

INSTRUCTION MANUAL TT-SI 7002

25MHz active differential probe x20 / x50 / x200



TESTEC

Safety Summary

To avoid personal injury and/or product damage, review and comply with the following safety precautions. These precautions apply to both operating and maintenance personnel and must be followed during all phases of operation, service, and repair of this probe.



A **WARNING** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in injury or death to personnel.



A **CAUTION** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in damage to or destruction of parts or the entire product.

Do Not Work Alone

Do not work alone when working with high voltages.

Inspect the Probe

Inspect the probe and accessories for cracks and frayed or broken leads before each use. If defects or damages are noted, DO NOT USE the probe.

Dry Conditions

Hands, shoes, floor, and work bench must be dry. Avoid making measurements under humidity, dampness, or other environmental conditions that might affect safety.

Do Not Remove the Probe's Casing

Removal of the probe's casing may expose you to electric shock. If necessary, disconnect the inputs and outputs of the probe before opening the case.

Hazardous Contact

To avoid injury, remove jewelry such as rings, watches, and other metallic objects. Do not touch exposed connections and components when power is present.

Unexpected Charges

Hazardous voltages may be present in unexpected locations in circuitry being tested when a fault condition in the circuit exists.

Capacitors inside the instrument may retain a charge even if the instrument is disconnected from its source of supply.

Use Only in Office-Type Indoor Setting

The probe is designed to be used in office-type indoor environments.

Do not operate the probe:

- In the presence of noxious, corrosive, flammable fumes, gases, vapors, chemicals, or finely-divided particulates.
- In environments where there is a danger of any liquid spilled on the probe.
- In air temperatures exceeding the specified operating temperatures.
- In atmospheric pressures outside the specified altitude limits or where the surrounding gas is not air.

Not for Critical Applications

This probe is not authorized for use in contact with the human body or for use as a component in a life-support device or system.

Do Not Substitute Parts

Do not install substitute parts or perform any unauthorized modification to the instrument.

Only Qualified Personnel

Only qualified personnel should use this probe. This differential voltage probe is designed to be used by personnel who are trained, experienced, or otherwise qualified to recognize hazardous situations and who are trained in the safety precautions necessary to avoid possible injury when using such a device.

Observe Maximum Working Voltage

Do not use any probe above its maximum working voltage ranges. See specifications on page 7.

Use Proper Power Source

Do not operate this probe from a power source that applies more than the voltage specified.

Must be Grounded


This probe is grounded by the shell of the BNC connector through the grounding conductor of the power cord of the measurement instrument. Before making connections to the input leads of this probe, ensure that the output BNC connector is attached to the BNC connector of the measurement instrument, and that the measurement instrument is properly grounded. Whenever it is likely that the ground protection is impaired, you must make the instrument inoperative and secure it against any unintended operation.


Terms and Symbols

The following symbols appear on the product or in its documentation:

 Direct voltage

 Both direct and alternating voltage

 Caution, possibility of electric shock

 Caution, see documentation for details

 Earth Ground

Definitions

Measurement Category II (CAT II)

refers to local-level electrical distribution, such as that provided by a standard wall outlet or plug-connected equipment. Examples of CAT II measurements would be household appliances, portable tools, and similar modules.

Measurement Category III (CAT III)

refers to measurements on hard-wired equipment in fixed installations, distribution boards, and circuit breakers that form part of a building wiring installation. Other examples are wiring, including cables, bus bars, junction boxes, switches, socket outlets in the fixed installation, and stationary motors with permanent connections to fixed installations

Pollution Degree 2

refers to an operation environment where normally only dry, non-conductive pollution occurs. Temporary conductivity caused by condensation can be expected.

Working CAT rating is equal to that of the lowest rated element within the test set-up.

Compliance Statements

EC Declaration of Conformity

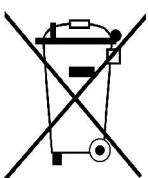


The product conforms to the applicable European Union requirements per IEC/EN 61010-031:2015 Safety requirements for electrical equipment for measurement, control and laboratory use. Part 31: Safety requirements for hand-held probe assemblies for electrical measurement and test.

EU RoHS Compliance

The probe and accessories conform to the 2011/65/EU RoHS2 Directive.

Disposal of Old Electrical & Electronic Equipment



(Applicable in the European Union and other European countries with separate collection systems). This product is subject to Directive 2012/19/EU of the European Parliament and the Council of the European Union on waste electrical and electronic equipment (WEEE), and in jurisdictions adopting that Directive, is marked as being put on the market after August 13, 2005, and should not be disposed of as unsorted municipal waste. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

This probe is in compliance with IEC/EN 61010-031:2015 CAT III, Pollution Degree 2.

1 Introduction

Overview

The TT-SI 7002 differential probe allows safe, accurate measurement between two voltage points where neither point is referenced to ground. The probe offers both a 25 MHz bandwidth for the x50x and x200 attenuation settings and 15 MHz bandwidth for the x20 attenuation setting. Compatible with oscilloscopes from all major manufacturers, the probe is exclusively powered by the included 9 V power adapter.

