TECHMIZE by TONGHUI

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OPERATION MANUAL

TH9010 Series

Parallel Multi-Channel AC/DC Withstand Voltage & Insulation Resistance Tester — TH9010 (8-channel) / TH9010A (4-channel). Covers front-panel operation, test parameter setup, scanning-module operation and the HANDLER/SIGNAL interface; see Chapter 6 for the remote-control interface.

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

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TH9010 Series Operation Manual

Parallel Multi-Channel AC/DC Withstand Voltage & Insulation Resistance Tester — TH9010 / TH9010A

This manual describes the installation, operation and programming interface of the Techmize TH9010 series. **TH9010** provides 8 independent test units; **TH9010A** provides 4. Each unit performs AC withstand-voltage, DC withstand-voltage, insulation-resistance and open/short-circuit testing, and can be expanded with the TH90101/TH90101A scanning module for multi-point contact testing.

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The full SCPI command reference is issued as a separate companion document, TH9010 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 interface and command-subsystem structure only.

CHAPTER 1

Safety & Compliance

1.1 About this manual

This is the operation manual for the Techmize TH9010 series parallel multi-channel AC/DC withstand-voltage and insulation-resistance tester, covering models **TH9010** (8 test units) and **TH9010A** (4 test units). Where this manual and the instrument itself appear to disagree, or where a described function is not present on your particular model or configuration, contact Techmize or your authorized distributor using the details in §1.9 before relying on the instrument for measurement or sorting decisions.

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 TEST VOLTAGE**
>
> The TH9010 series outputs an AC test voltage of up to **5.000 kV** and a DC test voltage of up to **6.000 kV** at each UNIT HV output. This is a lethal shock hazard. Never touch the device under test, the test leads, or any part of the test fixture while a test is in progress, while the HANDLER/DANGER indication is active, or before the instrument has completed its automatic discharge. Fence or otherwise guard the device-under-test area, and use the INT LOCK (interlock) signal on the HANDLER interface to disable high-voltage output whenever the guard is open (§7.1).

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. Also printed next to the instrument's rear-panel ground terminal.

1.3 General safety requirements

Protective earthing of the chassis, via the three-wire AC power cord, is essential to safety and must not be defeated.

> **WARNING — ELECTRIC SHOCK**
>
> Always use a supply outlet with a protective earth contact. Never connect the AC supply, or operate the instrument, with the protective ground disconnected or with a two-wire (ungrounded) adapter. The power cord's protective grounding conductor must be connected to ground; disconnect the power cord before replacing the fuse.

Power	
Supply voltage	100–242 V AC
Supply frequency	47.5–63 Hz
Power consumption	≤ 1200 VA
Fuse	15 A, slow-melting (factory-fitted; replace only with the same rating and type)

WARNING — TEST TERMINALS & FENCING

Each test unit's UNIT HV / UNIT RTN (return) terminal pair sources the AC/DC test voltage into the device under test. Provide a fence or other physical guard around the device-under-test area; if the guard cannot be kept in a safe (closed) state, disconnect the INT LOCK jumper on the HANDLER interface so that the instrument cannot start a high-voltage output (§7.1). Before re-closing the interlock and starting a high-voltage test, carefully check the test cable and the surrounding area for anything that could affect safety.

Contact inspection. Where the device under test's contact reliability must also be verified, the instrument's S.CK (single-ended) and D.CK (double-ended) contact-check functions can be used together with the TH90101/TH90101A scanning module (§4.5, §4.6). The contact-check test voltage is set in the range 50–500 V (§4.3.5, §4.3.6). Although this is not a withstand-voltage test, the scan ports are energised at up to 500 V while a check is running and must be treated with the same care as the high-voltage outputs.

Environment

Item	Requirement
Operating temperature	0–40 °C
Operating humidity	≤ 80% RH

Do not use the instrument in a dusty, vibrating, direct-sunlight or corrosive-gas environment. Keep the instrument's ventilation openings clear, since the high-voltage test modules dissipate significant heat under continuous use. A continuous-duty rating for uninterrupted back-to-back high-voltage testing has not been specified by the manufacturer; contact Techmize for application-specific guidance if your test sequence runs continuously for extended periods. If the instrument will not be used for an extended period, store it in a well-ventilated room within the storage conditions given in §A.2.

CAUTION — GROUND CURRENT DETECTION

The instrument's ground-current detection (GFI) function protects the operator from electric shock by cutting off high-voltage output within 0.3 s if the ground current exceeds 0.45 mA. Because the instrument's instantaneous output current can exceed 30 mA — enough to injure or kill — it is strongly recommended to keep ground current detection switched ON whenever the product under test allows it (§4.2.3, setting GFI).

1.4 Electrical safety test data

The TH9010 series (covering TH9010, ST9010, TH9010A and ST9010A) has been independently tested for electrical safety by Shenzhen BCTC Testing Co., Ltd. against **EN 61010-1:2010** (Safety requirements for electrical equipment for measurement, control and laboratory use — Part 1: General requirements), test procedure CE-LVD. Test Report No. BCTC-FY190301583S, dated April 16, 2019 (testing performed April 8–15, 2019), records a pass result against all applicable clauses. Dielectric-withstand, insulation-resistance and leakage-current figures for the instrument's own internal construction (as opposed to the device-under-test measurements the instrument performs) are documented in the full 71-page BCTC test report rather than in this manual; contact Techmize/Tonghui engineering for a copy if required.

