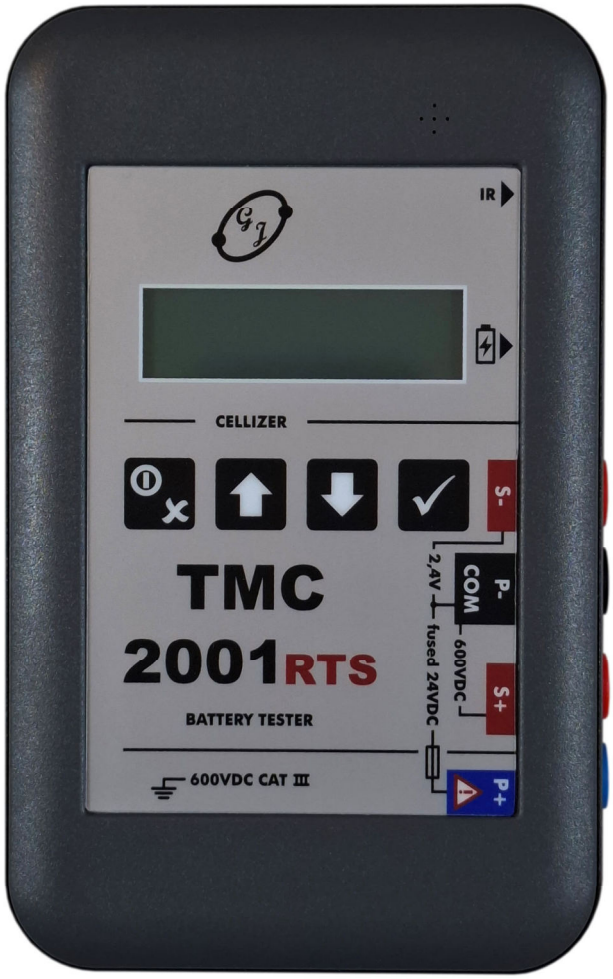
TMC-2001RTS

(Firmware V2.60)

Battery – Management – System



Manual

ICS Schneider Messtechnik GmbH
Briesestraße 59
D-16562 Hohen Neuendorf / OT Bergfelde
Tel.: 03303 / 50 40 66
Fax.: 03303 / 50 40 68
info@ics-schneider.de
www.ics-schneider.de

1 General

1.1 In One Word

Battery systems mounted in permanent area units are ever gaining on significance. Measurements and tests are a must for maintaining and retaining operational readiness. Only in this way is it possible to determine the momentary system status, to determine the availability of the batteries, to detect hidden malfunctions and to carry out appropriate measures for their elimination before damage is caused.

The computer integrated TMC-2001RTS supports the service staff in their tasks. It provides a system which features the following advantages:

- ❑ light, compact, portable
- ❑ menu controlled, easy operation
- ❑ quick measured value determination
- ❑ universal employment
- ❑ computer integrated analysis of the measuring results by means of PC

We appreciate the fact that in purchasing this measuring system you have been convinced of the advantages it offers and we wish to express our thanks for your decision. Naturally, a manual, describing the advantages offered, is a part of the system itself. We would request you to take the little time required to work yourself through the manual. Most important of all are chapter "Safety Requirements" and chapter "Fundamental Functional Procedure".

Should you have any further questions, desire extensive information or, also, have any critical remarks please do not hesitate to contact your local sales representative, or email us under info@cellizer.com .

1.1 Copyright notices

1.2 Safety Requirements

Before you begin to deal more deeply with the device itself, we 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.

⚠ The tests may only be carried out by a qualified electrician or under the direction and supervision of a qualified electrician.

⚠ **Never exceed the voltage of 24VDC at the P+ input.**

⚠ **Use of the battery tester and accessories in potentially explosive atmospheres is not permitted.**

⚠ **The measurement of the total voltage of a battery may only be carried out in fused networks / connections!**

⚠ Battery systems are electrical equipment systems have high short-circuit currents. Avoid short-circuits which can cause current interruption, damage to the battery, station equipment and/or harm to personnel.

Always keep in mind the possibility of short circuits due to incorrectly connected shunts, or due to a voltage greater than 24VDC at the P+ input!

⚠ **The Kelvin test probes may only be used in the CAT O measurement category**. These test probes may also only be used in the “RESISTANCE” measuring function. Please also observe the voltage limitation of 24VDC at the P+ input.

⚠ **The protective covers (protectors) contain strong magnets**. People who wear a pacemaker are particularly at risk. In this case, the protective covers must not be used!

⚠ The TMC-2001RTS, 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. Please only use the original accessories. **Damaged or used components must be immediately replaced.**

⚠ Always maintain a good contact with the test clamps. It is not allowed to move or remove test clamps during a measurement, otherwise unwanted sparks could be generated. Always wait for the acoustic acknowledgment of the completed measurement process!
A resistance measurement should not be performed while charging. Look for well-ventilated battery-rooms!

⚠ The TMC-2001RTS charging unit may only be connected to the power supply voltage indicated on the identification shield. The unit should not be covered up or exposed to dampness during charging operation. **The DATALOGGER should not be operated on the charging unit while carrying out measurements**.

