TECHMIZE by TONGHUI

OM OPERATION MANUAL

TH9320 / TH9320S Series

AC/DC Withstand Voltage & Insulation Resistance Tester — covering TH9310, TH9310B, TH9320, TH9320-S4 and TH9320-S8.

Techmize Electronic GmbH — an international subsidiary of Changzhou Tonghui Electronic Co., Ltd.

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TH9320/TH9320S Series Operation Manual

AC/DC Withstand Voltage & Insulation Resistance Tester — TH9310 / TH9310B / TH9320 / TH9320-S4 / TH9320-S8

This is the English-language edition of the TH9320/TH9320S Series Operation Manual. Where this manual and the instrument itself appear to disagree, or a described function is not present on your particular model, contact Techmize or your authorized distributor using the details in §1.10 before relying on the instrument for test decisions.

Techmize continually improves the performance, features and construction of its instruments; content, specifications and accessories described here are subject to change without notice. This manual covers the models actively offered by Techmize in Europe — **TH9310, TH9310B, TH9320, TH9320-S4** and **TH9320-S8** — and does not describe other regional variants of the underlying platform.

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CHAPTER 1

Safety & Compliance

1.1 About this manual

This manual covers the Techmize **TH9310**, **TH9310B**, **TH9320**, **TH9320-S4** and **TH9320-S8** AC/DC withstand-voltage (hipot) and insulation-resistance testers. All five models share the same display, control-panel layout, firmware platform and command set; the TH9320-S4/S8 models use a taller chassis that houses the built-in scanner (§7, Chapter 6). The models otherwise differ in maximum test current, which test functions are enabled, and — for the -S4/-S8 models — the number of built-in scan channels. Differences between models are called out at each relevant point in this manual and summarised in Chapter 7.

This instrument outputs hazardous high voltages (up to 5 kV AC / 6 kV DC). Read this chapter in full, together with Chapter 5, before operating the 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 (DUT).

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 at the instrument's rear-panel ground terminal.

1.3 General safety requirements

This instrument is a **Protection Class I** device: protective earthing of the chassis, via the power cord or the rear-panel ground terminal, is essential to safety and must not be defeated.

> **WARNING — HAZARDOUS VOLTAGE**
>
> This instrument generates test voltages up to 5 kV AC / 6 kV DC, which can cause injury or death. Never touch the DUT, the test leads, the HV output terminal or any exposed conductive part of the test circuit while the **HV** (DANGER) lamp is lit or a test is in progress.

Grounding. If the instrument's output, or a peripheral connected to it, is referenced to a building or mains ground that is not itself reliably earthed, the chassis can become hazardously live. Ground the instrument by one of the following methods before use:

1. Connect the supply cable to a single-phase, three-wire outlet with a reliably earthed protective-ground contact, **or**
2. Connect the rear-panel protective-ground terminal to a qualified earthing busbar with a conductor sized and installed by a qualified engineer.

1.4 Environment & handling

Condition	Requirement
Operating temperature	5–35 °C
Storage temperature	−20 to +60 °C
Operating humidity	20–80% RH, non-condensing
Storage humidity	< 90% RH, non-condensing

Do not operate the instrument near flammable gases or vapours, in a corrosive-gas or dusty atmosphere, on an inclined or unstable surface, or near strong magnetic or electric fields. Keep the side and rear ventilation openings clear — the instrument is force-air cooled. Above 3 kV, test leads can ionise the surrounding air (corona) and radiate RF interference; keep test leads well separated from each other, from sensitive nearby equipment, and from any sharp-edged conductive surface.

Moving the instrument. Switch off the power and disconnect all cables — mains, test leads, interface cables — before moving or transporting the instrument. Moving it with the power on, or with cables still attached, can cause electric shock or damage the connectors.

1.5 Connecting the AC supply

Model	Rated power	Input voltage	Fuse (slow-blow)
TH9320 / TH9320-S4 / TH9320-S8	≤ 500 VA	220 V 110 V	3.15 A 6.3 A
TH9310 / TH9310B	≤ 300 VA	220 V 110 V	2 A 3.5 A

The instrument accepts **100–121 V AC or 198–242 V AC, 47.5–63 Hz**, selected by the rear-panel line-voltage selector (its two positions are marked for nominal 110 V and 220 V mains); the inlet has a built-in fuse holder. Before connecting the supply, confirm the fuse rating and the selector position match your local mains, and confirm the instrument's power switch is off. Use only the 3-core power cable supplied with the instrument, fitted with an **EU plug (Schuko, CEE 7/7)** for European use, or a cable selected by a qualified engineer.

> **CAUTION**
> Replace a blown fuse only with the same type and rating shown above for your line-voltage setting. Using an incorrect fuse defeats the instrument's fire protection.

1.6 Operational check before use

Where practical, use the instrument's **INTERLOCK** function (§9.2): enclose the DUT and test area so that opening the enclosure breaks the interlock loop and disables the HV output. On power-up, the instrument lights every front-panel indicator during self-test; confirm all indicators — the **HV** (DANGER) lamp especially — illuminate correctly before relying on the instrument for testing. Allow at least a few seconds between switching the instrument off and back on.

1. Confirm the supply voltage is within the fuse/selector setting from §1.5.
2. Connect the AC supply cable to the rear-panel inlet, then to the wall outlet.
3. Power on; confirm all front-panel indicators light during self-test and the splash screen shows the instrument model and firmware version.
4. The display then opens on the <Measurement Setup> page showing the AC withstand-voltage parameters (§4.2).
5. Power off.

1.7 CE marking & conformity

This instrument carries the **CE** mark on its rear-panel nameplate. Contact Techmize (§1.10) for the full EU Declaration of Conformity and applicable directive/standard details.

1.8 Interface language

Techmize instruments in this series are supplied with an **English** operating interface. This manual describes the English-language menus only.

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.

This warranty does not cover: damage from misuse, accident, unauthorized modification or repair; consumable/wear items such as fuses and test cables; or damage from operation outside the environmental limits given in §1.4.

1.10 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 & standard accessories

Check the contents of the shipping carton against the list below before use. If the carton or its contents show signs of transport damage, do not power on the instrument — contact your carrier and your Techmize distributor before proceeding.

Item	TH9310 / TH9310B / TH9320	TH9320-S4	TH9320-S8
Instrument	1× as ordered		
EU power cable (Schuko, CEE 7/7)	1×		
TH90003D withstand-voltage test cable	1×		
TH90003R withstand-voltage test cable	1×	5×	9×
Operation manual, test report, warranty card	1× each		

Keep the original packaging: it is the recommended way to store or return the instrument.

2.2 Connecting the test leads

Use only test cables supplied or approved by Techmize/Tonghui. Connect the supplied withstand-voltage test cable(s) to the front-panel **HV OUTPUT** and **RTN/LOW** terminals (§3.1) — or, on -S4/-S8 models, to the appropriate **CH1…CH4/CH8** scan terminals (§3.2, §6). Keep test leads away from sharp or conductive surfaces and route them so they cannot be touched accidentally during a test.

