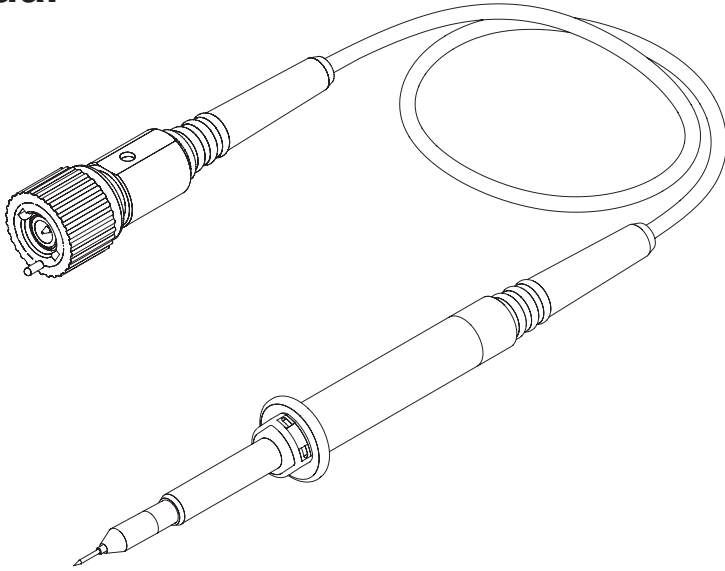


# Manual



## 400 MHz Passive High-Voltage Probe R&S® RT-ZH10 1409.7720.02

Printed in Germany



**ROHDE & SCHWARZ**

Test and Measurement

**ROHDE & SCHWARZ**

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(EC conformity marking)

The manufacturer declares the conformity of this product with the actual required safety standards in accordance with the Low Voltage Directive (LVD) 2006/95/EC:

CEI/IEC 61010-031:2008

Safety requirements for electrical equipment  
for measurement, control and laboratory use -

Part 031:

Safety requirements for hand-held probe  
assemblies for electrical measurement and test

### **WEEE/ RoHS Directives**

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(EC conformity marking)

This electronic product is classified within the WEEE/ RoHS\* category list as monitoring and control equipment (category 9). Category 9 products are exempted from the restrictions under the scope of the RoHS directive.

Your help and efforts are required to protect and keep clean our environment. Therefore return this electronic product at the end of its life either to the manufacturer or take care of separate WEEE collection and professional WEEE treatment yourself. Do not dispose as unsorted municipal waste!

\* EC Directives:

WEEE Directive 2002/96/EC

-

Waste Electrical and Electronic Equipment

RoHS Directive 2002/95/EC

-

Restriction of the use of certain Hazardous Substances  
in Electrical and Electronic Equipment

## Definitions and Examples (Clause 6.5.2)

<b>Measurement Category I</b>	<b>Definition:</b>	Measurement category I is for measurements performed on circuits not directly connected to a mains supply.
	<b>Examples:</b>	Measurements in circuits not derived from a mains supply and specially protected ( internal ) circuits derived from a mains supply. In the latter case, transient stresses are variable; for that reason it is required that the transient withstand capability of the equipment is made known to the user.
<b>Measurement Category II</b> CAT II	<b>Definition:</b>	Measurement category II is for measurements performed on circuits directly connected to the low voltage installation.
	<b>Examples:</b>	Household appliances, portable tools and similar equipment.
<b>Measurement Category III</b> CAT III	<b>Definition:</b>	Measurement category III is for measurements performed in the building installation.
	<b>Examples:</b>	Measurements on distribution boards, circuit breakers, wiring including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation and equipment for industrial use like for example stationary motors with permanent connection to the fixed installation.
<b>Measurement Category IV</b> CAT IV	<b>Definition:</b>	Measurement category IV is for measurements performed at the source of the low-voltage installation.
	<b>Examples:</b>	Electricity meters and measurements on primary over current protection devices and and ripple control units.