⚠ Take adequate precautions to protect against electrostatic discharge (ESD). Wear protective equipment!

⚠ The TMC-2001RTS is equipped with a transponder-module which will emit radio - frequencies. Please be sure that it is allowed to use this feature in your country! Contact your nearest sales-representative for more information. (125kHz)

⚠ Use only safety test leads of CATIII 600V or higher with a length of 1m or more.

⚠ Be sure to secure your data at regular intervals. This is valid for the measuring device stored measured values, as well as, for the data in your own PC.

⚠ The device should not be exposed to direct sunshine or temperatures exceeding 40 degrees Celsius (e.g. lying onto heating units, radiators, etc.).

1.3 Opening / Repairs

The device may only be opened by authorized specialists so that safe and faultless operation is possible and the guarantee is maintained. Spare parts may only be installed by authorized specialists. Unauthorized structural changes to the device are prohibited. If it can be determined that the battery tester has been opened by unauthorized personnel, no warranty claims regarding personal safety, measuring accuracy, conformity with the applicable protective measures or any consequential damage will be granted by the manufacturer.

1.4 Internal fuse

A special multimeter fuse is built into the current-carrying conductor P+. If this fuse is defective, the resistance cannot be measured.

⚠ **The fuse is permanently installed. A change by the user is prohibited.**

Only if the fuse is replaced by our repair service it is guaranteed that type-tested fuses with the correct tripping characteristics, the correct rated current and the correct current breaking capacity are used.

Due to possible operating errors, the total battery voltage may only be measured in fused networks.

1.5 Relevant standards

IEC 61 010-1, EN 61 010-1, VDE 0411-1
Safety regulations for electrical measuring, control, regulating and laboratory devices - General requirements

DIN EN 61 326-1 VDE 0843-20-1
Electrical measuring, control, regulating and laboratory devices - EMC requirements – Part 1: General requirements

1.6 Before you start / Important hints

⚠ Risk of injury from touching dangerous voltages. Use the battery tester only when the battery compartment cover is inserted and screwed tight.

⚠ Never touch the conductive ends of the test probes.

⚠ **The available Kelvin probes / Kelvin crocodile clips may only be used on the test instrument for the "Resistance" measurement and in environments of measurement category CAT 0. Never touch the conductive ends of the crocodile clips.**

⚠ **Never exceed the voltage of 24VDC at the P+ input.**

⚠ **The measurement of the total voltage of a battery may only be carried out in fused networks / connections!**

⚠ Leaking batteries can damage the device. Check the batteries at regular short intervals and after long periods of storage.

⚠ Do not turn on the battery tester while it is charging.

1.7 Fundamental Functional Procedure

The TMC-2001RTS measuring system serves the determination of the condition of permanent mounted local batteries, logging and the determination of the operating safety of these battery systems by employing computer integrated evaluation. The measuring system can, based upon its conception, be used for opened lead-acid/electrolyte batteries, as well as, for closed battery systems.

The system includes certain operational modes (also referred to as programs) for this purpose and the most important ones are listed below:

- ❑ Float
- ❑ Discharge, Charge
- ❑ Battery interval test

Alongside these operational modes there are a series of extension programs, such as, for example a bridge connector test which rounds off the power scope. These tasks are supported and backed up by the battery management system stored in the PC.

- ❑ Battery data base file

Hint: The battery database which is created and maintained in the PC- software should be the fundamental base of the use of TMC. If this database was not created yet it should be done now before the introduction into TMC is continued. For further information please refer to the PC-software manual which is separate from this one.

The "Float" is the simplest operational mode. During the “Float” the measurement of the individual cell voltages is carried out in the usual way. The value is measured, indicated on the display and internally stored. The device automatically allocates the date and time of day. The measured values are compared to previously entered tolerances and deviations are acoustically and optically signalized during measurement. Once measurement has been completed the number of measured cells, the average value, all individual cell voltages, as well as, the number of the cells having the highest and lowest voltages can be shown on the display.

The "Discharge", “Charge” and "Interval Test" are carried out in the same manner. Only here the number of measuring cycles and the time intervals of measured value recording are different.

In the operation mode „RESISTANCE“, all block voltages and internal resistance values are measured and stored simultaneously.

The operation mode „INTERVAL“ performs the storage of a discharge curve

The entire history of a battery can be followed using the "Battery Data Base File" on the PC. The file administrates all typical battery values, such as, nominal capacity, projected set-point capacity, allowable voltage tolerances, manufacturing and commissioning date and all exceptional occurrences. The file allows the immediate access to the historical data of the system and simplifies decision making in consideration to battery status in conjunction with the actual measured values.

1.8 Validity of the Manuals

The description of the firmware is valid for versions from V2.60.

The technical descriptions and safety instructions are valid for all versions.
Please replace all older versions.

