TECHMIZE by TONGHUI

OM

OPERATION MANUAL

TH2683 Series

Insulation Resistance / Leakage Current Meter — TH2683A / TH2683B. Covers front-panel operation, measurement/pickout setup, system configuration and file management; see Chapter 7 for the remote-control interfaces and Chapter 8 for the HANDLER interface.

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

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TH2683 Series Operation Manual

Insulation Resistance / Leakage Current Meter — TH2683A / TH2683B

This is the English-language edition of the TH2683 Series Operation Manual. Both models use a guarded 2-terminal DC voltage method for insulation-resistance and leakage-current testing. **TH2683B** differs from **TH2683A** only in its maximum output test voltage — see §6.5.

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The full SCPI and MODBUS command reference is issued as a separate companion document, TH2683 Series SCPI & MODBUS Command Reference, in line with Techmize's standard practice for command sets of this size. Chapter 7 of this manual covers the remote interfaces 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 TH2683 series insulation resistance / leakage current meter, covering models **TH2683A** and **TH2683B**. 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 TH2683A outputs a DC test voltage of up to **1000 V**, and the TH2683B up to **500 V**, at the front-panel HV(−) terminal. This is a shock hazard. Never touch the test terminals, the device under test, or any connected lead while a test is in progress or while the instrument is discharging. Wait until the HV indicator and discharge (DICH) indication on the display have both cleared before touching the test circuit, and always discharge a capacitive device under test fully before disconnecting it.

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	220 V AC ±10%
Supply frequency	50 Hz or 60 Hz
Power consumption	≤ 50 VA
Fuse	1 A / 2 A (factory-fitted; replace only with the same rating and type)

The AC power-inlet line L, neutral N and earth E conductors must match the instrument's power-inlet wiring. The instrument has been carefully designed to minimize noise picked up from the AC supply, but it should still be used in as low-noise an environment as practical; fit a power-line filter ahead of the instrument if this cannot be avoided.

> **WARNING — TEST TERMINALS**
>
> The front-panel test port (HV(−), INPUT, GUARD, marked with the test-voltage output symbol) sources the DC test voltage into the device under test using a guarded 2-terminal method. Always use the test cable or fixture supplied or specified by Techmize/Tonghui (TH26004B), matching the plug colour and connector to the panel socket. Disconnect the device under test before changing wiring, and never touch the test terminals or leads while **HV** is indicated or while the instrument is discharging.

Test fixtures and cables. Use only the test fixture or cable supplied by Techmize/Tonghui; a user-made or third-party fixture or cable can produce incorrect measurement results or create a shock hazard at this instrument's test voltages. Keep the fixture, cable and the device-under-test leads clean to ensure good contact.

Environment

Item	Requirement
Operating temperature	0–40 °C
Operating humidity	≤ 75% RH
Storage temperature	5–40 °C
Storage humidity	≤ 85% RH, non-condensing

Do not use the instrument in a dusty, vibrating, direct-sunlight or corrosive-gas environment. Keep the instrument's ventilation openings clear to maintain accuracy, and keep the test leads connected to the device under test away from strong electromagnetic fields. If the instrument will not be used for an extended period, store it in its original packaging, or a similar box, in a well-ventilated room within the storage conditions above.

> **CAUTION — WARM-UP AND ZERO CLEARING**
>
> Allow at least **30 minutes** of warm-up after switch-on before relying on the rated accuracy given in Chapter 6, and before performing open-circuit zero clearing (§4.2). Do not power-cycle the instrument frequently, as this may cause internal data confusion.

1.4 Electrical safety test data

Dielectric-withstand, insulation-resistance and leakage-current test figures for the instrument itself (as opposed to the device-under-test measurements the instrument performs) are not published in the operation manual for this series. Contact Techmize/Tonghui engineering if a formal electrical safety test report for the instrument is required.

