Battery testing and regeneration system for improving the start performance and capacity of 12V starter & traction batteries

accureg® 8000

Austrian Battery Research Laboratory GesmbH.

Important: Read through this manual carefully before start-up. Always keep this manual ready to hand for later reference.

USER MANUAL

As of 30.06.2008

Dear customer,

We congratulate you on your purchase of the **accureg® 8000** battery testing and regeneration system for improving the start performance and capacity of 12 V starter and traction batteries. In so doing you have chosen a system which contains a unique, patented technology which performs both qualified tests and maximises the improvement in the state of your battery. The system is therefore ideally suited for assessing the capacity and improvement in the properties of your battery.

You are able to make a professional decision, e.g. at the start of the cold season, about whether the battery used in your vehicle can and will meet the requirements for staring the vehicle's engine with sufficient reliability. You therefore prevent potential loss of earnings / restrictions on use / breakdowns when using your vehicles by reliably determining the performance of your energy supply before it breaks down. If a replacement is necessary, you have sufficient time to purchase a replacement battery. You can therefore replace the battery in peace and without the pressure of an emergency situation (due to the battery breaking down at an awkward time or possibly in an awkward place as well, e.g. a very busy road).

The **accureg® 8000** system is therefore ideally suited for the ongoing quality control of your battery, which you can do over a period of many years.

At the same time you mobilise with the **accureg® 8000** energy reserves which were contained in your battery, but were immobilised (deactivated) after use over time in the vehicle, by reducing the traceable damage of your battery. Your battery is therefore restored to the best possible condition for its age. Ultimately not only delays the accelerated process of irreversible damage which has already started, but its lifespan and therefore its use in the vehicle are increased significantly.

You therefore save costs in any event. On the one hand you use the battery until the end of its actual product life cycle and on the other hand you avoid the costs which would result from an unexpected breakdown of the battery during its use in the vehicle.

For simplicity the operating manual is divided into 3 main areas:

- Brief information
- Operational manual
- Further information (about battery technology, processes, statistics etc.)

☞ We ask you to carefully read through all parts of the user manual. This concerns in particular the safety information!

Read through the user manual before you perform any operation with the system. Carefully keep this manual in a suitable place for later use.

TABLE OF CONTENTS

CHAPTER 1: Safety information

1.1 Notations

In this manual the following notations are used:

Tips: Provide you with information or tips on how to best use your system.

Warning ! Important safety information

Caution ! Indicates that non-compliance with the suggested procedure can cause damage to your system or the battery which is being used.

Danger ! Indicates that there is danger for the user with non-compliance!

1.2 Safety information

Warning ! Read through this manual carefully before you set up your system. Carefully keep this manual in an accessible place for later use.

Caution ! The **accureg® 8000** system many only be used for lead-acid batteries with a nominal voltage of 12 V! When connecting batteries with a nominal voltage other than 12V (in particular with a higher nominal voltage) and / or other voltage sources (electrical power supplies, chargers etc.) there is a risk of damaging the system. Non-rechargeable batteries may not be connected to the **accureg® 8000** !

Caution ! accureg® 8000 is designed to be used indoors. The system must not be exposed to rain or spray water!

Warning ! Only the power cable supplied may be used to start up the system. Always plug the power plug properly into the power socket.

Warning ! During set-up care has to be taken that the system is set up out of the reach of children.

Caution ! If foreign bodies or fluids infiltrate the system there is a risk of damage.

Danger ! When using the **accureg® 8000** small quantities of explosive gases can be produced in the batteries. Therefore please keep the battery well away from any flames and sparks and ensure that there is sufficient ventilation in the room.

1.3 Important safety instructions

The system must be used strictly without any additional network systems such as vehicle electrical systems (all poles disconnected). If this condition is not established (the battery can only be removed from the vehicle under very difficult conditions or with the use of a jump-start pole inside the vehicle), then to ensure the regeneration process is carried out properly with the **accureg® 8000** system it is recommended that the positive "+" pole of the battery is disconnected as a minimum requirement!

Caution ! Before the battery is disconnected always finish the started or completed operation (regeneration, short test, full test and trickle charging) of the **accureg® 8000** (by pressing the Esc./Stop button).

1.4 System features

The **accureg® 8000** has a few features which form a complex system for testing and improving the actual condition of starter and traction batteries. In chapters 5 and 7 you can find information about the system's functions and general information about batteries.

CHAPTER 2: Installation of the system

2.1 Delivery contents

	1 battery testing and regeneration system for improving the start performance and capacity of 12 V starter and traction batteries.
	1 power cable
	1 user manual

2.2 Choice of set-up location

Before setting up the **accureg® 8000** system choose a suitable set-up location. To do this, please observe the following points:

- To set up the system choose a stable, tilt-proof floor surface.
- Position the system outside of the sphere of influence of equipment which either causes vibration (e.g. compressors or the like), or emit heat (heaters, heat sinks etc.), or emit to a greater degree electromagnetic radiation (microwave ovens etc).
- Also avoid set-up locations where the **accureg® 8000** system could be exposed to rain or spray water.
- The ventilation slots of the system are always to be kept free to prevent excessive temperature inside the system!
- Make sure that the **accureg® 8000** system is not exposed to direct sunlight or is set up in particularly warm rooms.
- The system must not be exposed to chemical substances (risk of corrosion!) or vapours.
- Open the system's feet to the improve the discharge of the system's waste heat (convection, forced ventilation by ventilators) and to make it easier to read the display and only use the system in a slanting position.
- Ensure that the socket used to supply the power for the **accureg® 8000** has been installed professionally and has an appropriate earth connection.

2.3 Starting up the system

Connect the power cable

Caution ! The system must only be connected to a socket with 230 V and 50 Hz!

Connecting the supplied power cable to the back of the system.

The supplied power cable is to be connected to the back of the **accureg® 8000** system - as illustrated above.

Switch on the system

Switch on the system with the mains switch.

The system is switched on with the switch on the back of the system, as illustrated above. This step is acknowledged by the system with a bleep, after which the system performs an internal self-test.

LED status: All of the LEDs (red, green and yellow) briefly light up when switching on. When the internal self-test is being performed the green LED flashes.

In general there are three LED lights:
a red (for errors), a green (indicates OK) and a yellow light (indicates "in process")

The current software version and the time set are shown for approximately 3 seconds (if necessary set the time, see chapter 4.9.3 - Setting the time and date).

CHAPTER 3: Short description of the a c c u r e g® 8000

Short description of the system

- ✓ **accureg® 8000** is a fully-automated system for testing and improving the status of 12V lead-acid starter and traction batteries.
- ✓ **accureg® 8000** improves the state of batteries with optimised regeneration processes which maximise their upper performance limit, and is especially adapted to meet the requirements of conventional starter batteries (closed type, fluid electrolyte) and AGM or gel batteries (sealed type, bound electrolyte)
- ✓ **accureg® 8000** has its own programme for improving the state of traction batteries (closed and sealed type)
- ✓ **accureg® 8000** is also a fully-fledged load test system for starter batteries.
- ✓ **accureg® 8000** is suitable for performing capacity tests in accordance with DIN EN 50342.
- ✓ When the **"Trickle charging"** function is selected **accureg® 8000** works as a trickle charging system and is suitable for continuous operation.

✓ Please adhere to the operating manual of the system or follow the menu navigation shown on the display.

✓ Disconnecting the battery while the system is in use results in the selected process being interrupted and the system is returned to input mode or has to be re-started. *(The same also applies if there is a power failure!)**

3.1 Measures before start-up of the system:

Warning ! You must read the safety information and important safety instructions before you start using the system!

☞ Before connecting the battery check the following:

- Check the electrolyte level of the battery.
- If necessary fill up the electrolyte level with distilled water.
- Visually check the battery for mechanical damage (cracks in the battery box and the like)
- Clean the pole of the battery. Use a wire brush or steel wool do to this. It is advised that you do not use commercial pole cleaners which are based on scraping clean the top layer of the pole as these erode the pole too much during cleaning.
- If the contact surfaces of the clips of the **accureg® 8000** become dirty due to corrosion or excessive deposits of grease and dirt, these are also to be cleaned with a wire brush or steel wool.

You can now connect the battery / test item.

The display:

Selecting the function

forward: Ok/start
back: esc/stop

This provides you with the opportunity to select the desired function, see chapter 4.

☞ **Before selecting the function please select the battery type, see chapter 4.9.8**

LED status: In input mode both LEDs are “off”.

☞ If the poles of the battery are reversed (the “+” and “-” poles are the wrong way round) an error message appears on the screen:

LED status: If the poles are reversed the red LED flashes.

Check battery connection/poles

If this error message appears please reverse the poles! The red LED stops flashing and the system returns to input mode.

3.2 Guidelines for operation of the accureg® 8000 system:

1. Switch on the system
2. Connect the battery; take care to connect the poles correctly! See above!
3. Select the battery type. (Traction battery or starter battery)
4. Select the function (regeneration, short test, full test, trickle charge, cyclisation, capacity test)

☞ Warning: Before selecting the function you must select the battery type!

Starter battery type 1 (closed) or traction battery type 2 (sealed)

(see selecting services)

Battery types

Closed /1
Sealed /2
Enter:

5. Enter characteristics (capacity, cold cranking amps)
6. Confirm entry data or edit entry
7. Start process
8. Upon completion of the selected function disconnect the battery and switch off the system

CHAPTER 4: Working with the accureg® 8000

4.1 Flow charts of the system functions see also page 46 - 49 in the manual

4.2 Description of the menu items/navigation

- Menu navigation for main menu and submenu

▲ Navigate up to respective menu level (it is only possible to return to the higher menu in the first submenu item)

▼ Navigate down to respective menu level

OK/Start Go to the next submenu / acknowledge the command entered (save)

Esc./Stop Return to the higher menu / abort

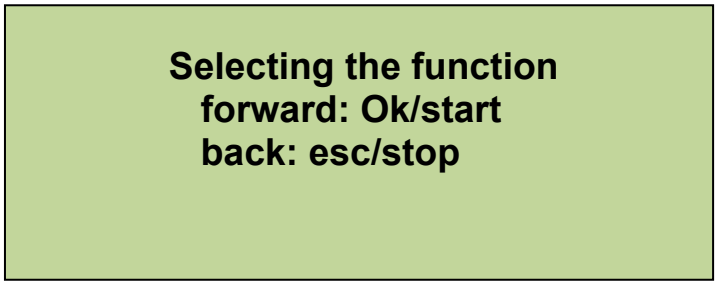
Navigate to the value entry level (rated capacity, rated cold cranking amps) with OK/Start

Editing can be done with Edit/Menu

- Main menu - Overview (navigation with ▲ ▼)

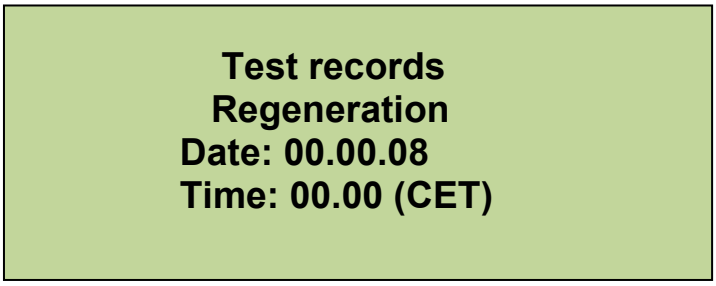
Main menus 1 - 4

Main menu 1:



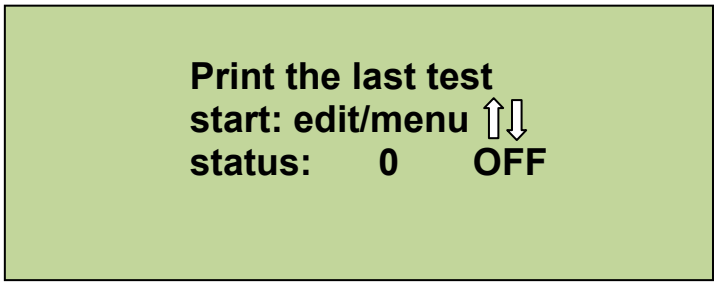
Description: Select the available test and regeneration functions.

Main menu 2:



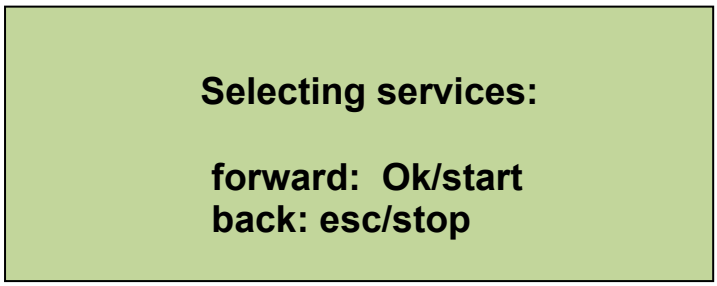
Description: View of the latest test and regeneration parameters

Main menu 3:



Description: Select print function (status indicated, here OFF, i.e. print function not activated).