1.9 Guarantee and Limitations

The manufacturer supplies a guarantee of 12 months after purchase for material and construction. The guarantee is not valid if the product is modified or altered in any way by the customer and, likewise, damaged by an act of God or by employment under unusual working conditions. The manufacturer reserves the right to replace the product by supplying a new or overhauled device.

Please contact your local representative by guarantee claims.

We reserve the right to impose the following limitations:

- 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.
- The programs may neither be copied nor duplicated. Even though we have taken the utmost care in the preparation of the program and this manual, malfunctions can still occur in the program sequence which we cannot take responsibility for.
- Should a part of the guarantee specification be invalid the laws and ordinances of the Federal Republic of Germany are valid.

This is valid for the device and for the evaluation of the software components employed in the computer.

2 TMC-2001RTS Components

2.1 Survey

2.2 Standard components and optional accessories

Standard components:

Item	Article-no.
TMC-2001RTS (DataLogger)	
Free of cost Software, CS-Manager (available as download from our website)	
Charging unit	
Measuring leads	
Manual (available as download from our website)	

Options:

Item	Article-no.
RF-ID Transponder Tags	
Temperature sensor	
Specific Gravity sensor	
Resistance / UBlock(min) = 1,5VDC	

Please note that you will download the latest version of PC software on the net. Older versions may not be able to communicate correctly with the TMC-2001RTS!

2.3 Manual

2.3.1 General Fundamentals

- This symbol ⚠ refers to situations or procedures which could cause danger to persons and/or damage to objects.
- Important hints and sequential steps are designated by "Hint".
- Important test sections in the manual are accentuated by bold type.
- Practice examples are indicated as follows: *Practice Example*

3 Employment Possibilities

The measuring system features the following main aspects:

- **Float**, whereby the cell voltages of a battery system are recorded, for example, in a monthly measurement of the charge retention.
- **Discharge and Charge**, whereby the cell voltages of a battery system are recorded.
- **Interval**, voltages or current sequences can be recorded in freely defined time intervals.
- A battery file is opened covering the entire lifetime of a battery using the PC and its installed analysis software. In this file all the activities concerning a battery (measurements, substitution of cells etc.) are stored and can be evaluated in graphic and/or table form.

The measuring system supports all operational sequences known in the past. The measuring results and/or inputs serve as unified data base for further processing on the PC or for on the spot output.

The different functional modes are selected in a menu system. The build-up of this menu system corresponds to the operational sequence. During measured value store the measured values are simultaneously monitored for high and low limit value violation of voltage tolerances and, when required, indicated as such.

The time of day and the date are automatically inserted.

The operational status of a battery system can be evaluated exactly by utilizing the battery file. The evaluation can be followed over a period of years. Thus, an extraordinary survey covering the individual battery floats, discharges and charges is established.

4 Operating Elements and Connections

4.1 Measuring Input Connection Jacks

The measuring device features four connection jacks..

(**Black** or **blue**)

The measuring signals refer to the reference and/or ground potential of the **[COM]-jack**.

⚠ **The measuring inputs are <u>not</u> galvanically isolated.**

Measuring Ranges:
The measuring ranges depend upon the occupation of the input jacks.

[COM] / [P-] Ground (earth)-/reference potential of each particular range. Current carrying connection to the –pole of a battery under test (resistance measurement).

[S+] Input for DC/AC Measurement. Cell/block voltages or battery voltage* are measured over this inputs. This input is also the positive sense lead during a resistance measurement.

Range 1: **±24.50** VDC Resolution: **0.0001** VDC
Range 2: **±600.00** VDC Resolution: **0.0010** VDC
600V CAT III
DC - Input impedance : **1.6 M**Ω

[S-] Inputs for DC Measurement (temperature …). This input is also the negative sense lead during a resistance measurement.

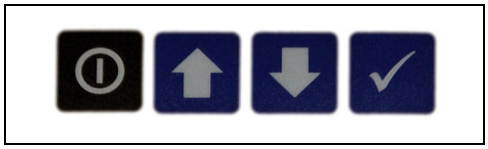
Range 1: **±2450.0** mVDC Resolution: **0.01** mVDC
DC - Input impedance: >10 MΩ

[P+] Current carrying connection to the +pole of a battery under test (resistance measurement). **Please observe the voltage limitation of 24VDC at this input! This input is directly connected to a power transistor!**

- Please read the safety instructions before measuring the total voltage of a battery.

4.2 Operating Switch Keys

The measuring device is operated using the membrane switch keys.



4.2.1 Key Occupation

The buttons are self-explaining. You can scroll or change number settings with the arrow-keys. The ⏻-key is used for exiting menus, or for an early stop of a function in use. The ✓-key is mainly used for a correct termination of a chosen program.

4.2.2 Switch On and Off

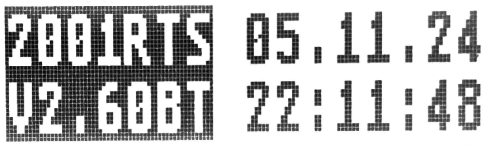
The device is switched on with the ⏻-key. Press and hold the button until you hear the power on signal (max. 2 seconds). Use “Power Off” in the main menu to shut down the device You can turn off the device in an emergency case, by pressing the ⏻-button longer than 5 seconds.

