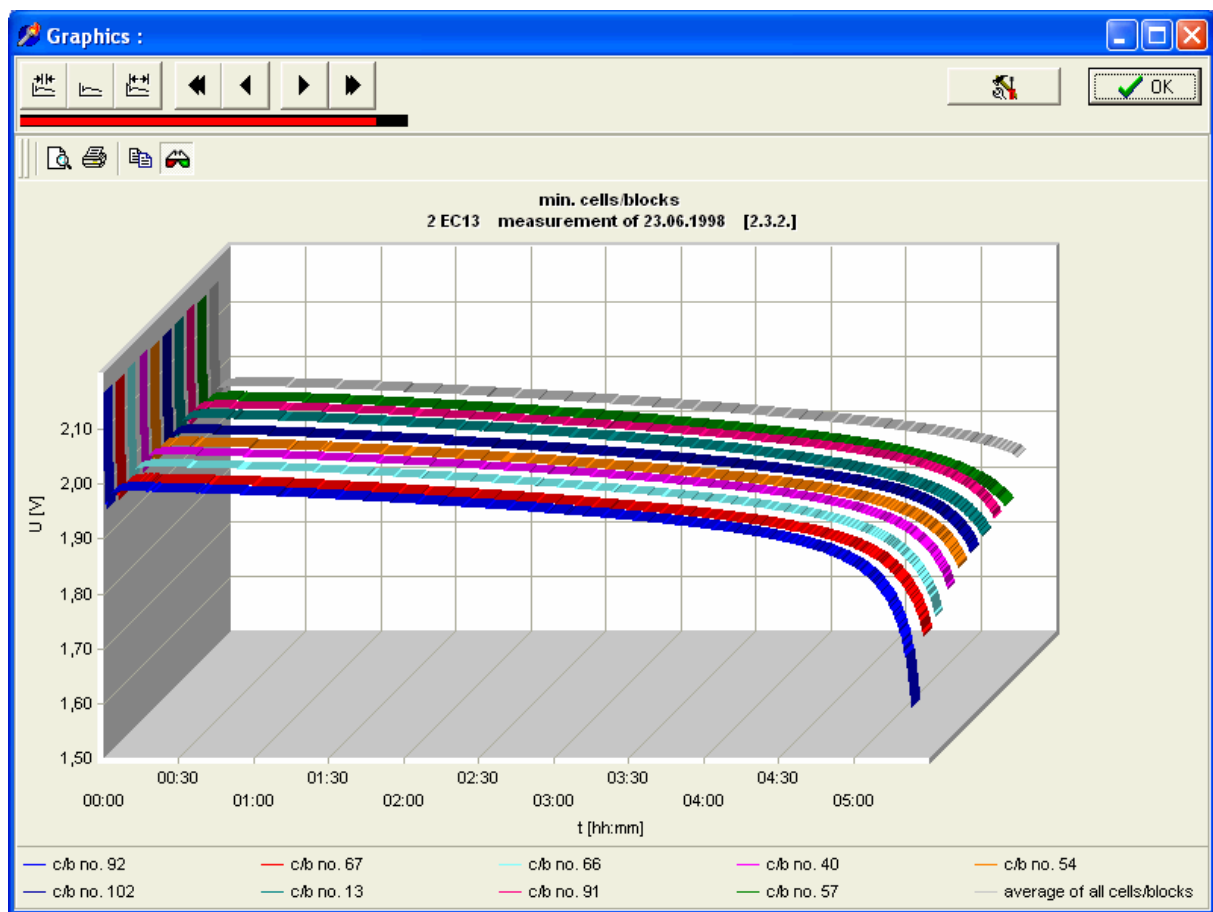


TMC4001 – light V1.03.01

Capacity test software



Operating Manual










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- ❑ We reserve the right to make alterations and changes in the said system and to make changes in the information included in this manual without notice.
- ❑ We do not accept responsibility for damages of any type occurring in the use of the test system and/or occurring due to the fact that employment purposes could not be performed. The manufacturer can, in no case, be held responsible for direct damages, indirect damages or subsequent damages which occur to the customer by employment or non-employment possibilities of the product.

Safety precautions :

Before you begin to deal more deeply with the device itself we would like to give you a few safety hints in advance.

-  Please observe the respective DIN/VDE/EN/IEC/ANSI-guidelines, the rules and regulations for local operators and the instructions of the battery manufacturer.
-  While preparing and performing a discharge/capacity test it may happen under certain circumstances that a cell/block can explode which can damage any equipment next to it and/or harm personnel. For that reason **never run a discharge test unattended**. Which means in return **never run the discharge test equipment such as TMC-4001, load units etc. unattended**.
-  Battery systems are electrical equipment systems having high short-circuit currents. Avoid short-circuits which can cause current interruption, damage to the battery, station equipment and/or harm to personnel. **Be sure to think about possible short-circuit dangers which can be caused by incorrectly connected shunts!**
-  Electrical conducting parts (Poles, Connectors, etc.) are only allowed to be touched with safety voltage probes or safety connection clamps.
-  The TMC-4001, the safety measuring leads and the accessories should only be employed for those purposes described here. Incorrect use can cause damage to the measuring system. Damage or used components must be immediately replaced. Do not use force in plugging the components together.
-  **TMC4001** must only be connected to the, on the unit stated, mains voltage and frequency.
-  **Data transfer and output may only take place using the data transfer cable included in the delivery. Please be sure that you do not use data-cables from older versions of the TMC.** The use of connection cables originating from other manufactures can lead to destruction of the measuring device, as well as, the follow-up data device.
-  Backup your data frequently.
-  The device should not be exposed to direct sunshine or temperatures exceeding 45 degrees Celsius (e.g. lying onto heating units, radiators, etc.).

Important note: Using TMC4001 abroad :

When using **TMC4001** abroad the following must be taken into consideration:

The measuring device must be set exactly to the frequency of the mains voltage it is supplied with. This setting takes place automatically according to the country settings of the Computers, on which **TMC4001-light** is installed on. This automatic detection **MUST** be disabled in case the local conditions of the country you're working in do not comply with the computer you're using.

How to do that in detail is described in [Appendix B](#).

Software installation

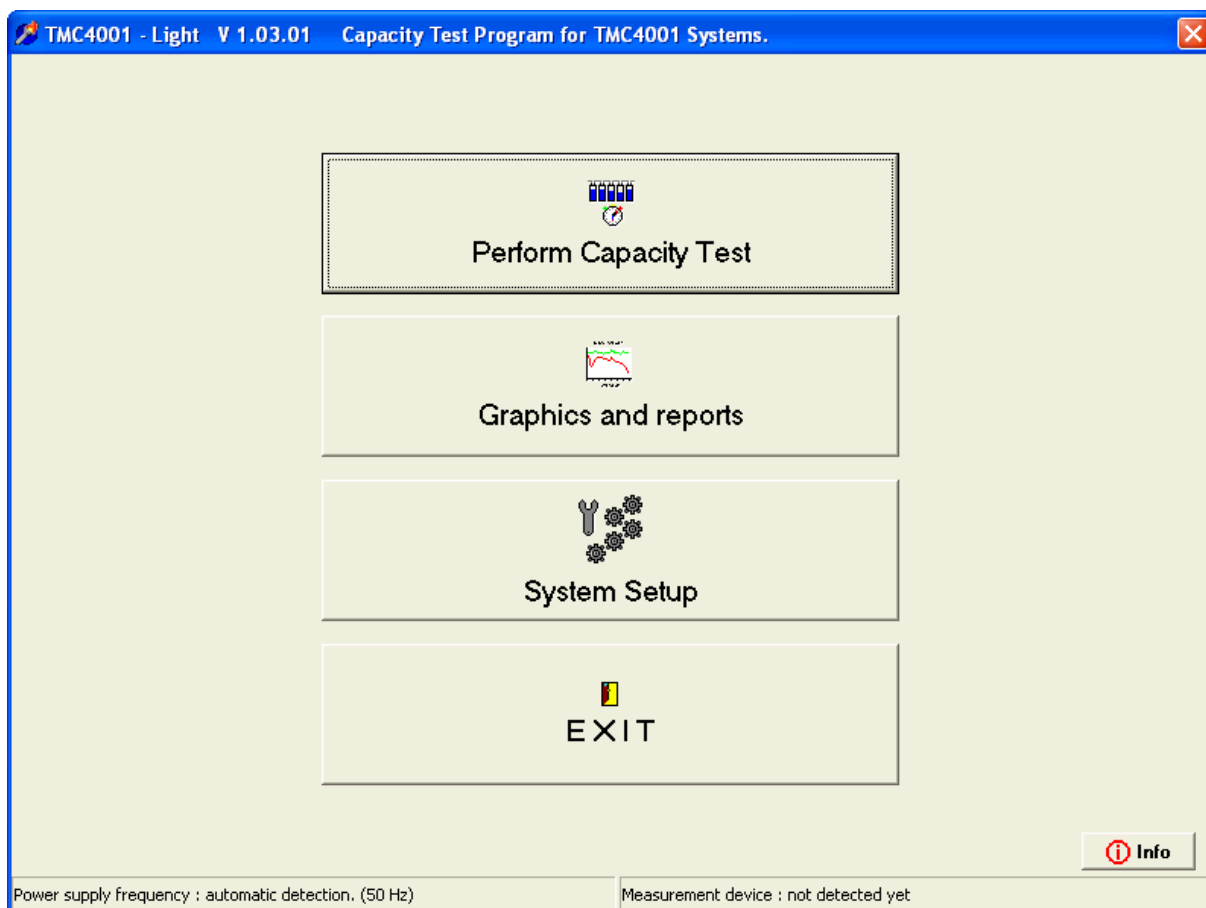
System requirements:

- Computer with Pentium CPU
- Windows 95 or later
- 32 MB RAM or more
- Screen resolution 800 * 600 or higher
- High Colour Graphic adapter
- CD Rom drive
- Fee serial com port

Insert the installation-CD into the CD-Rom drive of your computer and start the program **SETUPlight.EXE** from the folder "...english" on the CD. After the installation is completed start the program **TMClight.EXE** via the start menu (START → Programs → TMClight).

Start window :

At the first program start the following should appear on the screen:



Picture 1 : Start window

Performing a capacity test :

Connection of the battery to TMC4001 :

Attention!

The measuring cables must be connected to the TMC4001 first, BEFORE being connected to the battery!