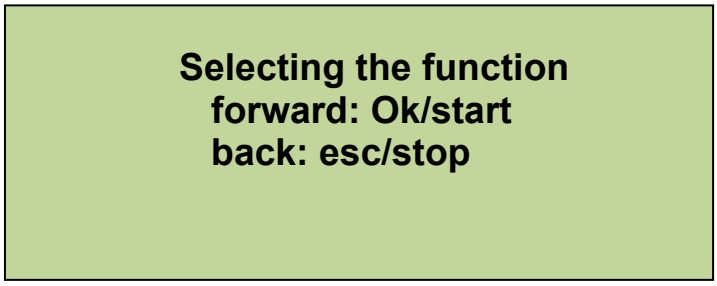
Main menu 4:



Description: Select the available services such as: operating hours indicator, indicators for processes, setting the time and date, activating the printer, setting the language, selecting the climate code, selecting the driving profile, setting the battery type.

4.4 Main menu – selecting the function

Main menu 1:



If you press OK/Start you go to the next submenu level with the following submenu items (navigation with ▲ ▼):

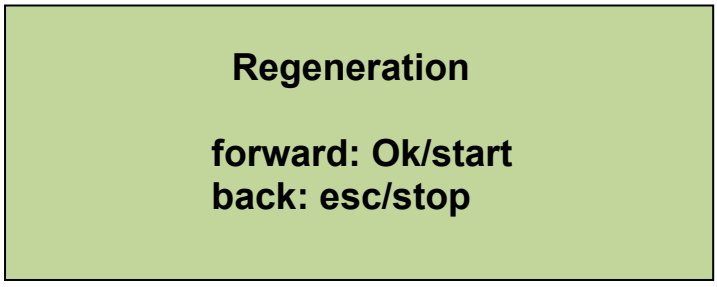
4.5 Submenus of main menu 1: 1.1 – 1.1.4
(Instructions for entering the characteristics of the battery)

The characteristics of the battery are to be entered for all six built-in system functions (regeneration, short test, full test, trickle charging, cyclisation, capacity test).

☞ Please note that with the cyclisation function, for traction batteries only the battery capacity is to be entered.

The characteristics are entered based on the example for activating the **"regeneration"** function illustrated below:

1.1



1.1.1. to 1.6.1 Select by pressing the button OK/Start

1.1.1

Enter capacity:
C = 20 Ah
(Nominal value in Ah)
Use ⇧⇩ arrows

The nominal value for battery capacity specified on the battery is to be entered. The system suggests as standard the value “70” (Ah).

You start to change the standard value to your battery’s imprinted nominal value by pressing the button Edit/Menu.

The first digit (the hundreds digit) then starts to flash and you can set the capacity to the nominal value of your battery with the buttons ▲ ▼.

After correctly setting the hundreds digit you press Edit/Menu again. The tens digit starts to flash. Set the tens digit to the correct value and then press Edit/Menu again. Now the units digit flashes and you can set the corresponding numerical value here.

Check whether the numerical value set corresponds with the nominal capacity of your battery and confirm your entry by pressing the button OK/Start.

The system now jumps to the input mode for cold cranking amps, where you enter, in a similar way to the previous entry for the nominal capacity, the rated cold cranking value (in A according to EN).

☞ With the cyclisation of a traction battery you only have to enter the battery capacity. The capacity entered here needs to be the specification for K20 (discharge capacity for discharges with 20-hour current). If there is another specification (K2.5; K3; K5; K10) on your battery, please use the conversion table on page 44/45

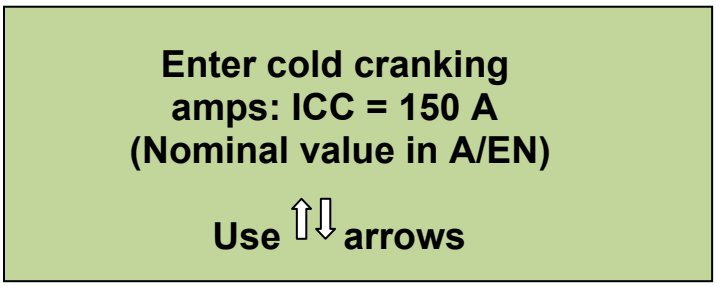
When you have calculated the battery capacity, enter the result.

1.5.1

Enter capacity:
C = 20 Ah
(Nominal value in Ah)
Use ⇧⇩ arrows

Confirm with OK/Start. The system then asks for the specifications for the cold cranking amps.

1.1.2



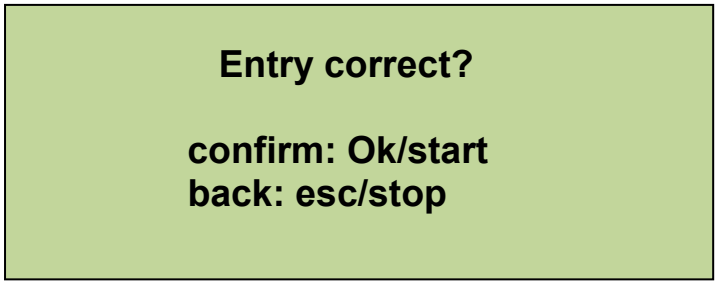
☞ The indicated value for the coldcrank amps are determined on the software and can be adopted. Just confirm the process with “OK” till the cycling function starts.

☞ If the nominal values on your battery cannot be seen, you have to estimate these based on the size and model of the battery or based upon what is known about its intended use.

☞ You can also find in chapter 9 a conversion table which converts cold cranking amp values specified in A according to DIN into A values according to EN.

After confirming the cold cranking amp value entered the following message appears on the display:

1.1.3

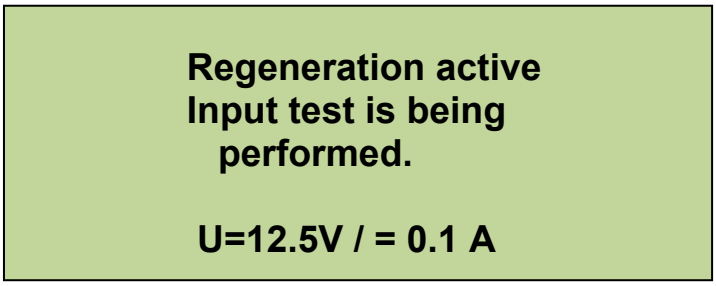


By pressing the button Esc./Stop the system again provides you with the opportunity to check or amend the values set by yourself. By pressing once the cold cranking amp value which has been set appears, by pressing again the capacity value which has been set appears. If the values are correct, the entry values are to be confirmed with OK/Start.

If you want to start the selected process, then press the button OK/Start in the entry menu.

The selected process is started automatically and on the display appears the text for the process selected:

1.1.4



4.6 Main menu 1: Test records 1.1 – 1.6

1.1

Regeneration

forward: Ok/start
back: esc/stop

See chapter 5.1 Description of the regeneration function

Caution ! When performing the **"Regeneration"** function never change the poles of the battery clips during active operation! When changing poles there is a risk of damage due to overloading the system.

1.2

Short test

forward: Ok/start
back: esc/stop

See chapter 5.2 Description of the short test function

1.3

Full test

forward: Ok/start
back: esc/stop

See chapter 5.3 Description of the full test function

1.4

Trickle charge

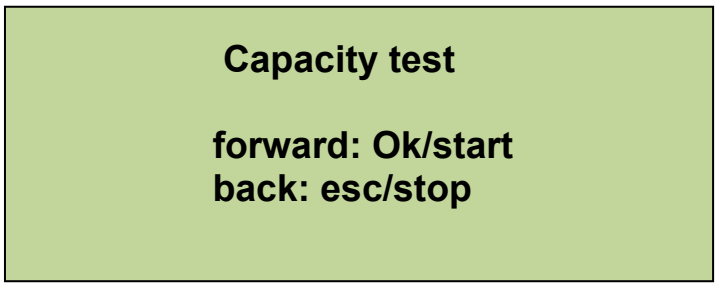
forward: Ok/start
back: esc/stop

See chapter 5.4 Description of the trickle charge function

1.5

See chapter 5.5 Description of the cyclisation function

1.6

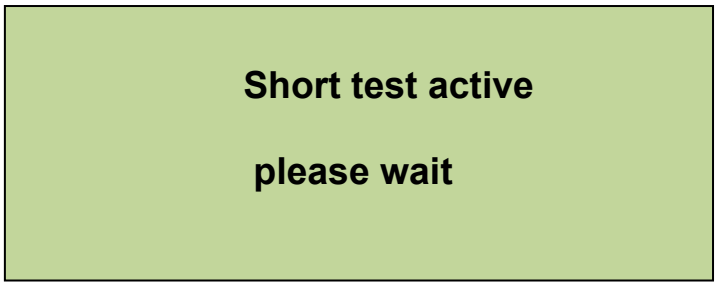


See chapter 5.5 Description of the capacity test function

☞ You return to the main menu level with the button Esc./Stop. It is only possible to return to the main menu from the first (top) submenu item.

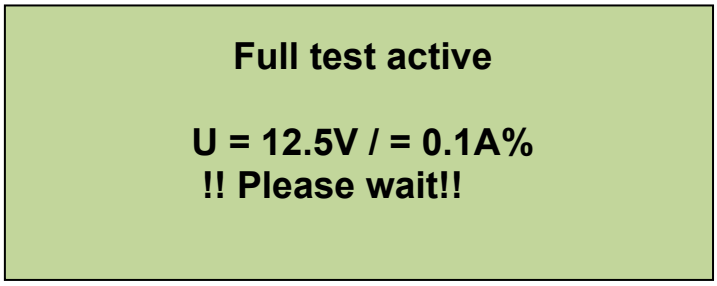
… when selecting the short test function:

1.2.4

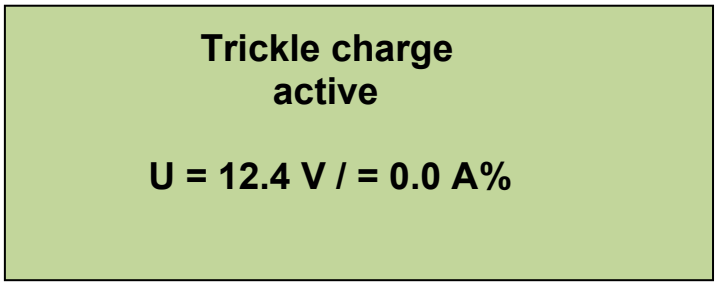


… when selecting the full test function:

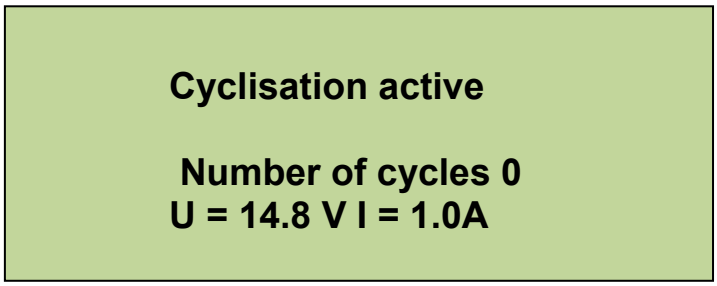
1.3.4



1.4.4

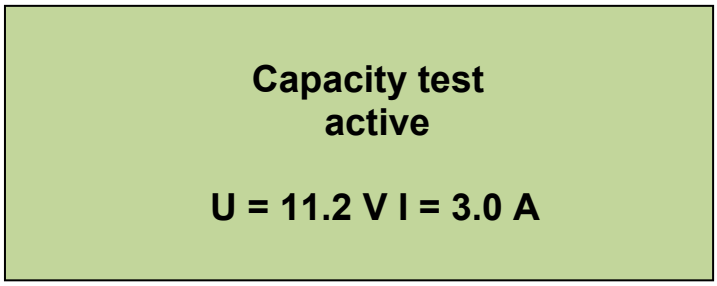


1.5.4



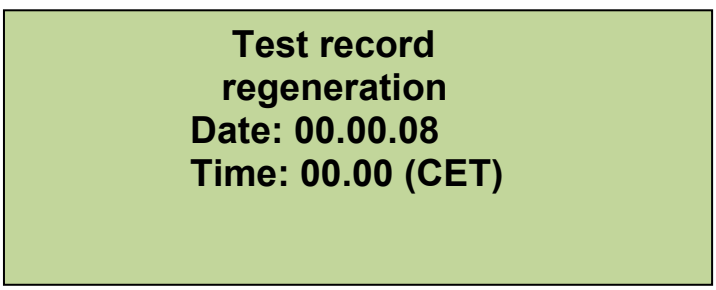
When you select the “cyclisation” function for a traction battery, please make sure that you have made the right selection under “select the battery type”.

