

R&S® RT-ZZ80

Transmission Line Probe

User Manual



1409768902

Version 03

ROHDE & SCHWARZ

Make ideas real



This user manual describes the following R&S®RT-ZZ models:

- R&S®RT-ZZ80 (1409.7608.02)

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1409.7689.02 | Version 03 | R&S®RT-ZZ80

Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol and without product type numbers, e.g. R&S®RT-ZZ80 is indicated as R&S RT-ZZ80.

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1 Safety and regulatory information

The product documentation helps you to use the product safely and efficiently. Follow the instructions provided here and throughout the manual.

Intended use

The product is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the product only for its designated purpose. Observe the operating conditions and performance limits stated in the data sheet.

The R&S RT-ZZ80 transmission line probe is designed for measurements on circuits that are only indirectly connected to the mains or not connected at all. It is not rated for any measurement category.

Where do I find safety information?

Safety information is part of the product documentation. It warns you of potential dangers and gives instructions on how to prevent personal injury or damage caused by dangerous situations. Safety information is provided as follows:

- In [Chapter 1.1, "Safety instructions"](#), on page 5. The same information is provided in many languages as printed "Safety Instructions". The printed "Safety Instructions" are delivered with the product.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

1.1 Safety instructions

Products from the Rohde & Schwarz group of companies are manufactured according to the highest technical standards. To use the products safely, follow the instructions provided here and in the product documentation. Keep the product documentation nearby and offer it to other users.

Use the product only for its intended use and within its performance limits. Intended use and limits are described in the product documentation such as the data sheet, manuals and the printed "Safety Instructions for Oscilloscopes and Accessories" document. If you are unsure about the appropriate use, contact Rohde & Schwarz customer service.

Safety instructions

Using the product requires specialists or specially trained personnel. These users also need sound knowledge of at least one of the languages in which the user interfaces and the product documentation are available.

Reconfigure or adjust the product only as described in the product documentation or the data sheet. Any other modifications can affect safety and are not permitted.

Never open the casing of the product. Only service personnel authorized by Rohde & Schwarz are allowed to repair the product. If any part of the product is damaged or broken, stop using the product. Contact Rohde & Schwarz customer service at <https://www.rohde-schwarz.com/support>.

In these safety instructions, the term "product" covers instruments (oscilloscopes), probes and their accessories.

Choosing the operating site

Only use the product indoors. The product casing is not waterproof. Water that enters can electrically connect the casing with live parts, which can lead to electric shock, serious personal injury or death if you touch the casing. If Rohde & Schwarz provides accessories designed for outdoor use of your product, e.g. a protective cover, you can use the product outdoors.

Unless otherwise specified in the data sheet, you can operate the product up to an altitude of 2000 m above sea level.

The product is suitable for pollution degree 2 environments where nonconductive contamination can occur. For more information on environmental conditions such as ambient temperature and humidity, see the data sheet.

Performing measurements

Take the following measures for your safety:

- To ascertain voltage-free state, use an appropriate voltage tester. Any measurement setup including an oscilloscope is not suitable for this purpose.
- The maximum input voltage on channel inputs and the external trigger input must not exceed the value specified in the data sheet.
- Observe all voltage and current ratings of the instrument, the probes, and the accessories. Exceeding the allowed voltages can lead to an electric shock. Limits and ratings are marked on the products and listed in the data sheets. Consider that the rated voltage depends on the frequency. The voltage limitation curves or values are provided in the data sheet.

Labels on the product


- Never cause any short circuits when measuring sources with high output currents.
- Use only probes and accessories that comply with the measurement category (CAT) of your measurement task. If the product is rated for any measurement category, the permitted category is indicated on the product and in the data sheet. If you use other than Rohde & Schwarz accessories, make sure that they are suitable for the instrument and the measurement task.
- Set the correct attenuation factor on the instrument according to the probe being used. Otherwise, the measurement results do not reflect the actual voltage level, and you might misjudge the actual risk.
- The probe pins are extremely pointed and can easily penetrate clothes and the skin. Handle the probe pins with great care. To exchange a probe pin, use tweezers or pliers to avoid injuries. When transporting the accessories, always use the box supplied with the probe.
- Prevent the probe from receiving mechanical shock. Avoid putting excessive strain on the probe cable or exposing it to sharp bends. Touching a broken cable during measurements can cause injuries.
- Set up all probe connections to the instrument before applying power.

1.2 Labels on the product

Labels on the casing inform about:

- Personal safety
- Product and environment safety
- Identification of the product

Table 1-1: Meaning of safety labels

	<p>Potential hazard Read the product documentation to avoid personal injury or product damage.</p>
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1.3 Warning messages in the documentation

A warning message points out a risk or danger that you need to be aware of. The signal word indicates the severity of the safety hazard and how likely it will occur if you do not follow the safety precautions.

WARNING

Potentially hazardous situation. Could result in death or serious injury if not avoided.

