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OM

OPERATION MANUAL

# TH530 Series

Semiconductor Device Avalanche Energy Tester (UIS Tester). Covers installation, the front-panel interface, element and test-mode configuration, performance specifications and the remote control interfaces for the TH530-25100A/B and TH530-25200A/B mainframe models.

Techmize Electronic GmbH · Ismaning, Germany · an international subsidiary of Changzhou Tonghui Electronic Co., Ltd.

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# TH530 Series Operation Manual

## Semiconductor Device Avalanche Energy Tester (UIS Tester) — mainframe

This manual describes the installation, front-panel operation and remote control of the TH530 series avalanche energy tester. The TH530 performs single-pulse (EAS) and repetitive-pulse (EAR) unclamped inductive switching (UIS) avalanche testing on MOSFETs, IGBTs and diodes, to MIL-STD-750E methods 3470 and 3469, and supports repetitive-pulse-to-failure (RPF) destructive testing.

> NOTE — SCOPE OF THIS EDITION
>
> This manual covers the **TH530 mainframe** only — models TH530-25100A, TH530-25100B, TH530-25200A and TH530-25200B. The TH530-01 programmable inductive load box is an **optional accessory**, required only when no suitable external inductor is already available, and is documented in its own separate *TH530-01 Operation Manual* — the two units have independent specifications and independent remote command sets, so a customer who orders the mainframe alone is not supplied with load-box-specific chapters.


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*The TH530's remote command set is hierarchical SCPI syntax (DISPlay, FUNCtion, MMEMory, FETCh and SYSTem subsystems). Because of its size, the full command reference is issued as a separate companion document, TH530 Series Command Reference, in line with Techmize's standard practice for command sets of this size; Chapter 7 of this manual covers the syntax conventions and command-set structure only.*

CHAPTER 1

# Safety, Compliance & Warranty

## 1.1 About this manual

This is the operation manual for the Techmize TH530 series avalanche energy tester mainframe. Where this manual and the instrument itself appear to disagree, contact Techmize or your authorized distributor using the details in §1.9 before relying on the instrument for a measurement or sorting decision.

Techmize continually improves the performance, features and construction of its instruments; content, specifications and accessories described here are subject to change without notice.

> **WARNING — HIGH VOLTAGE AND HIGH CURRENT**
>
> The TH530 sources a rated drain/source voltage of up to **150 V** and switches a rated breakdown voltage (BVDSS) of up to **2500 V** and a peak current of up to **100 A** (TH530-25100 tier) or **200 A** (TH530-25200 tier) at the side-panel test terminals during an avalanche test. Never touch the test terminals, test fixture, device under test or the connected load inductor while a test is running or the **High Voltage** warning label's conditions apply. Only qualified personnel familiar with high-voltage/high-current test practice should operate this instrument.

## 1.2 Safety symbols used in this manual

The following symbols and signal words appear in this manual and on the instrument itself:

**WARNING** — a hazard that, if not avoided, could result in personal injury or death.

**CAUTION** — a hazard that, if not avoided, could damage the instrument or the device under test, or invalidate a measurement.

**NOTE** — supplementary information that helps with correct or efficient use, but is not itself a hazard.

**Protective ground** — this terminal must be connected to protective earth.

## 1.3 General safety requirements

> **WARNING — GROUNDING**
>
> Connect the instrument only to an earthed three-wire outlet, using the supplied EU power cable. Never defeat the protective-earth connection.

| Power | |
|---|---|
| **Supply voltage** | 100–120 V AC or 200–240 V AC, selected by the rear-panel **LINE VOLTAGE RANGE** switch |
| **Supply frequency** | 50/60 Hz |
| **Maximum current** | 5 A |
| **Fuse** | Rated for the selected input voltage range — replace only with the type and rating specified on the instrument's rear-panel label |

> **CAUTION**
>
> Before connecting the AC power cable: confirm the power switch is off, confirm the rear-panel **LINE VOLTAGE RANGE** switch matches the available supply, and use only the power cable supplied with the instrument.

### Operating precautions

- **Do not power-cycle the instrument repeatedly.** Frequent on/off switching risks loss of stored data.
- **Keep ventilation openings clear.** The instrument draws cooling air in at the sides and exhausts at the rear; blocked ventilation raises internal temperature and degrades accuracy.
- **Avoid dust, vibration, direct sunlight and corrosive gases.** These degrade long-term accuracy and reliability.
- **Check all three device connections before each avalanche test.** The instrument performs a contact-resistance (Kelvin) check on the gate, drain and source connections before every test; a gate contact resistance above 50 Ω or a drain/source contact resistance above 15 Ω is reported as a contact-check failure (§4.1).

## 1.4 Environment

| Item | Requirement |
|---|---|
| **Operating temperature / humidity** | 0–40 °C, <90% RH |
| **Reference temperature / humidity** | 20 °C ± 8 °C, <80% RH |
| **Transport temperature / humidity** | 0–55 °C, <93% RH |
| **Storage (extended, in original packaging)** | 5–40 °C, ≤85% RH, away from corrosive gases and direct sunlight |

## 1.5 Prohibited and restricted actions

- Do not touch the test terminals, fixture, device under test or load inductor while a test is running.
- Do not disassemble the instrument, open the HANDLER interface board cover, or change its jumper settings without first switching off the instrument, disconnecting the power cable and allowing a few minutes for internal capacitors to discharge (§6.5).
- The side-panel **Side Panel** command interface (§4.6) can place hazardous voltage on the test terminals outside of a normal test sequence — only personnel trained on the TH530 should use it.

