Made in Germany

Operating Manual

HS 12/24-120

HS 12/24-120B

Charger for 12V und 24 V Lead- and Li-Ion Rechargeable Batteries

Charging Current up to 120 A

Article-No.: 328 xxx GB
Revision: 0.1 – Translation
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Be sure you have read and understood this operating manual before starting any work!

Keep operating manual for later use!

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1 General Information

1.1 Information concerning this operating manual

This operating manual will enable you to work efficiently and safely with this equipment.
The manual is an essential part of this product and must be stored ready at hand not far from the equipment, so that people can use it at any time without any problems. Operators must read and understand the manual before they carry out any work. Compliance with any and all information contained herein concerning health, safety and safe behaviour and procedures is a prerequisite for safe work.
Additionally, shall apply any and all local accident prevention regulations, any and all general safety regulations, that may apply to the scope of application of this equipment.
Pictures, drawings etc. contained in this operating manual are supposed to convey a general understanding of facts. In details, they may deviate from the reality you encounter.
Besides this operating manual, there may be specific instructions for units, components etc. They shall apply accordingly.

1.2 Copyright

1.3 Symbols

Safety information

This manual uses symbols to highlight important safety information. In addition, there is always a signal word heading the information indicating the severity of the danger or hazard that may be encountered.

Be sure to comply with any and all safety information. Proceed with care and circumspection. Prevent accidents and damage to people and property.

Warnings

	**DANGER!** … indicates a situation that is imminently dangerous and will entail the death of people and severe injuries unless it is properly avoided and prevented.
	**WARNING!** ... indicates a situation that may become dangerous and may entail the death of people and severe injuries unless it is properly avoided and prevented.
	**CAUTION!** ... indicates a situation that may become dangerous and may entail medium and small injuries unless it is properly avoided and prevented.

	**CAUTION!** … indicates a situation that may become critical and may entail damage to property unless properly avoided and prevented.
	**Electric Shock** Danger to life due to electricity
	**Warning about dangers due to batteries** Danger to persons and property due to incorrect handling.
	**Danger to life due to corrosive substances!** Battery acid is corrosive.
	**Danger to life due to explosive gases!** Danger of explosion due to oxyhydrogen during charging of batteries. Avoid fire, open light and generating sparkles.
	**Harmful substances** Danger due to toxic, at least harmful vapors.
	**Stumbling hazards** Danger of injuries due to stumbling and falling.

Personal protective equipment (PPE)

	**Non-inflammable safety clothing** is a tight-fitting sort of special clothing that is not inflammable, covers arms and legs completely and tears easily (instead of getting pulled in). Its main purpose is to protect against burns.
	**Face screen** protects the face and eyes against splashes, flying sparks and other hot particles.
	**Safety gloves** protects the hands against splashes, flying sparks and other hot particles. Never use wet gloves.

Tips and recommendations

	***NOTE!*** *... highlights information that may be helpful to maintain efficient and trouble-free operation.*

1.4 Disclaimer

Any and all information contained in this operating manual has been written on the basis of pertinent standards and regulations, the state of the art, and the long-standing insights and experience of our staff.

The manufacturer cannot be made liable for damage due to:

- Non-compliance with this operating manual
- Non-compliance with the purpose and intent of this equipment
- Deployment of unskilled personnel
- Unauthorised constructional changes, alterations etc.
- Unauthorised changes, modifications etc. to design and engineering etc.
- Use of unauthorised spare and wear parts

The scope of the delivery you actually receive may deviate from explanations and/or representations in this manual - if and when you ordered special options, your equipment is a special design and/or technical progress facilitates improvements.
Shall apply: any and all obligations and stipulations of the Delivery Contract, the General Terms of Business and Terms of Supply and Delivery of the manufacturer as well as any and all legal stipulations and regulations in force on the day the Contract was concluded.
We constantly strive to further develop and improve our products and their functionality. We, therefore, reserve the right to implement technical changes without notice.

1.5 Warranty and guarantee

The guarantee conditions shall be as stipulated in the General Terms of Business of the manufacturer.

1.6 Customer Service

Our customer service will be happy to provide technical support. For contact information, → see page 2 of this manual. Please note: Our staff is always eager to learn about new information, insights and / or experience our customers may derive from the work with our products that may be helpful for their future improvement.

1.7 Health and Safety

This section contains an overview of the most important health and safety at work aspects in order to protect employees and to guarantee safe and trouble-free operation.
Non-compliance with any and all of the information, safe behaviour and procedures etc. contained herein may entail severe health and safety risks.

1.8 Intended Use

This equipment has been designed and built for the following purpose(s), exclusively, and shall be used accordingly:

The battery charger **HS 12/24-120** is intended for charging of rechargeable 12 or 24 V-wet lead batteries (Lead-Calcium and EFB as well), as well as maintenance-free AGM-, Gel-, Fleece- and Li-Ion rechargeable batteries exclusively, and must be operated within the limits of the specification and operational limits (→ refer to chapter 7 “Specifications”). **Non-rechargeable batteries or primary batteries must not be connected!**

This charger is intended for use in industrial environments and may cause radio interference in residential areas.