2.3 Starting the instrument for the first time

1. Connect the power cable at the rear panel, then to the wall outlet.
2. Press the **POWER** switch at the front-left of the instrument.
3. All front-panel indicators light during self-test, then a splash screen shows the instrument model and firmware version while it loads.
4. The display opens on the <Measurement Setup> page, showing the last-used test file (§4.2).

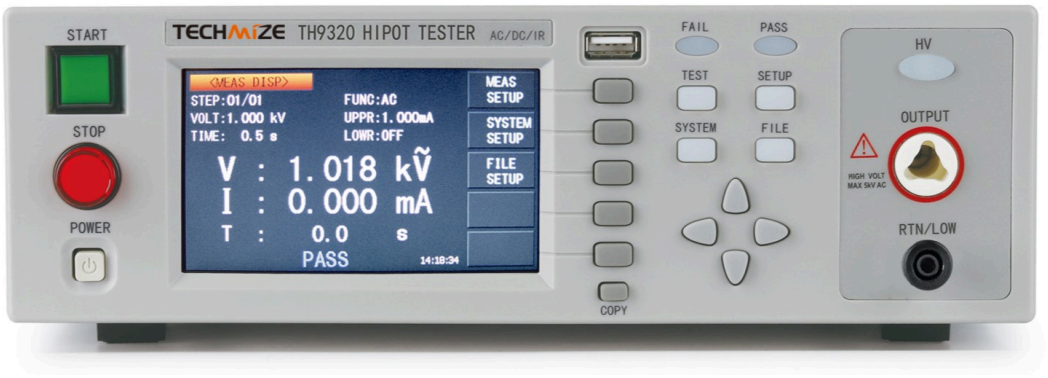
> **NOTE**
> Whatever test parameters are showing on the <Measurement Setup>/<Test> page when the instrument is switched off are restored automatically at the next power-on.

For an overview of the front panel, rear panel and basic navigation, continue to Chapter 3.

CHAPTER 3

Getting to Know the Instrument

3.1 Front panel — TH9310 / TH9310B / TH9320



POWER — power switch, front-left.

START (green) — starts a test; the **HV** lamp lights once output begins.

STOP (red) — stops a test in progress; also clears a PASS/FAIL indication.

Trademark & model — instrument brand and model.

USB port (front) — for a USB flash drive: transfer test files, capture the screen (**COPY**), upgrade firmware (§A.3).

FAIL / PASS indicators — light according to the outcome of the last test.

TEST / **SETUP** / **SYSTEM** / **FILE** — the four function keys; each opens the matching screen (§4.1).

Arrow keys — move the cursor between fields on the current screen.

F1–F5 soft keys — perform the action shown alongside them on the LCD.

COPY — saves the current screen as an image to a USB drive.

HV lamp — lit whenever high voltage is present at the output; treat the test circuit as live whenever this lamp is lit.

HV OUTPUT / **RTN/LOW** — high-voltage output and current-sense return terminals. Maximum 5 kV AC / 6 kV DC.

480 × 272-dot colour TFT-LCD; English interface.

3.2 Front panel — TH9320-S4 / TH9320-S8 (built-in scanner)

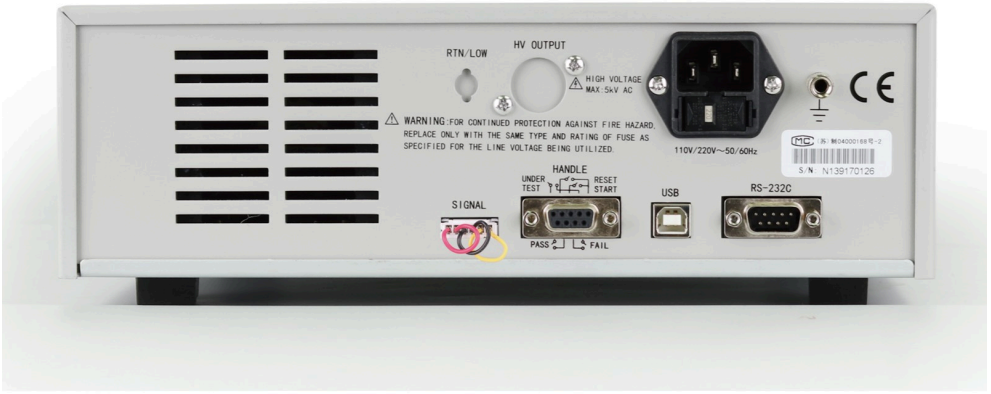


TH9320-S8 shown (8 channels); TH9320-S4 is identical except for 4 channels

The -S4 and -S8 models add a row of high-voltage scan terminals (**CH1…CH4** on -S4; **CH1…CH8** on -S8) below the main control panel. Everything described in §3.1 for the base panel — keys, display, HV lamp, indicators — is identical; the scan terminals replace the single HV OUTPUT/RTN-LOW pair as the test connection point, switched electronically per test step under the **SCAN** parameter (§6.1). The original HV OUTPUT/RTN-LOW terminals remain active and can be used as a common return.

> **WARNING**
>
> Do not connect test leads to a scan channel that is not part of the current test step's SCAN assignment — an unused channel can still be switched live during a later step in the same test file.

3.3 Rear panel



Cooling-fan vents — keep clear; the power-amplifier stage is force-air cooled.

RTN/LOW / **HV OUTPUT** — factory option: relocates the HV test connection to the rear panel.

AC inlet — with built-in fuse holder and 110 V/220 V selector (§1.5). **CE** mark.

Protective-ground terminal — see §1.3.

SIGNAL — interlock loop and auxiliary +24 V supply (§9.2).

HANDLE (HANDLER) — 9-pin D-sub remote start/stop/result interface (§9.1).

USB — USB device port for PC control (§4.4, §8).

RS-232C — 9-pin serial port for PC control (§8).

3.4 What each model can do

Model	AC withstand voltage	DC withstand voltage	Insulation resistance	Scan channels
TH9310B	5 kV / 10 mA	—	—	—
TH9310	5 kV / 10 mA	6 kV / 5 mA	Yes	—
TH9320	5 kV / 20 mA	6 kV / 10 mA	Yes	—
TH9320-S4	5 kV / 20 mA	6 kV / 10 mA	Yes	4, with contact check
TH9320-S8	5 kV / 20 mA	6 kV / 10 mA	Yes	8, with contact check

All five models also provide open/short (OS) pre-test detection, rapid discharge, arc detection and ground-leakage (GFI) operator protection — see Chapters 4–5. Full specifications are in Chapter 7.

