TECHMIZE by TONGHUI

OM

OPERATION MANUAL

# TH8400 Series

Covers the eight-model TH8400 series of programmable DC electronic loads, built on two chassis platforms: the compact/half-rack platform (TH8401, TH8402A, TH8402, TH8411, TH8412) and the full-rack platform (TH8403, TH8404, TH8405). Describes front/rear panel operation, all static and advanced test modes, system configuration, file management, protection functions, the HANDLER interface and remote-control communication.

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

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# TH8400 Series Operation Manual

## Programmable DC Electronic Load — TH8401 / TH8402A / TH8402 / TH8411 / TH8412 / TH8403 / TH8404 / TH8405


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*The full SCPI command tables are issued as a separate companion document, TH8400 Series SCPI Command Reference, in line with Techmize's standard practice for command sets of this size. Chapter 6 of this manual covers the remote interfaces and protocol overview only.*

CHAPTER 1

# Safety & Operating Conditions

## 1.1 About this manual

This manual covers the eight TH8400-series models, built on two chassis platforms:

- **Compact / half-rack platform** — TH8401, TH8402A, TH8402, TH8411, TH8412. Bench-top form factor with front-panel numeric keypad, adjustment knob and binding-post input terminals.
- **Full-rack platform** — TH8403, TH8404, TH8405. Full-rack, four-fan form factor with heavy-duty screw-terminal inputs.

Both platforms share the same control concept, menu structure, 4.3" colour TFT display, static and advanced test modes, and SCPI command language. Techmize continually improves the performance, features and construction of its instruments; content, specifications and accessories described here are subject to change without notice.

> **WARNING — HAZARDOUS VOLTAGE AND STORED ENERGY**
>
> A DC electronic load is connected directly across a live power source or a battery under test. TH8411/TH8412 operate at input voltages up to 500 V and TH8403/TH8404/TH8405 draw up to 240 A — both present a serious shock and arc-flash hazard. Never touch the input terminals, SENSE terminals or any connected test leads while a module is pulling current, and never exceed the instrument's rated input voltage or current (Chapter 7). Disconnect and discharge the device under test before connecting or disconnecting test leads, and disconnect the AC supply cord before opening the enclosure — there are no operator-serviceable parts inside.

## 1.2 Power connection

Before connecting the AC supply cord:

1. Confirm the local mains voltage and frequency are within the instrument's rated AC input range: 220 V AC (±10%), 50/60 Hz (±5%), <50 VA (Chapter 7).
2. Use the supplied EU power cable (Schuko, CEE 7/7); confirm the cable and plug are undamaged.
3. Connect the power cable to a properly earthed outlet. The protective-earth conductor must not be defeated or bypassed.
4. Connect test leads rated for the instrument's maximum input current and the expected short-circuit current of the device under test, before applying power to the device under test.

> **WARNING — INPUT TERMINAL RATING (COMPACT PLATFORM)**
>
> On the compact/half-rack platform, the front-panel input terminals accept both a bare lead secured under the binding post and a banana plug inserted in the centre pin. The banana-plug connection is rated to 20 A maximum. For any current above 20 A — including the full rated current of TH8402 (60 A) and TH8412 (30 A) — connect the test leads directly under the binding post, not through the banana-plug hole.

> **WARNING — ELECTRIC SHOCK**
>
> Always use a supply outlet with a protective earth contact. Never operate the instrument with the protective ground disconnected or with a two-wire (ungrounded) adapter.

## 1.3 Operating conditions

| Item | Requirement |
|---|---|
| **Operating temperature** | 0–40 °C |
| **Reference operating temperature** | 20 °C ± 8 °C |
| **Operating humidity** | <90% RH (<80% RH at reference conditions) |
| **Transport temperature** | 0–55 °C |
| **Transport humidity** | ≤93% RH |
| **Warm-up** | ≥20 minutes before relying on rated accuracy |
| **Safety class** | Class I (protective earth) |

Do not use the instrument in a dusty, vibrating, direct-sunlight or corrosive-gas environment. There are cooling vents on the rear (and side, on the compact platform) of the instrument; keep them clear at all times, and ensure the instrument has adequate airflow on all sides. Each platform uses intelligent fan control to reduce noise and conserve energy while keeping the power stage within its operating temperature.

