# TH199X Series

## Precision Source/Measure Unit

A precision source/measure unit (SMU) family that combines a current source, voltage source, voltmeter and ammeter in one instrument, with any function switchable on the fly. The TH1991 series (single channel) and TH1992 series (dual channel) output up to ±210 V DC / ±3.03 A DC / ±10.5 A pulse, with resolution down to 10 fA / 100 nV, and can generate diode, BJT, MOSFET and IGBT I/V characteristic curves directly on the 7-inch touch screen — no PC required. Seven models let you match voltage/current range and resolution to the application, from R&D characterisation to production-line device sorting.

Bench: 250(W) × 154(H) × 530(D) mm · Rack-mount: 215(W) × 132(H) × 490(D) mm · ≈8.5 kg (1 ch) / 10 kg (2 ch)




- 7-inch capacitive touch screen (800×480), Linux-based UI
- Single/dual-channel four-quadrant precision output & measurement
- Up to **±210 V** DC voltage, **±3.03 A** DC current / **±10.5 A** pulse current
- **10 fA / 100 nV** minimum output & measurement resolution (6.5-digit)
- Five source/measure functions — V-source, I-source, voltmeter, ammeter, ohmmeter
- Up to **1,000,000** samples/second, minimum time interval 1 µs
- DC, pulse, sweep and list output; minimum pulse width 50 µs
- Built-in I/V curve testing for diodes, BJTs, MOSFETs & IGBTs — no PC required
- 2-wire / 4-wire (Kelvin) measurement; Delta low-resistance method
- 14-level sorting (Grading & Sorting); standard PC software for control & data acquisition

## Model line-up — 7 models, one platform

TH1991 series = single channel · TH1992 series = dual channel. Suffix letters versus the base model: A = 5.5-digit source resolution, pulse output retained; B = 5.5-digit source resolution, no pulse output; C = 5.5-digit source resolution, reduced ±63 V / ±1.515 A range, no pulse output.

| Parameter | TH1991C | TH1991B | TH1991A | TH1991 | TH1992B | TH1992A | TH1992 |
|---|---|---|---|---|---|---|---|
| **Channels** | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| **Max DC voltage** | ±63V | ±210V | ±210V | ±210V | ±210V | ±210V | ±210V |
| **Max DC current** | ±1.515A | ±3.03A | ±3.03A | ±3.03A | ±3.03A | ±3.03A | ±3.03A |
| **Max pulse current** | — | — | ±10.5A | ±10.5A | — | ±10.5A | ±10.5A |
| **Source digits** | 5.5 | 5.5 | 5.5 | 6.5 | 5.5 | 5.5 | 6.5 |
| **Source min. resolution (V / I)** | 1µV / 1pA | 1µV / 100fA | 1µV / 1pA | 100nV / 10fA | 1µV / 100fA | 1µV / 1pA | 100nV / 10fA |
| **Measurement digits** | 6.5 (all models) | | | | | | |
| **Meas. min. resolution (V / I)** | 100nV / 100fA | 100nV / 10fA | 100nV / 100fA | 100nV / 10fA | 100nV / 100fA | 100nV / 100fA | 100nV / 10fA |
| **Voltage range** | 200mV–60V | 200mV–200V | | | | | |
| **Min. time interval** | 50µs | 20µs | 10µs | 1µs | 20µs | 10µs | 1µs |
| **Power / weight** | 31.8 W · ≈8.5 kg (1 ch) / 10 kg (2 ch) | | | | | | |

The ±10 nA current range is not available on TH1991A / TH1991C / TH1992A. Standard interfaces (RS232, USB Host, USB Device, LAN, HANDLER) and SCPI remote control are identical across all seven models.

## Applications

### Semiconductor, discrete & passive device testing

Diodes, laser diodes and LEDs; photodetectors and sensors; FETs and transistors; ICs (RFICs, MMICs); resistors, rheostats, thermistors and switches.

### Precision electronics & green-energy testing

PV cells; power semiconductors; batteries and automotive electronics; medical devices; board-level power and DC-bias testing.

### Research & education

New-material R&D, nanodevice characterisation, GMR and organic devices, and any application needing a precision I/V source or measurement bench.

