Operating Instruction

Part No.: 315 062 002 006
Date: 09 / 2014

PB-Charger/Trickle-Charger

EL11

DC 24V 5A/ DC 24V 1A // AC 230 V 50-60Hz
DC 24V 10A / DC 24V 5A

Part No.: EL11.142 100

NATO Stock No: 6130-12-356-2760

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PREFACE

These operating instructions, edited by the company Nortec Electronics GmbH & Co. KG describe the device PB-Charger / Trickle-Charger EL11.

CAUTION

Caution indicates that instructions should be followed precisely to avoid harm of human beings.

ATTENTION

Attention indicates that instructions should be followed to avoid damage of device.

NOTICE

Notice concerns technical instructions for a better understanding and points out specific requirements or specific processes of handling. In case of deviation or incompleteness of this operating instructions please immediately contact:

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Directory

1 Device Description

1.1 Area of application

The battery-charger and trickle-charger EL11 serves for the charging and trickle-charging of discharged partly-discharged and deep-discharged batteries from closed (open) or sealed Lead-Acid-batteries with 24V nominal voltage and nominal capacities between 45Ah and 500Ah. Lead-Acid-batteries with liquid electrolyte as well as sealed batteries in GEL- or AGM-technology can be charged. Alternatively the 5A-area or the 10A-area can be used. The device additionally can be used as constant voltage power supply with up to 10A. Based on the protection level (IP65) the charger can be used in closed shops as well as under shelters or in open air.

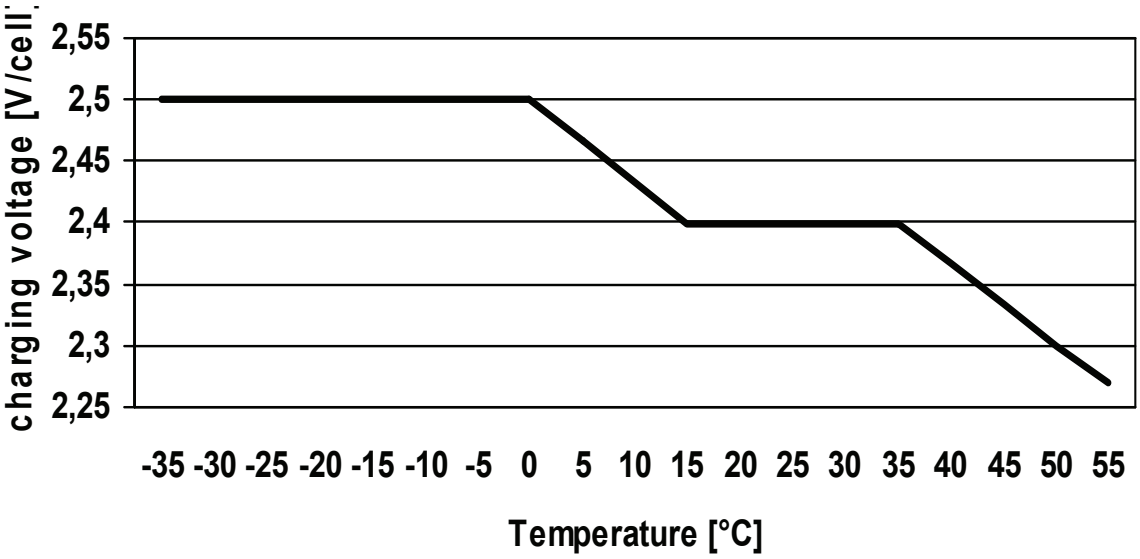
1.2 Electrical function

The electrical functions of the device are controlled and supervised by a microcontroller. The scope of function includes the self-test of the charger after switching on and the supervision of all functions during use. The control of battery cables measurement of all battery parameters and the control of charge and trickle-charge process. The present status of the charger is indicated by means of LEDs on the front panel. The charging functions of the device EL11 may be changed by JRR NorTec within the technical scope of the charger and can be adapted to specific requirements of the military user.

Picture 1:
EL11on transportation rack

NOTICE

The implemented version works - differently from the German VG requirements - with a temperature compensation performing the voltage correction parameters advised by the battery producers. This means even under extreme climatically circumstances optimum charging results are performed. Battery damages are reliably avoided. The following values of charging voltages are referred to an ambient temperature of 20°C.



Picture 2:
Temperature compensated charging voltage

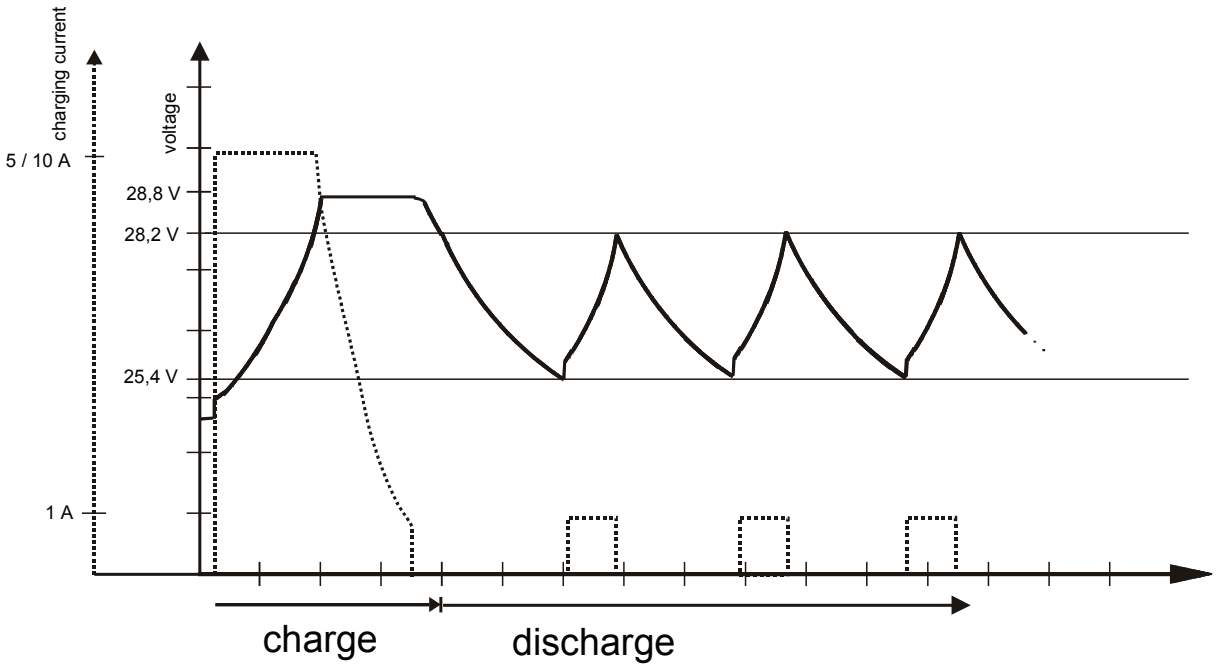
1.2.1 Functional sector according to VG 96 960-Part A

Charging area
- Pre-charge as a constant voltage charge with 28,8V until performing a charge current of 5A or 10A.
- Main charge section I as constant current charge with 5A or 10A until reaching a battery voltage of 28,8V
- main charge section U as constant voltage charge with 28,8V until charging current has decreased to 1A

1.2.2 Trickle-charging area

The trickle-charging process starts per definition immediately after finishing the charging. The device supervises the battery until the voltage has decreased to 25,4V. This point is called lower threshold. At this point the trickle-charge current of 1A (constant) is switched on until the battery has reached the upper threshold of 28,2V. The device now waits for the off-load voltage to decline to 25,4V and the process starts again. This process will be continued and guarantees an optimum status of charge of at least 50%, if the battery is not stretched by small consumers. If the battery set is stretched by small consumers in a mA-area the average status of charge of the battery set will be higher the more it is stretched. This is caused by the fact that the lower threshold is reached quicker than the upper threshold. So the battery is charged longer and more often with a higher load. This only applies if a minimum residual current for the battery set is higher than 100mA per 100Ah. In case of battery voltage falling below the lower threshold of 25,4V for more than 60 seconds caused by switching on of consumers a complete charging process including charging area and trickle-charging area will be performed. The same process happens by switching the charger on and off.

Charging curve functional sector 5A/10A



Picture 3:
Typical charging curve (partly discharged, closed lead acid batteries)

1.3 Mechanical construction

1.3.1 Device EL11

The battery charger EL11 is built into a dust- and spray water-protected 2 shell aluminum housing (protection IP65). The bottom shell includes fixation material for wall-mounting. All power components are connected to the rear and are functioning as a heat sink. The power supply cable is installed water protected and tension released on the topside of the housing by a PG-screw. The DC output-connector is placed on the bottom of the device. The top shell carries the mains switch on/off; 6 LEDs and 2 selection buttons for the 5A and 10A functional sector. The selected area A or B is illuminated. Two protective edges avoid mechanical destruction of the indication and handling equipment. The front foil protects the indication equipment against humidity and carries the short instructions.

Picture 5:
EL11

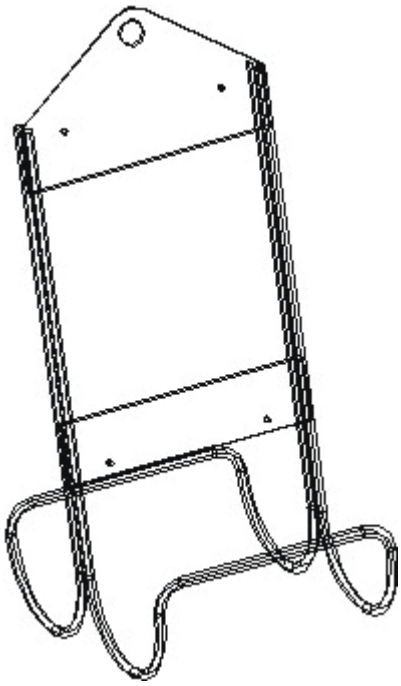
1.3.2 Transportation rack

The charger is fixed on the transportation rack which is equipped with 2 water protected sockets (IP54). One socket is used for connecting the EL11 and the other can be used for connecting the next transportation rack. The rack has a mains cable of 10m. Alternatively a 25m cable can be delivered. The device can be taken off the rack and mounted to the wall when permanently in use at the same place. Up to 4 devices may be used in line and may be protected by one fuse of 16A.

