

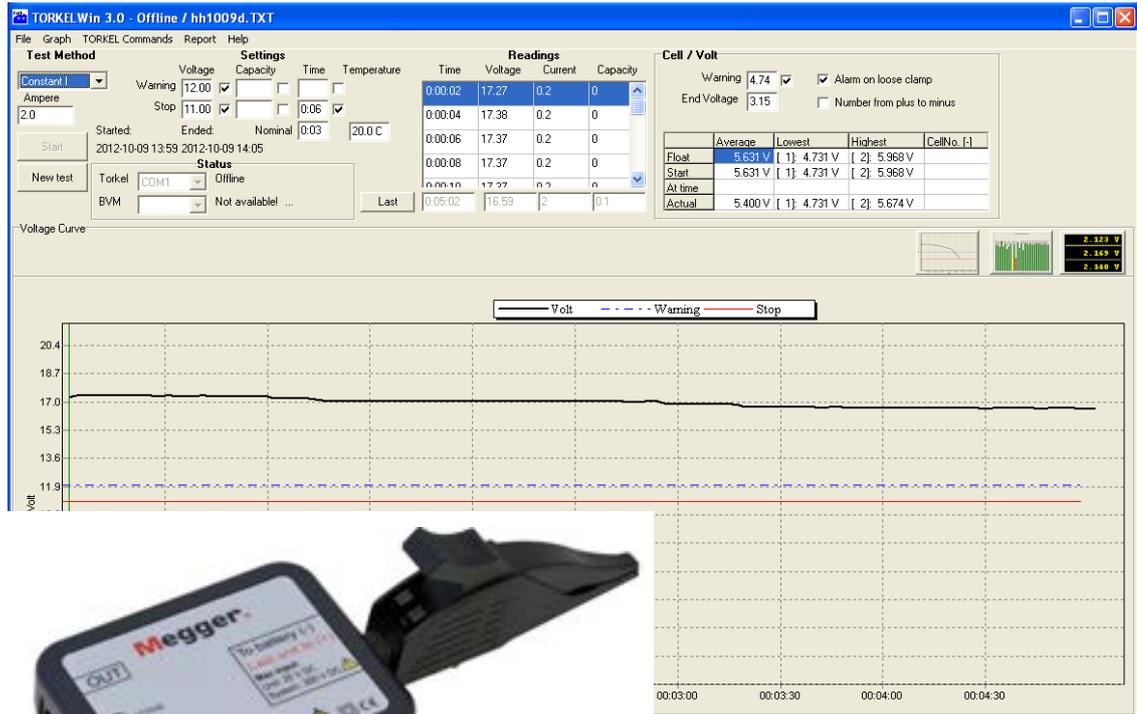
# TORKE Win

3.0

# BVM

PC software for TORKE 820/840/860  
Battery Voltage Monitor

# User's Manual



# Megger®



# **TORHEL Win BVM**

## **PC software for TORHEL 820/840/860 Battery Voltage Monitor**

# **User's Manual**

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# 1 Introduction

## **TORTEL Win**

The TORTEL Win program, which runs on a PC under Windows®, builds up a voltage curve on the screen in real time and displays the current, voltage and capacity readings. You can also use TORTEL Win to control TORTEL during the test. The program stores the results in a text file, and it can generate reports.

## **BVM - Battery Voltage Monitor**

The BVM (Battery Voltage Monitor) is a battery voltage measurement device that is used for the capacity testing of large, industrial battery banks commonly found in electrical power sub-stations, telecom facilities and computer data center UPS systems. In conjunction the TORTEL unit, and test data management software, such as PowerDB or TORTEL Win, the BVM enables a completely automated battery bank capacity test to be performed.

# 2 Safety

## 2.1 Symbols on the equipment



Caution, refer to accompanying documents.



Caution, risk of electric shock.



Hot, do not cover



Protective conductor terminal.



WEEE, Waste Electrical and Electronic Equipment. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

## 2.2 Safety instructions

### Read / Follow / Retain all instructions

- All safety and operating instructions must be read before using TORKEL.
- All safety and operating instructions for TORKEL must be followed.
- All safety and operating instructions must be retained for future reference.



### WARNING

1. The electrical voltage and current used in battery testing is potentially lethal. Ensure that the AC supply is isolated and any battery under test is disconnected before attempting any cleaning or maintenance of TORKEL.
2. Do not connect or disconnect any of the cables unless the circuit breaker F1 is in the lower (OFF) position.
3. Connection and disconnection procedures are extremely important. Be sure to follow the instructions faithfully.
4. Do not touch conducting parts of the clamps on the current cables or the voltage sensing cables when they are connected to TORKEL.
5. Explosion risk when using TORKEL and TXL (all models)
6. When a lead acid battery is charged or discharged i.e. when there is a current flow through the battery it is always a risk that the battery can explode. If there is a bad connection inside the battery and there is a current flow - the connection will burn off and there will be an arc, which will ignite the oxyhydrogen gas in the battery. For new open (vented) batteries the risk is medium to low but in old VRLA (sealed) batteries the risk is medium to high.
7. To minimize the risk for personnel injuries: Always place TORKEL/TXL as far away from the battery as possible - use long current cables and/or remote start/stop. Never stand close to a battery during charge/discharge.

- 
8. Too high discharge current applied on a battery can cause the battery to explode or get overheated. Be sure to not set too high current.