## 1.4 Precautions

- Do not use the instrument if the enclosure, test leads or the supply cord shows signs of damage.
- Do not exceed the current rating of the test leads, any connected fixture, or the instrument's maximum input current and voltage.
- Do not modify the instrument, install replacement parts yourself, or attempt unauthorized internal repairs.
- Do not operate the instrument with any cover removed or loose.
- This instrument is not designed or certified for life-support or other safety-critical applications.
- Avoid frequent power-cycling, as this can risk loss of stored data.
- The instrument is designed to reduce AC-input noise interference, but should still be used in a low-noise environment; install a power-line filter if a noisy supply cannot be avoided.
- If the instrument will not be used for an extended period, store it in its original packaging at 5–40 °C, ≤85% RH, away from direct sunlight and corrosive gases.

> **CAUTION — WARM-UP**
> Allow at least **20 minutes** of warm-up after switch-on before relying on the instrument for a measurement or production decision.

## 1.5 Safety symbols

**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. Also printed next to the power-inlet ground terminal.

## 1.6 CE marking

The TH8400 series carries the CE mark, as shown on the instrument's rear-panel nameplate, confirming conformity with the applicable EU directives.

## 1.7 RoHS compliance

The TH8400 series complies with Directive 2011/65/EU (RoHS); supporting documentation is available from Techmize on request.

## 1.8 WEEE — disposal of electrical and electronic equipment



This symbol 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.

## 1.9 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 delivery to the original purchaser. During the warranty period, Techmize will repair or replace, at its discretion, a product that proves defective, provided it has been used within the specified operating conditions. A warranty card is required to claim warranty service.

This warranty does not cover damage from misuse, accident, unauthorized modification or repair, or damage from operation outside the environmental limits given in §1.3. Repair must be carried out by qualified technical personnel; after any repair, the instrument must be re-measured and re-calibrated to avoid affecting test accuracy.

## 1.10 Manufacturer & EU contact

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CHAPTER 2

# Overview

## 2.1 Model lineup

| Model | Voltage | Current | Power | Platform |
|---|---|---|---|---|
| **TH8401** | 0–15V / 0–150V | 0–3A / 0–30A | 175W | Compact / half-rack |
| **TH8402A** | 0–15V / 0–150V | 0–3A / 0–30A | 350W | Compact / half-rack |
| **TH8402** | 0–15V / 0–150V | 0–6A / 0–60A | 350W | Compact / half-rack |
| **TH8411** | 0–50V / 0–500V | 0–1.5A / 0–15A | 175W | Compact / half-rack |
| **TH8412** | 0–50V / 0–500V | 0–3A / 0–30A | 350W | Compact / half-rack |
| **TH8403** | 0–15V / 0–150V | 0–12A / 0–120A | 1000W | Full-rack |
| **TH8404** | 0–15V / 0–150V | 0–18A / 0–180A | 1500W | Full-rack |
| **TH8405** | 0–15V / 0–150V | 0–24A / 0–240A | 2000W | Full-rack |

## 2.2 Front panel — compact / half-rack platform

(TH8401, TH8402A, TH8402, TH8411, TH8412)

**USB port** — for a USB drive (file save/load, screen capture, firmware update) and front-panel communication accessories.

**Trademark & model** label, with the model's rated voltage/current/power.

**Display** — 4.3" colour TFT, 480 × 272, 24-bit colour.

**DISP** — opens the function display page (test-mode selection, §2.5).

**SETUP** — opens the system setup page (§3.13–3.17).

**SHORT** — short-circuit test shortcut (§4.4).

**LOCK/LOCAL** — locks the keypad and switches to remote control; also starts/stops USB data logging (§4.2).

Power switch — bottom-left of the front panel.

Left/right arrow keys — move the cursor or change page.

Adjustment knob — moves the cursor up/down and adjusts a value.

Numeric keypad — direct value entry.

**ON/OFF** — starts or stops the load pulling current.

**TRIG** — manual trigger for Dynamic, Timing and Auto modes.

**ENTER** — confirms a value; also triggers screen capture when a USB drive is locked.

Six softkeys — function follows the on-screen menu bar directly above each key.

**INPUT terminals (+/−)** and **SENSE terminals (+S/−S)** — see §1.2 and §3.13 (remote compensation).

## 2.3 Front panel — full-rack platform

(TH8403, TH8404, TH8405). The full-rack platform shares the same display, keypad layout, knob and softkey menu concept as the compact platform (§2.2), with two differences: the power switch is a rocker switch on the far left of the front panel, and the INPUT terminals are heavy-duty screw terminals sized for the higher rated current of these three models, rather than binding posts. SENSE terminals (+S/−S) are fitted above the INPUT terminals as on the compact platform.

