
5-10 cell	Fast charge: Top-off charge: Trickle charge:	0.8 A ± 100 mA 110 mA ± 30 mA 30 mA ± 15 mA	2.2 A ± 150 mA 330 mA ± 70 mA 150 mA ± 50 mA	1.8 A ± 150 mA 270 mA ± 70 mA 100 mA ± 50 mA	3.5 A ± 300 mA 480 mA ± 70 mA 100 mA ± 50 mA	1.8 A ± 150 mA 270 mA ± 70 mA 100 mA ± 50 mA	
6-12 cell	Fast charge: Top-off charge: Trickle charge:	0.7 A ± 100 mA 100 mA ± 30 mA 30 mA ± 15 mA	1.8 A ± 150 mA 270 mA ± 60 mA 100 mA ± 50 mA	1.5 A ± 100 mA 240 mA ± 60 mA 100 mA ± 50 mA	3.0 A ± 200 mA 420 mA ± 60 mA 100 mA ± 50 mA	1.5 A ± 100 mA 240 mA ± 60 mA 100 mA ± 50 mA	
10-20 cell	Fast charge: Top-off charge: Trickle charge:	0.4 A ± 50 mA 65 mA ± 20 mA 25 mA ± 10 mA	1.2 A ± 150 mA 160 mA ± 50 mA 50 mA ± 25 mA	0.9 A ± 150 mA 130 mA ± 40 mA 50 mA ± 25 mA	1.8 A ± 150 mA 250 mA ± 50 mA 60 mA ± 30 mA	0.9 A ± 150 mA 130 mA ± 40 mA 50 mA ± 25 mA	
12–25 cell	Fast charge: Top-off charge: Trickle charge:				1.5 A ± 100 mA 210 mA ± 50 mA 50 mA ± 30 mA		
15–30 cell	Fast charge: Top-off charge: Trickle charge:				1.3 A ± 100 mA 170 mA ± 50 mA 50 mA ± 30 mA		
40-cell	Fast charge: Top-off charge: Trickle charge:				1.0 A ± 100 mA 150 mA ± 40 mA 60 mA ± 25 mA		1.0 A ± 100 mA 150 mA ± 40 mA 60 mA ± 25 mA

* For custom versions see marking on product

For import to the U.S.A.: see the U.S. DOE Compliance Certification Database for maximum battery capacity allowed

TYPE B CHARGER

Specific technical data

	3546	3743	3540 (115VAC)	3540 (230VAC)
Input voltage : current : frequency:	100 - 240 VAC max.0.7 A 50 - 60 Hz	100 - 240 VAC max.0.5 A 50 - 60 Hz	110 - 120 VAC max.4.3 A 50 - 60 Hz	220 - 240 VAC max.2.4 A 50 Hz
Max. Output Power	30 W	16 W	252 W	294 W
Protection at input	Fuse: T1.6 AH 250 V, 5 x 20 mm	Fuse: T1.0 AH 250 V, 5 x 20 mm	Fuse: T6.3 AH 250 V, 5 x 20 mm	Fuse: T3.15 AH 250 V, 5 x 20 mm
Protection against ingress of water (IEC 60529)	IP4X	IP41	IP41/IP44	
Insulation Class	Class II	Class II	Class II	
Dimensions (LxWxH)	123x49.5x37mm	108.5x49x29.3mm	210x113x53mm	
Weight	220g	150g	With mains cable 1400g. With IEC60320 1150g	
Input terminals	2-pin connector (IEC 60320/C8) for excangeable mains plug (EU, US, UK and AUS) or detachable mains cord set		Non-detachable mains cord or 2-pin connector (IEC 60320/C8) for detachable mains cord set (220-240VAC version only)	

