

USER MANUAL



ATGB 1200

Battery Test Equipment

Charging · Discharging ·
Life Cycle Test · DC-Impedance Test ·
Reconditioning



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SAFETY INSTRUCTIONS

The following general safety instructions must be followed in all of the device's operating phases. Not following these safety regulations, special warnings or operating instructions in the product handbooks is a violation of safety standards, manufacturer specifications and the intended use of the device. BMZ is not responsible for damages arising from non-observance of these guidelines.

Use of Equipment

The ATGB 1200 is designed with adequate safeguards to protect the user from shock and other hazards when used as specified within this document. However, if the equipment is used in a manner not specified by this documentation, the protection provided by this equipment may be impaired. Please read this document and equipment labeling before using the equipment.

Modification of Equipment

CE and other approvals apply only to ATGB 1200 in the factory-authorized configuration. Changes or modification to the equipment not expressly approved by batteryuniversity.eu GmbH will void the approvals and void the user's authority to operate the equipment.

Disposal of Waste Electrical and Electronic Equipment (WEEE) in the European Union



This symbol on the product and package indicates that this product must not be disposed of with unsorted municipal waste. Instead, it is your responsibility to dispose of WEEE by handing it over to a designated collection point for the disposal. The separate collection and recycling of waste equipment will help conserve natural resources and ensure that it is disposed of in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for disposal, please contact your local municipal office, waste disposal service or wherever you purchased the product.

Environmental conditions










According to safety approvals, the ATGB is permitted for the following operating conditions:

- Stationary equipment in buildings.
- Ambient temperature range: 0-50°C.
- Maximum relative humidity: 90% (non-condensing).
- Operating altitude: up to 3,000 m.
- Pollution degree 2.











ROHS Compliance

The ATGB 1200 complies with the European Union's Directive 2002/95/EC, Restrictions of Hazardous Substances (RoHS).

Safety and warning symbols

	<p>CAUTION! Live parts - danger of electric shock or energy.</p>
	<p>Handbook symbol. The device or parts of the device are indicated with this symbol if the user must look up instructions in the handbook.</p>
	<p>Live parts with dangerous voltage.</p>
	<p>Ground connection, no protective earth (e.g., ground connection to a consumer load).</p>
	<p>Terminal clamp to protective conductor.</p>
	<p>Symbol for a switch or push buttons — “On” position.</p>
	<p>Symbol for a switch or push buttons — “Off” position.</p>
	<p>WARNING indicates danger. This indicator draws attention to an operating sequence, a procedure, etc., for which non-compliance can lead to injury or death. Do not carry out a procedure marked WARNING until you have understood and fulfilled all conditions.</p>
	<p>This “caution warning” indicates danger. The indicator draws attention to an operating sequence, a procedure, etc., for which non-compliance can lead to product damage or the loss of important data. If a procedure is marked with the indicator CAUTION, do not proceed until you have understood all specified conditions and fulfilled them.</p>

Explosion hazard

	<p>Batteries can burst / explode if treated improperly. Follow these precautions at all times.</p>
	<p>Clean battery contacts before servicing. To clean battery contacts, use a lintfree cotton swab dipped in 100% isopropyl alcohol.</p>
	<p>Press the battery firmly into the adapter to ensure a good connection.</p>
	<p>Ensure that the selected parameters are correct for the chemistry, voltage, and nominal capacity of the battery being serviced.</p>
	<p>Observe battery temperature. Service batteries between 5°C (41°F) and 50°C (122°F). Stop service if battery becomes very hot. The temperatures cited here are the battery temperatures, not ambient the ambient temperatures. Fast charging outside this temperature range may damage or reduce the life of the battery. Allow cold batteries to warm up and hot batteries to cool before charging.</p>
	<p>Do not attempt to charge non-rechargeable and primary batteries such as alkaline, carbon-zinc, or non-rechargeable lithium batteries.</p>
	<p>Do not short the positive (+) and negative (-) battery terminals together at any time.</p>
	<p>Do not connect leads from one station to another, or to the case. An electrical short to any point outside the station bypasses the current regulation loop and may blow a fuse or cause permanent component damage.</p>
	<p>Do not exceed the battery manufacturer's recommended charge current and voltage limits for batteries.</p>
	<p>Do not remove the adapter from the ATGB while the battery is charging or discharging!</p>

Charging and discharging lithium-ion batteries

Lithium-ion (Li-ion) batteries are safe when used as directed. Battery safety cannot be assured when a battery pack is built with individual cells of an unknown nature with a serial and parallel connection. Not all Li-ion cells are suited for multi-cell packs. Only cells that meet tight voltage and capacity tolerances can be used for serial and parallel connection. Mismatched packs are subject to overcharge resulting in venting with flame and fire. Check with the cell manufacturer to see if the cells are suitable for multi-cell packs.

In the past, single Li-ion cells were only available to authorized battery manufacturers. Today, imports are becoming readily available and often fall into the hands of the inexperienced. While most brand name cells are equipped with an internal cell disconnect that permanently opens the current path on high pressure, some brands do not provide this safeguard. Many brands don't use a separator that shuts down the battery when high temperatures are reached. The internal safety features are omitted for cost reasons.








Please follow the following guidelines when charging and discharging lithium-ion cell(s) and packs. Failing to follow these rules could result in venting with flame, explosion, fire and personal injury.

Warning for charging and discharging lithium-ion cells and battery packs

- ✘ Never connect cells in parallel and/or series that are not designed for that purpose. A cell mismatch may overcharge and vent with flames.
- ✘ Never charge or discharge the battery without connecting a working protection circuit. Each cell must be monitored individually and the current disconnected if an anomaly occurs.
- ✘ Never leave the battery unattended while under charge or discharge.
- ✔ Always attach a temperature sensor when charging and discharging the battery. The temperature sensor must disconnect the current on excess temperature.
- ✔ Only connect cells that are matched and have the identical state-of-charge.
- ✔ Pay special attention when using an unknown brand. Not all brands contain intrinsic safety features that protect the cell when stressed.
- ✔ During experiments, place the test battery into a well-ventilated fireproof container.

Shock hazard

	<p>The ATGB 1200 contains high-voltage circuits, and can pose a shock hazard when the upper cover is removed. Do not attempt to perform any service procedures on the ATGB 1200.</p>
	<p>To reduce the risk of electrical shock hazard, service batteries only when they are removed and disconnected from their end-use equipment.</p>
	<p>Use the ATGB 1200 only as specified in the documentation. Other uses may impair the protection provided by the unit.</p>
	<p>Use only a grounded AC outlet to power the analyzer.</p>
	<p>Before attempting any internal service, remove all batteries from the battery stations, turn the ATGB off and disconnect the power cord from the wall socket. Wait a few minutes before opening the cover.</p>

WARRANTY & SERVICE

BMZ warrants the ATGB 1200 against defective materials and workmanship for a period **of one (1) year from the original purchase date.**

The warranty does not cover:

- Damage caused by abusive operation, negligence, accident, or improper installation.
- Damage caused by an attempted repair not authorized by batteryuniversity.eu.
- Cosmetic damage caused by normal wear and tear.
- Damage from external causes such as leakage spills, power fluctuations, power failure or inadequate shipping.
- Product received without the appropriate model number, serial number, or safety markings.
- Products used for rental purposes.

Warranty Service

Before sending the unit for service, contact the batteryuniversity.eu Technical Support. If the product requires warranty service, the representative will provide a Return Authorization form or number.

- Ship the product to the batteryuniversity.eu Head Office with freight, insurance, and customs duties prepaid. The Return Authorization form must be included to obtain warranty service.
- Ensure that the unit(s) is properly packed before shipping, preferably in the original ATGB boxes. Damage caused in transit due to improperly packed items is not covered under warranty.

Non-Warranty Repairs

Before sending the unit in for service, contact the batteryuniversity.eu Technical Support: ATGB@batteryuniversity.eu. If the ATGB 1200 is not covered by warranty, the representative will provide a Return Authorization form or number.

- Ship the product to the batteryuniversity.eu Head Office with freight, insurance, and customs duties prepaid.
- Ensure that the unit(s) is properly packaged before shipping.

Note: A Purchase Order or written authorization is required to proceed with repair.

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INTRODUCTION

The ATGB is a battery testing device. For operation, the German and English languages are available. The ATGB is intended for use in laboratories, production and service. It offers the following functions: Charging, discharging, cycles, internal resistance measurement, pulse charging and reconditioning of batteries. Depending on the chemical type, the battery's permissible voltage range lies between 0.8 and 48 V and the charging and discharging current between 0 and 10 A (max. 200 W). During discharging, the peak current can be up to 50 A. The ATGB also offers a power supply unit for supplying batteries with their own recharge electronics. The remote sensors for voltage measurement allow voltage to be measured precisely. With a Pt1000 temperature sensor, the ATGB can monitor the battery's temperature. On the back of the ATGB, there are a USB port and a power switch. The ATGB is laid out for **lithium-ion, LiFePh, li-titanate, NiCd, NiMh and lead** battery technologies.

In the work menu on the display, the voltage, current, temperature, capacity and time stamp are shown. When turned on, the "ATGB" logo, the device type and the device and program version appear. The following parameters can be seen on the display:



Line 1	Bat.:		
Line 2	Prg.:		
Line 3			▷ Start
Line 4	Volt.:	0.002 V	Meas.
Line 5	Curr.:	0.001 A	Menu
Line 6	Temp.:	25.5°C	
Line 7	Char.:	0mAh	P
Line 8		0.0%	

- ▶ Line 1 shows the name of the selected battery (Bat.), and Line 2 the name of the program (Prg.) to be executed. With Start, the set program can be launched, and with Meas. the measurement values can be displayed. Menu allows access to the program functions, to the battery functions, and to the ATGB settings.
- ▶ Line 4 displays the battery's current voltage (Volt.). In Lines 5 to 8, the current and the present temperature (Temp.), as well as the battery's charge (Char.) in mAh and in percent of nominal capacity can be seen.
- ▶  The keys can be used to set, monitor or change the batteries and functions.
- ▶  While the ATGB is operating, the symbols are shown to the right underneath the window. An example is the idle state symbol

1 SETTINGS


1.1. CURSOR

The cursor (▷) can be moved with the arrow keys in the display to the possible setting points. There are numerical values that can be set, and options that can be selected. The empty triangle (▷) is the cursor symbol. During a menu change, the cursor remains at the most recently selected



1.2. SETTING NUMERICAL VALUES

A setting's numerical value is selected by placing the cursor (▷) on it and using the OK key to confirm it. Once it has been selected, the cursor blinks with a frequency of 1 Hz. The numerical value is set with the ▲ and ▼ keys. The OK key confirms the set value, and then the cursor stops blinking. Use the ◀ key to reject the change in value and restore the original value.

1.3. SELECTING A FUNCTION

Select an option by placing the cursor (▷) on it. Pressing the  key confirms the option selection. The selection is shown by a solid triangle (▶). If the cursor (▷) and the option indicator (▶) are on the same function, the display switches between the option indicator and the cursor at a speed of 1 Hz.

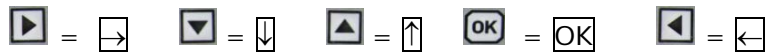
1.4. IMPORTING SETTINGS

Settings and numerical values are basically imported with the  key. If the setting has not been not imported within 20 sec. after the last change with the  key, it will be rejected and the old value used again.

Another function is automatic import of numerical values if they have not been changed in more than 20 sec. Automatic import is selected in the display settings menu (see 4.4.1).

1.5. CHANGING MENUS

Change menus by moving the cursor (▷) to the menu item. If the menu simultaneously offers an option, the menu is changed only with the → key. If it is a plain menu item, it can also be selected with the **OK** key. With the ← key, you can exit a menu again. With the key combination ↑ + ↓, you can jump from the work menu to a menu's last altered setting.



1.6. RETURNING TO A MENU

When there are no more changes to be made, after a maximum of 60 sec. all menus jump back to the work menu. With the key combination ◀ + ▶, you can jump back to the menu position that you have just jumped out of.

1.7. LOCKING

To prevent unwanted changes to the settings, there is a lock that can be activated and deactivated with the key combination ◀ + ▼ + **OK**. However, the lock must then be turned on in the display settings menu (see 4.4.1).