## 2.4 Rear panel — compact / half-rack platform

| Item | Description |
|---|---|
| **Three-wire power inlet** | 220 V AC / 50 Hz mains connection |
| **I-MONITOR** | 0–10 V analog output proportional to the full-scale current of the active current range, for external oscilloscope monitoring. **Not fitted on TH8401.** |
| **HANDLER** | 9-pin automated-test interface (Chapter 5) |
| **RS-232C** | 9-pin serial communication interface (Chapter 6) |
| **Nameplate** | Model, serial number, rating/fuse label, CE mark |

## 2.5 Rear panel — full-rack platform

| Item | Description |
|---|---|
| **Four cooling fans** | Independent forced-air cooling for the higher-power stage |
| **Three-wire power inlet** | 220 V AC / 50 Hz mains connection |
| **I-MONITOR** | 0–10 V analog output proportional to the full-scale current of the active current range |
| **HANDLER** | 9-pin automated-test interface (Chapter 5) |
| **RS-232C** | 9-pin serial communication interface (Chapter 6) |
| **LAN** | Ethernet port for network-based remote control (Chapter 6) — fitted on the full-rack platform only |
| **Nameplate** | Model, serial number, rating/fuse label, CE mark |

## 2.6 Display layout

The display is divided into seven regions: a title bar showing the active page name; an information area showing live prompts or error messages; a working-mode indicator (shown in Static mode); three stacked measurement rows for voltage (U), current (I) and power (P), each with an optional peak/valley/peak-to-peak readout (Vp+/Vp−/Vpp etc., sampled at 500 kHz) alongside the main reading, selectable in Display Mode (§3.13); a status row showing the active voltage/current range, short-circuit state and internal temperature; and a softkey menu bar across the bottom, matching the six softkeys directly beneath it.

## 2.7 Function display pages (DISP)

Press DISP to open the function display page, then select a test mode from the softkey bar:

| Mode | Covered in |
|---|---|
| **Static (CC, CV, CR, CP)** | §3.1 |
| **Dynamic (DYN)** | §3.2 |
| **List (LIST)** | §3.3 |
| **CR-LED** | §3.4 |
| **Battery (BATT)** | §3.5 |
| **Time (TIMING)** | §3.6 |
| **Over-current protection test (OCPT)** | §3.7 |
| **Over-voltage protection test (OVPT)** | §3.8 |
| **Over-power protection test (OPPT)** | §3.9 |
| **Load Effect** | §3.10 |
| **Frequency sweep (SWP)** | §3.11 |
| **Automatic test (AUTO)** | §3.12 |

## 2.8 System setup pages (SETUP)

Press SETUP to open the system setup page, then select a function from the softkey bar: System (§3.13), Von/Voff (§3.14), Protect (§3.15), File Store (Chapter 4), and RS232 (§3.17, Chapter 6).

## 2.9 Basic operation

1. Press DISP and select the required test mode from the softkey bar.
2. Turn the adjustment knob to move the cursor to a setting field; enter a value from the numeric keypad or select an option from the softkey bar.
3. Press ON/OFF to start the load pulling current; press it again to stop.

On power-on, the display briefly shows the trademark, model and rated parameters before the measurement display appears. Allow at least 20 minutes of warm-up (§1.4) before relying on the instrument for a measurement or production decision.

CHAPTER 3

# Operation & Configuration

The TH8400 series offers 16 operating modes: four static modes (CC, CV, CR, CP) and twelve advanced modes. Each range (high/low) and numeric span depends on the installed model — see Chapter 7 for every model's exact ranges.

## 3.1 Static Mode

| Mode | Function | Key setup fields |
|---|---|---|
| **CC** | Holds a constant current regardless of the input voltage. | Working current, Rising slope, Falling slope, Voltage/Current range |
| **CV** | Regulates the input voltage to the set value by adjusting the pulled current. | Working voltage, Rising slope, Voltage/Current range |
| **CR** | Behaves as a fixed resistance: the load current changes linearly with the input voltage. | Working resistance, Voltage/Current range |
| **CP** | Holds a constant power: as input voltage rises, current is reduced to keep P = V×I constant. | Working power, Voltage/Current range |

Rising/falling slope sets the rate of change of the load current between 0 and the set value, in A/µs.