"Intended use" and "intended purpose" shall include proper compliance with any and all information contained in this operating manual. Any and all use diverting from and / or going beyond the limits as set by the equipment's intended purpose and use shall be deemed as misuse and may entail dangerous situations.

WARNING! Misuse may entail danger

Misuse of this equipment may entail dangerous situations.
Therefore:

- Do not operate this equipment unless clearly within its specs and limits of use (→ see chapter 7 “Specifications”).
- Do not use this equipment in explosive atmospheres.
- Do not open, alter, modify and/or manipulate etc. this equipment.

The manufacturer shall not be held liable for any and all damage due to misuse of this equipment.

1.9 Responsibilities of the Operating Company

1.9.1 General Obligations

This equipment has been designed for professional use. The owner/operator or operating company therefore being a businessman or commercial company, they are subject to any and all legal obligations concerning health and safety at work. This means, in addition to this operating manual, any and all accident prevention, health and safety at work and environmental regulations pertaining to this equipment's scope of application shall apply as well.

This means in particular:

- The operating company must be informed about any and all pertinent health and safety at work regulations and must carry out a risk assessment in order to determine additional hazards existing under the specific conditions in the specific work environment at the place of operation. Any and all findings from such a risk assessment must then be used to draw up additional operating instructions for the operation of this equipment.
- During the entire lifetime of this equipment, the operating company must check in regular intervals whether such additional operating instructions are still up to date and must update them when necessary.
- The operating company must unambiguously determine and communicate responsibilities concerning the installation, operation, maintenance and cleaning of this equipment.
- The operating company must make sure that any person handling this equipment has read and understood this operating manual. Operating personnel, in addition, must be trained in regular intervals and must be informed about the dangers existing in connection with this equipment. (For a draft of a training report form, see "Appendix”

- The operating company must equip operating personnel with suitable personal protective equipment (PPE) and check it for proper working condition in regular intervals. Defective PPE must be replaced with new ones.
- The operating company must take appropriate and suitable fire protection measures and make available fire extinguishers and first aid kits.

The operating company is responsible that the equipment is in proper working order at all times.

Therefore:

- The operating company must make sure that any and all maintenance jobs described in this manual are really carried out.
- The operating company must have any and all safety labels, markings etc. on the equipment checked for integrity and readability in regular intervals.

1.9.2 Demands on Employees

WARNING! People with insufficient skills may suffer injuries.

Inexpert handling may entail severe damage to persons and property.
Therefore:

- Make sure that any and all activities are carried out by skilled personnel, only.

- This equipment may be operated only by persons who do reliably their work properly.
- Persons whose capability of reaction is impaired, e.g. by drugs, alcohol or medication, must not be allowed to handle this equipment.
- When selecting suitable operating personnel, be sure to respect occupational regulations and legislation concerning skills, age etc.

This operating manual specifically names the following types of personnel who must have the following skills:

- **Operator**
  The operator has been coached / trained by employees of ELEKTRON and / or an authorised representative / dealer of ELEKTRON concerning his tasks and duties and possible hazards in connection with inappropriate behaviour and confirms this with his signature (see draft of training report form, "Appendix").
- **Service Personnel**
  refers to manufacturer's own service personnel and/or that of his representative / dealer. Such service personnel have the professional training, skills and experience as well as knowledge of pertinent regulations to carry out the jobs they accept and to identify, avoid and prevent hazards on their own and without additional support.

1.9.3 Personal protective equipment (PPE)

CAUTION! Insufficient protection against injuries

Defective safety clothing may not constitute a proper protection against injuries.
Therefore:

- Be sure to check PPE for integrity and good working condition before you start any works.
- Replace defective PPE.
- Consider manufacturer's instructions and expiration dates, when and where applicable.

Wearing PPE during work is essential to minimise health and safety risks.

- Be sure to be always wearing the appropriate PPE for the job at hand.
- Be sure to take note of and comply with warning signs concerning PPE that may be installed at the workplace.

	**Face screen** protects the face and eyes against splashes, flying sparks and other hot particles.
	**Non-inflammable safety clothing** is a tight-fitting sort of special clothing that is not inflammable, covers arms and legs completely and tears easily (instead of getting pulled in). Its main purpose is to protect against burns.
	**Safety gloves** protects the hands against splashes, flying sparks and other hot particles. Never use wet gloves.
	Furthermore Do not wear long hair, rings, necklaces, watches or other jewellery. Do not carry inflammable items such as matches or lighters.

1.10 Particular Dangers

1.10.1 Dangers due to the equipment

Electricity

	**DANGER! Electricity constitutes a danger to life and limb.** Touching live components can result in a fatal electrical shock. Therefore: ■ As soon as you notice any damage to insulation, disconnect the power supply and have the damage repaired. ■ Do not open this equipment yourself. Have all repairs carried out by service personnel, exclusively. Have works on electrical equipment carried out by skilled electricians, exclusively. ■ Before any and all electrical works: disconnect power, earth and short. Check whether equipment is really dead. ■ Keep live components away from liquids and humidity. They may cause short circuits. ■ Protect cables against running over, contact with oils, aggressive substances, tools, pointed and/or hot objects. ■ When pulling from a socket: Never pull on the cable. Pull on the plug. ■ Do not use the cable to trail or drag equipment over the floor. Always grab equipment by the handles provided for that purpose. ■ Use strain relief clamps to protect cables. ■ Make sure protective ground conductors have been connected properly.