1.6.4



4.7 Main menu 2: Test records

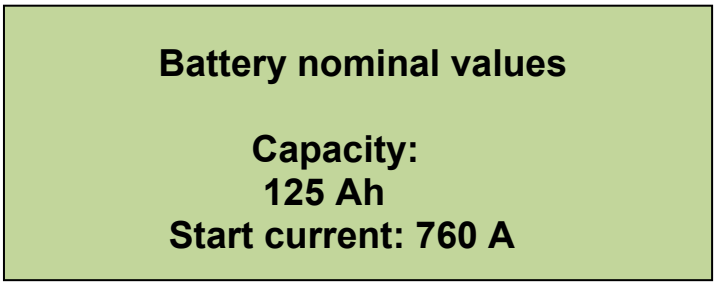
2



By selecting this menu item the results of the previously performed regeneration process can be shown.

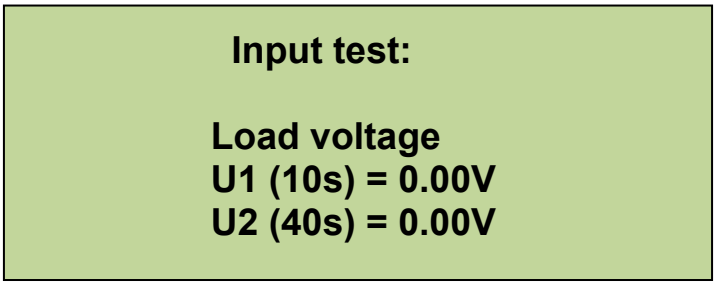
The test results can be printed out.

2.1



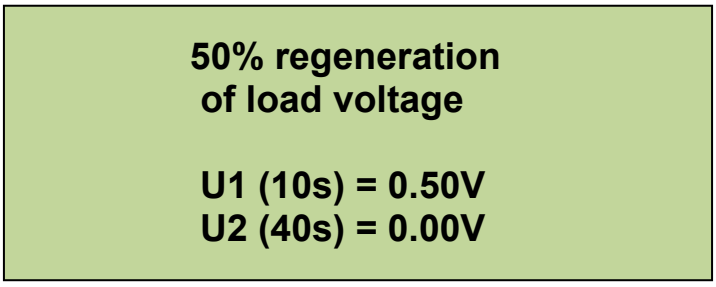
On the display the values for the capacity (nominal capacity) entered by the user and the cold cranking amps (testing current according to the standard DIN EN 50342) are shown

2.2



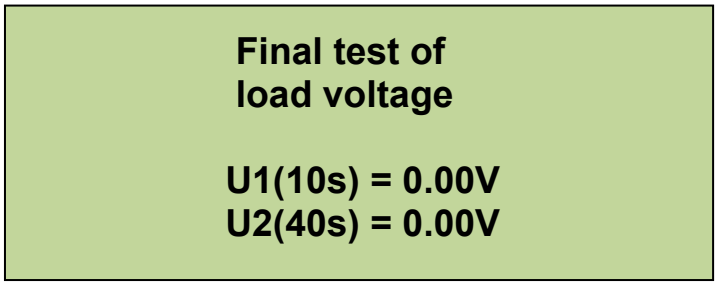
On the display the load voltage values (results of load tests) are shown at the start of the regeneration process (input test). U1(10s) is the voltage for 10s load, U2(40s) the voltage value for 40s load with the testing current.

2.3



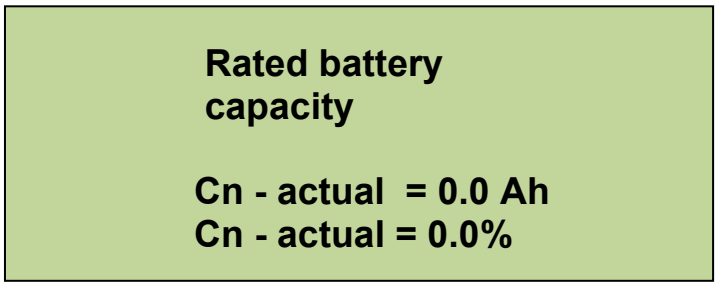
The “50% REGENERATION” display shows the load test result values when the regeneration process is approx. 50% complete.

2.4



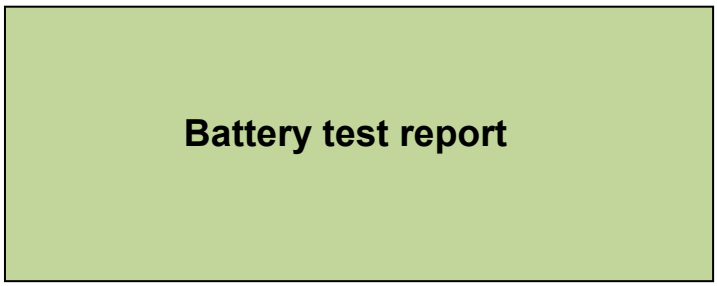
The load voltage final test display shows the load voltage test result values at the end of the regeneration process.

2.5



Upon successful completion of the regeneration process at this point the rated battery (K20) is displayed in Ah (Cn_actual absolute) and in % (Cn_actual in % of the new capacity).

2.6

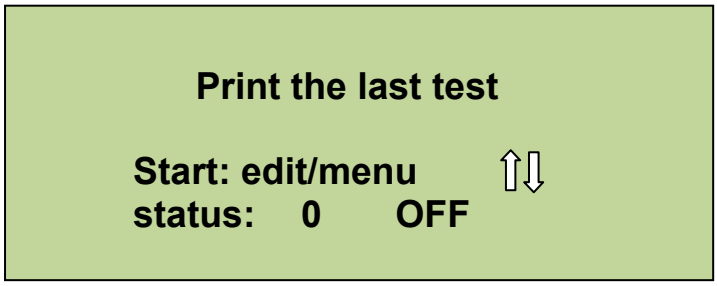


Upon successful completion of the regeneration process at this point the status message “Battery OK” is displayed, or a short description of the fault which has occurred (for a complete overview of possible battery faults see the appendix) is displayed.

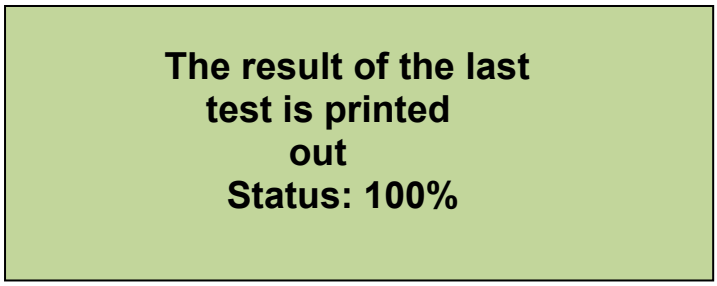
Description: View of the latest test and regeneration parameters

4.8 Main menu 3: Printing

3



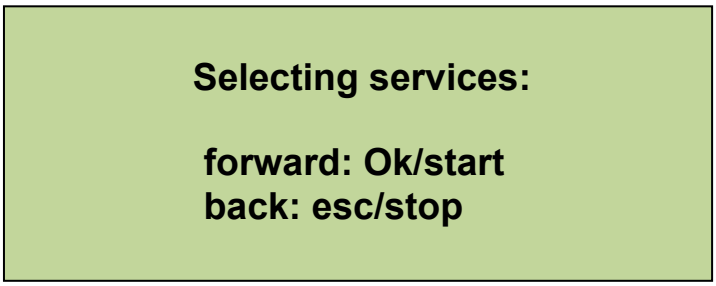
3.1



Description: Select print function (status indicated, here OFF, i.e. print function not activated).

4.9 Main menu 4: Selecting services

4



Description: Select the available services such as: operating hours indicator, indicators for processes, setting the time and date, activating the printer, setting the language, selecting the climate code, selecting the driving profile, setting the battery type.

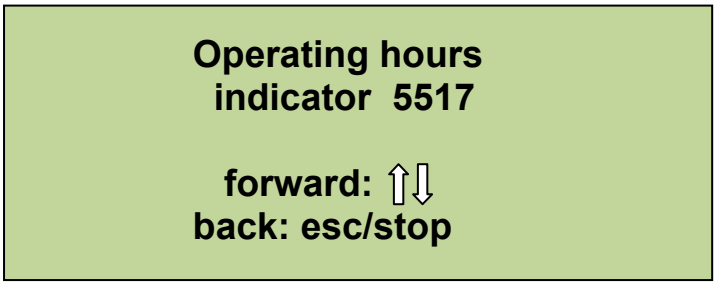
The system provides the following services:

4.5.1 Operating hours indicator

List of the submenu items (navigation with ▲ ▼):

4.9.1 Operating hours indicator

4.1

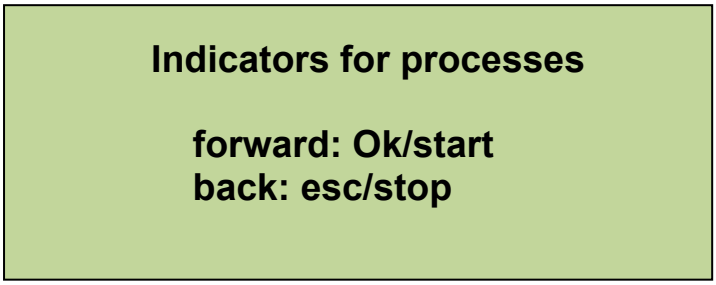


Description: Displays the number of operating hours completed.

4.2 to 4.2.6.1.2 Indicators, number of processes

List of the submenu items (navigation with ▲ ▼):

4.2.



Description: Displays the number of processes.

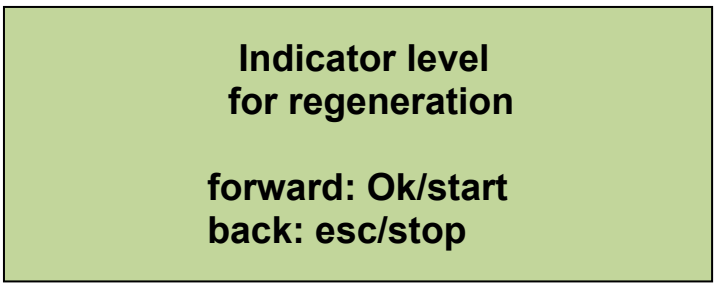
The indicators of the functions performed by the system are supported by:

4.2.1 to 4.2.6 Indicator levels:

Individual indicators / all indicators can only be reset by authorised personnel entering the service code.

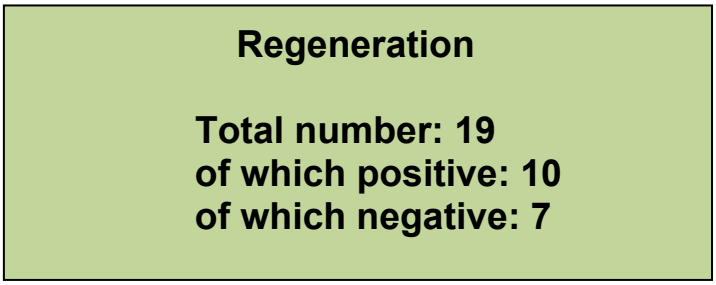
When you are in the submenu:

4.2.1



and press the OK/Start button the processes are displayed as follows:

4.2.1.1



The numbers under the text “Number”, “Pos.” and “Neg.” have the following meaning:

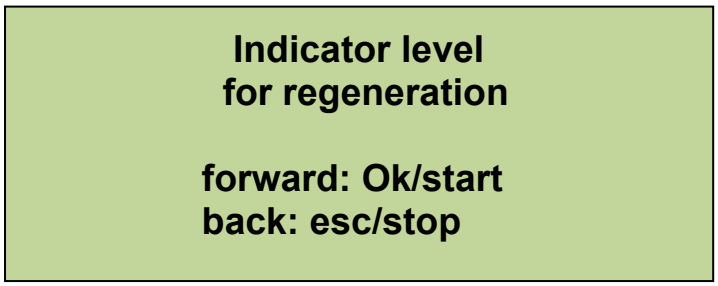
“Number” the number of times the respective function has be called upon (process has been started),

“Pos.” the number of successful (without battery fault) processes and

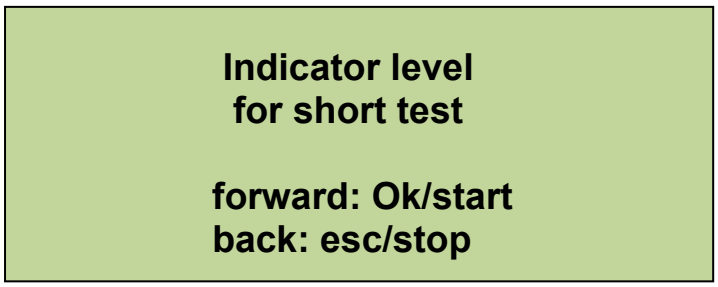
“Neg.” the number of negative (battery failure with fault) processes

4.9.2 Indicators for processes and submenus

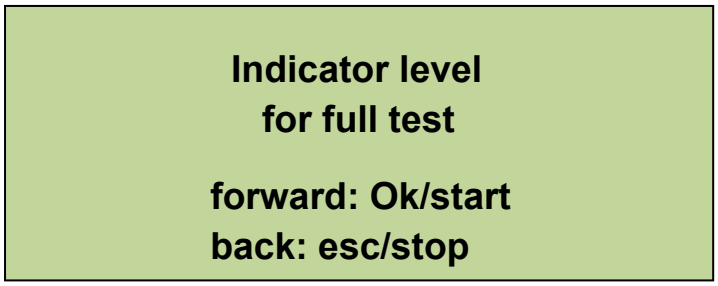
4.2.1.