1.5 CE marking

The TH2683A/B series carries the CE mark, as shown on the instrument's rear-panel nameplate, supported by the following EU certificates of conformity:

Directive	Harmonized standard	Certificate
Low Voltage Directive 2014/35/EU	EN 61010-1:2010+A1:2019	No. MTZS26034069, issued 2026-03-20
EMC Directive 2014/30/EU	EN IEC 61326-1:2021	No. MTZS26034056, issued 2026-03-19

Certificates issued by Shenzhen Most Technology Service Co., Ltd., covering the TH2683A/B model range.

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 TH2683A/B 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

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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
TH2683A or TH2683B instrument (model as ordered)	1
Two-terminal test clip lead (TH26004B)	1
EU power cable (Schuko, CEE 7/7)	1
Fuses, 1 A / 2 A	1 each
This operation manual	1
Certificate of conformity	1
Test report	1
Warranty card	1

A footswitch trigger (TH1801-001) is an optional accessory and must be ordered separately — it is not included as standard.

Keep the original packaging — it is the recommended way to store or return the instrument. Store the instrument in a dry, well-ventilated room at 5–40 °C and ≤85% RH when not in use for an extended period, away from corrosive gases.

2.2 Connecting the power supply

Item	TH2683A / TH2683B
Supply	220 V AC ±10%, 50/60 Hz
Power consumption	≤ 50 VA
Power switch	Front-panel power switch

Match the L (line), N (neutral) and E (earth) conductors of the supply cable to the instrument's rear-panel power inlet, and confirm reliable grounding before switching on. If mains conditions are noisy, fitting a power-line filter ahead of the instrument is recommended.

> **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

Connect the two-terminal test clip lead (TH26004B, or an equivalent Techmize-specified fixture) to the front-panel test port: **HV(−)** sources the DC test voltage, and **INPUT** is the sampling input through which the leakage current / insulation resistance is measured. A separate **GUARD** terminal is provided to divert surface-leakage and stray capacitive current away from the measurement, for improved accuracy on devices with a guard ring or a third terminal.

WARNING — OBSERVE CORRECT POLARITY AND NEVER TOUCH LIVE TERMINALS

Connect the device under test with correct polarity before starting a test. Never touch the test terminals, clip leads or the device under test while the instrument is charging, testing, or discharging (see §4.5) — the HV(−) terminal can be at up to 1000 V DC (TH2683A) or 500 V DC (TH2683B).

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 away from strong electromagnetic fields.

2.4 Open-circuit zero clearing

Before precision measurement, open the test terminals (disconnect any device under test) and execute the open-circuit zero clearing function (<Measurement Setup> → OPEN CLR, §4.2) to remove the instrument's own leakage/stray-capacitance offset from subsequent readings. Allow at least 30 minutes of warm-up before performing this (§1.3). If zero clearing fails, the instrument falls back to the factory-default zero base; a successful clearing stays in effect, with the acquired zero base used for subsequent measurements, until it is explicitly turned off (<Measurement Setup> → OPEN CLR OFF), which reverts to the factory-default zero base.

2.5 Starting the instrument for the first time

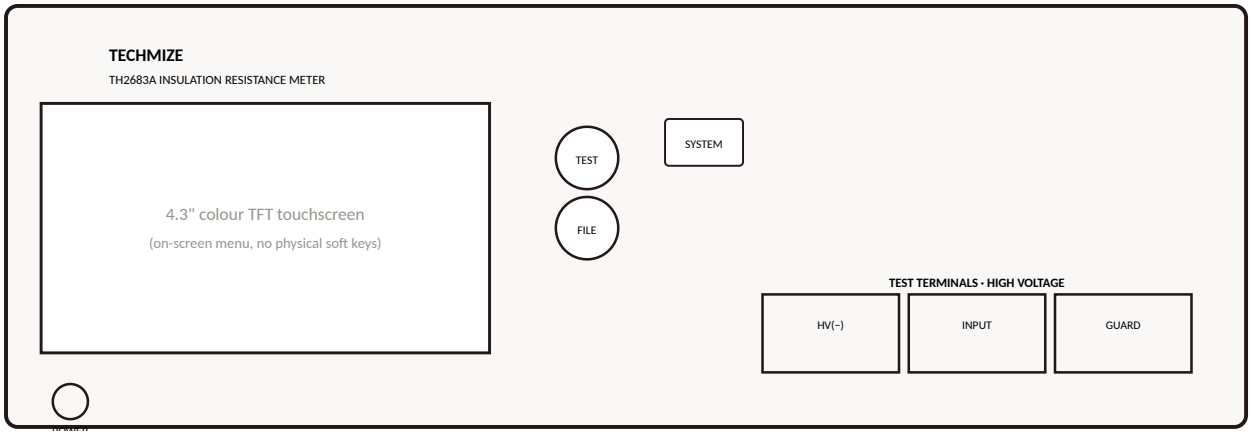
1. Connect the EU power cable to the rear-panel inlet, confirming reliable earth-ground connection.
2. Press the front-panel power switch.
3. The instrument displays a startup screen showing the Tonghui trademark, model and firmware version.
4. If password protection is enabled, the instrument prompts for the startup password before continuing (factory default: `2683`).
5. The display opens on the default <Measurement Display> page.