3.5 Screen structure & navigation

The four function keys open four groups of screens:

Key	Opens
SETUP	<Measurement Setup> — create/edit the test file: steps, test mode (AC/DC/IR/OS, plus CK on -S4/-S8) and their parameters (§4.2–§4.3).
TEST	<Measurement Display> — the run screen; press START here to begin testing with the currently loaded file (§4.4, §5.1).
SYSTEM	<System Setup> 1/2/3 — protection, handling, beeper, communications and other instrument-wide settings, independent of any test file (§4.5).
FILE	<File> — load, save, delete or copy test files between internal memory and a USB drive (§4.6).

Use the arrow keys to move the cursor to a field, then the F1–F5 soft keys (labelled on-screen) to change it. Holding F4 while switching the instrument on restores factory-default settings for the current test file and System-1 page — useful after a firmware upgrade or if a loaded file displays incorrectly.

CHAPTER 4

Menu & Parameter Reference

4.1 <Measurement Setup> screen (SETUP)

Each test file holds up to **20 steps**; the instrument stores up to **20 files**. The header of the SETUP screen shows the current step (e.g. `STEP: 01/01`) and its test mode. The right-hand soft keys manage steps:

Key	Function
F1 **INS**	Insert a new step after the current one.
F2 **DEL**	Delete the current step.
F3 **NEW**	Start a new, empty test file (adds a default first step).
F4 / F5	Move to the next / previous step.

With the cursor on the test-mode field, the soft keys switch that step between **AC**, **DC**, **IR** and **OS** (plus **CK** and **MF** on -S4/-S8 models, §6). Each mode has its own parameter set, detailed in §4.2. AC/DC/IR/OS steps can also be configured remotely (§8); CK and MF steps must be set up from the front panel — a remote application can still start the file and read the overall result (§8.10).

> NOTE
> With System-1 "Test Safe" (§4.5) set to OFF, pressing START from the SETUP screen begins a test immediately using the on-screen file. If accidental starts are a concern, disconnect the SIGNAL interlock loop (§9.2) before editing parameters.

4.2 AC withstand-voltage (AC) parameters

Field	Range	Description
VOLT	0.050–5.000 kV	Test voltage.
UPPER	0.001–20.00 mA (TH9320-family) / 0.001–10.00 mA (TH9310-family)	Upper current limit — a FAIL if exceeded.
LOWR	Same range as UPPER, or OFF	Lower current limit — a FAIL if the reading is below it. OFF disables the check.
ARC	1.0–20.0 mA, or OFF	Arc-detection current threshold (§5.3).
TIME	0.2–999.9 s, or OFF	Test duration. OFF = untimed (ends only on FAIL or STOP); requires RISE ≠ OFF.
RISE	0.1–999.9 s, or OFF	Voltage rise time. OFF defaults to 0.1 s internally.
FALL	0.1–999.9 s, or OFF	Voltage fall time. OFF cuts the output immediately at test end.
FREQ	50 / 60 Hz	AC test frequency.

4.3 DC withstand-voltage (DC) parameters

Not available on TH9310B. Fields not listed here (VOLT range, TIME, RISE, FALL) behave as for AC (§4.2), with the DC voltage/current ranges below.

Field	Range	Description
VOLT	0.050–6.000 kV	Test voltage.
UPPER / LOWR	0.1 µA–10.00 mA (TH9320-family) / 0.1 µA–5.00 mA (TH9310)	Current limits, as for AC. Values below 1 µA must be typed in with the numeric soft-keyboard.
WAIT	0.2–999.9 s, or OFF	Charging wait time — extra settle time before the current-limit judgement is applied, for capacitive DUTs. Must satisfy RISE < WAIT < RISE + TIME.
ARC	1.0–20.0 mA, or OFF	Arc-detection current threshold.
RAMP	ON / OFF	ON applies the current-limit judgement during the voltage-rise phase too (catches a fault early). OFF suppresses it during rise only — useful for DUTs with high capacitive inrush current, to avoid a false trip; the hard current-limit (SHORT) protection in §5.3 is never suppressed.

4.4 Insulation-resistance (IR) parameters

Not available on TH9310B or TH9310A-class variants outside this manual's scope. VOLT/TIME/RISE/FALL behave as in §4.2–4.3.

Field	Range	Description
VOLT	0.10–1.00 kV	Test voltage.
UPPER	0.1 MΩ–10.00 GΩ, or OFF	Upper resistance limit.
LOWR	0.1 MΩ–10.0 GΩ	Lower resistance limit — a FAIL if the reading is below it.
RANG	AUTO, or a fixed current range	AUTO ranges automatically for best accuracy (adds up to ≈0.5 s per range change). Fixed ranges — TH9320-family: 2/20/200 µA, 2/10 mA; TH9310: 1/10/100 µA, 1/5 mA — let you pre-select a range (I ≈ U/R) for faster, more predictable test timing.

> **NOTE**
> Only the SHORT-circuit judgement is active while the IR test is charging; the lower-limit judgement is applied at the end of the test. A displayed reading of "----" means the true value exceeds 9.99 GΩ; over an interface, this reads back as the actual value above 9.99 GΩ (reference only).

4.5 Open/short (OS) pre-test detection

OS runs before the high-voltage stage to confirm the DUT is actually connected, using a low-voltage (100 V, 100 ms) stray-capacitance measurement; it resolves down to about 100 pF.

Field	Range	Description
STAN	< 10 nF	Standard (reference) capacitance value for a correctly connected DUT.
GET	—	Soft key: samples the current connection and stores it as STAN. Do not connect the DUT when sampling the OPEN condition.
OPEN	10–100% (1% steps)	Trip point below STAN, as a percentage — flags a disconnected DUT.
SHRT	OFF, 10–500% (10% steps)	Trip point above STAN — flags an unexpected short between test points.

4.6 <System Setup 1> screen (SYSTEM, 1st page)

System settings apply instrument-wide and are independent of the loaded test file.