> NOTE — OPTIONAL INTERLOCK & AVALANCHE CONTROL
>
> The rear-panel **Interlock** connector and side-panel avalanche-clamp (“Avalanche Control”) circuit are factory-fitted options on certain model variants. Every unit ships with an interlock bypass plug fitted to the Interlock connector; removing it without connecting an external safety-interlock loop causes the front-panel **SW Interlock**/**HW Interlock** indicators to assert and halts all testing (§3.1, §3.4).

## 1.6 CE marking

The TH530 series carries the CE mark, as shown on the instrument's rear-panel nameplate.

## 1.7 WEEE — disposal of electrical and electronic equipment



This symbol, shown on the instrument's rear-panel nameplate, indicates that the instrument must not be disposed of as unsorted municipal waste at the end of its service life. Within the European Union, return the instrument to Techmize, your distributor, or a designated collection point for electrical and electronic equipment, in accordance with the WEEE Directive (2012/19/EU) and its national transposition in your country.

## 1.8 Warranty

Techmize warrants this instrument to be free from defects in material and workmanship for a period of **two (2) years** from the date of shipment. During the warranty period, Techmize will repair a product that proves defective, provided it has been used within the specified operating conditions. A warranty card is required to claim warranty service.

Repair must be carried out by qualified technical personnel; do not replace internal modules or components without authorization. Damage resulting from unauthorized repair or component replacement is not covered by the warranty, and the repair cost is borne by the user. After any repair, the instrument must be recalibrated before further use, to avoid affecting measurement accuracy.

> **NOTE**
>
> Protect the instrument from direct sunlight and humidity, and use it only within the environmental conditions of §1.4. For extended non-use, store the instrument sealed in its original factory packaging.

## 1.9 Manufacturer & EU contact

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**Registration**

Managing Director: Haohua Zhao
Register Court: Amtsgericht München
HRB 312530 · VAT ID DE463170824

CHAPTER 2

# Out of the Box

## 2.1 Unpacking

Inspect the shipping container for damage after unpacking; it is not recommended to power on the instrument if the container shows signs of damage. Check the contents against your order; if anything does not conform, notify Techmize or your distributor promptly.

| Item | Qty |
|---|---|
| **TH530 mainframe** | 1 |
| **EU power cable (Schuko, CEE 7/7)** | 1 |
| **Interlock bypass plug (fitted to the rear-panel Interlock connector)** | 1 |
| **This operation manual** | 1 |
| **Certificate of conformity & warranty card** | 1 each |

*Standard accessories match the TH530 Series Datasheet — only the EU power cable ships as standard. The TH530-01 programmable inductive load box, the TH26092B HANDLER cable, the TH530-A58 and TH530-A59 test cable sets and the TH530 manual test socket (§3.6) are **optional accessories**, ordered separately. This operation manual is supplied as a PDF document, not as a printed copy. Keep the original packaging for storage or return shipment (§1.8).*

## 2.2 Connecting the power supply

| Item | TH530 mainframe |
|---|---|
| **Supply** | 100–120 V AC or 200–240 V AC (set by rear-panel **LINE VOLTAGE RANGE** switch), 50/60 Hz |
| **Maximum current** | 5 A |
| **Dimensions (W×H×D)** | 350×122×425 mm |
| **Weight** | ≈50 kg |

Set the rear-panel **LINE VOLTAGE RANGE** switch to match the available supply, connect the EU power cable to the rear-panel IEC inlet, and confirm the instrument is reliably grounded (§1.3) before switching on.

> **WARNING**
> Make sure the protective-earth path is reliably grounded before connecting the power cable, to prevent electric shock from leakage current.

## 2.3 Starting the instrument for the first time

1. Connect the EU power cable to the rear-panel inlet, confirming the instrument is reliably grounded and the **LINE VOLTAGE RANGE** switch matches the supply.
2. Press the front-panel power switch. The instrument runs a power-on self-test on Port #1 (internal supply-voltage checks, §4.6), then opens on the main menu (§3.4).
3. From the main menu, open **Element Setup** to define the device parameters (§4.2), **Test Setup** to define how many packages/devices are connected (§4.3), and **Test Mode** to configure the test sequence (§4.4–4.5), before pressing **Trigger**.

> **NOTE — SETTINGS RETAINED AT POWER-OFF**
> The instrument retains the full element-setup, test-setup and test-mode configuration in use when it was last switched off, so it is not necessary to re-enter test parameters after a normal power cycle.

## 2.4 Connecting the device under test

The side panel provides two independent test ports, each with Gate Drive and Drain/Source connections, plus a shared Inductor Connections terminal pair (§3.3). Connect the device under test using the side-panel test terminals directly, the optional TH530 manual test socket (for TO-247 MOSFETs and diodes, §3.6), or a customer-built test fixture wired per §4.1.