Allow at least 30 minutes of warm-up before relying on the rated accuracy (§1.3). For an overview of the front panel, rear panel and screen layout, 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 **LCD display** — 4.3" colour TFT touchscreen; all menu navigation is by touch, with no dedicated physical soft keys.

2 **TEST** — in Manual trigger mode, press once to start one measurement (§4.5).

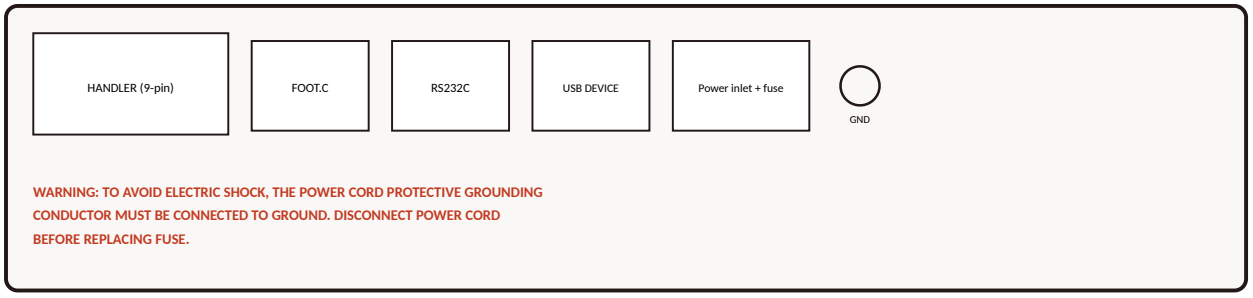
3 **FILE** — opens the internal/external file management page (§5.2).

4 **SYSTEM** — opens the <System Setup> page (§5.1).

5 **Test port** — HV(−) (DC voltage output), INPUT (sampling input), GUARD; guarded 2-terminal method (§2.3, §6.1).

6 **POWER switch**.

3.2 Rear panel



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

1 **HANDLER port** — 9-pin connector; outputs the pickout/comparator result and interlock signals, and accepts an external "start" trigger, for automatic test-system integration (Chapter 8).

2 **FOOT.C** — footswitch input; with Trigger source = External, a connected footswitch (optional accessory TH1801-001) triggers one measurement, the same as the HANDLER external-trigger input.

3 **RS232C port** — serial communication with a host PC, also usable with an RS485 transceiver board for a multi-drop bus (§7.1, §7.2).

4 **USB DEVICE** — rear-panel USB port for PC control over USBTMC or USBVCOM (§7.3, §7.4).

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

6 **Nameplate** (not shown) — manufacturer, model, serial number and CE mark.

3.3 Screen display regions

The <Measurement Display> page (and the other main pages) is navigated entirely by touch, through an on-screen menu structure with soft-key zones that change to match the current page and selected field.