---

  9. If the external current measurement is interrupted or giving false values during the test, the current will rise to a higher level than the set value before the test is shut down. If the battery is too small for this current or in a bad condition - it may explode.

---

  10. Never use the TORKEL/TXL Extra Load in an explosive environment. Never put the TORKEL/TXL Extra Load where it can be reached by battery gas.

---

  11. Improperly connected cables carrying high current can cause fire. Make sure that the cables are not twisted in such a way that could cause them to turn and come loose from the connector.

---

  12. Position TORKEL/TXL Extra Load where air flow is unobstructed and where it does not come into contact with any flammable or heat-sensitive material. Keep a free distance of 1.5 m (5 ft) to the vertical sides of TORKEL/TXL and 2.0 m (6.5 ft) above TORKEL/TXL.

---

  13. Do not place TORKEL a) near another TORKEL, a TXL Extra Load or any other heat source or b) where the cooling airflow can be blocked. TORKEL will overheat if there is insufficient cooling.

---

  14. External current shunt may not be used above 300 V DC

---

  15. Do not use any other equipment other than what is provided or specified.

---



### Important

- 
1. When using the external current measurement function:
    - Check that the CT is connected in the right current direction.
    - Always replace the CT internal battery before a test.
    - Set the correct current ratio in the external current measurement menu.

---

  2. Do not use liquid detergents or aerosols when cleaning TORKEL or TXL units. Use a damp cloth.

---

  3. If TORKEL has been stored below freezing for an extended period of time, you must allow 3 hours for it to adapt to room temperature.

---

# 3 TORHEL Win

## 3.1 General

The TORHEL Win program builds up a voltage curve on the screen while the test is running and presents the current, voltage and capacity values in a scrollable table. The program can be run together with TORHEL and/or BVM.

TORHEL Win is delivered with every TORHEL. However a software key must be loaded into the TORHEL in order to make it able to communicate with TORHEL Win. This key can be purchased from Megger Sweden.

You can evaluate the program without the key since a file containing test data is included. Select "Files", "Open" and double-click "demo".

### TORHEL Win with TORHEL

With TORHEL Win you can control TORHEL during a test, print out a report and store the measured values in a text file, which can be imported easily into Microsoft® EXCEL

Because TORHEL always stores the total voltage curve during the test (one curve can be stored), you can also connect TORHEL to a PC after the test, transfer the voltage curve, examine it and store it as a file using TORHEL Win.

### TORHEL Win features

#### Displayed while test is running (or retrieved later from a file)

- Voltage curve  
6000 measurement values can be stored in TORHEL.
- Time, voltage, current and capacity in tabular form.

#### Commands that can be issued to TORHEL

- Set the test method
- Set the load (current, power or resistance)
- Set current or power profile
- Set warning and stop limits
- Start the test
- Pause the test
- Restart the test
- Reset the alarm
- Set current measurement

- Set sample rate

#### Reporting

- Fill in report
- Copy voltage curve to clipboard

#### Other commands

- Transfer voltage curve from TORHEL
- Load a new language into TORHEL

### TORHEL Win with BVM

The BVM "Auto Discovery" feature enables the TORHEL Win software to automatically determine the number of batteries under test and provide sequential identification of each BVM in the test string.

## 3.2 Installing TORKEL Win

### The TORKEL Win software package consists of

- One CD containing TORKEL Win
- One USB memory stick with software key
- Serial cable

### Requirements on your PC

- PC with Pentium processor
- Display with at least 640 x 480 pixels
- Windows 95/98/2000/NT/XP/7/8
- An unoccupied serial port to connect with TORKEL

If BVM is to be used also:

- An unoccupied USB port for the BVM system

### Installation

- 1] Insert the TORKEL Win CD.
- 2] The TORKEL Win setup program will start. Follow the wizard instructions which will guide you through the installation procedure.
- 3] If the setup program doesn't start automatically select the CD drive and run the TORKELWin setup.exe

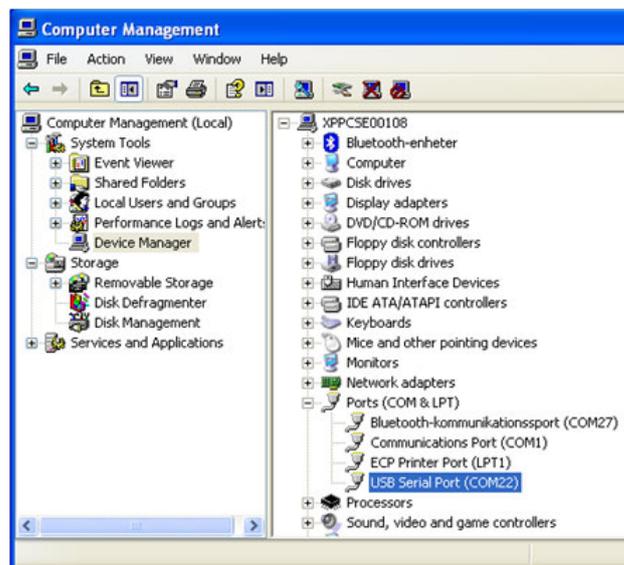
### Installation of driver for the USB serial port