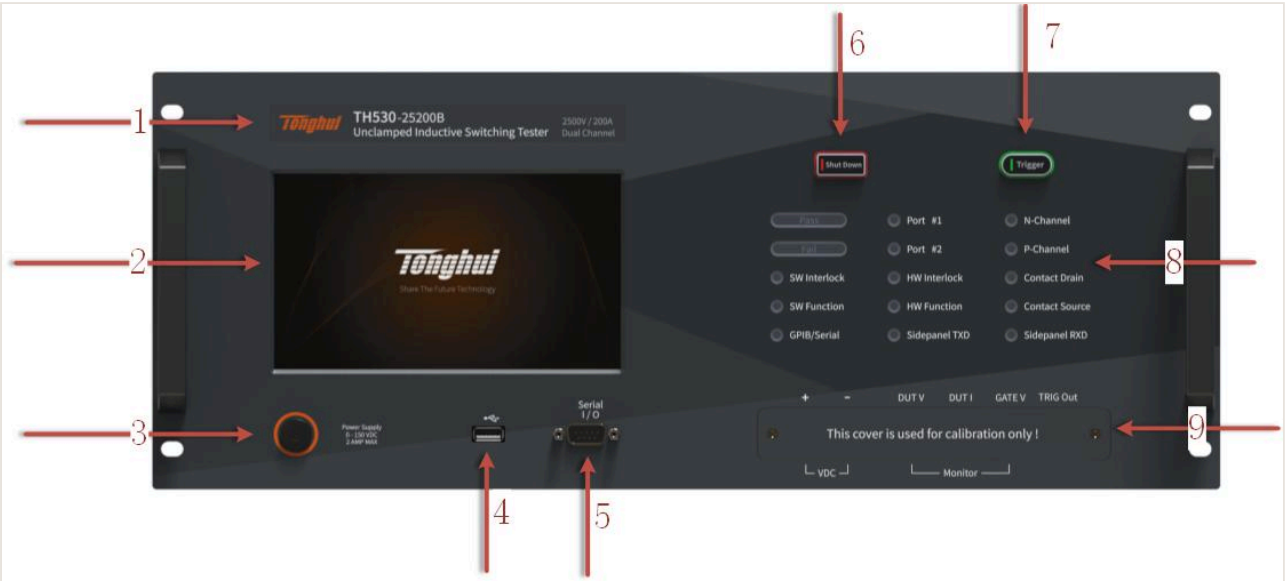
> **WARNING — HAZARDOUS VOLTAGE ON THE SIDE-PANEL CONNECTIONS**
> Do not touch the Gate Drive, Drain/Source or Inductor Connections terminals, the device under test, or the load inductor while a test is running — the side panel's own warning label states this explicitly. Disconnect or connect the device under test only while the instrument is idle (not running a test).

Testing TH530-25100B/TH530-25200B dual-port and higher-channel packages requires a load inductor on the Inductor Connections terminals: either the optional TH530-01 programmable inductive load box (0.01–159.9 mH, selected via the rear-panel Inductor Selector Control connector) or a suitable external inductor of fixed value.

CHAPTER 3

# Getting to Know the Instrument

## 3.1 Front panel




1 **Brand & model nameplate**

2 **7" LCD touchscreen** — displays all measurement parameters, status and results.

3 **Power switch** — pressed = on, released = off.

4 **USB (Host)** — for firmware updates from a USB flash drive (§7.8.3).

5 **Serial I/O (RS-232)** — data interface; SCPI command syntax, no MODBUS support.

6 **Shut Down** — stops the running test.

7 **Trigger** — starts a test (manual trigger mode).

8 **Status LEDs** — 15 LEDs in three columns; see §3.2.

9 **Calibration-only monitor panel** — behind the cover plate: VDC (source voltage), DUT V / DUT I (device drain-source voltage/current), GATE V (gate voltage), TRIG OUT (test trigger output), for connecting an oscilloscope (§7.8.1). For calibration use only.

## 3.2 Front-panel status LEDs

The 15 front-panel LEDs are arranged in three columns and indicate the state of the last test and of the instrument's interlocks and interfaces:

| Left column | Meaning |
|---|---|
| **Pass** | The last test (including self-test) passed |
| **Fail** | The last test (including self-test) failed |
| **SW Interlock** | Lit when the rear-panel safety-interlock loop is open; all testing is stopped |
| **SW Function** | Indicates clamp function enabled, leakage-check fault, peak-current-detect fault or destructive-test fail |
| **GPIB/Serial** | Activity on the GPIB or serial port |

| Middle column | Meaning |
|---|---|
| **Port #1 / Port #2** | Indicates the currently selected test port |
| **HW Interlock** | Lit when the rear-panel safety-interlock loop is open; all testing is stopped |
| **HW Function** | Lit at power-on, extinguished after the first test; thereafter lit only while the clamp function is enabled |
| **Sidepanel TXD** | The side panel is transmitting serial data |

| Right column | Meaning |
|---|---|
| **N-Channel / P-Channel** | Indicates the channel polarity enabled on the active port |
| **Contact Drain / Contact Source** | Drain / source contact-check passed |
| **Sidepanel RXD** | The side panel is receiving serial data |

## 3.3 Rear panel




**1** **Smart Box Interface** — accessory interface.

**2** **Interlock** — safety-interlock connector (§3.4).

**3** **AC power inlet** — three-wire IEC inlet (§1.3, §2.2).

**4** **Inductor Selector Control** — connects to the optional TH530-01 load box, to select inductance.

**5** **Control 15 Bins** — HANDLER output, 15-bin sorting signals (§6.5).

**6** **Control 4 Bins** — HANDLER output, 4-bin sorting signals (§6.5).

**7** **CANBus** — CAN communication interface.

**8** **LAN** — network remote-control interface (§6.2).

**9** **RS-232C** — serial remote-control interface; SCPI syntax, no MODBUS support (§6.2).

**10** **LINE VOLTAGE RANGE** — slide switch, selects 100–120 V / 200–240 V AC input (§1.3).

**11** **Parallel Port** — accessory interface.

**12** **GPIB** OPTIONAL — IEEE-488 general-purpose interface bus. Factory-fitted card option — shown unpopulated above; not fitted on every unit (§6.2).

**13** **Output Selector Link** — accessory interface.

## 3.4 Side panel & optional Interlock




The side panel provides two independent test ports (Port 1, Port 2), each with a Gate Drive connection pair and a Drain/Source connection pair, plus one shared Inductor Connections terminal pair (+/−). Use the tri-axial test cables supplied with the instrument, or the optional manual test socket (§3.6); do not touch these terminals, the device under test, or the load inductor while a test is running.

> **WARNING — HAZARDOUS VOLTAGE ON THESE CONNECTIONS**
>
> As labelled on the side panel itself: hazardous voltage is present on the Gate Drive, Drain/Source and Inductor Connections terminals during a test.