2 POWER ON

Line 1
Line 2
Line 3
Line 4
Line 5
Line 6
Line 7
Line 8



After the ATGB has been turned on, the upper activation menu appears for 2 sec. before changing automatically to the work menu (see 3).

- Line 1-5:** "ATGB" logo
- Line 6:** Empty line
- Line 7:** Device model
- Line 8:** Device and program version

3 WORK MENU














Line 1	Bat . : BAT. 1 12V	
Line 2	Pr g . : LI FE CYCLE	
Line 3		▷Start
Line 4	Vol . : 88.888V	Meas .
Line 5	Cur r . : 88.888B	Menu
Line 6	Temp . : 888.8° C	Symbol field
Line 7	Char : 88888mAh	
Line 8	888.8%	

- Line 1:** Name of selected battery (max. 15 characters). If a battery name is chosen, one goes directly to the battery selection menu (see 4.1.1.), and another battery can be selected.
- Line 2:** Name of selected program (max. 15 characters). If the program name is chosen, one goes directly to the program selection menu (see 4.2.1.), and another program can also be selected.
- Line 4:** The left half shows the battery's present terminal voltage.
- Line 5:** The left half shows the present charging current (2-wire system only) and the discharging current. On 3- and 4-wire systems, the supply current of the battery's recharge electronics is shown.
- Line 6:** The left half shows the battery's temperature measured with a Pt1000 sensor.
- Line 7:** The left half shows the charge directed to or discharged from the battery.

Line 8: The left half shows the charge directed to or discharged from the battery as a percentage of nominal capacity.

Lines 3...5: The right half shows three options. The "Start" option launches the selected program. While the program is running, the option changes from "Start" to "Quit", which allows the currently running program to be exited. If there is a malfunction, this option changes to "Quit" in order exit the malfunction. The menu item "Meas." leads to the operational data set of the last program run, collected by measurement value storage (see 4.3.1.). The menu item "Menu" leads to the selection menu (see 4). If the lock is active, instead of the text "Menu", the text "####" appears.

Lines 6...8: The right half shows the symbol field for the operational status:

	Idle state		Condition battery capacity or charging status Function: BBL01, BBV01, BKA01, BKA02,
	Program message has arrived (Function: MEL01)		Condition Ri Function: BRI01
	Malfunction (warning/error)		Condition recharge voltage Function: BNL01
	Charge with duration Function: LAD01, LAD02		Repeat Condition: WID01
	Compensation charge with duration Function: EHL01		Pause with duration Function: PAU01
	Discharge with duration Function: ENL01, ENL02, SPE01		End of program Function: END01
	Reconditioning charge with duration Function: RKE01		

If there is a warning, the symbol field can be selected. Then the error menu appears with the description of the error.

3.1. ERROR MENU

If an error occurs, the error menu will display immediately. If the error menu is exited by pressing a key, the cursor will be in front of the "Quit" option.

Line 1	ERROR MENU
Line 2	Battery is too
Line 3	warm
Line 4	
Line 5	
Line 6	
Line 7	
Line 8	

Line 1	PRG. MESSAGE PREVIEW
Line 2	No. : 1
Line 3	CAPACITY IS OK
Line 4	
Line 5	
Line 6	
Line 7	
Line 8	

Line 1: Name of menu.
Line 2...8: Description of error.

3.2. Program message issuance

A program message appears when a program message is created in the running program. By pressing a key, the program message can be exited again. The display jumps back to the menu that was up before the message was issued.

Line 1: Name of menu.
Line 2: Number of program message
Lines 3...8: Program message lines 1...6

4 SELECTION MENU

Line 1	S E L E C T I O N M E N U
Line 2	▷ B a t t e r y
Line 3	P r o g r a m
Line 4	M e a s u r e d d a t a s
Line 5	D e v i c e s e t t l i n g s
Line 6	I n f o r m a t i o n
Line 7	
Line 8	

The ← key takes you back to the **work menu**.

Line 1: Name of menu.

Line 2: Menu item Battery menu (see 4.1.)

Line 3: Menu item Program menu (see 4.2.)

Line 4: Menu item Measured data menu (see 4.3.)

Line 5: Menu item Device settings menu (see 4.4.)

Line 6: Menu item Information menu (see 4.5.)

4.1. BATTERY MENU

Line 1	B A T T E R Y M E N U
Line 2	▷ S e l e c t / e d i t
Line 3	C r e a t e
Line 4	D e l e t e
Line 5	
Line 6	
Line 7	
Line 8	

The ← takes you back to the **Selection menu** (see 4).

Line 1: Name of menu.

Line 2: Menu item Select and Edit (see 4.1.1.) a battery data set

Line 3: Menu item Create (see 4.1.2.) for creating a new battery data set

Line 4: Menu item Delete (see 4.1.3.) for deleting a battery data set

4.1.1. Battery selection menu

Line 1	BATTERY SELECTION
Line 2	
Line 3	▶ 1 BATTERY 1
Line 4	2 BATTERY 2
Line 5	3 BATTERY 3
Line 6	4 BATTERY 4
Line 7	5
Line 8	next . . . 2

The ← key takes you back to the **battery menu**.

Line 1: Name of menu.

Line 2: Empty line.

Line 3...7: Option items for the various battery data sets (1...95), which are numerically sorted in series (left of the name). A battery data set can only be selected using the key if its parameters are complete; otherwise an error message will show up in the error menu (see 3.1.). The → key changes the **settings menu** (see 4.1.1.1.), so that the saved data on this battery can be viewed and edited.

Line 8: To the next page.

4.1.1.1. Battery settings menu

When creating a new battery, a set sequence must be followed, because the entry fields for the charging and discharging parameters depend on the chemistry type, the nominal capacity and the connection, and are monitored accordingly.

When creating a battery data set, the following sequence is reasonable:

- Create the battery name. The battery name is the primary creation characteristic. Without it, no further settings can be made.
- Determine the battery's chemistry type. The chemistry type is the secondary creation characteristic; without this characteristic, the other settings cannot be made. Once the chemistry type has been created, the factory default settings are entered for the specific values and the connection.
- Create the battery's specific values. The battery's capacity and the number of cells connected in series are the tertiary creation characteristics. Once the specific values have been created, the factory default settings for the discharge parameters are entered.
- The battery's connection. Contains the connection information that the ATGB needs to connect the battery properly during charging and discharging. The connection is the quaternary creation characteristic. Furthermore, the possible charging end criteria are drawn from the connection. Once the connection has been created, the factory default settings are entered for the charging parameters.

Then the following settings can be made in any sequence:

- The battery **type** is a plain information field independent of all other battery settings.
- The battery's **charging parameters**, which depend on the battery's chemistry type, the capacity and connection, are then filled with standard values.
- The battery's **discharging parameters**, which depend on the battery's chemistry type and capacity, are then filled with standard values.
- If a battery's **chemistry type** is changed, the settings for the connection and the charging and discharging parameters are reset. If a battery's connection is changed, the charging parameters are also reset.
- **When a program is launched**, the battery data set is checked for completeness. If it is incomplete, the ATGB goes into malfunction status and issues a corresponding error message.

A battery data set can be selected only if all parameters are defined!

Line 1	BATTERY SETTINGS
Line 2	▷Name :
Line 3	Type :
Line 4	Chemistry Li Ionen
Line 5	Specific values
Line 6	Connection
Line 7	Charging parameters
Line 8	Discharge parameters

The ← takes you back to the **battery selection menu** (see 4.1.1).

Line 1: Name of menu.

Line 2: Menu item Battery name (see 4.1.1.1.2.).

Line 3: Menu item Battery type (see 4.1.1.1.3.).

Line 4: Menu item Chemistry type (see 4.1.1.1.4.).

Line 5: Menu item Specific values (see 4.1.1.1.5). If the battery's chemistry type has not been defined, no menu change occurs, but an error message in the error menu (see 3.1.).

Line 6: Menu item Connection (see 4.1.1.1.6).

Line 7: Menu item Charging parameters (see 4.1.1.1.7). If the battery's chemistry type, connection or capacity has not been defined, no menu change occurs, but an error message in the error menu (see 3.1.).

Line 8: Menu item Discharge parameters (see 4.1.1.1.8). If the battery's chemistry type or capacity has not been defined, no menu change occurs, but an error message in the error menu (see 3.1.).

4.1.1.1.1. Battery name creation menu

```
Line 1 CREATE BATTERYNAME
Line 2 No. : 888
Line 3 Name: ▷ ABCDEFG
Line 4
Line 5 1 2 3 4 5 6 7 8 9 0 ( ) Es cape
Line 6 A B C D E F G H I J K L En t er
Line 7 M N O P Q R S T U V W X Bk ddl
Line 8 Y Z . , : ; + - / _ < > De l et e
```

The ← key takes you back to the **battery name creation selection menu** (see 4.1.1). If the name created is not confirmed with "Enter", the program goes directly to the battery settings menu (see 4.1.1.1.) in order to set the battery parameters.

Line 1: Name of menu.

Line 2: Serial number of battery data set.

Line 3: Name of battery (max. 15 characters); at least one character must be entered. The rest of the battery's parameters are set in the battery selection menu (see 4.1.1.).

Lines 4...7: Selection menu for name entry (capital letters only).

4.1.1.1.2. Battery name menu

```
Line 1 BATTERY NAME
Line 2 Name: BATTERY 1
Line 3
Line 4
Line 5 1 2 3 4 5 6 7 8 9 0 ( ) Es cape
Line 6 A B C D E F G H I J K L En t er
Line 7 M N O P Q R S T U V W X Bk ddl
Line 8 Y Z . , : ; + - / _ < > De l et e
```

The ← takes you back to the **battery settings menu** (see 4.1.1.1).

Line 1: Name of menu.

Line 2: Name of battery (max. 15 characters), which can be changed.

Line 5...8: Selection keys for name entry (capital letters only).

4.1.1.1.3. Battery type menu

Line 1	BATTERY TYPE
Line 2	Name: 10S4P US18650V1
Line 3	
Line 4	
Line 5	1 2 3 4 5 6 7 8 9 0 () Es cape
Line 6	A B C D E F G H I J K L Ent er
Line 7	M N O P Q R S T U V W X Bk ddl
Line 8	Y Z . , : ; + - / _ < > De l et e

The ← key takes you back to the **battery settings menu** (see 4.1.1.1).

Line 1: Name of menu.

Line 2: Name of battery (max. 15 characters), which can be changed.

Line 5...8: Selection keys for name entry (capital letters only).

4.1.1.1.4. Battery chemistry type menu

Line 1	BAT. CHEMI STRY TYPE
Line 2	▶ Li Ion en
Line 3	Li FePh
Line 4	Li Ti t a n a t e
Line 5	Ni Cd
Line 6	Ni MH
Line 7	Pb (l e a d)
Line 8	

The ← key takes you back to the **battery settings menu** (see 4.1.1.1).

Line 1: Name of menu.

Lines 2...7: Options for the battery's various chemistry types. If the chemistry type is changed, the parameters for the specific values, charging, discharging and the connection are reset. For each chemistry type, the typical input limits for the charging and discharging parameters are stored.

Line 8: To the next submenu if more than six chemistry types have been registered.

4.1.1.1.5. Battery specific values menu

Line 1	BAT. SPECIFIC VALUES
Line 2	Cells in row: > 88
Line 3	Nom. vol.: max.: 88.88 V
Line 4	min.: 88.88 V
Line 5	Capacity: 888888 mA h
Line 6	Int. res. Ri: 8888 mΩ
Line 7	General meas.
Line 8	interval: 888.8 s

The ← key takes you back to the battery settings menu (see 4.1.1.1). For undefined specific values, all numbers are displayed as “_”.

Line 1: Name of menu.

Line 2: Number of series-connected cells in the battery.

Lines 3 and 4: The ATGB calculates the battery’s nominal voltage according to the number of cells entered and the chemistry type selected and is given as a range.

Line 5: Setting the battery’s nominal capacity as a numerical value.

Line 6: Setting the Ri internal resistance of the battery as a numerical value. If the internal resistance is not to be used, “----” is shown.

Lines 7 and 8: Setting the general sampling time as a numerical value for the battery measurement values that are determined outside of charging and discharging.