#### For operative system Win XP

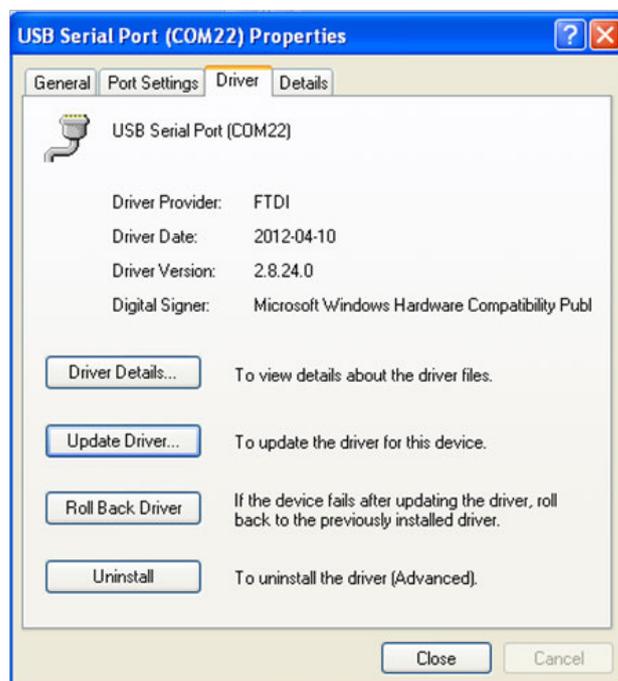
- 1] If the computer is connected to Internet go to the below link and choose the driver for the appropriate operative system.

If that's not possible the driver can also be loaded from the TORKEL Win CD.

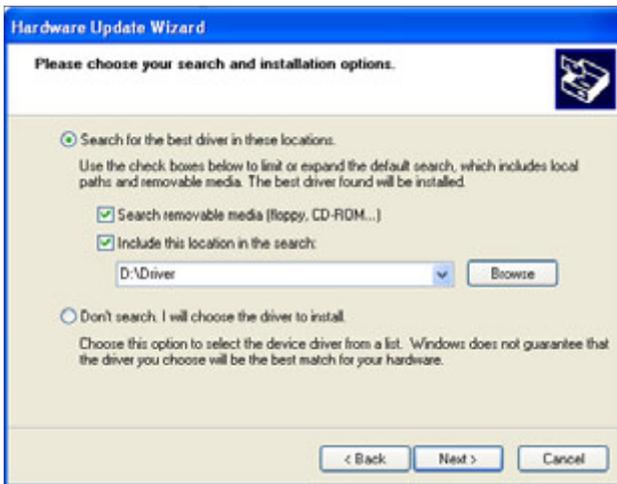
- 2] Insert the TORKEL Win CD into the computer.
- 3] Connect the USB connector from the Power and Signal Connector to the PC, see "4 BVM" on page 17
- 4] To update the USB driver go to the "Device Manager"  
The "Device Manager" can be opened from "My Computer" icon on the desktop.
- 5] Right click on the icon and choose "Manage" and after that choose "Device Manager".
- 6] Go to Ports (COM & LPT) and choose USB Serial Port (COMxx).



- 7] Select "Driver" on the drop down list and after that "Update Driver".



- 8] The Hardware Update Wizard opens up, choose "Yes, this time only" and "Install from a list, the following menu appears.



- 9] The update of the driver should be ready. Possibly you will be directed to restart the computer.

### For operative system Win 7

- 1] Insert the TORHEL Win CD into the computer
- 2] Connect the USB connector from the Power and Signal Connector to the PC, see "4 BVM" on page 17
- 3] Go to the control panel.
- 4] Click on "System and security" > "System" > "Device Manager".
- 5] If no driver loaded. Right click on the USB port that displays, "Unknown device" and a warning sign.
- 6] Or if you want to update the driver. Right click on the "USB Serial Port (COMx) line and choose "Update Driver Software"
- 7] Choose "Browse my computer for driver software"
- 8] Choose the directory for the TORHEL Win CD and "Driver" (Example: D:\Driver)
- 9] Click "Next".  
After this, the computer should install the appropriate driver from the TORHEL Win CD.

### For operative system Win 8

- 1] Insert the TORHEL Win CD into the computer
- 2] Connect the USB connector from the Power and Signal Connector to the PC, see "4 BVM" on page 17
- 3] Right click the "Computer" icon on the desktop.
- 4] Click on "Manage" and then "Device Manager".

- 5] Go to "Ports (COM & LPT)" and choose the port where the USB connector is connected to.
- 6] On the drop down list select "Driver" and click on "Update Driver".
- 7] Choose "Browse my computer for driver software"
- 8] Choose the directory for the TORHEL Win CD and "Driver" (Example: D:\Driver)
- 9] Click Next  
After this, the computer should install the appropriate driver from the TORHEL Win CD.

### Loading the software key

**Note** *If you purchase a TORHEL together with TORHEL Win the software key is already loaded.*

- 1] Connect the serial port on TORHEL to the serial port on the PC using a straight pin-to-pin cable.
- 2] Right click the "Computer" icon on the desktop.
- 3] Click on "Manage" and then "Device Manager".
- 4] Click on ports in the device manager.
- 5] Right click on the USB serial port.
- 6] Select "File" and click "Load Software key". Put the USB memory stick into the PC and instruct TORHEL Win to open the file with extension .key on the USB memory.

### Changing the language used in TORHEL

You can replace one of the languages in TORHEL with the contents in the language file.

**Note** *You do not need a software key for loading a new language into TORHEL.*

- 1] Connect the serial port on TORHEL to the serial port on the PC using a straight pin-to-pin cable.
- 2] Click on ports in the device manager.
- 3] Right click on the USB serial port.
- 4] Select "TORHEL Commands," and click "Load Language to TORHEL". Insert the TORHEL Win CD into your CD drive and instruct TORHEL Win to open the desired language file.