- 1) Connect the first measuring cable (multi-cable) to the connector **C1** of the TMC4001.
- 2) Take the first crocodile-clamp (labelled with “1”) and connect it to the **electrical minus pole of the battery**. Continue connecting the remaining clamps in ascending order of numbering (from low voltage to high voltage) to the plus pole of each cell. If you need more than one multi-cable, connect them analogue to the first cable to the connectors **C2** to **C8** (TMC4001/31 to **C2** and TMC4001/63 to **C4**).
- 3) Connect the shunt voltage cable to the **I**-connectors of the TMC4001 (**I1**-connectors on TMC4001/127). Observe the correct polarity!
- 4) Connect the total voltage cable to the **U**-connectors of the TMC4001 (**U1**-connectors on TMC4001/127).
If you are using a temperature sensor connect it to the **T**-connector (**T1** on TMC4001/127).

Testing two batteries in parallel :

When testing two batteries in parallel (TMC4001/127 only) proceed as follows:

Connect the first battery to the connectors **C1** to **C4**, but **not more than 62 cells**. Connect the second battery to the connectors **C5** to **C8**. Connect the shunt voltage cables and the total voltage cables to the specific connectors (**I1**, **U1** and **T1** = batterie1; **I2**, **U2** and **T2** = batterie2) on the TMC4001.

- 5) Connect the **SER**-connector of the TMC4001 to the serial port of your computer. When you are using a TORCEL for testing connect it to the **AUX**-connector of the TMC4001.
- 6) Power-up the TMC4001 and start the TMC4001-Light Software on your computer.
- 7) Start the capacity test from the software.

Entering test data :

The following window appears:

The screenshot shows the 'Capacity test setup' window with the following fields and values:

- select default data folder > C:\Dokumente und Einstellungen\KS\Eigene Dateien\Messungen\TMClight\Test\
- site name: [empty]
- street: [empty]
- ZIP code / town: [empty]
- examiner: [empty]
- battery name: [empty]
- date of commission: [empty]
- cells/blocks per batt.: 0
- product type: [empty]
- rated capacity [Ah]: 0 Ah
- rated test time [h]: 0 h
- c/b voltage min. / max. [V]: 0 0 V
- total voltage min./max. [V]: 0 0 V
- c/b numbering direction plus to minus
- type in temperature
- type in current
- shunt specification: 0 mV / 0 A
- stop Torkel on main voltage: 0 V
- stop Torkel on cell voltage: 0 V
- examination no.: [empty]
- enable battery button
- load setup, save setup, start test buttons

Picture 2 : empty input form for test data

Entering data is mandatory for all yellow input fields. A test can not be started without having completed these entries.

Please note, that your entered data is checked by the program **AFTER** leaving this window. The button "start test" will be enabled when all input fields have changed into white colour.

After having entered the appropriate data correctly, the window should look approximately as below:

The screenshot shows the 'Capacity test setup' window with the following fields and values:

- select default data folder > C:\Dokumente und Einstellungen\KS\Eigene Dateien\Messungen\TMClight\Test\
- site name: test site
- street: test road
- ZIP code / town: 12345 test town
- examiner: Mr. Tester
- battery name: 20 EA 70
- date of commission: 11.02.2000
- cells/blocks per batt.: 16
- product type: 20 GroE 1000
- rated capacity [Ah]: 1000 Ah
- rated test time [h]: 5 h
- c/b voltage min. / max. [V]: 1,8 2,33 V
- total voltage min./max. [V]: 28,8 37,3 V
- c/b numbering direction plus to minus
- type in temperature
- type in current
- shunt specification: 60 mV / 600 A
- stop Torkel on main voltage: 0 V
- stop Torkel on cell voltage: 0 V
- examination no.: [empty]
- enable battery button
- load setup, save setup, start test buttons

Picture 3 : completed input form for the test of one battery

When you're using a TMC-4001/127 you can test two batteries in parallel. For doing so you click on the button "enable battery 2" and enter the required data for the second battery. Please note that the program will let you know if by mistake the names are equal or too many cells/blocks are established for one or both batteries.

When testing two batteries the window could look as follows:

The screenshot shows the 'Capacity test setup' window with two columns of input fields for two different batteries. The left column is for battery '20 EA 70' and the right column is for '20 EA 71'. Both columns have identical input fields for site information, battery details, and test parameters. The 'start test' button at the bottom center is highlighted with a green border.

Field	Value (Battery 1: 20 EA 70)	Value (Battery 2: 20 EA 71)
site name	test site	test town
street	test road	
ZIP code / town	12345	test town
examiner	Mr. Tester	
battery name	20 EA 70	20 EA 71
date of commission	11.02.2000	12.02.2000
cells/blocks per batt.	16	16
product type	20 GroE 1000	20 GroE 1000
rated capacity [Ah]	1000 Ah	1000 Ah
rated test time [h]	5 h	5 h
c/b voltage min. / max. [V]	1,8 2,33 V	1,8 2,33 V
total voltage min./max. [V]	28,8 37,3 V	28,8 37,3 V
c/b numbering direction plus to minus	<input type="checkbox"/>	<input type="checkbox"/>
type in temperature	<input type="checkbox"/>	<input type="checkbox"/>
type in current	<input type="checkbox"/>	<input checked="" type="checkbox"/>
shunt specification	60 mV / 600 A	0 mV / 0 A
stop Torkel on main voltage	0 V	
stop Torkel on cell voltage	0 V	
examination no.		

Picture 4: completed input form for the test of two batteries

As soon as the button "start test" is bordered in green colour your entries are complete and the test can be started.

It is recommended to save this test setup in case you might have to test this battery in the future again. For a future test on this battery you just have to reload the test setup and maybe to change examination no. and examiner.

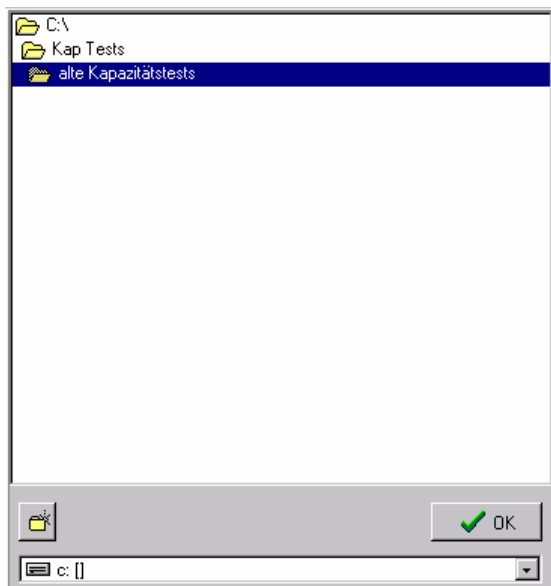
Entry fields and their effects on testing and the program itself are described in detail in [Appendix A](#).

Please observe that you've selected a default data folder BEFORE you click on the "start test" button!! How to select a data folder is described in detail on the following pages.

Selecting a data folder :

By clicking on the button “select default data folder” in the upper left corner of the Capacity test setup window you select a folder or you create a new folder on your hard disk in which all further data will be saved. The text next to the button displays the actual selected data folder. It is recommended to establish and to keep a structure for your measuring data e.g. to sort them according to customers, sites and test dates. This enables you to find saved tests and test setups easily later on.

Now click on the button “select default data folder”:

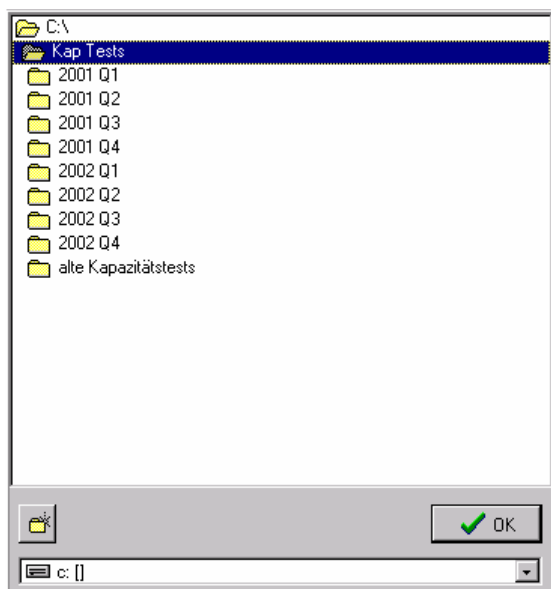


The blue bar indicates the actual folder.
(In this case **C:\Kap Tests\alte Kapazitätstests**)


To change to another data folder double-click on the desired one. Here you have access to all folders and hard disk drives of your computer

If you want to create a new folder please select a destination in which it should be created in first.

Picture 5 : Select a data folder



In this example **Kap Tests** was selected by double-clicking as the destination for the new folder.

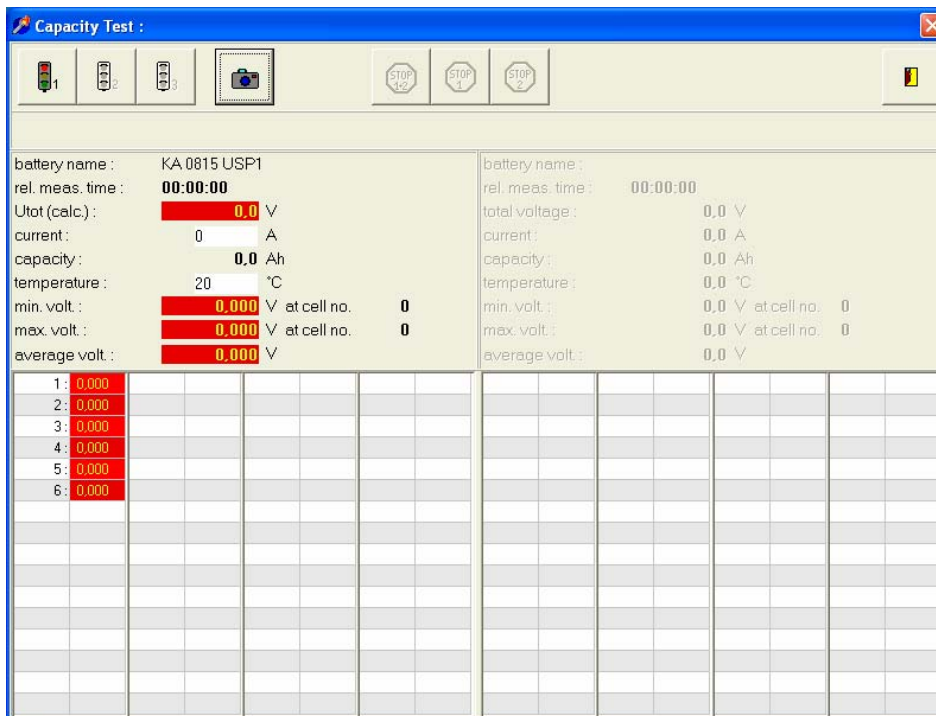
To create new folders now click on the -button in lower left corner.

(This example also shows how well structured folders can be created.)