Picture 5:
Transportation rack

1.3.3 Ceiling-frame for two chargers

The ceiling-frame can take one or two devices EL11, which are fixed on the frame. The ceiling-frame can be fixed with a snap hook, biner. The vehicles will be positioned at the left or the right next to the devices which come down from the ceiling. The vehicle connection cables are connected to the device and the charging-socket of the vehicles which are not in use.



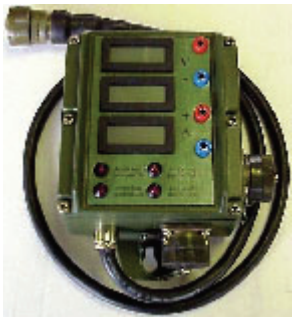
Picture 6:
Ceiling-frame for two chargers

1.3.4 Vehicle connection cables

Batteries and vehicles are connected to the charger EL11 by robust cables. They are screwed non-interchangeably by military connectors. Watertight connection between cable and connector is performed by heat shrinks. In case of demolition of cable skilled personnel may perform repair themselves. Spare parts are available at JRR NorTec (see Spare parts list in Appendix B). Each cable contains 2 load lines (+) and (-), 2 sensor lines (+) and (-) and 2 temperature lines. Independent of the cable length the sensor lines always guarantee the correct charging voltage on the borne of the battery respectively the connecting sockets of the vehicle. The vehicle connection cables are equipped with temperature sensors. The temperature of the battery is sensored as closely as technically possible. The connecting cables are described in Appendix A.

1.3.5 Tester FPG03

The stable connection of battery and cables can be tested by the function tester FPG03. Voltage and charging current as well as cable temperature are shown on separate displays. The correct function of all cable lines is shown by LEDs. Each military unit should have a tester. The tester is mounted in a robust aluminum housing (IP65).



Picture 7:
Tester FPG03

1.3.6 Double-trickle-charge connector

The wheel-tank Pandur (producer: Steyr) is equipped with two sets of batteries, one for the start of the vehicle and the other for the supply of electronic systems. You will find both sets underneath the covering plates inside the tank. From the outside of the vehicle the batteries are connected with two NATO-sockets, connection is without turning the mains switch. Both battery sets can be contacted and charged by the double trickle-charge connector at the same time. Connection is permitted even if the battery sets have a significantly different status of charge. By means of the built-in electronic disastrous differential current is avoided. Battery and cable damage is prohibited.
According to the operating instruction of double trickle-charge connector PANDUR/ULAN, both batteries sets of the Pandur can be connected to the charger at the same time. 24V chargers (28,8V) with maximum 10A power may be connected by a standard cable with 2-pins connector (size 16S) on the vehicle side. In the first step the integrated electronic ensures the charging of the empty battery to the level of the second battery. In the second step both harmonized battery sets are charged completely full. In case of an installed trickle-charge connector and a free connector 16S (battery charger disconnected) the voltage of the lower battery set can be detected on the sockets of the connector (A = +; B = -).

Picture: 8
Double Trickle-charge connector

1.4 Technical data

1.4.1 Technical data EL 11

Type:	EL11
Part no.:	EL11.142 100
Military requirement:	VG 96960 Part A and B
NATO Stock No. (NSN):	6130-12-356-2760
AC - voltage:	230 V ±10% / 45-65 Hz
Inrush power:	< 400VA (max.)
Output voltage:	max. 33VDC ±1% (Device limit)
Output voltage pre-charge:	28,8V DC ±1% (constant voltage)
Output current main charge:	5A ±5% (constant current) / 10A±5% (constant current)
Output voltage main charge:	28,8V DC ±1% (constant voltage)
Output voltage:	because of temperature compensation variable from 26,5V to 31V
Constant voltage supply:	28,6 V
Output current trickle-charging:	1A ±5% (constant current)
Output voltage trickle-charging:	25,4 < U < 28,2V

Indicating LEDs:	1 LED, green - NETZ = mains 3 LED, yellow - LADUNG = charging The indication „LADUNG“= charging is illuminated during the charging process 5A/10A according to chapter 2.4.2.1(I-charge and U-charge) - ERHALTUNGSLADUNG = trickle-charging is flashing in the control phase U > 25,4V is illuminated if the trickle-charge current of 1A is switched on (25,4 < U < 28,2V). - Voltage supply 2 LED, red - SPANNUNG <25,4V = under voltage - FEHLER = Error
EMC:	according to VG 95 373-1, class 3 EN50081-1, EN 55022, EN 61000-3-2, EN 61000-3-3, EN 50082-2 EN 61000-4-2, -3, -4, -5, -6, -11, EN 50204, EN 61131-2
Protection:	IP65
Ambient temperature:	-30 to +55 ºC
Storage temperature:	-40 to +85 ºC
Humidity:	< (95 - 5) % at TU = 55ºC
Dimensions (H x W x D in mm):	350 x 180 x 170
Weight:	4,4 kg (without battery connection cable)
Conformity declaration:	CE conformity

Voltage values are valid at 20°C ambient temperature.

1.4.2 Technical data trickle-charge connector

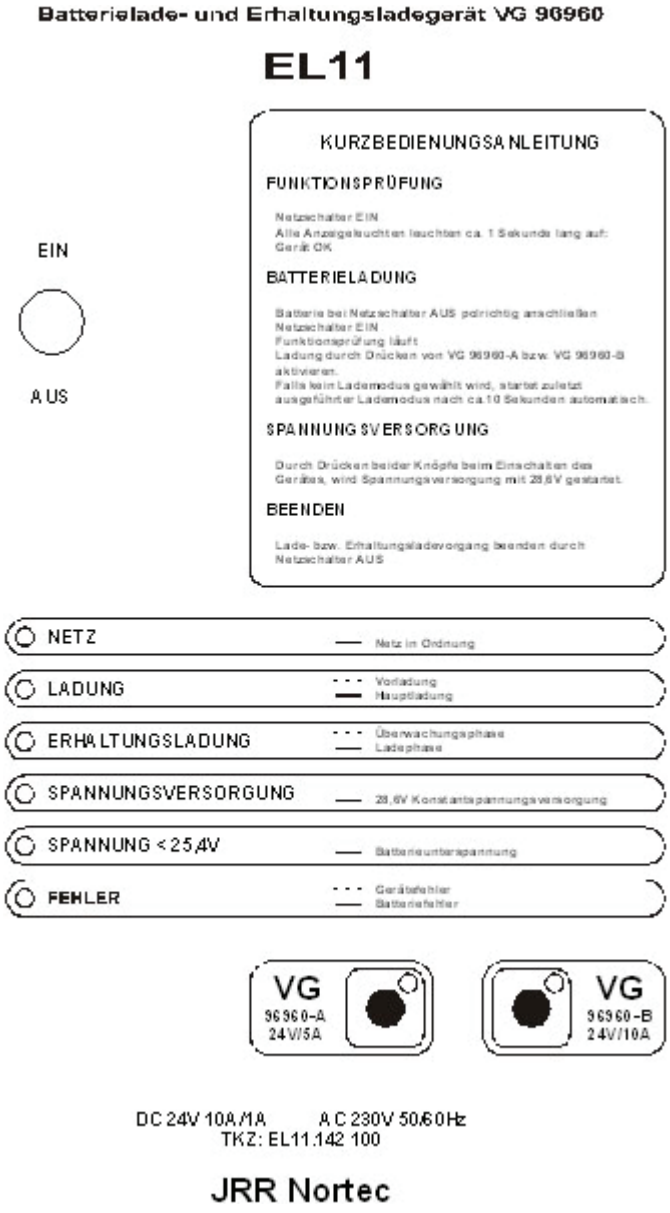
Type:	double trickle-charge connector for wheel tank Pandur
Part No.:	309 010 092 001
NATO Stock Number (NSN):	5935-0-000-0542
Maximum permitted voltage:	30V
Maximum permitted current:	10A
Maximum voltage decrease over connector:	0,65V at 10A 0,4V at 1A
Maximum balancing-current Between batteries when connector plugged and charger disconnected:	200mA
Length:	171mm
Width:	90 mm
Height:	121mm
Weight:	ca. 940g
Connector vehicle side twice: without connector end housing	VG96 917 E-001
Connector charger side:	CA3101E16S-4S

The trickle-charge connector fits for cables of the series EL11– UL30/31 – LE20/21.

1.4.3 Technical data transportation rack

Type:	transportation rack with two UK-sockets power line 10m
Part No.:	EL11.9440 000 267.UK
NATO Stock Number (NSN):	6150-12-xxx-xxxx
Maximum permitted voltage:	260 V
Maximum permitted current:	16 A
Dimension(H x W x D in mm):	370 x 350 x 700 mm
Color:	RAL 6031 olive
Weight:	10,4 kg

1.5 Short instructions



Picture 9:
Front foil EL11

2 Handling

The following handling instruction describes the general use of EL11. User specific installations and handling requirements are separately described in Appendix A especially for the use of wheel-tank Pandur.

2.1 Installation and electrical connection

2.1.1 Preparation for mounting and connection

The UK-socket (230V AC ± 10% / 45 - 65 Hz) has to be fixed in a distance of max. 1,2m above the planned installation position. Alternatively the socket can be fixed 10 or 25m away from position of transportation rack with mounted EL11.

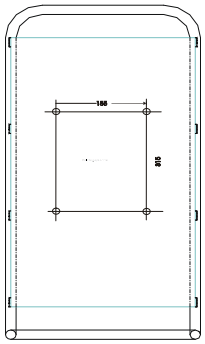
NOTICE

Connecting several devices EL11 on a common fuse the maximum number of charges is restricted by diameter of connecting cable and value of the fuse. Maximum inrush EL 11: 400VA = 2A at 200V AC net voltage (under voltage).

2.1.2 Wall-mounting

The 4 holes for mounting EL 11 are to be marked on the wall according to Picture 9 and to be equipped with the appropriate dowels. When measuring the fixation points please keep in mind that there has to be a distance of minimum 10cm below the rack and at least 5cm each side.
Additional fixation material:
- 4 wood screws (5mm x 60mm)
- 4 dowels (type corresponding to material of the wall).