1.5 CE marking

The TH9010 series carries the CE mark, as shown on the instrument's rear-panel nameplate. CE conformity is supported by independent third-party test reports covering both directives applicable to this product:

Directive	Standard	Report / certificate
Low Voltage Directive 2014/35/EU	EN 61010-1:2010	Test report BCTC-FY190301583S, Shenzhen BCTC Testing Co., Ltd., Apr. 16, 2019 — pass
EMC Directive 2014/30/EU	EN 61326-1:2013	Certificate of Compliance BCTC-FY181206900C, Shenzhen BCTC Testing Co., Ltd., approved Mar. 21, 2019 (full test report BCTC-FY181206900E)

Both reports list TH9010, ST9010, TH9010A and ST9010A together, noting that all four share the same schematic, PCB layout and construction and differ only in model name/appearance; testing was performed on the TH9010. Contact Techmize if you require copies of these documents.

1.6 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. Correct disposal helps prevent potential harm to the environment and human health from uncontrolled waste handling.

1.7 RoHS compliance

The TH9010 series is covered by Techmize's own RoHS (Directive 2011/65/EU, as amended) self-declaration. No independent third-party RoHS certificate is currently available for this series.

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 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, consumable/wear items such as the fuse, or damage from operation outside the environmental limits given in §1.3. Repair must be carried out by qualified technical personnel; do not replace internal components without authorization. After any repair, the instrument must be recalibrated before further use, since a user-performed repair that damages a component is not covered by the warranty.

1.9 Manufacturer & EU contact

Techmize Electronic GmbH

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Tonghui Electronic Co., Ltd. (China)

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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 — contact your carrier and your Techmize distributor before proceeding. Check the contents against your order; if anything does not conform, notify Techmize or your distributor promptly.

Item	Qty
TH9010 or TH9010A instrument (model as ordered)	1
EU power cable (Schuko, CEE 7/7)	1
TH26034 RS232 connection cable	1
TH90016 HV test cable (without clips)	1
TH90015 HV test cable (with clips)	1
Anti-interference ferrite ring	8
Fuse, 15 A slow-melting	1
This operation manual	1
Certificate of conformity	1
Warranty card	1

Standard accessories match the TH9010 Series Datasheet. TH90101 / TH90101A scan expanders (8-unit / 4-unit, 4-channel) and test fixtures are optional and must be ordered separately — up to four expanders can be cascaded per unit. Ask your Techmize contact or authorized distributor for test-fixture options.

Keep the original packaging — it is the recommended way to store or return the instrument. Store the instrument in a dry, well-ventilated room within the storage conditions in §A.2 when not in use for an extended period.

2.2 Connecting the power supply

Item	TH9010 / TH9010A
Supply	100–242 V AC, 47.5–63 Hz
Power consumption	≤ 1200 VA
Fuse	15 A, slow-melting

Match the line (L), neutral (N) and earth (E) conductors of the supply cable to the instrument's rear-panel power inlet, and confirm reliable grounding before switching on.

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

2.3 Connecting the device under test

Each of the instrument's test units has its own UNIT HV / UNIT RTN output on the rear panel. Connect the device under test with the correct polarity; when the optional TH90101/TH90101A scanning module is fitted, the module's channel outputs are wired to the device under test instead, and the unit is addressed through the module (§4.5).

WARNING — OBSERVE CORRECT POLARITY AND NEVER TOUCH LIVE TERMINALS

Connect the device under test before starting a test. Never touch the test leads, fixture or device under test while a test is running, while the DANGER/HANDLER signal is active, or before the automatic discharge has completed (§4.4.6). Each UNIT HV output can reach up to 5.000 kV AC or 6.000 kV DC.

CAUTION

A user-made or third-party test fixture or cable can produce incorrect measurement results or compromise safety. Keep the fixture/cable and the device-under-test leads clean for good contact, and keep test leads away from strong electromagnetic fields. The stray capacitance of long test leads and fixtures affects current-based judgements; use the current-clear (OFFSet) function described in §4.4.12 to compensate.

2.4 Zero/base clearing

Before precision current-based testing, clear the base current contributed by the test leads' and fixture's own stray capacitance, using <System> → Test → OFFSET = GET (§4.2.3, §4.4.12). This starts a brief high-voltage test on the currently configured test conditions to sample and store the zero base; do not connect the device under test while this is in progress.

NOTE

Clearing the base does not change the instrument's actual test range or rated accuracy — it compensates the current reading for the specific test cable/fixture connected, not the instrument itself.

