TECHMIZE by TONGHUI

OM

OPERATION MANUAL

TH9120 Series

AC/DC Withstand Voltage & Insulation Resistance Tester — TH9120 (AC/DC/IR/OSC) / TH9120A (AC/OSC) / TH9120D (DC/IR). Covers front-panel operation, test parameter setup, breakdown-voltage testing and the HANDLER 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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TH9120 Series Operation Manual

AC/DC Withstand Voltage & Insulation Resistance Tester — TH9120 / TH9120A / TH9120D

This manual covers the TH9120 Series AC/DC withstand-voltage and insulation-resistance testers. **TH9120** is the all-in-one model, supporting AC withstand-voltage, DC withstand-voltage, insulation-resistance and open/short-circuit (OSC) testing. **TH9120A** is a dedicated AC withstand-voltage model (AC + OSC only); **TH9120D** is a dedicated DC withstand-voltage and insulation-resistance model (DC + IR only). All three models additionally support a pin/contact-check mode and a destructive breakdown-voltage test mode.

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The full SCPI command reference is issued as a separate companion document, TH9120 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 original-language (English) edition of the operation manual for the Techmize TH9120 series AC/DC withstand-voltage and insulation-resistance tester, covering models **TH9120**, **TH9120A** and **TH9120D**. Where this manual and the instrument itself appear to disagree, or where a described function is not present on your particular model, 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 TH9120 series outputs an AC test voltage of up to **10.00 kV** (TH9120 / TH9120A) and a DC test voltage of up to **12.00 kV** (TH9120 / TH9120D) at the 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 DANGER indicator is lit, or before the instrument has completed its automatic discharge. Fence or otherwise guard the device-under-test area, and use the INTERLOCK signal to disable high-voltage output whenever the guard is open (§1.3, §3.2).

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. Check that the rear-panel safety ground terminal is reliably connected to electrical earth before testing — otherwise the chassis itself can become live if any part of the test circuit short-circuits to ground.

Power	
Supply voltage	100–240 V AC
Supply frequency	47–63 Hz
Power consumption	No-load <100 W · Rated 300 W
Fuse	5 A, slow-melting (factory-fitted for 300 VA load, both 100–120 V and 200–240 V ranges; replace only with the same rating and type)

WARNING — CONNECTING THE DEVICE UNDER TEST

Press STOP and confirm the DANGER indicator is off before connecting or disconnecting test leads. When wiring the device under test, connect the RTN/LOW lead first — an incomplete or disconnected RTN/LOW connection is dangerous, since the entire device under test can become charged to the full test voltage. After plugging the HV test lead into the HV terminal, turn it 90° clockwise to lock it in place. Before every test, check that both the HV and RTN/LOW leads are securely connected.

Pausing a test. To change test conditions, press STOP first so the instrument leaves the test-ready state and the DANGER indicator goes out. If you are stepping away from the instrument or taking a break, switch off the power to prevent an accidental START.

Remote operation. When the instrument is started and stopped remotely, the operator cannot see the instrument's actual working state from the interface, so remote wiring must be reliable: the remote STOP input must always work, and should be pressed before changing the device under test; in a multi-person work area, the remote switch must include an INTERLOCK loop and a high-voltage indicator, and the INTERLOCK loop must be opened before changing the device under test; no one may touch the device under test, test leads, probes, output terminals or surrounding area while test voltage is present.

Environment

Item	Requirement
Operating temperature / humidity	0–45 °C, 20–90% RH
Storage temperature / humidity	−10–55 °C, <80% RH
Reference conditions (for rated accuracy)	18–28 °C, 30–70% RH

Do not use the instrument in a dusty, vibrating, direct-sunlight or corrosive-gas environment. Keep the ventilation openings on the rear and sides of the chassis clear. If the instrument will not be used for an extended period, store it in a well-ventilated room within the storage conditions above, in its original packaging where possible.

CAUTION — SHOCK PROTECTION

The instrument's shock-protection function detects the current that would flow through an operator who comes into contact with the HV output and cuts off high-voltage output when it exceeds 0.5 mA ±0.25 mA. Because the instrument's output power can reach 200 VA and its output current can reach 20 mA (AC withstand-voltage test mode), contact is a serious hazard — keep shock protection switched ON whenever the device under test allows it (§4.2.1.5).

1.4 Internal electrical safety data

Item	Specification
Insulation resistance, supply terminals to chassis (reference conditions)	≥50 MΩ
Insulation resistance, supply terminals to chassis (damp-heat transport conditions)	≥2 MΩ
Insulation strength, supply terminals to chassis	1.5 kV AC, 50 Hz, 1 minute — no breakdown or flashover
Leakage current	≤3.5 mA

These figures describe the instrument's own internal construction — the chassis, supply and enclosure — and are independent of the high-voltage test the instrument performs on a device under test.