4.1.1.1.6. Battery connection menu

Line 1	BATTERY CONNECTION
Line 2	Charg. 2-wire
Line 3	connec.: 3-wire pos.
Line 4	3-wire neg.
Line 5	▶4-wire
Line 6	Charging supply
Line 7	Nom. volt.: 88.8 V
Line 8	max. curr.: 88.8 A

The ← key takes you back to the battery settings menu.

Line 1: Name of menu.

Lines 2...5: Options for the battery’s connection type. For definition of the battery’s connection type, see 7 (page 62-63).

Lines 7 and 8: Setting the nominal voltage and the max. current for supplying the battery’s charging circuit with 3- and 4-wire connections.

4.1.1.1.7. Battery charging parameter menu

The menu is structured in various ways, depending on the chemistry type selected. The ← key takes you back to the battery settings menu (see 4.1.1.1).

2-wire connection:

Lithium and lead battery nickel battery

Line 1	CHARGING PARAMETER
Line 2	max. chr. vol.: ▷ 88.88V
Line 3	Recharge vol.: 88.88V
Line 4	Voltage per cell
Line 5	Char. curr.: 88.88A
Line 6	End of char.: 88.88A
Line 7	Temp. band.: 88-88°C
Line 8	Meas. interv.: 888.8s

Nickel-battery

Line 1	CHARGING PARAMETER
Line 2	Char. curr.: ▷88.88A
Line 3	Comp. curr.: 8.88A
Line 4	
Line 5	dTemp. / dt : 8.8°C/ min
Line 6	- ΔU/ cell : 88 mV
Line 7	Temp. - Band: 88-88°C
Line 8	Meas. interv.: 888.8s

- Line 1:** Name of menu.
- Line 2:** Setting the max. charging voltage per battery cell. The setting range is limited by the chemistry type.
- Line 3:** Setting the recharge current per battery cell. The setting range is limited by the chemistry type.
- Line 4:** Voltage per cell
- Line 5:** Setting the charging current as a numerical value.
- Line 6:** Setting the current for the end of the charging process. The setting range (0.01...0.2 C) depends on the battery capacity.
- Line 7:** Setting the battery's permissible temperature band during charging. The setting range is limited by the chemistry type.
- Line 8:** Setting the sampling time as a numerical value for the battery measurement values during charging.

- Line 1:** Name of menu.
- Line 2:** Setting the charging current.
- Line 3:** Setting the compensation charge current.
- Line 4:** Empty line
- Line 5:** Setting the end-of-charge criteria Temperature rise "dTemp./dt"
- Line 6:** Setting the end-of-charge criterion Voltage decrease "-ΔU"
- Line 7:** Setting the battery's permissible temperature band during charging. The setting range is limited by the chemistry type. The upper limit of the temperature band is also an end-of-charge criterion.
- Line 8:** Setting the sampling time as a numerical value for the battery measurement values during charging.

3- and 4-wire connection:

Line 1	CHARGING PARAMETER
Line 2	End of charge
Line 3	Supply curr: 88.88A
Line 4	Delay: 0s
Line 5	
Line 6	
Line 7	Temp. band: 88-88°C
Line 8	Meas. interv.: 888.8s

The ← key takes you back to the **battery settings menu**.

Line 1: Name of menu.

Line 2: Setting the battery recharge electronics' supply current at which charging should stop (as a numerical value).

Line 7: Setting the battery's permissible temperature band during charging. The setting range is limited (by the chemistry type).

Line 8: Setting the sampling time as a numerical value for the measurement values during charging.

4.1.1.1.8. Battery discharging parameter menu

Li-ion and Lead-Acid - Battery

Line 1	DISCHARGE PARAMETER
Line 2	Disch. curr.: >88.88A
Line 3	End vol./cell: 8.88V
Line 4	Target capac.: 888%
Line 5	Temp. band.: 88-88°C
Line 6	Meas. interv.: 888.8s
Line 7	Curr. peak/Ri meas.
Line 8	

Nickel-Battery

Line 1	DISCHARGE PARAMETER
Line 2	Disch. curr.: >88.88A
Line 3	End vol./cell: 8.88V
Line 4	Target capac.: 888%
Line 5	Temp. band.: 88-88°C
Line 6	Meas. interv.: 888.8s
Line 7	Curr. peak/Ri meas.
Line 8	Reconditioning

The menu is structured in various ways, depending on the chemistry type selected. The ← key takes you back to the battery settings menu (see 4.1.1.1).

Line 1: Name of menu.

Line 2: Setting the continuous discharge current (as a numerical value).

Line 3: Setting the end-of-discharge voltage per cell. The setting range is limited by the chemistry type.

Line 4: Setting the capacity to be reached during discharge.

Line 5: Setting the battery's permissible temperature band during discharging. The setting range is limited by the chemistry type.

Line 6: Setting the sampling time as a numerical value for the battery measurement values during discharge.

Line 7: Menu item Discharge peak current and Ri measurement (see 4.1.1.1.9.a).

Line 8: Only for nickel batteries, menu item Reconditioning (see 4.1.1.1.9.b).

4.1.1.1.9.a. Menu Battery discharge peak current and Ri measurement

Line 1	DISCHARGE PEAK CURR.
Line 2	Curr . peak: ▷88.88 A
Line 3	Peakt ime: 8888 ms
Line 4	
Line 5	Ri MEASURING
Line 6	Test curr 1: 88.88 A
Line 7	Test curr 2: 88.88 A
Line 8	

The ← key takes you back to the battery discharging parameter menu (see 4.1.1.1.8).

Line 1: Name of the Discharge peak current submenu

Line 2: Setting the discharge current peak as a numerical value.

Line 3: Setting the time for the discharge current peak as a numerical value. The settable time range is limited by the battery's nominal voltage.

Line 5: Name of the Ri measuring submenu.

Line 6: Setting Ri test current 1 as a numerical value.

Line 7: Setting Ri test current 2 as a numerical value.

To determine the battery's internal resistance, the battery voltage is measured, which is set after 3 sec. if the battery is discharged with Ri test current 1 (I1) and 2 (I2):

$$R_i = (U_1 - U_2) / (I_2 - I_1)$$

4.1.1.1.9.b. Battery discharge reconditioning menu

Line 1	RECONDI TI ONI NG
Line 2	Di sch. curr.: ▷ 88.88 A
Line 3	End vol./cell: 8.88 V
Line 4	
Line 5	
Line 6	
Line 7	
Line 8	

The ← key takes you back to the **battery discharging parameter menu** (see 4.1.1.1.8).

Line 1: Name of menu.

Line 2: Setting the discharge reconditioning current as a numerical value.

Line 3: Setting the discharge reconditioning end voltage per cell. The setting range is limited by the chemistry type.

The reconditioning discharge function is only available with **nickel batteries**. During the reconditioning discharge the battery is discharged with the reconditioning current set in the discharge parameters until the set reconditioning end voltage.

At the end of the operation, the actuation unit is shut off.

4.1.2. Battery creation selection menu

Menu 1. Page

Line 1	CREATE BATTERY
Line 2	
Line 3	1 BATTERY 1
Line 4	2 BATTERY 2
Line 5	3 BATTERY 3
Line 6	4 BATTERY 4
Line 7	▷ 5 BATTERY 5
Line 8	Next . . . 2

Menu 2. ... 20. Page

Line 1	CREATE BATTERY
Line 2	▷Back . . . 1
Line 3	6 BATTERY 6
Line 4	7
Line 5	8
Line 6	9
Line 7	10
Line 8	Next . . . 3

The ← key takes you back to the **battery menu** (see 4.1.).

Line 1: Name of menu.

Line 3...7: Option items for the free battery data sets (1...95), which are numerically sorted series (left of the name). The **OK** or → keys select a battery data set, and change one in the battery name creation menu (see 4.1.1.1.), in which the name of the new battery is entered.

Line 8: To the next page.

4.1.3. Battery delete menu

Menu 1. Page

Line 1	DELE TE BATTERY
Line 2	
Line 3	1 BATTERY 1
Line 4	▶ 2▷ BATTERY 2
Line 5	3 BATTERY 3
Line 6	4 BATTERY 4
Line 7	5 BATTERY 5
Line 8	Next . . . 2

Menu 2. ... 20. Page

Line 1	DELETE BATTERY
Line 2	▷Back . . . 1
Line 3	6 BATTERY 6
Line 4	7
Line 5	8
Line 6	9
Line 7	10
Line 8	Next . . . 3

The ← takes you back to the **battery selection menu** (see 4.1).

Line 1: Name of menu.

Line 2: To previous page.

Line 3...7: Options for deleting the available battery data sets. After selection of a battery data set with the **OK** key, the → key must be changed to the right and the **OK** key pressed again. The deletion can be cancelled with the ← key. The serial numbering of the data set will not be changed.

Line 8: To the next page.

4.2. PROGRAM MENU

Line 1	PROGRAM MENU
Line 2	▷Choose / edit
Line 3	Create
Line 4	Delete
Line 5	
Line 6	Program messages
Line 7	Create / Edit
Line 8	Delete

The ← key takes you back to the **selection menu** (see 4).

Line 1: Name of menu.

Line 2: Menu item Select and edit (see 4.2.1.) a program.

Line 3: Menu item Create (see 4.2.2.) a program.

Line 4: Menu item Delete (see 4.2.3.) a program.

Line 7: Menu item Create and edit (see 4.2.4.) a program message.

Line 8: Menu item Delete (see 4.2.5.) a program message.

4.2.1. Program selection menu

Line 1	PROGRAM SELECTION
Line 2	
Line 3	▶ 1 CHARGE
Line 4	2 DISCHARGE
Line 5	3 CAPACITY TEST
Line 6	4 DC RESISTANCE
Line 7	5 CYCLE 50
Line 8	Next . . . 2

The ← key takes you back to the **program menu** (see 4.2).

Line 1: Name of menu.

Line 3...7: Options for various programs that can be edited. The → key takes you into the program structure menu (see 4.2.1.1.), where the program structure and each individual program step can be altered.

Line 8: To the next submenu if more than six programs have been registered.

4.2.1.1. Program structure menu

```

Line 1 PROGRAM STRUCTURE
Line 2 ▷Pr g . : CAPACI TYTEST
Line 3   1 Charge LAD01
Line 4   2 Pause PAU01
Line 5   3 Di scharge ENL01
Line 6   4 Pause PAU01
Line 7   5 Con. cap. BKA01
Line 8 Next . . . 2

```

```

Line 1 PROGRAM STRUCTURE
Line 2 ▷Back . . . 1
Line 3   6 Message MEL01
Line 4   7 Message MEL01
Line 5   8 Charge LAD01
Line 6   9 End END01
Line 7  10
Line 8 Next . . . 3

```

The ← key takes you back to the **program selection menu** (see 4.2.1).

Line 1: Name of menu.

Line 2: Name of program. The → key takes you into the program menu (see 4.2.1.1.1.), where the program name can be altered.

Line 3...7: Menu items for various program steps that can be edited. The → key takes you into the program step menu (see 4.2.1.1.2.), where each program step can be specified and altered.

Line 8: To the next submenu if more than five steps are used.

When creating a program, a program name must always be entered first. Then each program step is entered. The program step parameters are monitored by their input limits.

4.2.1.1.1. Program name menu

```

Line 1 PROGRAM NAME
Line 2 Name: ▷ ABCDEFG
Line 3
Line 4
Line 5 1 2 3 4 5 6 7 8 9 0 ( ) Escape
Line 6 ABCDEF GHI JKL Enter
Line 7 MNOPQR STUVWX Bkddl
Line 8 YZ. , ; + - / _ < > Delete

```

The ← key takes you back to the **program structure menu** (see 4.2.1.1).

Line 1: Name of menu.

Line 2: Name of program (max. 15 characters), which can be changed.

Lines 5...8: Selection keys for name input.

4.2.1.1.2. Program step menu

Menu 1. Page

Line 1	PROGRAM STEP
Line 2	Step no.: 88
Line 3	Delete function
Line 4	Insert function
Line 5	▶ Charge LAD01
Line 6	Charge LAD02
Line 7	Comp. chr. EHL01
Line 8	Next... 2

Menu 2. ... 10. Page

Line 1	PROGRAMM STEP
Line 2	Back... 1
Line 3	Con. Vol. BSP01
Line 4	Message MEL01
Line 5	Pause PAU01
Line 6	Repetit. WI D01
Line 7	End END01
Line 8	Next... 3

The ← key takes you back to the **program structure menu** (see 4.2.1.1).