## 3.3 Testing with TORDEL and TORDEL Win

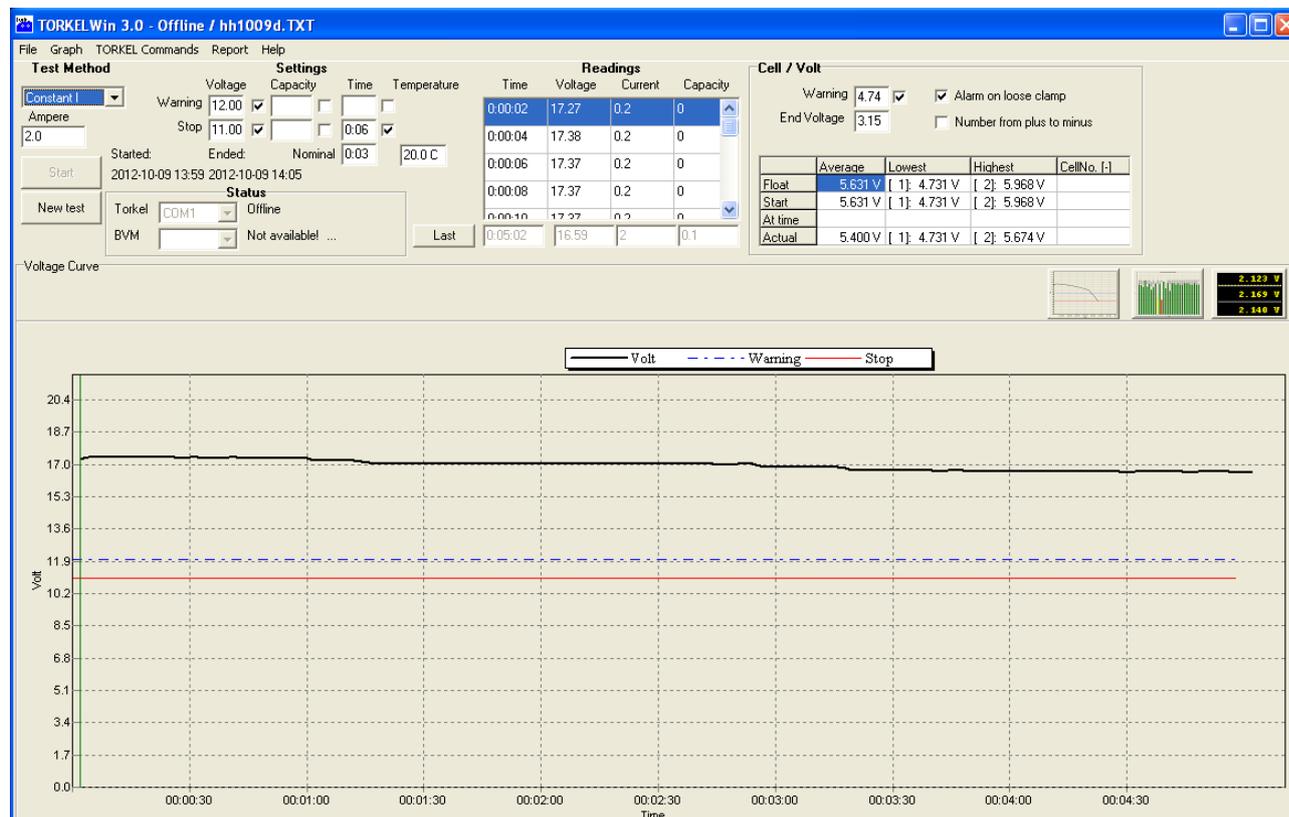
- 1] Proceed as set forth in the chapter "Conducting a test" in the TORDEL User manual

**Note** *F1 must be switched on before you start conducting test with TORDEL Win.*

- 2] Connect the serial port on TORDEL to the serial port on the PC using a straight pin-to-pin cable.
- 3] Start the TORDEL Win program.
- 4] In the "Status" field, select the desired COM port for TORDEL  
You may have to check port in the "Device Manager" (computer "Control Panel").
- 5] Deselect the COM port for BVM.
- 6] Switch on TORDEL.
- 7] Wait until TORDEL Win indicates "Online" in the "Status" field.
- 8] Select test method. Select current or power or resistance as desired. Set the desired warning limits
- 9] Click the "Start" button in TORDEL Win.
- 10] The test can be stopped manually by pressing "Stop" and then "End test".

11] "Do you want to save" is shown. Click "Yes" and two files will be created, one txt and one txt.bvm. This file will be empty when no BVM has been used.

12] When the test is ended you can create a report by selecting "Report" in the top menu, see "3.7 Reports" on page 15.



Voltage curve after completed test

### 3.4 Testing with TORDEL, TORDEL Win and BVM

1] Proceed as set forth in the chapter "Conducting a test" in the TORDEL User manual

**Note** *F1 must be switched on before you start conducting test with TORDEL Win.*

2] Connect the serial port on TORDEL to the serial port on the PC using a straight pin-to-pin cable.