1.10.2 Dangers due to work environment

Explosive Gases

DANGER! Explosive Gases constitute a danger to life and limb!

Charging batteries can produce explosive gases.
Explosion hazard due to oxyhydrogen gas formation.
Therefore:

- Charge batteries in well ventilated rooms only.
- Avoid fire, open light, and spark formation.

Corrosive substances

Danger! Danger to life due to corrosive substances!

Battery acid is corrosive.
Therefore:

- Wear protective goggles.
- If the acid is in contact with the skin or eyes, immediately rinse the affected area with plenty of water. Then contact a doctor.

Stumbling hazards

WARNING! Possibility of injuries due to stumbling and falling.

The work environment may pose stumbling risks. Stumbling and falling may lead to severe injuries.
Therefore:

- Make sure the work area is tidy and free of clutter and offers enough freedom to move.
- Install cables and supply lines in such a way that they do not constitute a stumbling trap.
- Ensure a stable location of the charger.

1.10.3 Danger to this equipment and other property

Batteries

WARNING! Material damage due to wrong supply voltage or charging not suitable batteries!

When charging unsuitable batteries, property damage may occur.
Therefore:

- Connect lead acid- or Li-Ion rechargeable batteries with 12 or 24 V rated voltage with appropriate setting of the charger only!
- Connect only rechargeable batteries.
- Never charge frozen batteries.
- Never charge damaged batteries.

Ambient conditions

WARNING! Material damage due to humidity, moisture and insufficient ventilation

Under certain circumstances material damage may occur.
Therefore:

- Protect the charger from moisture.
- Set up the charger so that the air inlet and outlet is not blocked.

1.11 Correct behaviour in accidents and dangerous situations

Preventive measures

- Be prepared to confront accidents and fires.
- Be sure to have first aid equipment (kits, blankets etc.) and fire extinguishers ready at hand.
- All personnel must know about accident signalling systems, first aid, rescue and escape equipment.
- Keep access ways for ambulances clear and open.

If there is a pungent smell of gas, there is an acute danger of explosion!

DANGER! Explosive Gases constitute a danger to life and limb!

- **Don’t switch off the charger!**
- **Don’t disconnect the charging clamps!**
- **Immediately ventilate the room very well!**
- **After sufficient ventilation switch off charger.**
- **Check battery!**

Measures to be taken in case of accidents

- Turn off power (→ see chapter 1.12 “Safety devices”).
- Initiate first aid.
- Evacuate people from danger zone.
- Alert persons in charge.
- Alert fire brigade and ambulance service.
- Keep access ways for ambulances clear and open.

Measures to be taken in case of work at the device

- De-energise.
- Secure against restarting.
- Determine unit is de-energized.

1.12 Safety devices

WARNING! Danger to life due to insufficient protection against residual current!

Connection to mains socket: the device may only be connected to an electrical socket equipped with an RCD switch (earth leakage circuit breaker) and an operational ground system.

Fig. 1: On-/Off-Switch

On-/Off-Switch

By pressing the On-/Off-Switch (8) for about 3 - 4 seconds the unit will be switched into Stand-By Mode. **Disconnect the power plug to completely disconnect the power supply!**

1.13 Safety labels and markings on the unit

1.13.1 On the top cover

	Observe operating instructions!	SERVICE	**Open the device only by qualified personnel!**
	Protect device against dripping water!		**Use only suitable tools!**

1.14 Spare parts

WARNING! Wrong spare parts constitute a hazard.

Wrong and/or defective spare parts may constitute a safety hazard and may entail errors, damage and even total destruction. Therefore:

- Always use genuine spare parts made by the manufacturer.

Be sure to buy your spare and wear parts directly from the manufacturer or an authorised dealer. For contact information →, see page 2 of this manual.

1.15 Waste management and environmental protection

CAUTION! Inexpert handling may constitute an environmental hazard.

Inexpert handling of environmentally harmful substances, especially wrong disposal, may constitute a hazard to the environment.
Therefore:

- Be sure to take appropriate measures whenever harmful substances get (or threaten to get) into the environment. In case of doubt, inform competent local authorities about the hazard or damage.
- Local authorities and specialised waste management companies will be happy to advise you with your disposal issues.
- Please also consider the following information.

Batteries and rechargeable batteries

Batteries contain toxic heavy metals. Batteries are subject to hazardous waste management and must be collected by specialised companies or taken to special collection centres.

Electronic components

Electronic components and scrap are subject to hazardous waste management and must be collected by authorised companies.

Other components

Unless you have concluded a return and / or disposal agreement with the manufacturer, please disassemble and recycle components.