Field	Options	Description
PASS HOLD	0.2–99.9 s, or KEY	How long a PASS result is held on screen. KEY holds until **STOP** is pressed.
FAIL MODE	STOP / CONTINUE / RESTART / NEXT / NORMAL	Behaviour after a FAIL: stop the file, continue to the next step and report at the end, wait for START to repeat the failed step, wait for START to move on, or finish the timed test normally and only then evaluate.
GFI	ON / OFF	Ground-leakage (operator-protection) trip (§5.3). Leave ON unless the DUT's own design leakage current makes this impractical.
STEP HOLD	OFF / KEY / 0.2–99.9 s	Wait time between steps in a multi-step file. KEY waits for **START**.
TURN MODE	ON / OFF	ON allows the output voltage to be fine-tuned manually during a test. Leave OFF for normal use — ON can cause false ARC trips.
DISP MODE	DATA / P-F	Show the live measured value plus PASS/FAIL, or PASS/FAIL only.
TEST SAFE	ON / OFF	ON requires **STOP** to clear a FAIL state. OFF returns to the ready state automatically — convenient for automated lines, but means a FAIL can be missed if not logged externally.
CTRL MODE	FILE / STEP	HANDLER result output timing: once per completed file, or once per step (§9.3).
CHECK MODE	OFF / CK	-S4/-S8 only: enables the contact-check test mode (§6.2).
PASS BEEP / FAIL BEEP	OFF / LOW-LONG / TWO-SHORT	Audible result indication.
KEY BEEP	ON / OFF	Key-press click.
STRT DLY	0.1–99.9 s, or OFF	Delay between pressing START and the first step actually beginning.
OFFSET	OFF / ON / GET	Stray-current zeroing (§5.4).
SHORT	LOW / HIGH	Short-circuit/current-extreme trip sensitivity (§5.3).
ARC MODE	VALUE / GRADE	Show the arc-event current value, or which sensitivity grade it fell in.
STEPMODE	NORMAL / REPEAT / FRAME / STEP	NORMAL runs the file once; REPEAT loops it continuously; STEP runs only the currently displayed step each time START is pressed; FRAME is a custom staged mode (contact Techmize for details).
DISCHG	OFF (20 ms) / 200 ms / 500 ms / 1 s / 2 s	Forced DC/IR discharge hold time after a test. If used, also add STEP HOLD ≥ 0.2 s.

4.7 <System Setup 2> & <System Setup 3> screens

Field	Options	Description
ARC ADJ *(page 2)*	OFF, or 0.1–10	Arc-detection calibration factor = (your reference DUT's known ARC value) ÷ (the ARC threshold the instrument reports for it with ARC ADJ off). Compensates for unit-to-unit frequency-response differences; see §5.3.
BUS MODE *(page 3)*	RS232C / RS485 / USBTMC / USBVCOM	Remote-interface mode (§8.1). RS232C/USBVCOM use 8 data bits, no parity, 1 stop bit.
BAUD	9600–115200	Serial baud rate.
BUS ADDR	1–32	Instrument address on an RS485 bus.
DEFAULT	—	Soft key: restores factory system settings (does not affect a PASSWORD, if set).
PASSWORD	OFF / SYSTEM / FILE / Modify	SYSTEM requires a password to open System Setup at power-on; FILE blocks saving/deleting test files. Default password: `9310`.
ADJ SET	SET / UPDATE	SET opens the calibration menu (qualified personnel only). UPDATE opens the USB firmware-upgrade entry point (§A.3).
COMMAND	SCPI / MODBUS	Remote command protocol (§8). Contact Techmize for the MODBUS register map.

The operating interface is configured in English by default (§1.8).

4.8 <File> screen (FILE)

Test files are stored in two parts: the step/parameter data, and the related System-1 settings. The FILE screen lists **Internal** memory (20 slots) or, with a USB drive fitted, **External** storage.

Key	Function
F1 Load	Loads the highlighted file as the active test file.
F2 Save	Saves the active test file to the highlighted slot.
F3 Delete	Deletes the highlighted file.
F4 Copy	Copies the highlighted file between internal memory and a USB drive.
F5 Select	Marks a file for a batch operation.

Use PgUp/PgDn (arrow keys) to page through the file list.

CHAPTER 5

Test Operation & Safety Functions

5.1 Test sequence

From the <Measurement Display> (TEST) screen, confirm the loaded file and DUT connection, then press START. One step runs as follows:

1. **Start delay** — STRT DLY (first step) or STEP HOLD (later steps), §4.6.
2. **Voltage rise** — output ramps to the test voltage over RISE; on DC/IR, charging current is monitored (RAMP, §4.3).
3. **Withstand-voltage / insulation-resistance test** — for the TIME duration, with continuous current/resistance monitoring against UPPER/LOWR, GFI, SHORT and ARC (§5.3).
4. **Voltage fall** — output ramps down over FALL; DC/IR then perform a brief forced discharge.
5. **Result processing** — PASS or FAIL is shown and held per PASS HOLD/FAIL MODE (§4.6); the HANDLER interface reports the result (§9.3).

Press STOP at any time to abort a test in progress or to clear a held PASS/FAIL — no result is reported for a manually stopped test. With OFFSET (§5.4) needed, do it before running production tests.

5.2 Warnings during operation

> **WARNING — STAY CLEAR DURING TEST**
>
> No one should approach the test leads, the DUT or any exposed conductor of the test circuit while the **HV** lamp is lit. If the DUT needs to be touched, or a connection changed, press STOP first and confirm the HV lamp is off.

Wear insulated gloves when handling the test leads, and never touch a live conductor even with gloves rated for the test voltage. If leaving the instrument unattended, power it off first.

Remote-start operation. Because a remote START can trigger the HV output without any front-panel action, confirm your STOP wiring is reliable before running the instrument in a remote-controlled cell, and use the SIGNAL interlock (§9.2) with a visible HV indicator wherever more than one person may be near the test area.

5.3 Built-in protection functions

Function	Trigger	Response
GFI (ground-leakage)	Chassis/ground leakage current > 0.5 mA ± 50%	Output cut within 0.3 s; display shows "GFI FAIL". Left ON unless the DUT's own leakage makes this impractical (§4.6).
LOW / HIGH current limit	Reading outside LOWR…UPPER, sampled every 100 ms	"LOW FAIL" / "HI FAIL" — the standard pass/fail judgement for withstand-voltage and IR tests.
SHORT (current extreme)	Instantaneous current exceeds roughly 2× the instrument's rated output (1.5× peak on AC)	"SHORT FAIL" — a fast hardware trip, faster than the 100 ms sampled limit above and not maskable. The reported result is the last valid reading from just before the trip.
ARC (arc detection)	A fast transient current spike, above the ARC threshold, superimposed on the normal test current	"ARC FAIL" — flags intermittent flashover inside coil-type DUTs that the 100 ms sampled limit is too slow to catch. See §4.7 (ARC ADJ) to compensate for unit-to-unit sensitivity differences. Because ARC magnitude is affected by test-lead routing and the test environment, treat it as a qualitative indicator.

Any FAIL from the table above ends the test immediately, cuts the HV output, and is processed per FAIL MODE (§4.6). On a multi-step file, one FAILed step fails the whole file.

5.4 Offset zeroing (OFFSET)

Stray capacitance in the test leads and fixture can add a small background current reading even with nothing connected. To zero it out:

1. Set up the test conditions you intend to use, on the SETUP screen.
2. On <System Setup 1>, set OFFSET to ON.
3. Press the GET soft key — the instrument runs a brief test automatically and stores the resulting reading as the zero point. **Do not connect the DUT during this step.**
4. If TIME is OFF, press STOP to end the sampling test.

> **CAUTION**
>
> OFFSET zeroes the *displayed* value only — it does not change the instrument's actual current range or improve absolute accuracy. It applies to every step in the file, so re-run it whenever the test conditions change.