If no selection is made in some menus for more than 10 minutes, the RTS switches off automatically.

After switching on, the current date, time, firmware version and the standard interface for PC-communication are displayed:

Examples:

Firmware: V2.60 with BT-interface:



Firmware: V2.60 with IrDA-interface:

5 General Explanation of the Menus

The device has three different menu sequences available.

1) The measurement menu
2) The database menu
3) The settings menu

The desired selection menu is selected, from the main menu by pressing the appropriate menu key. The sequence or sub-menus located below the main menu are paged using the -, -keys. The desired sub-point is selected using the -key, also called [RET]-key.

5.1 The internal database

The internal database enables a simple and efficient identification of battery banks. The database will be transferred from the PC-Software into the TMC-2001RTS data logger. The database can be activated inside the measurement setup functions.

Please note that all inputs/data such as limits, site no., battery no., were done in the CS-MANAGER-Software and will be used when executing the measurements. It is also possible to overwrite some of these settings.

The TMC can receive or send data while the unit is in the main-menu.

5.2 The Main Menu

After the measuring device has been switched on the main menu always appears on the display:

```
MAIN MENU


MEASUREMENT
DATA MENU
SETTINGS
INFO
POWER OFF
```

5.2.1 The INFO entry

The INFO-screen displays the version of the internal firmware, the battery voltage and the usage of the internal memory and directory entries.

6 Menu Measurement

After the selection of “Measurement”, you do have the choice of several menu entries:

MEASUREMENT

MULTIMETER
FLOAT (VOLTAGE)
DISCHARGE (VOLTAGE)
CHARGE (VOLTAGE)
RESISTANCE
TEMPERATURE
CONNECTOR
INTERVAL U
INTERVAL U + I
DMA35 (IrDA)
DMA35 (BT)
QUIT

6.1 Fundamental Operating Sequence

1) Selection of the desired function to use (Float, Discharge, …)

2) Program sequence.

3) Viewing of the short analysis.

Ending of the programs:

Programs are ended with the ✓-key or automatically. A so ended program ensures the correct storage of the measured values. **Please be sure, that you have entered the correct value of blocks! The selected function will stop, if the defined number of blocks have been processed.**

Running programs can also be interrupted by pressing the 0-key. **In this case the measured values recorded are still stored, but will not be transferred**. Please do not panic, these data can be reactivated using [DATA MENU]->[SHOW DATA] (press 0 until you see that the XXXXX-indication is replaced by the correct number of measured values).

6.1.1 The Battery Definition menu

After you have selected a desired function an input menu is shown. Here you can edit all inputs simply by moving the selection arrow over the entry to change.

Klick on ✓ and you will see, that the numbers are simply changed with the use of the arrow keys. With ✓ you will go to the next figure to change. After processing the last figure you will be put back into the box selection you had before. The limit values help in the recording of measured values and subsequent processing so that the operator is drawn attention to bad measuring values. Each sequence menu has its own limit value which is separately administrated and called up by the system.

<FLOAT>

START
SELECT BATTERY
AREA: 0123
BATTERY: 5663
BLOCKS: 0012
MIN: 11.8500 V
MAX: 13.6540 V
QUIT

Before you want to edit the desired entries, you can load a battery setup from the internal stored battery database. If you have downloaded a battery database, you can use the entry
[SELECT BATTERY].
The keys ↑ and ↓ scroll through the database. If you hold down these keys for longer than 2 seconds, the scroll-speed is increased. You can activate the stored battery definition by using the ✓-key. The ⏻ key will quit his function without the use of the stored battery definition.
You can always re-edit the loaded battery definition, before you start the desired function.

After all inputs are made, you must select “START” to measure the desired values.

6.1.2 Viewing of Measured Values

After you have made your measurement, a short overview of the measurement is displayed. Depending on the function, the average, minimum and maximum values are shown.

6.2 The Individual Measurement functions

The following chapters will describe most of all programs and functions which can be reached via the [Measurement]-selection menu.

⚠ **The measurement of the total voltage of a battery may only be carried out in fused networks / connections!**

6.2.1 Float

Application: Measuring of the cell voltages of a battery system in float condition.
(e.g. repeating measurements of charge retention according to individual time plans, quarterly ...).

Measuring Range: ±24.50V or ±600V. The range depends on the MAX limit value.

Connections: [COM]-jack, [S+]-jack.

Acoustic alarm indication by high/low violation of freely definable limit values.

Wait for the acoustic signal (no leads are connected to the battery) before you can start the measurement.

Key Functions

Interruption of this routine without storage. Can be reactivated in the [DATA] - [SHOW DATA]menu.

Go back to the block from which the new measurement should be carried out. The block number will change.

Under some circumstances it can happen, that the automatic reading is disturbed. By pressing this key, the measured values are always displayed and can be stored by using the ✓-key.

End of the function with **measured value memory store**. The storage is done automatically if the battery was selected from the internal database before!