Definitions (Clause 3.5.6 )

- Pollution Degree 1**      No POLLUTION or only dry, non conductive POLLUTION.  
NOTE: The POLLUTION has no influence.
- Pollution Degree 2**      Only- non conductive POLLUTION. Occasionally, however, a temporary conductivity caused by condensation must be accepted.
- Pollution Degree 3**      Conductive POLLUTION occurs or dry, non-conductive POLLUTION occurs which becomes conductive due to condensation which is to be expected.

## **IEC Safety Symbols**

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The following symbols may appear on the product or in this instruction manual:



Caution, risk of danger. Refer to manual.



Caution, risk of electric shock.



Earth (ground) TERMINAL.

To avoid personal injury and to prevent fire or damage to this product or products connected to it, review and comply with the following safety precautions. Be aware that if you use this probe assembly in a manner not specified the protection this product provides may be impaired.

**Only qualified personnel should use this probe assembly.**

**Use only grounded instruments.**

Do not connect the probe ground lead to a potential other than earth ground. Always make sure the probe and the measurement instrument are grounded properly.

**Connect and disconnect properly.**

Connect the probe output to the measurement instrument and connect the ground lead to earth ground before connecting the probe to the circuit under test. Disconnect the probe input and the probe ground lead from the circuit under test before disconnecting the probe from the measurement instrument.

**Observe probe and probe accessory ratings.**

Do not apply any electrical potential to the probe input which exceeds the maximum ratings of the probe or the accessories connected to it. In a combination always the *lower* rating / measurement category applies to both probe and accessories connected to it.

Make sure to comply with the voltage versus frequency derating curve on page 8.

**Keep away from live circuits.**

Avoid open circuitry. Do not touch connections or components when power is present.

**Do not operate with suspected failures.**

Refer to qualified service personnel.

**Indoor use only.**

Do not operate in wet/damp environment. Keep product surfaces dry and clean.

**Do not operate the product in an explosive atmosphere.**

Specifications that are not defined to be warranted are typical and are published as general information to the user. The instrument must have warmed-up for at least 20 minutes and the environmental conditions must not exceed the probe's specified limits.

Electrical Specifications

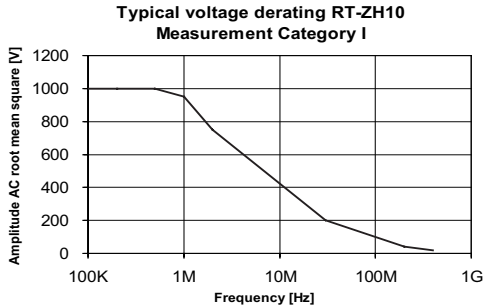
Attenuation Ratio <sup>(1)</sup>	100:1	± 2 % at DC (warranted)
Voltage Coefficient	0.0005 %/V	
System Bandwidth	400 MHz	(-3 dB)
Probe Risetime	900 ps	(10 % - 90 %)
Input Resistance (System)	50 MΩ	± 1 % (warranted)
Input Capacitance (System)	7.5 pF	

Maximum Rated Input Voltage <sup>(2)</sup>	
Measurement category I:	1000 V root mean square 4000 V transient overvoltage
Measurement category II:	1000 V root mean square CAT II
Compensation Range	5 pF - 20 pF
Input Coupling of the Measuring Instrument	1 MΩ AC / DC
Pollution Degree <sup>(2)</sup>	2