CAUTION

Potentially hazardous situation. Could result in minor or moderate injury if not avoided.

NOTICE

Potential risks of damage. Could result in damage to the supported product or to other property.

2 Product description

2.1 Key features and key characteristics

Transmission line probes like R&S RT-ZZ80 are a special type of passive probes. They are based on an impedance-controlled microwave cable (transmission line), which is terminated into a 50 Ω input impedance of the measuring instrument.

Compared to standard passive probes, the main differences of transmission line probes are:

- Higher bandwidth
- Higher input impedance at high frequencies
- Lower input impedance at DC

Transmission line probes are best suited for measurements of broadband single-ended signals in impedance-controlled environments, for example, 50 Ω lines.

The R&S RT-ZZ80 has a wide dynamic range. High input levels up to 20 V (RMS) can be measured without distortion. The low inherent noise enables the measurement of small input signals.

The comprehensive accessory set allows connection to a wide variety of devices under test (DUT) without impairing the very high bandwidth, short rise time and the low input capacitance of the R&S RT-ZZ80.

The R&S RT-ZZ80 has a standard SMA connector. For BNC input terminals, the BNC to SMA adapter R&S RT-ZA10 is delivered with the probe. Thus the probe can be connected to any Rohde & Schwarz oscilloscope and to most other high-frequency measuring instruments.

The key characteristics of the probe are the following:

Bandwidth	DC to 8 GHz
Maximum input voltage	20 V (RMS)
Input resistance	500 Ω
Input capacitance	0.3 pF
Full dynamic range over the entire frequency range	
No harmonic distortions	

Negligible noise contribution
Standard SMA connector

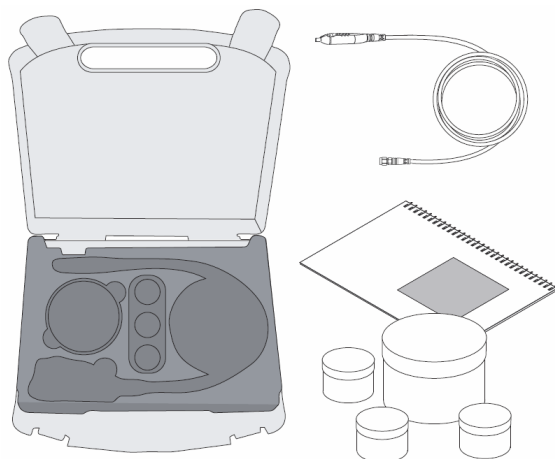
2.2 Unpacking and checking

1. Unpack the product carefully.
2. Retain the original packing material. Use it when transporting or shipping the product later.
3. Using the delivery notes, check the equipment for completeness.
4. Check the equipment for damage.

If the delivery is incomplete or equipment is damaged, contact Rohde & Schwarz.

Delivery notes

The delivery contains the following items:



- R&S RT-ZZ80 transmission line probe
- Carrying case
- Accessory boxes
- User manual
- Data sheet
- Calibration certificate
- Documentation of calibration values (if ordered)
- Safety instructions for oscilloscopes and accessories (multilingual)

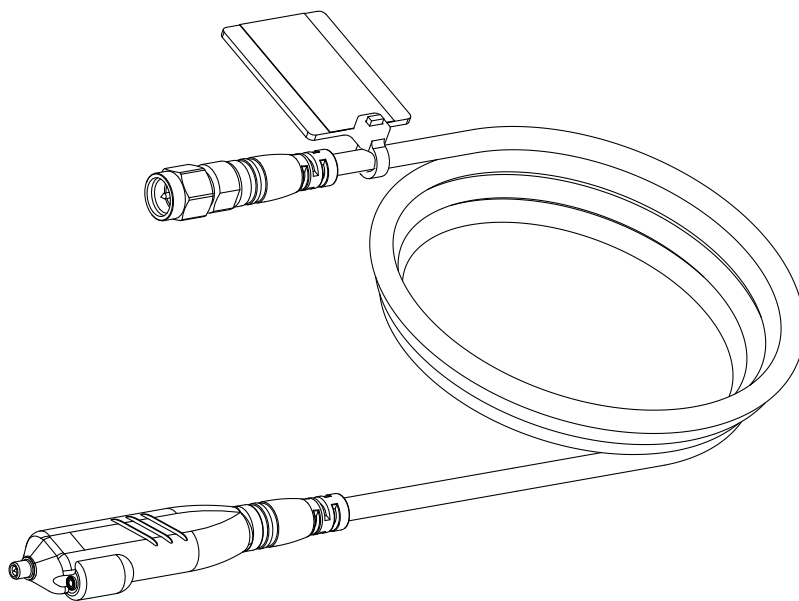
Accessories supplied with the probe are listed in [Chapter 2.4.1, "Accessories supplied"](#), on page 13.

2.3 Description of the probe

The probe consists of the probe head for connection to the DUT, the probe cable, and the SMA connector.