1.5 CE marking

The TH9120 series carries the CE mark, as shown on the instrument's rear-panel nameplate, in accordance with:

Directive	Harmonized standard
Low Voltage Directive 2014/35/EU	EN 61010-1:2010+A1:2019
EMC Directive 2014/30/EU	EN IEC 61326-1:2021, CISPR 11:2015+A1:2016+A2:2019 (Group 1, Class A), EN 61000-4-2:2009, EN 61000-4-3:2020, EN 61000-4-4:2012, EN 61000-4-5:2014+A1:2017, EN 61000-4-6:2014, EN 61000-4-11:2020, EN 61000-3-2:2019+A1:2021, EN 61000-3-3:2013+A1:2019+A2:2021

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.

1.7 RoHS compliance

The TH9120 series complies with Directive 2011/65/EU (RoHS); supporting documentation is available from Techmize on request.

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.

1.9 Manufacturer & EU contact

Techmize Electronic GmbH

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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
TH9120, TH9120A or TH9120D instrument (model as ordered)	1
EU power cable (Schuko, CEE 7/7)	1
TH90015 test cable	1
TH90003R/B test cable with clips	1
This operation manual	1
Certificate of conformity	1
Warranty card	1

Standard accessories match the TH9120 Series Datasheet. GPIB is a factory-fitted option — confirm availability when ordering. Keep the original packaging — it is the recommended way to store or return the instrument.

2.2 Connecting the power supply

Item	TH9120 / TH9120A / TH9120D
Supply	100–240 V AC, 47–63 Hz
Power consumption	No-load <100 W · Rated 300 W
Fuse	5 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, and always replace it with the same type and rating.

2.3 Connecting the device under test

The instrument's HV and RTN/LOW outputs on the front panel (duplicated on the rear panel as HV OUTPUT / HV CHECK / RTN CHECK / RTN LOW for automated-line integration) source the AC/DC test voltage and insulation-resistance test voltage into the device under test. Connect the RTN/LOW lead first, then the HV lead, as described in §1.3.

WARNING — NEVER TOUCH LIVE TERMINALS

Never touch the test leads, fixture or device under test while a test is running, while the DANGER indicator is lit, or before the automatic discharge has completed. The HV terminal can reach up to 10.00 kV AC or 12.00 kV DC, depending on model and test mode.

CAUTION

A user-made or third-party test fixture or cable can produce incorrect measurement results. Keep the fixture/cable and the device-under-test leads clean for good contact, and keep test leads at least 30 cm from the front panel to avoid high-voltage interference with the display. The stray capacitance of long test leads and fixtures affects current-based judgements; use the OFFSET function (§2.4, §4.4.1) to compensate.

2.4 Zero/base clearing (OFFSET)

Before precision current-based testing, clear the base leakage current contributed by the test leads' own stray capacitance: remove the device under test, set up the test conditions on <SETUP>, then press <TEST> → F1 (OFFSET). The instrument measures the leakage current of the test leads alone and stores it as the zero base. The DANGER indicator flashes while sampling; voltage is applied for 5 s (or the configured test time, if shorter).

NOTE

Do not connect the device under test while OFFSET is sampling, since this briefly applies the configured test voltage. 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

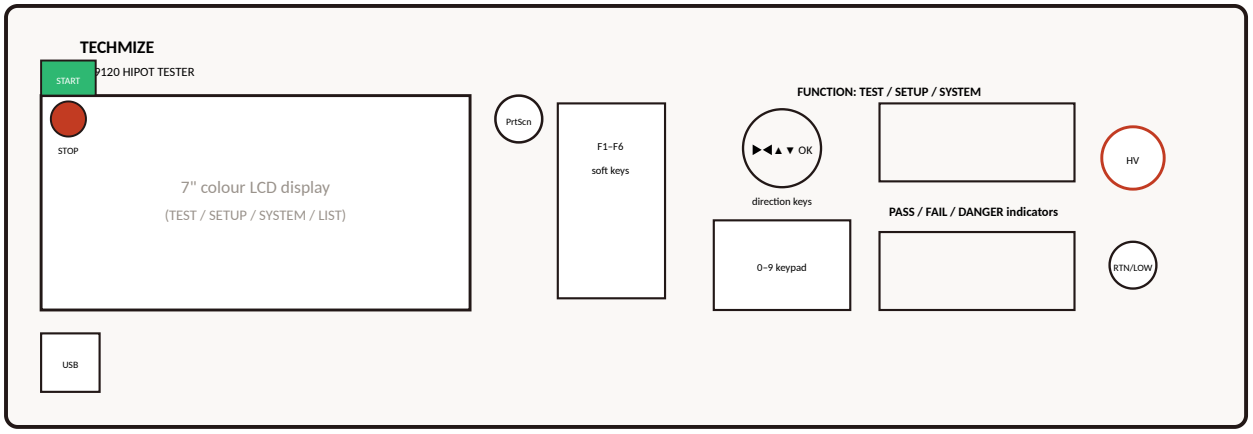
1. Connect the EU power cable to the rear-panel inlet, confirming reliable earth-ground connection.
2. Press the front-panel POWER switch. The instrument self-tests.
3. The instrument boots into the <TEST> interface by default, with the test data last in effect before the previous shutdown.