The cells of a battery system are measured after ending of the following run sequence:

- Press the measuring leads firmly on the cell poles.
- Wait for the "high" pitched tone, perhaps the tone sequence for alarm signals will sound (recording of the measured values).
- Remove the measuring leads from the cell poles.
- Wait for the single tone (ready for the next measurement).

This procedure is repeated until all cells of the battery system have been measured.

After each recorded value the cell voltage is indicated on the display.

Hint: Should you wish to additionally measure temperatures, density and bridge connections, in one Float, be sure **to carry out the FLOAT program first**.

To be sure of the measurements taken, the measured values can be viewed once again and, when required , also cancelled [DATA] - [SHOW DATA].

6.2.2 DISCHARGE, CHARGE

Application: Cyclic measurement of cell voltages of a battery system during controlled charging or discharging. The desired program is called up before each cell voltage measurement.

As opposed to a *FLOAT* a *DISCHARGE*, or *CHARGE* is measured here during a charging or discharging process. An essential difference to a *FLOAT* is that in the testing procedure the cell/block voltages of a battery system are measured several times. In order to be able to make a statement concerning a test, a minimum of two measuring sequences are required (measuring of all cell/block voltages).

If a test has less than two measuring sequences the recorded values are not stored.

Please do refer to the function *Float* for the use of the display and keys.

To be sure of the measurements the measured values can be viewed once again and when required also re-measured under [DATA] - [SHOW DATA].

Hint: **Please only transfer all saved measurement series after a charge or discharge has been completed.** Remember to delete all saved measurement series in the TMC after successful transfer to the PC, as otherwise subsequent charges and discharges will no longer be saved in the CS-Manager under the battery definitions used.

6.2.3 RESISTANCE

Application: Measuring of the internal block resistances and voltages

Measuring Range 1.50V - 24.0VDC

Connections [P+] and [S+] must be connected to the +Pole of the battery block

[P-] and [S-] must be connected to the -Pole of the battery block

Key Functions

Interruption of this routine without storage. Can be reactivated in the [DATA] - [SHOW DATA] menu.

Go back to the block from which the new measurement should be carried out. The block number will change.

End of the function with **measured value memory store**. The storage is done automatically if the battery was selected from the internal database before!

The cells of a battery system are measured after ending of the following run sequence:

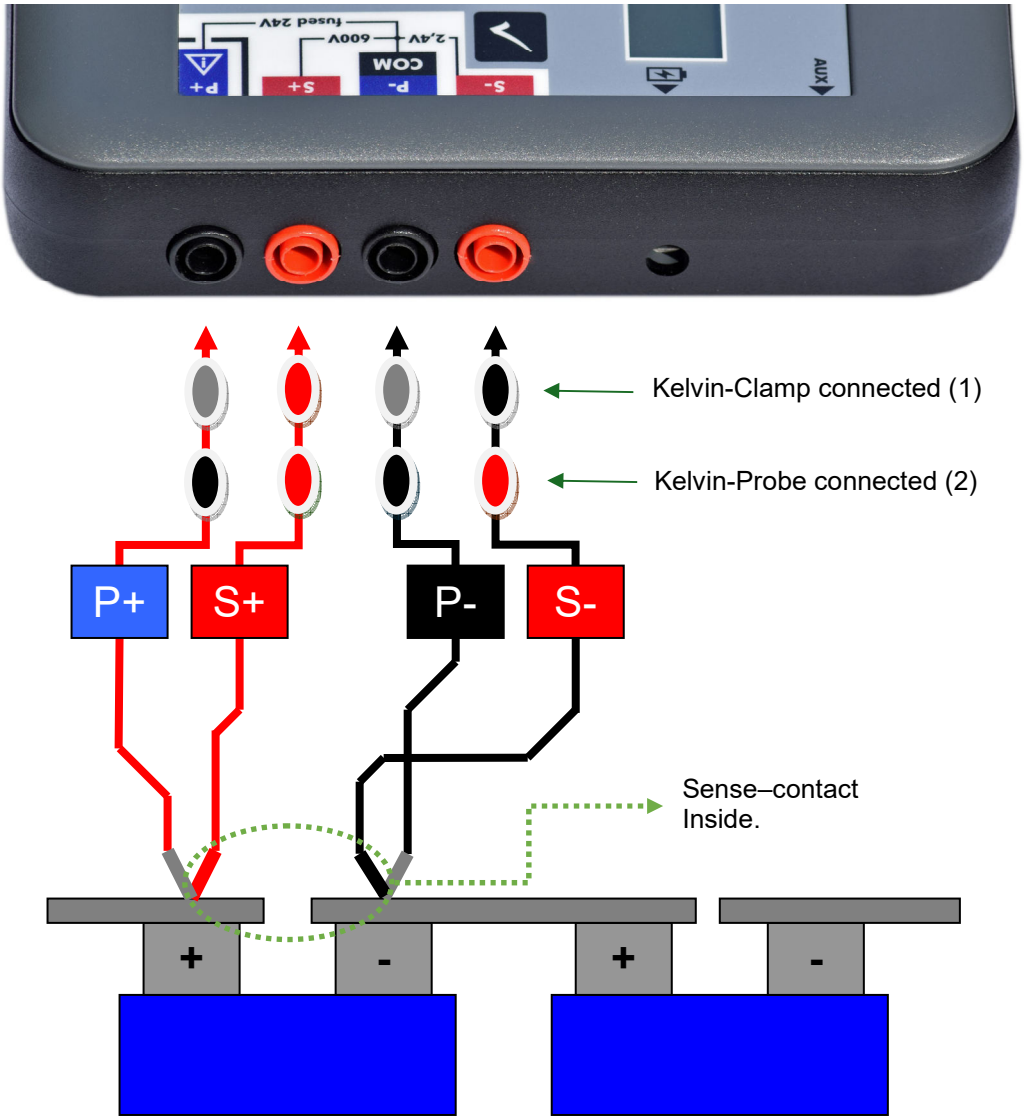
- Press the measuring probes firmly on the cell poles.
- Wait for the "high" pitched tone, perhaps the tone sequence for alarm signals will sound (recording of the measured values).
- Remove the measuring probes from the cell poles.
- Wait for the single tone (ready for the next measurement).