## 3.2 Dynamic Mode (DYN)

Dynamic mode switches the load current back and forth between two set values (A and B) to test a power supply's dynamic response. The current falls from level B to level A and is held for time A, then rises back to level B and is held for time B; this cycle repeats.

| Field | Description |
|---|---|
| **Set value A / Set value B** | The two current levels |
| **Time A / Time B** | Duration each level is held, 0.02 ms–60 s |
| **Rising slope / Falling slope** | Current change rate between the two levels |
| **Dynamic mode** | **Continuous** — switches continuously between A and B on the set timing. **Pulse** — each trigger moves the current from A to B for time B, then back to A. **Toggle** — each trigger moves the current from A to B; the next trigger moves it back to A. |
| **Repeat count** | Unlimited, or a user value from 1 to 65,535 cycles (continuous mode) |

## 3.3 List Mode (LIST)

List mode simulates a real load's current profile, or any complex load waveform, by stepping through a programmable sequence. Up to 10 files can be stored, each with up to 100 steps; every step sets a current value, a dwell time (20 µs–50 s) and a slope.

| Field | Description |
|---|---|
| **File** | Selects which of the 10 list files to edit or run |
| **Working mode** | **Continuous** — the load steps through the sequence repeatedly without stopping. **Counting** — each trigger runs the sequence once, repeated for the set count, then stops. **Single step** — each trigger advances the load by one step. |
| **Count** | Number of sequence repeats in continuous mode, 1–100 |

Within the file editor, steps can be added, inserted, deleted, copied and pasted using the softkey bar before confirming with Done.

## 3.4 CR-LED Mode

CR-LED simulates the true load characteristic of an LED driver, avoiding the oscillation that a conventional constant-resistance (CR) load can cause with an unstable LED power supply. The load is modelled as a series resistance Rd and voltage source Vf, equal to the tangent of the LED's real non-linear V–I curve at its operating point (Vo, Io).

| Field | Description |
|---|---|
| **Turn-on voltage (Vo)** | LED forward voltage at the forward operating current Io, taken from the LED datasheet's V–I curve. For a series string of n LEDs, set Vo to n times the single-LED value. |
| **Turn-on current (Io)** | Forward current at the operating point — the LED's rated output current |
| **Rd coefficient** | Ratio of the series equivalent resistance (Rd) to the LED load's total equivalent resistance (Vo/Io): Rd Coeff = Rd / (Vo/Io) |

## 3.5 Battery Test (BATT)

Battery mode discharges a battery under test in CC, CR or CP mode, and stops automatically once the selected stop condition is reached, displaying the elapsed discharge time and accumulated Ah/Wh capacity throughout.

| Field | Description |
|---|---|
| **Discharge mode** | CC, CR or CP |
| **Load value** | Current, resistance or power, matching the discharge mode |
| **Stop condition** | Voltage, time, discharged capacity (Ah) or discharged energy (Wh) |
| **Threshold** | Value of the selected stop condition |

## 3.6 Time Test (TIMING)

Time test measures the interval between a start trigger and an end trigger, with 0.1 ms accuracy over a 0–100,000 s range — for example, to time a battery's charge or discharge duration.

| Field | Description |
|---|---|
| **Working mode** | Load mode during the test: CC, CV, CR, CP or Off |
| **Start source / End source** | Voltage, current or an external trigger signal (HANDLER TRIG, §5.2) |
| **Start edge / End edge** | Rising or falling edge |
| **Start value / End value** | Trigger threshold, when the source is voltage or current |

## 3.7 Over-Current Protection Test (OCPT)

OCPT steps the load current upward from a starting value to a cut-off value, to verify the trigger point and behaviour of a power supply's own over-current protection. The load also captures the power, voltage and current at the maximum-power point reached during the test.

| Field | Description |
|---|---|
| **Starting current / Cut-off current** | Current span tested |
| **Steps** | Number of increments across the span, 1–1000 |
| **Dwell time** | Duration held at each current step |
| **Trigger level** | Voltage level that confirms the power supply's OCP has tripped |
| **Load lock** | Whether the load keeps pulling current after the test completes (open) or stops (closed) |

## 3.8 Over-Voltage Protection Test (OVPT)

OVPT captures the peak of the device under test's output voltage and its falling edge, triggering at a preset level (V-Trig) on that falling edge. The captured peak is the power supply's OVP trip point; the interval from the peak to the trigger moment is its OVP response time (Tovp), measured with 2 µs accuracy. Set the trigger level above the expected post-protection output voltage of the device under test.