3.4 Main pages

Page	Description
<Measurement Display> (MEAS DISP)	Live measured value(s) and pickout/comparator result (§4.1)
<Measurement Setup> (MEAS SETUP)	Test voltage, timing, range, speed, contact check, zero clearing, average, internal resistance (§4.2)
<Pickout Setup> (LTABLE)	Comparator/sorting bins and limits (§4.4)
<System Setup> (SYSTEM)	Beeper, password, bus mode, trigger source, baud rate, bus address, Handler power, date/time (§5.1)
<File List> (FLIST)	Internal/external file management (§5.2)

3.5 Basic operation

1. Touch the on-screen page tab, or press the corresponding front-panel key, to reach the page you want.
2. Touch the field to be changed; the matching soft-key zone appears at the side of the display.
3. Touch the soft key to apply the setting, or use the on-screen numeric keypad to type a value directly and confirm it with **ENTER**.

3.6 Starting the instrument

Confirm reliable earth-ground connection, then press the front-panel power switch (§2.5). The instrument shows a startup screen (trademark, model, firmware version), then opens on the default <Measurement Display> page. If password protection is enabled, enter the startup password when prompted (factory default: `2683`; see §5.1). Allow at least 30 minutes of warm-up before relying on rated accuracy (§1.3, Chapter 6).

CHAPTER 4

Basic Operation

This chapter covers the <Measurement Display> and <Measurement Setup> pages, the 6 current ranges, the <Pickout Setup> (comparator) page, and the charge–wait–test–discharge test sequence. The instrument measures with a DC voltage source, through the front-panel guarded 2-terminal test port.

4.1 <Measurement Display> page (MEAS DISP)

Shows the live measured value(s) from the front-panel test port: insulation resistance (R) and/or leakage current (I), together with the pickout/comparator result if pickout is enabled (§4.4).

Field	Options / range
Measurement parameters	R (insulation resistance) · I (leakage current)
Measurement display (MDISplay)	ON · OFF — turns the live result display on/off

> NOTE
> Resistance is shown to 4 significant digits. Leakage-current display resolution depends on the active current range: range 1–6 are resolved to 100 nA, 10 nA, 1 nA, 100 pA, 10 pA and 1 pA respectively (§6.1).

4.2 <Measurement Setup> page (MEAS SETUP)

Field	Options / range
Output voltage (OUTP VOLT)	TH2683A: 1–1000 V · TH2683B: 1–500 V
Measurement mode (MEAS MODE)	SINGLE · CONTinuous
Charge time (CHAR TIME / CTIMe)	0–999.0 s, 0.1 s resolution
Wait time (WAIT TIME / WTIMe)	0–999.0 s, 0.1 s resolution
Measurement time (MEAS TIME / MTIMe)	0–999.0 s, 0.1 s resolution
Discharge time (DICH TIME / DTIMe)	0–999.0 s, 0.1 s resolution
Measurement speed (MEAS SPEED)	FAST · SLOW
Range set (RANGE SET)	AUTO · LOCK (with a fixed locked range, §4.3)
Contact check (CONT CHEC)	ON · OFF — useful only for capacitive DUTs >100 pF; adds no measurement time
Open-circuit zero clearing (OPEN CLR)	ON · OFF (§2.4) — perform only after ≥30 min warm-up, with the test terminals open
Average (AVERage)	1–999, programmable
Internal resistance (MIRE / MIResistance)	AUTO · 10 kΩ · 1 MΩ (§4.3)

4.3 Current ranges and internal resistance

The TH2683A/B has 6 leakage-current ranges. Each range's input impedance can be set independently as **Auto**, **10 kΩ** or **1 MΩ** (field MIRE, §4.2):

Range	Current span	Input internal resistance	Auto-mode mapping
1	100 µA – 1 mA	10 kΩ or 1 MΩ (selectable)	10 kΩ
2	10 µA – 100 µA	10 kΩ or 1 MΩ (selectable)	10 kΩ
3	1 µA – 10 µA	10 kΩ or 1 MΩ (selectable)	10 kΩ
4	100 nA – 1 µA	10 kΩ or 1 MΩ (selectable)	10 kΩ
5	10 nA – 100 nA	10 kΩ or 1 MΩ (selectable)	1 MΩ
6	1 nA – 10 nA	10 kΩ or 1 MΩ (selectable)	1 MΩ

In Auto range mode, the instrument automatically selects the optimal range and the input internal resistance shown above for the device being measured, to achieve the best measurement result.