- Scrap metals.
- Recycle plastic parts.
- Other components must be sorted by materials and disposed of accordingly.

2 Transport, packing, storage

2.1 Safety during transport

Inexpert transport

CAUTION! Improper transport may cause damage to property.

Improper transport may cause damage to property.
Therefore:

- When you unload packing units and move them across your premises, proceed with care. Consider symbols and information on packaging.

2.2 Unpacking

1. Do not remove packaging until immediately before installation.
   During unpacking, do not use pointed tools.
2. Recycle packing materials.

What to do with packing materials

CAUTION! Improper waste disposal may cause environmental hazards.

Packing materials are valuable raw materials. In many cases, they can be recycled, i. e. used again for packaging or in some other way or they can be further processed or treated in some way.
Therefore:

- Be sure to dispose of packing materials in sustainable manner and/or according to local laws and regulations.
- Observe local waste management legislation. In case of doubt, contact a specialised company.

2.3 Acceptance after shipping

Check packing units immediately after delivery. Check for integrity, missing pieces and damage.
If you detect any external shipping damage, proceed as follows:

- Do not accept delivery. Or accept under reserve.
- Report damage on carrier's shipping papers or delivery ticket.
- Initiate complaint procedure.

NOTE

Be sure to register a complaint as soon as a defect has been detected. Claims for damages may be brought forward only within the deadlines set for complaints.

2.4 In case of further transport / return of goods

Use packing materials that correspond to original packing materials.

CAUTION! Improper transport conditions may cause damage to property.

Packaging with inappropriate dimensions, quality or weight, or cooling water left in coolant tank may cause damage during transport.
Therefore:

- Use packaging of appropriate size and quality.

2.5 Storage

Storage conditions:

- Do not store packing units outdoors.
- Provide for dry and dust-free storage.
- Protect against aggressive media.
- Protect against direct sun exposure.
- Protect against mechanical shocks and vibrations.

- Storage temperature: –10 to 50 degrees centigrade.
  –50 to 122 degrees Fahrenheit.
- Rel. humidity: 85 % max.; no dew.
- When storing equipment longer than three months, check general conditions of all parts and packaging in regular intervals. If and when necessary, refresh or renew corrosion protection.

3 Design and functionality

3.1 Short description

The battery charger HS 12 / 24-120 is exclusively for charging 12 V and 24 V wet lead acid batteries (also lead calcium, EFB), maintenance-free AGM, gel and fleece batteries as well as Li-ion accumulators.

3.2 Overview front panel

Fig. 2: Overview front panel HS 12/24-120

1	Touch display	Graphical user interface
2	LED – yellow	Charge Mode – Base charge
3	LED – yellow	Charge Mode – Recharge
4	LED – green	Charge Mode – End of charge, trickle charging
5	LED – blue	Support Mode
6	LED – white / red	Batterie missing / fault
7	USB-Interface	Service, Program Update
8	Push button On/Off	Put charger to pause or restart (press briefly)
		Switch-off charger (press for about 3 seconds)
		Switch-on charger (press briefly)
9	Mains connection	worldwide standardized IEC connection socket
10	Connection for charging cables	(**+**) red clamp, (**–**) black clamp

3.3 Rear stand

On the back of the HS 12 / 24-120 is a fold-out stand to bring the device in a convenient operating position.

3.4 Connection cables

Fig. 3: Connection cables

NOTE!

The charger **HS 12/24-120 B** has a reduced scope of delivery with 3 m charging cables and 2m mains cable.

3.5 Description of the unit

The battery charger **HS 12/24-120** can charge 12 V and 24 V wet lead acid batteries (lead antimon alloy, lead calcium alloy, EFB), maintenance free AGM-, Gel- und fleece-batteries as well as Li-Ion rechargeable batteries. The unit may be used as an external power supply (EPS) for vehicles as well. The charger **HS 12/24-120** has a desk top housing. Cooling is provided by an internal fan. Please observe that the vents of the charger **HS 12/24-120** are not covered. The cooling air flow must not be blocked.

Display

During the charging process the actual charging current and voltage are displayed on the LC-Touch-Display (1). Light emitting diodes (LEDs) show the respective state of charge or occurring faults.

Malfunction/Fault (6) (→ see chapter 5 “Troubleshooting”)

Maximum charging current: I_N = 120 A @ 12 V

I_N = 60 A @ 24 V

- Battery may remain in the vehicle during charging and there is no need to disconnect from vehicle electrical system.
- Safe protection of the on-board electronics, as no current and voltage peaks occur.

EPS-operation (External power supply)

The charger works in Support Mode as an external power supply.
This means that on-board systems in vehicles can also be supplied and tested without a battery.

Buffer operation

The charger ensures safe charging and battery retention in Charge Mode, even when an additional load is switched on: up to 60 A at 24 V and 120 A at 12 V.

Reverse voltage protection

The charger detects the reverse polarity and does not start charging in Charge Mode.
LED (6) lights up.

Clamp drop off

The charger reliably detects clamp drop off during charging and switches off.