5.5 Prohibited actions

- Do not power-cycle the instrument rapidly; wait at least one minute between switching off and back on.
- Do not switch off the power while the HV output is active, except in an emergency (§5.6).
- Do not reference the HV output or RTN/LOW terminal to the AC mains earth, building steelwork, or any other external ground — if the connection to true earth is not reliable, the chassis can become hazardously live (§1.3).
- Do not apply any external voltage to the HV OUTPUT or RTN/LOW terminals; the instrument's output stage is not designed to sink an external source.

5.6 Emergency handling

> **WARNING**
>
> If a hazard occurs (e.g. electric shock, a DUT catching fire) and the instrument does not cut the HV output on its own: (a) switch off the POWER switch, **and** (b) unplug the power cable — do both.

5.7 High-voltage test warnings

Confirm the RTN/LOW connector's locking collar is tightened before testing — a low-end connector that works loose during a continuous test can go unnoticed. If it does work loose during a hazardous or continuous test, and there is no safe way to stop the output (STOP key or a reliable remote-control path), switch off the power immediately.

After a test ends, the instrument applies a forced discharge, but a charged capacitive DUT can still present a shock hazard if disconnected too soon. Approximate discharge time: $t = -\ln(30/U) \times R \times C$, where U is the test voltage, C the DUT's capacitance, and R the discharge-path resistance (≈ 10 kΩ on a FAIL via the output transformer secondary; ≈ 20 kΩ on the dedicated discharge circuit). In practice, a 1 µF DUT charged to 6 kV discharges to a safe residual (< 30 V) in well under the instrument's fixed 0.2 s minimum discharge time — but always treat a DC/IR DUT as potentially live until the discharge period has elapsed.

5.8 If the instrument develops a fault

The most hazardous fault condition is high voltage present at the output with the instrument not responding to controls. If this occurs:

1. Switch off the power **and** unplug the power cable.
2. Stay clear of the instrument. Either have qualified personnel confirm the test circuit is de-energised, or leave the instrument disconnected for at least one hour before approaching it again.
3. Do not open the case or attempt a repair — internal high voltage may remain stored, and only qualified service personnel should work inside the instrument. Contact Techmize or your distributor (§1.10) to arrange repair.

5.9 Duty cycle for continuous output

The output stage is rated for continuous duty only up to the thresholds below; above them, observe the rest period shown to avoid overheating the power-amplifier stage.

Test	Output current	Maximum continuous run	Required rest
AC — TH9320 family	> 12 mA	1 minute	At least as long as the run
AC — TH9310 family	> 6 mA	1 minute	At least as long as the run
AC — either family	Below the thresholds above	Unlimited	—
DC — TH9320 family	> 6 mA	1 minute	At least as long as the run
DC — TH9310 family	> 3 mA	1 minute	At least as long as the run
DC — either family	Below the thresholds above	Unlimited	At least as long as the WAIT (charge) time

"Output time" = voltage-rise time + test time + voltage-fall time. If the cooling fan runs continuously for 30 minutes, pause use of the instrument — extended forced-air operation at high duty can otherwise overheat the power-amplifier module.

5.10 Daily inspection checklist

- Confirm the supply voltage matches the fuse/selector setting (§1.5).
- Confirm the protective-ground connection is intact (§1.3).
- Inspect test leads for cuts, cracks or exposed conductor — replace if damaged.
- With no test leads connected, run a test at the default settings and confirm it completes normally.
- With the test leads' high and low ends touching, run a test and confirm the instrument reports FAIL.

CHAPTER 6

Scanning Operation — TH9320-S4 / TH9320-S8

This chapter applies only to **TH9320-S4** (4 channels) and **TH9320-S8** (8 channels). Both add a built-in high-voltage relay matrix that connects the instrument's single test source to multiple DUT points in turn, so a multi-point DUT can be tested with one connection cycle instead of manually moving test leads between points.

6.1 The SCAN parameter

Every AC/DC/IR/OS step on a -S4/-S8 model carries an additional **SCAN** field listing all available channels (`1|2|3|4` on -S4, `1|2|3|4|5|6|7|8` on -S8). Assign each channel a role for that step:

Colour	Role
Red	Channel connects to the HV (high) side for this step.
Green	Channel connects to the test/return (low) side for this step.
Black / white	Channel is open (disconnected) for this step.

> **WARNING**
> The original front-panel HV OUTPUT/RTN-LOW terminals remain live during scanned tests and can be used as a shared common connection. Do not connect anything to a channel marked open for the current step — it may be switched live on a later step in the same file.

6.2 Contact check (CK)

Contact check confirms a DUT is properly seated in the test fixture — by verifying continuity between two channels — before the withstand-voltage stage runs, reducing false test results from a poor connection. Enable it first on <System Setup 1> (CHECK MODE = CK, §4.6); this adds a CK test mode alongside AC/DC/IR/OS. CK parameters are set up and activated from the front panel only — there is no SCPI command for it; a remote application can start a CK-containing file as usual and read the overall pass/fail result with `FETC4?` (§8.10).

Field	Range	Description
SCAN	Pick one channel per role	On TH9320-S4/S8, assign one channel **Red** (high) and one **Green** (low) — the pair spans the two points of the node under test.
VOLT	0.050–0.200 kV	Low-voltage continuity test voltage.
Current limit	60 µA–10.00 mA (TH9320-family)	Below this, the instrument reports the node as open (DUT missing or misaligned).

At a default 100 V CK test voltage, a channel pair with nothing connected reads roughly 100 µA on this platform's internal channel resistance; set the current-limit threshold to at least 1.5× that baseline so an open channel is not read as a false pass.

6.3 Worked example — two-secondary transformer

A transformer with a primary (P) and two isolated secondaries (S1, S2) needs three withstand-voltage tests between windings: P–S1, P–S2, and S1–S2. Using CH1–CH4 on a -S4:

1. Wire P to CH1, S1 to CH2, S2 to CH3.
2. Step 1 (P–S1): SCAN CH1 = Red, CH2 = Green, others open.
3. Step 2 (P–S2): SCAN CH1 = Red, CH3 = Green, others open.
4. Step 3 (S1–S2): SCAN CH2 = Red, CH3 = Green, others open.

For contact check on the same wiring, run CK first with SCAN CH1/CH2 paired, then CH1/CH3, then CH2/CH3 — one CK sub-step per node pair you want verified — before the withstand-voltage steps.

> **NOTE**
> To avoid a false CK trip from cross-talk between adjacent nodes, wire each winding to its own channel as shown, and use the same SCAN assignment for both the CK step and the corresponding withstand-voltage step for that node pair.