Picture 6 : Select a destination for a new data folder

Start a capacity test :

After clicking on the button “Start test“ in the window capacity test setup the following window appears (for a test of a 6-cell battery):



Picture 9 : Capacity test window

The toolbar of the window shows 8 icons which are (f.l.t.r.):

- Scan all cells (float voltage)
- Scan all cells (open circuit voltage)
- Cyclic scan – start of discharge
- Manual scan (Snap-shot)
- Finish the test for both batteries (when testing 2 batteries in parallel, TMC-4001/127 only)
- Finish the test or finish the test for battery 1 when testing 2 batteries in parallel
- Finish the test for battery 2 when testing 2 batteries in parallel
- Exit test window

Depending on the status of the test run some of the icons are disabled e.g. when testing only one battery it is not possible to finish a test for battery 2 or during a running test it is not possible to exit the window by clicking on the most right icon.

At later state additional icons will appear that are not visible yet.

Up to this window you can work without having a **TMC-4001** connected to the PC. But most of the actions from now on require a connected and powered-up **TMC-4001**.

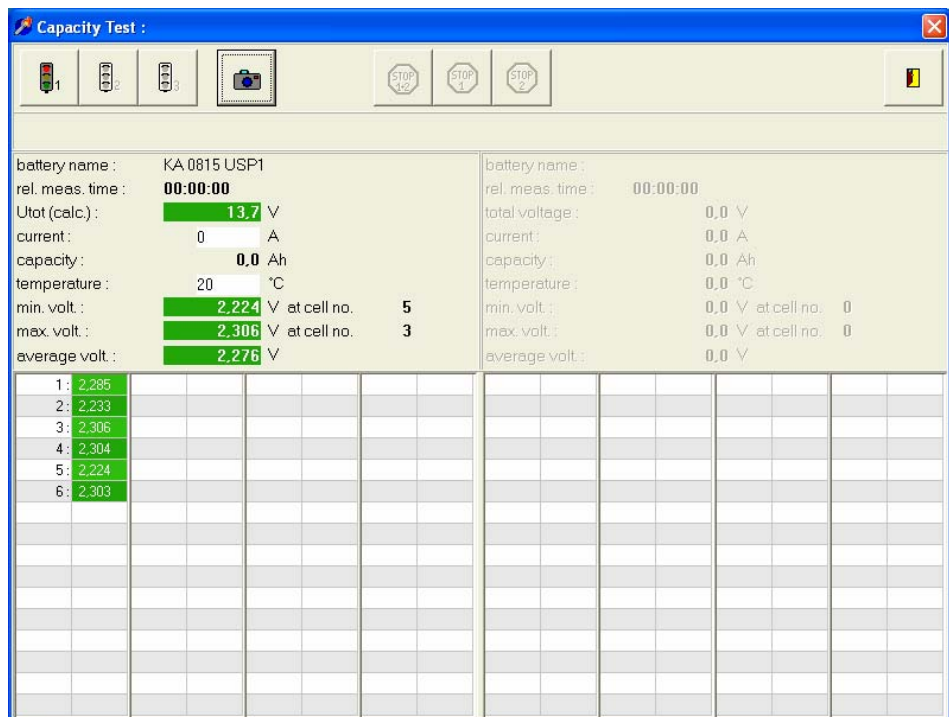
Do the necessary connections now. Follow the instruction in the **TMC4001 manual**.

After having the TMC-4001 connected to the battery and the PC, a manual scan (camera-button) should be performed in order to check the measuring lead connections.

After that scan measured values will be displayed

(See next page)

Start of measurement :



Picture 10 : Capacity test window after first (manual) scan

In lower part of the window cell/block voltages are displayed in green colour which indicates that all measurements are with in the by you entered limits. (See capacity test setup).

Further information is displayed above which are as follows (f.t.t.b.):

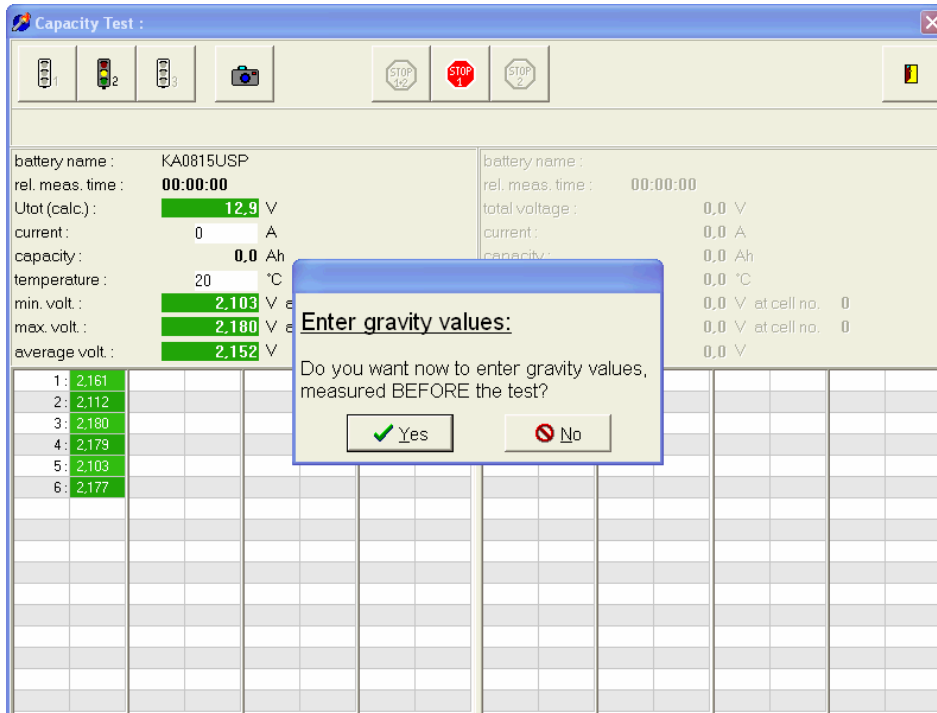
- Battery name
- Relative measuring time (here 00:00:00, because the test wasn't started yet)
- Total voltage of the battery (calculated)
- Measured battery current
- Discharged / charged Ah (added value)
- Temperature
- Lowest cell / block voltage incl. cell / block no.
- Highest cell / block voltage incl. cell / block no.
- Average of all cell / block voltages

If the manual scan was not conspicuous the test can be started. Here for you click on the button which shows the first traffic light in order to measure the floating voltage of all cells. After the scan is completed the previously operated button becomes inactive and the button with the second traffic light is active.

(See next page)

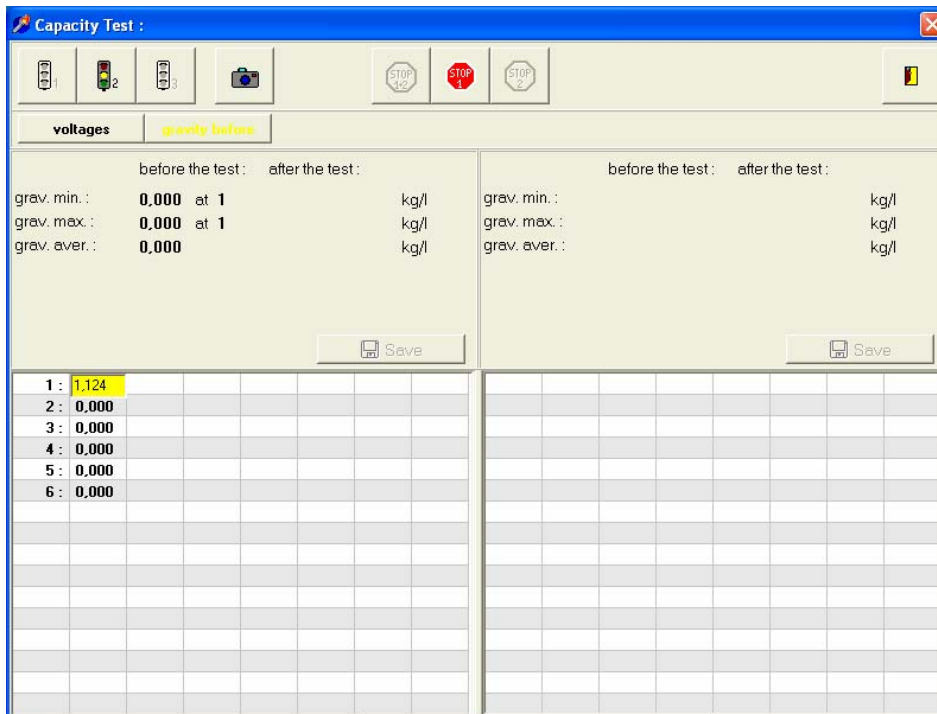
Input of gravity values measured BEFORE the test :

After the scan is completed you're asked if you want to enter gravity values that were measured before the test. Now the battery should be isolated – time enough to enter the values.



Picture 11 : after float voltage scan

In this example we enter values. Click on YES and the lower part of the window will change. A yellow entry field appears. Enter the first value now and press the ENTER key. The entry field moves to the next (second) cell / block. In this way the remaining gravity values can be entered. The arrow keys on the keyboard can also be used to move the entry field back and forth.



Picture 12 : Enter gravity values, measured BEFORE the test

The white fields indicate that these values (current and temperature) are not measured. Click on the white field and enter the value. When doing so an OK button appears next to it.

battery name :	test
rel. meas. time :	00:00:00
Utot (calc.) :	0,0 V
current :	2 A <input type="button" value="OK"/>
capacity :	0,0 Ah
temperature :	20 °C
min. volt. :	0,000 V at cell no. 0
max. volt. :	0,000 V at cell no. 0
average volt. :	0,000 V

Picture 15 : enter current 2

When the correct value is entered click on OK. From now on this value is regarded to be the current value of the test.