Serial interface / Firmware-Update

The charger is equipped with a serial interface (USB). The associated socket (7) is located on the right below the LED's. In case of a required software update the firmware of the charger can be updated easily via this interface using a corresponding USB memory.

4 Operation

4.1 Provisions

- Check compliance with the required operating conditions
  (→ see chapter 7 „Specifications“).
- If necessary, let the device slowly acclimate to room temperature.
- Check on-site supply networks for compliance with the specifications
  (→ see chapter 7 „Specifications“).

4.2 Connect the electrical system

WARNING! Stumbling hazards!

Mains and charging cables may constitute a stumbling hazard when improperly laid or installed and may cause people to fall and hurt themselves.
Therefore:

- Run the mains and charging cables along a safe route.

1. Run the cables along a safe route.
2. Connect the mains cable to the on-site mains supply.

4.3 Switching on

4.3.1 Checks before switching on

WARNING! Unskilled employees may hurt themselves and others. Inexpert operation constitutes a hazard of injuries.

Inexpert and / or negligent handling of this equipment and / or ignorance of hazards and dangers may entail the most severe injuries.
Therefore:

- Make sure this equipment is used by skilled operators with sufficient training and experience, exclusively.
- Before operation, consult the manual and make sure any and all preconditions are fulfilled, any and all checks and preliminary works etc. have been carried out.
- Work place must be clean and tidy – no clutter.
  Make sure you have enough room to move.

Fig. 4: Power up display

– The device automatically powers up to the default setting after plugging in the power cord. After mains disconnection or after switching on the charger via the "On / Off" button, the following standard parameters are preset:

– Battery voltage: 12 V

– Battery type: Uni (Universal characteristic)

– De-Sulphating: Off

4.4 Start-up

➔ **Observe safety instructions!**
➔ **Observe the operating instructions of the battery manufacturer!**

4.5 Charging / Trickle charging / Buffer operation (Charge Mode)

- Do not store the device outdoors.
- Determine battery type
- Connect device to mains or switch on with button (8) "ON / OFF"

- In the default setting, a universal characteristic (Uni) is selected, which can charge all mentioned accumulators.
- Connect the charging clamps to the battery terminals with the correct polarity. Red pliers (+) to positive pole, black pliers (-) to negative pole.
- The charger automatically turns on after a voltage test and starts charging / charge retention.
- Attention! Does the set charging voltage match the battery voltage?
- The charging current and the charging voltage are displayed on the LC-Display (1).
- The charge indicator lights (2, 3) light up depending on the state of charge of the battery.
- If, after a longer period, the green LED 'Charging end / charging conservation' (4) lights up, the charger has switched to trickle charging.
- If the battery is discharged by a consumer while charging is being maintained, the **HS 12 / 24-120** charger will automatically provide the appropriate charge.
- The charge retention can be performed indefinitely.
- Observe the maintenance instructions of the battery manufacturer.
- During the entire charge or charge retention, a buffer operation of the battery is possible. If the battery is discharged by a consumer, the charger **HS 12 / 24-120** (within the limits mentioned above) supplies the corresponding current.

Charging deep discharged batteries

- The charger safely detects deeply discharged batteries.
- The charger starts the charging process gently with low charging current and then automatically adjusts it to the battery condition.

The battery voltage needs to be at least 3 V!

4.6 External power supply / EPS operation (Support Mode)

- In **Support Mode**, the vehicle may be buffered when changing the battery. This preserves important data and settings. The charger **HS 12 / 24-120** switches on at 13 V and keeps it up to the maximum current drain.
- Switch on the charger with the button (8) "ON / OFF".
- Press the "Charge Mode" field on the touch display for approx. 5 seconds; the operating mode changes to Support Mode. The blue LED (5) flashes.
- Connect the charging clamps to the battery terminals with the correct polarity:
  red pliers (+) to positive pole, black pliers (-) to negative pole.

Attention! Danger of reverse polarity and short circuit!

- Start function with the button "ON / OFF" (8).
- The Support Mode light (5) lights up. The actual current and voltage are displayed via the LC display (1).
- This operating mode remains active until it is terminated via the "ON / OFF" button.
- In Support Mode, the charger operates only without a battery counter voltage. If this mode is selected, voltage is applied to the charging clamps and reverse polarity cannot be detected.

Attention! Please note that the charging clamps are not connected to each other!

Before disconnecting the charging clamps, the device must always be switched off using the "ON / OFF" button.

4.7 Operation

The charger **HS 12 / 24-120** offers a variety of functions and settings. The operating structure is clearly organized and enables intuitive operation of the device via the touch display.

The charger has two operating modes:

1. Charge Mode
2. Support Mode

If the charger is to be used for battery charging, the "Charge Mode" must be activated. When changing the battery, the charger can supply the electrical system of the consumer. The charger must be operated in "Support Mode" for this purpose.

Fig. 5: Operating panel: Display Charge Mode and Support Mode

The touch display serves to display a wide variety of parameters: voltage, charging current, charging characteristic, charging end voltage, battery type, operating mode, charged capacity and charging time. In addition, there are active areas; when touched operating functions are executed. The active areas are shown in Fig. 6.