Common technical data

NiCd/NiMH versions: (cells in series):	2-cell	3-6 cell	4-8 cell	5-10 cell	6-12 cell	10-20 cell	22-cell
Min. output voltage for -ΔV detection	2.5 V	3.7 V	5.0 V	6.2 V	7.5 V	12.5 V	27.5 V
Max. output voltage for -ΔV detection	3.4 V	10.2 V	13.6 V	17.0 V	20.4 V	34V	37.4 V

Fast charge current/ Top-off current/ Trickle current, std. models*

		2-cell	3-6 cell	4-8 cell	5-10 cell	6-12 cell	10-20 cell	20-22 cell
3546(P) 3546B(P)	Fast charge: Top-off charge: Trickle charge:	2,5 A ± 100 mA 300 mA ± 50 mA 100 mA ± 25 mA	2,2 A ± 100 mA 310 mA± 50 mA 100 mA ± 25 mA	2 A ± 100 mA 290 mA ± 50 mA 100 mA ± 25 mA	1,6A ± 100 mA 250 mA ± 50 mA 100 mA ± 25 mA	1,3A ± 100 mA 220 mA ± 30 mA 100 mA ± 25 mA	0,8 A ± 50 mA 125 mA ± 20 mA 50 mA ± 15 mA	NA
3743(P) 3743B(P)	Fast charge: Top-off charge: Trickle charge:	1,3 A ± 100 mA 160 mA ± 30 mA 30 mA ± 15 mA	1,3 A ± 100 mA 160 mA ± 30 mA 30 mA ± 15 mA	1,0 A ± 100 mA 130 mA ± 30 mA 30 mA ± 15 mA	0,8 A ± 100 mA 110 mA ± 30 mA 30 mA ± 15 mA	0,7 A ± 100 mA 100 mA ± 30 mA 30 mA ± 15 mA	0,4 A ± 50 mA 65 mA ± 20 mA 25 mA ± 10 mA	NA
3540(P) & 3540B(P) 115VAC	Fast charge: Top-off charge: Trickle charge:	20A ± 0.4A 2.9A ± 0.4A 1A ± 0.4A	20A ± 0.4A 2.9A ± 0.4A 1A ± 0.4A	17,5A ± 0.4A 2.65A ± 0.4A 1A ± 0.4A	14A ± 0.4A 2.3A ± 0.4A 1A ± 0.4A	11,6A ± 0.4A 2.06A ± 0.4A 1A ± 0.4A	7.0A ± 0.3A 1.15A ± 0.2A 0.5A ± 0.1A	6.3A ± 0.3A 1.08A ± 0.2A 0.5A ± 0.1A
3540(P) & 3540B(P) 230VAC	Fast charge: Top-off charge: Trickle charge:	20A ± 0.4A 2.9A ± 0.4A 1A ± 0.4A	20A ± 0.4A 2.9A ± 0.4A 1A ± 0.4A	20A ± 0.4A 2.9A ± 0.4A 1A ± 0.4A	16,3A ± 0.4A 2.53A ± 0.4A 1A ± 0.4A	13,6A ± 0.4A 2.26A ± 0.4A 1A ± 0.4A	8.1A ± 0.3A 1.26A ± 0.2A 0.5A ± 0.1A	7.4A ± 0.3A 1.19A ± 0.2A 0.5A ± 0.1A

P=2MOPP version. B=Special open frame PCB.

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TYPE B CHARGER

Specific technical data

	4040
Input voltage : **current :** **frequency:**	100 - 240 VAC max.1.6 A 50 - 60 Hz
Max. Output Power	118 W
Protection at input	Fuse: T3.15 AH 250 V, 5 x 20 mm
Protection against ingress of water (IEC 60529)	IP41/IP44
Insulation Class	Class II. Class I on request
Dimensions (LxWxH)	203.5 × 87 × 43.5 mm
Weight	590g
Input terminals	Non-detachable mains cord or for detachable mains cord set: 2-pin AC-inlet (IEC 60320/C8) or 3-pin AC-inlet (IEC 60320/C6)