## 3.9 Over-Power Protection Test (OPPT)

OPPT follows the same principle as OCPT (§3.7), stepping the load's drawn power upward instead of current, to verify a power supply's over-power protection trip point and behaviour.

## 3.10 Load Effect

Load Effect loads the device under test at three current levels — minimum (I-Min), normal (I-Normal) and maximum (I-Max) — each held for a preset delay, and records the resulting voltage at each level. The instrument then calculates and displays the voltage droop, source regulation and internal resistance:

| Term | Formula |
|---|---|
| **ΔV** | Vmax − Vmin, where Vmax = V@I-Min and Vmin = V@I-Max |
| **Internal resistance (Rs)** | ΔV / (I-Max − I-Min) |
| **Regulation** | ΔV / Vnormal, where Vnormal = V@I-Normal |

## 3.11 Frequency Sweep (SWP)

Frequency sweep captures a power supply's worst-case response by switching the load current between two levels while sweeping the switching frequency up to 25 kHz, to find the frequency at which the output voltage overshoots or droops the most.

| Field | Description |
|---|---|
| **Minimum current / Maximum current** | The two current levels |
| **Rising slope / Falling slope** | Current change rate between the two levels |
| **Start frequency / End frequency / Step frequency** | Sweep range and increment, 0.01 Hz–25 kHz |
| **Duration** | Time spent at each frequency point, 0.001–99.999 s |
| **Duty** | Proportion of the cycle spent at the maximum current level, 1–99% |
| **Work mode** | Auto (frequency advances automatically) or Manual (operator steps the frequency) |

During the test the load displays the peak overshoot voltage (Vp+) and valley voltage (Vp−) in real time, together with the frequency at which the overall maximum Vp+ and minimum Vp− occurred.

## 3.12 Automatic Test (AUTO)

Automatic test runs a multi-step, pass/fail test program for production-line inspection. Up to 10 files can be stored, each with up to 50 steps; each step sets its own load mode, parameters and acceptance limits.

### Setting up a program

1. Select the file to edit, and set its repeat count.
2. Open the file list, and use the knob to select the step to configure.
3. Select the step's load mode: CC, CV, CR or CP.
4. Enter the step's working value, rising/falling slope and voltage/current range.
5. Set the step's pass/fail condition: limit type (current, voltage or power), upper limit, lower limit, and the action on failure (continue to the next step, or end the test).
6. Set the delay before the next step: a fixed time, or wait for an external trigger (HANDLER TRIG, §5.2).
7. Repeat for every step, then confirm with Done.

Pressing **ON/OFF** runs the saved program; if the repeat count is greater than 1, the whole file repeats that many times. The display shows the failing step number, if any, once the program finishes. The HANDLER PASS/FAIL outputs (§5.2) report each step's result to external relay logic for automated sorting.

## 3.13 System Setup

Press SETUP, then System, to open System Setup.

| Field | Description |
|---|---|
| **Key sound** | On/off — audible feedback for front-panel key presses |
| **Remote compensation** | On/off — enables the +S/−S SENSE terminals, reducing the effect of test-lead voltage drop on the voltage reading in high-current applications. Requires two additional sense leads at the device under test, alongside the main input leads. |
| **Start-up parameters** | Factory parameters (loads default settings at every power-on) or User parameters (reloads the settings — or the checked file — active at the last power-off) |
| **Display mode** | Selects which readings appear in the measurement display: U,I,P with peak/valley/ripple values (sampled at 500 kHz); U,I,P only; or U,I,P,R (adds a resistance readout) |
| **Source under test** | CC (constant-current source) or CV (constant-voltage source) — tells the load what type of device it is testing; important for accurate CR and CP operation |
| **External analog** | On/off — enables the HANDLER VF/EXT-PROG port as a 0–10 V analog input that programs the load's voltage/current from 0 to full scale (§5.2) |

## 3.14 Load On/Off Voltage (Von/Voff)

Press SETUP, then Von/Voff. This sets the pull-in and drop-out thresholds used in CC mode.

| Field | Description |
|---|---|
| **Von (pull-in voltage)** | After pressing ON/OFF, the ON/OFF indicator flashes while the input voltage is below Von, and lights steadily once the input voltage exceeds it — only then does the load begin pulling current. |
| **Voff (drop-out voltage)** | While loading, if the input voltage falls below Voff, the load switches off and stops pulling current. |