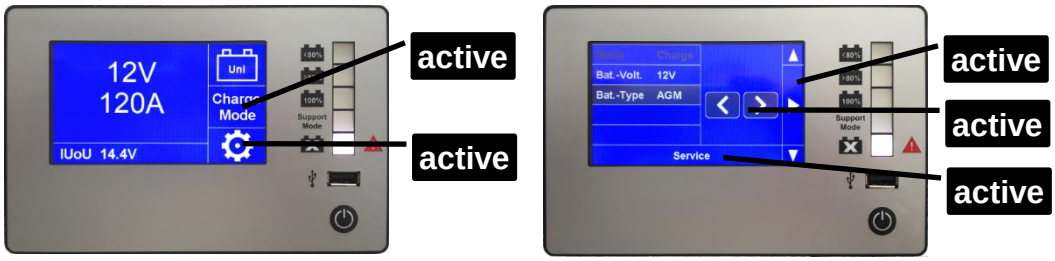


Fig. 6: Operating panel: Active areas

4.8 Operating modes

4.8.1 Auto-start function

The charger **HS 12 / 24-120** is equipped with an auto-start function. The device automatically starts in the basic setting "Charging 12 V" with the universal characteristic after pressing the "ON / OFF" button or on the mains plug connected to mains. With this characteristic all battery types can be charged without any problems. If no battery is connected, the device remains in standby mode. The charger starts after connecting a battery. If the battery is connected in reverse polarity, the device will not

start. If charging is aborted by a clamp drop off, the unit immediately returns to the standby mode. Charging begins again after reconnecting a battery. In the event of a power failure (or disconnection of the power plug), the device automatically restarts charging after the power returns.

Charging can be prematurely terminated or paused with the "ON / OFF" button (8). If necessary, the battery can be disconnected from the charger or charging can be resumed by pressing the “ON / OFF” button again. After 1-minute pause, the device automatically resumes charging.

4.8.2 Charging 12V

The battery is charged according to an IUoU characteristic, meaning that the battery is charged with a constant current during the first phase until reaching the end of charge voltage of generally 14.4 V. Subsequently, this voltage is kept constant until the current drops below a threshold or a safety time of 8 hours has expired. Thereafter, the charger switches to trickle charging, where the voltage is maintained at generally 13.3 V. Trickle charging is pulse-shaped and during the off time the chargers makes sure that the battery is still present.

While charging, the adjacent display appears.

The display constantly shows the current battery voltage and the charging current as well as the charged capacity and charging time.

When the battery is fully charged, the device switches to charge retention and the battery may stay connected indefinitely.

The “ON / OFF” button aborts charging at any time.

4.8.3 Selection of battery type / Adjustment of charging parameters

Starting from the main menu, various settings can be made.
Different battery types can be selected, characteristic parameters may be changed, a de-sulphating program can be switched on and languages may be selected.

4.8.3.1 Selection of battery type

With the touch display you can change over to “Setting Mode” by pressing the “gear wheel” symbol for about 3 seconds. There you can choose from predefined battery types with specified parameters.

The following additional battery types are available:

Wet	For batteries with liquid electrolyte (lead-antimony, lead-calcium or EFB).
AGM	For batteries with glass matt fixed electrolyte (**A**bsorbed **G**lass **M**att).
GEL	For batteries with fixed electrolyte.
Li-Ion	For batteries in Li-Ion technology.

The selection automatically loads the appropriate parameters of the characteristic:

	Wet	AGM	GEL	Li-Ion
U1	14,4 V	14,4 V	14,1 V	14,0
U2	13,3 V	13,3 V	13,3 V	14,0
Ia max	120 A	120 A	120 A	120 A
t in U1	Max. 8 h	Max. 8 h	Max. 8 h	Max. 6 h

4.8.3.2 Adjusting charge parameters

After pressing the “gear wheel” symbol the adjacent menu appears. With the active areas (see chapter 4.7 “Operation”) you can navigate in this menu. With the „Arrow Up/Down“ symbols the battery voltage and the battery type may be selected.

If the battery voltage field is selected (highlighted), "right / left" arrows will show up to switch the voltage from 12 to 24 volts.

Similarly, the battery type may be changed when selected (here, for example, AGM).

If you do not want to make any further settings, you can leave the dialog with the outer "arrow right" key. Before returning, you are prompted for saving the selected setting, which is selected by touching the "Yes / No" keys.

If no change has been made, the dialog is left directly. If no entry had been made for a long time, the dialog will be left as well.

4.8.4 Support Mode (External power supply EPS)

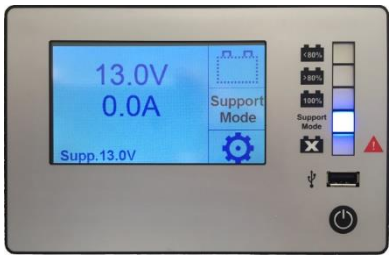
This operating mode is intended for vehicles without a battery or when changing the battery. The charger supplies a fixed output voltage up to the maximum power of the device.