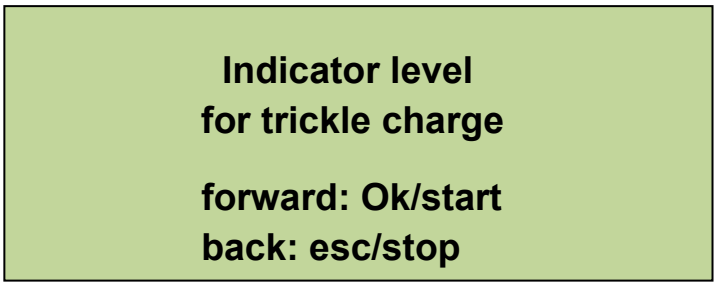
4.2.2



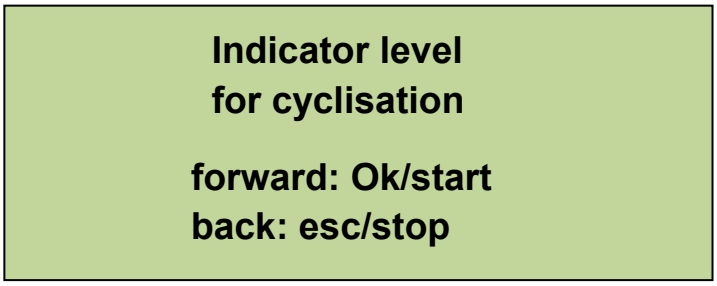
4.2.3



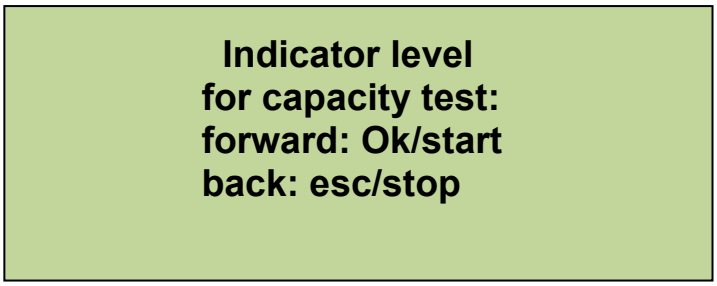
4.2.4



4.2.5



4.2.6

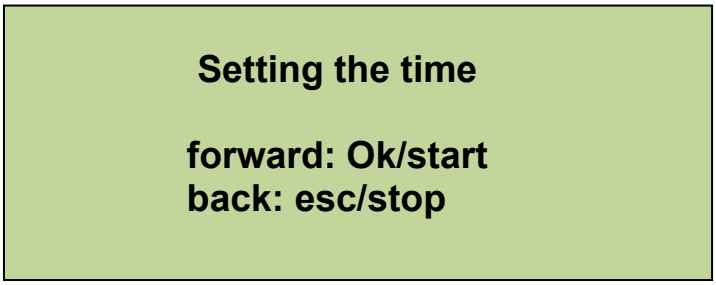


4.2.7

When this menu item has been called up you can reset all of the indicators.

4.9.3 Setting the time and date

4.3



List of the submenu items (navigation with ▲ ▼):

Description: This service provides you with the opportunity to reset or change the system time (date and time).

By pressing the button OK/Start you go to the setting menu:

4.3.1.

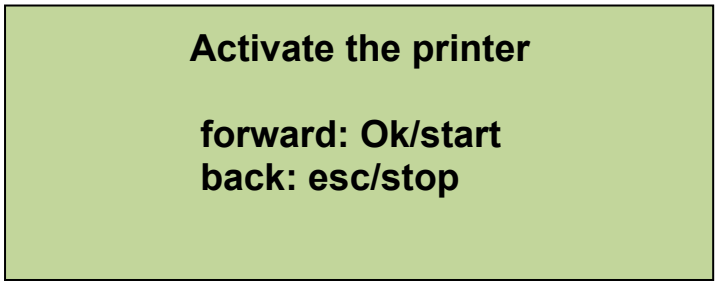
Press the button Edit/Menu. The tens digit for "Day" starts to flash. By using the buttons ▲ ▼ you select the correct number. After correctly setting the tens digit you press Edit/Menu again. The units digit for the date starts to flash and you can enter the correct numerical value here. Then you press the button OK/Start in order to confirm that the correct day has been set.

When you press Edit/Menu again, the tens digit for the month starts to flash.

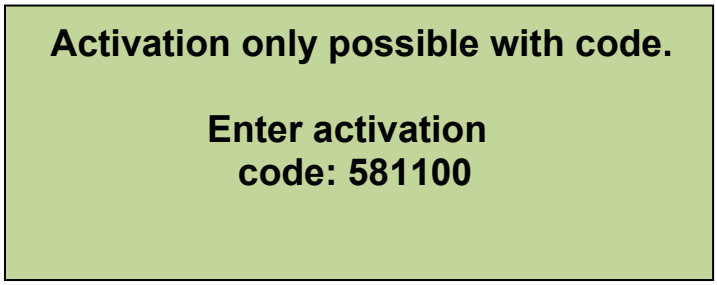
Proceed in the same way as described above by using the buttons Edit/Menu and ▲ ▼ in order to select the correct values for the month, the year and the time.

4.9.4 Activating the printer

4.4



4.4.1

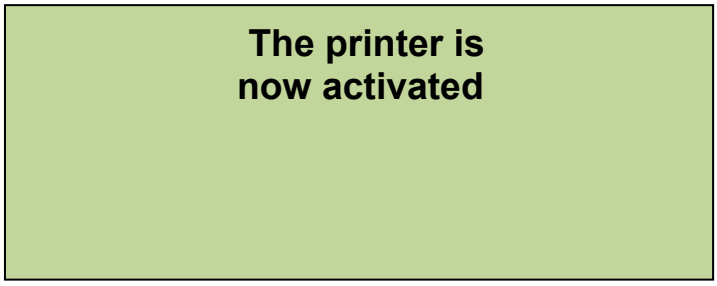


In order to enter the activation code, press the button Edit/Menu. The first number of a 6-digit number starts to flash.

With the buttons ▲ ▼ you can select the correct numerical value for the activation code, then press the button Edit/Menu again. Now the second number of the code starts to flash, which you can again set with the buttons ▲ ▼ etc. until you have entered all 6 numbers of your code.

The code is confirmed with the button OK/Start. The following message is now displayed:

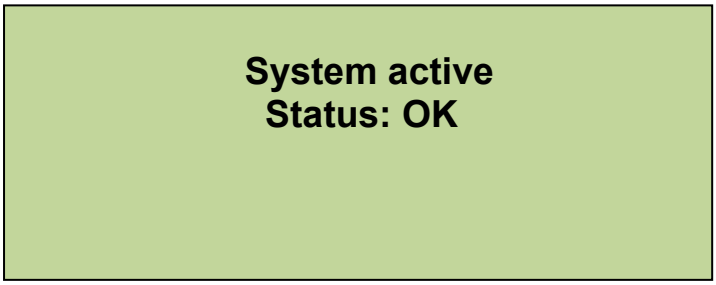
4.4.2



The activation code for the printer has now been successfully entered.

☞ If the button Esc./Stop is pressed in the menu **"Select function OK or ESC."**, the status information appears on the display:

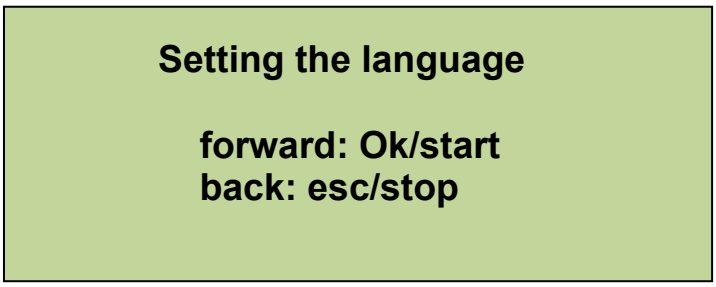
4.4.3



By pressing the button OK/Start or Esc./Stop you return to the main menu.

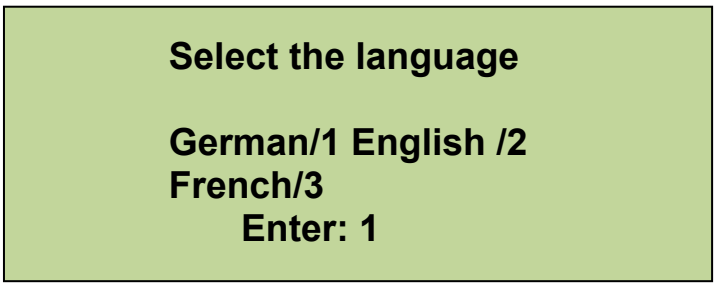
4.9.5 Setting the language

4.5



With the accureg systems it is possible for different users to make specific adjustments to the system settings, including selecting the language in which they can operate the system. German, English and French can be selected. The selection can be made in the following menu item

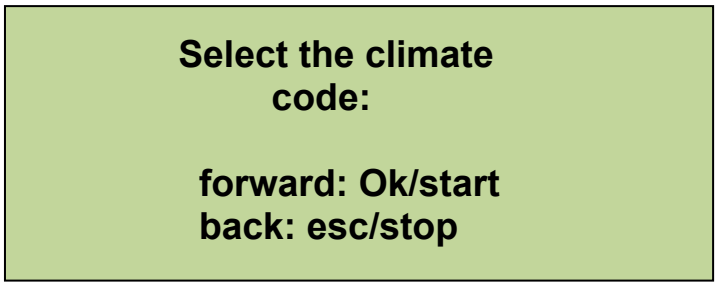
4.5.1



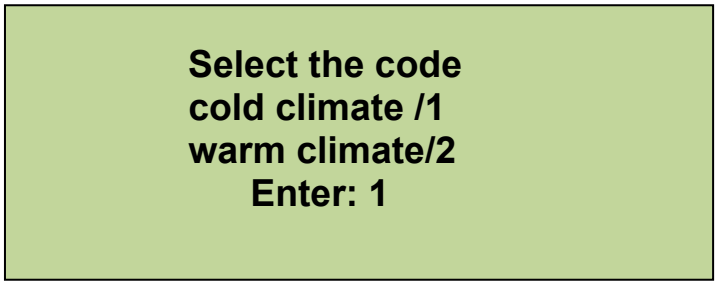
You can select German, English or French

4.9.6 Selecting the climate code

4.6



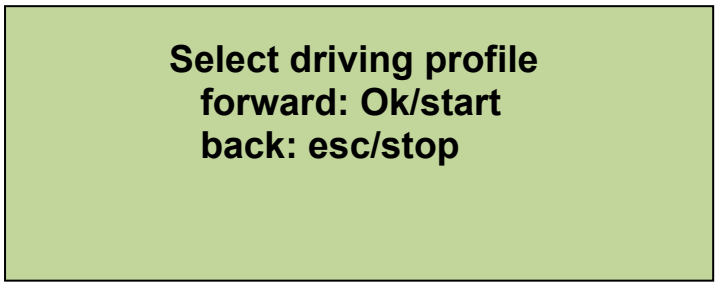
4.6. 1



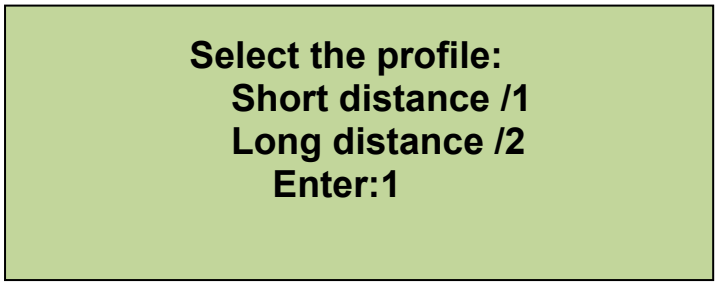
The climate code for your climate zone was set at the factory. Please do not change anything without consulting our Hotline.