Voltage Derating



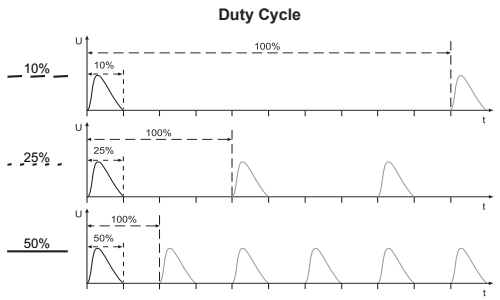
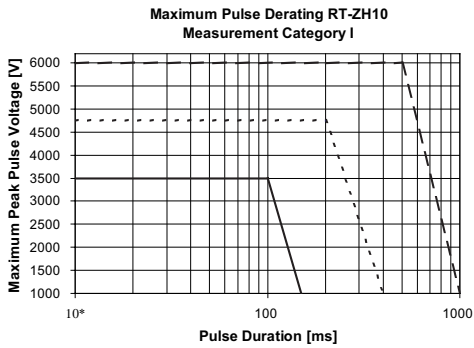
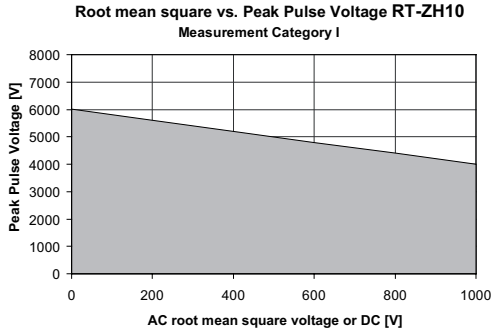
Note that the max. input voltage rating of the probe decreases as the frequency of the applied signal increases.



(1) Connected to appropriate R&S oscilloscope. See R&S oscilloscope operating manual for further details.  
 (2) As defined in IEC 61010-031. Also see definitions explained on page 4 and 5.

### Maximum Pulse Ratings

For pulse measurements make sure to comply with the ratings as shown on this page.



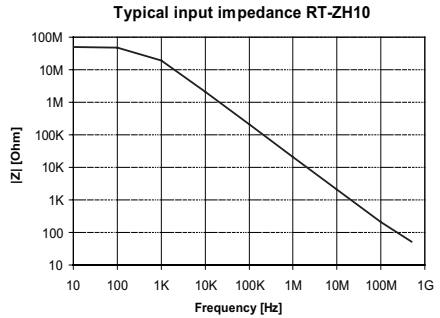
\* Values at 10 ms also apply to all Pulse Durations smaller than 10 ms.



**Input Impedance**



*Note that the input impedance of the probe decreases as the frequency of the applied signal increases.*



**Mechanical Characteristics**

Weight (probe)	67 g
Cable Length	2 m
Probe Tip Diameter	5 mm

**Environmental specifications**

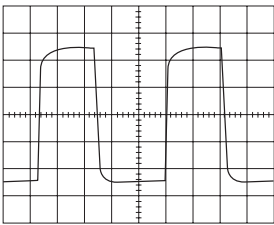
Altitude	operating	up to 2000 m
	non-operating	up to 15000 m
Temperature Range	operating	0° C to +50° C
	non-operating	-40° C to +71° C
Maximum Relative Humidity	operating	80 % relative humidity for temperatures up to +31° C, decreasing linearly to 40 % at +50° C

The probe can be adjusted for low frequency (LF) compensation and for high frequency (HF) compensation and DC dividing ratio.

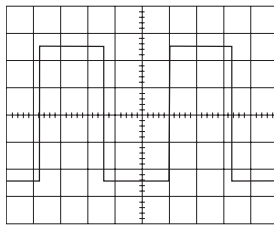
**LF Compensation**

LF needs to be adjusted when the probe is connected to the oscilloscope input for the first time. LF compensation matches the probes cable capacitance to the oscilloscope input capacitance. This matching assures good amplitude accuracy from DC to upper bandwidth limit frequencies. A poorly compensated probe clearly influences the overall system performance (probe + scope) and introduces measurement errors resulting in inaccurate readings and distorted waveforms.

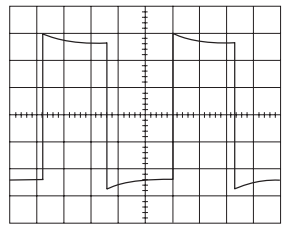
We recommend to use a square wave or rectangular wave generator with an amplitude of 5 Vpp minimum. When using a generator with smaller amplitude it may be useful to choose "RF Reject" in the trigger settings. Adjust the LF compensation trimmer to optimum square wave response. For clarification see below figures.