Features

- Meets IEC/EN 61010-031:2015 safety standard
- Selectable attenuation settings of x20, x50 and x200
- 25 MHz bandwidth (@ x50 and x200 attenuation settings)
- 15 MHz (@ x20 attenuation setting)
- Up to ± 700 V (DC + AC peak) differential mode
- High accuracy ($\pm 2\%$)
- Power indicator LED
- Over range indicator LED

Initial Inspection

This unit is tested prior to shipment. It is therefore ready for immediate use upon receipt. An initial physical inspection should be made to ensure that no damage has been sustained during shipment. After the inspection, verify the contents of the shipment.

Delivery Content

- Differential probe - TT-SI 7002
- 2 x Grabber, black & red – TT-SI GR2
- 2 x test leads with insulated 4 mm banana plugs – TT-SI TL7 silicone jacket, black & red
- insulated BNC cable, 100 cm – TT-SI BN7
- 9 V power adapter – EU version – TT-SI NT7
- User manual

2 Using the Probe

WARNING



At the time of powering on the probe, the input leads must not be connected to an item to be tested. Never operate the probe with the case open.

CAUTION



This probe is used to carry out differential measurements between two points on the circuit under test. This probe is not designed for electrically insulating the circuit under test or the measuring instrument.

Inspection Procedure

1. Connect the BNC output connector to the vertical input of the oscilloscope.
2. Power on the probe.
3. Set the attenuation setting on the oscilloscope to match the probe.
4. Connect the input of probe to a function generator. Then select a square-wave output of 10 V amplitude and 100 kHz frequency.
5. The square-wave will be displayed on the screen of the oscilloscope. This indicates the probe is working properly.

Note that the oscilloscope should show the same voltage and frequency as the function generator.

Getting Started

1. Connect the BNC output connector to the vertical input of a general purposed oscilloscope. The oscilloscope must have a ground referenced.
2. Connect power adapter.
3. Select the proper attenuation ratio. When measuring signals below 70 V, switch the attenuation ratio to x20 in order to get higher resolution and less noise ratio. For voltages up to 175 V, set the attenuation ratio to x50 and for voltages up to 700 V set the attenuation ratio to x200.
4. The power indicator LED should turn on.
5. Plug the supplied grips onto the test leads and connect the circuit under test.

Vertical Scale on Oscilloscope

The actual vertical scale of the oscilloscope is equal to the attenuation factor multiplied by the range of vertical scale selected on the oscilloscope. For example, with the probe on factor x20 and the oscilloscope on 0.5 V/div, the real vertical scale is $20 \times 0.5 = 10 \text{ V/div}$. With the probe on x200, the real vertical scale is $200 \times 0.5 = 100 \text{ V/div}$. These values apply when the oscilloscope is set to the typical 1 M Ω impedance input. When the scope is set to 50 Ω input, the actual vertical scale will be doubled: 20 V/div for the x20 setting and 200 V/div for the x200 setting.

Scope Input Impedance	Probe Attenuation Setting	Actual Attenuation Setting	Vertical Scale Reading on Oscilloscope	Actual Vertical Scale of the Oscilloscope
1 M Ω	x20	x20	0,5 V/div	10 V/div
1 M Ω	x50	x50	0,5 V/div	25 V/div
1 M Ω	x200	x200	0,5 V/div	100 V/div
50 Ω	x20	x40	0,5 V/div	20 V/div
50 Ω	x50	x100	0,5 V/div	50 V/div
50 Ω	x200	x400	0,5 V/div	200 V/div

3 Product Overview

Probe Input – 2 x 4mm Plug



Over Range Indicator (Red)

Attenuation Selector Switch

Power Indicator (Red)

External Power Supply

Probe Output
BNC Connector

Included Accessories



TT-SI NT7



TT-SI TL7



TT-SI GR2



TT-SI BN7

4 Specifications

All specifications apply to the unit after a temperature stabilization time of 20 minutes over an ambient range of $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

TT-SI 7002 – order number 15175

Bandwidth	25 MHz @ x50 and x200 15 MHz @ x20
Rise Time	14 ns @ x50 and x200 23 ns @ x20
Attenuation	x20, x50, x200
DC-Accuracy	$\pm 2\%$
CMRR	80 dB @ 60 Hz 60 dB @ 100 Hz 50 dB @ 1 MHz
Maximum Input Voltage @ x20 (DC + AC peak)	$\pm 70\text{ V}$
Maximum Input Voltage @ x50 (DC + AC peak)	$\pm 175\text{ V}$
Maximum Input Voltage @ x200 (DC + AC peak)	$\pm 700\text{ V}$
Absolute Maximum Input Voltage (each side to ground)	240 Vrms
Input Impedance (differential)	4 MOhm // 1,2 pF
Input Impedance (each side to ground)	2 MOhm // 2,3 pF
Output Voltage Swing	$\pm 8\text{ V}$ using 1 M Ω oscilloscope input
Offset (typical)	$\pm 5\text{ mV}$
Noise (typical)	2 mVrms
Source Impedance	50 Ohm
Power Supply	9 V power adapter (included)
Weight	250 g
Dimensions	195 x 55 x 30 mm
BNC cable length	100 cm
Input lead length	55 cm each
Operation Temperature/Humidity	0°C to 50°C / 10% to 85% RH
Storage Temperature/Humidity	-30°C to 70°C / 10% to 90% RH
Safety Standard	IEC/EN 61010-031:2015 CAT III
Pollution Degree	2