4.9.7 Selecting the driving profile

4.7



4.7.1

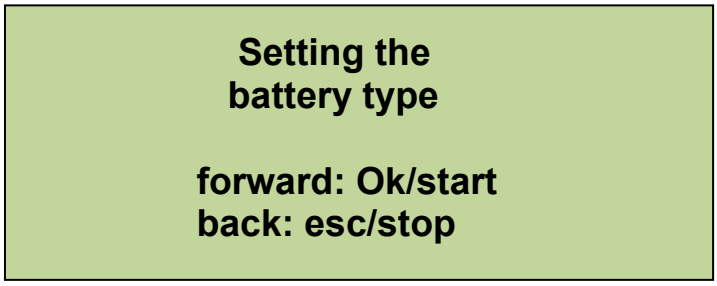


Here you can choose between a short and a long-distance vehicle when you regenerate a starter battery.

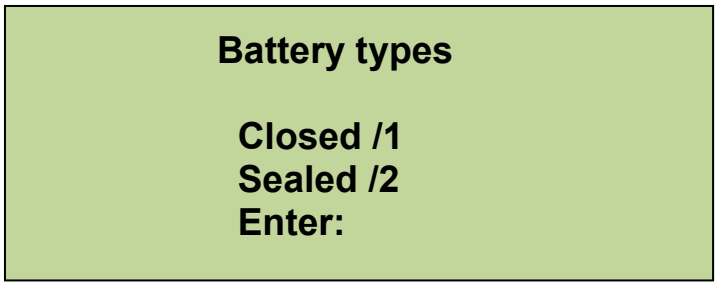
4.9.8 Setting the battery type

A particularly important entry is the definition of the battery type to be regenerated. Normal starter batteries in wet chemistry technology are – according to the specifications of the standard DIN EN 503423 of the “closed” type. Batteries in AGM technology or other recombination batteries are described as “sealed”. When performing a regeneration you MUST WITHOUT FAIL select the battery type “sealed” to prevent damage to the battery!!!

4.8



4.8.1



☞ **Important: For traction batteries please select the setting 2**

For starter batteries please select the setting 1

☞ You return to the main menu level with the button Esc./Stop. It is only possible to return to the main menu from the first (top) submenu item.

CHAPTER 5: Description of the functions of the accureg® 8000

5.1 “Regeneration” function >>

If the **“Regeneration”** function was selected, the system automatically performs the following operations on the connected battery:

- ✓ Tests the charge characteristics
- ✓ Performs a cell short circuit test; an error message appears if the battery has a cell short circuit
- ✓ Monitoring function for deep discharge batteries; activation of deep discharge batteries; error message for batteries which can no longer be activated after a deep discharge
- ✓ Identification of state of charge; process ended when the battery is fully charged; automatically changes to trickle charge mode

- ✓ Pre-charge phase
- ✓ Regeneration phase; regeneration charging in stages with patented process
- ✓ Test phase for batteries when the regeneration process is complete; filter for batteries with too low capacity (country specific); filter for batteries with low start voltage
- ✓ Automatically changes to trickle charge

Caution ! When performing the “Regeneration” function never change the poles of the battery clips during active operation. When changing poles there is a risk of damage due to overloading the system.

☞ If the display shows the text:

1.1.5

Regener. active
After-charge phase

the battery can be disconnected from the system and used if urgently required. At the start of the after-charge phase the battery has already been completely desulphated and has already satisfied the required performance test. It is though recommended to leave the battery connected to the system until the process has been finally completed and the following message appears on the display:

1.1.6

Regeneration successfully completed

5.2 “Short test” function >>

If the **“Short test”** function is selected, the system performs a short test to determine the start characteristics of the battery.

- ✓ Performs a cell short circuit test; regeneration recommendation for batteries with suspected cell short circuit
- ✓ Performs a start voltage test; regeneration recommendation for batteries with reduced start voltage
- ✓ Automatically changes to trickle charge if significant damage to the battery is identified

5.3 “Full test” function >>

When selecting the **“Full test”** function the connected battery is subjected to a comprehensive battery test:

- ✓ Tests the charge characteristics; error message for batteries with insufficient charge characteristics
- ✓ Monitoring function for deep discharge batteries; activation of deep discharge batteries; error message for batteries which can no longer be activated after a deep discharge
- ✓ Performs a cell short circuit test; regeneration recommendation for batteries with suspected cell short circuit
- ✓ Performs a start voltage test; regeneration recommendation for batteries with reduced start voltage
- ✓ Automatically changes to trickle charge if significant damage to the battery is identified

5.4 “Trickle charge” function >>

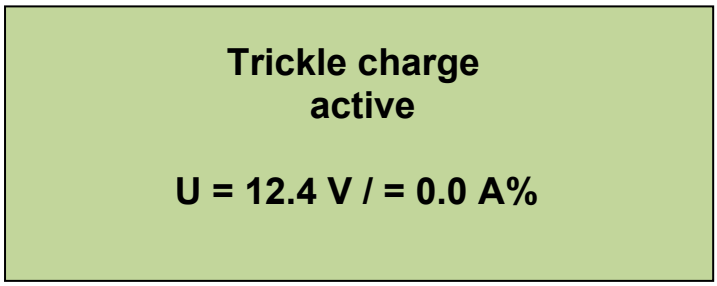
In **“trickle charge”** mode a very sparing, likewise patented mode for performing a trickle charge is activated. This mode is suitable for bridging short-term breaks in battery use, but can also be used ideally for permanent trickle charging because of the process implemented which takes into account the battery data.

5.4.1 Trickle charging function with charge pause

Activating the charge pause based on the charge current limit shortfall method

By pressing the button ▼ you obtain the status information on the current voltage and current value for the test item.

1.4.4



When the button ▼ is pressed the original display appears again.

5.5 “Cyclisation” function >>

The “Cyclisation” function is designed for mobilising reversible capacities of traction batteries (primarily sealed types, AGM or gel batteries). With the consecutive completion of several discharge and charge cycles passivated parts of the battery plates are reactivated and subsequently participate in the electrode reaction again.

The discharge – charge process is performed as standard 5 times in total. The user is asked afterwards whether – specifying the improvement rate of the last cycle compared with the last-but-one cycle – a further cyclisation sequence should be performed (at the same time the user is asked whether to continue / repeat the process a recommendation is displayed).

The process stops when the capacity increase rate is lower than a defined minimum increase rate.

5.6 “Capacity test” function

Test scope:

When the “Capacity test” function is called upon the following test routines are performed:

A) Load test
B) Capacity test

ad A), Load test

The test item (test battery) is subjected to a warm start test (load test using the cold cranking amp value specified on the test item). Based on the absolute position of the voltage value (start value, plateau value) determined and the voltage drop over the test period a statement is generated on the cold start characteristics of the battery using the system’s built-in empirical database.

ad B), Capacity test

By using the specifications for the battery’s capacity (nominal capacity according to the text on the label) the current for a 10-hour charge of the battery (K10) is calculated and the test item is charged over a period of 5 hours with this current. Therefore 50% (for testing with a setting for cold climate zones with a longer charge duration 60%) of the capacity contained in the battery in real terms is taken (capacity test).

If the terminal voltage of the battery falls during the testing period (5h) below the lower voltage limit of 10.5V, the discharge is aborted and the current capacity (K20) is calculated based on the determined discharge capacity (according to K10).

If the terminal voltage of the test item is over the voltage value of 10.5V after the test period, the remaining capacity is calculated by built-in databases based on the voltage value before the discharge current (U>10.5V) was cut off. By adding the value determined in the previous discharge (after it has been converted to K20) the total capacity of the test item is determined.

CHAPTER 6: Care and maintenance of the accureg® 8000

6.1 Service

The **accureg® 8000** does not require a regular service.

Services or repairs may only be carried out by the manufacturer or authorised specialists. Failure to comply means you no longer have the right to claim warranty!

6.2 Cleaning

Clean the system with a dry cloth; use a dampened cloth for more persistent dirt.

Danger ! Always unplug before cleaning!

CHAPTER 7: Information about starter batteries

General

The functional principle upon which a starter battery is based is over one hundred years old. The lead-acid battery still has a market share of almost 100% for starter batteries of vehicle combustion engines. This circumstance is the result above all of the high efficiency of lead batteries in comparison with other technological solutions available.

Functional principle and characteristics of a starter battery

The functional principle of a starter battery is based on the charging and discharging of an electrochemical system. Charging adds energy to the system (e.g. by the generator in a vehicle electrical system, or by external battery chargers), discharging takes energy away from the system (e.g. by the starter or by the vehicle electrical system). If a battery is left to itself (clips open), there is a constant “inner discharge current” (self discharge) which also consumes energy from the battery’s system. We have consciously not provided a detailed description of the electrical and chemical processes which take place during the charging and discharging of a battery. We refer here to the numerous sources of information in the available technical literature.

The primary characteristics of a starter battery are:

- the nominal voltage [V] (normally 12V),
- the nominal capacity (the battery’s capability to deliver a current over a defined time) in [Ah] and
- the cold cranking current in [A] (the current which can be delivered under certain test conditions[1] [temperature, time, current strength] by the battery).

[1] When specifying cold cranking amp values the test process upon which they are based also has to be indicated, e.g. 500 EN, 340A DIN, 440 A SAE, etc. Normally the specifications are made in “EN” (a two-stage test

The design and the layout of the poles also have a significant and decisive impact on the possibilities for using a starter battery (dimensioning). All of the relevant information is taken from the so-called “ETN number” (European Type Number) which can be seen on the battery box of many products. As well as the ETN the five-digit DIN type number can also be specified.

Decoding the ETN

The structure of the ETN consists of 9 numbers of respectively 3 groups with 3 numbers. The first group of 3 numbers (Group A) codes the battery voltage and the nominal capacity, the second group of 3 numbers (Group B) comprises the model and the third group of numbers (Group C) the cold cranking amps of the battery.

Structure of Group A

Group A consists of 3 numbers which specify the battery voltage and the nominal capacity. For 6V batteries the value of the nominal capacity is specified. By definition numbers up to the maximum number of 499 are available, i.e. 6V batteries with capacities between 1 and 499Ah can be coded with the ETN (e.g. Group A: 036 => 6V, 36Ah). Batteries with a nominal voltage of 12V are coded with numbers from 500, i.e. the capacity value specified by the manufacturer is calculated from the text on the label by deducting the number 500 (e.g. Group A: 645 => 12V, 145Ah).

Structure of Group B

The description of the structure of Group B is restricted to specifying the most important coded battery characteristics. These are the dimensions (length, width, height), cell layout, position and type of connection poles, information on the design (base hold down, handles, etc.) cover type, information about water consumption etc.

Structure of Group C

The 3 numbers for Group C correspond to one tenth of the cold cranking amps specified by the manufacturer (e.g. 033 => 310 A EN)

Operations and maintenance of a starter battery

Before starting to use a starter battery (installation in a vehicle) the energy store should be subjected to a complete charge at room temperature. To do this commercial battery chargers can be used. The maximum charge current should not exceed $C_N/4$ (one quarter of the specified nominal capacity), the voltage should in the process not exceed 16V. After 24 hours the charging can be considered to be finished and the battery is ready for use. When buying you have to take into account the size and type of the battery specified. Under-dimensioned batteries have a higher wear rate and accordingly fail earlier.

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process). There are conversion tables for current specifications for the individual test processes. In the appendix to this operational manual a EN – DIN conversion table is displayed.

Install the starter battery in accordance with the requirements of the vehicle manufacturer. Make sure the battery is assembled properly (fastening via base hold down or anchor) and the pole clips.

Always use - in particular for short distance journeys during the cold season – only as many electrical consumers in the vehicle electrical system (rear window heating, seat heating, fan) as absolutely necessary. Turn off these consumers upon completion of the required activity (de-icing of the rear window, etc.).

The life of the battery is increased significantly if you perform a trickle charge at least once a year (before the start of the cold season). To do this connect a trickle charging system or charge the battery over a longer period (e.g. 48 hours) with a current of $C_N/100$ (e.g. 60Ah, charge current = 0.6A) and an upper voltage limit of 14.4V. The specified loading time can also be staggered.

If an electrical consumer has been supplied by the battery for a longer period (reducing the capacity by e.g. forgetting the light, the stereo system, repeated attempts to start without starting the engine etc), you should subsequently charge the battery to compensate for this in the manner described above.

If you have electrical consumers in the vehicle electrical system (possibly installed retrospectively), which also consume considerable energy from the battery when the engine is idle (e.g. alarm system, battery chargers for mobile phones etc.), then you should also charge the battery – in particular during the cold season – to compensate for this.

If you have a battery with accessible openings in the lid area (plugs), check the electrolyte level at the start and at the end of the warm season. The fluid level should be well (0.5 – 1 cm) above the plate of the battery. Do not overfill the battery and keep (where these exist) to the manufacturer's specifications (maximum level).

Ageing of a starter battery

A battery is subject to natural ageing (decline in the performance data[2]) from the time of its manufacture.

This decline in the performance data is comprised of 2 components:

a) reversible deterioration in performance

b) irreversible deterioration in performance

Concerning a), reversible deterioration in performance mainly comprises discharging (discharging by consumers or self-discharging). The "sulphation" (= forming of granular crystalline lead sulphate crystals, fusion of microcrystalline lead sulphate crystals into larger structures) which has appeared as a result of the discharge can also be reversed for the most part ("desulphation").