When the rear-panel **Interlock** connector (§3.3, item 2) is disconnected and no bypass plug is fitted, the front-panel **SW Interlock** and **HW Interlock** LEDs assert and all testing is stopped. Every unit ships with an interlock bypass plug fitted; if it is missing on receipt, fit it before testing (§1.5).

## 3.5 Main menu

After the power-on self-test (§4.6) completes, the touchscreen opens on the TH530 main menu, with six tiles:

| Tile | Function |
|---|---|
| **Element Setup** | Device and test-energy parameters for each defined element — drain voltage, peak current, BVDSS, gate voltages, energy/inductance, T1/T2 (§4.2) |
| **Test Setup** | Number of packages connected, test type (device/package/all), package editing (§4.3) |
| **Test Mode** | Test-sequence configuration across five sub-screens — start mode, destructive test, waveform capture, fault-determination method, optional clamp, fail-ratio stop (§4.4–4.5) |
| **Test Results** | Results and waveform of the most recently completed test, plus the derived T1/T2/collapse-voltage limits (§4.6) |
| **System Setup** | Display language (Chinese/English) and firmware update from USB (§7.8.3) |
| **Communication Setup** | Selects the active remote interface — RS-232, USB, LAN or GPIB (Chapter 6) |

> **NOTE — ENGLISH UI**
>
> Techmize ships the TH530 with its touchscreen UI set to English. The System Setup → Language toggle also offers Chinese for the China domestic market; European units are configured and shipped in English.

CHAPTER 4

# Operation & Configuration

## 4.1 Avalanche test concept

Before an avalanche test, the TH530 checks the contact resistance of all three device leads (gate, drain, source), then — if enabled — runs a pre-test leakage check at zero gate bias. If the device passes, the internal high-speed solid-state switch closes, applying the drain voltage (VDD) across the load inductor; the gate pulse generator then turns the device on through its series gate resistor. Drain current rises through the inductor until it reaches the user-set peak current, at which point the high-speed switch and gate both turn off together. The energy stored in the inductor then forces the device into avalanche breakdown, discharging through it over the measured avalanche time (T2). The resulting single-pulse avalanche energy is:

$$EAS = ½ \times L \times I_{pk}^{2}$$

where $I_{pk}$ is the peak drain current at turn-off and L is the selected load inductance. A longer-than-expected T2 time (low-impedance breakdown or other fault) is used by the instrument to flag a failure, reported through the front-panel LEDs, the HANDLER bins and the remote interfaces.

| Test type | Standard reference | Description |
|---|---|---|
| **Single-pulse UIS / EAS** | MIL-STD-750E method 3470 | One gate pulse per **Trigger** press; energy or peak current can be the controlled variable |
| **Repetitive-pulse EAR** | MIL-STD-750E method 3469 | 2 to 1,000,000 consecutive pulses at a set interval; last result shown, last three waveforms retained |
| **Repetitive-pulse-to-failure (RPF)** | — | Current or inductance increments automatically after each pulse until the device fails (destructive test, §4.4.1) |

## 4.2 Element Setup

Defines the device and test-energy parameters for one element; up to 10 internal and 10 external (GPIB-nameable) element specifications can be stored (§7.8.2).

| Parameter | Range / step | Notes |
|---|---|---|
| **Drain voltage** | 10–150 V, 1 V step | Charges the load inductor to the set peak current; polarity set by N-/P-channel selection |
| **Peak current** | 0.1–100 A (TH530-25100 tier) / 0.1–200 A (TH530-25200 tier), 0.1 A step | Combined with the selected inductance to compute the resulting energy |
| **Leakage voltage** | 2 V to (set drain voltage − 2) V | Used for the pre-/post-avalanche leakage check; >1.0 mA leakage current flags a fault, 8.0 mA maximum |
| **Rated voltage (BVDSS)** | 5–2500 V, 1 V step | Must be set correctly before testing — used to compute the expected avalanche (T2) time |
| **Gate turn-on voltage** | 2–28 V, 0.1 V step | Absolute value; positive for N-channel, negative for P-channel devices |
| **Gate turn-off voltage** | 0–28 V, 0.1 V step | Absolute value, opposite sign to turn-on. **Gate turn-on voltage + gate turn-off voltage must not exceed 30 V** — each has its own 28 V ceiling, and the two also share this combined limit |
| **Energy switch** | Enable / disable | Enabled: energy entered/shown in mJ. Disabled: inductance entered/shown in mH |
| **Energy** | 0–9999 mJ | Only shown when the energy switch is enabled; used with peak current to derive the required inductance |
| **Charge time (T1)** | 1–100,000 µs, 0.1 µs step | Auto-calculated from inductance and drain voltage, or entered manually (requires T1/T2 calculation disabled, §4.4.2) |
| **Multi-pulse** | Enable / disable | When enabled, outputs the pulse count set below on each trigger |
| **Leakage type** | Off / pre-test / post-test / both | Selects when the leakage check runs |
| **Inductance** | 0.01–159.9 mH | Only shown when the energy switch is disabled |
| **Discharge time (T2)** | 1–100,000 µs, 0.1 µs step | Maximum allowed time for peak drain current to fall to zero; auto-calculated or entered manually |
| **Pulse count** | 2–1,000,000 | Number of pulses output in multi-pulse mode |
| **Clamp mode, threshold voltage, avalanche voltage** | Threshold 10–500 V · avalanche-voltage limit 10–2500 V | Greyed out here — only editable from Test Mode 4, on units fitted with the optional avalanche-clamp (“Avalanche Control”) circuit (§4.5.4) |

## 4.3 Test Setup & Package Edit

Test Setup selects how many packages are connected and how they are tested; Package Edit (opened from Test Setup) assigns the connection and device type for each package.