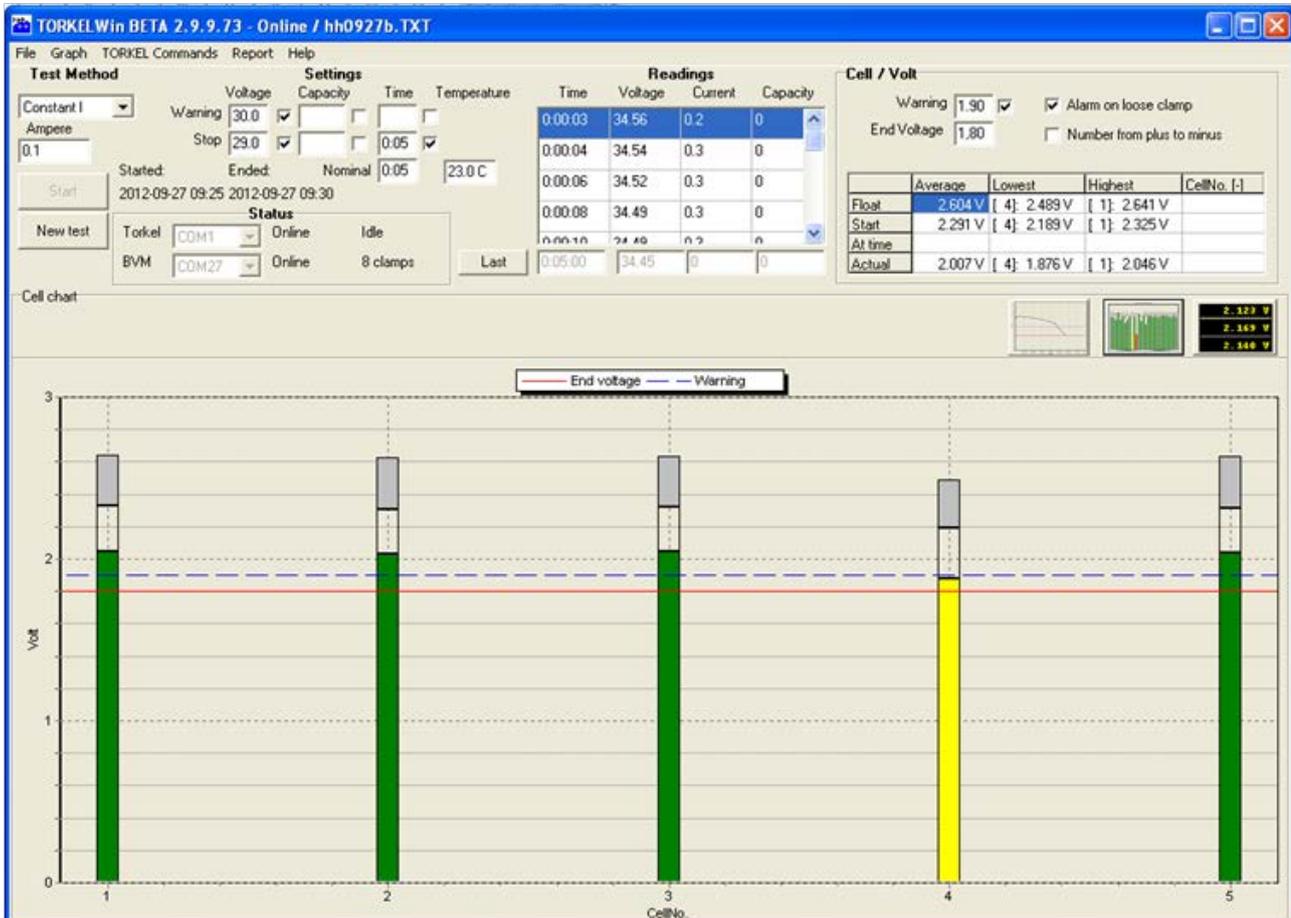
**Note** *If a BVM unit fails during a test it must be replaced. If you just remove it the cell numbering will be wrong.*

*If a BVM unit loose its battery cell contact, this cell and the previous cell in the chain will show 0V.*

3] Connect the BVM system as described in section "4.2 Test setup" on page 18. Keep battery charger connected to measure the float voltage.

**Note** *To get information of the connected BVM clamps. Go to "Help" and choose "BVM HW info" from the drop down list. A list in Excel format will be created showing the connected BVM clamps with: s/n, hw version and calibration dates.*

- 4] Start the TORDEL Win.
- 5] Set COM ports for TORDEL and for BVM in the "Status" field. You may have to check port in the "Device Manager" (computer "Control Panel").



Each cell is presented as a vertical bar during the test. Colours indicate if the cell voltage is above or below the set limits.

Settings				
	Voltage	Capacity	Time	Temperature
Warning	44.00 <input checked="" type="checkbox"/>	100.0 <input checked="" type="checkbox"/>	4:50 <input checked="" type="checkbox"/>	
Stop	43.20 <input checked="" type="checkbox"/>	105.0 <input checked="" type="checkbox"/>	5:00 <input checked="" type="checkbox"/>	
Ended:	Nominal	5:00	20.0 C	

Cell / Volt	
Warning	1.85 <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Alarm on
End Voltage	1.80 <input type="checkbox"/> Number f

Cell / Volt				
Warning Limit	5.50 <input type="checkbox"/>	<input checked="" type="checkbox"/> Alarm on loose clamp		
End Voltage	5.40	<input checked="" type="checkbox"/> Number from plus to minus		
	Average	Lowest	Highest	CellNo. 1-1
Float				
Start				
At time				
Actual				

**Note** See also connection diagram on "4.1 BVM Unit" on page 17

- 6] Wait for the BVM units to be initiated, that is when the cell bars appears on screen in the cell diagram view.
- 7] Wait until "Start" button is highlighted.
- 8] Disconnect the battery charger.
- 9] Click the "Start" button to activate the TORKEL discharge and the BVM measurement.
- 10] The test can be stopped manually by pressing "Stop" and then "End test".
- 11] "Do you want to save" is shown. Click "Yes" and two files will be created, one txt and one txt.bvm.
- 12] When the test is ended you can create a report by selecting "Report" or "Advanced Report" in the top menu, see "3.7 Reports" on page 15.