Line 1: Name of menu.

Line 2: Name of program step as information

Line 3...7: Options for various program functions that are available. The → key takes you into the associated program function menu (see 4.2.1.1.3., etc.). The parameters belonging to these functions cannot be modified if the function is selected. If a new function is selected, the settings to the previous function are lost. During selection, the corresponding program function menu automatically changes (see 4.2.1.1.3., etc.).

Line 8: To the next submenu if more than five steps are used.

4.2.1.1.3. Program functions

Each program function has its own assigned menu, in which the program function's parameters can be set.

4.2.1.1.3.1 LAD01 function menu

Battery charging function with three selectable end-of-charge functions (charging time, capacity increase and battery data). Only with a 2-wire battery connection are the three end-of-charge criteria completely functional, because here the ATGB measures the charging current. For batteries with their own charging circuit, the capacity increase end-of-charge criterion isn't functional, and if it is nonetheless selected, it will be cancelled and an error message shown.

The end-of-charge battery data criterion has the highest priority. That means that even if both of the other criteria have been selected, charging will stop as soon as the criteria corresponding to the battery data is fulfilled. With the end-of-charge charging time criterion, charging will end if the selected charging time in minutes has expired.

With the end-of-charge capacity increase criterion, charging will stop as soon as the battery's capacity has changed by the selected capacity increase as a percentage.

With this function, the following function data sets are recorded:

Measured value 1: The capacity increase at the end of charging with timestamp.

Line 1	PROGRAM FUNCTI ON
Line 2	Name: Charge LAD01
Line 3	▶Charg. time: 8888mi n
Line 4	Inc. of cap. : 888%
Line 5	Battery data
Line 6	
Line 7	
Line 8	

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

Line 1: Name of menu.

Line 2: Name (max. 15 characters) of function as information.

Lines 3...5: Options for the various end-of-charge criteria and their settings as a numerical values.

4.2.1.1.3.2 LAD02 function menu

Zeile 1	PROGRAM FUNCTI ON
Zeile 2	Name: Charge LAD02
Zeile 3	►Charg. time: 8888mi n
Zeile 4	Inc. of cap. : 888%
Zeile 5	Battery data
Zeile 6	
Zeile 7	Charge current in
Zeile 8	C- value: 8.88C

The ← key takes you back to the program **step menu** (see 4.2.1.1.2).

Line 1: Name of menu.

Line 2: Name (max. 15 characters) of function as information.

Lines 3...5: Options for the various end-of-charge criteria and their settings as a numerical values.

Line 7: Setting value for the charging current as C-value.

4.2.1.1.3.3 EHL01 function menu

Function for the compensation charge with nickel batteries. With other chemistry types or other types of battery connection, such as the 3-wire connection, the program sequence is cancelled with an error message. During the compensation charge the battery is charged with the compensation charge current set in the charging parameters.

With parameter 1, the duration of the compensation charge can be set; with the zero value the compensation charge never stops. The battery's temperature is monitored, and if there is an error, the function is cancelled.

Line 1	PROGRAM FU NCTI ON
Line 2	Name: Comp. chr. EHL01
Line 3	Compensati on
Line 4	charge time: ▷■■■■h
Line 5	
Line 6	
Line 7	
Line 8	

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

Line 1: Name of menu.

Line 2: Name (max. 15 characters) of function as information.

Lines 3 and 4: Setting the duration of the compensation charge as a numerical value. At the zero value "----", the compensation charge doesn't stop during the period.

4.2.1.1.3.4 ENL01 function menu

Function for discharging the battery with three selectable end-of-discharge functions (discharge time, loss of capacity and battery data). The end-of-discharge battery data criterion has the highest priority. That means that even if both of the other criteria have been selected, discharging will end as soon as the criteria corresponding to the battery data is fulfilled.

With the end-of-discharge charging time criterion, discharging will end if the selected discharge time in minutes has expired.

With the end-of-discharge capacity increase criterion, discharging will stop as soon as the battery's capacity has changed by the selected loss of capacity as a percentage.

The level and duration of the peak discharge current are specified in the discharge parameters. The peak discharge current flows after a 2-second starting time. During the start time, the normal discharge current flows. During the peak current, the discharge parameters are not queried. After the peak current, there is a 1-second recovery time, so that the battery voltage can return to normal values without the discharge parameters reacting. With this function, the following function data sets are recorded:

Measured value 1: Capacity removed with timestamp at the end of discharge in mAh.

Measured value 2: Battery voltage with timestamp 3 ms after start of peak current in mV.

Measured value 3: Battery current with timestamp 3 ms after start of peak current in mA.

Zeile 1	PROGRAM FUNCTI ON
Zeile 2	Name: Di scharge ENL 01
Zeile 3	▶Di sch. time: 8888mi n
Zeile 4	Loss of cap.: 888%
Zeile 5	Battery data
Zeile 6	
Zeile 7	Peak curr.: ▶Of f
Zeile 8	ON

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

Line 1: Name of menu.

Line 2: Name (max. 15 characters) of function as information.

Lines 3...5: Options for the various discharge criteria and their settings as a numerical values.

Lines 7 and 8: Option for turning the discharge peak current on and off. The level and duration of the current are specified in the battery's discharge parameters.

4.2.1.1.3.5 ENL02 function menu

Zeile 1	PROGRAM FUNCTI ON
Zeile 2	Name: Di scharge ENL 02
Zeile 3	▶Di sch. time : 88 88min
Zeile 4	Loss of cap. : 888%
Zeile 5	Battery data
Zeile 6	
Zeile 7	Discharge current
Zeile 8	C-value: 8.88C

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

- Line 1:** Name of menu.
- Line 2:** Name (max. 15 characters) of function as information.
- Lines 3...5:** Options for the various end-of-discharge criteria and their settings as a numerical values.
- Line 7:** Setting value for the discharge current as C-value.

4.2.1.1.3.6 RKE01 function menu

Line 1	PROGRAM FU NCTI ON
Line 2	Name: Rc. di sch. RKE01
Line 3	
Line 4	No se t t i n g s
Line 5	
Line 6	
Line 7	
Line 8	

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

- Line 1:** Name of menu.
- Line 2:** Name of the function as information.
- Line 4:** Information that no settings exist.

With this function, the following function data set is recorded:

Measured value 1: Capacity removed with timestamp at the end of reconditioning discharge in mAh.

4.2.1.1.3.7 SPE01 function menu

Line 1	PROGRAM FUNCTI ON
Line 2	Name: CP. di sch. SPE01
Line 3	Di sch. cur. 1: 88.88A
Line 4	Di sch. cur. 2: 88.88A
Line 5	Di sch. time: 8888s
Line 6	Unit: ▶ms
Line 7	s
Line 8	mi n

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

Line 1: Name of menu.

Line 2: Name (max. 15 characters) of function as information.

Line 3: Setting the discharge current at the beginning of the discharge time.

Line 4: Setting the discharge current at the end of the discharge time.

Line 5: Setting the discharge time.

Lines 6...8: Options for the discharge time unit.

With this function, the following function data set is recorded:

Measured value 1: Capacity removed with timestamp at the end of discharge time in mAh.

4.2.1.1.4. Condition functions

4.2.1.1.4.1 BBL01 function menu

```
Line 1  PROGRAM FUNCTI ON
Line 2  Name: Con. emp. BBL01
Line 3  Condition:
Line 4   Battery discharge?
Line 5
Line 6  If passed step:  88
Line 7
Line 8
```

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

- Line 1:** Name of menu.
- Line 2:** Name of the function as information.
- Lines 3 and 4:** Query condition.
- Line 6:** Setting the program step (1...48) with which the program sequence should be continued if the condition is fulfilled, as a numerical value.

4.2.1.1.4.2 BBV01 function menu

```
Line 1  PROGRAM FUNCTI ON
Line 2  Name: Con. full BBV01
Line 3  Condition:
Line 4   Battery charge?
Line 5
Line 6  If passed step:  88
Line 7
Line 8
```

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

- Line 1:** Name of menu.
- Line 2:** Name of the function as information.
- Lines 3 and 4:** Query condition.
- Line 6:** Setting the program step (1...48) with which the program sequence should be continued if the condition is fulfilled, as a numerical value.

4.2.1.1.4.3 BKA01 function menu

Condition function with which the program sequence is continued at the program step if the following query condition is fulfilled. If the query condition is not fulfilled, the program sequence is continued with the program step that follows the condition function.

- Battery capacity < Comparison capacity in %
- Battery capacity ≤ Comparison capacity in %
- Battery capacity = Comparison capacity in %
- Battery capacity ≥ Comparison capacity in %
- Battery capacity > Comparison capacity in %

```
Line 1  PROGRAM FUNCTI ON
Line 2  Name: Con. cap. BKA01
Line 3  Matching value: ▷888%
Line 4  Condition:
Line 5   Bat.  < = ≥ Matching
Line 6   cap. ▶≤  > value
Line 7
Line 8  If passed step: 88
```

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

Line 1: Name of menu.

Line 2: Name of the function as information.

Line 3: Setting the capacity's matching value as a numerical value.

Lines 5 and 6: Options for the condition.

Line 8: Setting the program step (1...48) with which the program sequence should be continued if the condition is fulfilled, as a numerical value.

4.2.1.1.4.4 BKA02 function menu

- Battery capacity < Target capacity (discharge parameters)
- Battery capacity ≤ Target capacity (discharge parameters)
- Battery capacity = Target capacity (discharge parameters)
- Battery capacity ≥ Target capacity (discharge parameters)
- Battery capacity > Target capacity (discharge parameters)

Line 1	PROGRAM FUNCTI ON
Line 2	Name: Con. t. c. BKA02
Line 3	Target cap.: 888%
Line 4	Condition:
Line 5	Bat. < = ≥ Target
Line 6	cap. ▶ ≤ > cap.
Line 7	
Line 8	If passed step: 88

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

- Line 1:** Name of menu.
- Line 2:** Name of the function as information.
- Line 3:** Display of the target capacity set in the discharge parameters of the selected battery, as information.
- Lines 5 and 6:** Options for the condition.
- Line 8:** Setting the program step (1...48) with which the program sequence should be continued if the condition is fulfilled, as a numerical value.

4.2.1.1.4.5 BNL01 function menu

Condition function for querying the recharge current to be set as the charge parameter for lithium and lead batteries. With the 3- and 4-wire connection types and nickel batteries, the program sequence is cancelled with an error message.

- Battery voltage < Recharge current (charge parameters)
- Battery voltage \leq Recharge current (charge parameters)
- Battery voltage = Recharge current (charge parameters)
- Battery voltage \geq Recharge current (charge parameters)
- Battery voltage > Recharge current (charge parameters)

Line 1	PROGRAM FUNCTI ON
Line 2	Name: Con. r. v. . BNL01
Line 3	Rech. vol./ C. : 8.88V
Line 4	Condition:
Line 5	Bat. < = \geq Recharge
Line 6	vol. \blacktriangleright \leq > vol.
Line 7	If passed step: 88
Line 8	If fail step: 88

The \leftarrow key takes you back to the **program step menu** (see 4.2.1.1.2).

- Line 1:** Name of menu.
- Line 2:** Name of the function as information.
- Line 3:** Display of the recharge current per cell that is set in the selected battery's charging parameters, as information.
- Lines 5 and 6:** Options for the condition.
- Line 7:** Setting the program step (1...48) with which the program sequence should be continued if the condition is fulfilled (as a numerical value).
- Line 8:** Setting the program step (1...48) with which the program sequence should be continued if the condition is not fulfilled (as a numerical value).

4.2.1.1.4.6 BRI01 function menu

If the query condition is not fulfilled, or the Ri nominal internal resistance in the specific values is set to "do not use", the program sequence is continued with the program step that follows the condition function.