| Test Setup field | Description |
|---|---|
| **Package count** | Number of packages connected to the instrument |
| **Test type** | Device (one device in the package) / Package (all devices in the package) / All (every connected package) — with destructive test enabled, only Device is selectable |
| **Select package / Select device** | Chooses which package, and (for multi-device packages) which device within it, to configure or test |
| **Package type** | Single / dual / triple / quad; IGBT, inverse IGBT, MOSFET or dual-diode types are additionally available with the optional RSF (HANDLER) accessory box connected |

| Package Edit field | Description |
|---|---|
| **Package / Device** | Selects which package, and which device inside a multi-device package, is being edited |
| **Package type** | As above |
| **Test port** | Assigns the package/device to side-panel Test Port 1 or Test Port 2 (§3.4) |

## 4.4 Test Mode 1 — start, destructive test & timing

| Parameter | Range / step | Notes |
|---|---|---|
| **Auto start** | Enable / disable | Enabled: accepts a start signal from the HANDLER. Disabled: only the front-panel **Trigger** key (or a remote command) can start a test |
| **Destructive test** | Disable / current / inductance | Steps peak current or inductance up automatically after each cycle until the device fails or a set limit is reached; requires auto start disabled |
| **Current increment / Inductance increment** | Model- and inductor-dependent | Step size used by destructive test |
| **Current limit / Inductance limit** | Model- and inductor-dependent | Maximum value destructive test will reach before stopping |
| **Device period** | 1–60,000 ms, 1.0 ms step | Delay before the next multi-pulse/destructive-test cycle, allowing the device to recover |
| **Relay period** | Model-dependent | Delay inserted whenever a relay (load-box or RSF box) switches |
| **Duty cycle** | 0.001–99.999%, 0.001% step | Alternative way of setting the inter-cycle delay for multi-pulse/destructive test |
| **Multiplex period** | 10–60,000 ms, 1 ms step | Period between test cycles when a multiplexer is connected |

## 4.4.1 Test Mode 2 — waveform, sorting & interface

| Parameter | Options | Notes |
|---|---|---|
| **Capture** | Enable / disable | Captures the voltage/current waveform; slows the test slightly. Disabling it also disables Collapse and Store |
| **Collapse** | Enable / disable | Flags a fault if the measured voltage swing on the device exceeds its maximum-voltage setting |
| **Store** | Disable / waveform / peak / DL | Waveform: last 4 waveforms in FIFO memory · Peak: last 2000 peak readings · DL: last 80 results |
| **Collapse voltage** | Waveform max / rated voltage | Reference used when analysing destructive-test maximum voltage |
| **Collapse ratio** | 5–90% | Accepted voltage-collapse percentage for a pass |
| **T2 delay ratio** | 0–75% | Delay, as a percentage of T2, before the destructive-test voltage analysis window starts |
| **Sort type** | Level / pulse | HANDLER bin-output signal type — continuous level, or a 50 ms pulse |
| **Interface power** | Internal / external | Powers the HANDLER interface from the instrument's internal supply, or from an external supply |
| **Gate check** | Enable / disable | Gate contact-check test; enabling it permits gate resistance above 50 Ω |
| **Interface polarity** | High / low | Sets the active output level for HANDLER bin signals when Sort type is Level (§6.5) |
| **Open/short** | — | Verifies whether the device under test will be tested; requires Leakage type set to pre-test |
| **Inductor box** | — | Not user-modifiable on this model |

## 4.4.2 Test Mode 3 — calculation & fault determination

| Parameter | Options | Notes |
|---|---|---|
| **Calculation type** | Raw / corrected / ideal | Raw: includes circuit-loss compensation (no external inductor) · Corrected: measured value, including inductor/side-panel losses (no external inductor) · Ideal: pure ½LI² value, no compensation |
| **T1/T2 calculation** | Enable / disable | Enabled: T1/T2 recalculated automatically whenever an input changes. Disabled: T1/T2 must be entered manually in Element Setup |
| **First fail** | Stop / continue | Multi-device test: stop testing on the first device failure, or complete and report every device |
| **Avalanche (fault method)** | T2 time / VDS collapse | VDS collapse requires Capture enabled (§4.4.1) |
| **T1/T2 type** | Signal waveform / hardware comparator | Signal waveform requires Capture enabled |
| **Trigger mode** | T1 / T2 / start-stop / S/E | Defines the behaviour of the front-panel +5 V trigger-out signal |
| **T1 min. time / T2 min. time** | 1–100% / 0–100%, 1% step (defaults 5% / 1%) | Minimum allowed T1/T2 as a percentage of the set or calculated time, before a fault is flagged |
| **VDS min./max. ratio** | 10–100% / 100–1000%, 1% step (defaults 10% / 200%) | Acceptable measured peak voltage window, as a percentage of the rated voltage (BVDSS) |
| **Min/max ratio** | Disable / single point / all points | Mutually exclusive with VDS-collapse fault determination |
| **T1 type** | Original / strict / extended | Original: T1 = (calculated T1×2)+overhead · Strict: T1 = calculated T1×2 · Extended: uses 4× the calculated value for very short (<25 µs) T1 times |

## 4.5 Test Mode 4 & 5 — optional clamp and fail-ratio stop

Test Mode 4 is active only on units fitted with the optional avalanche-clamp ("Avalanche Control") circuit:

| Parameter | Range | Notes |
|---|---|---|
| **Clamp setup** | Enable / disable | Enabled: this page's settings override Element Setup's (greyed-out) clamp values for every test |
| **Clamp mode** | Off by default | The avalanche-voltage overvoltage limit itself is always active, to protect the instrument, regardless of this setting |
| **Threshold voltage** | 10–500 V | Lower limit the device's T2 avalanche voltage must clear; if not, the clamp circuit diverts the current away from the device |
| **Avalanche voltage** | 10–2500 V | Upper (overvoltage) limit for the clamp circuit; always enforced |
| **Sensor port 1 / port 2** | Local / remote | Selects local or remote sensing for each test port |