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 **POWER switch** — pressed-in = on, released = off.

2 **START** (green) / **STOP** (red) — starts the test (DANGER lights immediately) / aborts the test or clears a PASS/FAIL prompt.

3 **USB port** — for a USB storage device.

4 **PrtScn** — captures the current screen to the connected USB drive.

5 **F1–F6 soft keys** — context-sensitive, matched to the labels shown on-screen; a blank or greyed label means the key is inactive.

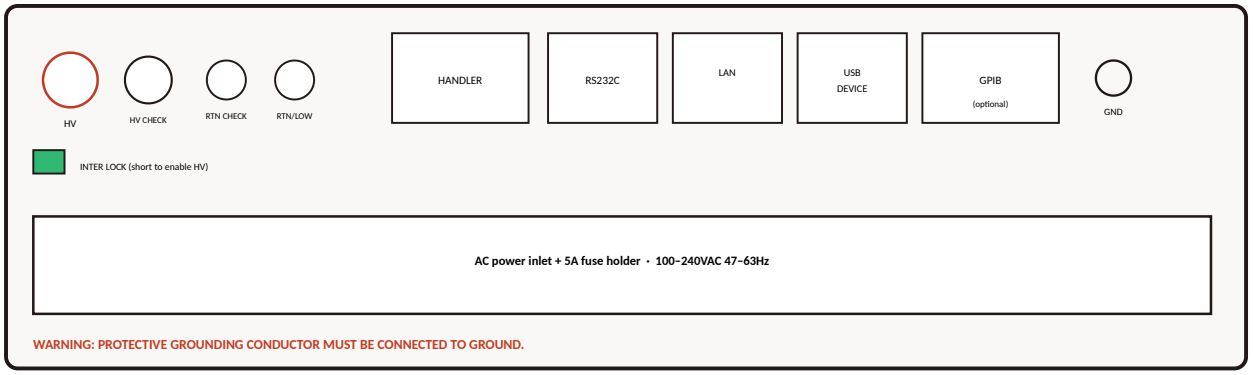
6 **Test** / **Setup** / **System** — FUNCTION keys that switch directly to the matching interface (§4.1).

7 **Direction keys & knob** — move the cursor (selected field shown on blue background) and adjust values.

8 **0–9 numeric keypad** — direct value and filename entry.

9 **PASS / FAIL / DANGER indicators, HV and RTN/LOW front-panel test terminals.**

3.2 Rear panel



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

1 **HV OUTPUT** — high-voltage output terminal, duplicated from the front-panel HV terminal for automated-line wiring.

2 **HV CHECK / RTN CHECK** — sense-return terminals for the respective output terminal.

3 **RTN/LOW** — test reference (low-potential) terminal.

4 **INTER LOCK** — short these two terminals to permit high-voltage output (§1.3).

5 **HANDLER** — start/stop control and test-result output for automated test-system integration (Chapter 7).

6 **RS232C / USB DEVICE** — serial / USB communication with a host PC (§6.1).

7 **LAN** — network connector, present on all models as a standard interface.

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

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

3.3 Main interfaces

Interface	Description
<TEST>	Starts the high-voltage test process and shows live results. Parameters cannot be modified from this interface (§4.4). Power-on default.
<SETUP>	Edits the current test file: test steps and the per-mode test parameters (AC / DC / IR / PAUSE / OSC / pin-check) (§4.3).
<SYSTEM>	Test-safety settings, environment (brightness/language/alarm/date-time), and communication-port configuration (§4.2).
<FILE>	Internal/external (USB) test-file save, load and management (§4.7).

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

3.4 Model & test-mode overview

Model	AC	DC	IR	OSC	Pin-check	Breakdown test
TH9120	✓	✓	✓	✓	✓	✓ (AC/DC)
TH9120A	✓	—	—	✓	✓	✓ (AC)
TH9120D	—	✓	✓	—	✓	✓ (DC)

On <SETUP>, the test mode offered for the current step is restricted to what the instrument supports: TH9120 can select AC withstand-voltage, DC withstand-voltage, insulation resistance (IR), pause, OSC (open/short-circuit detection) or pin-check; TH9120A can select AC, pause, OSC or pin-check; TH9120D can select DC, IR, pause or pin-check. Each test mode has its own parameter set (§4.3).

3.5 Starting the instrument

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

CHAPTER 4

Operation & Configuration

This chapter covers the <SYSTEM>, <SETUP> and <TEST> interfaces, the per-test-mode parameter tables, the breakdown-voltage test mode, file storage and the HANDLER interface.