## Four-quadrant output

Maximum output range at each voltage level (selected models only — see model line-up on page 1).

| Output mode | Max. voltage | Max. current |
|---|---|---|
| **DC or pulse** | 210V | 0.105A |
| | **21V** | 1.515A |
| | **6V** | 3.03A |
| **Pulse only** | 200V | 1.515A |
| | **6V** | 10.5A |

## 8 basic modes

**01 V-Source**
Constant-voltage (CV) output.

**02 I-Source**
Constant-current (CC) output.

**03 Voltmeter**
Internally set as a current source outputting 0 A, to measure an external source's voltage; source-meter internal resistance is very high in this state.

**04 Ammeter**
Internally set as a voltage source outputting 0 V with the LO terminal floated, to measure an external source's current; source-meter internal resistance is very low in this state.

**05 Ohmmeter**
Internally set as a current source; measures the voltage across the resistor and calculates DUT resistance via Ohm's law.

**06 Transistor Curve Tracer**
Built-in sweep templates plot I/V characteristic curves for diodes, BJTs, FETs and IGBTs directly on screen.

**07 Pulse Generator**
High-current pulse output up to 10.5 A; max. pulse width 1 ms, max. duty cycle 2.5%.

**08 Electronic Load (current sink)**
Outputs voltage while absorbing current; the source-meter operates in the fourth quadrant.

## Output methods

| Mode | Description |
|---|---|
| **DC** | Continuous constant-voltage or constant-current output. |
| **Pulse** | High-speed pulsed output (min. width 50µs) to limit DUT self-heating. |
| **Sweep** | Linear or log staircase sweep across a start–stop range, up to 1,000,000 points/second. |
| **List** | Arbitrary-waveform list output with independent per-point timing, minimum 1µs step. |

## Built-in semiconductor device testing

The TH199X series performs semiconductor parameter analysis without a PC connection. Sweep parameters are configured directly on the touch screen and characteristic curves are plotted in real time:

- **Diode:** forward and reverse I/V characteristic curves
- **BJT:** output characteristic curves ($I_c$–$V_{ce}$), Gummel plots, current gain ($h_{FE}$) and $BV_{ceo}$/$BV_{cbo}$/$BV_{ebo}$ breakdown-voltage tests
- **FET / MOSFET / CMOS:** output characteristic curves ($I_d$–$V_d$), threshold voltage ($V_{th}$) and transconductance ($g_m$) curves, $BV_{dss}$/$BV_{gss}$ breakdown, on/off-slope tests
- **Discrete / passive:** 2- and 4-terminal (Kelvin) resistance (R-I, R-V), junction breakdown and DC parameters, CV curve, thermal ($T_{Set}$/T2420)
- Pre-set device library covering these BJT, CMOS and discrete-component test items for one-click testing — see the application case on page 4 for pairing with an LCR meter

## Voltage source / measurement

Accuracy: reading % + bias. Source and measurement values are identical per range.

| Range | Resolution | Accuracy |
|---|---|---|
| **±200mV** | 100nV | ±(0.015% + 225µV) |
| **±2V** | 1µV | ±(0.02% + 350µV) |
| **±20V** | 10µV | ±(0.015% + 5mV) |
| **±200V** | 100µV | ±(0.015% + 50mV) |

## Current source / measurement

Accuracy: reading % + bias, noise peak-to-peak (0.1Hz–10Hz). Source and measurement values are identical per range.

| Range | Resolution | Accuracy |
|---|---|---|
| **±10nA**[1] | 10fA | ±(0.10% + 50pA) |
| **±100nA** | 100fA | ±(0.06% + 100pA) |
| **±1µA** | 1pA | ±(0.025% + 500pA) |
| **±10µA** | 10pA | ±(0.025% + 1.5nA) |
| **±100µA** | 100pA | ±(0.02% + 25nA) |
| **±1mA** | 1nA | ±(0.02% + 200nA) |
| **±10mA** | 10nA | ±(0.02% + 2.5µA) |
| **±100mA** | 100nA | ±(0.02% + 20µA) |
| **±1A** | 1µA | ±(0.03% + 1.5mA) |
| **±1.5A** | 1µA | ±(0.05% + 3.5mA) |
| **±3A** | 10µA | ±(0.4% + 7mA) |
| **±10A (pulse)** | 10µA | ±(0.4% + 25mA) |

[1] Not available on TH1991A / TH1991C / TH1992A.