Test Mode 5 configures automatic test-sequence stop conditions and the high-speed-switch (HSS) delay:

| Parameter | Description |
|---|---|
| **Fail-ratio stop** | After the configured monitor count of tests, stops testing if the pass ratio falls below the configured fail-ratio limit (e.g. 100 tests monitored, 95% limit → stops if the pass rate drops below 95% over that window) |
| **Consecutive-fail limit** | Stops testing once this many consecutive failures occur |
| **HSS delay** | On/off — the delay between turning on the device's gate and turning on the high-speed switch |

## 4.6 Test Results & self-test

Test Results 1 shows the outcome of the most recently completed test, including peak current, Pass/Fail result, calculated vs. measured T1/T2, package/measurement type and the voltage/current waveform (up to the last 4 waveforms, viewable with **Previous**). Test Results 2 adds the derived T1/T2 and collapse-voltage limits actually applied (T1/T2 max/min time, collapse max/min voltage, collapse-voltage ratio), plus the test time, energy and inductance used.

From System Setup, **Utilities** gives access to **Internal Voltage** (checks the instrument's internal supply rails against specification, without removing the cover — used for self-test and preventive maintenance) and, beneath it, **Side Panel** (toggles individual side-panel function switches directly, for troubleshooting — restricted to personnel trained on the TH530, since it can place hazardous voltage on the test terminals, §1.5). A dedicated **Self-Test** screen repeats the power-on self-test on both ports (the power-on test itself checks only Port #1).

## 3.6 Optional manual test socket

An optional manual test fixture box is available, connected to the side-panel test terminals via test cables, for convenient manual testing of TO-247 MOSFETs and diodes.

CHAPTER 5

# Performance & Specifications

## 5.1 Model line & measurement specifications

| Model | Channels | Peak current |
|---|---|---|
| **TH530-25100A** | Single | 0.1–100 A |
| **TH530-25100B** | Dual | 0.1–100 A |
| **TH530-25200A** | Single | 0.1–200 A |
| **TH530-25200B** | Dual | 0.1–200 A |

| Parameter | Specification |
|---|---|
| **Output energy limit** | 1 mJ to (0.00495 × $V_{DD}^{2}$) mJ |
| **Load inductance range** | Set by the connected load inductor — 0.01–159.9 mH with the optional TH530-01 programmable load box, or per the external inductor used. The TH530-01 is optional, not bundled as standard |
| **Current sensor** | Hall-effect |
| **Drain voltage range** | 10–150 V, 1 V step (magnitude; polarity set by N-/P-channel selection) |
| **Rated voltage range (BVDSS)** | 5–2500 V, 1 V step |
| **Gate turn-on voltage range** | 2–28 V (N-/P-channel), 0.1 V step |
| **Gate turn-off voltage range** | 0–28 V, 0.1 V step. Gate turn-on + turn-off voltage sum must not exceed 30 V |
| **Pre-/post-avalanche leakage test voltage** | 2 V to (set drain voltage − 2) V |
| **Gate drive resistance** | 25 Ω (effective series value) |
| **Gate voltage accuracy** | ±0.5 V, over −28–+28 V |
| **Gate pulse time** | <1 ms |
| **Device types** | N-, P-channel or combined MOSFET, IGBT, diode |

*Parameters are entered from the front-panel touchscreen or remotely over GPIB/RS-232/LAN; the instrument refuses to start a test with any parameter out of range.*

## 5.2 Triggering, timing & accuracy

| Parameter | Specification |
|---|---|
| **Trigger modes** | Internal (continuous, multi-pulse/destructive test) · manual (front-panel **Trigger**) · external (remote command over RS-232C/LAN/GPIB) |
| **T1/T2 time setting range** | 1–100,000 µs, 1 µs step |
| **Test port** | Dual coaxial-cable connection, with contact-check capability |
| **Measurement speed** | Single-measurement time depends on inductance, current, energy (if energy switch enabled) and T1/T2 (if T1/T2 calculation enabled), on a µs timescale |
| **Waveform refresh rate** | Front-panel LCD: 100 ms, shown once the measurement completes, up to 4 waveforms stored · LAN-connected host display: 1 ms, real-time |
| **Basic accuracy** | 1% |

## 5.3 Test-signal monitoring accuracy

| Signal | Range | Accuracy |
|---|---|---|
| **Supply (drain) voltage** | 10–150 V, 1 V step | ±(1%×setting + 1 V) |
| **DUT voltage (DUTV)** | 5–2500 V, 1 V step | ±(1%×setting + 1 V) |
| **DUT current (DUTI)** | 0.1–200 A, 0.1 A step | ±(1%×setting + 0.1 A) |
| **Gate voltage (GATEV)** | 2–28 V, 0.1 V step | ±(1%×setting + 0.1 V) |
| **T1/T2 time** | 1–100,000 µs, 1 µs step | ±(1%×setting + 2 µs) |

## 5.4 Functions & storage

| Function | Description |
|---|---|
| **Signal monitoring** | Removable front-panel cover (§3.1, item 9) exposes VDC, DUT V, DUT I, GATE V and TRIG OUT test points for connecting an oscilloscope — calibration use only |
| **Test-specification storage** | 10 internal + 10 external (GPIB-nameable) element specifications |
| **Firmware update** | Via USB flash drive carrying a .sec update file, started from System Setup or the `SYST:update` remote command |
| **Setting retention** | The instrument reopens with the configuration in use when it was last powered off |