- measured internal resistance < nominal internal resistance (specific values)
- measured internal resistance ≤ nominal internal resistance (specific values)
- measured internal resistance = nominal internal resistance (specific values)
- measured internal resistance ≥ nominal internal resistance (specific values)

```
Zeile 1  PROGRAM FUNCTI ON
Zeile 2  Name: Con. Ri m. BRI 01
Zeile 3  Nom. Ri :      8 8 8 8 mΩ
Zeile 4  Condition:
Zeile 5  Act.   < = ≥ Nominal
Zeile 6  Ri    ▶ ≤   > Ri
Zeile 7
Zeile 8  If passed step: 88
```

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

Line 1: Name of menu.

Line 2: Name of the function as information.

Line 3: Display of Ri nominal internal resistance set in the selected battery's specific values, as information.

Lines 5 and 6: Options for the condition.

Line 8: Setting the program step (1...48) with which the program sequence should be continued if the condition is fulfilled (as a numerical value).

With this function, the following function data set is recorded:

Measured value 1: measured internal resistance in mΩ.

4.2.1.1.4.7 BSP01 function menu

```
Line 1  PROGRAM FUNCTI ON
Line 2  Name: Con. Vol. BSP01
Line 3  Rech. vol.:  ▷88.88V
Line 4  Condition:
Line 5   Bat.   < = ≥ Matching
Line 6   vol.  ▶≤  >  vol.
Line 7
Line 8  If passed step:  8
```

The ← key takes you back to the program step menu (see 4.2.1.1.2).

- Line 1:** Name of menu.
- Line 2:** Name of the function as information.
- Line 3:** Setting the battery's comparison voltage (0...48 V) as a numerical value.
- Lines 5 and 6:** Options for the condition.
- Line 8:** Setting the program step (1...48) with which the program sequence should be continued if the condition is fulfilled, as a numerical value.

4.2.1.1.4.8 MEL01 function menu

```
Line 1  PROGRAM FUNCTI ON
Line 2  Name: Message MEL01
Line 3  Prg.-message no.: ▷88
Line 4  Name: CAPACITY OK
Line 5  Message procedure:
Line 6  ▶Time of issu:  888s
Line 7  waiting of key
Line 8  Next Step:  88
```

The ← key takes you back to the program step menu (see 4.2.1.1.2).

- Line 1:** Name of menu.
- Line 2:** Name of the function as information.
- Line 3:** Setting the program message number (1...50) as a numerical value.
- Line 4:** Name of program message as information.
- Lines 6 and 7:** Options for the message procedure; either the program message is displayed for the set time (1...999 sec.) or until the key is pressed.
- Line 8:** Setting the program step (1...50) with which the program sequence should be continued after the program message has been displayed.

4.2.1.1.5. Control functions

4.2.1.1.5.1 PAU01 function menu

Function for inserting a pause into the program sequence. During the pause, the battery's temperature is not monitored.

Line 1	PROGRAM FU NCTI ON
Line 2	Name: Pause PAU01
Line 3	Break time: ▷8888mi n
Line 4	
Line 5	Uni t : s
Line 6	mi n
Line 7	
Line 8	

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

- Line 1:** Name of menu.
- Line 2:** Name of the function as information.
- Line 3:** Setting the pause as a numerical value.
- Lines 5 and 6:** Setting the unit for the pause.

4.2.1.1.5.2 WID01 function menu

Function for repeating the program steps in which the program sequence jumps back to the step from which the count corresponding to the parameter choice for the program sequence is repeated. If the count 9999 is chosen for the parameter, the repetition occurs with unending frequency.

With this function, the following function data sets are recorded:

Measured value 1: Number of the repetition with timestamp.

Line 1	PROGRAM FUNCTI ON
Line 2	Name: Repet i t . WI D01
Line 3	Count : ▷8888
Line 4	Fr om St ep: 88
Line 5	
Line 6	
Line 7	
Line 8	

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

- Line 1:** Name of menu.
- Line 2:** Name of the function as information.
- Line 3:** Setting the repetition count as a numerical value.
- Line 4:** Setting the program step (1...48) from which the program sequence should be repeated (as a numerical value).

4.2.1.1.5.3 END01 function menu

Every program ends with this function. The ATGB returns from the program run to the idle state. This function must always be entered as the last program step.

Line 1	PROGRAMM- FUNCTI ON
Line 2	Name: End END01
Line 3	
Line 4	No s e t t i n g s
Line 5	
Line 6	
Line 7	
Line 8	

The ← key takes you back to the **program step menu** (see 4.2.1.1.2).

- Line 1:** Name of menu.
- Line 2:** Name of the function as information.
- Line 4:** Information that no settings exist.

4.2.2. Program creation selection menu

Menu 1. Page

Line 1	CREATE PROGRAM
Line 2	
Line 3	▷ 1 CHARGE
Line 4	2 DI S CHARGE
Line 5	3 CAPACI TY TEST
Line 6	4 DC RESISTANCE
Line 7	5 CYCLE 50
Line 8	Next . . . 2

Menu 2. 5. Page

Zeile 1	CREATE PROGRAM
Zeile 2	Back 1
Zeile 3	6 RECONDI TI ONI NG
Zeile 4	7
Zeile 5	8
Zeile 6	9
Zeile 7	10
Zeile 8	Next . . . 3

The ← key takes you back to the program menu (see 4.2).

Line 1: Name of menu.

Line 3...7: Option items for the free program positions (1...25), which (in numerically sorted series) appear left of the name. The OK or → key selects a program position, and changes one in the program creation menu (see 4.2.2.1.), in which the name of the new program is entered.

Line 8: To the next submenu if more than five programs have been registered.

4.2.2.1. Program creation menu

When creating a program, a program name must always be entered first in one of the ATGB's two languages (German/English). The program name is the only creation characteristic used.

Then each program step is entered. The program step parameters are monitored by their input limits.

Line 1	CREATE PROGRAMNAME
Line 2	No. : 88
Line 3	Name: ▷ ABCDEFG
Line 4	
Line 5	1 2 3 4 5 6 7 8 9 0 () Es ca pe
Line 6	A B C D E F G H I J K L Ent er
Line 7	M N O P Q R S T U V W X Bk dd l
Line 8	Y Z . , : ; + - / _ < > De l e t e

The ← key takes you back to the **program menu** (see 4.2). If the name created is not confirmed with "Enter", the program goes directly to the program structure menu (see 4.2.1.1.) in order to set the battery parameters.

Line 1: Name of menu.

Line 2: Serial number of program.

Line 3: Name of program (max. 15 characters); at least one character must be entered. The program itself is written in the Program selection menu (see 4.2.1.).

Lines 5...8: Selection keys for name entry (capital letters only).

4.2.3. Program deletion menu

Line 1	DELETE PROGRAM	
Line 2		
Line 3	▷ 1 CHARGE	
Line 4	2 DI SCHARGE	
Line 5	3 CAPACI TYTEST	
Line 6	4 DC RESISTANCE	
Line 7	5 CYCLE 50	
Line 8	Next . . .	2

Line 1	DELETE PROGRAM	
Line 2	Back	1
Line 3	6 RECONDITIONING	
Line 4	7	
Line 5	8	
Line 6	9	
Line 7	10	
Line 8	Next . . .	3

The ← key takes you back to the program menu (see 4.2).

Line 1: Name of menu.

Line 2: To previous page.

Line 3...7: Options for deleting the available programs. After selection of a program with the OK key, the → key must be changed to the right and the OK key pressed again. The deletion can be cancelled with the ← key. The serial numbering of the data set will not be changed.

Line 8: To the next page.

4.2.4. Program message menu

```
Line 1 PRG. MESSAGE
Line 2
Line 3 ▷ 1 CAPACITY OK
Line 4 2 CAPACITY NOT OK
Line 5 3 RI OK
Line 6 4 RI NOT OK
Line 7 5 VOITAGE OK
Line 8 Next . . . 2
```

```
Line 1 PRG. MESSAGE PR
Line 2 Back . . . 1
Line 3 6 VOITAGE NOT OK
Line 4 7
Line 5 8
Line 6 9
Line 7 10
Line 8 Next . . . 3
```

The ← key takes you back to the program menu (see 3.2).

Line 1: Name of menu.

Line 2: To previous page.

Line 3...7: Options for various program messages that can be edited. The ► key takes you into the program message structure menu (see 4.2.4.2.), where the program message can be altered. When there are free positions (1...50) for the program messages, the ► key takes you to the program message name creation menu (see 4.2.4.1.), where the name of the new program message is entered. The program messages are inserted into the program sequence with program function MEO1.

Line 8: To the next submenu if more than five programs have been registered.

4.2.4.1. Program message name creation menu

Line 1	CREATE PRG . MESSAG
Line 2	No . : 6
Line 3	Name : ▷ VOLTAGE NOT OK
Line 4	
Line 5	1 2 3 4 5 6 7 8 9 0 () Escape
Line 6	A B C D E F G H I J K L Enter
Line 7	M N O P Q R S T U V W X Bkddl
Line 8	Y Z . , : ; + - / _ ◀ ▶ Delete

The ← key takes you back to the menu for creating and editing program messages (see 4.2.4). If the name created is not confirmed with “Enter”, the program goes directly to the program message structure menu (see 4.4.2.2.) to specify the content of each line of the message. The program messages are inserted into the program sequence with program function MEL01.

Line 1: Name of menu.

Line 2: Serial number of the program message.

Line 3: Name of program message (max. 15 characters); at least one character must be entered. The program message itself is written in the program message structure menu (see 4.4.2.2.). The name entered for the program message is automatically transferred to the other languages, so that when the ATGB’s language settings are changed, a program message name can be displayed for the other language also, if it has not been entered.

Lines 4...7: Selection keys for name entry (capital letters only).

4.2.4.2. Program message structure menu

Line 1	PRG. MESS. STRUCTURE
Line 2	▷Name : VOLTAGE NOT OK
Line 3	Line 1 Line 4
Line 4	Line 2 Line 5
Line 5	Line 3 Line 6
Line 6	
Line 7	Preview
Line 8	

The ← key takes you back to the menu for creating and editing program messages (see 4.2.4). The program messages are inserted into the program sequence with program function MEL01.

- Line 1** Name of menu.
- Line 2:** Menu item Change message name (see 4.2.4.2.1.)
- Lines 3...5:** Menu items Program message structure lines 1...6 (see 4.2.4.2.2.)
- Line 7** Menu item Preview of program message (see 4.2.4.2.3.).

4.2.4.2.1. Program message name menu

Line 1	PRG. MESSAGE NAME
Line 2	Name : ▷VOLTAGE NOT OK
Line 3	
Line 4	
Line 5	1 2 3 4 5 6 7 8 9 0 () Escape
Line 6	A B C D E F G H I J K L Enter
Line 7	M N O P Q R S T U V W X Bkddl
Line 8	Y Z . , : ; + - / _ < ▷ Delete

The ← key takes you back to the program message structure menu (see 3.2.4.2). The program messages are inserted into the program sequence with program function MEL01.

- Line 1:** Name of menu.
- Line 2:** Name of program message (max. 15 characters), which can be changed.
- Lines 4...7:** Selection keys for name entry (capital letters only).

4.2.4.2.2. Program message structure line menu

```

Line 1 PRG. MESSAGE LINE
Line 2 Line: 1
Line 3 > VOLTAGE IS
Line 4
Line 5 1234567890 ( ) Escape
Line 6 ABCDEFGHIJKL Enter
Line 7 MNOPQRSTUVWXYZ Bkddl
Line 8 YZ.,:;+ - / _ <> Delete
    
```

```

Line 1 PRG. MESSAGE LINE
Line 2 Line: 2
Line 3 > TOO LOW
Line 4
Line 5 1234567890 ( ) Escape
Line 6 ABCDEFGHIJKL Enter
Line 7 MNOPQRSTUVWXYZ Bkddl
Line 8 YZ.,:;+ - / _ <> Delete
    
```

The ◀ key takes you back to the program message structure menu (see 4.2.4.2.). The program messages are inserted into the program sequence with program function MEL01.

- Line 1:** Name of menu.
- Line 2:** Number of the program message line (1...6).
- Line 3:** Line content (max. 20 characters).
- Lines 4...7:** Selection keys for name entry (capital letters only).

4.2.4.2.3. Program message preview menu

```

Line 1 PRG. MESSAGE PREVIEW
Line 2 No. : 6
Line 3 VOLTAGE IS
Line 4 TOO LOW
Line 5
Line 6
Line 7
Line 8
    
```

All keys lead back to the program message structure menu (see 4.2.4.2.). The program messages are inserted into the program sequence with program function MEL01.