4.4 <Pickout Setup> page (comparator)

Configures the instrument's 3-bin pass/fail sorting function (BIN1–BIN3, plus NG for a result outside all three bins).

Field	Options / range
Pickout function	ON · OFF — master enable for the comparator function
Pickout item	CURRent · RESistance — which parameter the 3 bins compare
Lower/upper limit, BIN1–3	Current: 1 pA – 1.25 mA · Resistance: 100 kΩ – 10 TΩ
Beeper (BEEPer)	BIN1 · BIN2 · BIN3 · NG · OFF — which sorting result triggers a beep
Bin display (BDISplay)	ON · OFF
Pickout limit value (PLIMitvalue)	ON · OFF — when OFF, an unset bin limit is treated as unbounded (±∞) rather than 0
Output result type (ORESult)	LEVel · PULSe
Pulse width (PWIDth)	1–25 ms (PULSe mode only)

4.5 Starting a test

Connect the device under test to HV(−) and INPUT (and GUARD, if used) with correct polarity (§2.3). A test proceeds through four stages, controlled by the timing fields on <Measurement Setup> (§4.2):

Stage	Description
Charge	Instrument ramps up and applies the output test voltage for the configured charge time (CTIMe); the HV indicator is active
Wait	Test voltage is held for the configured wait time (WTIMe) before measurement begins, to let the reading stabilize; the HV indicator remains active
Test	Instrument measures for the configured measurement time (MTIMe); the HV indicator remains active
Discharge	Instrument discharges the device under test for the configured discharge time (DTIMe); the DICH indicator blinks

> **WARNING**
> Do not touch the test terminals or device under test while the HV indicator or the DICH (discharge) indicator is active. For a device under test with significant capacitance, allow a discharge time long enough for a full discharge, or discharge it externally before disconnecting.

Trigger the test by pressing the front-panel [TEST] key (Manual trigger), an external signal at the HANDLER or FOOT.C input (External trigger, §3.2, Chapter 8), or a remote command (Bus trigger, Chapter 7) — selected on <System Setup> (§5.1).

4.6 Worked example

Testing a CBB film capacitor rated 250 V, 2.2 µF, with insulation resistance expected >100 GΩ: set output voltage to 250 V; charge time from $T = K \times C \times U$ with K = 5000 (a Tonghui-recommended constant for this type of DUT), giving T = 5000×2.2 µF×250 V ≈ 2.75 s, rounded up to 3 s; measurement time 0 s; speed SLOW; range AUTO; open-circuit zero clearing recommended before the first test; measurement display ON; mode CONTinuous; wait time 0 s; discharge time 0 s (a large capacitance should instead be discharged externally after the test); contact check OFF; average 1; internal resistance AUTO.

CHAPTER 5

System Setup & File Management

5.1 <System Setup> page

Field	Options / range
Beeper (system)	ON · OFF — key-press / touch tone
Password	OFF · Lock System · Lock File · Modify (factory default startup password: `2683`)
Bus mode	RS232C · RS485 · USBTMC · USBVCOM
Trigger source	Manual (front-panel **TEST** key) · External (HANDLER or FOOT.C input) · Bus (remote command)
Baud rate	9.6 k · 19.2 k · 28.8 k · 38.4 k · 48.0 k · 57.6 k · 67.2 k · 76.8 k · 86.4 k · 96.0 k · 105.6 k · 115.2 k
Bus address	1–32 (0 = broadcast) — RS485 only
Handler power (HPOWer)	Internal · External (§8.1)
Date / time	Format YY-MM-DD HH:MM:SS, adjusted with the increase/decrease soft keys or direct numeric entry

> NOTE
> The startup password is factory-set to `2683`. Record any password you change it to — a lost password requires Techmize/Tonghui support to clear. Units shipped for the European market are configured to the English operator interface.

5.2 File management

Reached with the front-panel **FILE** key, then Internal File or External File. Configuration settings can be saved to and recalled from a file, so a complete instrument setup does not need to be re-entered manually. Internal denotes the instrument's internal flash; External denotes a connected USB drive (shown as drive `E:`).