Probe connection:

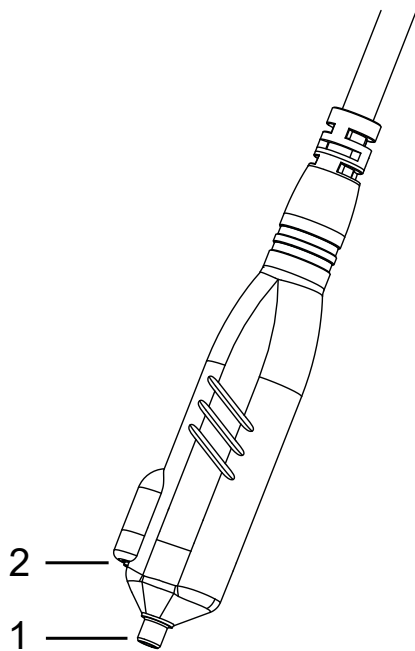
- To a base unit with SMA inputs: direct connection
- To a base unit with BNC connectors: using the SMA to BNC adapter delivered with the probe



2.3.1 Probe head

The small and lightweight probe head is designed for easy handling and high-performance measurements. The probe head is used for connecting the probe and the DUT. Different accessories for the signal and ground sockets allow the probe head to be connected to a wide range of DUTs.

The signal socket of the R&S RT-ZZ80 has a special design to ensure optimal performance. The signal socket is *not* compatible to standard accessories based on 0.64 mm (25 mil) square pins or 0.8 mm (35 mil) round pins. Use only special accessories for R&S RT-ZZ80 provided by Rohde & Schwarz.



- (1) Signal socket
- (2) Ground socket

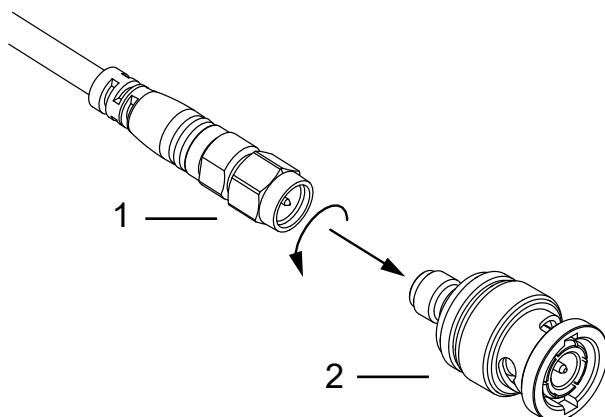
The accessories supplied for the probe head sockets are listed in [Chapter 2.4.1, "Accessories supplied"](#), on page 13.

The ground socket is compatible with 0.64 mm (25 mil) square pins and 0.6 mm to 0.8 mm (24 mil to 35 mil) round pins.

2.3.2 SMA connector and SMA to BNC adapter

The R&S RT-ZZ80 has an SMA male connector for connection to the instrument. To connect the probe to a Rohde & Schwarz oscilloscope, you need the SMA to BNC adapter that is delivered with the probe. Screw the SMA connector on the SMA to BNC adapter as shown below.

- Use a torque wrench to tighten the SMA connector.



- (1) SMA connector
- (2) SMA to BNC adapter

2.4 Accessories and items

The figure below shows all accessories that are available for the R&S RT-ZZ80 transmission line probe.