Attention!
In this mode, there is no automatic check for incorrect polarity of the clamps. The operator is fully responsible for the correct polarity.

The selection of this mode is made by touching the active area “Charge Mode” for approximately 3 seconds.

The device switches to support mode, which is also illustrated by the brighter background and the flashing blue LED (5). The voltage set in **Charge Mode** is transferred.

The battery clamps are now still de-energized, which is signaled by the flashing blue LED (5). The device can now be connected with the correct polarity.



The power is now switched on with the "ON / OFF" button (8). The output voltage runs up to 13 volts and the blue LED “Support Mode” (5) lights up continuously.
Now the necessary work can be done on the vehicle.
After completion, the voltage can be switched off again with the "ON / OFF" button (8), so that the clamps can be disconnected de-energized.
Touching the field "Support Mode" switches back to "Charge Mode".

For example, if the support mode is required for 24-volt commercial vehicles, change to 24V in the “Charge Mode” Setup menu (see chapter 4.8.3.2 “Adjusting charge parameters”) and then select “Support Mode”.

The display permanently shows the actual values of the output voltage and the output current.

4.8.5 Charging rate test, deep discharged batteries

At the beginning of a normal charging process, the charger checks the charging rate of the battery and if it is deeply discharged. The battery voltage must be above 1.5 volts / cell after 30 minutes to pass the test. Charging will be continued automatically in this case. Otherwise a time fault will be displayed (see chapter 5.2.2 “LED – Display Table”). In case the battery voltage is between 0.5 Volts / cell and 1.5 volts / cell the battery automatically will be charged gently with a reduced current.

4.9 Service-Menu

In this menu settings can be made, which concern further functions of the device.

The service area is a submenu of the settings menu (see chapter 4.8.3.2 “Adjusting charge parameters”). In the settings menu you touch the area "Service" for approx. 3 sec.

This will bring up more lines in the menu. You can navigate through these lines with the "up / down" arrows and select the corresponding entries. The selected entry is highlighted in a dark background.

4.9.1 General functions

The software version is displayed in the bottom line.

Another menu item is the selection of the language. Here the stored languages can be set. The selection works exactly as described in 4.8.3.2 .

4.9.2 Charging parameters

In another line you have the possibility to adjust the gassing voltage (end of charge voltage) for all battery types except the universal characteristic "Uni" in 0.1 Volt steps.

Attention:

The changes made here are not monitored by the software! Nonsensical or harmful settings must be avoided at all costs!

After selecting, for example, a gel battery, in the line gassing voltage the end-of-charge voltage can be reduced with the "right / left" arrows (here 13.8 volts). The menu can be left again via the outer "right" arrow. Before, you will be asked to confirm as usual whether the setting should be saved with the "Yes / No" keys.

In this example, the selected gel battery was stored with an end-of-charge voltage of 13.8 volts. This is also displayed in the “Charge Mode” stand-by screen.

4.9.3 De-sulphating program

For wet batteries, you can choose a de-sulphating program that charges with a small current over 21 hours to the end of charge voltage of 15 volts. Light sulphating formation can be restored again.

With the "ON / OFF" keys the de-sulphating program can be switched on and back off. This is possible only if the battery type "wet" has been selected; for other types, the line is locked.

After switching on, you can exit the menu again by the outer "right" key and get back to "Charge Mode" by confirming with the key “Yes”.

Now the charging parameters for the de-sulphating program are displayed and the battery will be charged for a maximum of 21 hours with 1.5 Amps. During the charging process the voltage rises to exactly 15 volts. The charged capacity in ampere-hours and the elapsed time will be displayed additionally.

5 Troubleshooting

5.1 Health and safety during troubleshooting

WARNING! People with insufficient skills may suffer injuries.
If you carry out troubleshooting and repairs yourself, you may encounter certain risks and hazards that may entail severe injuries.
Therefore:

- Do not open the unit. Do not modify the unit. Do not try to carry out repairs yourself.
- For any and all troubleshooting measures not explicitly mentioned and/or described in this manual, you should call service personnel and/or contact the manufacturer.
- Be sure to adhere strictly to the hierarchy of responsibilities defined in the table.
- When you're in doubt: do contact service personnel / manufacturer.
- If a damage does occur: minimise, contain and avert consequential damage.

NOTE!

In the event that problems occur more frequently due to above-average workloads, you must adapt the inspection and maintenance intervals accordingly.