## Pulse source

Pulse width = time from 10% rising edge to 90% falling edge. Min. programmable pulse width 50µs, resolution 1µs.

| Voltage | Max. peak current | Max. base current | Pulse width | Max. duty cycle |
|---|---|---|---|---|
| **DC or pulse** | 210V → 0.105A | 0.105A | 50µs – 99999.9s | 99.9999% |
| | **21V → 1.515A** | 1.515A | 50µs – 99999.9s | 99.9999% |
| | **6V → 3.03A** | 3.03A | 50µs – 99999.9s | 99.9999% |
| **Pulse only** | 200V → 1.515A | 50mA | 50µs – 2.5ms | 2.5% |
| | **180V → 1.05A** | 50mA | 50µs – 10ms | 2.5% |
| | **6V → 10.5A** | 0.5A | 50µs – 1ms | 2.5% |

## Resistance measurement

Auto resistance measurement mode, 4-wire, 2V range.

| Range | Resolution | Test current | Total tolerance |
|---|---|---|---|
| 2Ω | 1μΩ | 1A | 0.02% + 0.00035Ω |
| 20Ω | 10μΩ | 100mA | 0.006% + 0.0035Ω |
| 200Ω | 100μΩ | 10mA | 0.065% + 0.035Ω |
| 2kΩ | 1mΩ | 1mA | 0.06% + 0.35Ω |
| 20kΩ | 10mΩ | 100μA | 0.065% + 3.5Ω |
| 200kΩ | 100mΩ | 10μA | 0.06% + 35Ω |
| 2MΩ | 1Ω | 1μA | 0.095% + 350Ω |
| 20MΩ | 10Ω | 100nA | 0.18% + 3.5kΩ |
| 200MΩ | 10Ω | 10nA | 1.08% + 35kΩ |

## Interfaces

| RS232C | USB Host | USB Device | LAN | HANDLER | SCPI |
|---|---|---|---|---|---|
| standard | standard | standard | standard | standard | standard |

Environment & general: 23°C±5°C operating/storage/accuracy-guarantee range, 30–80%RH, 60 min preheat, 1-year calibration cycle · 90–264V AC, 47–63Hz, 250VA max, 31.8W.

## Standard accessories

| Item | Description | Qty 1991 | Qty 1992 |
|---|---|---|---|
| — | EU power cable (Schuko, CEE 7/7) | 1 | 1 |
| TH26050B | Dual-end test cable (2-wire) | 1 | 2 |
| TH26050C | Four-end test cable (5-wire, Kelvin) | 1 | 2 |
| TH26017 | USB cable | 1 | 1 |
| TH26087B | Banana plug to dual BNC adapter | 1 | 2 |
| TH199X-001 | Control & DAQ software | 1 | 1 |

## Optional accessories

| Item | Description |
|---|---|
| TH26087 / A | Low-noise filter |
| TH26087C | Banana plug to 4-terminal coaxial adapter |
| TH26087D | Banana plug to RF (4-terminal) test box |
| TH26087E | Shield box |
| TH26087F / G | Triaxial cable |

Qty columns show standard ship quantity per unit. TH1992-series (dual-channel) units ship with two sets of test cables/adapters — one per channel (TH26050B, TH26050C, TH26087B) — while the power cable, USB cable and software remain single-count on both series.

## Application case — diode CV curve analysis

Standard I/V testers usually sweep forward voltage vs. capacitance only. Pairing a TH199X with a Tonghui precision LCR meter (TH2838H, or the TH2840 / TH2848 / TH2851 series) via a TH26011D adapter cable adds **forward and reverse** CV characteristic-curve testing — 20 Hz–2 MHz test frequency, ±200 V DC bias — without third-party test software. Ask your Techmize contact for the recommended cabling and LCR meter selection.

## Programmable control

Remote control via SCPI over RS232C, USB Device or LAN. Ships with the TH199X-001 I/V curve & semiconductor parameter test software (Windows) plus a LabVIEW driver for custom test-program integration.

## About Tonghui

Techmize products are engineered and manufactured by Changzhou Tonghui Electronic Co., Ltd. — a National High-Tech Enterprise and China's leading manufacturer of electronic component measuring instruments, in continuous operation since 1994, with roughly 300 employees (28% in R&D) and annual R&D investment above 18% of revenue.

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