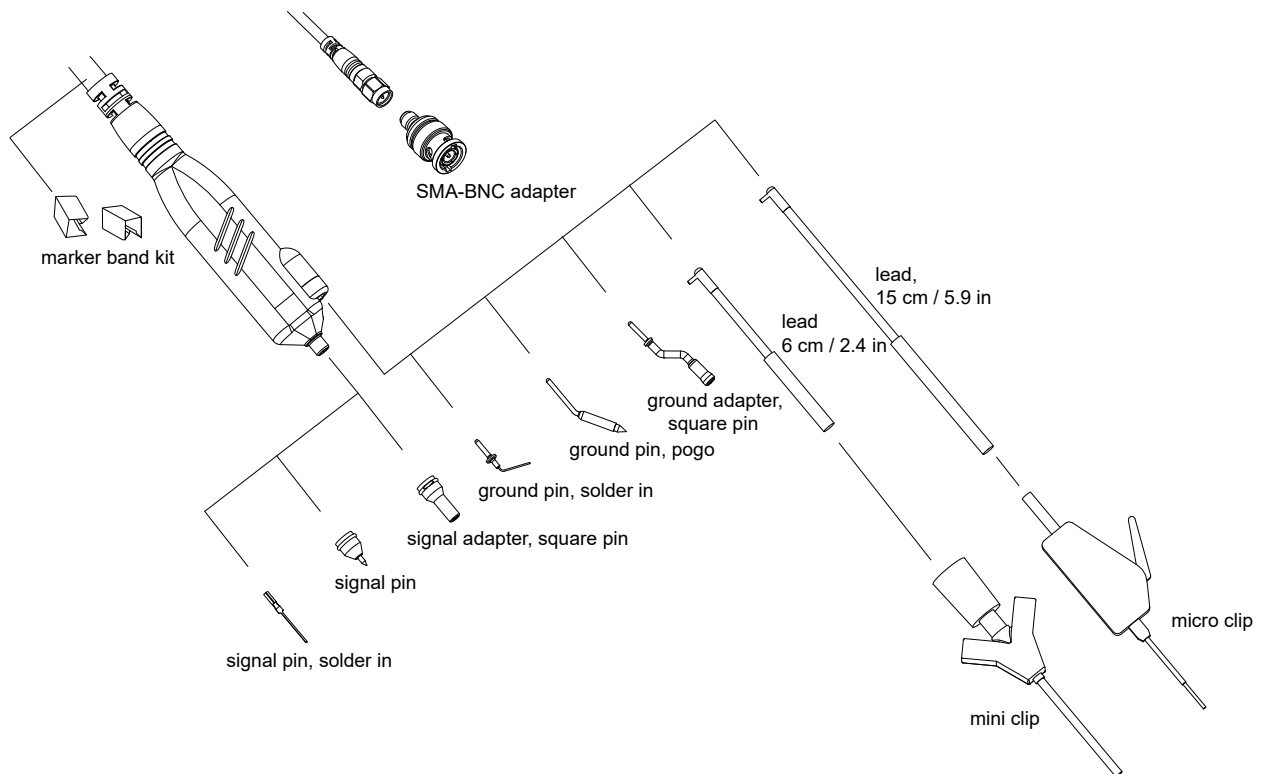


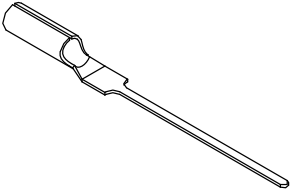
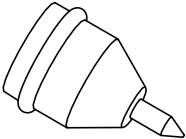
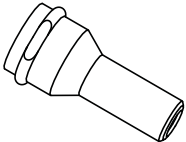
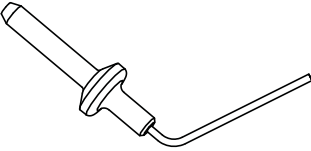
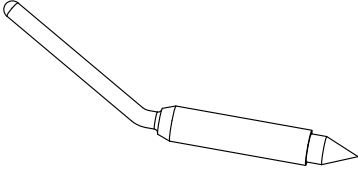
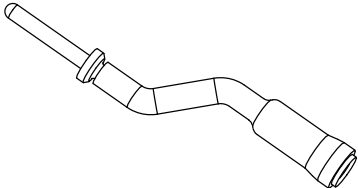
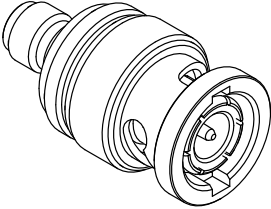
Figure 2-1: Available accessories

Leads, mini clip and micro clip are not included in the delivery.

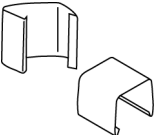
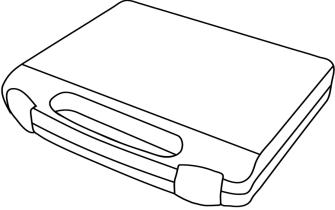
2.4.1 Accessories supplied

The following table shows the accessories supplied with the R&S RT-ZZ80 transmission line probe.

Table 2-1: Accessories supplied

Item	Quantity	Description
	50	Signal pin, solder in
	2	Signal pin
	2	Signal adapter, square pin
	10	Ground pin, solder in
	2	Ground pin, pogo
	2	Ground adapter, square pin
	1	R&S RT-ZA10 SMA (female) to BNC (male) adapter

Accessories and items

Item	Quantity	Description
	1	Marker band kit
	1	Carrying case with foam inlay

2.4.2 Optional accessories

If the delivered accessories do not meet individual customer requirements, Rohde & Schwarz offers different accessory sets for sale. The order numbers are provided in the data sheet.

Table 2-2: Optional clips and leads

Accessories	Items	Quantity
R&S RT-ZA4 mini clips	Mini clip	10
R&S RT-ZA5 micro clips	Micro clip	4
R&S RT-ZA6 lead set	Lead, 6 cm / 2.4 in	5
	Lead, 15 cm / 5.9 in	5

2.4.3 Service accessories

To order accessories for servicing the probe, contact your Rohde & Schwarz service center. The following accessories are available:

Table 2-3: Service accessories

Item	Description
R&S RT-ZK2	The service kit is used to calibrate the probe, to do performance tests, and for servicing. The service kit includes all adapters and accessories to connect the probe to the required measuring instruments.
R&S RT-ZZ80 Service Manual	The service manual contains a detailed description of the performance test to verify the specifications, and other important service procedures.