Attention:

During a scan is in progress entered values may appear delayed on screen.

battery name :	test
rel. meas. time :	00:00:00
Utot (calc.) :	0,0 V
current :	200,0 A
capacity :	0,0 Ah
temperature :	20 °C
min. volt. :	0,000 V at cell no. 0
max. volt. :	0,000 V at cell no. 0
average volt. :	0,000 V

Picture 16 : enter current 3

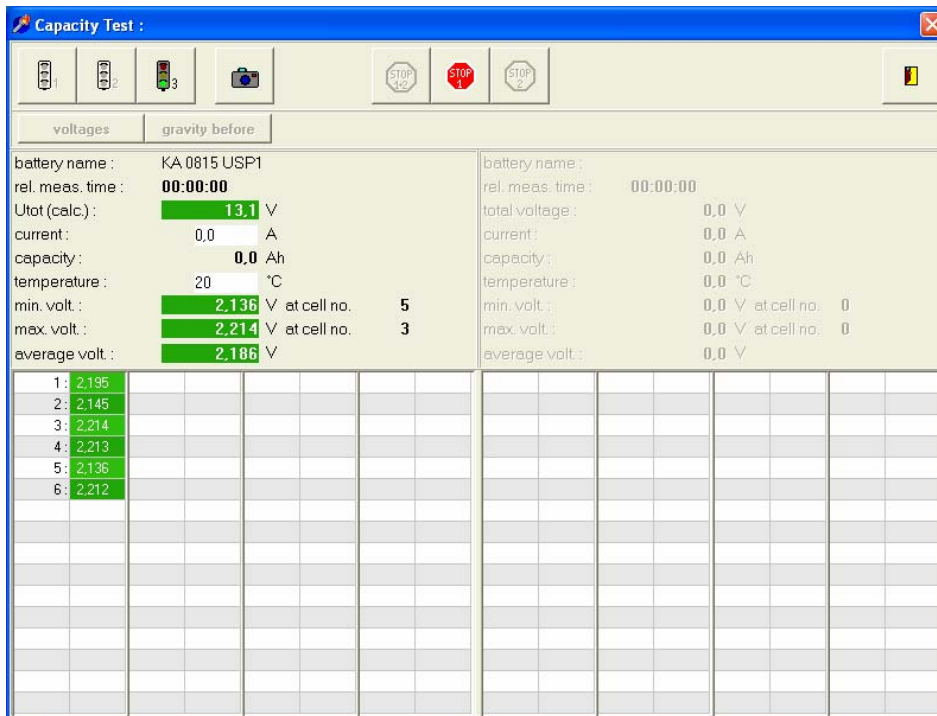
The new current value is active as soon as the OK button has disappeared.

Enter temperature :

The procedure for the temperature values is similar to entering current. The only difference is that 20°C is used as default value.

Scan open circuit voltage :

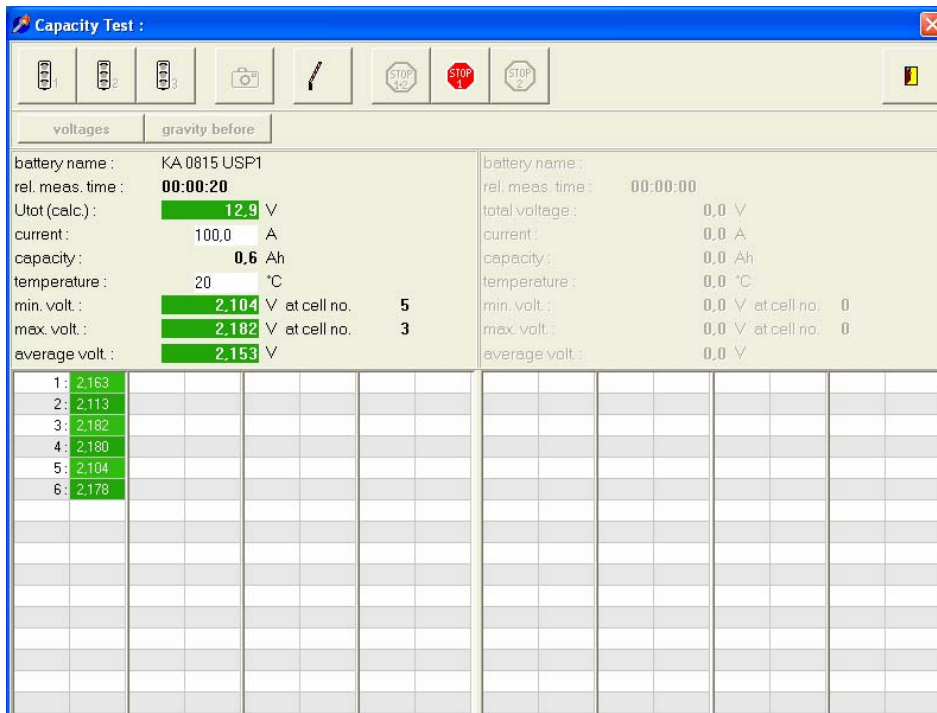
Click on the button with the second (yellow) traffic light to measure the open circuit voltage



Picture 17 : after open circuit voltage scan

Start periodic scan (discharge) :

You can now click on the third traffic light which is green, thereby starting the automatic sampling tests. Next, you cut in the load. In case you are using the electronic load unit TORDEL it will start automatically. The following picture shows a running measurement:



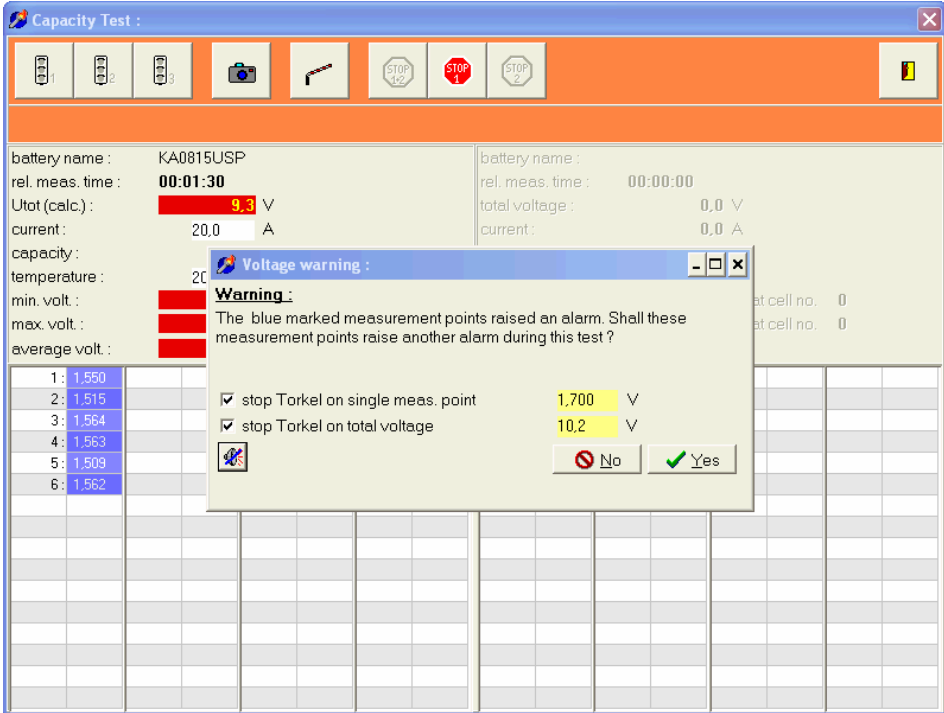
Picture 18 : running measurement

(See next page)

A new button (barrier) has appeared. It can be operated at any time to interrupt the test. In this case the symbol will change from an open barrier into a closed one. A new click on this button continues the test and the symbol will change again to an open barrier.

By this you have the possibility to undertake appropriate actions during a running test if for example the end voltage of a single cell/block is reached.

Is TORKEL used and the Stop-TORKEL-on-Alarm function activated the test would be interrupted automatically and the buzzer in TMC4001 will sound. This is visualised in the following picture.



Picture 19 : Stop on alarm

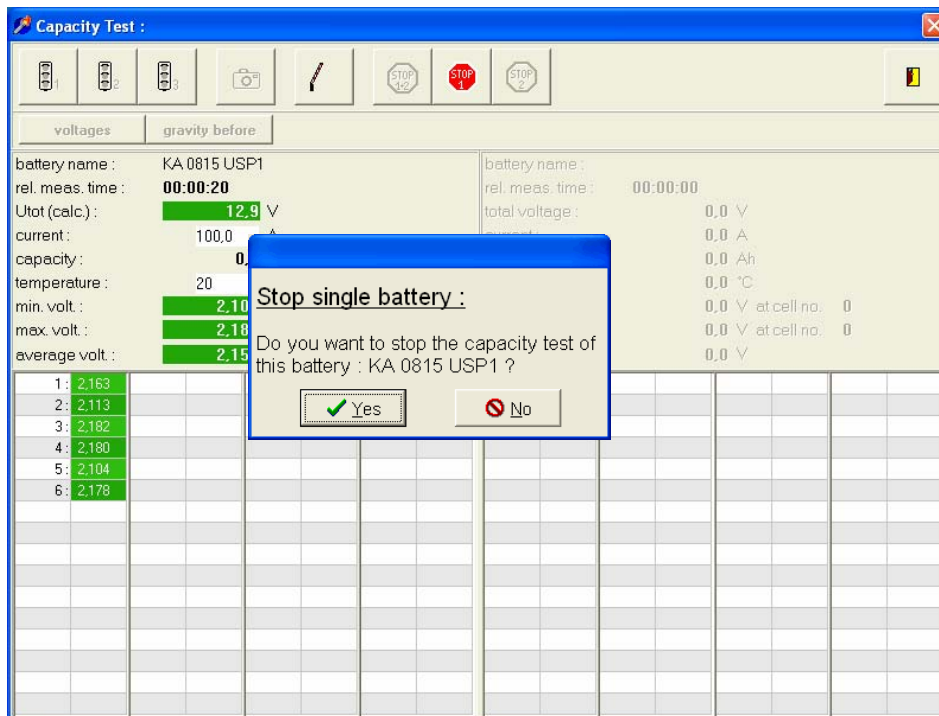
You can acknowledge the buzzer (small button with loudspeaker symbol) and change or disable the alarm function. Next, the test can be continued by clicking on the barrier button.

You end a test by clicking on one of the previously described Stop buttons and Yes/No confirmation. When clicking on the stop button the battery is scanned a last time.

(See next page)

Finish the test :

Click on the stop button to finish the test. Next, click on Yes to confirm.



Picture 20 : Finish the test

When testing two batteries in parallel there are two possibilities to stop the test:

- Stop the test for both batteries simultaneously.
- Stop the test for one of the batteries only (battery 1 or battery 2). The test of the remaining battery continues as when testing a single battery.