This procedure is repeated until all cells of the battery system have been measured.

To be sure of the measurements the measured values can be viewed once again and when required also re-measured under [DATA] - [SHOW DATA].

For the connection, use only the supplied Kelvin clips. Each Kelvin terminal consists of two measurement leads, one power (P) lead and one sense lead (S).

How it works:



⚠ **Never apply voltages higher than 24VDC at the P+ input jack!**

At the beginning of the measurement, please wait for the acoustic start signal (<u>only sounds if there is no voltage applied</u>!)

⚠ **Never apply voltages higher than 24VDC at the P+ input jack!**

⚠ When measuring resistance, a test current flows which can lead to spark formation. Perform the resistance measurement:
- only under the hydrogen concentration permitted in the standard DIN EN 50272-2 in the air.
- **not** immediately after charging the battery system. Wait at least 30 minutes.
- only in well-ventilated battery rooms.

Scheme: Kelvin-Clamp (1)

Scheme: Kelvin-Probe (2)

Hint: **Depending on the device version, the P+ input is equipped with either a black or a blue socket. Only use the P+ input for resistance measurement at a maximum voltage of 24VDC.**

6.2.4 TEMPERATURE

Application: Measuring of the individual cell temperatures of a battery system. The system expects an IR-Temperature probe (1mV / 1°C).

Measuring Range ±2.450VDC, is set automatically.

Connections [COM]-jack, [S-]-jack.

Acoustic alarm indication by high/low violation of freely definable limit values.

Key Functions


Interruption of this routine without storage. Can be reactivated in the [DATA] - [SHOW DATA] menu.


Go back to the block from which the new measurement should be carried out. The block number will change.


Takeover of the displayed value.


(Press the key longer). End of the function with **measured value memory store**. The storage is done automatically if the battery was selected from the internal database before!

To be sure of the measurements the measured values can be viewed once again and when required also cancelled under [DATA] - [SHOW DATA].

6.2.5 CONNECTOR

Application: Recording of all the bridge connector losses of a battery system. The losses are measured in mV. You should perform this function within a capacity test.

Measuring Range 0 mV – 2450mVDC

Connections [COM]-jack, [S-]-jack.

Key Functions


Interruption of this routine without storage. Can be reactivated in the [DATA] - [SHOW DATA] menu.


Go back to the block from which the new measurement should be carried out. The block number will change.


Takeover of the displayed value.


(Press the key longer). End of the function with **measured value memory store**. The storage is done automatically if the battery was selected from the internal database before!

To be sure of the measurements the measured values can be viewed once again and when required also cancelled under [DATA] - [SHOW DATA].

6.2.6 DMA35 (IrDA)

Application: Readout of the DMA35 V3 density sensor from Anton-Paar. All density and temperature values will be stored.

Connections IrDA-Interface.

After selection of this function, the system waits for data on the infrared data port.

Place the DMA35 in 10cm distance from the TMC (the infrared transmitter and receiver must face each other). Start the transmission on the DMA35 with:

Menu->Measuring Data->Export->Export All

On the TMC display, the indication <RECEIVING> should be seen. The DMA displays <Export xx%>. After a successful transmission, the evaluation of the transmitted readings will be displayed.

How it works:

(The infrared port is in the region of the label „Aux“ behind the plastic)

6.2.7 INTERVAL U

Application: Recording and display of measured values with storage.

These measured values are continuously recorded in freely definable time intervals (e.g. for the recording of **one** total voltage curve during discharging).

TMC measures a certain electrical variable at equal "Interval Measurement" time intervals. In the TMC the time intervals are adjustable, starting with the smallest time interval of 1 second. Thus, it is possible to record the entire voltage of a battery during charging or discharging in intervals of 5 seconds.

Measuring Range The measuring range is 600VDC.

Key Functions

Interruption of this routine without storage. Can be reactivated in the [DATA] - [SHOW DATA] menu.

End of the function with **measured value memory store**.