2.5 Starting the instrument for the first time

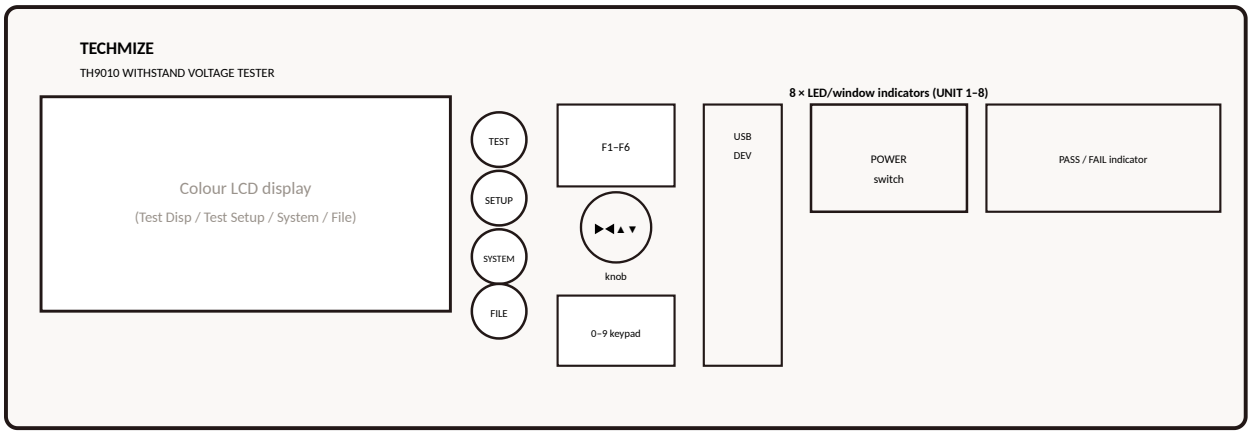
1. Connect the EU power cable to the rear-panel inlet, confirming reliable earth-ground connection.
2. Press the front-panel power switch. The instrument self-tests and queries which test units and scanning modules are fitted.
3. The instrument boots into the <TEST> interface by default, with the test data last in effect before the previous shutdown.
4. Factory default: single step, AC withstand-voltage test, default parameters.

For an overview of the front panel, rear panel and interface structure, continue to Chapter 3.

CHAPTER 3

Getting to Know the Instrument

3.1 Front panel



Simplified front-panel layout (schematic, not to scale) — see the legend below for the full item list

1 **Display** — shows the four main interfaces: <TEST>, <SETUP>, <SYSTEM> and <FILE> (§4.2).

2 **TEST** / **SETUP** / **SYSTEM** / **FILE** — direct interface-switch keys (§4.2).

3 **F1–F6 soft keys** — context-sensitive, matched to the soft-key labels shown on-screen.

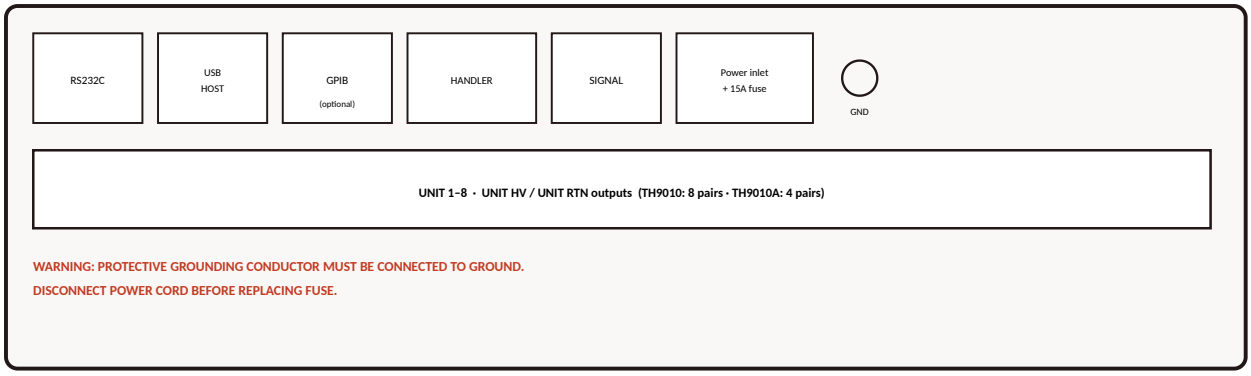
4 **Direction keys & knob** — move the cursor and adjust values quickly.

5 **0–9 numeric keypad** — direct value entry; the valid input range for the selected field is shown in the information prompt area at the bottom of the screen.

6 **Front USB DEV port** — the port for a USB flash drive: exporting/importing test files and firmware upgrade (§4.7). The label DEV is as printed on the panel; do not use this port to connect a PC.

7 **Per-unit PASS/FAIL window and LED indicators, and POWER switch.**

3.2 Rear panel



Simplified rear-panel layout (schematic, not to scale) — see the legend below for the full item list

1 **RS232C** — serial communication with a host PC (§6.1).

2 **USB HOST** — rear-panel USB port for connecting a control PC, USBTMC or USBVCOM mode (§6.1). The label HOST is as printed on the panel; do not use this port for a USB flash drive.

3 **GPIB** (optional) — factory-fitted only when ordered; confirm availability when purchasing.

4 **HANDLER / SIGNAL** — automatic test-system integration: start/stop input, PASS/FAIL/BAK/WAIT/READY/TEST/DANGER output, interlock (§7.1, §7.2).