5.2.1 Storage types

Type	Format	Recallable	Where
Configuration save	*.STA	Yes	Internal flash or USB drive
Measurement data save	*.CSV	No	USB drive only

5.2.2 USB folder structure

Folder	Max files	Contents
STA	Up to 999	Instrument configuration *.STA files, named sequentially e.g. `2683A001.STA`
CSV	Up to 999	Measurement-result *.CSV files, e.g. `2683A001.CSV`

The STA and CSV folders are created automatically when a USB drive is connected. Use a USB2.0 drive formatted as FAT16 or FAT32 (FAT32 recommended above 512 MB), and avoid storing an excessive number of files or folders on it for best save/load performance. Back up data on the USB drive before connecting it to the instrument — Techmize/Tonghui is not responsible for USB-drive data loss.

5.2.3 File operations

The internal-file and external-file pages each list 4 files per screen, with name and save date/time. With the cursor on a non-empty file entry, the soft-key area shows:

Operation	Effect
Load	Recalls the selected file's saved settings into the active configuration (confirm with Yes/No)
Copy to E:	Copies the selected internal file (or multiple selected files) to a connected USB drive
Select	Marks the file for a multi-file copy to USB; touch again to deselect
Delete	Deletes the selected file (confirm with Yes/No)

With the cursor on an empty entry, the soft key shows **Save**: confirm with Yes/No, then enter a file name on the on-screen keyboard and confirm again (ENTER) to save the current configuration to that file. If the chosen file number already exists, saving overwrites the existing file.

To save measurement results continuously: on <Measurement Display>, touch the soft-key menu's **Start Save** to begin writing results to a connected USB drive; touch **Stop Save** to stop.

CHAPTER 6

Performance & Specifications

6.1 Measurement function

Item	Specification
Measurement parameters	R (insulation resistance) · I (leakage current)
Range	6 leakage-current ranges; AUTO or LOCK (Hold, ↑ / ↓ step) (§4.3)
Trigger	Manual (TEST key) · External (HANDLER/FOOT.C input) · Bus (remote command)
Test-terminal configuration	Guarded 2-terminal: HV(−) (DC voltage output), INPUT (sampling input), GUARD
Measurement speed (MEAS DISP & bin display OFF)	FAST: R ≤30 ms, I ≤30 ms · SLOW: R ≤60 ms, I ≤60 ms
Average	1–999, programmable
Display digits	Resistance: 4 significant digits · Leakage current: range 1–6 resolved to 100 nA, 10 nA, 1 nA, 100 pA, 10 pA, 1 pA respectively · Time: 0.1 s
Contact check	ON/OFF; useful for capacitive DUTs >100 pF; adds no test time

6.2 Test signal

Item	Specification
Output voltage range — TH2683A	1–1000 V DC
Output voltage range — TH2683B	1–500 V DC
Output voltage accuracy	≥10 V: 1%±1 V · <10 V: 10%±0.1 V

6.3 Maximum measurement display range

Parameter	Measurement display range
Resistance test	100.0 kΩ – 10.00 TΩ
Leakage current test	Range 1: 100 µA – 1 mA, input internal resistance 10 kΩ or 1 MΩ
	Range 2: 10 µA – 100 µA, input internal resistance 10 kΩ or 1 MΩ
	Range 3: 1 µA – 10 µA, input internal resistance 10 kΩ or 1 MΩ
	Range 4: 100 nA – 1 µA, input internal resistance 10 kΩ or 1 MΩ
	Range 5: 10 nA – 100 nA, input internal resistance 10 kΩ or 1 MΩ
	Range 6: 1 nA – 10 nA, input internal resistance 10 kΩ or 1 MΩ

6.4 Measurement accuracy

Measurement accuracy includes stability, temperature coefficient, linearity, repeatability and correction interpolation error. Checking measurement accuracy requires: (a) warm-up time ≥30 minutes; (b) the output terminal open-circuited, with open-circuit zero clearing performed on <Measurement Setup> (§2.4, §4.2).