Required tools:
- drilling machine
- drills (corresponding to size of dowels)
- 1 screwdriver for the wood screws
- 1 slotted screw driver, size 8 x 1,5.

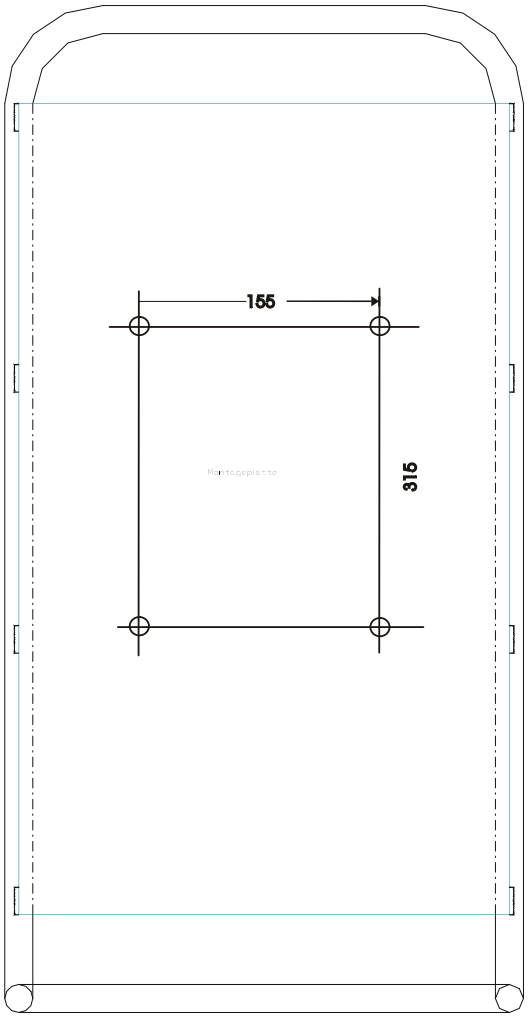


Picture 10:
Drilling Dimensionen

Picture 11:
Rear side of device

2.1.3 Frame-mounting

- 4 recessed-head screws (M5x12mm)
- Screwdriver intersecting slots size 2



Picture 12:
Drilling on transportation rack

2.2 Indication and operation elements

The PB-Charger / Trickle charger EL11 (Part No.: EL11.142 100.UK) contains the following handling and indication elements (see chapter 1.5):
- Power supply cable (top of device)

- DC output connector (bottom of device)

- Mains switch (front panel of device)

- Green LED „NETZ“= MAINS

- Yellow LED “LADUNG” = CHARGING

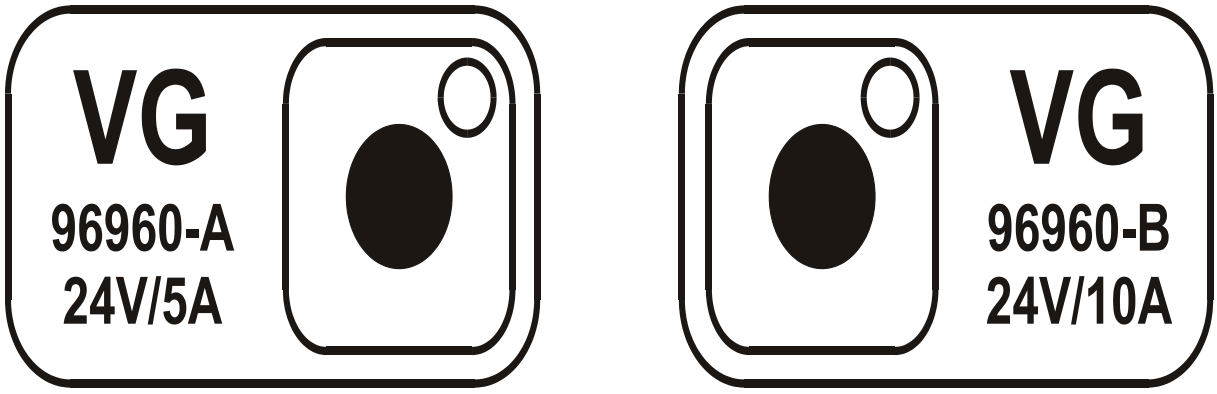
- Yellow LED “ERHALTUNGSLADUNG” = TRICKLE-CHARGE

- Yellow LED “SPANNUNGSVERSORGUNG” = POWER SUPPLY

- Red LED “SPANNUNG < 25,4V” = LOW BATTERY VOLTAGE

- Red LED “FEHLER” = ERROR

- FOLIENDRUCKTASTER = FOIL SELECTION SWITCH illuminated



Picture 13:
Foil selection switch, functional sector 5A and 10A

2.3 Function test

The procedure is as follows:
- compare available net voltage with value on the name plate.

ATTENTION

Only connect device if the values are identical, normally 230VAC.

- Mains switch in position „AUS“= OFF

- connect power supply cable to wall socket

- make sure DC-output-connector of EL11 is not contaminated and mechanically damaged (no dirt, bent or broken contacting pins, no deformed connector housing).

- Mains switch in position „EIN“= ON (without battery/vehicle connection).

The automated Selftest of the device starts after switching on and before starting the charging process. All LEDs are flashing for 1 second. After successfully Selftest green LEDs "NETZ" = NET is permanently illuminated. LEDs in foil selection switch "5A" and "10A" are blinking. After connecting vehicle connection cable the charging process can be started by pressing one of the operating keys.

2.4 Battery charging

2.4.1 Rechargeable batteries

The PB-charger / Trickle charger EL11 has been devised for charging and maintaining open and sealed lead-acid batteries or battery sets of a nominal voltage of 24VDC and a nominal capacity between 45Ah and 500Ah. The charging process is optimized for batteries and battery sets of sealed lead-acid batteries in GEL-technology according to VG 96 924. The following types are treated:

-	NBB 249	12 V	45 Ah	VG 96 924 T 10
		12 V	50 Ah	VG 96 924 T 03
-	NBB 248	12 V	100 Ah	VG 96 924 T 09

All other lead-acid batteries of the same voltage and capacity may be connected. Section VG 96 960-A (5A) is valid for capacities from 12Ah to 200Ah. For higher capacities choose section VG96 960-B (10A) valid for capacities between 25Ah to 500Ah.

2.4.2 Charging methods / charging curves

The PB-charger / Trickle-charger EL11 is equipped with IUa-charging-programs (for deep-discharged batteries UIUa-charge) with the following charging steps:

- Main charge consisting of pre-charge-U, main charge-I and main charge- U
- Trickle-charge-I

NOTICE:

The charging functions cannot be chosen individually. The process starts with the switching on the device und the selection of a functional area.

2.4.2.1 Charging (section 24V / 5A or 24V / 10A)

- Pre-charge-U
The pre-charging process has been devised for activating and recharging deep-discharged battery sets with an off-load voltage of more than 0,5VDC. The battery set is charged with a constant voltage of 28,8V until the charging current has increased to 5A respectively 10A. Maximum pre-charging time 12 hours otherwise the charger indicates an error. Starting from an off-load voltage of 25V the pre-charging step will be skipped.

- Main charge-I
The battery set is charged with a constant current of 5A respectively 10A until the voltage of the battery set has reached 28,8V.

- Main charge-U
The battery set is charged with a constant voltage of 28,8V until the charging current has decreased to 1A. The main charging process must have finished latest after 34h (functional sector 5A) respectively 22h (functional sector 10A).

2.4.2.2 Trickle-charging (section 24 V 1 A)

The trickle-charging is identical for both sectors. The trickle-charging process starts directly after finishing the main charge process. The device waits until the off-load voltage has declined to the lower threshold of 25,4V. This phase is called supervision. The yellow LED "ERHALTUNGSLADUNG" = TRICKLECHARGE is blinking. The battery set will be charged with a constant current of 1A until the upper threshold 28,2V has been reached. This phase is called trickle-charge. The yellow LED "ERHALTUNGSLADUNG" = TRICKLE-CHARGE is illuminated until this value is reached. Again the device waits until the lower threshold of 25,4V is reached, after that the trickle charge current of 1A is started. This process repeats again and again and guarantees an average status of charge of minimum 50%. The whole charging process consisting of charge and trickle-charge starts automatically:

- After starting the charging section after pressing the push-button with connected batteries

- After mains failure and return of power

- In the trickle-charge phase if the battery voltage is beneath the lower threshold of 25,4V for more than 60 seconds

2.4.3 Constant-voltage power supply

The charger EL11 is equipped with a constant voltage power supply function. All electrical consumers of the nominal voltage of 24V can be supplied with 28,6VDC and maximum 10A. The electrical functions of a vehicle can be tested even with dismounted batteries. Deep-discharged battery sets of a voltage lower than 0,5V can be revitalized. This function can be used as well for battery sets with permanent consumers (UPS-function).

NOTICE

Electrical consumers with a load of more than 10A bring down the output voltage of the charger EL11. The device will not be damaged by this kind of operation. It is short circuit stable.

After switching on EL11 both push-buttons (5A and 10A) are blinking. By pressing both sections at least for 1 second the UPS-function will be started.
The yellow LED "SPANNUNGSVERSORGUNG" = POWER SUPPLY is illuminated.

A2.6 Constant voltage application

In cases of dismounted batteries i.e. test on BT2000 the vehicle can be supplied with up to 10A. Tests and maintenance can be performed. The voltage is controlled electronically and harmless to the electronic of the vehicle. For starting the constant voltage operation please press both blinking push-buttons (5A and 10A) at the same time.
The yellow LED „SPANNUNGSVERSORGUNG“= CONSTANT VOLTAGE is illuminated.

2.5 Battery-charging

2.5.1 Battery connection and start of charging process

- perform function test according to section 2.3

- connect battery set with appropriate charging cable in right polarity to the charger

NOTICE

Charging cables and batteries should be tested concerning mechanical and electrical status before installation. The tester FPG03 can be used for the checks.