3 Connecting the probe

3.1 Handling the probe

The R&S RT-ZZ80 can withstand a moderate amount of physical and electrical stress. To avoid damage, treat the probe with care:

- Handle the probe by the probe head.
- Prevent the probe from receiving mechanical shock.
- Avoid strain on the probe cable and route it carefully.
- Do not spill liquids on the probe.

Preventing electrostatic discharge (ESD)

Electrostatic discharge is most likely to occur when you connect or disconnect a DUT.

- ▶ **NOTICE!** Electrostatic discharge can damage the electronic components of the product and the device under test (DUT).

Ground yourself to prevent electrostatic discharge damage:

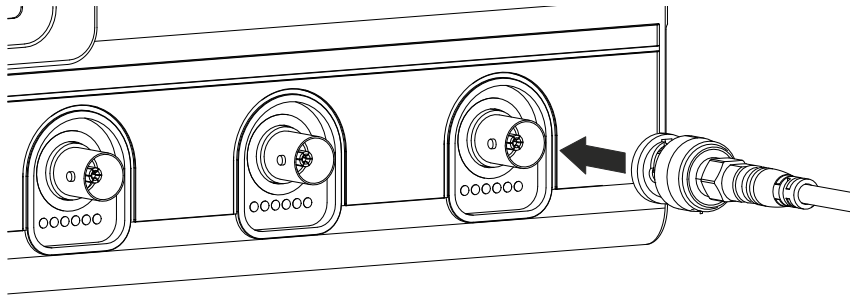
- a) Use a wrist strap and cord to connect yourself to ground.
- b) Use a conductive floor mat and heel strap combination.

Discharge cables and probe clips before you connect them.

3.2 Connecting the probe to the oscilloscope

Supported Rohde & Schwarz oscilloscopes are listed in the probe's data sheet.

1. Connect the SMA connector of the probe to the SMA to BNC adapter. See [Chapter 2.3.2, "SMA connector and SMA to BNC adapter"](#), on page 12.
2. Connect the SMA to BNC adapter to one of the BNC input connectors of the oscilloscope. Turn the collar until it clicks. Check that it is locked securely.



3. Set up the oscilloscope, depending on the used model:
 - If the probe is known to the oscilloscope as "Predefined probe" in the probe setup, select "RT-ZZ80".
 - If the probe is not known to the oscilloscope, adjust the channel and probe settings:
 - Input impedance of the channel = 50 Ω
 - Unit = Volt
 - Attenuation = 10 : 1

During usage, the probe slightly heats up. Warming is normal behavior and not a sign of malfunction.

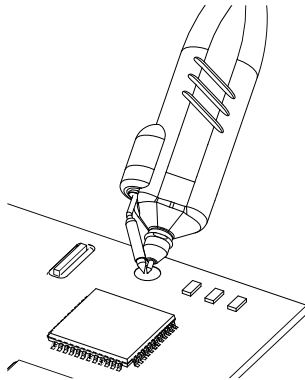
3.3 Zero adjustment

The zero error can impair the measurement results, therefore, correct the zero error if necessary. The R&S RT-ZZ80 has no zero error.

However, differences in DUT and oscilloscope ground levels can cause larger zero errors visible on the oscilloscope's screen. If the DUT is not floating but ground-referenced, an zero adjustment improves the measurement results.

The zero error is corrected at the oscilloscope. Depending on the type of the used oscilloscope, correction is done automatically using the AutoZero function, or manually ("Zero Adjust" or similar setting). Refer to the oscilloscope's user manual for available functionality and its usage.

1. Connect the probe to the oscilloscope.
2. Set the oscilloscope to the smallest vertical scale.
3. Short the signal pin and the ground pin together and connect them to the ground of the DUT.



4. Adjust the zero position of the waveform using the appropriate function of the oscilloscope ("AutoZero", "Zero Adjust" or similar).

The waveform is set to 0 V on the horizontal centerline of the oscilloscope.

3.4 Connecting the probe to the DUT

This chapter describes the different ways of connecting the probe to the DUT. In addition, the usage of the supplied accessories is explained.

Handling the accessories

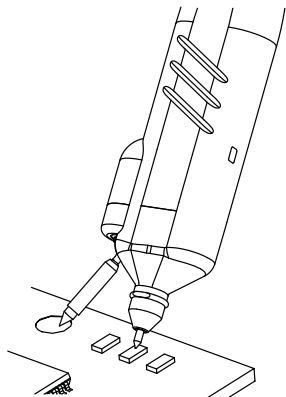
- The maximum non-destructive input voltage is 20 V (RMS). A higher input voltage can destroy the probe and the accessories.
- The probe pins are extremely pointed and can easily penetrate clothes and the skin. Handle the probe pins with great care. To exchange a probe pin, use tweezers or pliers to avoid injuries.
- Always keep the connections as short as possible for best performance and signal integrity.
- When transporting the accessories, use the boxes supplied with the probe.