6.4.1 Basic accuracy for resistance measurement

SLOW, FAST (this accuracy is obtained at 20 ℃ ±5 ℃):

Test condition	Accuracy
Voltage ≥10 V and I>10 nA	±2%
Voltage <10 V or I≤10 nA	±5%

6.4.2 Basic accuracy for leakage-current measurement

SLOW, FAST (this accuracy is obtained at 20 ℃ ±5 ℃):

Test condition	Accuracy
All ranges	±2%±3 pA

6.5 General specifications

Item	Specification
Display	4.3" colour TFT touchscreen
Dimensions (bench, incl. protective boot)	235 mm (W) × 105 mm (H) × 360 mm (D)
Weight	≈ 3.6 kg
Power	220 V AC ±10%, 50/60 Hz, ≤50 VA
Warm-up time	≥ 30 minutes
Operating environment	0–40 ℃, ≤75% RH
EU compliance	LVD 2014/35/EU — EN 61010-1:2010+A1:2019 | EMC 2014/30/EU — EN IEC 61326-1:2021

Model quick-reference: TH2683A — output voltage 1–1000 V; TH2683B — output voltage 1–500 V. All other specifications (current ranges, accuracy, display, interfaces, dimensions) are identical between the two models.

PART II

Remote Control & Handler

Covers the RS232C, RS485, USBTMC and USBVCOM remote interfaces and the HANDLER interface for automated test integration. The full SCPI and MODBUS command tables are issued separately as the *TH2683 Series SCPI & MODBUS Command Reference*.

CHAPTER 7

Remote Control

The TH2683A/B series can be controlled remotely over RS232C, RS485, USBTMC or USBVCOM, using the SCPI command set (and, over RS485, the MODBUS protocol as an alternative). For the complete command syntax and parameter ranges, see the companion *TH2683 Series SCPI & MODBUS Command Reference*.

7.1 RS232C

Item	Specification
Pin assignment (9-pin)	TXD = pin 2, RXD = pin 3, GND = pin 5
Baud rate	9.6 k – 115.2 k, 12 selectable values (§5.1)
Data format	No parity, 8 data bits, 1 stop bit
Command termination	LF (0x0A)
Max. command length	2 KB per SCPI command string

Note that the instrument's RS232C implementation provides only a minimal subset of the full RS-232 standard (TXD, RXD, GND), rather than the complete 9-pin signal set — this is a deliberate simplification common to this class of instrument, since a 3-wire interface is cheaper to operate than a full handshaking link.

7.2 RS485

RS485 operates over the same RS232C interface through an external RS485 transceiver board, for a multi-drop bus linking several instruments. Each command is prefixed with the instrument's bus address:

```
ADDRESS + @ + SCPI command
```

where **ADDRESS** is the instrument's bus address (1–32; 0 = broadcast, §5.1) and **@** separates the address from the SCPI command.

7.3 USBTMC

USBTMC-USB488 and USB2.0 compliant, over the rear-panel USB DEVICE port. Requires a VISA/USBTMC driver on the host PC; once installed, the instrument appears in the host OS's device manager as a USB test-and-measurement device, addressable with LabVIEW or any USBTMC-capable client.

7.4 USBVCOM

Presents a virtual COM port over the rear-panel USB DEVICE connector, selected via Bus Mode = USBVCOM (§5.1). Requires the Tonghui USBCDC driver for the TH2683A (available from the Tonghui website, Support & Downloads); once installed, the instrument appears as a "usb VCom port" in the host OS's device manager and can be addressed as an ordinary serial port — useful when the host PC has no physical serial port.

7.5 Command-set overview

The instrument uses the SCPI command set over all interfaces. Commands are organized into subsystems — display (`DISPlay`), function (`FUNCtion`), discharge (`DISCharge`), trigger (`TRIGger`), fetch (`FETCh?`), comparator (`COMParator`), system (`SYSTem`) and mass memory (`Mass MEMory`) — plus the IEEE 488.2 common commands (`*RST` , `*TRG` , `*IDN?`).

Command keywords use mixed-case notation in the source documentation: the capitalized portion of a keyword is mandatory, the lower-case portion is optional (e.g. `FUNCtion:RANGe` can be sent in full or abbreviated to `FUNC:RANG`); the instrument itself does not distinguish upper and lower case on received commands. SCPI numeric formats NR1 (integer), NR2 (fixed point) and NR3 (floating point) are used as appropriate per command; NL (newline, decimal 10) terminates each command line.