- Mains-switch in position „EIN“= ON, green LED "NETZ" = MAINS is illuminated

- Internal function test: all LEDs are flashing for about 1 second

- Section VG 96 960-A = 5A charge for battery sets starting from 12Ah or

- Section VG 96 960-B = 10A charge for batteries starting from 25Ah activated by pressing push-button

- After pressing yellow LED „LADUNG“= CHARGE

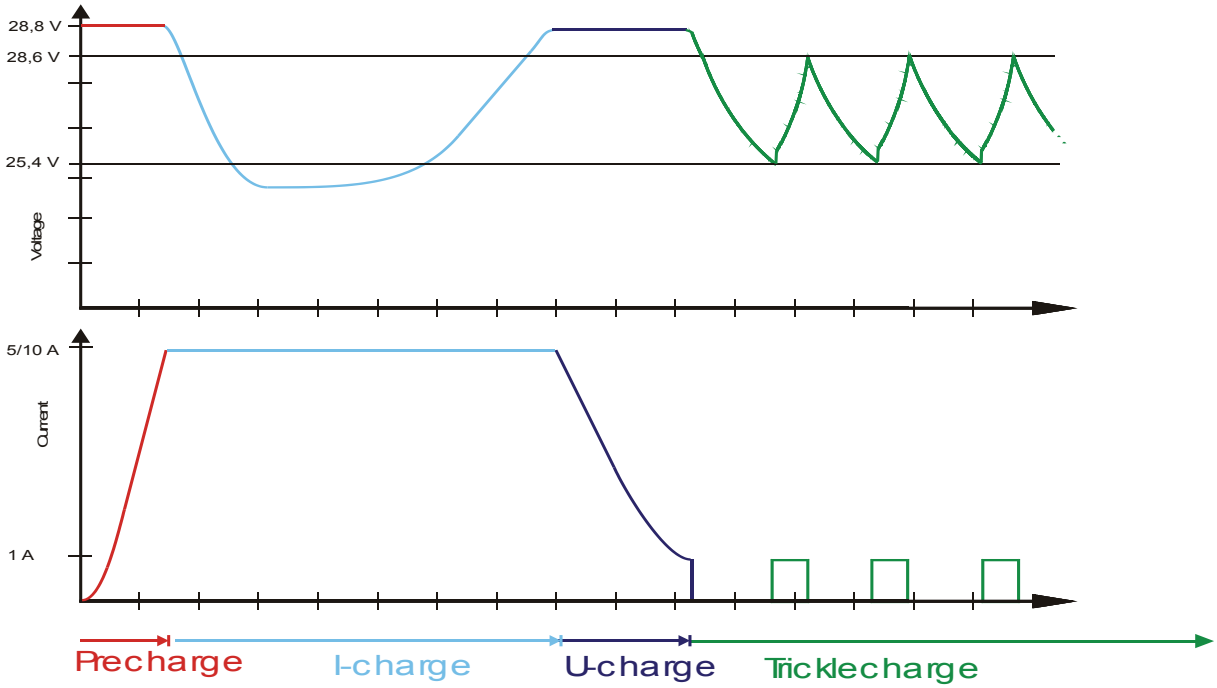
In the preface-charge yellow LED “LADUNG” = CHARGE is blinking.
In case of connecting a freshly charged battery with an off-load voltage of more than 25V the pre-charge phase is skipped and the charging process starts immediately with the main charge phase. The cut-off voltage of 28,8V and the cut-off criterion of 1A are quickly reached. In this case the user might get the impression the charger directly goes into the control phase of the trickle-charging.
The yellow LED “ERHALTUNGSLADUNG” = TRICKLE-CHARGE is blinking. (Control phase).

- The charger is ok and the batteries are treated according to prescription.

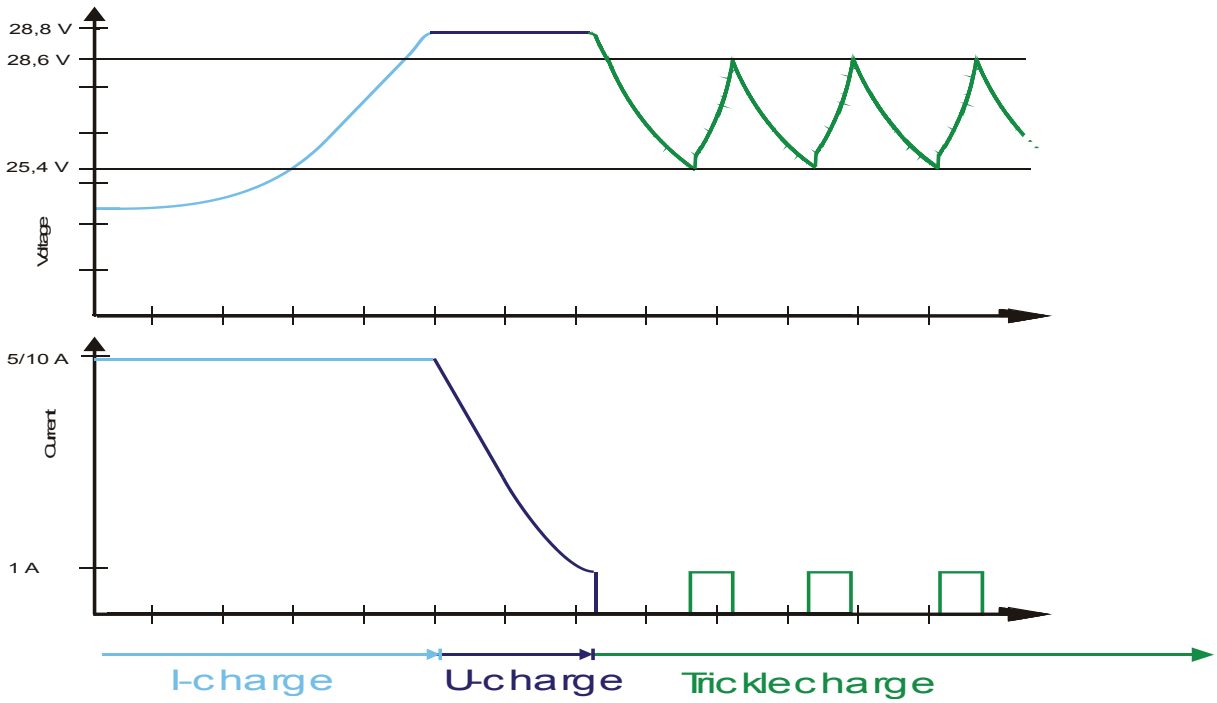
  - If the red LED „SPANNUNG < 25,4V“= UNDER VOLTAGE is permanently illuminated check battery according to section 2.6.

  - If the red LED “FEHLER” = ERROR is blinking, the charger is defect. Switch off charger; disconnect batteries and check the device according to section 2.6.

2.5.2 Typical charging curves



Picture 14:
Charging curve of a deep-discharged battery



Picture 15:
Charging curve of partly-discharged battery

2.6 Indication of failures and error resolution

2.6.1 The red LED „VOLTAGE <25,4V“

The error indication is illuminated if the battery voltage decreases below 25,4V. This characterizes the edge of starting ability of the vehicle by all means. This error indication might shine together with the yellow LEDs “LADUNG” = CHARGE or “ERHALTUNGSLADUNG” = TRICKLE-CHARGE (permanent light).

Reasons and solutions:

- Battery set deep discharged?

- Test battery voltage with FPG03

- If battery voltage between 0,5 and 25,4V continue charging under further control of battery voltage.

The recharge of a completely discharged battery set might take up to 2 days if selecting section 5A (VG 96 960-A). The device controls charging time.

- Short-circuit in the battery set?

- Test voltage of each single battery by FPG03 and adaptation cable 6150-033B

- if voltage of a single battery below 0,5V the whole battery set should be remitted to a specialized battery shop or - if available - connected to a battery tester BT2000 (Part No.: BT2000.040000; Nato Stock No.: 6625-12-317-4425)

- Battery charging cable or battery connection broken?

- Test charging cable and battery connectors on electrical function and correct contact, change cables if necessary, continue charging process.

- short-circuit in battery connection cable?

- test charging cable and battery connectors on electrical function and correct contact, change cables if necessary, continue charging process.

- Wrong polarity in battery connection cable?

- continue charging process with correct polarity

- check vehicle for activated consumers

2.6.2 The red LED „error“, battery defective (permanent light)

For testing the battery voltage each military unit should be equipped with a tester FPG03 (NATO Stock No.: 6625-0-000-2577) to easily identify defect batteries. The permanent light is illuminated if the charging cable is not correctly connected or a battery failure emerged.

Battery failure:

- Dismount battery set out of the vehicle

- Identify defective single battery by tester FPG03.

- If available start check with load-tester BT10

- Connect defective batteries to tester BT2000; perform maintenance cycle (program no. 3).

- perform the same procedure with all other batteries of the set which contained the defective battery.

- compose a new battery set.

NOTICE

Compose only batteries of identical technology. Never mix GEL-batteries with other lead acid batteries containing liquid electrolyte.

Max. 12 month difference in the time of production of the batteries.

Max. 20% difference in available capacity.

ATTENTION

The weakest battery determines lifespan of the whole battery set.

2.6.3 The red LED „error“, battery defective (LED flashing)

Reasons for errors and additional measures:

Mains fuse (2A) for power unit defective?
- Remit device to maintenance for further tests to a specialized electronic shop or JRR NorTec Reparaturen.

After switching on mains switch all LEDs stay off?
Mains fuse (63mA) for power supply CPU defective.
- Remount top shell of the device section 2.1.2, renew fuse 63mA mounted on power PCB bottom shell, close device and start function test according to section 2.3.
- If positive charger ok repeat battery charge according to section 2.5.
- If negative (i.e. all LEDs stay off defective in electronic device) remit device to maintenance for further tests to a specialized electronic shop or JRR NorTec Reparaturen.

Temperature sensor defective?
- Repair cable

Temperature < -40°C or > + 70°C?
- Wait

Temperature of the device > 100°C?
- Put device in the shadow
- Make sure that there is no cover over the device
- Wait until device is cooled down
- Start device

Cable defective or disrupted?
- Again connect battery clamps
- Repair cable and test it with tester FPG03 or
- Change cable

Switch without voltage or output relays sticks?
- Remit device for maintenance and further tests to a specialized electronic shop or JRR NorTec Reparaturen.