## 5.5 Current-monitor sampling coefficients

The following dimensionless scaling coefficients apply to the internal drain-voltage ($V_{DS}$) and drain-current ($I_P$) monitoring circuits, by measurement range:

| Monitored signal | Range | TH530-25100 | TH530-25200 |
|---|---|---|---|
| $V_{DS}$ | 5–80 V | 12.9 | |
| | **80.1–400 V** | 51.4 | |
| | **400.1–800 V** | 102.7 | |
| | **800.1–2500 V** | 202.3 | |
| $I_P$ | 0–10 A | 1.24 | 1.24 |
| | **10.1–40 A** | 4.55 | 4.55 |
| | **40.1 A–max.** | 11.15 | 22.3 |

PART II

# Remote Control

Covers the RS-232C, LAN and GPIB remote interfaces, the HANDLER sorting interface, and the TH530 SCPI command set.

CHAPTER 6

# Interfaces & Remote Control

The TH530 can be controlled remotely over RS-232C, LAN or GPIB — select the active interface from Communication Setup on the main menu (§3.5); only one interface is active at a time. All three use the same SCPI command set (Chapter 7).

| Interface | Connector | Notes |
|---|---|---|
| **RS-232C** | 9-pin D-sub (DB9), rear panel | 9600 bps, 8 data bits, no parity, 1 stop bit, ≤15 m cable · SCPI syntax — **MODBUS is not supported** |
| **LAN** | RJ45, rear panel | SCPI over a network socket connection |
| **GPIB** OPTIONAL | IEEE-488, rear panel | Factory-fitted card option, not standard on every unit (§3.3); SCPI syntax, ASCII data |

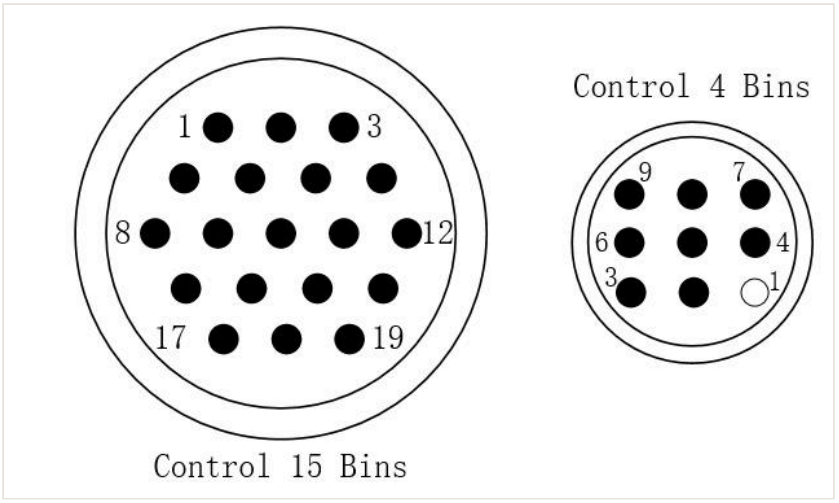
> **NOTE — NO MODBUS SUPPORT**
>
> The TH530's RS-232C, LAN and GPIB interfaces all use SCPI command syntax exclusively. The instrument does not support the MODBUS protocol on any interface.

## 6.1 Command debugging checklist

1. Become familiar with the SCPI command set (Chapter 7 and the companion Command Reference).
2. Check the instrument's baud rate, selected interface and cable connections.
3. Configure the host with matching settings, and confirm the correct port.
4. Send `*IDN?` — the instrument returns its model and ID, confirming communication is working. Check the character format and terminator used.
5. Switch to the relevant setup screen (if needed) before sending the matching setting command — Element Setup/Test Setup/Test Mode screens respond to `FUNC` commands; screen switching responds to `DISP` commands; `*IDN?` is valid in any state.

## 6.2 HANDLER sorting interface

The rear-panel HANDLER interface (§3.3) outputs the sorting result of each test for use in an automated handling/sorting system, using an isolated 5–20 V supply (internal +5 V, 3 W max., or an external supply selected from Test Mode 2). Two connector options are provided — **Control 15 Bins** and **Control 4 Bins** — selected by jumpers on the HANDLER interface board (§6.4); dual-channel models (TH530-25100B/25200B) default to both connectors active together, and Techmize recommends using the 15-bin connector on these models so that each port's results are reported on separate bins.




| Control 15 Bins — pin | Signal |
|---|---|
| 1 | Bin 5 — Port 1 pre-test leakage-check fault |
| 2 | +V supply (from HANDLER) |
| 3 | Test End |
| 4 | Bin 1 — contact-check fault, Port 1 |
| 5 | Bin 2 — peak-current-detect fault, Port 1 |
| 6 | Bin 3 — avalanche fail, Port 1 |
| 7 | Bin 4 — test pass |
| 8 | Test Start (Trigger input) |
| 9 | Common |
| 10 | Bin 6 — Port 1 post-test leakage-check fault |
| 11 | Bin 7 — avalanche fail, Port 2 |
| 12 | Bin 8 — peak-current-detect fault, Port 2 |
| 13 | Bin 9 — Port 2 post-test leakage-check fault |
| 14 | Bin 10 — Port 2 pre-test leakage-check fault |
| 15 | Bin 11 — contact-check fault, Port 2 |
| 16 | Bin 12 — Port 1 device turn-on failure |
| 17 | Bin 13 — Port 2 device turn-on failure |
| 18 | Bin 14 — Port 1 destructive-test fail |
| 19 | Bin 15 — Port 2 destructive-test fail |

| Control 4 Bins — pin | Signal |
|---|---|
| 1 | Not connected |
| 2 | +V supply (from HANDLER) |
| 3 | Test End |
| 4 | Bin 4 — test pass |
| 5 | Bin 1 — contact-check fault |
| 6 | Bin 2 — peak-current-detect fault |
| 7 | Bin 3 — avalanche fail |
| 8 | Test Start (Trigger input) |
| 9 | Common |