4.1 Interface structure overview

The front-panel FUNCTION keys switch directly between <TEST>, <SETUP> and <SYSTEM>; <FILE> is reached from the SETUP soft-key row. <TEST> starts the test and cannot be edited. <SETUP> edits the current step's test mode and parameters — for example, switching a step's mode from AC to OSC replaces the AC parameter fields with the OSC parameter fields. <SYSTEM> covers test-safety settings, environment settings and communication-port settings, reached via its own F1–F3 soft keys.

4.2 <SYSTEM> settings

4.2.1 Test settings (F1)

Setting	Range	Default	Description
Trigger mode	Manual / External / Bus	Manual	Source of the signal that starts a test; only the selected mode's trigger is accepted (§4.2.1.1)
Trigger delay	0.0–99.9 s	0.0 s	Delay from trigger received to measurement start
Test mode	Normal / Repeat / Continuous	Normal	Normal: runs the file once. Repeat: runs for a set repeat count. Continuous: loops without interruption
Repeat count	0–999	0	Repeat count for Repeat mode
Test interval	0.0–99.9 s	0.0 s	Interval between tests, for Repeat and Continuous mode
After-fail behaviour	Continue / Restart / Stop	Continue	Continue: runs remaining steps even after a FAIL. Restart: press START to re-run from the start. Stop: press STOP, then START, to re-run (§4.2.1.2)

4.2.1.3 Hardware/software compensation

Because of the test signal source's own output impedance, the output voltage drifts under load unless compensated. Hardware compensation corrects the output within 0.1 s using a comparator circuit; software compensation is slower, avoiding any instantaneous voltage shock to the device under test.

Test / voltage range	Hardware compensation	Software compensation
AC withstand voltage, 50 V–10 kV	Always ON	Default ON, can be set OFF
DC withstand voltage, 50–499 V	Default ON, can be set OFF	Default ON, can be set OFF
DC withstand voltage, 500 V–12 kV	Always ON	Default ON, can be set OFF
Insulation resistance, 50–499 V	Default ON	Default ON, can be set OFF
Insulation resistance, 500 V–12 kV	Always ON	Default ON, can be set OFF

4.2.1.4 Withstand-voltage autorange

When autorange is enabled for AC/DC withstand-voltage testing, the instrument monitors the measured current during the test; if it fits a lower current range, the instrument automatically switches to that lower range 0.6 s before the test ends, improving resolution on the final reading. This is distinct from the per-step current range selectable for insulation-resistance testing (§4.3.3).

4.2.1.5 Shock protection

> **WARNING**
> The instrument's output power can reach 200 VA with an output current of up to 20 mA (AC withstand-voltage mode) — contact at this level is a serious hazard that can cause unconsciousness or death. Keep shock protection switched ON whenever the device under test allows it.

Shock protection is a simple ON/OFF setting. When ON, the instrument monitors the current an operator would draw by contacting the HV terminal; if that current exceeds the shock-protection threshold (0.5 mA ±0.25 mA, per §5.5), high-voltage output is cut off immediately.

4.2.2 Environment settings (F2)

Setting	Range	Default	Description
Key sound	Off / On	Off	Keypad click sound
Display language	English	English	The user interface is English only
Alarm volume	Off / Low / Medium / High	High	Buzzer volume
Key-lock unlock	Manual / Bus	Manual	Whether the key lock is released manually or by remote command
PASS alarm	Off / On	On	Audible PASS alarm
Screen brightness	1–10	5	Display brightness
FAIL alarm	Off / On	On	Audible FAIL alarm
Date / Time	—	—	System clock (24-hour format)

The key lock is engaged from the <SETUP> or <SYSTEM> interface by pressing STOP, then F6 to lock (F6 again to unlock); while locked, only INTERLOCK, START, STOP and the unlock key respond. Manual unlock uses a password (default `666666`); bus unlock is released by remote command only.

4.2.3 Communication settings (F3)

Configures the active communication port: RS232C, GPIB (optional), USB or LAN. Only one remote-control port is active at a time; see Chapter 6 for the remote-control command set.

4.3 <SETUP> — test-mode parameter tables

On <SETUP>, F1 inserts a new step after the current one, F2 deletes the current step, F3 creates a new test program, F4 saves the current test file, F5/F6 step to the previous/next step. Move the cursor right to the test-mode field and use F1–F5 to choose the mode for that step (§3.4); the parameter fields below update to match.