Common technical data

NiCd/NiMH versions: (cells in series):	4-6 cell	6-8 cell	8-12 cell	12-20 cell	20-30 cell	25-40 cell
No-Load Voltage	12.8 V ± 0.7 V	15.0 V ± 1.0 V	23.0 V ± 1.5 V	36.9 V ± 2.0 V	54.0 V ± 2.0 V	67.5 V ± 2.0 V
Min. output voltage for -ΔV detection	5.0 V	7.8 V	10.4 V	15.6 V	26.0 V	32.5 V
Max. output voltage for -ΔV detection	10.2 V	13.6 V	20.4 V	34.0 V	51.0V	64.0 V

TYPE B CHARGER

Specific technical data

	4340
Input voltage : current : frequency:	100 - 240 VAC max.1.5 A 50 - 60 Hz
Max. Output Power	80 W
Protection at input	Fuse: T3.15 AH 250 V, 5 x 20 mm
Protection against ingress of water (IEC 60529)	IP4X/IP44
Insulation Class	Class II. Class I on request
Dimensions (LxWxH)	172.5 × 73 × 42 mm
Weight	400g
Input terminals	Non-detachable mains cord or for detachable mains cord set: 2-pin AC-inlet (IEC 60320/C8) or 3-pin AC-inlet (IEC 60320/C6)

Common technical data

NiCd/NiMH versions: (cells in series):	3-6 cell	4-8 cell	6-8 cell	5-10 cell	6-12 cell	8-12 cell	10-20 cell	15-30 cell	20-40 cell
No-Load Voltage	12.8 V ± 0.7 V	15.0 V ± 1.0 V	15.0 V ± 1.0 V	19.2 V ± 1.2 V	23.0 V ± 1.5 V	23.0 V ± 1.5 V	36.9 V ± 2.0 V	54.0 V ± 2.0 V	67.5 V ± 2.0 V
Min. output voltage for -ΔV detection	3.75V	5.0V	7.5V	6.25V	7.8V	10.4V	13.0V	19.5V	26.0V
Max. output voltage for -ΔV detection	10.2V	13.6V	13.6V	17.0V	20.4V	20.4V	34.0V	51.0V	64.0V

Fast charge current/ Top-off current/ Trickle current, std. models*

		4-6 cell	6-8 cell	8-12 cell	12-20 cell	20-30 cell	25-40 cell
4040(P) 4040B(P)	Fast charge: Top-off charge: Trickle charge:	10A ± 100mA 1.3A ± 100mA 400mA ± 50mA	8.0A ± 100mA 1.0A ± 100mA 300mA ± 50mA	5.4A± 100mA 720mA ± 100mA 200mA ± 50mA	3.2A ± 100mA 500mA ± 100mA 200mA ± 50mA	2.18A ± 100mA 400mA ± 50mA 200mA ± 50mA	1.80A ± 100mA 270mA ± 50mA 100mA ± 25mA

		3-6 cell	4-8 cell	6-8 cell	5-10 cell	6-12 cell	8-12 cell	10-20 cell
4340(P) 4340B(P)	Fast charge: Top-off charge: Trickle charge:	7.0A ± 200mA 950mA ± 100mA 200mA ± 50mA	5.4A ± 200mA 730mA ± 100mA 200mA ± 50mA	5.4A ± 200mA 730mA ± 100mA 200mA ± 50mA	4.7A ± 200mA 650mA ± 100mA 200mA ± 50mA	3.9A ± 200mA 560mA ± 100mA 200mA ± 50mA	3.9A ± 200mA 560mA ± 100mA 200mA ± 50mA	2.35A ± 200mA 370mA ± 100mA 150mA ± 50mA

		15-30 cell	20-40 cell
4340(P) 4340B(P)	Fast charge: Top-off charge: Trickle charge:	1.55A ± 100mA 245mA ± 50mA 100mA ± 25mA	1.25A ± 100mA 210mA ± 50mA 100mA ± 25mA

P=2MOPP version. B=Special open frame PCB.

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