- Line 1:** Name of menu.
- Line 2:** Number of program message.
- Lines 3...8:** Program message lines 1...6 as a preview.

4.2.5. Program message deletion menu

```
Line 1 DELETED PRG. MESSAGE
Line 2
Line 3 > 1 CAPACITY OK
Line 4 2 CAPACITY NOT OK
Line 5 3 RI OK
Line 6 4 RI NOT OK
Line 7 5 VOITAGE OK
Line 8 Next... 2
```

```
Line 1 DELETED PRG. MESSAGE
Line 2 Back... 1
Line 3 > 6 VOITAGE NOT OK
Line 4 7
Line 5 8
Line 6 9
Line 7 10
Line 8 Next... 3
```

The ◀ key takes you back to the program menu(see 4.2).

Line 1: Name of menu.

Line 2: To previous page.

Line 3...7: Options for deleting the available program messages. After selection of a program message with the OK key, the ▶ key must be changed to the right and the OK key pressed again. The deletion can be cancelled with the ◀ key. The serial numbering of the program messages will not be changed.

Line 8: To the next page.

4.3. MEASURED DATA MENU

Line 1	MEASURED DATA
Line 2	▷Read
Line 3	Del et e: e x e c u t
Line 4	
Line 5	St o r a g e o f O f f
Line 6	f u n c t i o n d a t a s : ▶On
Line 7	St o r a g e o f O f f
Line 8	m e a s u r e d d a t a s : ▶On

The ← key takes you back to the selection menu (see 4).

Line 1: Name of menu.

Line 2: Menu item View measured data (see 4.3.2.) for saved function data sets.

Line 3: Option for deleting the saved data sets. After deletion, the → key must be changed to the right and the OK key pressed again. The deletion can be cancelled with the ← key.

Lines 5 and 6: Options for turning function data set storage on and off.

Lines 7 and 8: Options for turning the measured value data sets on and off.

4.3.1. Program sequence measured value menu

Line 1	PRG. PROCESS MEASUR.
Line 2	Count of charge: 8888
Line 3	Count of disch.: 8888
Line 4	Start-Cap.: - - - - -mAh
Line 5	Curr.-Cap.: - - - - -mAh
Line 6	Int.res. Ri: 8888mΩ
Line 7	Prg.-Step: 88
Line 8	▷Read measurem. data

The ← key takes you back to the **work menu** (see 3.) or the **measured data menu** (see 4.3.).

- Line 1:** Name of menu.
- Line 2:** Count of battery charges performed.
- Line 3:** Count of battery discharges performed.
- Line 4:** removed charge for the first battery discharge in program sequence.
- Line 5:** removed charge for the last performed battery discharge in program sequence.
- Line 6:** last specified Ri internal resistance.
- Line 7:** Number of program steps currently being performed.
- Line 8:** View measured data.

4.3.2. Measured data view menu

```
Line 1  VIEW MEASURED DATA
Line 2  Bat . : BATTERIE 1
Line 3  Pr g . : CYCLE 50
Line 4  Time :      88888888. 8s
Line 5  Funct ion :      LAD01
Line 6  M. value  8 : 888888
Line 7                      Dat ano . :
Line 8  ▷Next . . .                1
```

The ← key takes you back to the measured data menu (see 4.3).

- Line 1:** Name of menu.
- Line 2:** Name of battery whose function data sets have been recorded.
- Line 3:** Name of program with which the function data sets have been recorded.
- Lines 4...6:** Value of the function data set that has been stored.
- Line 7:** To previous data set.
- Line 8:** To next data set.

The USB port is for direct communication with the battery testing device, in order to perform settings and read measured values. The USB port is used as a virtual RS232 interface.

4.4. DEVICE SETTINGS MENU

Line 1	DEVI CE SETTING S
Line 2	▷Di spl ay setti ngs
Line 3	Factory setti ngs
Line 4	Cali brati on
Line 5	Rel ease
Line 6	
Line 7	
Line 8	

The ← key takes you back to the selection menu (see 4).

- Line 1:** Name of menu.
- Line 2:** Menu item Display settings (see 4.4.1.).
- Line 3:** Menu item Factory settings (see 4.4.3.).
- Line 4:** Menu item Calibration (see 4.4.5.).
- Line 5:** Menu item Release (see 4.4.6.).

4.4.1. Display settings menu

Line 1	DI SPLAY SETTING
Line 2	▷Language a. bright n.
Line 3	Auto. Transfer: Of f
Line 4	▶On
Line 5	Locking: Of f
Line 6	▶On
Line 7	
Line 8	

The ← key takes you back to the Device settings menu (see 4.4).

- Line 1:** Name of menu.
- Line 2:** Menu item Language settings for display (see 4.4.2).
- Lines 3 and 4:** Options for turning automatic adoption of numerical value settings on and off.
- Lines 5 and 6:** Options for turning on and off the settings locking ATGB against unwanted modifications. To be able to make settings, the lock must be removed with a key combination. The same key combination reactivates the lock.

4.4.2. Language settings menu

Line 1	L ANGUAG E A. BRI GHTN.
Line 2	▶ Ger man
Line 3	Engl i sh
Line 4	
Line 5	
Line 6	
Line 7	
Line 8	Br igh t ness: 888%

The ← key takes you back to the display settings menu (see 4.4.1).

- Line 1:** Name of menu.
- Lines 2...7:** Options for display language.
- Line 8:** Setting the display brightness.

4.4.3. Factory settings menu

Line 1	F ACTORY SETT I NG
Line 2	▷
Line 3	Rebui l d f a c t o r y
Line 4	set t i n g
Line 5	
Line 6	
Line 7	
Line 8	

The ← key takes you back to the device settings menu (see 4.4).

- Line 1:** Name of menu.
- Lines 2 and 3:** Option for rebuilding the factory settings with which the ATGB was delivered by the BMZ company. Then the ATGB performs a reset.

4.4.4. Calibration menu

Line 1	CALIBRATION MENU
Line 2	▷ Battery temperature
Line 3	
Line 4	
Line 5	
Line 6	
Line 7	
Line 8	

The ← key takes you back to the device settings menu (see 4.4).

Line 1: Name of menu.

Line 2: Menu item Battery temperature (see 4.4.5.1.) for calibrating the battery's temperature measurement.

4.4.4.1. Battery temperature calibration menu




Line 1	BATTERY TEMPERATURE
Line 2	Actual temperature
Line 3	of battery set:
Line 4	
Line 5	
Line 6	Act temp. : ▷- 888.8
Line 7	(0- 100° C)
Line 8	

The ← key takes you back to the Calibration menu (see 4.4.5).





Line 1: Name of menu.

Line 2: Setting the actual battery temperature that the ATGB accepts for aligning its temperature measurement.

4.4.5. Release menu

Line 1	RELEASE MENU
Line 2	Release level 1: 
Line 3	Put in No.:  8 8 8 8
Line 4	Change No.: 8 8 8 8
Line 5	Release level 2: 
Line 6	Put in No.: 8 8 8 8
Line 7	Change No.: 8 8 8 8
Line 8	

The ← key takes you back to the device settings menu (see 4.4).

- Line 1:** Name of menu.
- Line 2:** Display of Release level 1 status (: locked, : active).
- Line 3:** Entering the release number as a numerical value for Release level 1, with which the release level is activated. After the release level is turned on, it is always locked, i.e., the release number is set to "0000".
- Line 4:** Setting a new release number as a numerical value for Release level 1. To set the release number, the release level must first be activated with the existing release number. The release number is set to "0000" at the factor, so that initially access is also activated when the ATGB is switched on.
- Line 5:** Display of Release level 2 status (: locked, : active)
- Line 6:** Entering the release number as a numerical value for Release level 2, with which the release level is activated. After the release level is turned on, it is always locked, i.e., the release number is set to "0000".
- Line 7:** Setting a new release number as a numerical value for Release level 2. To set the release number, the release level must first be activated with the existing release number. The release number is set to "0000" at the factor, so that initially access is also activated when the ATGB is switched on.

4.5. INFORMATION MENU

Line 1	I NFORMATI ON
Line 2	Serial no. : 000000006
Line 3	Manuf. no. : 3909002
Line 4	BMZ
Line 5	D- 63791 Karlstein
Line 6	06188 / 9956- 0
Line 7	kontakt@bmz-gmbh.de
Line 8	www.bmz-gmbh.de

The ← key takes you back to the **selection menu** (see 4).

Line 1: Name of menu.

Line 2: Serial number of ATGB

Line 3: Manufacturer number (WWJJNNN) of ATGB

Lines 4...8: Contact data for BMZ company.

5 SAMPLE PROGRAM (quick-start guide)

The example shows the 5S1P lithium-ion battery pack with the following parameters from the data sheet:




- US 18650VTC
- Nominal voltage: 18 V,
- Capacity: 1.3 Ah,
- Internal impedance = 18 m Ω ,
- Ambient temperature = 23°C.


This battery should be fully charged and after a pause discharged again. After that, the battery must be charged to 30 percent of its capacity. This process should be repeated 10 times.


Note: The charging or discharging parameters in the **BATTERY MENU** and the times for charging and discharging in the **PROGRAM MENU** and the pauses can automatically be imported from the battery testing device. It is also possible to enter these parameters manually from the data sheet or from experience. The 2-wire connection must be used. The overall internal resistance to be entered in the ATGB is calculated from the R_i of a cell connected in series or in parallel (aSbP), by which S stands for series or P for parallel and a, b is $\in \mathbb{N}^+$.



5.1. PROCEDURE

- Turn on the ATGB 1200 battery testing device
- Enter the parameters and functions

With the  key, the cursor \triangleright is placed on the menu and then confirmed with  or . This brings you to the **SELECTION MENU**.

If the setting has not been imported within 20 sec. after the last change with the  key, the setting will be rejected and the old status used again. This instruction applies to all settings; otherwise automatic adoption is available in the display settings menu. Thus, the following will be displayed:

Line 1	Battery:		Line 1	SELECTION MENU
Line 2	Prg.:		Line 2	\triangleright Battery
Line 3		Start	Line 3	Program
Line 4	volt.: 0.002 V	Meas.	Line 4	Measured data
Line 5	Curr.: 0.001 A	\triangleright Menu	Line 5	Device settings
Line 6	Temp.: 25.5°C		Line 6	Information
Line 7	Charge: 0mAh		Line 7	
Line 8	0.0%		Line 8	

First the battery must be selected by confirming with the  or  key.

Then comes the **BATTERY MENU**, which consists of three sub-functions:


- **Select/Edit** \Rightarrow With this, the available battery names can be viewed. Their respective battery parameters can also be monitored and changed.
- **Create** \Rightarrow Before selecting or editing, the battery name must first be created. Then more new battery names can be created.
- **Delete** \Rightarrow Deletes available battery names in the **DELETE BATTERY** menu.



After creation is confirmed, the **CREATE BATTERY MENU** comes up.






Here the first battery name can be created (see field 1) or the old battery name can be viewed with its corresponding numbering, and more new battery names can be created (see field 4). In lines 5...7 there are selection keys for entering the name (capital letters only, see fields 2 and 3).

The following illustrations depict the descriptions above:




Line 1 CREATE BATTERY Line 2 Line 3 ▷1 Line 4 2 Line 5 3 Line 6 4 Line 7 5 Line 8 next	CREATE BATTERY NAME No.: 1 Name: ▷ 1 2 3 4 5 6 7 8 9 0 () Escape A B C D E F G H I J K L Enter M N O P Q R S T U V W X Bkddl Y Z . , : ; + - / _ < > Delete	CREATE BATTERY NAME No.: 1 Name: ▷US 18650VTC 1 2 3 4 5 6 7 8 9 0 () Escape A B C D E F G H I J K L Enter M N O P Q R S T U V W X Bkddl Y Z . , : ; + - / _ < > Delete	Line 1 CREATE BATTERY Line 2 Line 3 ▷1 US 18650VTC Line 4 2 ANR 26650 Line 5 3 A 123 Line 6 4 BATT 4 Line 7 5 BATT 5 Line 8 next
---	--	---	---

After the battery name has been adopted with the  key, the **BATTERY SETTINGS** window opens automatically. This menu consists of the battery's name, type, chemistry, specific values, connection, and the charge and discharge parameters.