5 **Power inlet, fuse & ground** — AC power inlet and 15 A fuse holder (§1.3, §2.2); separate chassis ground terminal.

6 **UNIT 1–8 HV/RTN outputs** — one pair per test unit (8 on TH9010, 4 on TH9010A), or routed through the optional TH90101/TH90101A scanning module (§4.5).

The LAN connector on the rear panel is reserved and is not supported for user communication.

3.3 Main interfaces

Interface	Description
<TEST>	Starts the high-voltage test process and shows live results per unit (§4.2.1). Power-on default.
<SETUP>	Edits the current test file: test steps, test mode (AC/DC/IR/OS/S.CK/D.CK) and parameters (§4.2.2, §4.3).
<SYSTEM>	Test-safety settings, environment (brightness/language/alarm/date-time), and I/O (communication) configuration (§4.2.3).
<FILE>	Internal/external (USB) test-file save and recall (§4.2.4).

> **NOTE**
> The instrument only saves data changes when the interface is switched. After modifying data in <SETUP> or <SYSTEM>, switch to another interface to commit the change, and avoid shutting the instrument down directly after a change, to avoid data loss.

3.4 Instrument architecture overview

Each test unit integrates a 50 VA test power module capable of 5 kV AC / 10 mA or 6 kV DC / 5 mA output, together with AC withstand-voltage, DC withstand-voltage, insulation-resistance and open/short-circuit (OS) measurement functions, and (with the optional scanning module) S.CK/D.CK contact-check functions. All test units can be run in parallel as independent channels, or sequenced through a multi-step test file; a hardware current-overrun/ARC detection path runs alongside the normal current-sampling path for faster protection against insulation breakdown (§4.4.8).

3.5 Starting the instrument

Confirm reliable earth-ground connection, then press the front-panel power switch (§2.5). The instrument self-tests, queries the fitted test units and scanning modules, and opens on the <TEST> interface with the data last in effect before shutdown.

CHAPTER 4

Operation & Configuration

This chapter covers the <TEST>, <SETUP>, <SYSTEM> and <FILE> interfaces, the per-test-mode parameter tables, the test-sequence timing, and the optional scanning-module operation.

4.1 <TEST> interface

Starts the test process for all units participating in the current test file. Parameters cannot be modified from this interface.

Item	Description
Start condition	HANDLER INT LOCK signal closed, STOP not pressed, any START button pressed
Key lock	F6 locks the keyboard so only INT LOCK, START, STOP and the unlock key respond; unlocking is governed by the <SYSTEM> password setting (§4.2.3)
On PASS	Displays total PASS, then returns to the test-wait state after the configured hold time
On FAIL	Displays FAIL result; press STOP to return to the test-wait state

4.2 <SETUP> interface

Edits the current test file's steps, test mode and parameters. Move the cursor to the test-mode field to switch the step between AC, DC, IR, OS, S.CK and D.CK — the parameter fields update to match the selected mode. F1–F5 insert, delete, create, or step through test projects.

4.2.1 <SYSTEM> → Test sub-page

Setting	Values	Description
PASS HOLD	OFF, 0.2–99.9 s	PASS signal output / hold time after a passed test
STEP HOLD	OFF, KEY, 0.1–99.9 s	Wait time between steps in multi-step testing; KEY = pause after each step until START is pressed
STRT DLY	OFF, 0.1–99.9 s	Wait time between pressing START and the first test item
GFI	ON, OFF	Ground-current detection enable (§1.3)
OFFSET	ON, OFF, GET	Base current clearing (§4.4.12); GET starts sampling
FAIL MODE	STOP, CONT, PAUS	Behaviour on a failed step: stop test / continue and allow query / pause the failed unit only
LOOP MODE	ON, OFF	Uninterrupted loop test on the existing file
CTRL MODE	FILE, STEP	Result/control-signal output at end of file, or at the end of each step
DISP MODE	ON, OFF	Live result display on/off

4.2.2 <SYSTEM> → Envi. sub-page

Setting	Description
Brightness	Display brightness
Display language	English
Pass alarm / Fail alarm / Key sound	Volume level (OFF, High, Low)
Password	Key-lock password (default 666666), with a separate firmware-upgrade function key
Adj. Setup	Restore factory default settings
Date / Time	System clock

4.2.3 <SYSTEM> → I/O sub-page

Communication-interface configuration: RS232C, RS485 (via an external converter, bus address set here), USB, GPIB (optional), and HANDLER. See Chapter 6 for the remote-control command set.

> NOTE
> RS485 reuses the RS232C physical connection through an external RS232–RS485 converter; the bus address field is inactive in plain RS232C mode. GPIB is a factory-fitted option — confirm when ordering.

4.2.4 <FILE> interface

Saves or recalls a test file, internally or to a connected USB drive (shown as drive `E:`). Up to **20 test files** can be stored; each file can hold up to **16 test steps**, any combination of AC/DC/IR/OS/S.CK/D.CK.