As an alternative to SCPI, the instrument also supports the MODBUS protocol over its serial interfaces, with a documented read/write register map and CRC-checked frame format, for integration with PLCs and other MODBUS-based test-system controllers.

For the full command syntax, parameter ranges, worked examples and the complete MODBUS register map, see the *TH2683 Series SCPI & MODBUS Command Reference*.

CHAPTER 8

Handler Interface

The rear-panel 9-pin HANDLER interface lets the TH2683A/B series integrate into an automatic test or sorting system: it accepts an external trigger and outputs the 3-bin pickout/comparator result, together with a measurement-complete (end-of-conversion) signal.

8.1 HANDLER connector pin assignment

Pin	Signal	Description
1	/START	Low-level pulse, falling edge active. When the instrument is in External trigger mode and this signal is active, the instrument performs one triggered measurement.
2	/PASS2	Pickout BIN2 pass signal
3	/FAIL	Pickout failure (NG) signal
4	VCC	Internal power, +5 V
5	EXTV	External power, +5 V (note: a higher external voltage such as 24 V can also be used)
6	/PASS1	Pickout BIN1 pass signal
7	/PASS3	Pickout BIN3 pass signal
8	/EOC	End-of-measurement signal
9	COM	External power ground/return

All comparator and trigger signals (/PASS1–3, /FAIL, /START, /EOC) are active-low, output through open-collector optocouplers, with each line pulled up through a shared resistor to either the internal +5 V (VCC) or an external supply (EXTV), set on <System Setup> (§5.1, field HPOWer).

8.2 HANDLER timing

Parameter	FAST	SLOW
/START to result valid	> 30 ms	> 60 ms
Result signal duration (/PASS1–3, /FAIL)	25–30 ms	40–50 ms
/EOC pulse width	10 ms	
Minimum trigger pulse width	1 ms	
Minimum interval between triggers	1 sampling time (≥30 ms FAST, ≥60 ms SLOW)	

Timing figures above apply with the measurement display and bin display both switched off (§6.1). The output result type (LEVel or PULSe, §4.4) determines whether /PASS1–3 and /FAIL stay active until the next trigger (LEVel) or pulse for the configured pulse width (PULSe, 1–25 ms).

8.3 Using the HANDLER interface

1. Set Trigger source to External on <System Setup> (§5.1) so the instrument waits for a HANDLER trigger before each measurement.
2. Enable Pickout on <Pickout Setup> (§4.4) and configure the BIN1–3 limits for the parameter (current or resistance) to be sorted.
3. Apply a trigger pulse (≥1 ms) to /START (pin 1) from the external handler/sorter.
4. The instrument runs the charge–wait–test–discharge sequence configured on <Measurement Setup> (§4.2, §4.5); /EOC goes active once the measurement completes.
5. Read the sort result from /PASS1, /PASS2, /PASS3 (pins 6, 2, 7) or /FAIL (pin 3), all active-low.

> **NOTE — EXTERNAL POWER**
>
> If the connected handler system needs to drive the HANDLER interface from its own supply rather than the instrument's internal +5 V, set Handler power to External on <System Setup> (§5.1) and connect the external supply to EXTV (pin 5), with COM (pin 9) as the return.

APPENDIX

Packing, Warranty & Related Documents

A.1 Standard accessories

See §2.1 for the standard packing contents (instrument, two-terminal test clip lead TH26004B, EU power cable, fuses, documentation). A footswitch trigger (TH1801-001) is an optional accessory, purchased separately.

A.2 Transport & storage

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

A.3 Nameplate & markings

Each instrument's front panel or nameplate carries: the manufacturer's name/trademark; product name and model; serial number and date of manufacture; and the test-terminal markings.

A.4 Related documents

- TH2683 Series Datasheet (Techmize)
- TH2683 Series SCPI & MODBUS Command Reference (Techmize, companion to this manual)

A.5 Contacting Techmize

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

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