Attention:

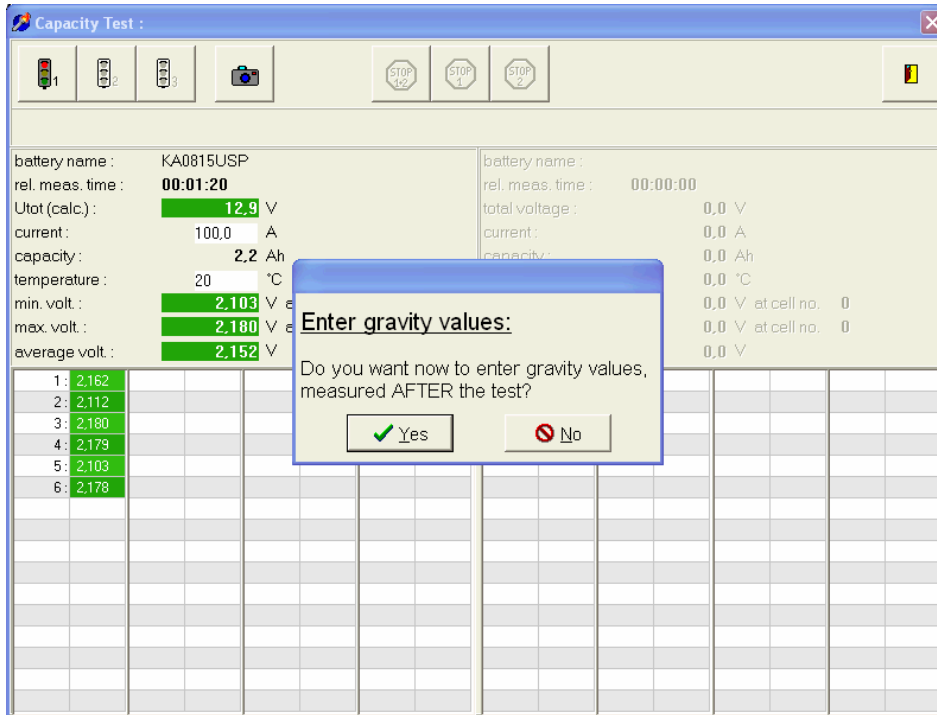
If you are not using TORKEL the battery load is not cut off automatically when interrupting (barrier button) or stopping a test from the TMC-4001light software. Only the measurements and the timer are effected.

In that case it is your responsibility and obligation to control the load manually in order to avoid uncontrolled discharge of the battery and/or a corrupted test while the measurement and the timer are disabled.

The absolute time (clock) is always stored besides the relative measuring time. This enables you to detect test interruptions later on.

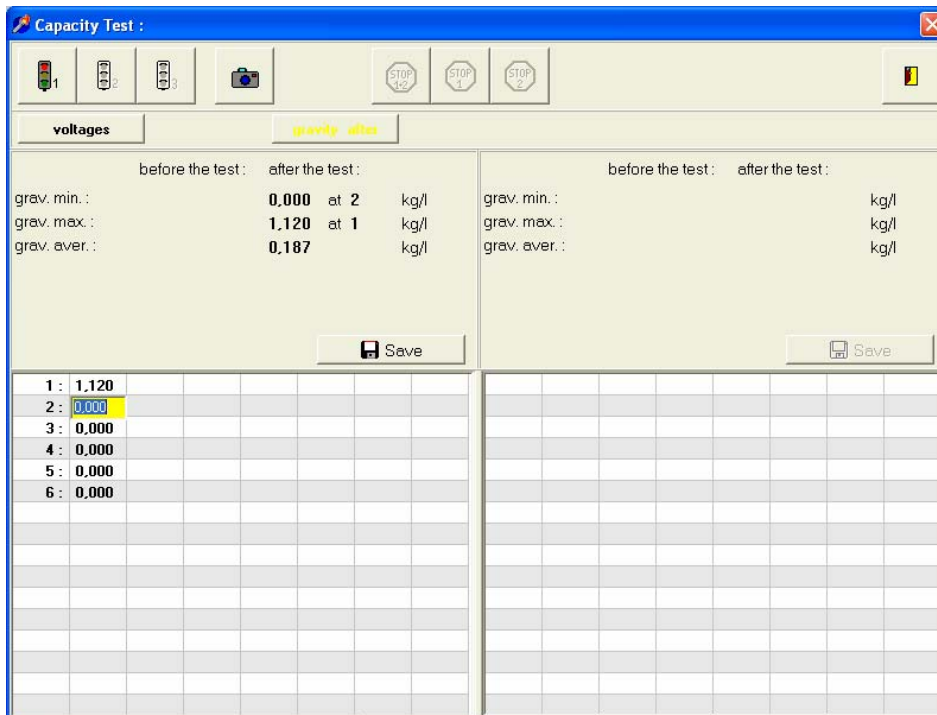
Input of gravity values, measured AFTER the test :

After the test is finished you'll be asked, if you want to enter gravity values that were measured after the test.



Picture 21 : Enter gravity values, measured AFTER the test (1.)

After you clicked on YES you can enter the values similar to the procedure you used before the test. Don't forget to click on the save button!

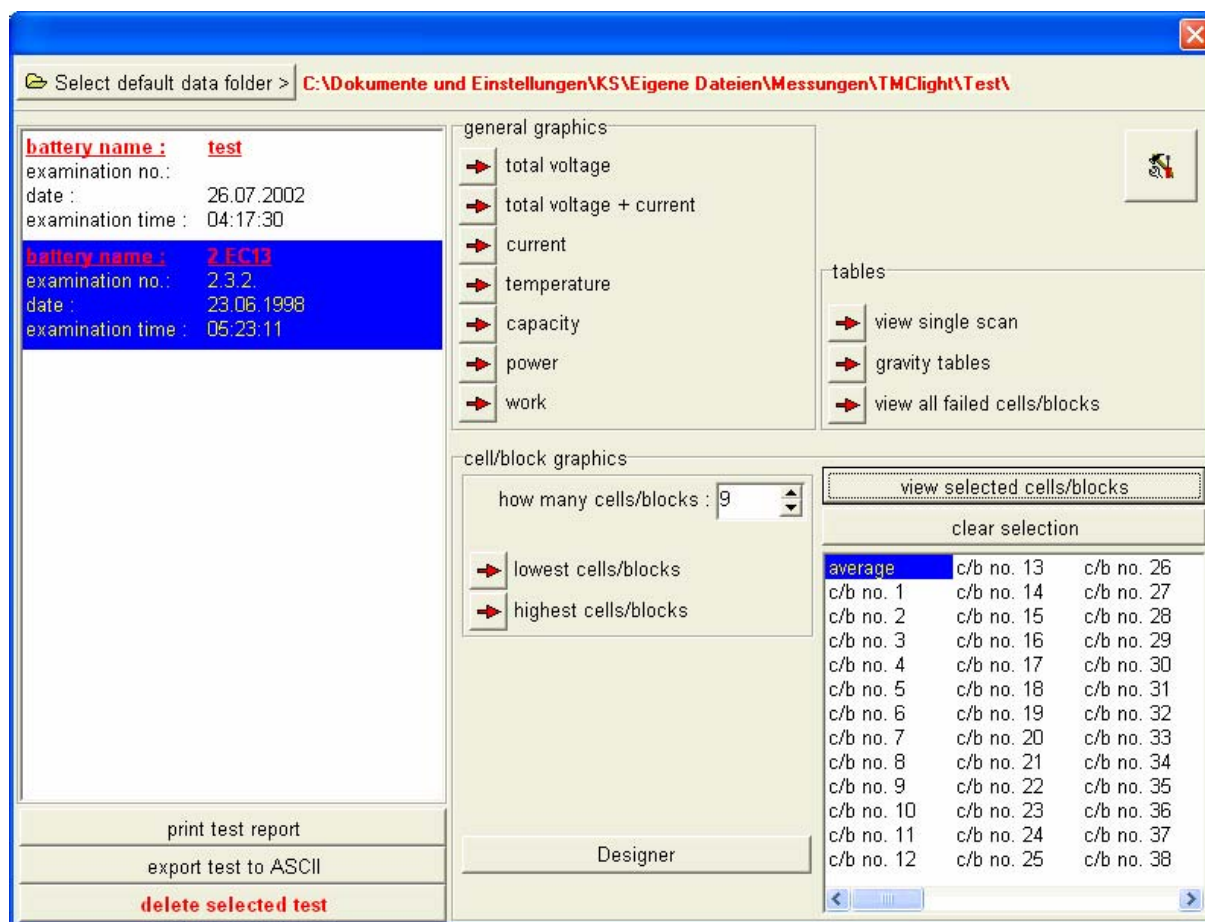


Picture 22 : Enter gravity values, measured AFTER the test (2.)

Graphics, Reports and Export of Measurements :

Click on the button “graphics and reports” in the start window of the program to view or to print out graphics and reports.

The following window appears:



Picture 24 : Selection window for graphics, reports and export of measurements

On the left hand side a list of all measurements available in the selected data folder is displayed. The already known button “Select default data folder” is located in the upper part of the window with the folder name next to it.

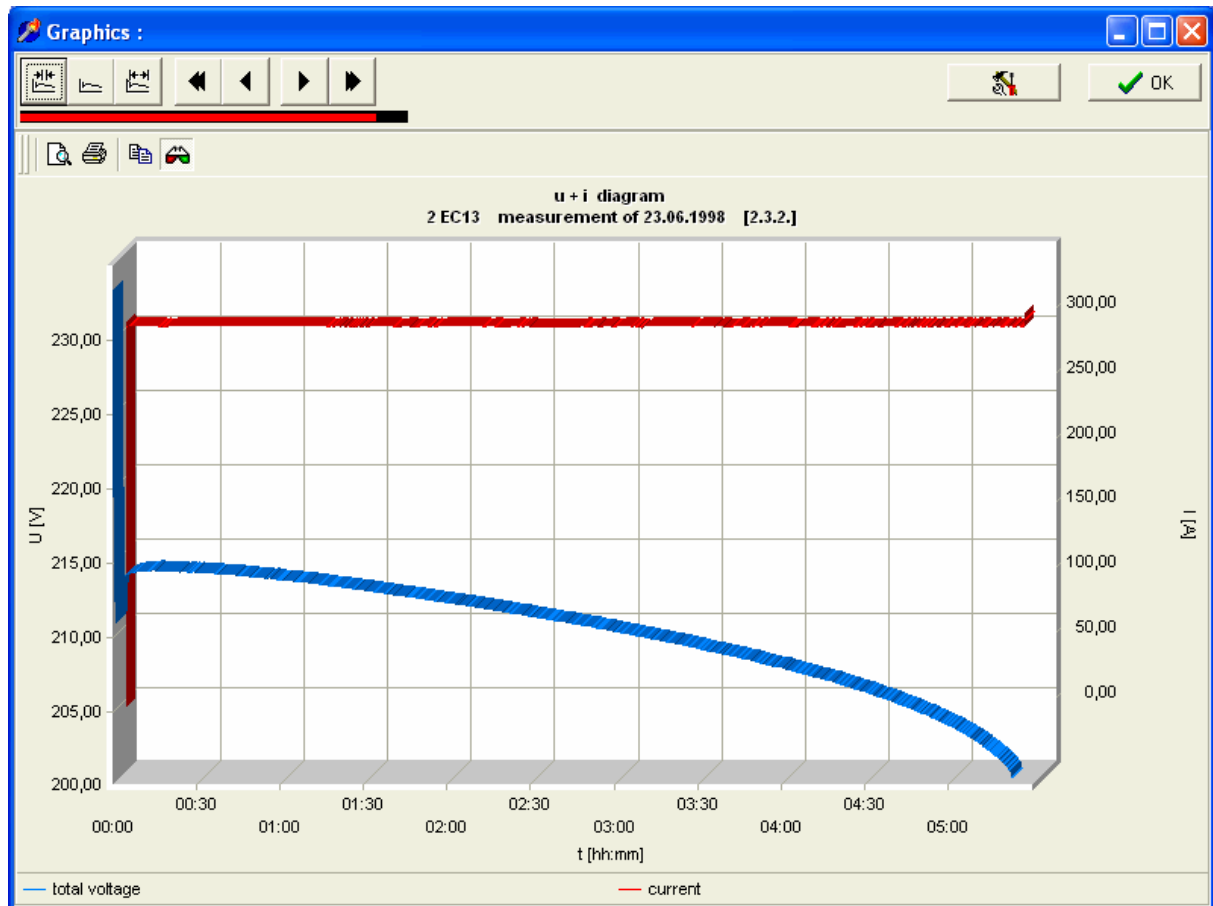
Select the desired measurement clicking on it in the list. In case the list gets to long a scrollbar will appear.