undercompensated

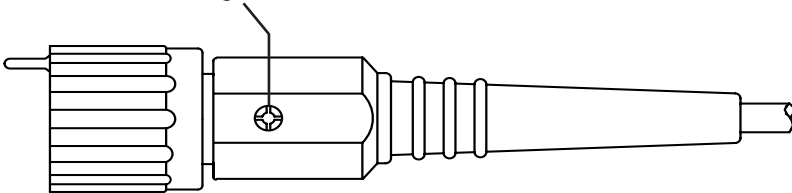


optimum



overcompensated

LF Compensation

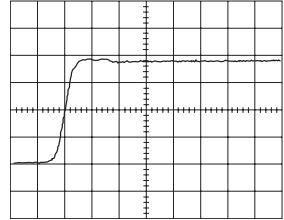


**HF Compensation**

It is typically not necessary to adjust HF compensation unless the probe is being used with an oscilloscope having large differences in input characteristics to the oscilloscope that was used for factory adjustment. We recommend to use the following equipment for proper HF compensation:

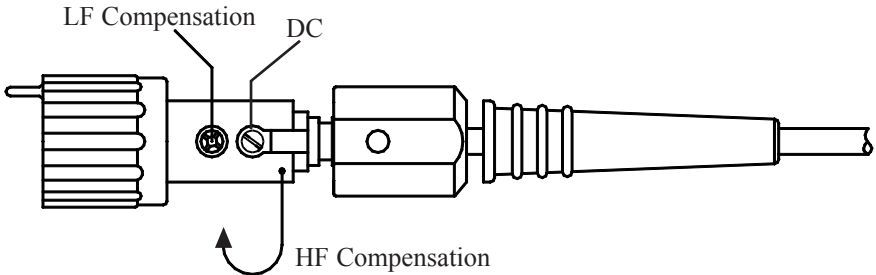
Rectangular wave generator with a risetime faster than 700 ps, with an amplitude of 5 Vpp minimum, 50 Ohm feed-through and probe BNC adapter.

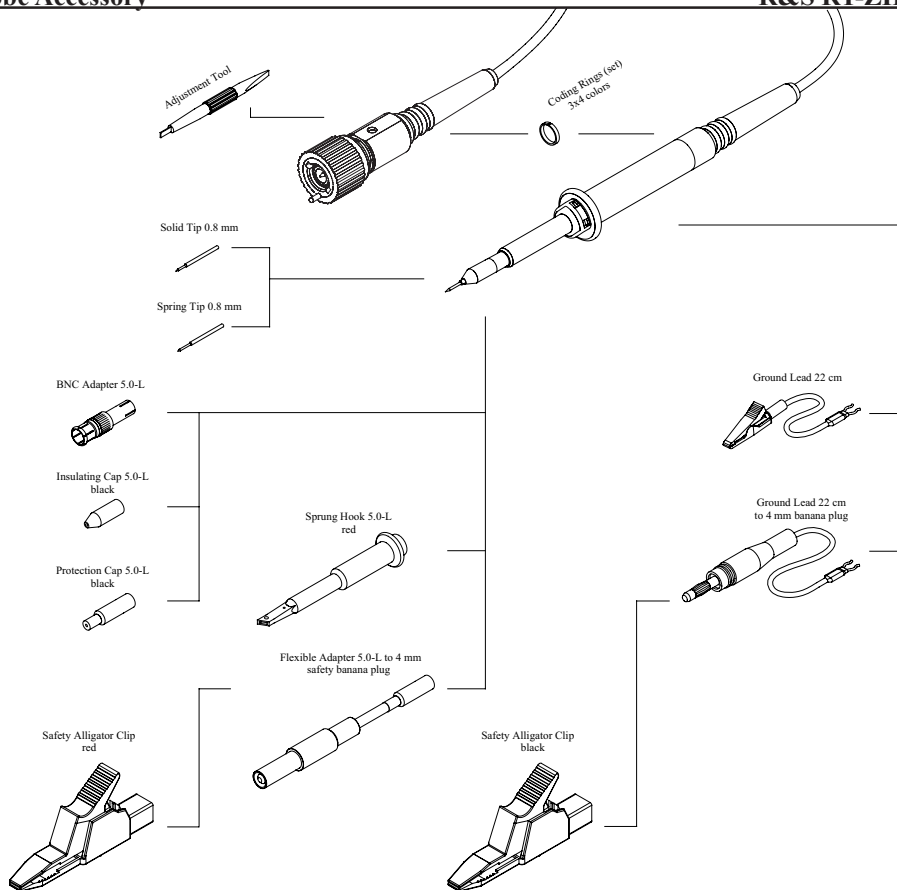
HF adjustment is performed by connecting the probe to the rectangular wave generator. Adjust trimmers for optimum square wave response.