6.4 Multichannel auxiliary control (MF) — advanced integration

An **MF** test mode is also available on -S4/-S8 models, used to combine this instrument with a Tonghui turns-ratio/impulse tester (e.g. as part of a TH90010-class system) so that withstand-voltage and turns-ratio testing can run as one automatic sequence on the same DUT. Configuring MF requires system-level integration; contact Techmize for details if your application needs it. MF is automatically disabled while CK (§6.2) is enabled.

6.5 Standard accessories by channel count

Item	TH9320-S4	TH9320-S8
TH90003D withstand-voltage test cable	1×	1×
TH90003R withstand-voltage test cable	5×	9×

CHAPTER 7

Performance & Specifications

These figures match the current Techmize European datasheets for this platform; if a number here ever differs from the datasheet in effect, the datasheet governs.

Parameter	TH9310B	TH9310	TH9320
Display	480 × 272-dot TFT-LCD, colour, English UI		
AC WITHSTAND VOLTAGE TEST			
Output voltage	0.05–5.00 kV, ±(2% reading + 5 V); 50/60 Hz selectable		
Current test range	1 µA–10.00 mA	1 µA–10.00 mA	1 µA–20.00 mA
All: ±(2% reading + 5 digits)			
DC WITHSTAND VOLTAGE TEST			
Output voltage	—	0.05–6.00 kV, ±(2% reading + 10 V)	
Current test range	—	0.1 µA–5.00 mA	0.1 µA–10.00 mA
Both: ±(2% reading + 5 digits); automatic discharge after test ends (DCW)			
INSULATION RESISTANCE TEST			
Output voltage	—	0.10–1.00 kV, ±2%	
Resistance range	—	0.1 MΩ–10.0 GΩ	
Resistance accuracy	—	0.10–999 MΩ: ±(10% rdg + 2 digits) · 1.00–10.0 GΩ: ±(20% rdg + 2 digits)	
ARC DETECTION & GENERAL			
Arc-current detection range	1–20 mA (§5.3)		
Rise / test / fall time	0.1–999.9 s (rise, fall) · 0.2–999.9 s (test, IR wait)		
Time accuracy	±(1% + 0.1 s)		
Memory	20 test files, 20 steps per file		
GFI trip threshold	0.5 mA ± 50% chassis leakage current		
Dimensions (W×H×D)	280 × 88 × 428 mm		280 × 88 × 428 mm
Weight	11 kg	11 kg	12.3 kg
Power supply	100–121 V / 198–242 V AC (switchable), 47.5–63 Hz		
Interfaces, standard	RS232, USB Device, USB Host, HANDLER, SIGNAL, PLC (SCPI & MODBUS)		

Parameter	TH9320-S4	TH9320-S8
Display	480 × 272-dot TFT-LCD, colour, English UI	
Scan interface	4 channels	8 channels
AC / DC WITHSTAND VOLTAGE & INSULATION RESISTANCE		
Identical to TH9320 (previous page): AC 0.05–5.00 kV/20.00 mA, DC 0.05–6.00 kV/10.00 mA, IR 0.10–1.00 kV / 0.1 MΩ–10.0 GΩ, arc detection 1–20 mA		
CONTACT CHECK (CK)		
Test voltage	0.050–0.200 kV	
Current limit	60 µA–10.00 mA	
GENERAL		
Memory	20 test files, 20 steps per file	
Dimensions (W×H×D)	280 × 138 × 428 mm	
Weight	18 kg	
Power supply	100–121 V / 198–242 V AC (switchable), 47.5–63 Hz	
Interfaces, standard	RS232, USB Device, USB Host, HANDLER, SIGNAL, PLC (SCPI & MODBUS)	

NOTE

LAN connectivity is not offered on this platform's European models. Do not connect a network cable to any port not documented in Chapter 3 as a communications interface.

7.1 Applications

Automated test systems · household appliances · transformers & motors · electrical equipment · electric heating appliances · lighting products · new-energy-vehicle components · electronic components · medical devices.

7.2 Optional accessories

Item	Description	Applies to
TH9320-S4 / -S8	4/8-channel built-in scanning (own datasheet — a separate product line from base TH9320)	Sold as a distinct model, not an add-on to a base TH9320

The rear-panel HV OUTPUT/RTN-LOW relocation shown in some Tonghui documentation is a factory-fit option; consult Techmize before ordering if you need it.

CHAPTER 8 · PART II — REMOTE CONTROL & HANDLER

Remote Command Reference (SCPI)

8.1 Getting started

Select the interface and set matching parameters on the PC side: RS232C/USBVCOM use 8 data bits, no parity, 1 stop bit at the BAUD rate set in §4.7; USBTMC is a standard USB-TMC device. Every command must end with a line terminator — `\n` (0x0A), or a bare CR/LF — or the instrument will not parse it.

On an RS485 bus, prefix every command with the instrument's two-digit bus address and `@`, e.g. `08@FUNC:STAR`. Address `00@` is a broadcast to all instruments on the bus.

Commands are case-insensitive ASCII text. Numeric values are sent as plain decimal strings (no units in the command itself — the unit is fixed per field, as shown in the tables below). Allow the instrument time to respond before sending the next command; commands sent faster than the instrument can process them are lost, not queued.

Task	Example
Identify the instrument	`*IDN?` → `Tonghui,TH9320,Version1.5.1`
Read the serial number	`THID:PROD SNUM?`
Switch screens first (each subsystem below only responds when its matching screen is open)	`DISP:PAGE MEAS` before `FUNC:STAR/STOP` · `DISP:PAGE MSET` before any `FUNC:SOUR:STEP` · `DISP:PAGE SYST1/2/3` before `SYST`

8.2 DISPlay subsystem — screen selection

Command	Effect
`DISP:PAGE MEAS`	Measurement Display (run) screen.
`DISP:PAGE MSET`	Measurement Setup screen.
`DISP:PAGE SYST1` / `SYST2` / `SYST3`	System Setup, page 1 / 2 / 3.
`DISP:PAGE FLIS`	Internal file list.
`DISP:PAGE?`	Query the currently open screen.

8.3 FUNCtion:SOURce:STEP — file & step management

Command	Effect
`FUNC:STAR` / `FUNC:STOP`	Start / stop the test (from the Measurement Display page).
`FUNC:SOUR:STEP NEW`	Start a new, empty test file (adds a default step 1).
`FUNC:SOUR:STEP INS`	Insert a new step after the current one.
`FUNC:SOUR:STEP DEL`	Delete the current step.
`FUNC:SOUR:STEP <n>`	Select step *n* (1–20) for editing.
`FUNC:SOUR:STEP <n>?`	Query which test mode step *n* uses; also switches the active editing step to *n*.
`FUNC:SOUR:STEP <n>:AC`	Set step *n*'s mode to AC withstand-voltage.
`FUNC:SOUR:STEP <n>:DC`	Set step *n*'s mode to DC withstand-voltage.
`FUNC:SOUR:STEP <n>:IR`	Set step *n*'s mode to insulation resistance.
`FUNC:SOUR:STEP <n>:OS`	Set step *n*'s mode to open/short detection.