## Changing the BVM clamps numbering order

### Numbering from plus to minus

- 1] Checkbox is unmarked.  
The BVM clamp closest to the "Power and signal connector" is denoted No. 1.

### Numbering from minus to plus

- 1] Checkbox is marked.  
The BVM clamp furthest away from to the "Power and signal connector" is denoted No. 1.

## 3.5 Testing with TORHEL Win and BVM

**Note** *If a BVM unit fails during a test it must be replaced. If you just remove it the cell numbering will be wrong.*

*If a BVM unit loose its battery cell contact, this cell and the previous cell in the chain will show 0V.*

- 1] Connect the BVM system as described in section "4.2 Test setup" on page 18. Keep battery charger connected to measure the float voltage.

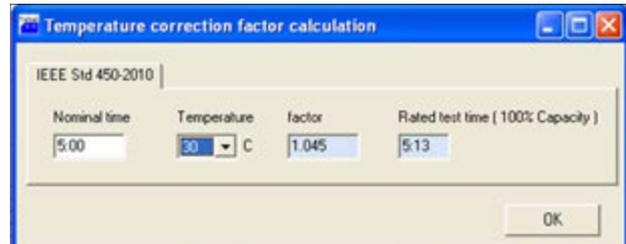
**Note** *To get information of the connected BVM clamps. Go to "Help" and choose "BVM hw info" from the drop down list. A list in Excel format will be created showing the connected BVM clamps with: s/n, hw version and calibration dates.*

- 2] Deselect the COM port for TORHEL.
- 3] Use the "Device Manager" (computer "Control Panel") to select the COM port for the USB BVM equipment.  
The "Start" button will be highlighted and you can start the test by clicking the "Start" button.
- 4] The test can be stopped manually by pressing "Stop" and then "End test".
- 5] "Do you want to save" is shown. Click "Yes" and two files will be created, one txt and one txt.bvm.
- 6] When the test is ended you can create a report by selecting "Report" or "Advanced Report" in the top menu, see "3.7 Reports" on page 15.

## 3.6 Temperature correction factor

### To set a corrected temperature factor

- 1] Go to "Help" and from the drop down list choose "Temperature correction factor". Temperature set to 25°C at initial start of test will not affect the test time.



The temperature corrected test time will be shown as a new "Nominal time" below "Settings". in the main menu.

## 3.7 Reports

There are two different reports to choose from, "Report" or "Advanced report".

# Test Report

**Company** Megger  
**Location** Täby

**Battery ID** LC-R064R5P

**Battery type** Panasonic  
**Tested by** Klas B

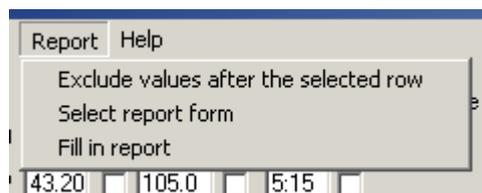
**Current** 2.3 A  
**Start Date** 2012-02-22  
**Start Time** 11:34:21  
**End Date** 2012-02-22  
**End Time** 12:56:05  
**Duration** 1:21:44  
**Nominal Duration** 1:20  
**End Voltage** 34.15 V  
**Capacity** 2.7 Ah  
**Temperature** 20.0 C

**Comments**

Report: Title and summary data

## Report

- 1] In the menu select "Report"



- 2] From the drop down list select report form. The report can be presented in three documents:
  - With the title and summary data
  - As a voltage / time diagram
  - In a table with measured values as values in percent of the whole test.
- 3] Select desired .rpt file and click "Open". The report form window will be closed.
- 4] Select "Report" and then "Fill in report". The report form is shown.
- 5] Fill in desired fields and click the "OK" button.

## To make your own report templates

- 1] In the file "report.rpt" you can design your own templates using the text editor e.g. Word pad. Instructions are in the file. The file is normally placed in the TORTEL Win directory.

## Advanced report

**Megger.** Battery monitor/discharge test

Your Company Logo

Location	Stockholm	Date	
Substation	Täby	Test report no.	