Item	Description
Int. File	Internal storage; Load / Copy to E: / Delete
Ext. File	USB drive (E:); Sub Dir / Parent Dir navigation

> CAUTION
> Keep the USB flash drive at 8 GB or smaller and avoid storing excessive files/folders on it, to avoid read failures. A file saved under a different firmware version may not load correctly if its test conditions display incompletely — restore factory settings and re-edit the file in that case.

4.3 Test-mode parameter tables

4.3.1 AC withstand-voltage (AC)

Field	Range	Description
VOLT	0.050–5.000 kV	AC test voltage
UPPER	0.001–10.00 mA	Upper current limit
LOWR	OFF, 0.001–10.00 mA	Lower current limit (must be less than UPPER)
ARC	OFF, 0.1–20.0 mA	Arc-current upper limit
TIME	OFF, 0.2–999.9 s	Test time
RISE	OFF, 0.1–999.9 s	Voltage rise time (OFF = 0.1 s default)
FALL	OFF, 0.1–999.9 s	Voltage fall time (OFF = cuts off directly at end of test; DUT may remain charged)
FREQ	50 / 60 Hz	Test frequency

4.3.2 DC withstand-voltage (DC)

Field	Range	Description
VOLT	0.050–6.000 kV	DC test voltage
UPPER / LOWR	0.1 µA–5.00 mA / OFF, 0.1 µA–5.00 mA	Current upper/lower limit
TIME / RISE / FALL	OFF, 0.1–999.9 s each	Test / rise / fall time
WAIT	OFF, 0.1–999.9 s	DC charging wait time before current judgement begins (short-circuit detection still active during wait)
ARC	OFF, 0.1–20.0 mA	Arc-current upper limit
RAMP	ON, OFF	Judge the current upper limit during voltage rise

After a DC test ends, the instrument automatically performs a 0.2 s rapid discharge.

4.3.3 Insulation resistance (IR)

Field	Range	Description
VOLT	0.050–1.000 kV	Insulation test voltage
UPPER / LOWR	0.1 M–10.00 GΩ / OFF, 0.01 M–10.0 GΩ	Resistance upper/lower limit
TIME / RISE / FALL	OFF, 0.1–999.9 s each	Test / rise / fall time
RANG	AUTO, or fixed: 1 µA, 10 µA, 100 µA, 1 mA, 5 mA	AUTO improves accuracy; a fixed range (using I = U/R) can speed up testing

4.3.4 Open/short-circuit detection (OS)

Field	Range	Description
OPEN	10–100%, 1% step	Open-circuit threshold, as a fraction of the standard (STAN) value
SHRT	OFF, 100–500%, 10% step	Short-circuit threshold, as a fraction of the standard value
STAN	Previous value, or GET	Standard capacitance value; GET samples the current distribution as the new standard (100 V output for ≤100 ms)

The displayed capacitance is not the device's actual capacitance, but the sampled current after impedance conversion — a reference value, not an absolute measurement. Example: coil-to-coil capacitance ≈60 pF measured as STAN; OPEN set to 33% (20/60) flags an open circuit, SHRT set to 140% (85/60-ish) flags a short, with the useful band in between.

4.3.5 S.CK — single-ended contact check (requires scanning module)

Field	Range	Description
VOLT	0.050–0.500 kV	Test voltage
UPPER	0.1 µA–5.00 mA	Current upper limit
SCAN / UNIT	Red = tested, Gray = ignored / White = participates, Gray = excluded	Per-channel / per-unit participation

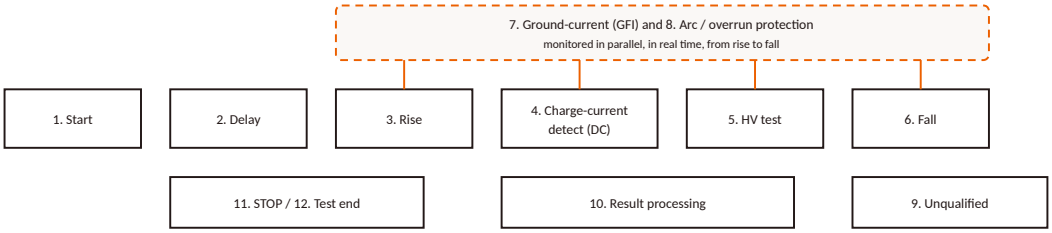
Checks whether the two test leads of the same scan port are reliably connected to the same DUT pin. Total test time ≈ 0.5 s + 0.3 s × number of test points; a 0.2 s rapid discharge follows.

4.3.6 D.CK — double-ended contact check (requires scanning module)

Field	Range	Description
VOLT	0.050–0.500 kV	Test voltage
UPPER	0.1 µA–5.00 mA	Current upper limit
SCAN	Red = high-voltage end, Green = test end, Gray = open	Per-channel role

Checks that two separate scan ports (one assigned HIGH, one LOW) are both reliably connected — typically to the same DUT pin via two different scan channels. One high/low pair per test; total test time ≈0.7 s, followed by a 0.2 s rapid discharge.