4.3.1 AC withstand-voltage (AC) — TH9120, TH9120A

Field	Range	Default	Description
Test voltage	0.050–10.00 kV, or OFF	OFF	AC test voltage
Test frequency	50 / 60 Hz	50 Hz	AC withstand-voltage frequency
Current upper limit	0.001–20.0 mA	500.0 µA	Upper current limit
Current lower limit	0.001 mA–upper limit, or OFF	OFF	Lower current limit; must not exceed the upper limit
Arc limit	1–20 mA, or OFF	OFF	Allowed AC arc-current upper limit; OFF = no arc judgement
Rise time	0.1–999.0 s, or OFF	OFF	Time to ramp up to the test voltage; OFF completes the ramp within the first test cycle
Test time	0.3–999.0 s, or 0 = continuous	3.0 s	0 tests continuously until STOP is pressed
Fall time	0.1–999.0 s, or OFF	OFF	Time to ramp down; OFF cuts the output directly at the end of the test

4.3.2 DC withstand-voltage (DC) — TH9120, TH9120D

Field	Range	Default	Description
Test voltage	0.050–12.00 kV, or OFF	OFF	DC test voltage
Current upper / lower limit	0.0001 mA–10 mA / same, or OFF	500.0 µA / OFF	Current limits; lower must not exceed upper
Arc limit	1–10 mA, or OFF	OFF	Allowed DC arc-current upper limit
Rise-time arc limit	1–10 mA, or OFF	OFF	Separate arc-current limit applied only during the voltage rise
Rise-time current judgement	On / Off	Off	When On, the current upper limit is also checked during the voltage-rise period
Rise / fall time	0.1–999.0 s each, or OFF	OFF	Voltage ramp times
Wait time	0.1–999.0 s, or OFF	OFF	Charging wait period; current limits are not judged during this time (capped at the configured current range)
Test time	0.3–999.0 s, or 0 = continuous	3.0 s	0 tests continuously until STOP is pressed

After a DC withstand-voltage test ends, the instrument automatically discharges the device under test (DCW auto-discharge). If fall time is set to OFF, the output is cut directly at the end of the test and the device under test may remain charged until discharge completes.

4.3.3 Insulation resistance (IR) — TH9120, TH9120D

Field	Range	Default	Description
Test voltage	0.050–12.00 kV (TH9120) · 0.050–5.000 kV (TH9120D), or OFF	OFF	Insulation-resistance test voltage
Resistance lower limit	0.01 MΩ–50 GΩ	1.000 MΩ	Resistance lower limit
Resistance upper limit	Lower limit–50 GΩ, or OFF	OFF	Must exceed the lower limit
Rise / fall time	0.1–999.0 s each, or OFF	OFF	Voltage ramp times
Test time	0.3–999.0 s, or 0 = continuous	3.0 s	0 tests continuously until STOP is pressed
Current range	Auto, or fixed: 10 mA / 3 mA / 300 µA / 30 µA / 3 µA / 300 nA	Auto	Auto switches range to match the reading; a fixed range can speed up testing

Choose the current range from the expected resistance I = U/R, or leave it on Auto:

Current range	Resistance range, 50–499 V	Resistance range, 500–12000 V
10 mA (3–10 mA)	0.1–1 MΩ	0.1–4.5 MΩ
3 mA (0.3–3 mA)	0.5–4.5 MΩ	3.0–15.0 MΩ
300 µA (30–300 µA)	3.0–15.0 MΩ	10.0–45 MΩ
30 µA (3–30 µA)	10.0–45 MΩ	35.0–450 MΩ
3 µA (0.3–3 µA)	45 M–0.45 GΩ	0.40–4.5 GΩ
300 nA (20–300 nA)	0.40–4.9 GΩ	4.0–50.0 GΩ

4.3.4 Pause (PAUSE) — all models

Inserts a pause step between high-voltage steps, e.g. to prompt the operator to reposition or rotate the device under test. **Message:** up to 16 characters (letters, digits, `.` and `–`). **Duration:** set to a time (0.3–999.0 s) to end the pause automatically, or leave on Continue to require a fresh START (front panel or remote) to proceed.

4.3.5 Open/short-circuit detection (OSC) — TH9120, TH9120A

Field	Range	Default	Description
Open-circuit threshold	10–100%; 1% resolution when entered numerically, 10% per +/– key press	50%	As a percentage of the sampled standard capacitance
Short-circuit threshold	100–500%, 10% step, or OFF	300%	OFF disables short-circuit judgement
Standard capacitance	0.001–40 nF	10.0 nF	Reference value — enter directly or sample it (F1 → GET)

Sampling the standard value applies a 100 V, 600 Hz AC signal for 1 s and measures the current through the device under test (voltage is present during sampling — observe the usual precautions). The displayed value is not the actual capacitance but the sampled current after impedance conversion, used as a relative reference against which OPEN/SHORT thresholds are judged.

4.3.6 Pin/contact check — all models

Field	Range	Default	Description
Test voltage	0.100–0.500 kV	0.100 kV	Voltage used for the contact check
Current lower limit	0.001–5 mA	500.0 µA	Basis for judging an open (unreliable) contact

Applies a low voltage to the HV and RTN/LOW ends of the test circuit to check whether the device under test is reliably connected: contact closes the loop and a current above the lower limit flows; no contact (open circuit) means no current flows. Running a pin/contact-check step ahead of a high-voltage step reduces the risk of a high-voltage test proceeding on a poorly-seated device under test.