**Battery data**

Battery type	Battery model	
LC-R064R5P		
Battery ID	Nominal voltage	
LC-R064R5P		
Capacity rating	Number of cells/block	
Specific gravity range (kg/l)	Capacity rating	Nominal Time
		0:05
Commission date		
2012-09-27		

**Test data**

Instrument	Test method	Test method value	
	Constant I	0.1 Ampere	
Start time	End time	Duration	
2012-09-27 09:25:08	2012-09-27 09:30:37	0:05:00	
Start voltage	End voltage	Highest cell voltage	Lowest cell voltage
34.56	34.45	[1] 2.045V	[4] 1.876V
Measured capacity	End Current	Ambient temperature	Temp. compensated?
0	0	23.0 C	
Cells outside limits	Cell numbering: starting from		
-	Minus to plus		

**Comments**

Attached documents:

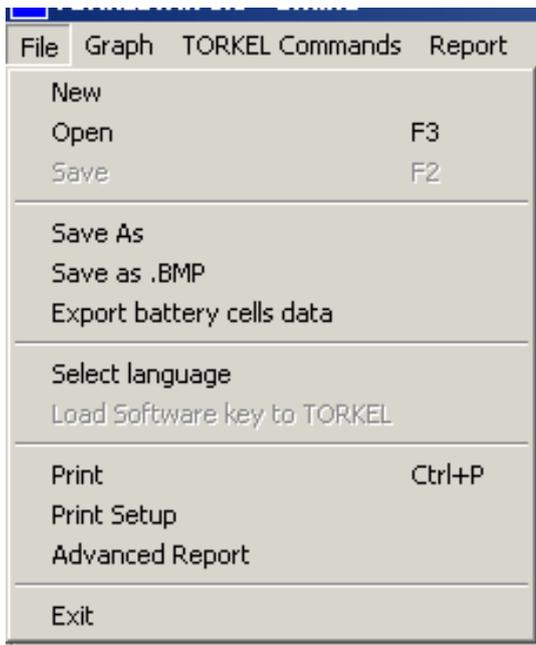
- Battery bank graph and compressed table of measurements
- BVM graph and compressed table of measurements

Tested by	Signature	Approved
Mikael Hagberg		

An example of the advanced report

**Note** To use the advanced report requires that MS Word 2003 or later is installed on your computer.

- 1] In the "File" menu select "Advanced report" from the drop down list.



- 2] Select one of the templates and click the "Generate" button.  
A report in Word format will be created.
- 3] To edit the test parameters to be used in the report, click the "Design" button.

### To show the parts or the whole test set of individual cell voltages

- 1] Select "Export battery cells data" from the drop down list in the "File" menu.
- 2] The file created can be further used for reports in Word or Excel.

### To examine the whole set of battery discharge data from TORKEL

A file with the test filename and extension TXT is created. This file is saved in the TORKEL Win library on the computer. It shows the time stamp, total voltage, current and capacity values for the whole test.

# 4 BVM

## 4.1 BVM Unit



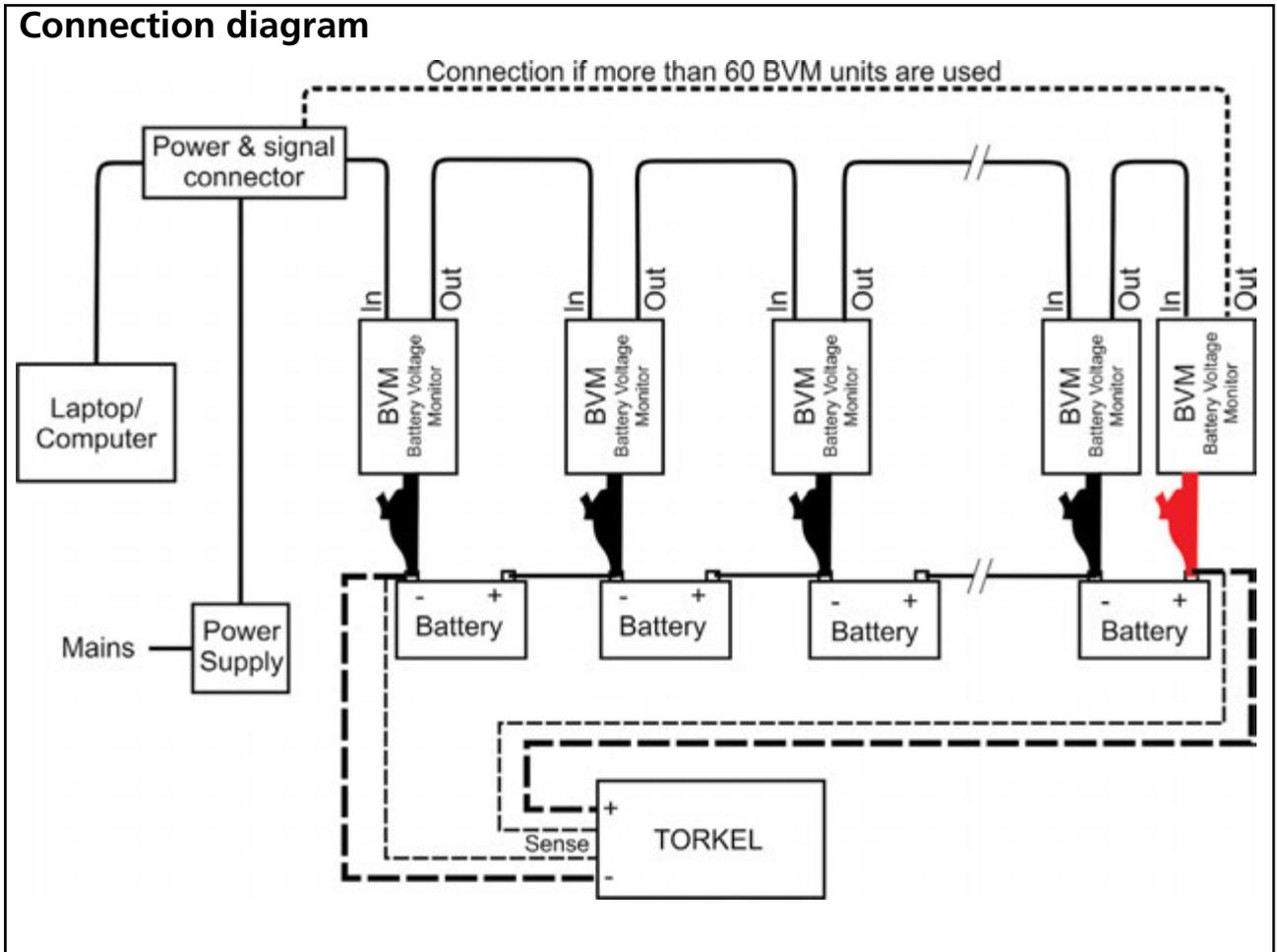
cell and each unit can handle up to 20 V. The BVMs connects to the batteries in a “daisy-chain” fashion, thereby providing easy and economical expandability to meet the testing requirements for small-to-large battery bank systems. Up to 120 BVMs can be daisy-chained in a single battery bank under test.