4.4 Test-sequence timing & protection functions



Simplified test-sequence flow (schematic) — start → delay → rise → (DC charge-current check) → HV test → fall → result processing; GFI and ARC/overrun protection run in parallel during the test

4.4.1–4.4.7 Sequence stages

Start / Delay / Rise: pressing START begins the test; a configurable delay precedes the first step, then the output voltage steps up over the configured rise time. **DC boost decision:** an optional current-upper-limit check during voltage rise, which can be disabled for DUTs with significant distributed capacitance to avoid charging-current misjudgement. **HV test:** the configured test voltage and current are applied and measured for the configured test time. **Voltage fall:** output steps down over the configured fall time (DC: discharges through the AC circuit path if the fall is interrupted).

Ground current detection (GFI): protects against electric shock via the chassis; cuts off high-voltage output within 0.3 s if detected ground current exceeds 0.45 mA, and the display shows GFI FAIL (§1.3).

4.4.8 Current overrun & arc detection (ARC)

Judgement	Description
LOW (current lower limit)	Flags LOW FAIL if leakage current is below the configured lower limit (typically indicates no DUT connected); timed sampling, 100 ms per cycle
HIGH (current upper limit)	The most common judgement — flags HI FAIL if leakage current exceeds the configured upper limit (insufficient withstand-voltage impedance); timed sampling, 100 ms per cycle
SHORT (current limit)	A hardware fast-response path that reacts faster than timed sampling when the current spikes past 1.5× (AC) the instrument's allowable output; flags SHORT FAIL, fall time is bypassed
ARC	Detects high-speed current-pulse changes from local sparking/discharge in the test loop; a qualitative indicator only — sensitive to DUT, fixture and test-lead layout

4.4.9–4.4.12 Result handling, STOP and OFFSET

Failure judgement: the instrument cuts off voltage output and enters the unqualified-result procedure immediately once any configured limit is exceeded; in a multi-step test, one failed step fails the entire file. **Result processing:** a result with no failure flag is judged PASS; the PASS-hold time and the multi-step control/failure mode (§4.2.1) govern how results reach the control-signal output. **STOP:** pressing STOP at any point ends the test immediately with no result judgement; results up to that point can still be queried over the remote interface. **OFFSET (base clearing):** see §2.4 and §4.2.1; do not connect a device under test while OFFSET = GET is sampling, since this briefly applies the configured test voltage.

4.5 SCAN multi-channel scanning-module operation

The optional TH90101 / TH90101A scanning module is a high-voltage relay matrix that lets the withstand-voltage tester address multiple scan-channel outputs per test unit, without manually re-wiring the device under test between steps.

Module	Test-unit inputs	Scan outputs per input	Used with
TH90101	8	4	TH9010 (8-channel)
TH90101A	4	4	TH9010A (4-channel)

Up to 4 scanning modules can be cascaded per test unit, giving up to 4×4 = 16 scan channels per unit (up to 128 channels total on the 8-unit TH9010, or 64 on the 4-unit TH9010A). Each scan port is a two-wire lead-out, enabling single-ended contact inspection (S.CK) directly; the two leads of the same port must not be directly shorted during a contact check — connect them to two different contacts of the same DUT pin, or to two pins joined by a resistor/inductor. When a port is not used for contact checking, its two wires can be shorted together and connected to the DUT pin as a normal single test point.

SCAN colour code	Meaning
Black	Open-circuit state
Red	Connected to the high-voltage end
Green	Connected to the test end

4.6 Worked example — AC withstand-voltage test

Testing a Class I appliance rated 1000 V AC withstand for 1 minute, current limit 5 mA: on <SETUP>, select TestMode = AC; set VOLT = 1.000 kV, UPPER = 5.00 mA, TIME = 60.0 s, RISE and FALL to a few seconds appropriate to the DUT's capacitance, FREQ = 50 Hz; leave LOWR and ARC OFF unless the application calls for them. Connect the DUT to the relevant UNIT HV/RTN pair, confirm the safety fence/interlock, then press <TEST> → START.

4.7 File storage, other interfaces & functions

Interface	Function
Front-panel USB (labelled DEV)	USB flash drive: export/import customer settings files; firmware upgrade (upgrade file placed on the USB drive)
Rear-panel USB (labelled HOST)	Connection to a control PC: USBTMC (standard USB slave, IEEE 488-compatible software) or USBVCOM (USB virtual serial port, data format 8.n.1, IEEE 485-compatible software)
RS232C	Computer connection; data format 8.n.1, IEEE 485-compatible software; baud rate set on <SYSTEM> → I/O

CHAPTER 5

Performance & Specifications

5.1 AC / DC withstand-voltage output

AC output	
Range	0.050–5.000 kV
Waveform / distortion	Sinusoidal, <3%
Frequency	50 / 60 Hz selectable
Output power	50 VA (5.000 kV / 10 mA)
Voltage regulation	±(1.0% + 50 V), rated power
Current range	0.001–10 mA; instantaneous SC current >20 mA when set voltage >500 V
Current accuracy	±(2% reading + 5 digits)
DC output	
Range	0.050–6.000 kV
Source frequency	600 Hz
Output power	25 VA (5.000 kV / 5 mA)
Voltage regulation	±(1.0% + 100 V), rated power
Current range	0.1 µA–5.00 mA
Current accuracy	±(2.0% reading + 5 digits)
Discharge	Automatic, after the test (DCW only)