Concerning b), irreversible deterioration in performance comprises primarily shedding (loss of active mass from the plates) and corrosion of the lattice.

[2] Under certain circumstances the battery only reaches its maximum performance data after a certain period of use in the vehicle.

Reversible and irreversible deterioration in performance normally occur together as part of the natural ageing process of a starter battery; even with optimal maintenance the battery is subject to a certain minimum amount of damage due to being used in the vehicle. Advanced reversible and irreversible deterioration in performance ultimately result in the failure of the energy store.

A significant reduction in performance can be seen when the battery is unable to start the vehicle reliably under certain conditions.

The battery-related causes of this are:

- state of charge too low,
- voltage drop too high when starting,
- drop of one (or several) cells due to cell short circuit (cell short circuits).

Water consumption itself does not represent as such a deterioration in performance of the battery. Deterioration in performance due to loss of electrolytes only occurs when the parts of the plates are no longer sufficiently washed with fluid or these are to be classified in the above list.

Parameters to change the ageing of a battery / options to eliminate reversible deterioration in performance

The ageing mechanism of a starter battery is based on complex and interrelated processes, a description of which is beyond the scope of this manual.

Parameters to change the ageing process of a starter battery

State of charge

- Charging in cycles (with discharging)
- Mechanical charging with vibration
- Thermal conditions at the point of installation
- (electrolyte level)
- (layout, dimensioning)

State of charge / charging in cycles: a good state of charge is beneficial. If the discharge of considerable amounts of capacity (beyond the starting of the vehicle) cannot be avoided (e.g. by additional consumers, short-distance journeys – in particular during the cold season), charging the battery to compensate for this has a positive effect.

Mechanical charging / thermal conditions: low mechanical charging and operating at around 25°C (e.g. at the point of installation inside the vehicle, in the car boot) also have a positive effect.

Electrolyte level, battery layout: Regular checking of the electrolyte level (for batteries where this is still possible) and a good basic design of the battery to meet the requirements of the vehicle (additional electrical consumers, driving habits) when retrofitting batteries are equally beneficial.

Options for eliminating reversible deterioration in performance

"Sulphation" can be described as the only sustainable and reversible deterioration in performance. As a temporal reaction product granular crystalline lead sulphate is formed from microcrystalline lead sulphate through clusters. The sulphation results in a considerable reduction in the start performance of a battery. It can only be reduced to a limited extent by a commercial battery charger, just as the generator in a vehicle electrical system in general can only make a small contribution towards preventing sulphation.

Rather the opposite effect occurs, namely that strongly sulphated batteries are either declared as faulty when using commercial battery chargers systems or are "overcharged" due to too high a charge current and are broken in the process.

The patented process contained in the **accureg® 8000** system for desulphation (breaking up of granular crystalline lead sulphate and reconverting it to active mass and electrolyte) is essentially based on performing specific charge and discharge cycles. The parameters which appear in the process and are constantly measured by the **accureg® 8000** system are used to calculate the current variables (voltage, current). In this way the battery virtually dictates "the tempo" of its "regeneration", preventing the battery from being overcharged.

Options for electrically determining the status of a starter battery / battery tests

Rapid test / voltage measurement

a) Rapid test including a back-calculation on the internal values of the battery (e.g. internal resistance)

b) Full test (determining the CURRENT capacity and the CURRENT cold cranking amps)

The measurement of the acid density of the electrolyte (as far as the lid design allows this) is determined chemically and can be drawn upon as a separate source of information (see below).

a) Rapid test / voltage measurement

Rapid test methods are based only on the measurement of the voltage of the battery and say nothing in practice about the current status of the battery.

b) Rapid test including a back-calculation on the internal values of the battery

This is a widely used method for determining the status of the battery. In most cases the battery is either charged by means of a constant charge over a period of a few seconds to minutes, or charged by means of a defined number of charge impulses with a defined frequency.

Another common method of measurement in this category is by charging the test item with alternating signals with different frequencies. The "reaction" of the battery to these signals is recorded and evaluated.

In all cases, based on the voltage, current and complex resistance values determined during the charging, an approximate calculation of the characteristic values of a battery (capacity, cold cranking amps) and the state of charge (SOC), including even the state of health (SOH), is made.

c) Full test (determining the current capacity and the current cold cranking amps)

The right to perform a full test is in general retained by a specialist testing laboratory. Here test items are tested for their specifications concerning capacity cold cranking amps on the basis of valid regulations (standards).

Functional principle of the accureg® 8000

The **accureg® 8000** is the first fully-automated system for testing and improving the status of starter batteries based on lead-acid technology.

The following fundamental functional principles have been applied in the **accureg® 8000**:

- Performance measurement based on the principle of fully testing the capacity and the cold cranking amps
- Optimised, sparing desulphation process for lead-acid batteries
- Time-optimised test process to detect irreversible damage of batteries at the earliest possible time
- Use of the starter battery's characteristics to reveal whether a battery can continue to be used for its original purpose

Description of the integrated processes

A detailed description of the processes is provided in chapter 5 (Description of the functions). Here in particular the integrated functional principles regarding the latest state-of-the-art technology and the innovative features of the **accureg® 8000** system are described in text form.

Test process

The test modes (short test / full test) aim to provide a quick initial measurement of the functionality of the battery. The focus here is on producing immediate information on whether the battery to be tested is all right or what has happened to the battery if it is determined to be unsatisfactory for its original purpose (voltage drop is too great under normal load).

The short test accordingly either shows that it is OK for use for its original purpose (Battery all right) or requests that it is regenerated (Regenerate battery). It cannot in the process provide any other information on any possible existing damage to the battery. Before starting a regeneration the short test can be followed by a full test to shorten the process.

The full test also includes, as well as the features of the short test, a process to carry out an activation charge (cell activation for deep discharge batteries with e.g. high resistance) and tests the battery's ability to absorb energy. The full test procedure can last up to 10 hours. The information provided at the end of the process is though much more specific and enables the system to sort out batteries are actually unusable (identifies irreversible faults).

Description of the processes of the accureg® 8000 when selecting the regeneration function:

The algorithm applied tests as a first step the battery's fundamental functional capability. If this is not established (whereby at the start a priori both reversible and irreversible loss of performance can be responsible for causing a detected deterioration), activation processes are carried out by the **accureg® 8000** in the same way as described in the section for the full test. In this phase batteries can already be recognised as irreversibly faulty and the appropriate test items can be declared faulty. If all of the conditions for a successful regeneration (eliminating the reversible faults of a battery), this phase is started automatically by the system. The regeneration phase passes through many stages, whereby tests are constantly carried out by the **accureg® 8000** to provide information on the current status of the battery and the regeneration process. This is done by e.g. load tests (load current: 10% of the battery's preset cold start test current), which are evaluated based on defined criteria (absolute position of the discharge voltage level, voltage progress during discharge). Monitoring whether the time permitted for completing the individual regeneration stages is kept to guarantees on the one hand that the total process is carried out within the specified time (max. 5 days). On the other hand further information on the state of the battery and the progress of the regeneration is fed to the algorithm. The time-optimised process for reducing reversible faults (in particular the granular crystalline lead sulphate layers) is completed as soon as the increase in the battery's performance values falls below a certain limit. Following the phase to reduce the reversible faults the **accureg® 8000** automatically switches to capacity testing mode, i.e. a discharge in accordance with K20 takes place to determine the current capacity. Then the battery is re-charged with a subsequent, further load test to check for any possible damage which may have occurred to the test item during the discharge in the capacity test. If a fault is found, this is shown accordingly. If everything is OK, the battery is subject to a further full load cycle. After the first phase of the full load cycle the battery can if needed be disconnected from the **accureg® 8000** system. It is though recommended to leave the battery connected to the system until the regeneration process has been finally completed as Phase II of the full load cycle also continues with the desulphation of the battery.

Upon completion of the regeneration process the system automatically switches to trickle charging.

Trickle charging

The trickle charging mode is reached either directly by selecting the trickle charging function or by automatically switching to this mode upon successful completion of a regeneration.

As well as the normal feeding of a reduced trickle charge current while keeping to a voltage limit of 13.8V, the algorithm includes a new, likewise patented switch-off criterion (current criterion). This ensures that, when a trickle charge or compensation charge is carried out, the battery is actually fully charged (switches off only when the load current falls below a certain value) and on the other hand overloading is prevented (capacity-dependent specification of the load current, voltage limit).

CHAPTER 8: Help

8.1 What is when?

The following errors can be resolved as follows:

Error pattern	Possible cause	Corrective action
Is not working	No supply voltage	Check whether the power cable plug is placed firmly in the socket. Check the fuse in the mains switch!
Check battery connection/poles	Battery connected with poles reversed, contact fault with battery clips	Connect battery to correct poles, check battery connection clips for contact!
Fan running constantly	System's internal temperature too high	Check whether the system's feet are open and the ventilation slots are covered – ventilation slots must be kept free!

8.2 Online help

Provides help for using the system and describes the **accureg® 8000** and its fundamental operation, as well as FAQ's. At the internet address below you will also find the latest version of software for the system so that you can upgrade your system's software. You can find the internet help at:

www.system-elektrotechnik.de/accureg.htm

8.3 Overview of battery errors

Battery errors are recognised automatically by the **accureg® 8000** and reported in coded form on the system's display.

LED status: If the battery fails during the regeneration process the red LED lights up.

The following battery errors can occur:

Battery error code 81: Capacity between 30 and 50% of Cn, start voltage in last measurement before capacity test too low

Battery error code 8: Capacity less than 30% of Cn

Battery error code 5: Voltage drop in warm start test too high during the regeneration

Battery error code 6: Criterion for error indicator triggered during regeneration

Battery error code 52: Voltage drop in warm start test too low after capacity test (cell short circuit in capacity test)

Battery error code 53: Criterion for error indicator triggered at the end of the capacity test

Battery error code 11: Voltage position of the battery in warm start test too low during the regeneration (< 8.0V)

Battery error code 12: Voltage position of the battery in warm start test too low after capacity test

Battery error code 51: Voltage drop in warm start test too high in spite of previous over-charging (by the customer) of the battery

Battery error code 4 (cell activation): Cell activation unsuccessful (high-resistance battery)

Battery error code 5 (activation charge): Activation charge unsuccessful (battery's energy absorption insufficient)

8.4 Overview of various LED light statuses

LED status:

- All three LEDs (red, green and yellow) briefly light up when switching on. When the internal self-test is being carried out the green LED flashes.
- When the software version and the set time are displayed the green LED flashes.
- If the poles are reversed the red LED flashes.
- In input mode (function selection mode, calling off services and printing) all of the LEDs are "off".
- In the operating modes "regeneration", "short test" and "full test" etc. the yellow LED flashes.
- Upon completion of the processes "short test", "full test" etc. all of the LEDs remain "off" with a regeneration recommendation.
- When the battery fails during the regeneration process the red LED lights up.
- In the "trickle charge" operating mode the green LED is continuously.
- When calling up the service or print functions all of the LEDs are switched to "off".

CHAPTER 9: Technical data

Details about the system

Nominal voltage:	~230V
Nominal frequency:	50 Hz
System's nominal current (standby, trickle charge / max.):	0.25 A / 1.2 A
Power absorption (standby, trickle charge / max.):	30 W / 250 W
Mains fuse in connector plug:	1 x T 2 A (250V)
Rated output voltage:	12 V (DC)
Max. rated output current:	10 A (DC)
Max. load current (test current):	140 A
Max. power absorption from battery:	1.8 kW (at 12 V)
Environmental conditions for operation:	-20°C to +30°C
Environmental conditions for storage:	-20°C to +50°C, 10% to 80% r.F.

Details about the batteries

The **accureg® 8000** systems are suitable for testing, assessing and improving (by removing reversible battery faults) the batteries listed below:

General specifications:

Battery types:	Lead-acid batteries with fluid or bound (in gel or fleece) electrolytes
Lattice technology:	no restrictions (antimony, hybrid, calcium)
Cell structure:	no restrictions
Manufacturing process:	no restrictions (casting process, expanded metal process)
Models:	any
Type of separator:	any (jacketed, non-jacketed)
Nominal voltage of the battery:	12 V
Number of cells:	6 cells

Details about application of the batteries:

Application areas of the batteries: Starter batteries, traction batteries, batteries for fixed installation

Details about test items (batteries):

Capacity scope: 10 – 240 Ah

Cold cranking amps scope: 70 – 1.400 A (EN) / 50 – 980 A (DIN)

Internal resistance: depending on type, > 1 mOhm

Warning ! When using the **accureg® 8000** system to test or improve batteries whose characteristics are different to the values specified, errors can occur in the assessment of the performance of the batteries. In individual cases this can result in a negative assessment of the battery (breakdown with battery error) by the system.