Contact check (CK) is a front-panel-only test mode on this instrument — it has no SCPI equivalent (§8.7). *n* is an integer 1–20 throughout this chapter, with precision 1.

8.4 AC withstand-voltage parameters

Prefix: `FUNC:SOUR:STEP<n>:AC:`

Keyword	Range	Precision / unit
`VOLT`	50–5000	1 · V
`UPPC`	0.001–20.00 (TH9320-family) / 0.001–10.00 (TH9310)	0.001 · mA
`LOWC`	0–20.00 (0 = OFF, TH9320-family) / 0–10.00 (TH9310)	0.001 · mA
`TTIM`	0 (OFF), or 0.2–999.9	0.1 · s
`RTIM`	0–999.9 (0 = OFF)	0.1 · s
`FTIM`	0–999.9 (0 = OFF)	0.1 · s
`ARC`	0–20.0 (0 = OFF)	0.1 · mA
`FREQ`	50 / 60	Hz
`CH<n>` (-S4/-S8 only, *n* = scan channel)	`HIGH` / `LOW` / `OPEN`	—

Example — step 1, AC, 1000 V, 1 mA upper limit, 9.9 s test, channel 1 as HV and channel 2 as return:
`FUNC:SOUR:STEP 1:AC:VOLT 1000;UPPC 1;TTIM 9.9;CH1 HIGH;CH2 LOW`

8.5 DC withstand-voltage parameters

Prefix: `FUNC:SOUR:STEP<n>:DC:` — not available on TH9310B.

Keyword	Range	Precision / unit
`VOLT`	50–6000	1 · V
`UPPC`	0.001–10.00 (TH9320-family) / 0.001–5.00 (TH9310)	0.001 · mA
`LOWC`	0–10.0 (0 = OFF, TH9320-family) / 0–5.0 (TH9310)	0.001 · mA
`TTIM`	0 (OFF), or 0.2–999.9	0.1 · s
`RTIM` / `FTIM`	0–999.9 (0 = OFF)	0.1 · s
`WTIM`	0 (OFF), or 0.2–999.9	0.1 · s
`ARC`	0–20.0 (0 = OFF)	0.1 · mA
`RAMP`	`OFF`(0) / `ON`(1)	—
`CH<n>` (-S4/-S8 only)	`HIGH` / `LOW` / `OPEN`	—

Values below 1 µA (i.e. below the field's stated precision) must be entered via the front-panel numeric soft-keyboard, not over the remote interface.

8.6 Insulation-resistance parameters

Prefix: `FUNC:SOUR:STEP<n>:IR:` — not available on TH9310B.

Keyword	Range	Precision / unit
`VOLT`	100–1000	1 · V
`UPPC`	0–1E4 (0 = OFF)	0.1 · MΩ
`LOWC`	0.1–1E4	0.1 · MΩ
`TTIM`	0 (OFF), or 0.2–999.9	0.1 · s
`RTIM` / `FTIM`	0–999.9 (0 = OFF)	0.1 · s
`RANG`	0–5 (0=AUTO, 1–5 = fixed current ranges, high to low — see §4.4)	integer
`CH<n>` (-S4/-S8 only)	`HIGH` / `LOW` / `OPEN`	—

8.7 Open/short (OS) parameters

Prefix: `FUNC:SOUR:STEP<n>:OS:`

Keyword	Range	Precision / unit
`OPEN`	10–100	1 · % of STAN
`SHOT`	0–500 (0 = OFF)	10 · % of STAN
`STAN`	0–10.000	0.001 · nF
`GET`	— (soft trigger: samples the current connection and stores it as STAN)	—

Example — set STAN directly to 1.00 nF: `FUNC:SOUR:STEP 1:OS:STAN 1.00`. To sample it instead: `FUNC:SOUR:STEP 1:OS:GET` (with nothing connected, for the OPEN baseline).

> **NOTE**
>
> Contact check (CK, §6.2) is a front-panel test mode only on this instrument — it has no SCPI command set. Configure and run CK tests from the front panel; a remote application can still poll the overall result via `FETC4?` once a CK-containing file has run.

8.8 SYSTem subsystem

These commands apply instrument-wide, independent of the loaded test file — see §4.6–4.7 for what each one does.

Command	Range / values
`SYST:PASS <s>`	0.3–99.9 s (PASS HOLD)
`SYST:STEP <s>`	0.3–99.9 s (STEP HOLD)
`SYST:GFI <ON|OFF>` / `<1|0>`	Ground-leakage protection.
`SYST:FAIL <0–3>`	0 STOP · 1 CONTINUE · 2 RESTART · 3 NEXT.

Command	Range / values
SYST:BEEP <0–2>	0 OFF · 1 short · 2 long.
SYST:DISP <0|1>	0 PASS/FAIL only · 1 DATA (value + PASS/FAIL).
SYST:DELA <s>	0–99.9 s (0 = OFF); start delay.
SYST:OFFS <ON|OFF|GET> / <1|0|GET>	Offset zeroing; GET triggers an immediate sampling test — confirm the test setup is safe before sending it.
SYST:TURN <ON|OFF> / <1|0>	TURN MODE — manual voltage fine-adjust during output.
SYST:SMOD <0,1,3>	0 NORMAL · 1 REPEAT · 3 STEP.
SYST:ARCADJ <0, 0.1–10>	0 = OFF; otherwise the arc-calibration factor (§4.7).
SYST:RES	Restore factory system settings (no parameter).

The operating interface is configured in English by default (§1.8).

8.9 MMEMory subsystem — file storage

Command	Effect
MMEM:STOR:STAT <slot>,"<name>"	Save the active test file to internal slot 1–20, with a 1–15 character name.
MMEM:LOAD:STAT <slot>	Load internal slot 1–20 as the active test file.

8.10 Reading results — FETCh

Command	Returns
`FETC?`	Full result string for every tested step in the file: `<mode>,<voltage kV>,<current mA / resistance MΩ>,<PASS|FAIL>` per step, steps separated by `;`, terminated 0x0A. Example: `AC,1.000,1.000,PASS;IR,0.500,100.000,PASS`. Only tested steps appear — an untested step has no entry.
`FETC:AUTO <ON|OFF>` / `<1|0>`	Enable/disable automatic result upload after each test (factory default: ON). Query with `FETC:AUTO?`.
`FETC2?`	Sorting state, valid immediately after a test completes: `READY` / `PASS` / `FAIL` / `TEST`.
`FETC3?`	Instrument busy state: `0` idle, `1` testing.
`FETC4?`	Overall file result: `pass` or `fail`.

8.11 Other commands

Command	Returns
`*IDN?`	`<manufacturer>,<model>,<firmware>` — e.g. `Tonghui,TH9320,Version1.5.1`.
`THID:PROD SNUM?`	Instrument serial number (string, up to 20 characters).