Common to AC/DC	
Voltage resolution	1 V
Voltage output accuracy	±(2.0% reading + 5 V), no load
Voltage generation	DDS signal source + PWM amplifier

5.2 Insulation resistance (IR)

Output voltage	0.050–1.000 kV
Voltage resolution / accuracy	1 V · ±(1.0% range + 5 V)
Max. output current / power	5 mA · 5 VA (1000 V / 5 mA)
Instantaneous SC current	>10 mA, when set voltage >500 V
Load adjustment rate / ripple	≤1% (rated power) · ≤3% (1 kV, no load)
Discharge	Automatic, after the test
Resistance test range	0.1 MΩ–10.0 GΩ

Resistance display range (at 1000 V)	
5 mA range	0.2–1 MΩ
1 mA range	1–10 MΩ
100 µA range	10–100 MΩ
10 µA range	100 MΩ–1 GΩ
1 µA range	1–10 GΩ

Accuracy of resistance measurement	
≥500 V, 1–100 MΩ	±(5% range + 5 digits)
≥500 V, 100 MΩ–1 GΩ	±(10% range + 5 digits)
<500 V, 0.1–100 MΩ	±(10% range + 5 digits)
Above 1 GΩ up to 10 GΩ (any voltage)	Reference only; no accuracy specified
Current measurement accuracy	±(2% range + 5 digits), after base clearing

This is distinct from the separately specified resistance upper/lower limit-setting ranges (0.1 M–10 GΩ / 0.01 M–10 GΩ, §4.3.3 and §5.3), which are unaffected.

5.3 ARC detection & comparator

Item	Specification
ARC test range — AC / DC	1–20 mA / 1–20 mA
Comparator judgement	Window comparison: LOWR ON — PASS when LOWR < I < UPPER, FAIL otherwise; LOWR OFF — PASS when I < UPPER, FAIL otherwise. Insulation-resistance judgement follows the same logic.
Current upper limit — AC / DC	0.001–10 mA / 0.1 μA–5 mA
Current lower limit (OFF available) — AC / DC	0.001–10 mA / 0.1 μA–5 mA
Resistance upper / lower limit	OFF–0.1 M–10 GΩ / 0.01 M–10 GΩ (lower-limit current ≤5 mA)
Discriminant output	PASS/FAIL on LCD and per-unit LED, plus audible alarm

5.4 General technical indicators

Item	Specification
Ambient temperature / humidity	0–40 °C, ≤80% RH
Power	100–242 V AC, 47.5–63 Hz
Power consumption	≤1200 VA
Dimensions (W×H×D) — TH9010 & TH9010A	430×177×630 mm
Net weight — TH9010 & TH9010A	38 kg
Control interface	HANDLER, SIGNAL
Communication interface	RS232C, USB; GPIB optional

PART II

Remote Control & Handler

Covers the RS232C, USB and GPIB remote interfaces and the HANDLER/SIGNAL interface for automated test-system integration. The full SCPI command tables are issued separately as the *TH9010 Series SCPI Command Reference*.

CHAPTER 6

Remote Control

The TH9010 series can be controlled remotely over RS232C, USB (USBTMC or USBVCOM) or the optional GPIB interface, using the SCPI command set. The instrument does not support MODBUS. For the complete command syntax and parameter ranges, see the companion *TH9010 Series SCPI Command Reference*.

6.1 RS232C & USB

Item	Specification
RS232C data format	8 data bits, no parity, 1 stop bit (8.n.1)
Baud rate	Set on <SYSTEM> → I/O (§4.2.3)
Command termination	NL (newline, 0x0A); optionally ^END (EOI) over GPIB
USB HOST modes	USBTMC (standard USB slave, IEEE 488-compatible software) · USBVCOM (virtual serial port, 8.n.1, IEEE 485-compatible software)
GPIB	Optional, factory-fitted — confirm when ordering

Multiple commands can be sent in one line, separated by a semicolon, to reduce communication overhead, e.g.: `FUNC:SOUR:STEP_1:AC:VOLT_1000;UPPC_1;TTIM_9.9;CH1_HIGH;CH2_LOW`.

6.2 Command-set overview

Commands are organized into subsystems: `DISPlay` (display page), `MMEM` (internal file store/load), `FUNCtion` (test start/stop, file editing, and the per-mode test-parameter trees for AC/DC/IR/OS/S.CK/D.CK), `SYSTem` (pass-hold, step-hold, GFI, fail mode, delay, offset, control mode) and the common query `*IDN?`. The `FETCh` command returns the measurement results for the current or just-completed test, with a structured step/unit/voltage/current/result return format.

Command keywords use mixed-case notation: the capitalized portion of a keyword is mandatory, the lower-case portion optional. The instrument does not distinguish upper and lower case on received commands.

For the full command syntax, parameter ranges and worked examples, see the *TH9010 Series SCPI Command Reference*.