3. SAFETY INSTRUCTIONS

While using the PB-charger / trickle-charger EL11 the following safety instructions should be kept in mind to avoid harm on human beings:
- While charging the safety note for users (Picture 16) has to be positioned inside the vehicle in the focus of the driver.
- The PB-charger / trickle-charger is under voltage which can cause danger on life. Take care that the device is not under power supply while doing maintenance work.
- Before starting the vehicle the device EL 11 has to be cut off and the vehicle connection cable has to be taken off.

3.1 Safety note for users

During the charge with EL11 normally the mains switch of the tank is switched off. In the cover of this manual you will find the warning sign for the tank driver.

ATTENTION

Before starting the vehicle please remove trickle-charge cables! Please install this sign visibly in the driver's cabin. After removal of cables replace safety note in Operating instructions!

Picture 16:
Safety note for users

4 Care and maintenance

4.1 EL11

Charger and cables should be tested before use on cleanness and mechanical integrity. In case of deformed connector housing, bent contacts, faulty mains switch charger and cables should be remitted to electronic shop. If necessary the charger can be cleaned by humid towel and standard cleaning material.

ATTENTION:

Before cleaning the device release mains connector and disconnect battery set.
Clean mains connector only dry.

4.2 Double-trickle-charge connector

For cleaning the DC-output connector never use acid tools. Clean polluted parts by compressed air or humid towel.

4.3 Maintenance

NOTICE:

The maintenance should be performed by trained personnel.

The following works are foreseen for troop repairs:

- repair failures according to section 2.6
- replace power supply cable
- replace mains-switch and dust hood
- replace electronic fuse 63mA according to section 2.6.1.2
- replace DC-output connector plus dust protection cap if installed.

ATTENTION:

When performing maintenance works take device from AC-net and disconnect batteries. After repair works at opened device check correct fitting of sealing rubber lip. Renew if defective.

4.4 Replacement of power supply cable

- Release top-shell of the charger according to section 2.1.2 and lay aside. Release protective conductor from bottom shell. Release orange colored 2-pole connector from power PCB in the bottom-shell.
- Release screw of power-supply cable from bottom-shell by two open-end wrenches size 20.
- Install new precast power supply cable in reverse order and connect to the power PCB. Close the charger and start function test according to section 2.3.

4.5 Changing of dust protection cap

Take off screw with intersected screw driver size 2 and renew dust protection cap.

4.6 Changing of DC-output connector

Release cable shoes + (red) and – (blue) from power PCB with taper-nose pliers. Release four screws with interceptive screwdriver size 2. Remove yellow 9-pole line-connector from power PCB. Put rubber gasket on new connector and remount new connector to bottom shell of the housing. Guide nose in connector shell showing to the top shell. Install 9-pole line-connector on PCB in reverse order.

PIN A = + = red (+) on power PCB large fast-on-connector

PIN B = - = blue (-) on power PCB large fast-on-connector

PIN C = + = sensor line = Pin 4 on 9-pole connector

PIN D = - = sensor line = Pin 2 on 9-pole connector

PIN E = Pin 7 on 9-pole connector

PIN F = Pin 8 on 9-pole connector

PIN G = open

NOTE

Further repairs should be performed by JRR NorTec Reparaturen.

4.7 Changing of the dust protection cap of the output connector

- Take of fastening screw of dust protection cap of the output connector
- Replace dust protection cap
- Replace des VG-plug
- Open the housing cover
- tear 4-pole and 2-pole orange colored plug (Weidmüller)
- loosen stranded conductors in the plugs and tear them out
- loosen 4 fastening screws at the VG-plug
- tear off VG-plug
- Installation in reverse order:

4-pole plug (Weidmüller)

- A = 2
- B = 3
- C = 1
- D = 4

2-pole plug (Weidmüller)

- E = 2
- F = 1
- G = not occupied

NOTICE

Additional maintenance should be executed by JRR NorTec-Reparaturen.

APPENDIX

Examples for connections of different batteries
This section deals with the most frequently emerging battery connection configurations as well as vehicle connection with trickle-charge adapter or external start socket.

A.1 General Information

The charger EL11 has been optimized on charging gel-field batteries according to VG 96924 of the following types:

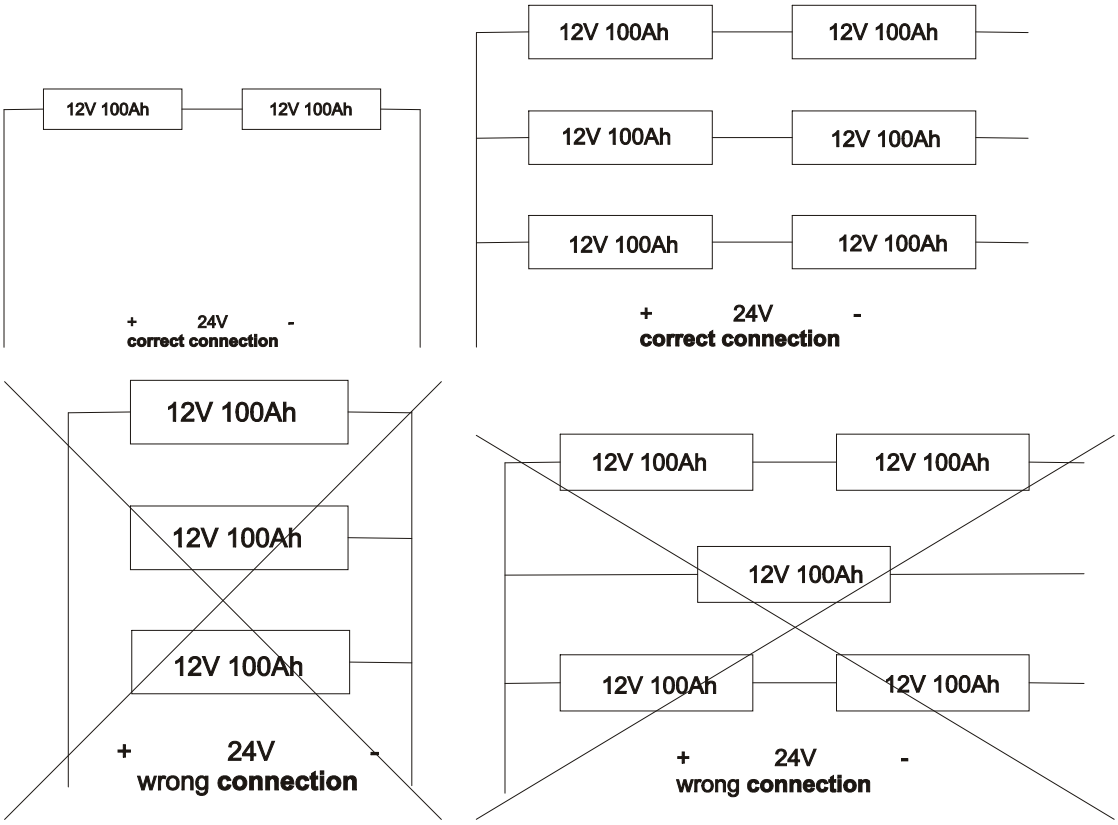
- NBB 249 12V 45 Ah VG 96 924 T 10
12 V 50 Ah VG 96 924 T 03

- NBB 248 12 V 100 Ah VG 96 924 T 09

These batteries have a nominal voltage of 12V. The vehicles have 24V. This means the battery sets consist of a serial or a serial/parallel configuration of the above mentioned single batteries.

A.1.1 Connection of batteries or battery sets

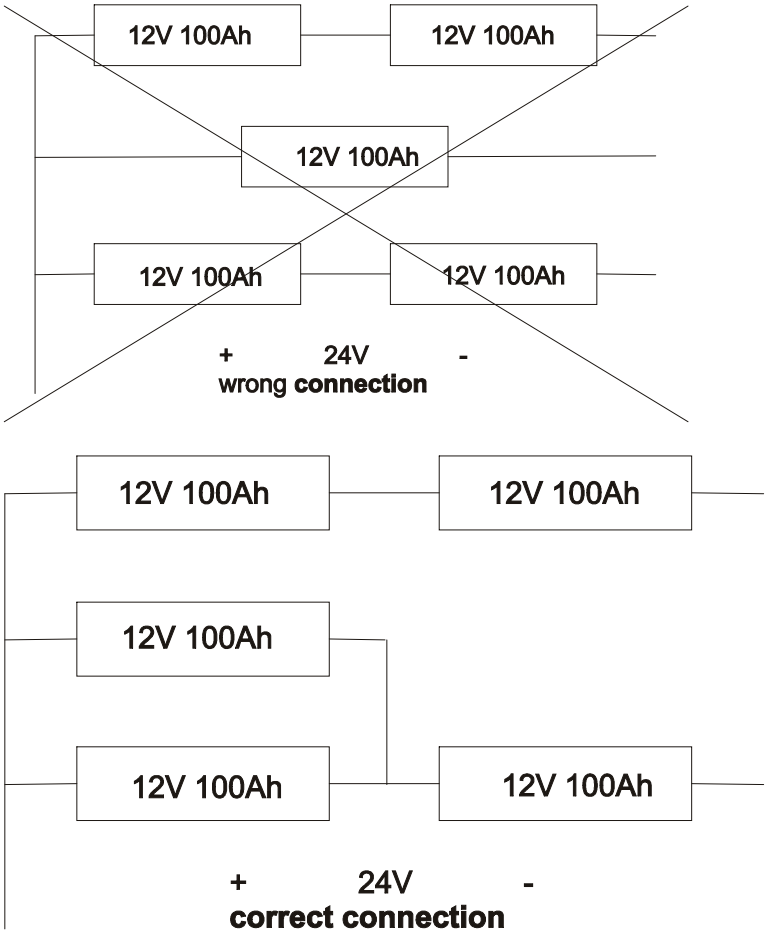
The 12V batteries to be treated should be connected to 24V sets.