5.2 Error messages and troubleshooting tables

5.2.1 Fault indicator

2 **Charge indicators**
lights yellow when charging

4 **Trickle charging**
lights green when battery is fully charged

6 **Fault indicator**
lights white/red

8 Button „**ON / OFF** “

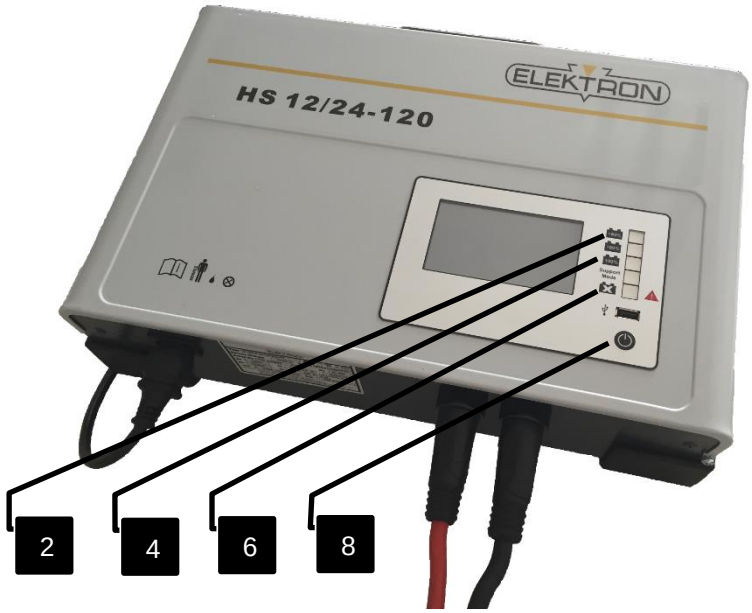


Fig. 7: Fault indicator

5.2.2 LED – Display Table

				Support Mode		Remarks
	<80%	>80%	100%			
Operational State before Charging						
Charger off					white	Short flashing every 4 s
Battery missing or reverse polarity					white	Permanent lighting
Charging preparation					white	Slow flashing
Operational State during Charging						
Deep discharge start	Flashing					Battery voltage >1,25 V/cell <1,5 V/cell
De-Sulphating		Flashing				21 h + 0,5 h + charge
Basic Charge	x					
Recharging		x				Gained end-of-charge voltage (2.4 V/cell)
End-of-charge/Trickle Charge			x			
Pause	x		x			Flashing alternately
Support Mod Operational				x		
Support Mode selected (clamps de-energized)				Flashing		
Operational State in Case of a Fault						
Temperature Fault			x		red	
Control Fault		x			red	
Timing Error	x				red	Also Switch-off by Charging rate test or Deep Discharge Start

6 Maintenance

6.1 Maintenance schedule

Intervals	What needs to be done?	By whom?
Before each use	Visually check the equipment and its periphery for damage, dirt, contamination etc. Clean, if necessary.	Operator
	Check connections for tight fit.	
	Check personal protective equipment. Replace as appropriate.	
	Check working environment of compliance with operation conditions.	

6.2 Maintenance jobs

6.2.1 Personnel

- The maintenance jobs described here may be carried out by operators, if not explicitly stated otherwise.
- Have works on electrical equipment carried out by skilled electricians, exclusively.

6.2.2 Cleaning

ATTENTION! Danger of property damage by neglected or improper cleaning!

If you do not clean the equipment at all or use aggressive cleaning agents or –methods, there is a danger of damage to property. Therefore:

- Do not use aggressive cleaning agents and/or –methods.
- Do not use steam cleaners and/or pressure washers.
- Be sure to clean the equipment on a regular schedule.

- Clean the device with a dry, lint-free cloth, if heavily soiled, with a cloth soaked in mild detergent.
- Just dust off the display. Otherwise there is a risk of scratching.

6.3 Measures after maintenance

When you finish maintenance and before you switch the tool back on, carry out the following:

1. Re-establish any and all connections you loosened and/or removed before. Check for tight fit.
2. Make sure any and all safety devices, covers etc. you may have removed are properly back in place.
3. Make sure you have properly removed and taken away from the work area any and all tools, materials etc. you may have used.
4. Clean the work area. If there have been any leaks, spills etc., clean up.

7 Specifications

HS 12/24-120

Item	Value	Unit
Rated charging voltage	12 / 24	V
Charging current	max. 120 / 60	A
Mains voltage	100-253 50/60	V Hz
Input power	2070	W
Charging characteristic	IUoU	
Protection class	IP21	

Dimensions

Item	Value	Unit
Hight	130	mm
Width	430	mm
Depth	270	mm
Weight w/o accessories	10	kg

Environmental conditions

Item	Value	Unit
Ambient temperature	40	°C
Relative humidity, not condensing	85	%

Type plate

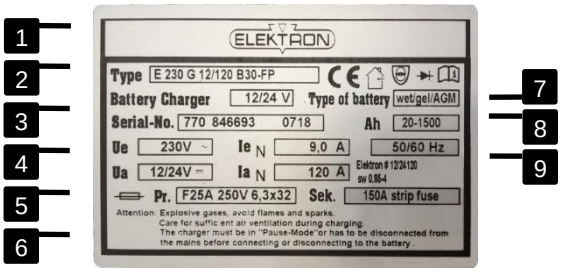


Fig. 8: Type plate

1 Brand name
2 Type designation
3 Serial number of the unit
4 Mains voltage (in VAC), mains current
Rated charging voltage (in VDC), charging current
5 Primary and secondary fuses
6 Safety indication
7 Battery types
8 Battery sizes
9 Mains frequency

8 Index

9 Appendix

9.1 Training report

NOTE!

Master copy! Do not fill in. Make copies!!

Date	Name	Type of training	Training conducted by	Signature