4.4 <TEST> interface

Press <TEST> to view the test interface; press START to begin. The display shows three values in large characters: output voltage (top, kV), the measured value (middle — current in mA/µA for withstand-voltage tests, resistance in MΩ/GΩ for IR, capacitance in nF for OSC, or current for pin-check), and elapsed time (bottom, s, covering rise/wait/test/fall and inter-step time as applicable). If test time is set to 0 (continuous), the time field counts up from test start (wrapping after 65535) until STOP is pressed. F1 performs OFFSET zero-clearing (§2.4); F3/F4 page between steps; F6 switches to the list display (§4.4.2).

4.4.2 List display and step display

Press F6 on the <TEST> interface to switch between the step display (one step at a time, large-character readout) and the list display, which shows all steps of the current file together: step number, test mode, set value, limit, and result — updating with live voltage/current (or resistance) readings as the test proceeds.

4.5 How to run a test

1. **OFFSET zero-clearing** for the test leads/fixture, if required (§2.4).
2. **Sample the OSC standard capacitance**, if an OSC step is used (§4.3.5).
3. **Connect the device under test**: RTN/LOW lead first, then the HV lead (§1.3, §2.3).
4. **Run the test program**: press START; the instrument steps through AC/DC/IR steps by applying the configured voltage and judging the result against the configured limits, runs OSC steps by applying a low-level signal and comparing against the sampled standard, and runs pin-check steps by judging continuity. On a FAIL, the after-fail behaviour configured in §4.2.1 determines what happens next.

4.6 Breakdown-voltage test

WARNING — DESTRUCTIVE TEST

The breakdown-voltage test deliberately raises the applied voltage, in steps, until the device under test's insulation fails. This is a destructive test used to characterise the actual breakdown limit of a device, not a pass/fail production test — the device under test will typically be destroyed or degraded by a successful breakdown test.

From <SYSTEM> or <SETUP>, press STOP, then F1 to select breakdown-test mode, then press <TEST> to enter the breakdown-test interface. Use F3/F4 to choose step mode or voltage-step mode, then configure the parameters below before starting.

Field	Range	Default	Description
Step mode	Step / Voltage-step	Step	Advance by a fixed number of steps, or by a fixed voltage increment
Number of steps	2–999	—	Step-mode only: number of voltage increments from start to end voltage
Voltage step	0.010–0.500 kV, in 0.010 kV (10 V) units	0.010 kV	Voltage-step mode only: voltage increment per step
Test mode	AC / DC	—	TH9120 can select either; TH9120A is fixed to AC; TH9120D is fixed to DC
Start voltage	0.05 kV–end voltage	0.05 kV	Starting voltage of the sweep
End voltage	0.05–10 kV	0.05 kV	Terminating voltage of the sweep
Rise time	0–999 s, or OFF	OFF	Rise time per step
Wait time (DC only)	0.1–999.0 s, or OFF	—	DC test mode only: charging wait period before the current limits are judged; not available in AC test mode
Test time	0.3–999 s	3.0 s	Dwell time per step
Current upper limit	AC: 0–20 mA · DC: 0–10 mA	0.500 mA	Leakage-current upper limit
Current lower limit	0–upper limit, or OFF	OFF	Leakage-current lower limit
Arc limit	AC: 0–20 mA · DC: 0–10 mA, or OFF	OFF	Arc-current upper limit
Continuous	On / Off	Off	Whether to keep testing continuously once all steps have run

4.7 File storage

Press <FILE> to open the file-management interface; F1/F2 switch between internal and external (USB) file lists. File names are limited to 8 characters. The instrument can store **100 files**, each editable with up to **50 steps**, any combination of the test modes available on that model.

Key	Function	Description
F1	New	Create a new file
F2	Save	Save the currently loaded file
F3	Load	Load the selected file as the current file
F4	Copy all	Bulk-copy all files, for batch handling
F5	Copy	Copy an internal file to USB, or a USB file to internal storage
F6	Delete	Delete the currently selected file

4.8 HANDLER interface — overview

The rear-panel HANDLER connector lets the TH9120 series integrate into an automatic test or sorting system, carrying the start/stop control input and the per-test PASS/FAIL/status output. Signals fall into two groups: internal outputs (test results and status) and external inputs. Internal signal output rating: DC 24 V, 20–40 mA. External signal input rating: DC 3–26 V (HIGH), 10 mA ±4 mA. Full pin assignments are given in Chapter 7.