Picture 17:
Permitted connection of batteries

A.1.1.1 Connection of unequal number of batteries

Situations may occur that an unequal number of 12V batteries have been charged. In this case the battery in access is branched in parallel to one battery in the serial connection as shown in picture below.



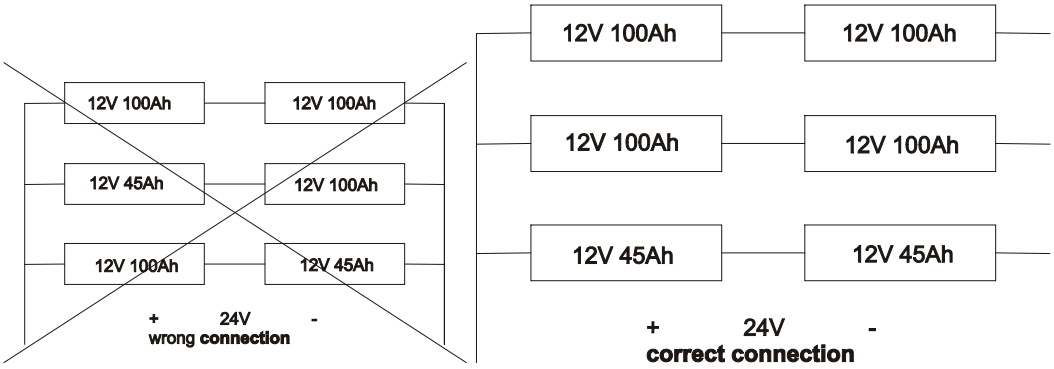
Picture 18:
Permitted connection of batteries

Warning

Only use in case of emergency!

A.1.1.2 Connection of batteries with different capacities

Always connect same capacities to serial sets when connecting batteries of different capacities. The different capacity serial connections are combined in parallel shown on picture below.



Picture 19:
Permitted connection of batteries

NOTE

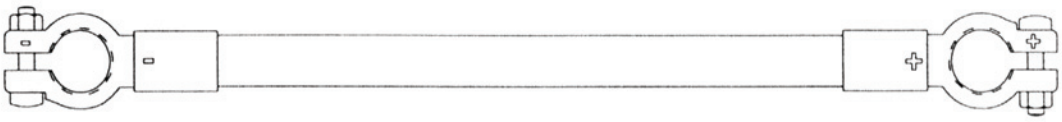
Adding or removing batteries out of a serial/parallel configuration always start with the removal of the serial connection and then remove the parallel connectors.

Before changing a set configuration switch off the charger.

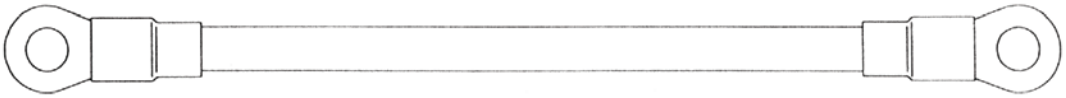
A.1.2 Connection cables for generating battery sets

The following cables are available in different length as a standard.

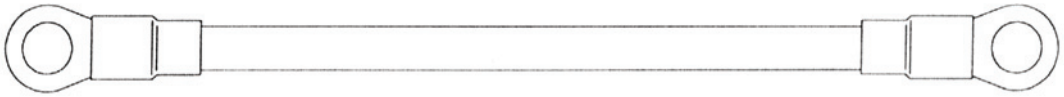
- Battery connection cable according to VG 95 282 Part 14, Form F, length 300 mm with battery clamps VG 95 282 T 13 B3 (-) and battery clamps VG 95 282 T 13 A3 (+) for serial connection of two batteries. *NorTec* Part No.: 309 010 020 001, NATO Stock No.: 6140-12-198-6529



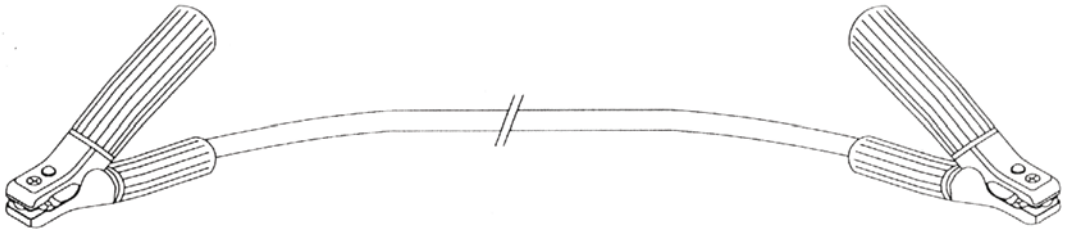
- Battery connection cable according to VG 95 282 Part 14, Form L, length 300 mm with cable shoe VG 88 710-10-50 for M10 stay bolt for parallel connection of the minus poles of the battery set. *NorTec* Part No.: 309 010 021 001, NATO stock No.: 6140-12-311-6701



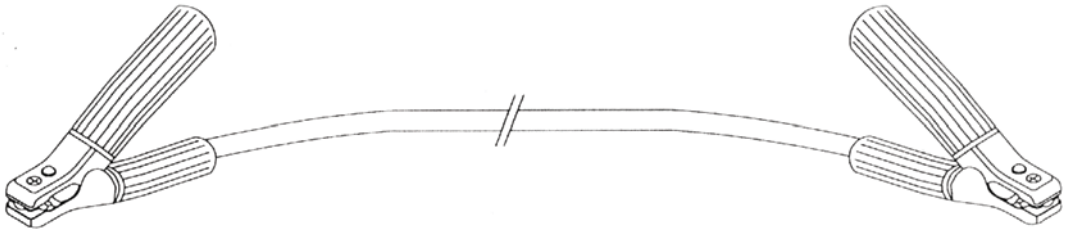
- Battery connection cable according to VG 95 282 Part 14, Form K, Length 300 mm with cable shoe VG 88 710-12-50 for M12 stay bolt for parallel connection of the plus poles of the battery set. *NorTec* Part No.: 309 010 022 001, NATO Stock No.: 6140-12-311-6703



- Connection cable MTV 6150-038 A -1000 (positive) with battery clamps color code red, Length 10000 mm for parallel connection of plus poles of the battery set. *NorTec* Part No.: 309 010 038 001, NATO Stock No.: 6150-12-315-3079



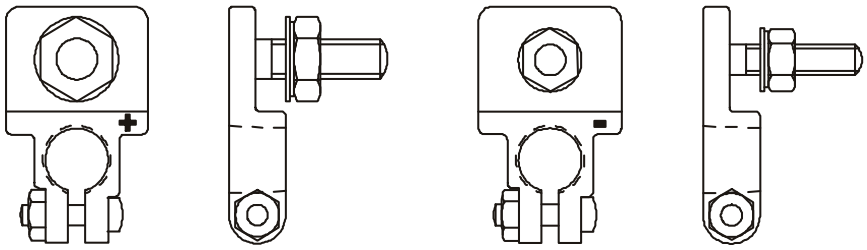
- Connection cable MTV 6150-038 B – 1000 (negative) with battery clamps, color code blue or black, Length 1000 mm for parallel connection of the minus poles of the battery set. *NorTec* Part No.: 309 010 038 002, NATO Stock No.: 6150-12-315-3087



You will find additionally available cables for different use in Appendix B Spare parts list.

A.1.3 Battery clamps

Charging batteries in a battery shop the necessary connections are performed by battery clamps.



Poleshoe, positive
VG 95 282 T 13 A 2 with
M12 connection-bolt

Poleshoe, negative
VG 95 282 T 13 B 2 with
M10 connection-bolt

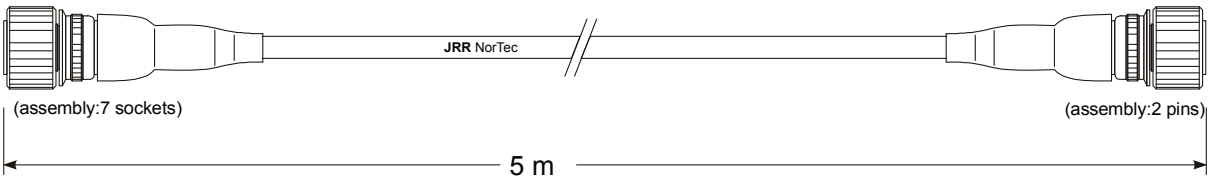
Picture 20:
Pole shoes

Battery clamp positive *NorTec* Part No.: 309 010 023 001
Battery clamp negative *NorTec* Part No.: 309 010 024 001

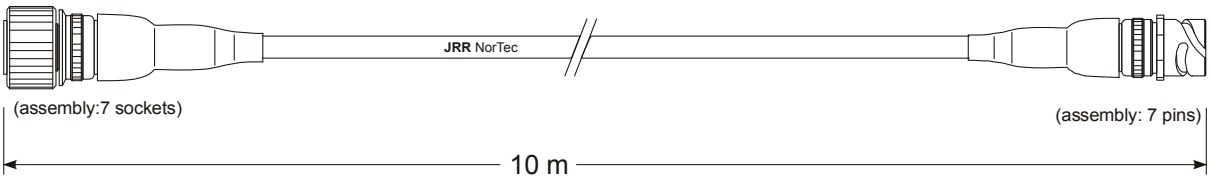
A.1.2 Battery connection cables

For charging batteries mounted into vehicles equipped with a trickle-charge socket the following cables are applied.

