# TERMA BATTERY CELL TESTER – TBCT12

## FOR APPLICATIONS THAT REQUIRE METICULOUS ACCURACY AT LOWER CURRENTS THE TBCT12 PROVIDES A MAXIMUM CURRENT OF 12.5A.

## TBCT12 Key Features Description

### Self-Calibration Capability

Each channel in the system can self-calibrate the voltage measurement mechanism by utilizing a precision voltage reference in the device. This allows for automated voltage calibration on command without user intervention. Current calibration is done using a traditional calibration kit and requires user intervention to perform.

### Built-in Snapshot

Each channel has the capability of capturing quick snapshots of the output current and voltage to provide deep diagnostic capabilities of the battery cell. This snapshot is fully programmable and can be triggered automatically during the test run.

### Built-in Direct Current Internal Resistance (DCIR)

Each channel has the capability to perform a DCIR function automatically and provide the calculated results. A minimum pulse of 2msec is guaranteed.

## Built-in EIS

The system can also perform EIS to give detailed data on the state of health of the cell. This powerful Feature can be used without adding any additional external testing hardware. EIS specifications:

- Plug and play integration with TBCT, integration to cell tester workflows
- AC Output Current range: 10A (p-p)
- Frequency range: 1 mHz – 10 kHz
- Battery Impedance: 0.1 mΩ– 100 mΩ
- Fast measurement with multi-sine excitation
- Accuracy of impedance measurement < 1% (of measured values)
- Voltage input resolution (AC) <2 mV
- Voltage input resolution (DC) <0.5 mV
- Voltage measurement Accuracy (DC) <0.225 mV
- Cable impedance compensation

## Built-in Cyber-Security

- Operating system updates (Debian based for Embedded controller)
- Authentication Authorization for GUI
- Encrypted sensitive information:
- Security Related Telemetry
- Remote Connections
- User management
    - Configure user and passwords access
- Firewalling
- Accounts for different roles, Admin, Developer, Tester,
- Debug UART Protection
- Virus scanner installation and execution

## TBCT12 performance and feature levels

The TBCT12 model is available in three feature levels: Basic, Standard and Premium.

### Basic
- Covers all cycling testing scenarios
- High voltage and current accuracy
- EtherCAT and Ethernet
- Basic Snapshot per channel included
    - Voltage and current measurement per channel
    - Up to 4096 samples per snapshot per signal.
    - Fixed sampling rate of 10kHz
    - Voltage and current setpoints for triggering snapshot

### Standard
All Basic features plus:
- Minimum output voltage reduced to 650mV
- RS485 interface

### Premium
All Standard features plus:
- Minimum output voltage reduced to 250mV
- Full Snapshot per channel included
    - Voltage, current, temperature, analog-in and analog-out measurement per channel[1]
    - Up to 4096 samples per snapshot per signal.
    - Configurable sampling rate from 100Hz up to 100kHz
    - Voltage, current, temperature, analog-in and analog-out setpoints for triggering snapshot[2]
- Built in self-calibration, increasing the lifetime of the accuracy
- Cybersecurity package

[1] Available in Q2 2025
[2] Available in Q2 2025

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# TBCT12 key features

| | Basic | Standard | Premium |
|---|---|---|---|
| Max. Voltage Per Channel | Up to 10VDC | Up to 10VDC | Up to 10VDC |
| Voltage Accuracy | 1mV | 1mV | 1mV |
| Current Accuracy | 0.05% FS 12.5mA | 0.03% FS 7.5mA | 0.01% FS 2.5mA |
| Voltage Resolution | 150µV | 150µV | 150µV |
| Current Resolution | 300µA | 300µA | 300µA |
| EtherCAT | Yes | Yes | Yes |
| Ethernet | Yes | Yes | Yes |
| Cards Parallelization[3] | Yes | Yes | Yes |
| CC, CV, CP Modes | Yes | Yes | Yes |
| Remote Voltage Sense | Yes | Yes | Yes |
| Dynamic Profiles Mode | No | Yes | Yes |
| Thermistors Per Device | - | 32 | 64 |
| RS485 (Full Duplex) Per Device | - | 8 | 16 |
| Graphical User Interface and open API | Yes | Yes | Yes |
| Snapshot Per Channel | Basic | Basic | Full |
| Cyber Security Package | No | No | Yes |
| Self-Calibration Per Channel | No | No | Yes |
| DCIR Capability | Yes | Yes | Yes |
| EIS Capability[4] | No | No | Yes |

[3] same type of channels in the same device only
[4] Available not earlier than Q1/2025

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# Detailed Specifications

## Static Performance

| | | |
|---|---|---|
| Maximum Number of Channels Per Rack | Large Cabinet | 512 |
| | Small Cabinet | 256 |
| Number of Possible Parallel Channels (parallel only possible with channels in same device) | | 8 |
| Operation Modes | | CC, CV, CP |
| Max. Power per channel | | 125W |
| Current range | | ±12.5A |
| Voltage Range | | 0 - 10V |
| Efficiency | | Up to 95% |

## Measurement

| | | Basic | Standard | Premium |
|---|---|---|---|---|
| Current | Resolution | 300µA | 300µA | 300µA |
| | Accuracy | 12.5mA | 7.5mA | 2.5mA |
| Voltage | Resolution | 150µV | 150µV | 150µV |
| | Accuracy | 1mV | 1mV | 1mV |
| Temperature | Accuracy | 0.1°C | 0.1°C | 0.1°C |
| Data acquisition | EtherCAT | up to 1kHz | up to 1kHz | up to 1kHz |
| | Ethernet | up to 1kHz (bandwidth dependent) | up to 1kHz (bandwidth dependent) | up to 1kHz (bandwidth dependent) |

## Waveform Measurement Built-in Snapshot

| | |
|---|---|
| Digitizing Rate Range | 100 – 100KSamples/Sec |
| Default Digitizing Rate | 10 KSamples/Sec |
| Memory | 4096 samples |

## Dynamic Performance

| | |
|---|---|
| Current Rise/Fall Time (10-90%) | < 1.8msec |
| Time from Minus to Maximum Current | < 2.0msec |

## Safety

| | |
|---|---|
| Isolation AC Input | 1.0 kV AC Input to Chassis / 1.0 kV AC to DC Output |
| Isolation UUT Input | 1.0kV Channel to Chassis for all channels 150VDC isolation channel-to-channel for 12.5 channels in same channel group (channel groups are channels: 1-8, 9-16, 17-24, 25-32, 33-40, 41-48, 49-56, 57-64). 500VDC isolation between channels of different groups |
| Safety Interlocks | Emergency Stop, External User Input |
| Internal Protection | Over- Current (OC) Under-Voltage (UV) Over-Voltage (OV) Over-Power (OP) Over-Temperature |
| Programmable Safety | Over/Under- Current (OC/UC) Over/Under-Voltage (OV/UV) Over/Under-Power (OP/UP) Over-Temperature |

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