Considerations for soldering

- Do not leave the soldering iron in contact with the probe tip for more than a few seconds at a time. Excess heat can damage the probe.
- Some solder-in accessories are very fine and sensitive. Stabilize the probe using appropriate means (e.g. adhesive pads, probe positioner) to protect the solder joint from excessive mechanical stress.

Connecting the probe to the DUT

Signal pin and ground pin, pogo



Using the signal pin and ground pin, manual measurements can be performed without or with only minor limitation of the measurement bandwidth. Best results are achieved if the distance between signal and ground is small.

Even with maximum distance, rise times shorter than 55 ps can be reached.

Because the spring-loaded ground pin compensates for minor unevenness and movements, this pin can establish a firm contact with the test point. It fits into the ground socket of the probe head.

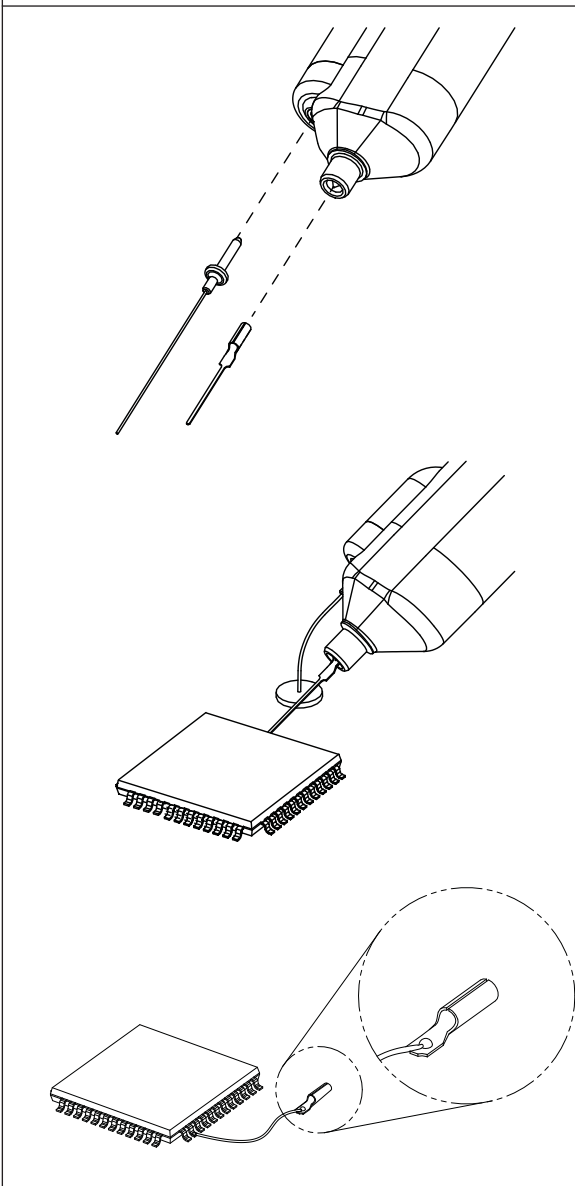
The distance to the signal pin can be varied by turning the ground pin.

Distance range:

0 mm to 10 mm (0 mil to 400 mil)

Connecting the probe to the DUT

Signal pin, solder in, and ground pin, solder-in



Using two solder-in pins for ground and signal, the R&S RT-ZZ80 is soldered directly into the circuit.

The pins can be exchanged on the probe and can remain in the circuit. Thus, you can plug the probe on different test points.

Use tweezers to insert the solder-in pins into the sockets on the probe, and then cut to the appropriate length. Keep the pins as short as possible.

The fine wires on this adapter are best suited to make secure contact with small contact points, such as SMT components or IC pins.

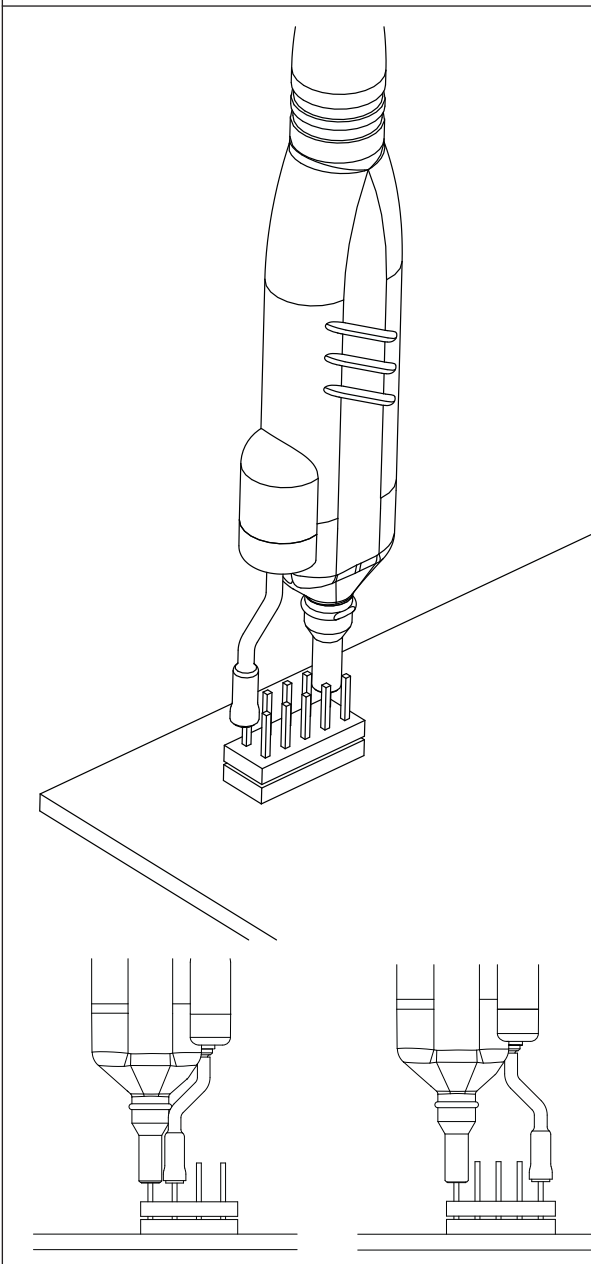
Alternatively, the signal pin has a solder tail for direct soldering of wires.