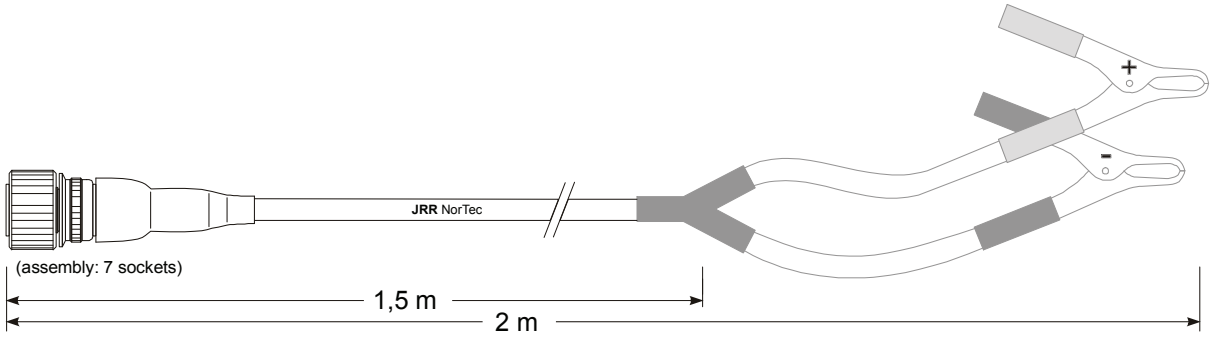
Vehicle connection cable MTV 6150-032E / *NorTec* Part No.: 309 010 071 001



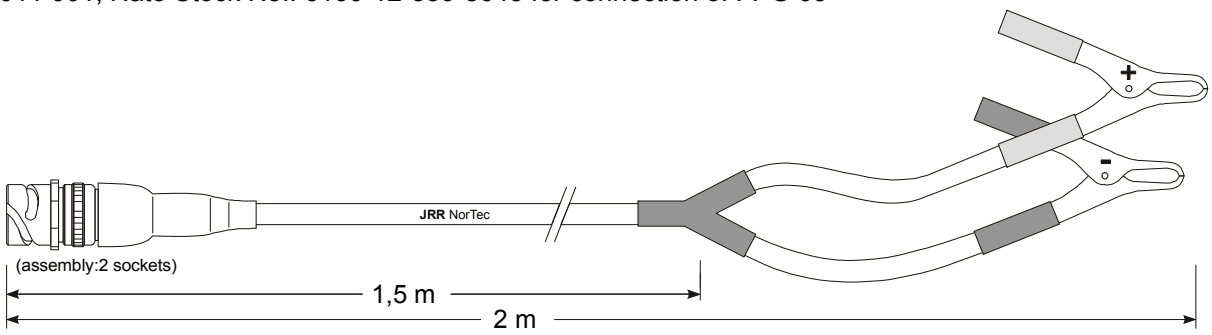
Prolongation cable MTV 6150-032D / *NorTec* Part No.: 309 010 070 003



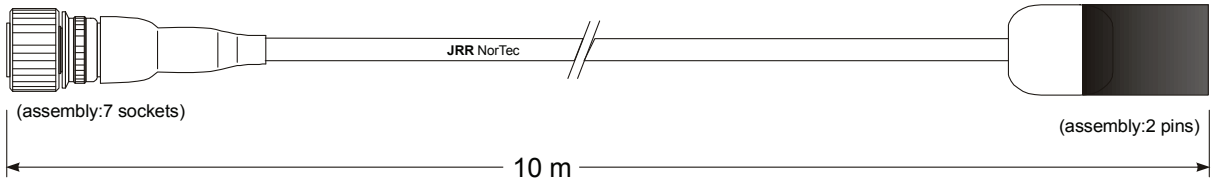
Battery connection cable MTV 6150-033 E / VG 96 965 T 04 A with battery clamps *NorTec*
Part No.: 309 010 072 002



Adaptation cable MTV 6150-033 B / VG 96 965 T 04 B with battery clamps. *NorTec* Part No.: 309 010 011 001, Nato Stock No.: 6150-12-339-8645 for connection of FPG 03



Adaptation cable TV 6150-032F for connection of tactical vehicles with external start sokket.
NorTec Part No.: 309 010 073 005



The above mentioned cables can be applied in the following combinations:

- For vehicles with trickle-charge socket VG 95 234 E-16S-4SN
    - Vehicle connection cable MTV 6150-032E or
    - Vehicle connection cable MTV 6150-032E + prolongation cable MTV 6150-032D
- For vehicles or battery sets without trickle-charge socket
    - Battery connection cable MTV 6150-033E or
    - Vehicle connection cable MTV 6150-032E + adaptation cable MTV 6150-033B

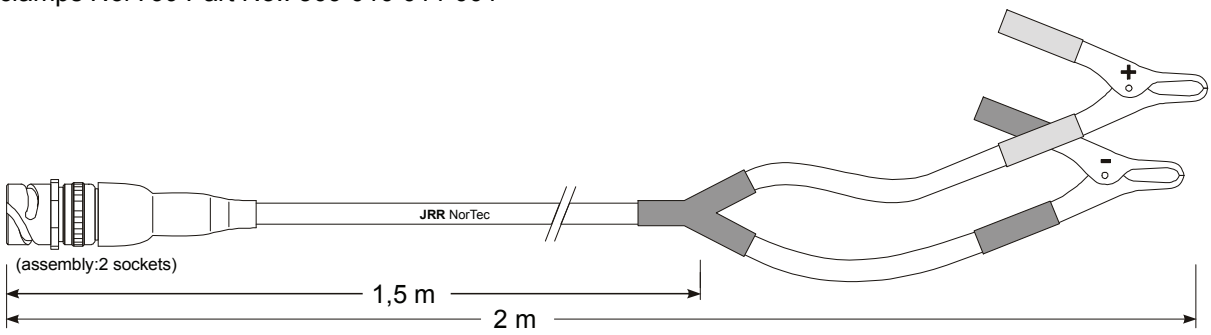
In all cases the prolongation cable MTV 6150-032D can be applied. By means of the sensor lines EL11 always compensates the voltage decline on the conductor.

ATTENTION:

Connection/disconnection of cables to batteries with switched off charger.

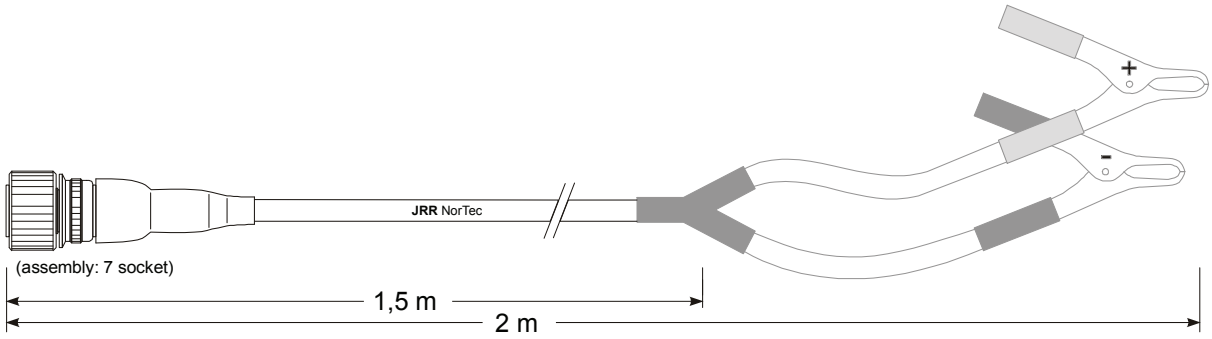
A.1.5 Connection of vehicles without trickle-charge plug

In case of charging vehicles without trickle-charge socket connect batteries in correct polarity with adaptation cable 033B and 032E. Adaptation cable MTV 6150-033B / VG 96 965 T 04 B with battery clamps *NorTec* Part No.: 309 010 011 001



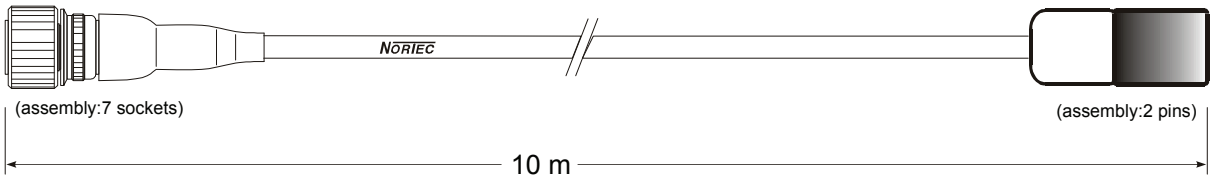
A.1.6 Connection of battery sets

In case of connection of a battery set of 24V directly to the device please use cable MTV 6150-033E *NorTec* Part No.: 309 010 072 002



A.1.7 Connection of military vehicles with external starting socket

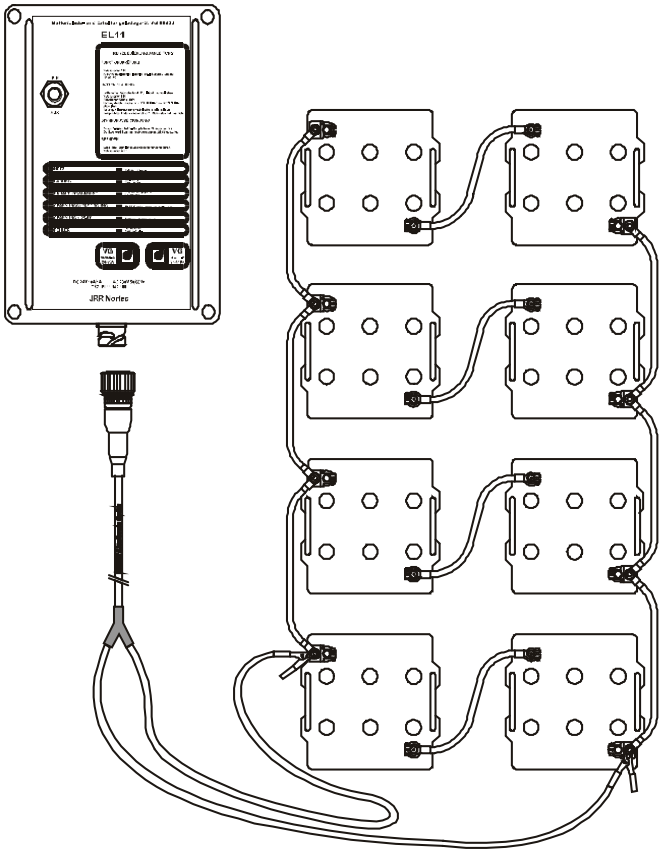
All military vehicles can be charged by EL11 over the standard NATO external start socket. Eventually set mains switch of the vehicle in position: "EIN" = ON. Vehicle connection cable MTV 6150-032F, alternatively MTV 6150-032E and external start adapter 309 010 090 004 can be used.