CHAPTER 5

Performance & Specifications

5.1 AC withstand-voltage output — TH9120, TH9120A

Voltage range	0.050–10.00 kV
Voltage waveform	50/60 Hz sine wave, ±0.1%
Output power	200 VA (10.0 kV / 20 mA)
Current test range / resolution	0.001–20 mA / 0.001 mA
Current accuracy, 0.100–2.999 mA	±(1% reading + 0.5% full scale)
Current accuracy, 3.00–20.00 mA	±(1.5% reading + 0.5% full scale)
Max. short-circuit current	40 mA (AC test only)

5.2 DC withstand-voltage output — TH9120, TH9120D

Voltage range	0.050–12.00 kV
Output power	120 VA (12.0 kV / 10 mA)
Current test range / resolution	0.0001–10 mA / 0.1 µA
Current accuracy	±(1% reading + 0.5% full scale)
Fast discharge	Automatic, after the test (DCW)

5.3 Common withstand-voltage parameters

Load change rate	±(1% set value + 10 V), rated power
Voltage resolution	2 V
Voltage accuracy	±(1% set value + 0.1% full scale)

5.4 Insulation resistance (IR) — TH9120, TH9120D

Output voltage	DC 0.050–12.00 kV (TH9120) · DC 0.050–5.000 kV (TH9120D)
Voltage resolution / accuracy	2 V · ±(1% set value + 0.5% full scale)
Resistance test range	0.1 MΩ–50.0 GΩ

Resistance accuracy, ≥0.5 kV	
1–1000 MΩ	±(3% reading + 0.1% full scale)
1–10 GΩ	±(7% reading + 2% full scale)
10–50 GΩ	±(10% reading + 1% full scale)
Resistance accuracy, <500 V	
0.1–1000 MΩ	±(5% reading + 2% full scale)

See §4.3.3 for the recommended current-range selection against expected resistance and test voltage.

5.5 ARC detection, shock protection & safety functions

Item	Specification
ARC threshold, AC	1.0–20.0 mA
ARC threshold, DC	1.0–10.0 mA
Shock protection	0.5 mA ±0.25 mA, selectable ON/OFF
Interlock	High-voltage output enabled only when the rear-panel INTER LOCK terminals are shorted
Panel protection	Key lock, password
Result indication	PASS: short tone, green indicator · FAIL: long tone, red indicator

5.6 OSC (open/short-circuit detection)

Sampling capacitance range	0.001–40 nF
Open-circuit judgement	10–100%
Short-circuit judgement	100–500%

5.7 Timing & general specifications

Item	Specification
Test time	0.3–999 s, 0 = continuous
Rise time	0.1–999 s, 0 = off
Fall time	0.1–999 s, 0 = off
Wait time (DC withstand-voltage only)	0.1–999 s, 0 = off
Display	7" TFT-LCD, English UI
Internal storage	100 files, up to 50 steps per file
Standard interfaces	RS232C, USB Device, USB Host, LAN, HANDLER
Optional interface	GPIB
Reference conditions (rated accuracy)	18–28 °C, 30–70% RH
Operating temperature / humidity	0–45 °C, 20–90% RH
Storage temperature / humidity	–10–55 °C, <80% RH
Power supply	100–240 VAC, 47–63 Hz
Power consumption	No-load <100 W · Rated 300 W
Dimensions (W×H×D)	430×132×500 mm
Weight	21 kg

PART II

Remote Control & Handler

Covers the RS232C, USB and GPIB remote interfaces and the HANDLER interface for automated test-system integration. The full SCPI command tables are issued separately as the *TH9120 Series SCPI Command Reference*.

CHAPTER 6

Remote Control

The TH9120 series can be controlled remotely over RS232C, USB (USB Device, control-command mode) or the optional GPIB interface, using the SCPI command set. Only one of RS232C or GPIB can be active at a time; both use the same command set over different hardware. For the complete command syntax and parameter ranges, see the companion *TH9120 Series SCPI Command Reference*.

6.1 RS232C

Item	Specification
Connector	9-pin D-sub (DB9), using only TXD (pin 3), RXD (pin 2) and GND (pin 5) — a minimal 3-wire subset, not the full RS-232 pinout
Baud rate	9600 / 19200 / 38400 / 115200 bps
Data bits / stop bits	8 or 7 / 1 or 2
Parity	None / Odd / Even
Handshake	Software (character echo) — no hardware handshake lines are used
Terminator	NL (line feed, ASCII 10)

Set the active port to RS232C from <SYSTEM> → F3 (Communication) before connecting (§4.2.3). The instrument echoes each received character; the host should wait for that echo before sending the next character to avoid data loss, and should fully read a query's response (through its terminating NL) before issuing the next command.