Here the battery type can be entered. The following sequence must be adhered to: First enter the chemistry, second the specific values, and third the other parameters. This entry is done line by line with the cursor ▷, and with  or  the respective data are confirmed (see field 1 in the illustration below).

BATTERY SPECIFIC VALUES: On Line 2 (see "Cells in series" in field 2 of the following chart), confirmation must be made with . Then comes entry of the cell count in series (with the  key or ) , by which the value is adopted again with . The same principle applies to the rest of the data (confirmation and adoption using the  key).


Here the series has 5 batteries. With this the ATGB automatically gives the maximum and minimum nominal voltage (in this example the nominal voltage is 18.50 V).

The capacity (here 1300 mAh) from the data sheet is entered with the  key or  and confirmed with  (see field 2 of the illustration below).

The internal resistance to be carried is $5 \cdot 18 \text{ m}\Omega = 90 \text{ m}\Omega$ and is not obligatory.

In the **BATTERY CONNECTION** menu, 2-wire must then be chosen.

The charge supply is only to be set with 3- or 4-wires.

Line 1 BATT SETTINGS Line 2 ▷Name: US 18650VTC Line 3 Type: 5S1P Line 4 Chemistry: Li Ion Line 5 specific values Line 6 Connection Line 7 Charge parameters Line 8 Discharge parameters	Line 1 BATTERY SPECIFIC VALUES Line 2 Cells in series: 5 Line 3 Nom. volt.: max. 18.50 V Line 4 min. 18.50 V Line 5 Capacity: 1300mAh Line 6 Intern. resist. Ri: ▷90mΩ Line 7 General Line 8 Meas. inter.: 0.0s	Line 1 BATTERY CONNECTION Line 2 Charging  2-wire Line 3 connection: 3-wire-P Line 4 3-wire-N Line 5 4-wire Line 6 Charge supply Line 7 Nom. volt.: 0.0 V Line 8 max. current: 0.0 A
--	--	--

In this example, the charge and discharge parameters, and the pause, are adopted automatically in the ATGB (see fields 2 and 3).

Line 1 CHARGE PARAMETERS	Line 1 DISCHARGE PARAMETERS	Line 1 PEAK DISCHARGE CURRENT
Line 2 max. Charge volt.:▷4.20 V	Line 2 Discharge current: ▷0.91 A	Line 2 Peak current: ▷ 0.00 A
Line 3 Recharge volt.: 4.00 V	Line 3 End volt./cell: 3.00 V	Line 3 Duration: 3ms
Line 4 Volt. data/cell	Line 4 Target capacity: 80%	Line 4
Line 5 Charging current: 0.91A	Line 5 Temp. band: 5- 45°C	Line 5 Ri condition
Line 6 End of charge: 0.13A	Line 6 Meas. inter.: 0.0s	Line 6 Test current 1: 0.13 A
Line 7 Temp. band: 5- 45°C	Line 7 Peak current/Ri cond.	Line 7 Test current 2: 0.91 A
Line 8 Meas. inter.: 0.0s	Line 8	Line 8

After the battery settings comes the battery program with its respective functions. First the program must be selected by confirming with the **OK** or **▶** key. Then comes the **PROGRAM MENU**, which consists of three sub-functions:

- **Select/Edit** ⇒The available program names can be viewed. The respective program functions can be monitored and changed.
- **Create** ⇒Before selecting or editing, the program name must always be created. Then new programs can be created.
- **Delete** ⇒Deletes existing program names in the **DELETE PROGRAM** menu.

After creation is confirmed, the **CREATE PROGRAM MENU** comes up.

The first program name can be created, or old program names with their corresponding numbering can be viewed, and more new programs names can be created.

There are selection keys for name entry (capital letters only). The following illustrations clarify these descriptions.

Line 1 SELECTION MENU	Line 1 CREATE PROGRAM	Line 1 CREATE PROGRAM
Line 2 Battery	Line 2	Line 2 No.: 1
Line 3▶Program	Line 3 ▷ 1	Line 3 Name: ▷
Line 4 Measured data	Line 4 2	Line 4
Line 5 Device settings	Line 5 3	Line 5 1 2 3 4 5 6 7 8 9 0 () Escape
Line 6 Information	Line 6 4	Line 6 A B C D E F G H I J K L Enter
Line 7	Line 7 5	Line 7 M N O P Q R S T U V W X Bkddl
Line 8	Line 8 next	Line 8 Y Z . , : ; + - / _ < > Delete

Line 1 CREATE PROGRAM	Line 1 CREATE PROGRAM
Line 2 No.: 1	Line 2
Line 3 Name: CYCLE30	Line 3 1 CYCLE30
Line 4	Line 4 2 CYCLE1
Line 5 1 2 3 4 5 6 7 8 9 0 () Escape.	Line 5 3 CYCLE2
Line 6 A B C D E F G H I J K L Enter	Line 6 4 CYCLE3
Line 7 M N O P Q R S T U V W X Bkddl	Line 7 ▷5
Line 8 Y Z . , : ; + - / _ < > Delete	Line 8 next

After allocation of the program name, the other desired functions are called up in **PROGRAM STRUCTURE**, such as Charge (LAD01), Discharge (ENL01), Pause (PAU01) and Repetition (WID01). In this example, the parameters for the aforementioned functions (other than WID01) have been adopted automatically by the ATGB. On the other hand, in Line 7 of field 3, the charging capacity for LAD01 has been set manually at 30%.

The following table clarifies the precise configuration of the program sequence.

Line 1	CREATE PROGRAM NAME	Line 1	PROGRAM STRUCTURE	Line 1	PROGRAM STRUCTURE
Line 2	No.: 1	Line 2	Prg.: CYCLE 30	Line 2	Prg.: CYCLE 30
Line 3	Name: CYCLE 30	Line 3	▷1	Line 3	1 LAD01
Line 4		Line 4	2	Line 4	2 PAU01
Line 5	1 2 3 4 5 6 7 8 9 0 () Escape.	Line 5	3	Line 5	3 ENL01
Line 6	A B C D E F G H I J K L ▶Enter	Line 6	4	Line 6	4 PAU01
Line 7	M N O P Q R S T U V W X Bkddl	Line 7	5	Line 7	5 LAD01
Line 8	Y Z . , : ; + - / _ < > Delete	Line 8	next	Line 8	▷6 WID01

Finally, the exact desired battery and program name must be selected and confirmed with the cursor (▶). If everything has been set correctly, and the battery pack has been connected to the ATGB, the complete program can be started.

After start-up, depending on the charging or discharging process, the following display appears:

Line 1	Battery: US 18650VTC	Line 1	Battery: US 18650VTC
Line 2	Prg.: CYCLE 30	Line 2	Prg.: CYCLE 30
Line 3	▷Start	Line 3	▷Quit
Line 4	volt.: 19.570 V Meas.	Line 4	volt.: 19.570 V Meas.
Line 5	Curr: 0.001 A Menu.	Line 5	Curr: 0.912 A Menu
Line 6	Temp.: 25.0°C	Line 6	Temp.: 25.0°C
Line 7	Char.: 0mAh	Line 7	Char.: 97mAh
Line 8	0.0%	Line 8	7.5%

- the selected battery name (Batt) and program name (Prg.)
- the current voltage (Volt.) in our example 19.570 V as charging begins
- the present current, which is constant here at 0.920 A
- the battery's current temperature and capacity
- Symbol for charge (◀) or discharge (▶), batt (), time in min.; in our example, the current charging time is 6 min.
- Meas.⇒ View measured data at end of program
- Menu⇒back to SELECTION MENU

After start-up, it is also possible to leave the program (using **Quit**).

While the program is running, no new battery or function can be created.

5.2. COMMENTS

The LED for State changes from yellow to orange after the program starts.

When NiCd batteries are being charged, the voltage at the terminals rises to a maximum value and then begins to drop. The end of charging is recognized by the classic **minus delta V** process ($\Delta V / \Delta t < 0$). Another way to determine the end of charging is to watch the temperature or the charging time using a microcontroller.

The parameters must be set correctly or there is a danger of overloading the battery. This overload leads to corrosive gases, a rise in temperature and to a steep rise in internal pressure. As a result, the battery's life decreases or it can explode.

5.3. PEAK CURRENT AND INTERNAL RESISTANCE MEASUREMENT

With the ATGB it is possible to determine a battery's internal resistance, and during discharge to set a peak current up to 50 A and the duration.

As an example, during discharge a peak current of 20 A should be tested with a duration of 10 ms. The internal resistance must also be determined.



For this purpose, in the DISCHARGE PARAMETERS window the item peak current/Ri – Best must be confirmed. Through PEAK DISCHARGE CURRENT the so-called peak current and peak duration must be entered.

The following chart shows the structure:

<p>Line 1 DISCHARGE PARAMETERS Line 2 Discharge current: 0.91A Line 3 End volt./cell: 3.00V Line 4 Target capacity: 80% Line 5 Temp. band: 5- 45°C Line 6 Meas. inter.: 1.0s Line 7 ► Peak current/Ri cond. Line 8 a</p>	<p>Line 1 PEAK DISCHARGE CURRENT Line 2 Peak current: ▷ 20.00 A Line 3 Peak duration: 10ms Line 4 Line 5 Ri condition Line 6 Test current 1: 0.15 A Line 7 Test current 2: 0.95 A Line 8 b</p>	<p>Line 1 PROGRAM STEP Line 2 back... Line 3 Cond. Cap. BKA01 Line 4 Cond. t. - c. BKA02 Line 5 Cond. r. - v. BNL01 Line 6 ► Cond. Ri-C. BRI01 Line 7 Pause PAU01 Line 8 next... c</p>
<p>Line 1 PROGRAM FUNCTION Line 2 Name: Cond. Ri-C. BRI01 Line 3 Nom. in. res. Ri: 200mΩ Line 4 Condition: Line 5 act. < = ≥ nom. Line 6 Ri ► ≤> Ri Line 7 Line 8 If passed step: 6 d</p>	<p>Line 1 PROGRAM STRUCTURE Line 2 ▷ Prg.: DISCHARGE PEAK/Ri Line 3 1 Discharge ENL01 Line 4 2 Cond. Ri-C. BRI01 Line 5 3 Charge LAD01 Line 6 4 Pause PAU01 Line 7 5 Repetit. WID01 Line 8 next... 2 e</p>	<p>Line 1 PROGRAM STRUCTURE Line 2 ▷ back... 1 Line 3 6 End END01 Line 4 7 Line 5 8 Line 6 9 Line 7 10 Line 8 next... 3 f</p>

To field d:

- Line 2:** Name of function as information
- Line 3:** Display of Ri nominal internal resistance set in the specific values of the selected battery (as information).
- Lines 5 and 6:** Options for the condition.
- Line 8:** Setting the program step (1...48) with which the program sequence should be continued if the condition is fulfilled (as a numerical value).

After confirmation of Meas. using  or , at the end of the program the measured value (internal resistance, time, capacity) is displayed. The individual functions used and the battery and program names are additionally displayed.

Depending on the program, these displays can consist of several pages (see Set no.:).

The measurement sampling time must be entered in increments of 0.1 sec. (0...9998). If the value is zero, no battery measurement values are recorded.