Alternatively cable 032E and external start adapter Part No.: 309 010 090 004 can be used.

A.1.8 Connection set for 8 batteries

MTV 6150 004 Appendix 1A / Part No.: 309 010 030 001



Picture: 21
Connection set for 8 batteries

List of parts:

- 1 PB-charger/Trickle-charger EL 11
- 1 battery adaptation cable MTV 6150-033E

If necessary the vehicle adaptation cable 032E (5m) can be used in connection with battery adaptation cable 033B (2m).

Set for 8 batteries:

- 3 battery connectors VG 95 282 T 14 L 300
- 3 battery connectors VG 95 282 T 14 K 300
- 4 battery connectors VG 95 282 T 14 F 300
- 4 battery clamps VG 95 282 T 13 A 2 (positive)
- 4 battery clamps VG 95 282 T 13 A 2 (negative)

A2 Testing and charge of wheel-tank Pandur

NOTICE

Caused by the application conditions of the tank both battery sets (starter and vehicle set) show a different status of charge. For 100% availability both sets should be completely charged.

A.2.1 Testing off-load voltage

Open cover plate over the two NATO start sockets on the right side of the vehicle. Tests off-load voltage by FPG03. For that insert the external start adapter Part No. 309 010 090 004 into the left of the two sockets (set of start batteries), connect adapter with FPG03 the upper display will show the off-load voltage of the tank. Please note the voltage! In case of a value below 25,4V the starting ability of the vehicle is risked. If vehicle voltage is below 18V the battery set is called deep-discharged. The battery must be recharged immediately to avoid battery damages.

Picture 22:
External start sockets

Picture 23:
External start adapter

NOTICE

In case of deep discharge the probability of irreversible damages of the battery is very high.

As soon as possible dismount battery set and test single batteries by BT2000 on military readiness for use (minimum 75% capacity). For the test take program 3, maintenance cycle. Repeat the same procedure on the second external start socket (vehicle battery set). Note off-load voltage! Only a fully charged vehicle battery set guarantees the function of the electronic systems with not running tank engine.

NOTICE

The FPG03 takes current out of the tested battery set. At voltages below 7V (extreme deep discharge) the display remains dark. In this case apply multimeter for measurement.

A.2.2 Installation of double trickle-charge connector

Install connector tight to both sockets. In case of first use the position of both sockets has to be adjusted to the connector (socket wrench no.10). A maximum equalization of 200mA is performed with disconnected EL11. This is the adequate battery treatment in case of one of the battery sets being extremely deep discharged. The reformation of the battery can be achieved if technically possible.

Picture 24:
Battery equalizing charge

A.2.3 Connection for charging of the vehicle

Connect vehicle connection cable 032E to the 7-pole DC-output connector of EL11 and with the 2-pin connector to the 2-pole socket of the double connector. Switch on EL11. Both press-buttons 5A and 10A are blinking. Select one of both and start charging operation.

Picture 25:
Charging of the vehicle

A.2.4 Charging of the vehicle

Returning from mission and foreseeable new mission select section B = 10A. Both vehicle sets have a capacity of 100Ah. In case of a completely discharged vehicle minimum 24hrs of recharging time is needed before the charging trickle-charge with 1A is performed.

A.2.5 Maintaining of readiness for use

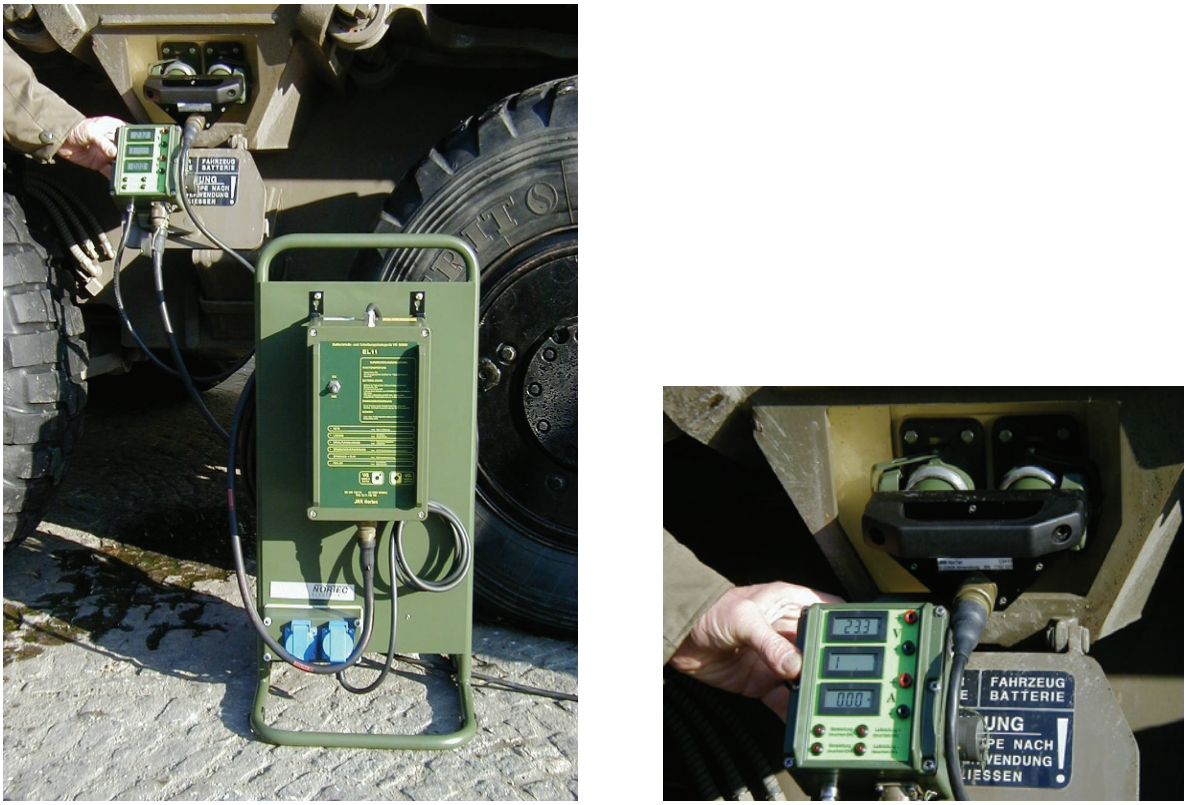
In normal military use with casual operation of the vehicle select section A=5A. The battery set will softly be recharged with 5A and trickle-charged with 1A.

A.2.6 Training application

Training the personnel on the wheel-tank the running engine might disturb the lesson. For supporting the batteries the constant voltage application can be chosen.

A.2.7 Screening of function of charger EL11

In each of the applications tester FPG03 can be hooked between charger and vehicle. Voltage and current are shown on the displays. The connection cable of FPG03 is connected to the vehicle either by external start adapter Part No.: 309 010 090 004 or double trickle-charge connector. The vehicle connection cable 032E is connected with the 2-pole socket to the FPG03.



Picture 26:
Charging with indication on FPG03

A.3 List of Pictures

APPENDIX B

Spare Parts list

B.1 Device EL11

Description	Type	Part No.
PB-charger/Trickle-charger	EL11 UK-Version	EL11.142 100.UK
Housing complete incl. mounting material	EL11	208 062 000 001
Top shell coated	EL11	108 062 001 001
Front foil with short instruction	EL11	108 062 024 002
Bottom shell coated	EL11	108 062 003 001
Set for wall-mounting	EL11	108 062 004 001
Dust hood ET307 grey		111 010 007 001
Mains switch complete with dust hood		211 062 020 001
Power supply cable complete	EL11	109 044 000 001
DC-output connector 7-pole, complete	VG95234-E-16S-1P	210 062 013 001
Protection cap	VG 95234 KR 16	210 050 001 001
ELG10 main PCB for EL11 complete	EL11	207 062 000 001
EPROM	Ö SMD dated 12.11.07	301 062 001 026
ELG10 LED PCB for EL11 complete	EL11	207 062 000 002
ELG10 keyboard PCB for EL11 complete	EL11	207 062 000 003
Power MOS-FET on insulation	IRFP460	101 010 024 000
PFC-Diode	DSEI30-06	101 030 030 006
Inrush current limiter	TRIAC BTA16/600B	111 030 016 600
Output rectifier diode on insulation	FEP30DP	101 030 200 215
Net rectifier	KBU8G	101 030 059 001
DC-output relays	12V16A	111 061 024 007
Inrush fuse power PCB 10ea	Glass-fuse 5x20T 3,15A	111 050 000 315
Warning sign driver cabin	EL11	315 062 002 010
Operating instructions	EL11	315 062 002 007

B.2 double trickle-charge connector

Double trickle-charge connector		
for wheel-tank Pandur		309 010 092 001
Connector shell ASB 171 x 90 x 20		108 017 150 000
Cover plate AL black/white,		
Coated 171 x 90 x 2		110 017 151 000
Equalization electronic		101 017 040 000
Handle plastic	RG-1S.140.84	108 140 000 000
Charging socket	CA3101E16S-4S-B-F42	110 020 027 002
PG 16 nut		110 075 501 000
Charging plug without connector shell	VG 96 917 E-001	110 020 059 001

B.3 Cables

Straight cable socket 7-pole complete	CA3106E16S-1S	110 020 041 007
Straight cable plug 2-pole complete	CA3106E16S-4P	110 020 042 000
Straight cable socket 2-pole complete	CA3101E16S-4S	110 010 015 000
Heat shrink coated	202K142-25/86-0	109 050 006 000
Clamp 40A positive		109 140 003 000
Clamp 40A negative		109 140 002 000
Battery clamp positive	VG 95 282 T13 A2	309 010 023 001
Battery clamp negative	VG 95 282 T13 B2	309 010 024 001
Temperature sensor		107 010 032 001
External starting socket		309 010 090 004

B.4 transportation rack

Transportation rack	EL11.9440 000 267
Installation UK socket 250V, 13A black	111 124 000 000
Cable clamp, plastic, black	316 003 000 000
Slip shell 4ea	108 045 001 000
Power supply cable 10m	109 020 002 001
Power supply cable 25m	109 020 002 002

B.5 Tester FPG03

FPG03	FPG03.020 001