## 3.15 Protection Setting (Protect)

Press SETUP, then Protect. The load monitors the input against user-configurable over-voltage, over-current and over-power thresholds, independent of any hardware range limit, and stops pulling current if a sampled value exceeds its threshold.

| Field | Description |
|---|---|
| **Over-voltage / Over-current / Over-power protection value** | **Default** — automatically tracks 1.05× the active range as the range is changed. **User** — a fixed value set by the operator, up to the maximum range. |
| **Turn-off delay** | Time the load keeps pulling current after a protection threshold is first exceeded, before actually stopping — filters out brief, unintended pulses. If the condition is still present when the delay expires, the load stops. |

## 3.16 Communication Setup (RS232)

Press SETUP, then RS232, to configure the serial-port parameters used for remote control (Chapter 6).

| Field | Options |
|---|---|
| **Baud rate** | 4800, 9600, 19200, 38400, 115200 bps |
| **Data bits** | 5, 6, 7, 8 |
| **Stop bits** | 1, 2 |
| **Parity** | None, odd, even, mark, space |

CHAPTER 4

# File Management & USB Functions

Press SETUP, then File Store, to save or recall the instrument's complete parameter configuration, or to log live measurement data. Fit a USB flash drive to the front-panel USB port for any of the USB-based functions below; the drive automatically gets three folders — STA, CSV and PIC.

## 4.1 Configuration files (.STA)

| Operation | Description |
|---|---|
| **Internal file save** | Saves the instrument's current parameters and configuration to internal memory under a chosen file name |
| **Internal file load** | Recalls a saved internal file into the active settings; if checked for autoload, it loads automatically at the next power-on (Start-up parameters = User, §3.13) |
| **Save to USB drive** | Copies a saved internal file to the USB drive's STA folder |
| **Load from USB drive** | Loads a .STA file from the USB drive's STA folder, replacing the instrument's active configuration |

## 4.2 Measurement data logging (.CSV)

With a USB drive fitted, press LOCK/LOCAL to put the keypad in Lock state, then press the left arrow key to start logging. In Automatic data-storage mode the instrument logs a sample every 3 s; in Manual mode, each press of the left arrow key logs one sample. Press the right arrow key to stop logging and write the file. Logged parameters: Volt, Curr, Pow, Vpp, Ipp, Ppp.

## 4.3 Screen capture (.GIF)

With a USB drive fitted and the keypad locked (LOCK/LOCAL), press ENTER to save the current screen as a GIF image to the USB drive's PIC folder. Each press of ENTER captures one additional image.

## 4.4 Short-circuit test

Press SHORT while the load is stopped to begin a short-circuit test: the instrument applies the maximum current of the active current range, independent of and without disturbing any other active test mode's settings. The SHORT and ON/OFF indicators both light while the test runs; press ON/OFF to stop it.

CHAPTER 5

# Protection & HANDLER Interface

## 5.1 Protection functions

The TH8400 series provides over-voltage (OVP), over-current (OCP) and over-power (OPP) protection, configured under Protect (§3.15). When a protection threshold is exceeded for longer than the configured turn-off delay, the load stops pulling current and the display shows the tripped condition.

## 5.2 HANDLER interface

The rear-panel HANDLER port is a 9-pin interface for integrating the load into an automated test system: it accepts an external ON/OFF and trigger signal, and outputs pass/fail results for automatic test sequencing.

| Pin | Signal | Function |
|---|---|---|
| 1 | DGND | Digital ground (earth / chassis / power ground) |
| 2 | ON | External ON/OFF control — equivalent to the front-panel ON/OFF key, low-pulse active |
| 3 | TRIG | External trigger — equivalent to the front-panel TRIG key, low-pulse active |
| 4 | AGND | Instrument internal (analog) ground |
| 5 | VF/EXT-PROG | Selectable function (§3.13): either an output indicating reverse input-polarity (VF), or a 0–10 V external analog programming input (EXT-PROG) — factory default is EXT-PROG |
| 6 | PASS2 | Success signal (Auto test) |
| 7 | PASS1 | Success signal (Auto test) |
| 8 | FAIL2 | Failure signal (Auto test) |
| 9 | FAIL1 | Failure signal (Auto test) |

### 5.2.1 ON

Equivalent to the front-panel ON/OFF key. On receiving a low-pulse signal, the load starts pulling current and the ON/OFF indicator lights; on the next low-pulse signal, the load stops and the indicator goes out.