The following chart shows the structure of the display window:

<p>Line 1 Battery: US 18650VTC Line 2 Prg.: DISCHARGE PEAK/Ri Line 3 Start Line 4 volt.: 19.315 V ▶ Meas. Line 5 Curr. 0.001 A Menu. Line 6 Temp.: 22.7°C Line 7 Charge: 0mAh P Line 8 0.0%</p>	<p>Line 1 MEASURED DATA Line 2 Battery: US 18650VTC Line 3 Prg.: DISCHARGE PEAK/Ri Line 4 Time: 2.0s Line 5 Function: ENL01 Line 6 Measured value 2: 15.739V Line 7 back... Set no.: Line 8 ▷next 1</p>	<p>Line 1 MEASURED DATA Line 2 Battery: US 18650VTC Line 3 Prg.: DISCHARGE PEAK/Ri Line 4 Time: 2.0s Line 5 Function: ENL01 Line 6 Measured value 3: 19.962A Line 7 back... Set no.: Line 8 ▷next 2</p>
<p>Line 1 MEASURED DATA Line 2 Battery: US 18650VTC Line 3 Prg.: DISCHARGE PEAK/Ri Line 4 Time: 59.4s Line 5 Function: ENL01 Line 6 Measured value 1: 15mAh Line 7 back... Set no.: Line 8 ▷next... 3</p>	<p>Line 1 MEASURED DATA Line 2 Battery: US 18650VTC Line 3 Prg.: DISCHARGE PEAK/Ri Line 4 Time: 65.3s Line 5 Function: BRI01 Line 6 Measured value 1: 223mΩ Line 7 back... Set no.: Line 8 ▷next... 4</p>	<p>Line 1 MEASURED DATA Line 2 Battery: US 18650VTC Line 3 Prg.: DISCHARGE PEAK/Ri Line 4 Time: 124.7s Line 5 Function: LAD01 Line 6 Measured value 1: 15mAh Line 7 back... Set No.: Line 8 ▷next... 5</p>

6 TECHNICAL DATA

Power supply :

Incoming voltage:	100 V – 240 V; 50 Hz / 60 Hz
Frequency:	47 Hz – 63 Hz
Engaging power impact:	at 115 V: 20 A; at 230 V: 40 A
Leakage current:	max. 0,75 mA
Power failure:	Bridging time: 20 ms at 115 V and 230 V
Overvoltage category :	II

Accu connection:

Voltage:	0 V – 48 V
Loading current:	0 A – 10 A (max. 200 W)
Discharge current:	0 A – 10 A (max. 200 W)
Current impact at discharging:	Up to max. 50 A; max. application of energy 35000W ² s
Voltage measurement:	Resolution: 1 mV Accuracy: 0,05 % FS +/- 1 Dig. Linearity: 0,01 % FS
Current measurement:	Resolution: 1 mA Accuracy: 0,25 % FS +/- 1 Dig. Linearity: 0,05 % FS

Charging supply:

Voltage:	1,5 V – 48 V
Current:	0 A – 10 A (max. 200 W)
Voltage measurement :	Resolution : 0,1 V Accuracy : 1,5 % FS +/- 1 Dig.

Accu-Temperature:

Sensor:	Pt1000
Range:	0 – 100°C
Temperature measurement:	Resolution : 0,1°C Accuracy (without sensor): 1 % FS +/- 1 Dig. Linearity(without sensor): 0,1 % FS

EMV:

Interfearance resistance:	EN 61000-6-2
Transient emissions:	EN 61000-6-3

Housing and Assembly:

Material:	Steel
Protection class:	I
Type of protection:	IP 20
Weight:	5 kg
Dimensions (WxHxD):	210x151x301 mm
Assembly:	Keep a distance toward the back wall of at least 200mm, because the ATGB has a air-oultet of about 60°C
Protection:	6,3A / 250 V inert, interior of the switching power supply

Connections:

Power line:	Cold appliance connector according to DIN VDE 0625 or rather IEC 60320-C14
Accu:	Plug: FM 9W4P-K120 Performance contacts (20 A): FMP006P103
USB-Interface:	Connector Type B

Surroundings:

Operating temperature:	5°C – 45°C
Condition temperature:	-10°C – 70°C
Humidity:	30 – 90 %, RH noncondensing

Storage:

Accu Datas:	Quantity: 95
Programms:	Quantity : 25
Data storage:	Quantity of datas: max. 36403 Scan time(adjustable): 0,1 – 999,8 s

USB-Interface:

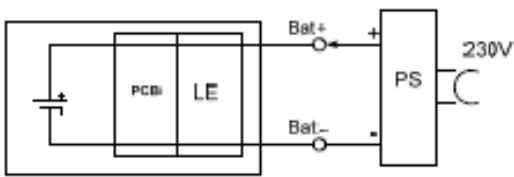
Format:	USB 1.1 und 2.0; Converter from USB- at RS232-Interface
RS232-Format (Factory setting):	9600 Baud, 1Startbit, 8 Databits, 1 Stopbit, no equality
RS232 Baude rate:	9600Bit/s; 19200Bit/s; 38400Bit/s; 57600Bit/s; 115200 Bit/s

Accu technologies:

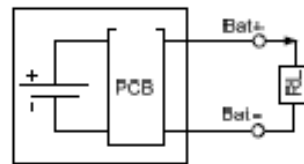
Accu-Types	Nominal cell voltage	Quantity of cells in a row
NiCd / NiMh:	1,2 V	1 – 30 cells in series
Lead:	2 V	1 – 18 cells in series
Li-Ionen:	3,7 V	1 – 10 cells in series
LiFePh:	3,3 V	1 – 12 cells in series
Li-Titanat:	2,3 V	1 – 15 cells in series

7 FOR DEFINITION OF THE BATTERY'S CONNECTION TYPE

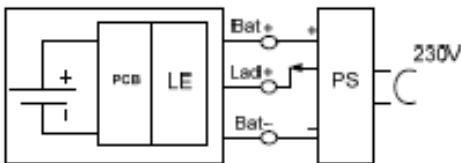
- 2-wire, battery without charging circuit
- 3-wire with recharge electronics in the positive feed line, mutual negative connection with the battery
- 3-wire with recharge electronics in the negative feed line, mutual positive connection with the battery
- 4-wire with separate battery connection and recharge electronics connection



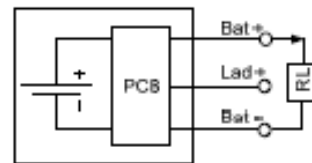
2-wire, charge



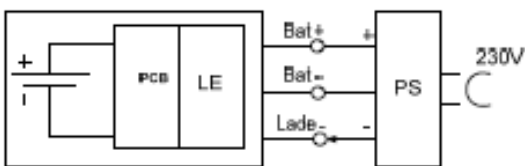
2-wire, discharge



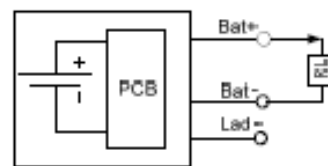
3-wire-P, charge



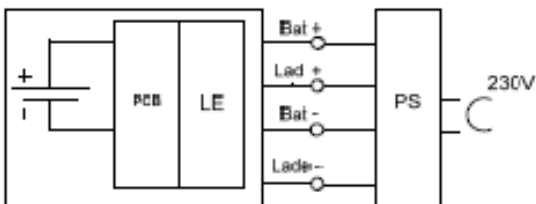
3-wire-P, discharge



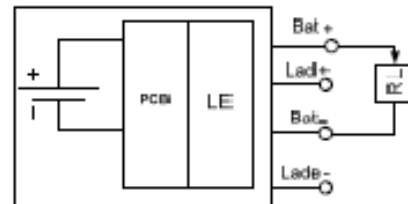
3-wire-N, charge



3-wire-N, discharge



4-wire, charge



4-wire, discharge

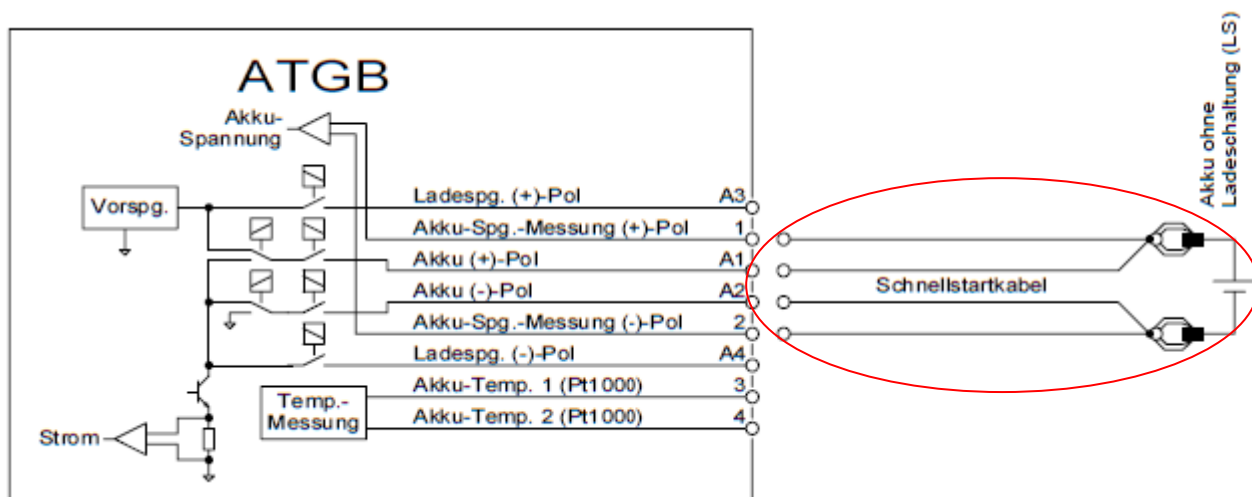
PCB = printed circuit board LE = recharge electronics PS = power supply RL = load

8 ACCESSORIES

8.1 QUICK-START CABLE

The quick-start cable comes standard with the ATGB; the item number in BMZ is: 13558.

8.1.1. ATGB connection diagram and quick-start cable



This connection diagram shows:

- The quick-start cable consists of two wires: Battery (+) and Battery (-); see 8.1.2 for the exact technical data.
- It contains no temperature sensor. When charging NiMh and NiCa battery technologies, first deactivate the dTemp./dt charge parameter (BATTERY SETTINGS → charge parameters). Otherwise an error message will be issued.

8.1.2. Quick-start cable specification

Packing:	For batteries with 2-wire connections, LIFYY control cable (highly flexible)
Cross-section:	Battery charge and discharge current: 1.5 mm ² Battery voltage measurement: 0.5 mm ²
Socket:	FM 9W4S-K120
Power contacts (20 A):	FMP 006S103
Battery:	4 mm tower plug, rated current: 24 A Rated voltage: 60 V _{DC}
Alligator clips:	Clamp area to 9.5 mm Rated current: 25 A; Rated voltage: 60 V _{DC}
Material:	Cable: PVC
Length:	1000 mm
Weight:	190 g
Operating temperature:	0-50°C
Storage temperature:	-10° to 70°C
Humidity:	30-90%, RH, non-condensing

8.1.3. Picture: Quick-start cable

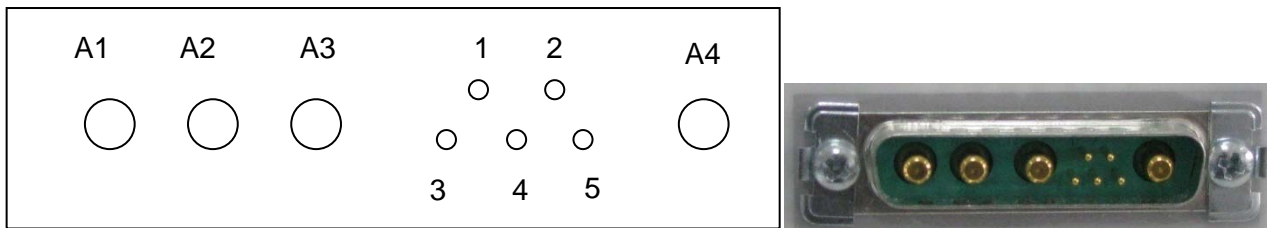


The quick-start cable



ATGB operating with quick-start cable

8.2. BATTERY PLUG



Battery plug: Schematic view and photo

- A1:** Batt (+)-Pol
- A2:** Batt (-)-Pol
- A3:** Charge voltage (+)-Pol; not connected
- A4:** Charge voltage (-)-Pol; not connected
- Pin1:** Battery voltage measurement (+)-Pol
- Pin2:** Battery voltage measurement (-)-Pol
- Pin3:** Battery temperature 1(Pt1000); not connected
- Pin4:** Battery temperature 2(Pt1000); not connected
- Pin 5:** not connected

TECHNICAL SUPPORT

For a technical problem that cannot be solved with this manual, contact our Technical Support department by e-mail: ATGB@batteryuniversity.eu

Please provide the following information:

- Serial number of the ATGB and firmware version
- Display message and/or code
- What happened when the problem occurred?
- Move the adapter and/or battery between stations to isolate if it is a battery or adapter issue.

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