For report printouts, export into text file and for deleting a measurement there are three buttons located underneath the list.

The text file that is created by clicking on the button “export test to ASCII” is in a format that enables further processing in standard spreadsheet programs.

As soon as a measurement is selected, you can visualise it in different ways with a single mouse click. As an example we start with the Graphic of total voltage and battery current. To do so, please click on the button "total voltage + current" on the right hand side of the list of measurements.

The following window appears:



Picture 25 : total voltage- and battery current diagram

In the toolbar of the window shown above there are nine different buttons. The meaning of them is as follows (f.l.t.r.):

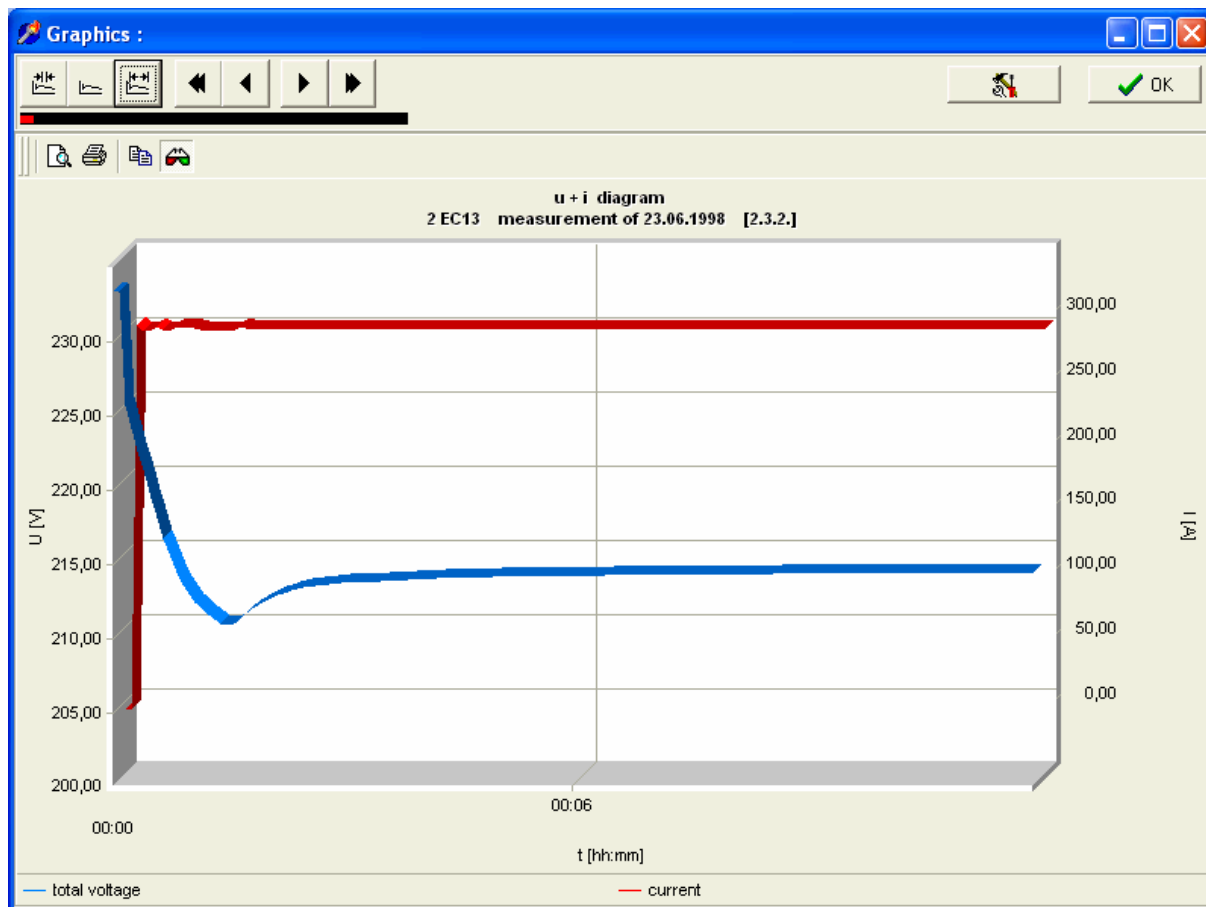
- Compress diagram in the time domain
- Re-establish total view of diagram
- Expand diagram in the time domain
- Move displayed graphic on the time axis to the left in big steps
- Move displayed graphic on the time axis to the left
- Move displayed graphic on the time axis to the right
- Move displayed graphic on the time axis to the right in big steps
- Open graphic settings window
- Exit graphic window

Below that a row of another four buttons is located as follows:

- Print preview / page setup
- Print graphic
- Copy graphic to clipboard
- 3d presentation on/off (toggle function)

Expand and compress diagrams :

If you click on the button “Expand” several times the following will be displayed:



Picture 26 : Expanded total voltage and battery current diagram

Instead of a 5 ½ h time span 12 minutes of the test are displayed now. Doing so, the voltage sag is clearly visible. With the help of the arrow button you can move this graphical extract over the whole measurement. Hereby the red bar indicates approximately size and position of the extract related to the entire measurement.

You come back to the total diagram by using the buttons “Compress” or “Re-establish”.

Print diagrams :

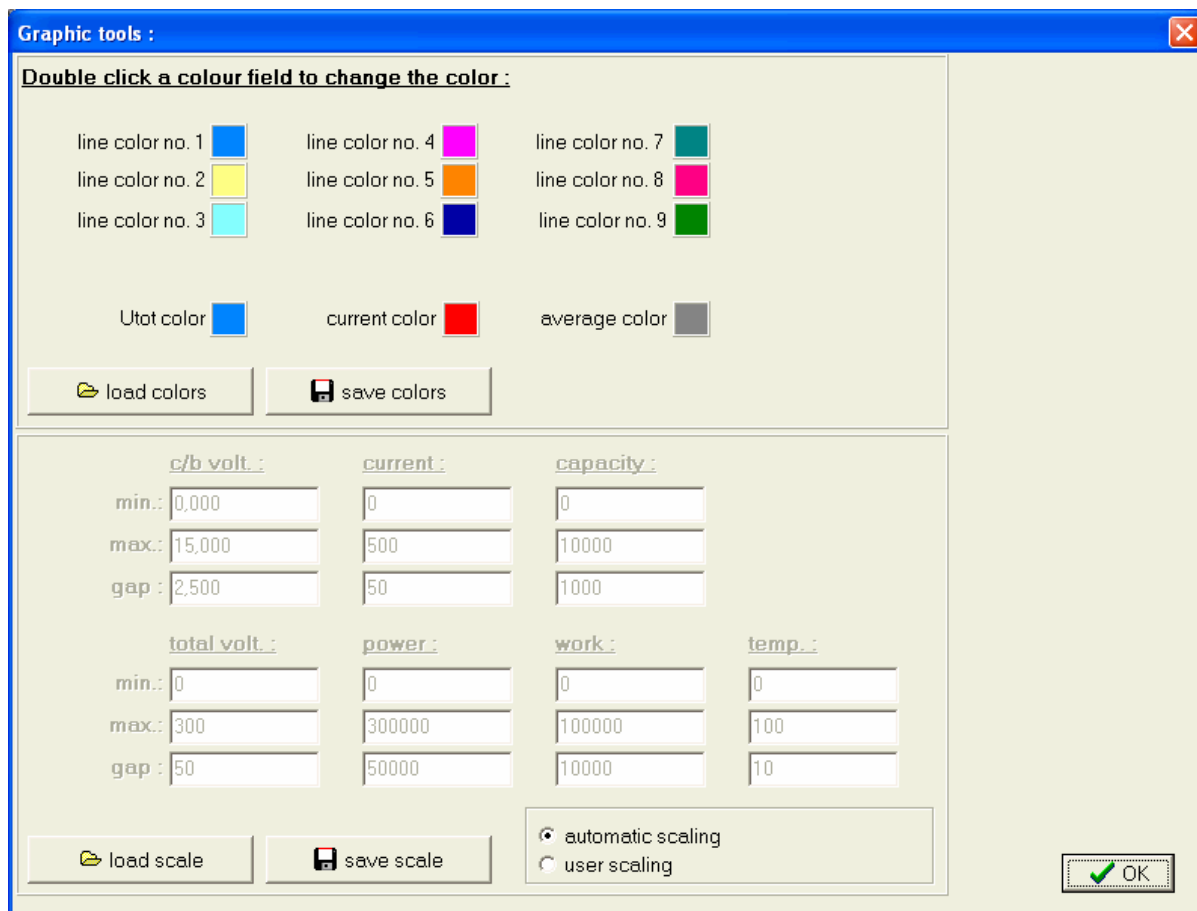
To printout a diagram, click on the button with the printer symbol. Diagrams are printed as displayed on screen. The Windows standard printer is used automatically.

Copy diagrams to clipboard :

For further use of the diagram (graphic) in another software application you can copy it to clipboard by clicking on the copy button here.

Adjusting diagram colours :

Click on the button “Open graphic settings” to change diagram colours temporarily or permanently. The following window appears:



Picture 27 : Graphic tools window (1.)