Distance range:

0 mm to 20 mm (0 mil to 800 mil)

Connecting the probe to the DUT

Signal adapter, square pin, and ground adapter, square pin



Using two square-in pin adapters for ground and signal, the probe can be connected directly to a pin strip.

The sockets are compatible with 0.64 mm (25 mil) square pins and 0.6 mm to 0.8 mm (24 mil to 35 mil) round pins.

The distance between the signal and ground adapter can be adjusted by turning the ground adapter.

Distance range:

2.54 mm to 10.16 mm (100 mil to 400 mil)

4 Measurement principles

The R&S RT-ZZ80 transmission line probe provides an electrical connection between the DUT and the oscilloscope. The probe transfers the voltage of the electrical signal tapped off the DUT to the oscilloscope, where it is displayed graphically. Although a probe has a wide variety of specifications, these specifications can be grouped into two classes of basic requirements:

- High signal integrity of the transferred signal:
With an ideal probe, the output signal that is transferred to the base unit is identical to the input signal between the probe tips, and signal integrity is extremely high. Every real probe, however, transfers the input signal in altered form. A good probe causes only minimum alterations.
How the probe can fulfill this requirement is mainly determined by its bandwidth.
- Acceptable loading of the input signal:
Every probe is a load for the signal to be measured. The signal to be measured changes when the probe is connected. A good probe causes only a minimum change to the signal, also at higher frequencies.
How the probe can fulfill this requirement is mainly determined by its input impedance.

The parameters of a probe are usually specified for a minimally short connection between the probe and the DUT. With longer connections, the connection inductance has a significant effect on the measurement.

The high-frequency behavior of probes is typically characterized in a 50 Ω measurement environment. The probe is connected to a 50 Ω line that is fed by a source with 50 Ω internal impedance and that is terminated into 50 Ω .

The [Figure 4-1](#) shows the equivalent circuit model of a probe that is connected to the DUT.

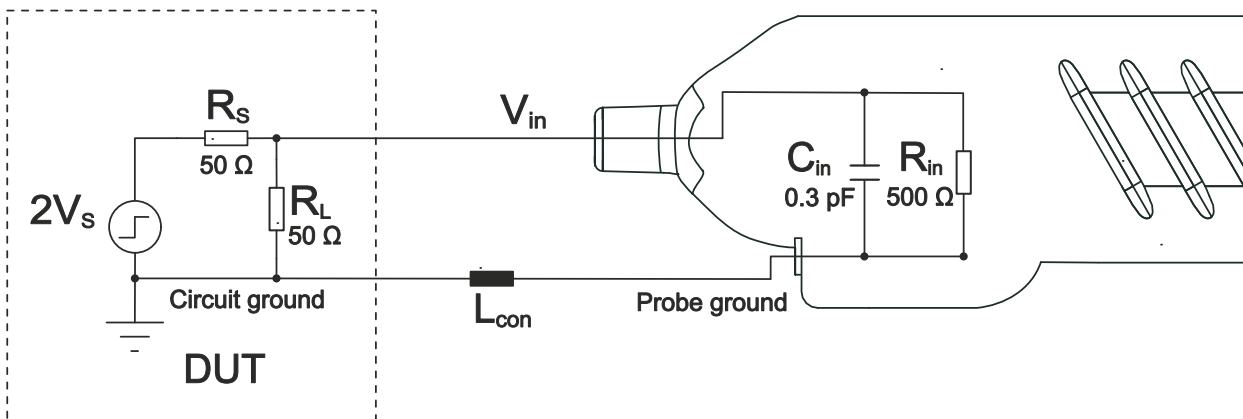


Figure 4-1: Equivalent circuit model of the R&S RT-ZZ80 probe

Table 4-1: Designations

Abbreviation	Description
V_S	Voltage at the test point without probe connected
V_{in}	Voltage at the test point with probe connected, corresponds to the input voltage of the probe
R_S	Source resistance of the DUT
R_L	Load resistance of the DUT
R_{in}	Input resistance of the probe
C_{in}	Input capacitance of the probe
L_{con}	Connection inductance, depends on the type of connection

In a 50 Ω system, the output resistance of the source, the load resistance of the DUT and the characteristic impedance of all lines equal exactly 50 Ω . However, the behavior of the probe in the circuit is determined by the effective source impedance which is the impedance present in the DUT between the probe tip and ground.