6.2 USB & GPIB

Item	Specification
USB Device	Standard interface; computer control via the SCPI command set
USB Host (front panel)	USB storage device for file export/import and screen capture (§4.7, §3.1)
GPIB	Optional, factory-fitted — single-address addressing, 0–31, factory default address 1, set from <SYSTEM> → F3

6.3 Command-set overview

Commands are organized into SCPI subsystems: `DISPlay` (display page), `FUNCtion` (test start/stop, the per-mode test-parameter trees for AC/DC/IR/PA(use)/OSC/CK(pin-check), and the breakdown-voltage parameter tree), `SYSTem` (test-safety settings and environment settings), `MMEM` (internal file store/load), `USB` (USB-drive file operations) and `FETCh` (measurement-result retrieval), plus the common query `*IDN?`.

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.

Command	Description
`*IDN?`	Returns <manufacturer>,<model>,<firmware>
`FETCh?`	Returns the current or most recent measurement result

For the full command syntax, parameter ranges and worked examples, see the *TH9120 Series SCPI Command Reference*.

CHAPTER 7

HANDLER Interface

The rear-panel HANDLER connector lets the TH9120 series integrate into an automatic test or sorting system: it provides the start/stop control inputs and carries the per-test PASS/FAIL and status outputs. Internal signal output rating: DC 24 V, 20–40 mA. External signal input rating: DC 3–26 V (HIGH), 10 mA ±4 mA.

7.1 Pin assignments

Pin	Signal	I/O	Description
1	/PA	Out	Goes LOW when the test starts; toggles HIGH/LOW relative to COM on each subsequent PAUSE step
2	/OPEN	Out	OSC open-circuit result; shares the output lines with /PASS and /FAIL
3	/SHORT	Out	OSC short-circuit result; shares the output lines with /PASS and /FAIL
4	/FAIL	Out	LOW on a FAIL result; only then do /HIGH, /LOW, /ARC_FAIL, /GFI_FAIL and /SHORT_FAIL carry a signal
5	/PASS	Out	LOW on a PASS result; /HIGH, /LOW, /ARC_FAIL, /GFI_FAIL and /SHORT_FAIL are all HIGH
6	/HIGH	Out	LOW when the result is an upper-limit (HIGH) fail
7	/LOW	Out	LOW when the result is a lower-limit (LOW) fail
8	/EXT_STOP	In	External STOP input; active LOW
9	/EXT_START	In	External START input; active LOW
10, 11	EXT_DCV (+VEXT)	In	External DC supply input for the interface, +3–26 V
12, 13	+24V	Out	Internal DC supply output
14	/SYSTEM ERROR	Out	LOW indicates an internal system error
15, 18	NC	—	Reserved, not currently used
16	/EOT	Out	HIGH while the test program is running; LOW when finished or idle
17	/EOS	Out	HIGH while the current step is running; LOW once that step (or the whole file) has finished
19	/SHORT_FAIL	Out	LOW on a hardware short-circuit fail
20	/ARC_FAIL	Out	LOW on an arc-detection fail
21	/GFI_FAIL	Out	LOW on a shock-protection (ground-current) fail
22, 23	COM	—	Common return for the input/output signals
24, 25	GND	—	Return for the internal +24 V supply

7.2 Using the HANDLER interface

1. Short the rear-panel INTER LOCK terminals (safety fence/guard in place) — the instrument will not start a high-voltage test otherwise (§1.3, §3.2).
2. Configure the test file on <SETUP> and the trigger/after-fail behaviour on <SYSTEM> (§4.2.1), including setting the trigger mode to External if the handler itself will issue /EXT_START.
3. Trigger the test with /EXT_START from the external handler/sorter, or the front-panel START key.
4. Read /PASS, /FAIL, /HIGH, /LOW and the other result outputs from the external system as the test proceeds.
5. /EXT_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 EXT_DCV (pins 10/11, +3–26 V), with COM (pins 22/23) as the return.

WARNING — REMOTE OPERATION

When the instrument is started and stopped through HANDLER, the operator cannot see the instrument's actual state directly from the interface. Keep the EXT_STOP line reliably wired, use it before changing the device under test, and keep the INTER LOCK loop tied to a physical guard in any multi-person work area (§1.3).

APPENDIX

Packing, Warranty & Related Documents

A.1 Standard accessories

See §2.1 for the standard packing contents (instrument, EU power cable, test cables, documentation). GPIB is an optional, factory-fitted interface, purchased at the time of order.

A.2 Transport & storage

Store the instrument in a dry, well-ventilated location within the storage conditions of §1.3 (−10–55 °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 ≈21 kg and should be moved and lifted accordingly.

A.3 Nameplate & markings

The 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	AC	DC	IR	OSC	Pin-check	Breakdown test
TH9120	✓	✓	✓	✓	✓	✓ (AC/DC)
TH9120A	✓	—	—	✓	✓	✓ (AC)
TH9120D	—	✓	✓	—	✓	✓ (DC)

SCPI, pin-check and breakdown-voltage test capability are standard across the model range, scoped to the test modes each model supports — not a unique feature of any one model.

A.5 Related documents

- TH9120 Series Datasheet (Techmize)
- TH9120 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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