6.3 *IDN? and basic query/fetch example

Command	Description
`*IDN?`	Returns <manufacturer>,<model>,<firmware> — e.g. `Tonghui,TH9010,Version1.0.0`
`FETCh:AUTO ON`	Enables automatic return of test results until the test ends
`FETCh?`	Returns the current measurement result

Example return for a 2-step, 2-unit test file (STEP1 AC 1000 V, STEP2 IR 500 V), with UNIT1 and UNIT3 active:

```
STEP1:AC:1,1000,1.000,PASS;3,1000,1.000,PASS;
STEP2:IR:1,500,100.000,PASS;3,500,100.000,PASS<0x0A>
```

Format: `step:test-mode:unit,test voltage (V),measured value,result`*. The measured value is the test current in mA for AC and DC steps, and the insulation resistance in MΩ for IR steps. Unit blocks within a step are separated by ";", steps by "; " (semicolon + space). The message is a single line (shown wrapped here) and is terminated once, at the end, with the line-feed character 0x0A.*

CHAPTER 7

HANDLER & SIGNAL Interface

The rear-panel HANDLER and SIGNAL connectors let the TH9010 series integrate into an automatic test or sorting system, provide the safety interlock, and carry the per-unit PASS/FAIL, DANGER and status signals.

7.1 Interface structure & levels

Signal	Description
+24VD / COM1	Internal +24 Vdc supply, 200 mA output current, for pulling up the output optocouplers; can also drive an external LED indicator
EXTV1 / COM1	External power input (8–24 V) controlling the input/output optocoupler power. Instrument's own internal current on this pin is <50 mA. Without this supply connected, the output signal is only a polarity-switch indication and the input signals are invalid.
INTLOCK (INT LOCK)	Online interlock. **The instrument cannot start high-voltage output when this signal is disconnected (open).**
/START, /STOP	Remote input control; valid when shorted to COM1
/TEST, /PASS, /FAIL, /DANGER	Remote output control (per-unit where applicable); default active-low, optocoupler secondary side on

The instrument is factory-fitted with the TH9010-IL accessory: the POWER JMP and INTLOCK JMP leads are short-circuited as shown in the interface diagram at the factory, with the other lead left floating. Disconnect the INTLOCK jumper, and fit an external interlock loop through a safety fence or guard door, before operating without that factory jumper (§1.3).

7.2 HANDLER timing

Stage	Typical duration
Start delay + ladder-rise + init	≈0.1–0.2 s each, per configured values
Test	Per configured TIME field (§4.3)
Ladder-fall + data process	≈0.1 s each, per configured FALL value
/READY, /TEST, /DANGER signal windows	Active per the stage above, per the default coarsening mode

/READY is active during the non-test idle state; /TEST is active from START to the end of the entire file test; /DANGER is active whenever high-voltage output is present; /PASS, /FAIL (and /BAK, undefined/backup) reflect the step-mode or file-mode result per the CTRL MODE setting (§4.2.1).

7.3 Using the HANDLER interface

1. Confirm the INTLOCK signal is closed (safety fence/guard in place) — the instrument will not start a high-voltage test otherwise.
2. Configure the test file on <SETUP> and the failure/control mode on <SYSTEM> (§4.2, §4.2.1).
3. Trigger the test with /START from the external handler/sorter, or the front-panel <TEST> key.
4. Read /PASS, /FAIL and /DANGER from the external system as the test proceeds; results are output per CTRL MODE (STEP or FILE).
5. /STOP can abort the test at any point from the external system, equivalent to the front-panel STOP key.

> **NOTE — EXTERNAL POWER**
> If the connected handler system needs to drive the interface from its own supply rather than the instrument's internal +24 V, connect the external supply to EXTV1, with COM1 as the return (§7.1).

APPENDIX

Packing, Warranty & Related Documents

A.1 Standard accessories

See §2.1 for the standard packing contents (instrument, EU power cable, fuse, documentation). The TH90101/TH90101A scanning module and any test fixtures are optional accessories, purchased separately.

A.2 Transport & storage

Store the instrument in a dry, well-ventilated location within the operating environment limits of §1.3 (0–40 °C, ≤80% RH), away from corrosive gases, for any extended period of non-use. During transport, protect the instrument from shock, vibration and moisture — this is a bench instrument of ≈38 kg and should be moved and lifted accordingly.

A.3 Nameplate & markings

Each instrument's rear panel or nameplate carries: the manufacturer's name/trademark; product name and model; serial number and date of manufacture; and the CE mark.

A.4 Model & function correspondence

Model	ACW	DCW	IR	OS	Test units	Scanning module	S.CK	D.CK
TH9010	✓	✓	✓	✓	8 channels	TH90101	✓	✓
TH9010A	✓	✓	✓	✓	4 channels	TH90101A	✓	✓

S.CK and D.CK are dedicated functions of the optional scanning module (§4.3.5, §4.3.6, §4.5) and require that module to be fitted. SCPI and S.CK/D.CK capability are standard across the model range — not a unique feature of either model.

A.5 Related documents

- TH9010 Series Datasheet (Techmize)
- TH9010 Series SCPI Command Reference (Techmize, companion to this manual)

A.6 Contacting Techmize

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

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