### 5.2.2 TRIG

TRIG is shared by several functions, equivalent to the front-panel TRIG key (low-pulse active):

- **Dynamic mode** — advances Pulse or Toggle timing (§3.2).
- **Time test** — provides the external trigger when the start or end source is set to External (§3.6).
- **Automatic test** — advances to the next step when a step's delay type is set to Trigger (§3.12).

### 5.2.3 VF/EXT-PROG

- **VF** — outputs a signal when the load's input polarity is reversed.
- **EXT-PROG** — accepts a 0–10 V external analog input, programming the load's voltage and current from 0 to full scale. Enabled under External analog (§3.13).

### 5.2.4 PASS/FAIL

Connect PASS1/PASS2 and FAIL1/FAIL2 to an external relay interface. During Automatic test, the load outputs the corresponding PASS or FAIL signal for each step's result, for automated sorting or binning.

## 5.3 I-MONITOR output

I-MONITOR is a rear-panel 0–10 V analog output proportional to the full-scale current of the active current range, for monitoring the load current on an external oscilloscope. Fitted on all models except TH8401.

CHAPTER 6

# Remote Control & Communication Interface

The TH8400 series can be controlled remotely over RS-232C (all models) or LAN (TH8403/TH8404/TH8405 only), using the SCPI command language. SCPI is a standard capability across the TH8400 range, not exclusive to any one model. For the complete command list, syntax and examples, see the companion *TH8400 Series SCPI Command Reference*.

## 6.1 RS-232C

The rear-panel RS-232C interface uses a 9-pin D-sub connector and implements a minimal subset of the full RS-232 standard: transmit data (TXD, pin 3), receive data (RXD, pin 2) and signal ground (GND, pin 5) only — no hardware flow-control lines. When wiring a cable to a PC's 9-pin serial port, cross TXD/RXD between the two ends, and short pins 4&6 and pins 7&8 together at the PC connector.

Default communication format: full-duplex asynchronous, 8 data bits, 1 stop bit, no parity, 9600 bps, terminated with <NL> (line feed, ASCII 10); see §3.16 to change these settings. Communication uses a software handshake with character echo rather than hardware flow control — refer to the companion SCPI Command Reference for the full command-string protocol (termination, query/response timing, and handling multiple commands in one string).

## 6.2 LAN (TH8403 / TH8404 / TH8405 only)

The full-rack platform additionally provides a rear-panel LAN port for Ethernet-based remote control. Contact Techmize or your authorized distributor for network configuration details for your application.

## 6.3 SCPI command structure

Commands are organized as a tree, up to three levels deep, with colons separating each level; a trailing question mark executes the corresponding query. Commands and parameters may be abbreviated — the companion Command Reference gives each command's abbreviated form in capital letters. Common (IEEE 488.2) commands include `*IDN?` (reads the instrument identification string), `*RST` (resets the instrument) and `*TRG` (equivalent to the front-panel TRIG key).

CHAPTER 7

# Technical Specifications

Specifications are guaranteed for the operating conditions in §1.3, after the warm-up period in §1.4, unless noted otherwise. Specifications are subject to change without notice.