Input connection used:

[**COM**] Ground reference

[**S+**] The voltage input signal, mainly the total voltage of the battery

The measurement of the total voltage of a battery may only be carried out in fused networks / connections!

The charging component cannot be used to extend the recording.

6.2.8 INTERVAL U+I

Application: Recording and display of measured values with memory storage.

The measured values are continuously recorded in freely definable time intervals. (E.g. for the recording of an **entire voltage curve and current curve** during discharging).

Measuring Range The measuring range for the voltage measurement is 600VDC.

The measuring range for the current clamp is set via the current/voltage-ratio.

Key Functions

Interruption of this routine without storage. Can be reactivated in the [DATA] - [SHOW DATA] menu.

End of the function with **measured value memory store**.

⚠ **The charging component cannot be used to extend the recording.**

Input connection used:

[**COM**] Ground reference

[**S+**] The voltage input signal, mainly the total voltage of the battery

[**S-**] The voltage input signal, mainly the output voltage of a current clamp.

⚠ **The measurement of the total voltage of a battery may only be carried out in fused networks / connections!**

⚠ **Danger! Please only use a current clamp! Short-circuit danger exists by incorrect connection when employing a shunt. The inputs are not galvanically isolated!**

All interval programs are limited to the acceptance of 16000 measured values. This limitation has been made in order to guarantee perfect processing of the measured values with the system software.

7 The DATA MENU

These functions contain the sub-menus for handling and further processing of gained measured values.

<DATA>

SHOW DATA
EXPORT (CSV)
SHOW BATTERY-DEF.
CLEAR DATA
CLEAR BATT-DEF.
QUIT

7.1 SHOW DATA

Application: This function provides a high efficiency aid for subsequent viewing of stored programs.

With the call-up of this function a menu is opened which presents all stored programs on the display.

First you can scroll through all stored functions (Float, Discharge, …) with the ⬆- and ⬇-keys. **If you keep the arrow-key pressed for more than 2 seconds, the displaying will be accelerated**. If you want to take a detailed look at the measurements, please select the desired function by pressing the ✓-key.

With the ⏻-key, you can activate or inactivate a stored function.

Key Function <u>while displaying measured values</u>

Short push:

⬆ Go to the next entry.
⬇ Go to the previous entry.
⏻ Quit this routine.

Long push:

⬆ Go forward faster.
⬇ Go backward faster.
✓ Press the ✓-key until you hear a short signal. The instrument is now ready for measuring a new value. The ⏻-key will quit his routine without storing a new value.

7.2 SHOW BATTERY DEFINITION

Application: This function is used for viewing a transferred battery database.

Use the arrow keys to scroll through the database. If you want to assign an RFID tag to a battery, push the ✓-button until „----- () -----„ is shown on the display. Now hold a *World Tag Unique* at a distance of 1-2cm over the display. The RTS reads the tag and assigns it to the selected battery. For a battery with assigned tag, the label "RF" is displayed.

7.3 CLEAR DATA

Application: This function is used to completely delete all stored measurements.

7.4 CLEAR BATTERY DEFINITION

Application: This function is used to completely delete all stored battery definitions.

8 SETTINGS

Under this menu item you enter the following submenus.

<EINSTELLUNGEN>

SYSTEM
MEASUREMENT
BT-SETTINGS
CSV-EXPORT
FACTORY ONLY
QUIT

8.1 SYSTEM

8.1.1 SET TIME & DATE

Application: This function is used to set the current time and date.

8.1.2 SELECT LANGUAGE

Application: This function can be used to set the desired language.

8.1.3 TEST TRANSPONDER

Application: This function is used to test the function of the RFID reader.

Keep a *WORLD-TAG-UNIQUE* transponder at a distance of 1-2cm over the display. The RTS shows the corresponding unique number of the transponder.

8.1.4 IR-DATA ON

Application: This function uses the integrated IrDA-interface as the standard for communication with the CS-Manager-software.

BT-communication with the PC is deactivated. This mode is displayed when the RTS is switched on: **V2.60IR** (firmware version and communication interface).

8.1.5 BT-DATA ON

Application: This function uses the integrated BT-interface as standard for communication with the CS-Manager-software.

IrDA-communication with the PC is deactivated. This mode is displayed when the RTS is switched on: **V2.60BT** (firmware version and communication interface).

8.2 MEASUREMENT

8.2.1 POLARITY ON

Application: With this function, the polarity of the input signal is taken into account when recording the measured values.

This setting has an influence on the measured value recording during "Float" and "Charge/Discharge".

8.2.2 POLARITY OFF

Application: With this function, the polarity of the input signal is not taken into account when recording the measured values.

This setting has an influence on the measured value recording during "Float" and "Charge/Discharge".
All recorded values are positive (absolute values).

8.3 BT-SETTINGS

8.3.1 LINK COMPUTER

Application: Make a Bluetooth connection to a computer.

The RTS support Bluetooth 5.1 as an option.