Comparison table for cold start performance

EN	European standard EN 60095 – 1
DIN	Deutsche Industrie Norm (German Industry Standard) 43539T 2
SAE	American standard
IEC	International Electrotechnical Commission 95 - 1

EN [A]	DIN [A]	SAE [A]	IEC [A]
280	170	300	195
330	200	350	225
360	225	400	260
420	255	450	290
480	280	500	325
510	310	550	355
540	335	600	390
600	365	650	420
640	395	700	450
680	420	750	485
760	450	800	515

TÜV Österreich
Prüf-, Überwachungs- und Zertifizierungsstelle
TÜV Austria
testing, inspection and certification body

TÜV ÖSTERREICH

Bestätigung – Confirmation

Nr.: becw0131-LI / 2003-ET/PZW-EX-1093

Produkt: Akkuregeneriergerät
Product:

Haupttype: accureg 7000
Maintype:

Antragsteller: BECOM - Burgenländische Elektronik- und Kommunikations Gesellschaft m.b.H.
Applicant: A-7442 Lockenhaus, Hochstraß, Technikerstraße 1

Hersteller: BECOM
Manufacturer:

Technische Kenndaten: 230V/50Hz/700mA
Rating and characteristics: Ausgangswerte:12VDC/5A

Prüfstandard: EN 60335-1:94 + A11:95 + A1:96 + A12:96 + A13:98 + A14:98 + A15:00 + A2:00 +
Test standard: A16:01 + EN 60335-2-29:96 + A1:97
EN 55014-1:00 + A1:01 + A2:02 + EN 55014-2:97 + A1:01 + EN 61000-3-2:00 +
EN 61000-3-3:95 + A1:01

Prüfbericht(e): Reference No.: 2003-ET/PZW-EX-1093 aus 01/2004 und
Test report(s): TÜV Nr.: M/EMV-04/114 aus 02/2004

Hiermit bestätigt der TÜV Österreich, dass das/die oben angeführte/n Produkt/e den Anforderungen der zutreffenden Prüfpunkte des oben angeführten Prüfstandards entspricht/entsprechen. Der Antragsteller darf das nachstehend abgebildete Zeichen in Zusammenhang mit dem/den oben angeführte/n Produkt/en entsprechend dem dafür gültigen Regulativ QVB-P-001/99 verwenden. Die Konformität wurde anhand des/der getesteten Muster/s festgestellt.

Hereby the TÜV Austria confirms the conformity of the product(s) with all applicable test points of the test standard mentioned above. The applicant is allowed to use the following label according to the adjustment factor QVB-P-001/99. The conformity was asserted by the tested sample(s).

Technischer Überwachungs-Verein Österreich
Stempel
Stamp
TÜV

TÜV ÖSTERREICH
TYPEN GEPRÜFT

08.03.2004	08.03.2007	Dipl. Ing. K. Mayerhofer
Datum der Ausstellung	Ende der Gültigkeit	der stv. Leiter
Date of issue	*End of validity*	*Assistant head of division*

TÜV Österreich
Technischer Überwachungs-Verein Österreich
Elektrotechnik
A-1230 Wien, Deutschstraße 10

Tel.: +43 / 1 / 610 91-6401
Fax: +43 / 1 / 610 91-6505
e-mail: et@tuev.or.at
http://www.tuev.or.at

Disposal of the accureg® 8000

Batteries and accumulators do not belong in household waste. In the interest of protecting the environment you as the end consumer are legally obliged (in accordance with regulations concerning batteries and accumulators) to return old and used batteries and accumulators. You can hand in used batteries at the collection points of your local public waste management organisations or anywhere where batteries of the type concerned are sold. The batteries are taken back at no cost to the consumer.

Warning ! If the **accureg® 8000** regeneration system is scrapped, the round cell battery has to be removed from the system. It then has to be disposed professionally!

CHAPTER 10: Conversion table for transaction batteries

Conversion table for transaction batteries

The table shown below helps to determine the exact capacity data for your transaction battery. This is requested when entering the data. Please proceed as follows.

1. Calculate based on the label on your battery whether the capacity (Ah) is specified according to K20 (discharge capacity when discharging with a 20-hour current), K10, K5, K3 or K2.5.
2. If none of the K values mentioned apply, please contact us.
3. For the entry into the accureg 8000 the **K20 value** is required. If this is already available there must be no conversion.
4. The following conversion factors are required:

Example calculation for *K3* into ***K20***

80Ah x 2.06 = 164.8 = **165** Ah

Example calculation for *K5* into ***K20***

100Ah x 1.65 = **165** Ah

Example calculation for *K10* into ***K20***

100Ah x 1.178 = 164.92 = **165** Ah

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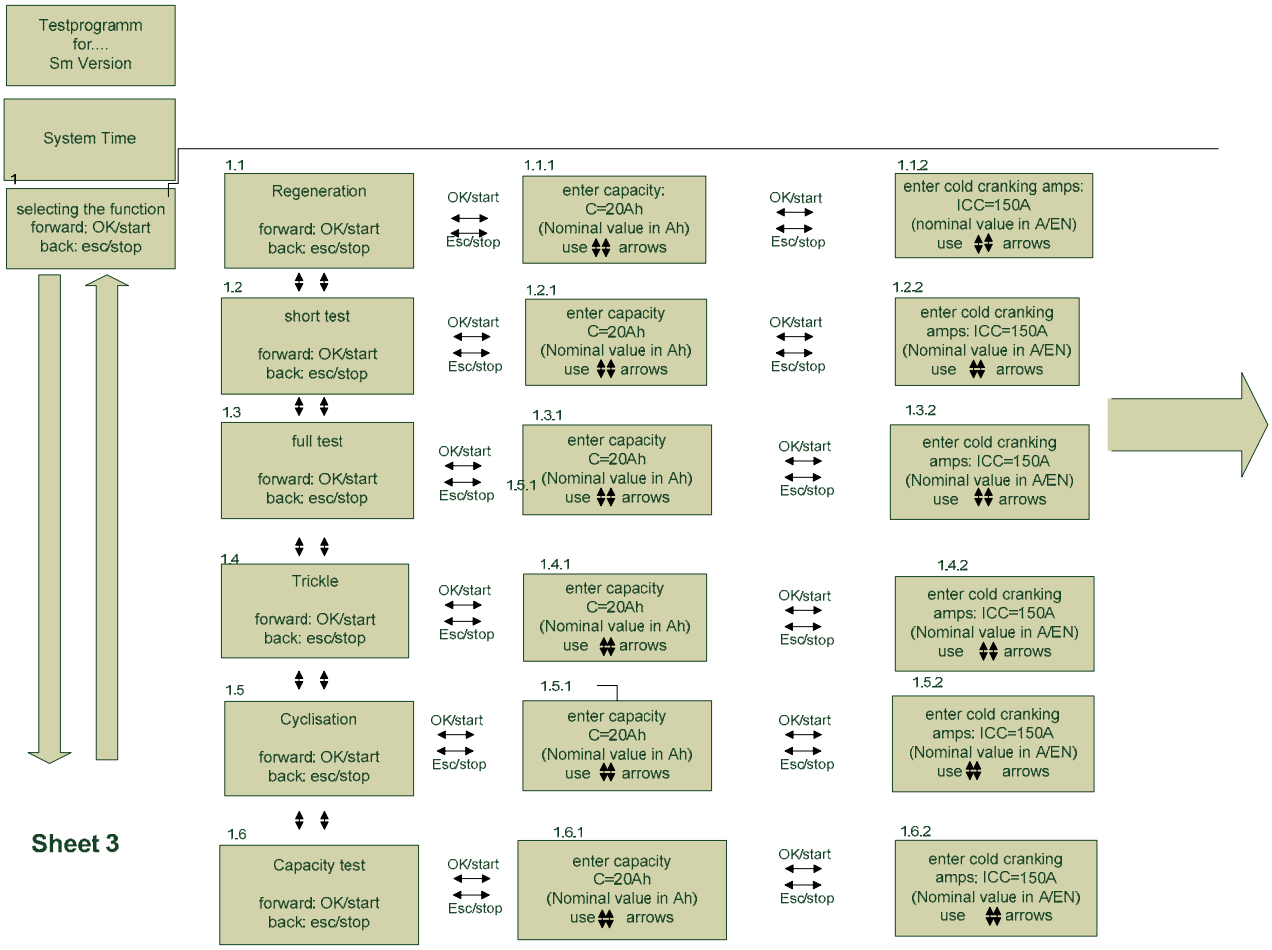
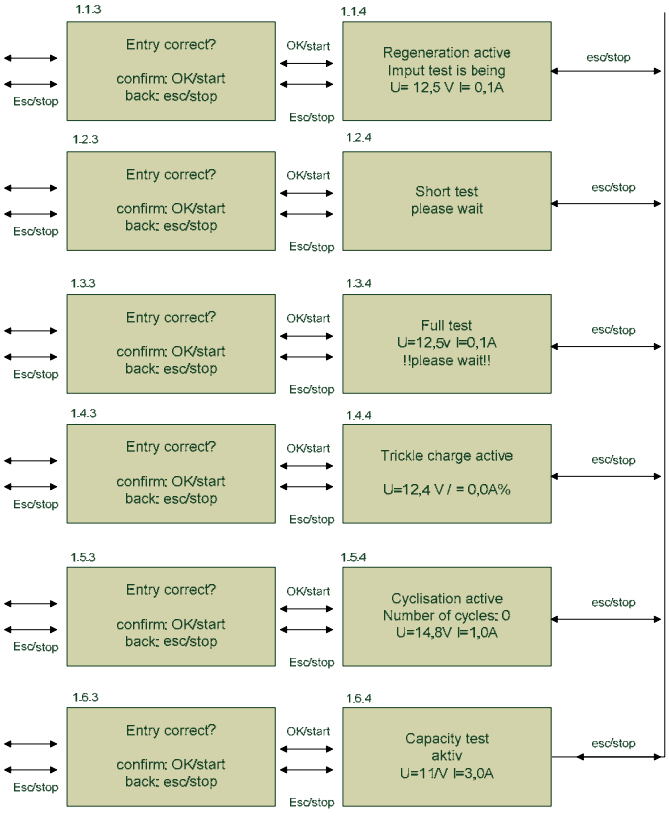
Conversion table							
Specified value in	**Conversion value in**						
K5	**K20**	**K10**	**K3**	**K2,5**	**others**		
100	165	140	80	70			
...	...	...	...	...			
Approximation formula: (K5 .... 100%)							
1	**1.65**	1.4	0.8	0.7			
0.61	**1**	0.71	1.25	1.43			
0.71	**1.178**	**1**	0.571	0.5			
1.25	**2.06**		**1**	0.875			