8.12 Worked example — set up and run a 2-step AC/IR file

`*IDN?`	Confirm the connection is working.
`DISP:PAGE MSET`	Switch to the Measurement Setup page.
`FUNC:SOUR:STEP NEW`	Start a new file (adds a default step 1).
`FUNC:SOUR:STEP 1:AC:VOLT 1000;UPPC 1;TTIM 9.9`	Step 1: AC, 1000 V, 1 mA upper limit, 9.9 s test time.
`FUNC:SOUR:STEP INS`	Insert step 2.
`FUNC:SOUR:STEP 2:IR:VOLT 500;LOWC 10;TTIM 2`	Step 2: IR, 500 V, 10 MΩ lower limit, 2 s test time.
`MMEM:STOR:STAT 1,"MYFILE"`	Save the file to internal slot 1 as "MYFILE".
`DISP:PAGE MEAS`	Switch to the Measurement Display page.
`FUNC:STAR`	Start the test.
`FETC3?`	Poll until this returns `0` (test finished).
`FETC?`	Read the full result string (§8.10).

Scanned steps on -S4/-S8 (AC/DC/IR/OS with a `CH<n>` assignment) are set up the same way — see the example in §8.4. Contact check (CK) is front-panel only (§8.7 note).

This chapter is a condensed reference to the commands most needed for routine remote test control; contact Techmize for the complete SCPI programming manual, including the MODBUS register map, if your application needs it.

CHAPTER 9

Handler & Signal Interface

9.1 HANDLER connector (9-pin D-sub)

Pin	Signal	Direction	Function
1	COM	—	Common return for the input signals below.
2	TEST2	Output	Duplicate of TEST (pin 5) for a second load.
3	START	Input	Remote start — equivalent to the front-panel START key. Closure to COM is active.
4	STOP	Input	Remote stop/reset — equivalent to STOP. Closure to COM is active.
5	TEST1	Output	Asserted while HV output is active — use as a synchronisation or "danger" signal to external equipment.
6	FAIL2	Output	Duplicate of FAIL (pin 7).
7	FAIL1	Output	Asserted on a FAIL result.
8	PASS2	Output	Duplicate of PASS (pin 9).
9	PASS1	Output	Asserted on a PASS result.

All outputs are relay contact closures; all inputs are opto-isolated. Result output timing (per file or per step) is set by CTRL MODE (§4.6).

9.2 SIGNAL connector (6-pin)

Pin(s)	Signal	Function
1, 2	+24 V	Auxiliary supply output — unregulated ≈24 V, instantaneous max 0.5 A, continuous < 0.2 A. For an indicator lamp, opto-switch or small solenoid; bring your own supply for larger loads.
3, 4	GND	Return for the +24 V supply above.
5 – 6	INTERLOCK	Safety interlock loop, shipped with a shorting jumper fitted (closed = normal operation). Open this loop — e.g. by wiring it through an enclosure door switch — to disable the HV output whenever the enclosure is open (§1.6).

WARNING

Do not connect an external voltage source to the +24 V pins, and do not exceed the current ratings above — this is an instrument-internal supply, not an isolated PSU.

9.3 Typical operation sequence

1. External controller closes START (pin 3) to COM (pin 1) — equivalent to pressing the front-panel START key.
2. TEST1/TEST2 assert once HV output begins, and stay asserted for the duration of the test (rise + test + fall).
3. At test end, PASS1/PASS2 or FAIL1/FAIL2 assert per the result, held per PASS HOLD/FAIL MODE (§4.6) — or, on a multi-step file with CTRL MODE = FILE, only after the last step completes.
4. The external controller reads the result, then closes STOP (pin 4) to clear it before the next cycle (required when TEST SAFE = ON, §4.6).

> **NOTE**
>
> With CTRL MODE = STEP, TEST/PASS/FAIL assert once per step instead of once per file — useful for monitoring a multi-point test sequence externally, e.g. on a -S4/-S8 model stepping through several SCAN channels.

9.4 Wiring notes

Use opto-isolated (or equivalent floating) switches for the START/STOP/INTERLOCK inputs; the COM return is the low side of the internal opto-couplers. Foot switches, enclosure interlock switches and simple push-buttons all work provided they present a clean, bounce-free contact closure. For PASS/FAIL/TEST outputs, an indicator lamp, PLC input card, or small relay coil can be driven directly within the current ratings in §9.1; use a flyback diode across any inductive load (e.g. a relay coil) to protect the output contacts.

APPENDIX

Terms, Firmware Upgrade & Quick Reference

A.1 Terms & abbreviations

Term	Meaning	Term	Meaning
AC / DC	Withstand-voltage test mode	IR	Insulation-resistance test mode
OS	Open/short pre-test detection	CK	Contact check (-S4/-S8 only)
MF	Multichannel auxiliary control (-S4/-S8 only, §6.4)	SCAN	Scan-channel assignment (-S4/-S8 only)
GFI	Ground-leakage (operator-protection) trip	ARC	Arc detection
DUT	Device under test	DCW	DC withstand-voltage test

A.2 Front-panel key quick reference

Key	Function
START / STOP	Start / stop a test (§5.1).
TEST	Open the Measurement Display / run screen (§3.5).
SETUP	Open the Measurement Setup screen (§4.1).
SYSTEM	Open System Setup 1/2/3 (§4.6–4.7).
FILE	Open the File screen (§4.8).
COPY	Save the current screen to a USB drive.
F1–F5	Soft keys — action shown on the adjacent LCD label.

A.3 Firmware upgrade via USB

1. Format a USB drive as FAT32 (< 32 GB, ideally empty). Copy the upgrade file to its root directory **without renaming it**.
2. Insert the drive into the front-panel USB port; the display confirms the drive is recognised.
3. Open <System Setup 3> → ADJ SET, and press the UPDATE (F2) soft key.
4. The instrument installs the firmware automatically and restarts when finished.
5. Hold F4 while powering on to clear any settings made invalid by the version change, restoring factory defaults.
6. Re-check every saved test file afterward — a firmware update can change the internal data format, and files saved under an older version may need re-entering.

> **CAUTION**
>
> Do not remove the USB drive or power during an upgrade. If in doubt about a firmware file's authenticity or version, contact Techmize before installing it.

A.4 Common remote commands

Task	Command
Identify the instrument	`*IDN?`
Start / stop a test	`FUNC:STAR` / `FUNC:STOP`
Read results	`FETC?`
Save / load a file	`MMEM:STOR:STAT` · `MMEM:LOAD:STAT`

See Chapter 8 for the full condensed command reference.

A.5 Contact, warranty and support

Warranty: two years from delivery, per §1.9. For service, calibration, accessories, the MODBUS register map, the MF/TH90010 integration option (§6.4), or any item flagged for confirmation in this manual, contact Techmize using the details below.

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