The included dolphin-style battery clamp can be easily removed and exchanged with different styles of standard banana plug clamps and/or extension cables to accommodate any battery connection requirement.

There is an Activity LED on the BVM that flashes whenever an individual BVM transmits data back to the data acquisition host computer. This LED activity is useful for indicating that the device is functioning properly.

The BVM is designed in modular form where one BVM device is used for each battery or “jar” in the string to be tested. It measures the voltage for each battery

### Connection diagram



The BVM must always be connected from minus to plus.

The last dolphin clip in the chain (red) should be connected to the positive battery pole of the last battery in the bank.



The other parts of the BVM system: AC Adapter, Power and Signal Connector and cables.

### Power & signal connector unit

The BVM units require external 24 DC power and RS-485 data communications for operation. These functions are provided by a combination of an external DC power supply and a Power & signal connector unit". The Power & signal connector conversion is performed within a single moulded plug that connects directly to the laptop computer or other data acquisition device. The Power & signal connector has an RJ-45 connector that provides a connection to the first BVM unit in the chain, and this connection provides RS-485 data and power to all BVM units in the BVM string.

### Optional equipment

#### BVM Cal Kit

Calibration system for BVM units.

Instructions for calibration included with the BVM Cal Kit.



## 4.2 Test setup



### WARNING

See the chapter "Safety" for safety precautions.

Battery string voltage max 300 V.

- 1] Connect the BVM units as shown in the connection diagram, page 17. Each BVM is identical and can be connected in any battery test position. Up to 120 BVMs can be daisy-chained in a single battery bank under test.

### Note

The BVM must always be connected from minus to plus. The last dolphin clip in the chain (red) should be connected to the positive battery pole of the last battery in the bank. If more than 60 BVM units are connected an extra cable is needed. See connection diagram.



### Warning

A BVM control cable must never be connected directly to a computer network inlet.

- 2] Connect the Power & signal connector to a laptop computer or other data acquisition device.
- 3] Connect the Power Supply.



### Warning

Do not use any other Power Supply than the original delivered together with BVM.

- 4] Start TORTEL Win.

The BVM "Auto Discovery" feature enables the host device to automatically determine the number of batteries under test and provide sequential identification of each BVM in the test string.

## Specifications BVM

Specifications are valid at an ambient temperature of +25°C, (77°F). Specifications are subject to change without notice.

### Environment

<i>Application field</i>	The instrument is intended for use in medium-voltage substations and industrial environments. Altitude <2000 m (6500 ft) above sea level.
<i>Temperature</i>	
<i>Operating</i>	0°C to +50°C (32°F to +122°F)
<i>Storage &amp; transport</i>	-20°C to +70°C (-4°F to +158°F)
<i>Humidity</i>	5% – 95% RH, non-condensing

### CE-marking

<i>LVD</i>	2006/95/EC
<i>EMC</i>	2004/108/EC

### General

<i>Power supply</i>	
<i>Mains voltage</i>	100–240 V AC, 50/60 Hz
<i>Power consumption</i>	50 VA (max)
<i>Protection</i>	Over voltage, reverse voltage, voltage transients, ESD
<i>Dimensions</i>	
<i>BVM unit</i>	75 x 64 x 25 mm (3" x 2.5" x 1")
<i>Carrying case</i>	575 x 470 x 205 mm (22.6" x 18.5" x 8.1")
<i>Weight</i>	
<i>BVM unit</i>	0.07 kg (0.15 lbs)
<i>With accessories and carrying case</i>	BVM system of 31 units 8.8 kg (19 lbs) BVM system of 61 units 12.5 kg (27 lbs)

### Measurement section

<i>Maximum number of channels</i>	120
<i>Voltage ranges</i>	0-5 V DC and 0-20 V DC
<i>Resolution</i>	1 mV both ranges
<i>Inaccuracy</i>	< 0.1% of full scale ±0.01 VDC
<i>Battery string voltage</i>	300 V DC (max)
<i>Measurement input impedance</i>	1 MΩ

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- Battery Test Equipment
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- Insulation Resistance Test Equipment
- Line Testing Equipment
- Low Resistance Ohmmeters
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- Multimeters
- Oil Test Equipment
- Portable Appliance & Tool Testers
- Power Quality Instruments
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- Relay Test Equipment
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- STATES® Terminal Blocks & Test Switches
- Professional Hands-On Technical and Safety Training Programs

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