**DC Adjustment**

In order to provide highest accuracy over the voltage range this probe's DC dividing ratio is factory adjusted at 500 V using a measuring device with a precision input impedance of  $1M\Omega \pm 0.01\%$ .





The following items are included in the scope of delivery. Please check the delivery for completeness.

RT-ZH10 400 MHz passive high-voltage probe (Order No. 1409.7720.02)

<b>Item</b>	<b>Qty</b>
Probe RT-ZH10	1
Operating Manual	1
Adjustment Tool	1
BNC Adapter 5.0-L	1
Insulating Cap 5.0-L (black)	1
Protection Cap 5.0-L (black)	1 <sup>(1)</sup>
Coding Rings (set) 3x4 Colors	1
Ground Lead 22 cm	2
Ground Lead 22 cm to 4 mm banana plug	1
Safety Alligator Clip (black)	1
Safety Alligator Clip (red)	1
Solid Tip 0.8 mm	5
Spring Tip 0.8 mm	5 <sup>(2)</sup>
Sprung Hook 5.0-L (red)	2
Flexible Adapter 5.0-L to 4 mm safety banana plug	1

(1) plugged on probe

(2) one is installed in probe



*Use ground lead only for connections to earth ground.*



*The BNC Adapter is rated: 100 V root mean square CAT II, Pollution Degree 1*



*The accessories provided with the probe have been safety tested. Do not use any other accessories than those "originally" provided.*



Handle with care especially when fitted with the extra thin and sharp spring contact tip to avoid any injury. Note that the probe cable is a sensitive part of the probe. Do not damage through excessive bending or pulling. Avoid mechanical shock to this product in general to guarantee accurate performance and protection.

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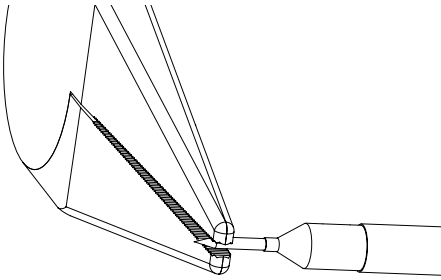
**Maintenance****Cleaning**

To clean the exterior of the probe use a soft cloth moistened with either distilled water or isopropyl alcohol. Before use allow the probe to dry completely.

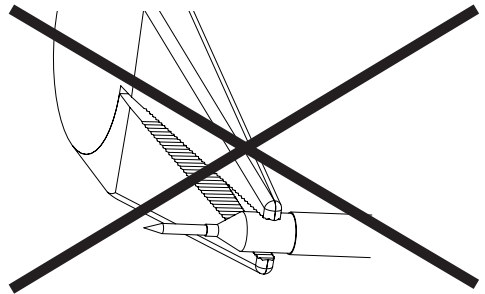
**Changing the Probe Tip**

To change the probe tip use pliers to grip and pull it carefully straight out of its contact socket, along the axis of the probe. Do not grip the white plastic insulator or the housing with pliers, because the tip could be squeezed and cannot be removed and respectively the probe could be damaged.

If the probe tip is removed, the new tip can be inserted with pliers into the contact socket, along the axis of the probe. In order to insert the probe tip completely into the housing, press the probe tip against a hard surface carefully.



Use pliers to grip and pull the probe tip carefully out of its contact socket.



Do not grip the white plastic insulator or the probe housing with pliers.