In the upper half of the window there are 12 coloured squares and two buttons for saving and loading of colour settings. Double click on the square which colour you want to change. The Windows standard colour dialog appears:



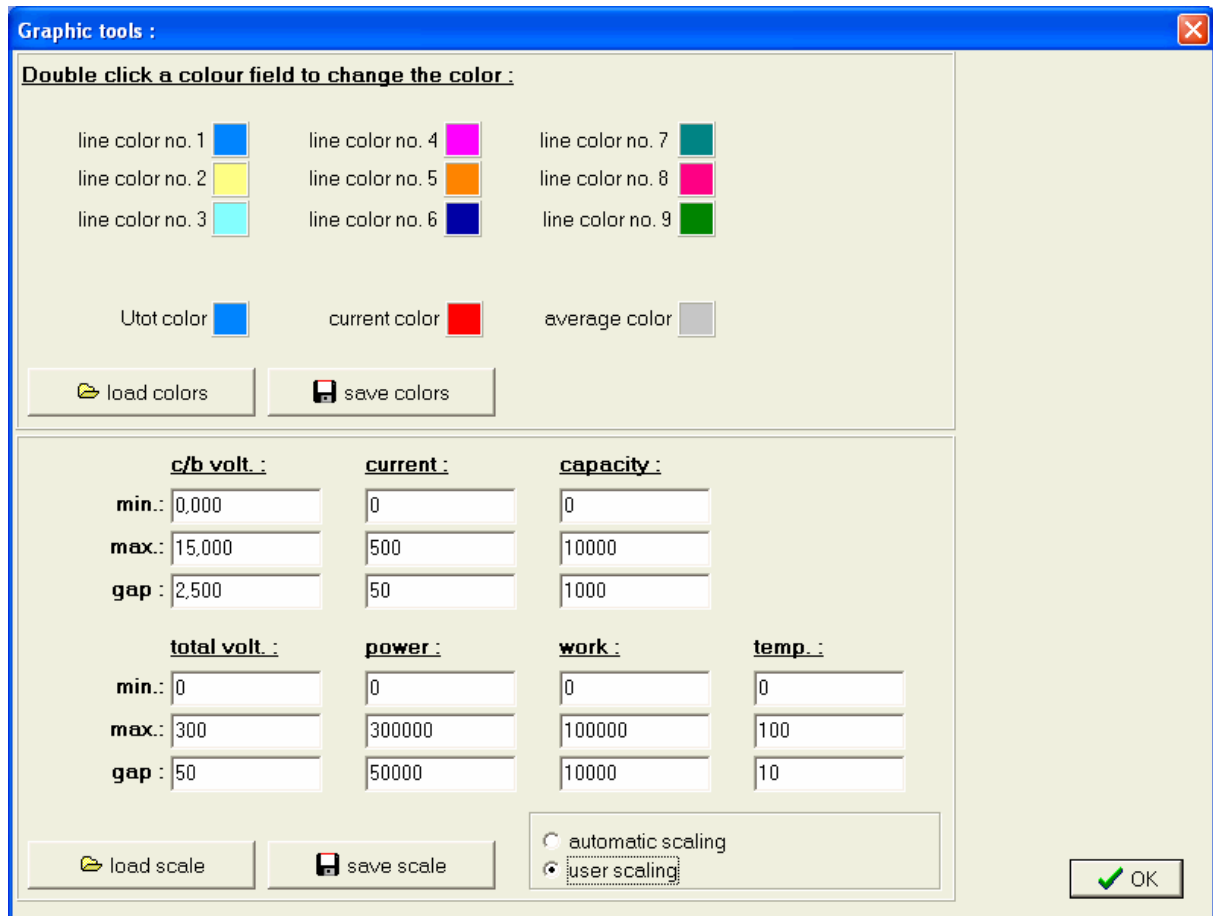
Select the desired colour and click on OK when ready.

Different colour combinations can be stored on the hard disk using the button “save colours” and later on be re-loaded using the button “load colours” By clicking on OK you leave the graphic tool window.

When closing the program the last used colour settings are stored and automatically used when starting the program the next time.

Adjusting diagram scale :

Scaling adjustments are also done in the graphic tools window:



Picture 28 : Graphic tools window (2.)

In the lower half of the window there are also two buttons for saving and loading of scale settings and a toggle possibility between automatic and user defined scaling. Above that 21 input fields are situated. The input fields are only active if the option **user scaling** is chosen.

Example: The total voltage in the diagram shall be displayed from 200V to 300V with a 10V grid. To do so please enter min = **200**, max = **300** and gap = **10** in the column "total volt.:".

In that way all diagram types can be adjusted to your needs.

The meaning of saving and loading different scale settings is the same as for the colours.

Manuel scaling is useful when comparing diagrams of two different measurements. Automatic scaling does not ensure to get the same scaling for two different diagrams.

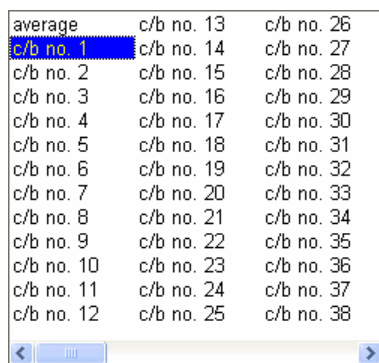
Overview of diagrams :

Following different diagrams and tables are available:

- total voltage
- total voltage + current (both in the same diagram)
- current
- Temperature
- Capacity
- Power
- Energy
- Lowest cells / blocks (1 to 9 at once)
- Highest cells / blocks (1 to 9 at once)
- Individually selected cells / blocks (from the list in the lower right corner)
- Single scan as table
- Gravity as table
- Table of all failed cells / blocks

Select any cells / blocks for a diagram :

average	c/b no. 13	c/b no. 26
c/b no. 1	c/b no. 14	c/b no. 27
c/b no. 2	c/b no. 15	c/b no. 28
c/b no. 3	c/b no. 16	c/b no. 29
c/b no. 4	c/b no. 17	c/b no. 30
c/b no. 5	c/b no. 18	c/b no. 31
c/b no. 6	c/b no. 19	c/b no. 32
c/b no. 7	c/b no. 20	c/b no. 33
c/b no. 8	c/b no. 21	c/b no. 34
c/b no. 9	c/b no. 22	c/b no. 35
c/b no. 10	c/b no. 23	c/b no. 36
c/b no. 11	c/b no. 24	c/b no. 37
c/b no. 12	c/b no. 25	c/b no. 38



In the lower right corner of the graphic selection window there is a list showing all cells / blocks and the mean value (average).

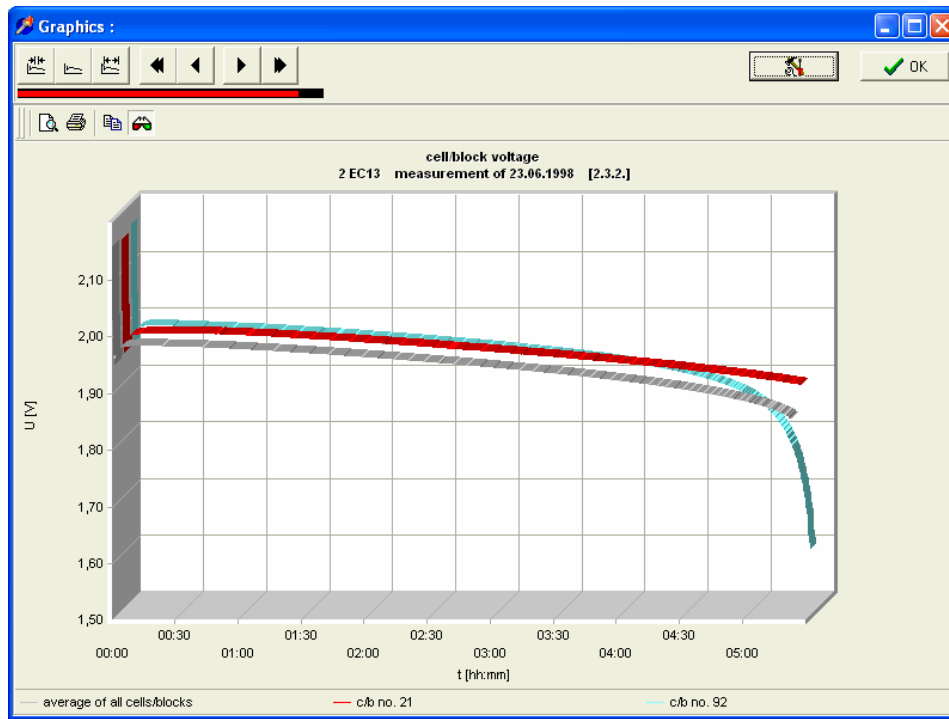
Cells / blocks that fell below the end voltage during the test are marked in red colour.

Selecting cells with the mouse works as usual under Windows using [SHIFT] - key or [CTRL] - key.

Up to nine cells can be selected. Further cells can be reached by moving the scroll bar.

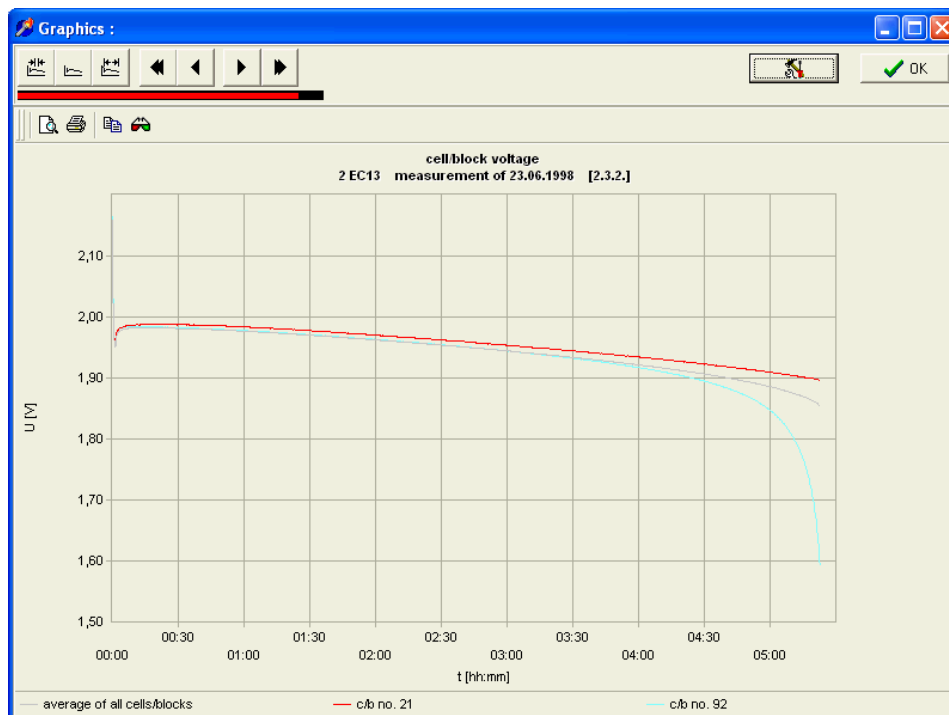
Picture 29 : Selection of cells / blocks

After the selection is done, click on “View selected cells / blocks” and the following diagram appears:



Picture 30 : Diagram of selected cells / blocks

In the shown diagram average, lowest and highest cell was selected. For better comparison you can toggle to a 2d diagram presentation. Than the diagram looks as follows:

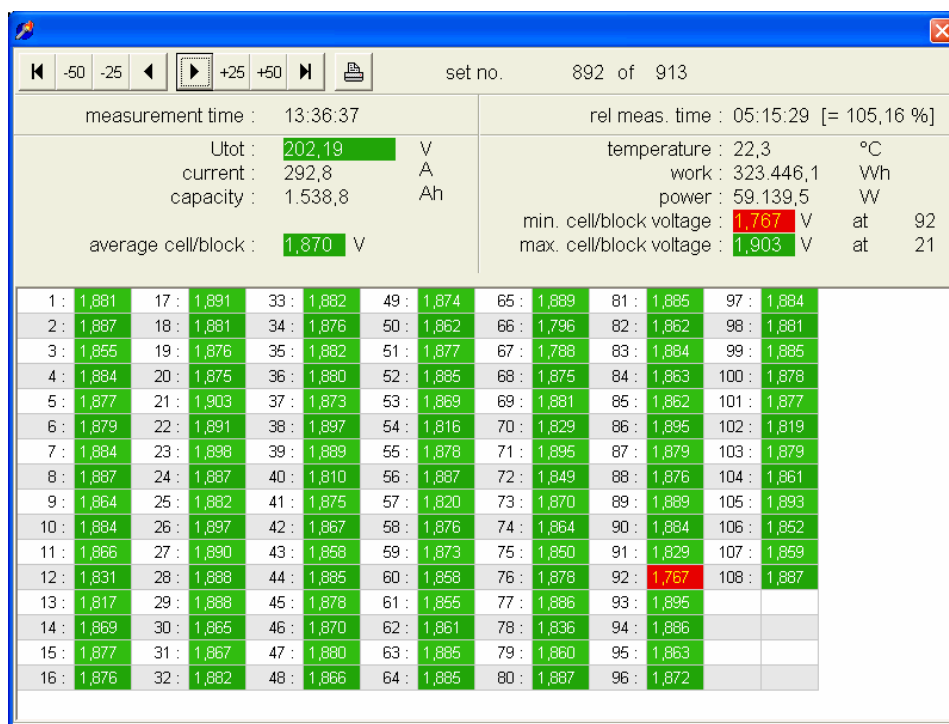


Picture 31 : Diagram of selected cells / blocks as 2d presentation

If there were irregularities during a measurement a diagram only might not be exact enough for analysing. In that case checking individual scans can be useful.

View single scan :

To scroll through the entire test scan by scan, click on the button “view single scan”. The following window appears:

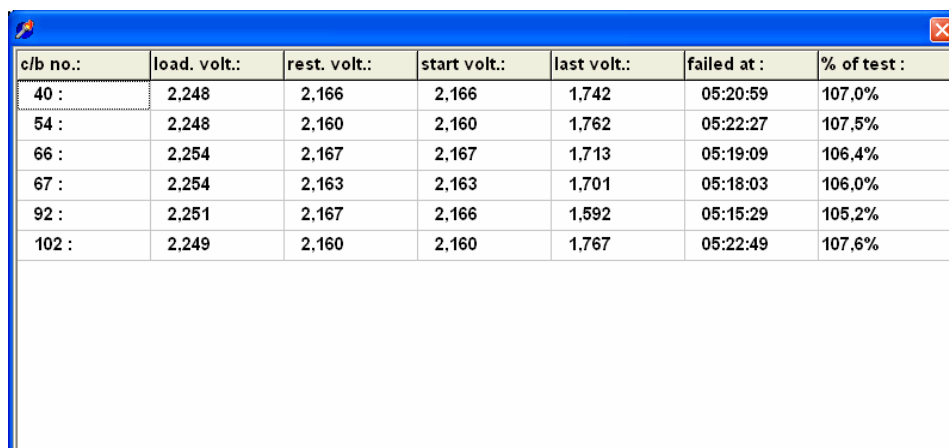


Picture 32 : Single scan of a measurement

This example shows exactly when the first cell felt below the end voltage. The toolbar of the window shows the icons to scroll through the measurement. Below that all information that was shown during the test is available her as well.

List of failed cells :

For each cell / block it is stated in the report if and when a single cell / block felt below the end voltage. A list of all failed cells/blocks can be displayed on screen by clicking on the button “view failed cells/blocks”.



Picture 33 : List of all failed cells / blocks

Appendix A :

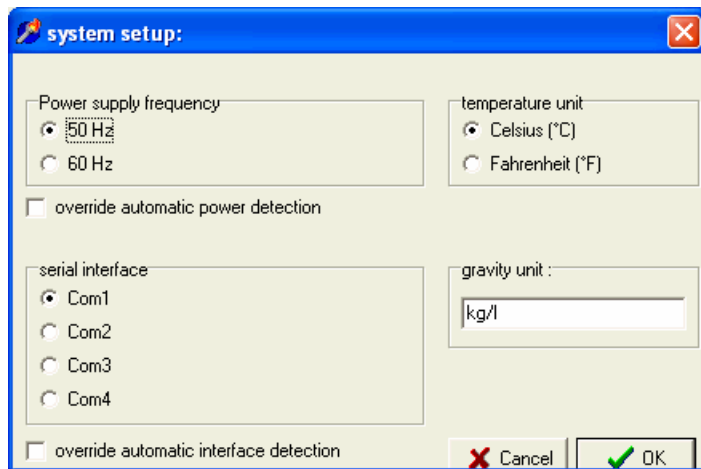
Meaning of the entry fields in the capacity test setup window :

Site name	Name of battery location
Street	Address of battery location
ZIP code / town	Address of battery location
Examiner	Name of examiners
Battery name	Name or term of battery. This name is used to save the measurement on the hard disc. That's why the following characters must not be used: \ / : * ? „ < > and . (These characters will be automatically removed by the program)
Date of commission	Date when the commissioning took place.
cells / blocks per Batt.	No. of measuring points (= single cells or blocks) of the battery.
Product type	Battery type, e.g. GroE 500
Rated capacity	If this capacity is reached the test is evaluated as 100%.
Rated test time	Discharge time that refers to the rated capacity
c/b voltage min. / max.	Lower and upper limit of cell- or block voltage, used as pass criteria if the measured voltage is within the limits. According to these values the range of TMC4001 is adjusted (3V or 15V range).
Total voltage min. / max.	Same as above, but for total voltage (75V or 600V range).
c/b numbering direction plus to minus	Input no.1C1 of TMC4001 must be always connected to the electrical minus pole of the battery. That is also where cell numbering starts which means cell / block no. 1 is at the minus pole of the battery. If cell / block no. 1 is at the plus pole instead, this option must be selected.
Type in temperature	This option is always selected when using TMC-4001/31 or TMC-4001/63 . If you're using TMC4001-127 without temperature sensor this option must be selected. In that case temperature values can be entered manually.
Type in current	This option must be selected if the battery current is not measured. In that case current values can be entered manually. If the current shall be measured the Shunt- or current clamp ratio must be entered. (e.g. 60mV / 600A or 1000mV / 1000A)
Stop Torkel on total voltage	If you have a Torkel connected to TMC4001 (SER2 or AUX) , the program can interrupt the test (Pause or Stop) when the entered limits are reached.
Stop Torkel on cell voltage	Same as above, but depending on cell voltage.
Examination no.	E.g. test no. work order no.

Appendix B :

System setup :

Click on the button “System Setup” in the start window to enter the system setup:



Picture 34 : System setup

Power supply frequency:

Using the country settings on your computer the program detects usually the mains frequency of the country. This works fine as long as these settings comply with the country **TMC4001** is used in. Only if the device is used abroad where the mains frequency is different, a manual setting is required here. Select the correct mains frequency **and** mark the checkbox “override automatic power detection”.

ATTENTION:

**TMC 4001 must be adjusted to the appropriate mains frequency.
Otherwise correct measurements are not possible!!!**

Serial interface:

In case **TMC4001** is not detected automatically, a Comport can be selected manually. Select the Comport on the computer **TMC4001** is connected to and mark the checkbox „override automatic interface detection“.

Temperature unit:

Select the desired unit. **Please note: After changing previously saved temperature values will not be recalculated to the new unit.**

Gravity unit:

Select the desired unit. **Please note: After changing previously saved temperature values will not be recalculated to the new unit.**

Appendix C :

Trouble-shooting :

<p>All data was entered in the capacity test setup window, but still the button “start test” is not enabled (no green frame)</p>	<p>Possibly one of the entry fields shows still yellow colour though the data was entered correctly. The program checks the entries NOT BEFORE leaving that entry field. Move cursor into another entry field.</p>
<p>The diagrams are empty</p>	<p>Possibly manual scaling is selected and the measurement values are outside that range. Select automatic scaling or adjust the scale.</p>
<p>I can't find a certain measurement anymore</p>	<p>Possibly the data folder was changed after the test. Search for files on the hard disc That start with the name of the battery (e.g. 20EA70.* , in case the battery name was 20EA70)</p>
<p>All measuring cables are connected, but when scanning only about –0.100V or negative voltages are displayed.</p>	<p>You have MISCONNECTED the battery to TMC4001. Make sure that the first measuring cable (Connector C1) is ALWAYS connected to the electrical minus pole of the battery.</p>
<p>All measuring cables are connected, but when scanning only voltages about 3,1V are displayed, though higher voltage is applied.</p>	<p>In the test data you've entered wrong limits for the cell voltage. TMC4001 has two cell voltage ranges: 3V and 15V which are automatically set according to the entered limits.</p>
<p>All voltages are displayed correctly, but the order of the cells in the matrix is upside down.</p>	<p>In the test data you've entered a wrong cell number direction (+ to -) or (- to +). Correct this setting BEFORE the final measurement.</p>
<p>All voltages values are correct, but they are all displayed in red colour.</p>	<p>In the test data you've entered wrong limits for the cell voltage. Please check and correct if necessary.</p>
<p>The total voltage cables are connected, but when scanning only voltage about 78V is displayed, though higher voltage is applied.</p>	<p>In the test data you've entered wrong limits for the total voltage. TMC4001 has two total voltage ranges: 75V and 600V which are automatically set according to the entered limits.</p>
<p>The shunt-cables are connected, but too less current is displayed.</p>	<p>In the test data you've entered a wrong shunt values. TMC4001 has two ranges: 60mV and 1000mV which are automatically set according to the entered limits.</p>
<p>Two cell voltages are not measured – only values about 0V are displayed.</p>	<p>One measuring wire has no contact to the battery connector or the corresponding fuse is blown. Please check that wire and its fuse.</p>

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