## Electrical characteristics

| Signal | Type | Low level | High level |
|---|---|---|---|
| **Bin outputs (all)** | Opto-isolated, open-emitter with pull-down resistor, active high | ≤0.5 V | Internal supply voltage, +5 V |
| **Test End** | Opto-isolated | ≤0.5 V | Internal supply voltage, +5 V |
| **Trigger input** | Opto-isolated; positive pulse, ≥1 ms, 1–5 mA (e.g. 1 kΩ series resistor at 5 V) | — | |

## HANDLER interface-board jumpers

> **WARNING**
>
> Switch off the instrument, disconnect the power cable, and allow a few minutes for internal capacitors to discharge before opening the chassis to change jumper settings.

Jumpers on the HANDLER interface board select 4-bin-only, 15-bin-only, or 4-bin/15-bin combined operation; dual-channel models (TH530-25100B/25200B) default to the combined setting.

## Using the HANDLER interface

1. Confirm the HANDLER cable connection.
2. In Test Mode 2, confirm whether Interface Power is enabled (internal supply) or disabled (external supply).
3. Set Sort Type (level or pulse).
4. Set Interface Polarity.
5. Proceed with testing — the HANDLER signals transfer automatically.

CHAPTER 7

# Command Reference

The TH530 command set is hierarchical SCPI, structured up to three levels, colon-separated. The full command set is issued as a separate companion document, *TH530 Series Command Reference*, in line with Techmize's standard practice for command sets of this size. This chapter covers the syntax conventions and command-set structure only.

## 7.1 Syntax conventions

| Convention | Meaning |
|---|---|
| **Character set** | ASCII only; commands are not case-sensitive |
| **Data format** | Integer or floating-point values, sent as ASCII numeric strings (shown as `<???>`); the unit is implicit and never written in the command |
| **Terminator** | Every command must end with a terminator (`NL^END`) — line feed, decimal 10 / hex 0x0A (LF or CR+LF accepted); a command with no terminator is not parsed |
| **Subsystem commands** | `DISPlay`, `FUNCtion`, `SYSTem`, `MMEMory`, `FETCh` — selected first, with each subsequent command level valid only once its parent is selected, separated by colons |

| Example | Function |
|---|---|
| `*IDN?` | Query instrument identification |
| `FUNC:DISP:PAGE?` | Query the currently displayed screen |
| `DISP:PAGEWAVE` | Switch to the waveform screen |
| `FUNC:SOUR:STEP1:DV?` | Query element 1's drain voltage |
| `FUNC:SOUR:STEP1:pki 20.1` | Set element 1's peak current to 20.1 A |
| `FUNC:STAR` | Start a test |
| `FETC?` | Query the test result |

## 7.2 Command-set overview

| Subsystem | Covers |
|---|---|
| `DISPlay` | Switches the active touchscreen page (18 named pages — main menu, element setup, test modes 1–5, waveform, etc.) and screen capture to USB |
| `FUNCtion:SOURce:STEPn` | The 15 Element Setup parameters per element (§4.2) — drain voltage, peak current, BVDSS, gate voltages, energy/inductance, T1/T2, etc. |
| `FUNCtion:MODE` | The Test Mode 1–5 parameters (§4.4–4.5) — around 40 settings covering start mode, destructive test, timing, waveform capture/storage, sort type/polarity, fault-determination method and the optional clamp |
| `FUNCtion:PACKage` | The Test Setup / Package Edit parameters (§4.3) |
| `MMEMory:STORe` / `MMEMory:LOAD` | Saves the current element setup to, or loads it from, one of 10 external specification slots |
| `FETCh?` | Retrieves the full test-result record, or an individual field (§4.6); 9 defined fault-type codes |
| `SYSTem:update` | Starts a firmware update from a USB-connected .sec file |
| `*IDN?` | Returns manufacturer, model and firmware version |

> **NOTE**
> For the full syntax, parameters, data ranges and worked examples for every command, see the companion *TH530 Series Command Reference*.

APPENDIX

# Model Comparison & Related Documents

## A.1 TH530 model comparison

| Item | TH530-25100A | TH530-25100B | TH530-25200A | TH530-25200B |
|---|---|---|---|---|
| **Channels** | Single | Dual | Single | Dual |
| **Peak current** | 0.1–100 A | | 0.1–200 A | |
| **Rated voltage (BVDSS)** | 5–2500 V | | | |
| **HANDLER connector** | 4 Bins or 15 Bins | | 4 Bins or 15 Bins (15-bin recommended) | |

*Remote control (RS-232C/LAN, SCPI syntax — see Chapter 7 and the companion Command Reference), the HANDLER sorting interface and the full element/test-mode configuration set are standard across every model, not a feature unique to any one model. GPIB and the avalanche-clamp ("Avalanche Control") circuit are factory-fitted options, independent of the single/dual-channel and 100 A/200 A distinctions above. Testing dual-channel and higher-current packages requires a load inductor — the optional TH530-01 programmable load box, or a suitable external inductor; it is not bundled as standard with any model.*

## A.2 Related documents

- TH530 Series Datasheet (Techmize) — full 4-model platform overview
- TH530 Series Command Reference (Techmize) — full remote-control SCPI command set, companion to this manual (Chapter 7)
- TH530-01 Operation Manual (Techmize) — covers the optional programmable inductive load box as a standalone unit, with its own specifications and command set

## A.3 Contacting Techmize

For technical support, accessories, calibration or service, contact Techmize directly or through your authorized Techmize distributor.

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