Chapter 11: Flow chart

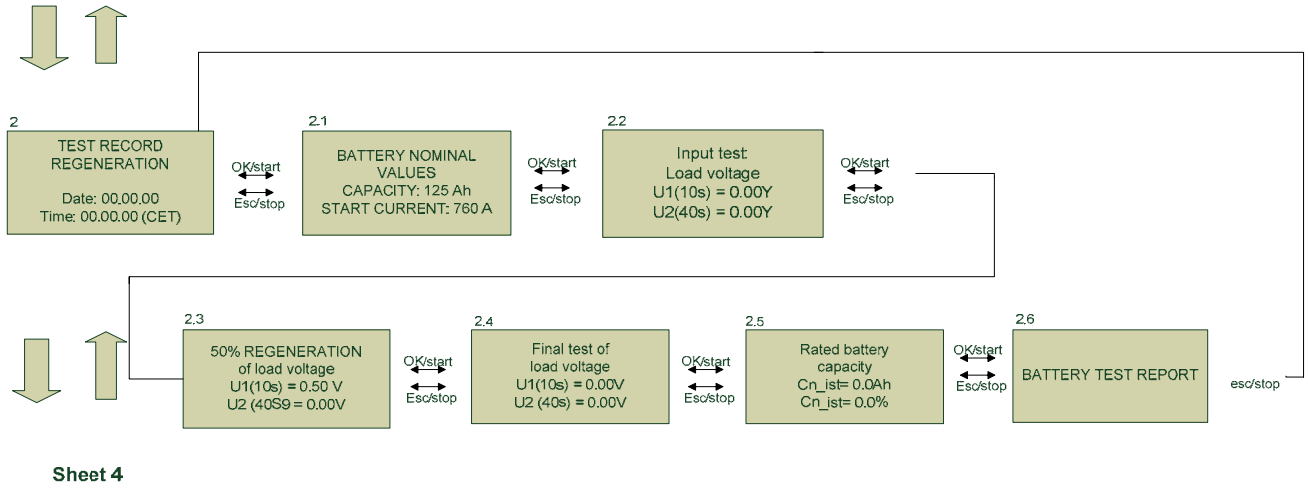
SHEET 1



SHEET 2

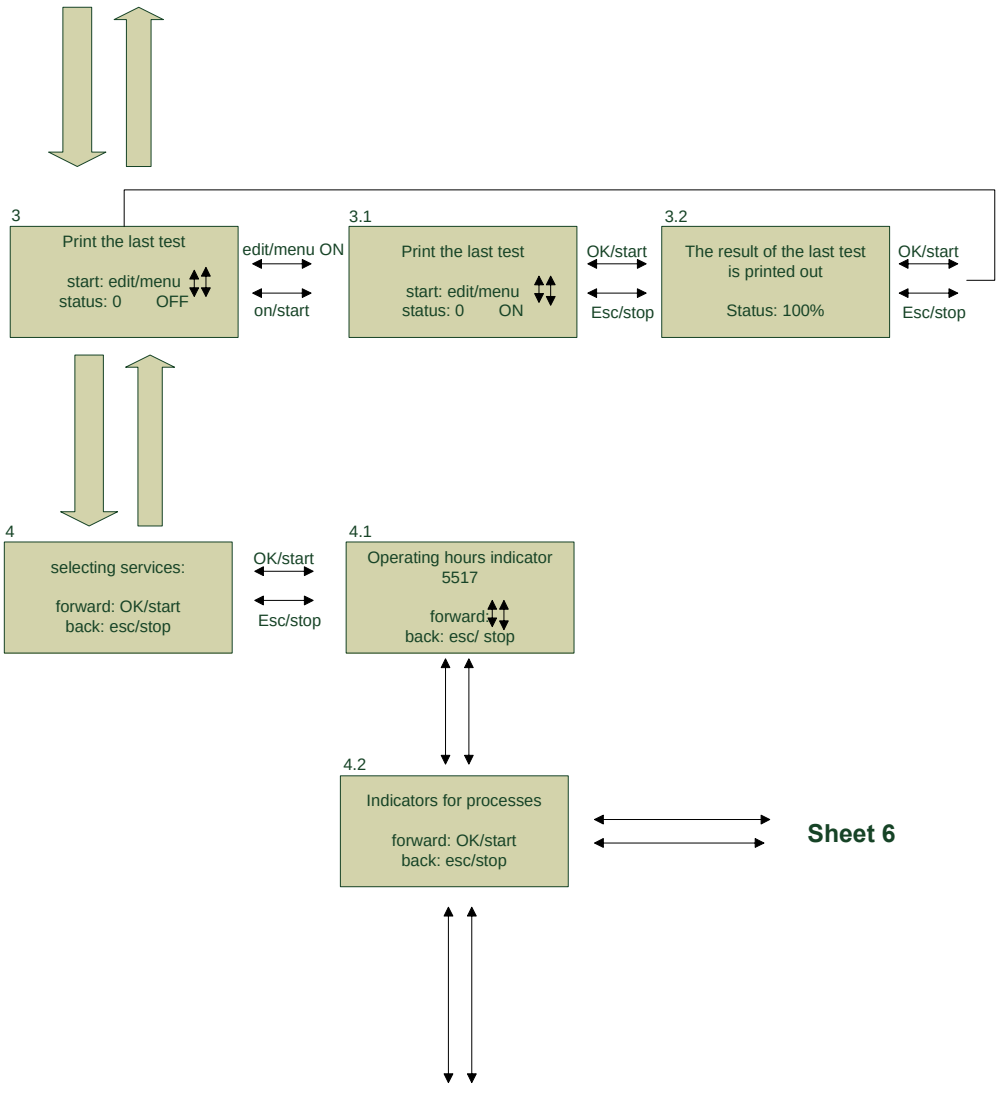


SHEET 3



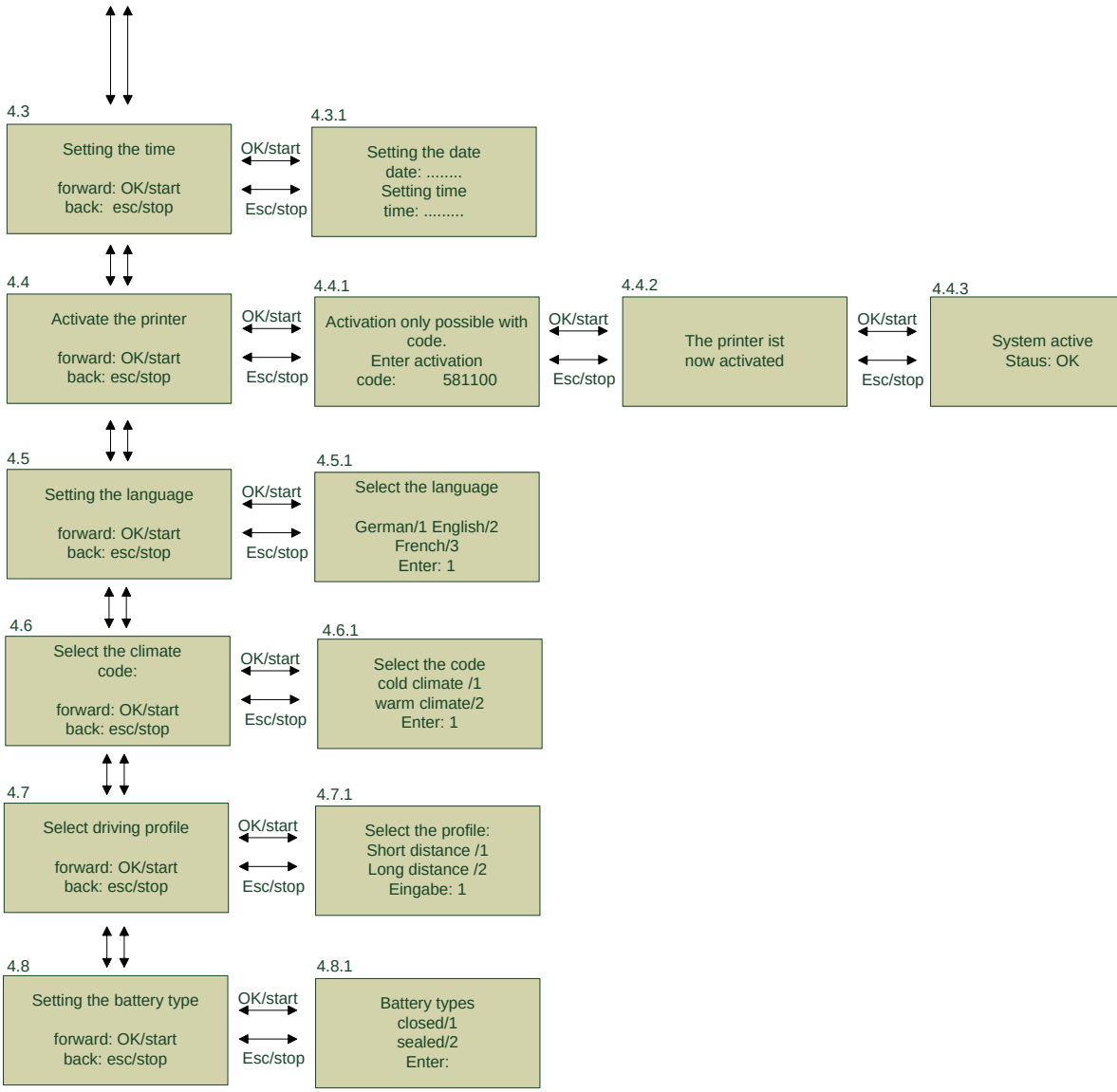
Sheet 4

SHEET 4

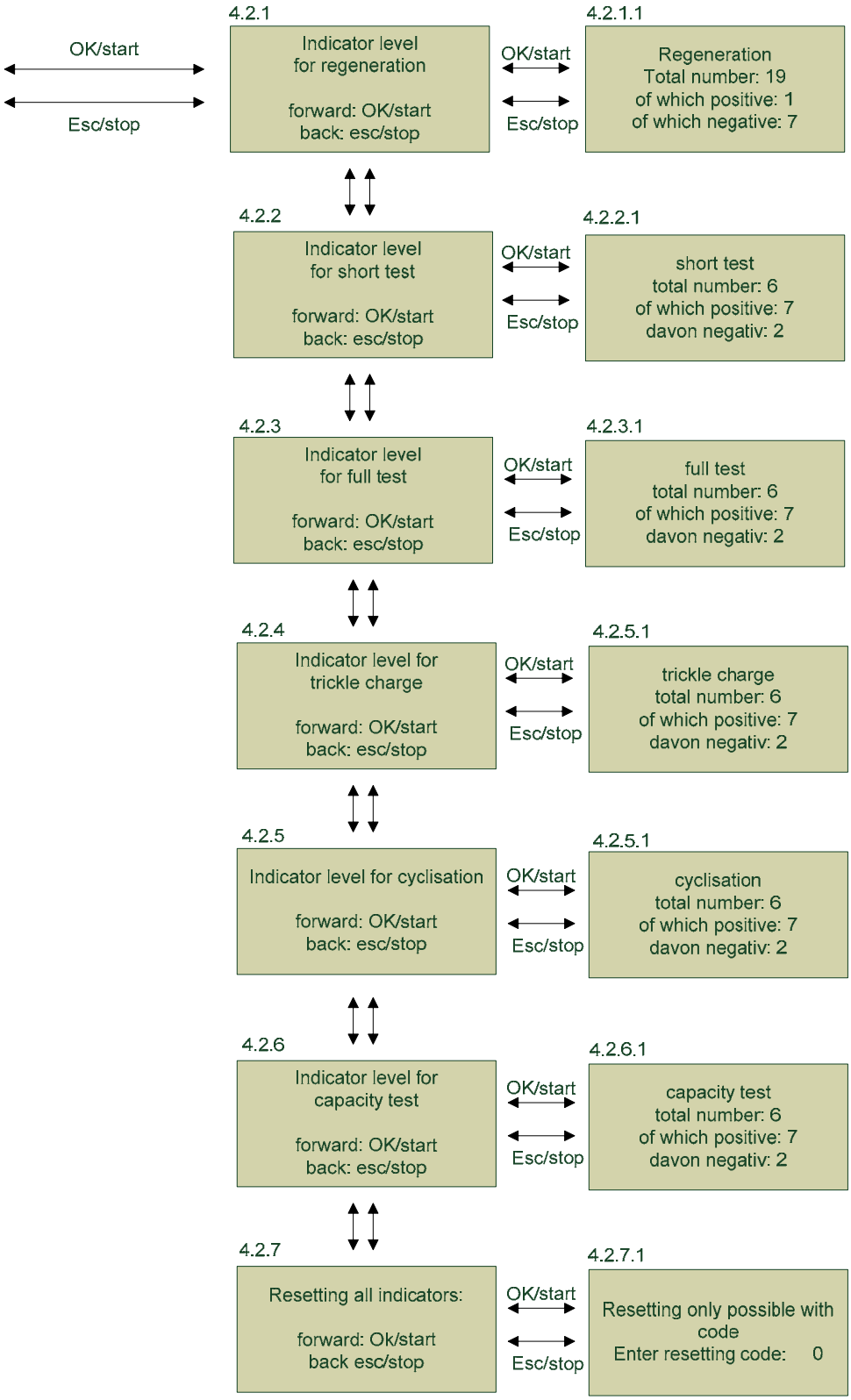


Sheet 6

Sheet 5


4.3
Setting the time
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.3.1
Setting the date
date: .....
Setting time
time: .....
4.4
Activate the printer
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.4.1
Activation only possible with code.
Enter activation code: 581100
OK/start
Esc/stop
4.4.2
The printer ist now activated
OK/start
Esc/stop
4.4.3
System active
Staus: OK
4.5
Setting the language
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.5.1
Select the language
German/1 English/2
French/3
Enter: 1
4.6
Select the climate code:
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.6.1
Select the code
cold climate /1
warm climate/2
Enter: 1
4.7
Select driving profile
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.7.1
Select the profile:
Short distance /1
Long distance /2
Eingabe: 1
4.8
Setting the battery type
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.8.1
Battery types
closed/1
sealed/2
Enter:

SHEET 6


OK/start
Esc/stop
4.2.1
Indicator level for regeneration
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.2.1.1
Regeneration
Total number: 19
of which positive: 1
of which negative: 7
4.2.2
Indicator level for short test
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.2.2.1
short test
total number: 6
of which positive: 7
davon negativ: 2
4.2.3
Indicator level for full test
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.2.3.1
full test
total number: 6
of which positive: 7
davon negativ: 2
4.2.4
Indicator level for trickle charge
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.2.5.1
trickle charge
total number: 6
of which positive: 7
davon negativ: 2
4.2.5
Indicator level for cyclisation
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.2.5.1
cyclisation
total number: 6
of which positive: 7
davon negativ: 2
4.2.6
Indicator level for capacity test
forward: OK/start
back: esc/stop
OK/start
Esc/stop
4.2.6.1
capacity test
total number: 6
of which positive: 7
davon negativ: 2
4.2.7
Resetting all indicators:
forward: Ok/start
back esc/stop
OK/start
Esc/stop
4.2.7.1
Resetting only possible with code
Enter resetting code: 0