## 7.1 Compact / half-rack models

| Parameter | TH8401 | TH8402A | TH8402 | TH8411 | TH8412 |
|---|---|---|---|---|---|
| **Rated power** | 175W | 350W | 350W | 175W | 350W |
| **Voltage range** | 0–15V / 0–150V | | | 0–50V / 0–500V | |
| **Current range** | 0–3A / 0–30A | 0–3A / 0–30A | 0–6A / 0–60A | 0–1.5A / 0–15A | 0–3A / 0–30A |
| **Min. operating voltage** | 1.5V@30A | 1.2V@30A | 1.5V@60A | 1.8V@15A | 3V@30A |
| **Min. rise time** | 20 µs | | | | |
| **CV accuracy** | 0.05% + 0.05% FS (resolution 1mV / 10mV, low/high range) | | | | |
| **CC accuracy** | 0.05% + 0.05% FS (resolution 0.1mA / 1mA, low/high range) | | | | |
| **CR range** | 0.05Ω–50kΩ | 0.05Ω–50kΩ | 0.05Ω–25kΩ | 0.2Ω–50kΩ | 0.1Ω–50kΩ |
| **CR accuracy** | 1% (resolution 0.01Ω) | | | | |
| **CP range** | 0–175W | 0–350W | 0–350W | 0–175W | 0–350W |
| **CP accuracy** | 0.5% + 0.1% FS (resolution 10mW) | | | | |
| **Dynamic mode range** | 20 µs – 60 S, resolution 2 µs, accuracy 2 µs + 100 ppm | | | | |
| **Dynamic current slew rate** | 0.6A/ms–1.5A/µs | 0.6A/ms–1.5A/µs | 1.2A/ms–3A/µs | 0.3A/ms–0.75A/µs | 0.6A/ms–1.5A/µs |
| **V / I measurement accuracy** | 0.08% + 0.05% FS | | | | |
| **Ripple measurement** | Bandwidth 250kHz, accuracy 0.1% | | | | |
| **Dimensions (shelf / exterior)** | 215×88×390 mm / 236×111×454 mm | | | | |
| **Weight** | 3.0 kg | 4.8 kg | 4.8 kg | 3.0 kg | 4.8 kg |

## 7.2 Full-rack models

| Parameter | TH8403 | TH8404 | TH8405 |
|---|---|---|---|
| Rated power | 1000W | 1500W | 2000W |
| Voltage range | 0–15V / 0–150V | | |
| Current range | 0–12A / 0–120A | 0–18A / 0–180A | 0–24A / 0–240A |
| Min. operating voltage | 1.5V@120A | 1.5V@180A | 1.5V@240A |
| Min. rise time | 20 µs | | |
| CV accuracy | 0.05% + 0.05% FS (resolution 1mV / 10mV, low/high range) | | |
| CC accuracy | 0.05% + 0.05% FS (resolution 0.1mA / 1mA, low/high range) | | |
| CR range | 0.05Ω–50kΩ | 0.02Ω–50kΩ | 0.01Ω–25kΩ |
| CR accuracy | 1% (resolution 0.01Ω) | | |
| CP range | 0–1000W | 0–1500W | 0–2000W |
| CP accuracy | 0.5% + 0.1% FS (resolution 10mW) | | |
| Dynamic mode range | 20 µs – 60 S, resolution 2 µs, accuracy 2 µs + 100 ppm | | |
| Dynamic current slew rate | 2.4A/ms–6A/µs | 3.6A/ms–9A/µs | 4.8A/ms–12A/µs |
| V / I measurement accuracy | 0.08% + 0.05% FS | | |
| Ripple measurement | Bandwidth 250kHz, accuracy 0.1% | | |
| Dimensions (exterior) | 430×88×529 mm | | |
| Weight | 13.0 kg | 15.5 kg | 18.0 kg |

## 7.3 Common specifications

| Item | Specification |
|---|---|
| Protection functions | OVP, OCP, OPP (user-configurable thresholds, §3.15) |
| Display | 4.3" colour TFT, 480×272, 24-bit colour |
| ADC sampling rate | 500 kHz |
| Power supply | 220 V AC (±10%), 50/60 Hz (±5%), <50 VA |
| Operating temperature / humidity | 0–40 °C / <90% RH |

APPENDIX

# Packing, Warranty & Related Documents

## A.1 Standard & optional accessories

Each TH8400 unit ships with an EU power cable (Schuko, CEE 7/7). TH8401, TH8402A, TH8402, TH8411 and TH8412 additionally ship with one YT3008 test cable as standard; this is not supplied with TH8403, TH8404 or TH8405. This operation manual is issued in PDF only and is not included as a printed item.

| Optional accessory | Description |
|---|---|
| **TH26035D** | Test cable |
| **TH26035E** | Test cable |
| **TH26035K** | Test cable |
| **TH26035L** | Test cable |

## A.2 Transport & storage

Store the instrument in a dry, well-ventilated location at 5–40 °C and ≤85% RH, away from corrosive gases, for any extended period of non-use. During transport, protect the instrument from shock, vibration and moisture; use the original packaging wherever possible.

## A.3 Nameplate & markings

The rear-panel nameplate carries: the manufacturer's name/trademark, product name and model, serial number and date of manufacture, the supply-voltage and fuse rating, and the CE mark.

## A.4 Related documents

- TH8400 Series Datasheet (Techmize)
- TH8400 Series SCPI Command Reference (Techmize, companion to this manual)

## A.5 Contacting Techmize

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

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