Specifications are subject to change without notice. To ensure the most current version of this manual, please download the current version from our website:
www.testec.de

5 Voltage Derating Curve

The derating curve of the absolute maximum input voltage in differential mode is shown as follows:

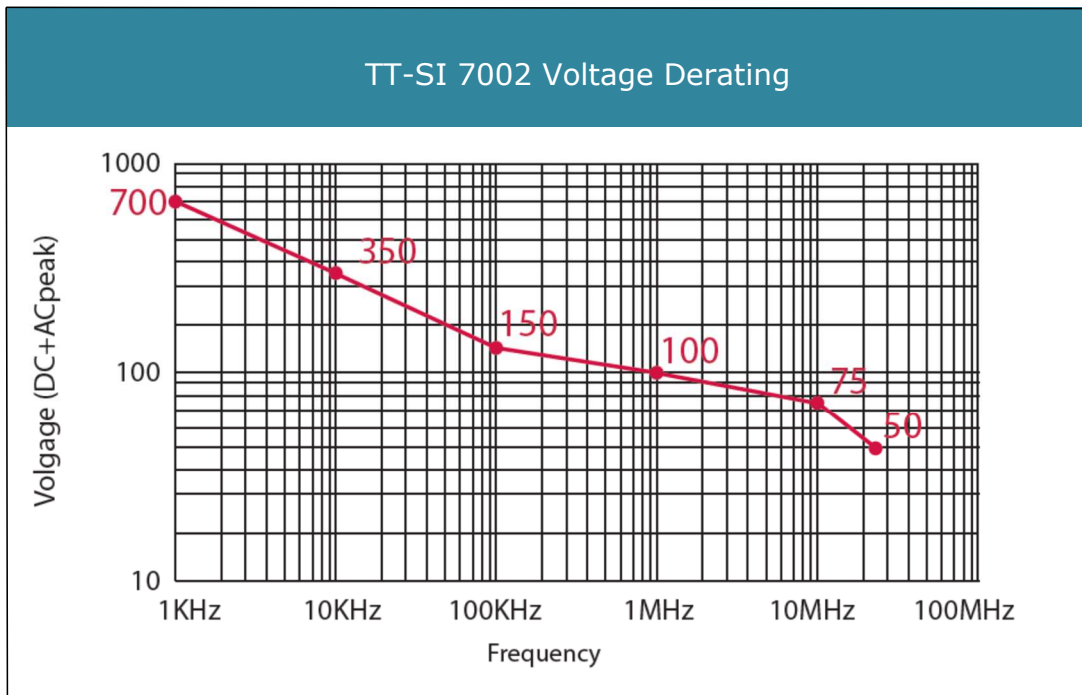


Figure: TT-SI 7002 Derating Curve

6 Cleaning

This probe does not require any particular cleaning. If necessary, clean the case with a soft cloth.



WARNING

Dry the probe thoroughly before attempting to make voltage measurements.



CAUTION

Avoid immersing or using abrasive cleaners or solvents containing Benzene (or similar solvents) on the probe as these can cause deterioration of the probe body and cables.

7 Service & Warranty Information

Limited One-Year Warranty

Testec Elektronik GmbH warrants these products to be free from defective material or workmanship for a period of 1 year from the date of original purchase. Under this warranty, Testec Elektronik GmbH is limited to repairing the defective device when returned to the factory, shipping charges prepaid, within the warranty period.

Units returned to Testec Elektronik GmbH that have been subject to abuse, misuse, damage, or accident, or have been connected, installed, or adjusted contrary to the instructions furnished by Testec Elektronik GmbH, or that have been repaired by unauthorized persons, will not be covered by this warranty.

Testec Elektronik GmbH reserves the right to discontinue models, change specifications, price, or design of this device at any time without notice and without incurring any obligation whatsoever.

The purchaser agrees to assume all liabilities for any damages and/or bodily injury which may result from the use or misuse of this device by the purchaser, his employees, or agents.

This warranty is in lieu of all other representations or warranties expressed or implied and no agent or representative of Testec Elektronik GmbH is authorized to assume any other obligation in connection with the sale and purchase of this device.

Service

If you have a need for calibration or repair services, technical, or sales support, please contact us:

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TT-SI 7002 Differential Probe User's Manual

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