The TMC-2001RTS will only be visible for other Bluetooth devices by selecting this function. To connect the TMC-2001RTS to a PC, please proceed as follows:

- Start the "Add bluetooth device" function on your PC. This function is located in the respective Bluetooth menu.
- Select the "LINK COMPUTER" function on the RTS. The message "BT connection: wait for PC" appears.
- On the PC, the TMC-2001RTS should be visible after a reasonable time (displayed)
- Select the TMC-2001RTS to pair.
- A 6-digit number is now displayed on the RTS and on the PC.
- If the numbers are the same, press the  key quickly.
- Confirm the correctness of the displayed digits on the PC.
- After successful coupling, press again a key to return to the higher-level menu.

The TMC-2001RTS is now paired to this PC for data transmissions with the management software.

Always select **the COM port for outgoing connections** on the PC when using the CS-Manager software.

The TMC-2001RTS can always be reached for a data transfer as long as it is in a main menu.

8.3.2 REMOVE PAIRINGS

Application: This function removes all paired Bluetooth connections.

Computer must be paired again.
Please also remove all old entries from previous RTS pairings in the PC.

9 Appendix

9.1 Firmware Update

The RTS can currently only be provided with a new firmware version at the factory.
As of version V2.40, a new calibration and storage procedure is used.
For this reason, an RTS also requires recalibration to upgrade to version V2.40.

From firmware version V2.40, the RTS can be programmed with an external program. Please download the CS-Update software from our website.

9.2 Charging and Transponders

9.2.1 Charging the TMC-2001RTS

Please connect the plug of the charging component to the corresponding connector of the measuring device. **Do not use force when plugging in the plug.**

Do only use our charging unit, never use a fixed voltage supply!

Now plug the accumulator charging component into the safety socket of the **AC mains**.

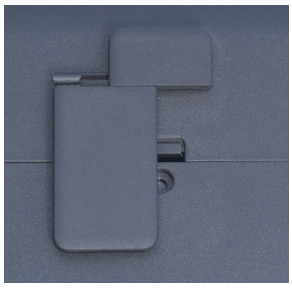
After charging has been carried out unplug the accumulator charging component from the mains. Subsequently, remove the plug of the accumulator charging component from the measuring device.

Complete charging takes approx. 3,5 hours.
The measuring device is ready for approx. 10 hours of operation when fully charged. Please turn the device on and off after charging, this resets the remaining power counter.

Please use only rechargeable NiMH batteries.

9.2.2 Remove batteries

The internal batteries are very easy to change. To do this, first remove the retaining clip. Slide the clip to the left out of the holder:



Now remove the battery cover. The unit has four AA sized batteries with a nominal voltage of 1.2V. **Please use only rechargeable NiMH batteries**. We recommend Ansmann maxE 2500mAh.Arrangement:

⚠ **Make sure that no test leads and no charger are connected!**

⚠ When connecting the charger, only NiMH batteries may be used.

9.2.3 Use of the RFID

The transponder function has different tasks depending on whether the management is switched on or off.

When the management is switched off, the transponder function is used to assign a tag to a measurement series (ONLY RFID ON). The unique tag number is then added in the CSV export.
When the management is switched on, this function only works if a battery bank has previously been transferred to the TMC.
Once you have selected a measurement function, you can use the "SELECT BATTERY" to navigate through the battery bank. You will notice that you will hear a constantly recurring beep at the first call. This is the sign of readiness of the TMC to read in a tag. Now hold a transponder tag 1-2cm over the display of the TMC. If the transponder tag is assigned to a battery record, the record is displayed and a tone is heard. If it is unknown, a lower beep sounds.

You can assign a transponder to an unused battery within the battery definitions at any time. To do this, hold down the  -button until a repeating beep sounds. Now you only need to hold the "new" transponder tag over the display of the RTS and wait for the acknowledgment tone. That's it. Please do not forget to transfer the newly assigned tags to the PC software. The menu point is MEASUREMENT SYSTEM-> TMC-2001 -> "Import new RF-IDs from TMC".

9.3 Frequently asked

How can I read out my data?

Make sure that the RTS is correctly paired with a PC.

The measured data can always be transferred to the PC-software, when the RTS is in one of the top-level menus.
To transfer a CSV-file, be sure the RTS is paired to a computer and you have selected this computer as the export target. Keep in mind, that the last paired PC is automatically set as the export target.

Can I measure a reading again?

Yes, during the measurement just press the -button.

You can also re-measure a stored reading. Select under DATA MENU->SHOW DATA the desired measurement series. The -button takes you quickly to the display of the individual measured values. Start with a long push of the -button the routine for a new reading.

Can I view the evaluation of a series again?

Yes, under DATA MENU->SHOW DATA you can move through the measurement series. If the desired measurement series is displayed, simply press the -button for a longer time. The evaluation is displayed again.

Which COM port should I use in the TMC Manager software?

The RTS communicates via a Bluetooth connection, which is initiated by the PC. Accordingly, you must use the "**COM port for outgoing connections**" in the CS-Manager software. On the computer are usually always both ports shown, one for incoming and one for outgoing connections.

The RTS support Bluetooth 5.1 as an option.