Effective source impedance:

$$R'_S = R_S \parallel R_L = 25 \Omega$$

4.1 Signal integrity of the transferred signal

The following sections describe the effect that bandwidth and the type of connection have on signal integrity.

4.1.1 Bandwidth

The bandwidth BW of a probe is one of its specific parameters. The bandwidth of the probe and the bandwidth of the base unit together form the system bandwidth. The following explanations refer to the probe itself, but can also be applied to the entire system.

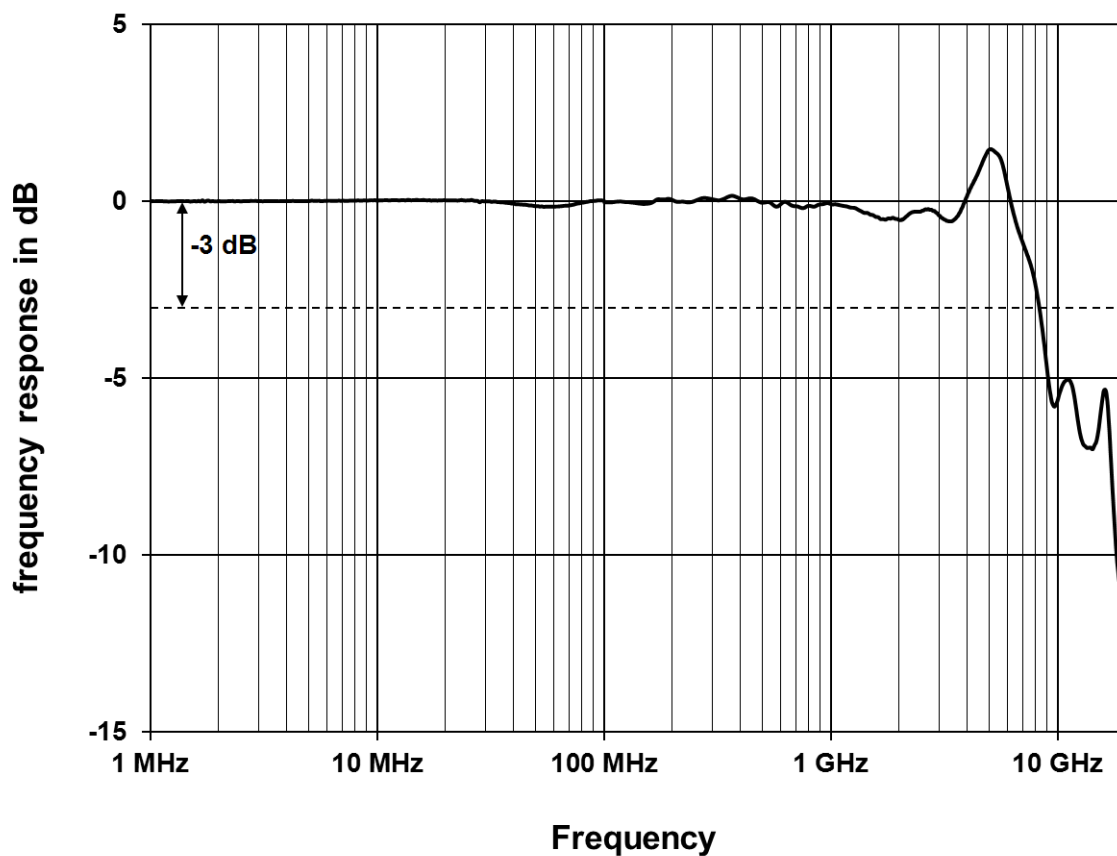


Figure 4-2: Amplitude frequency response of the R&S RT-ZZ80

The bandwidth:

- Specifies the maximum frequency at which a purely sinusoidal signal is still transferred at 70 % (–3 dB) of its amplitude.

Signal integrity of the transferred signal

- Specifies the transferable spectrum for other waveforms. E.g., with square wave signals, the fifth harmonic should still be within the bandwidth for a high signal integrity.
- Determines the minimum measurable signal rise time. The rise time t_{rise} of the probe is inversely proportional to its bandwidth. The following approximation applies:

$$t_{rise} \approx \frac{0.5}{BW}$$

The [Figure 4-3](#) shows a typical step response of an R&S RT-ZZ80 transmission line probe.

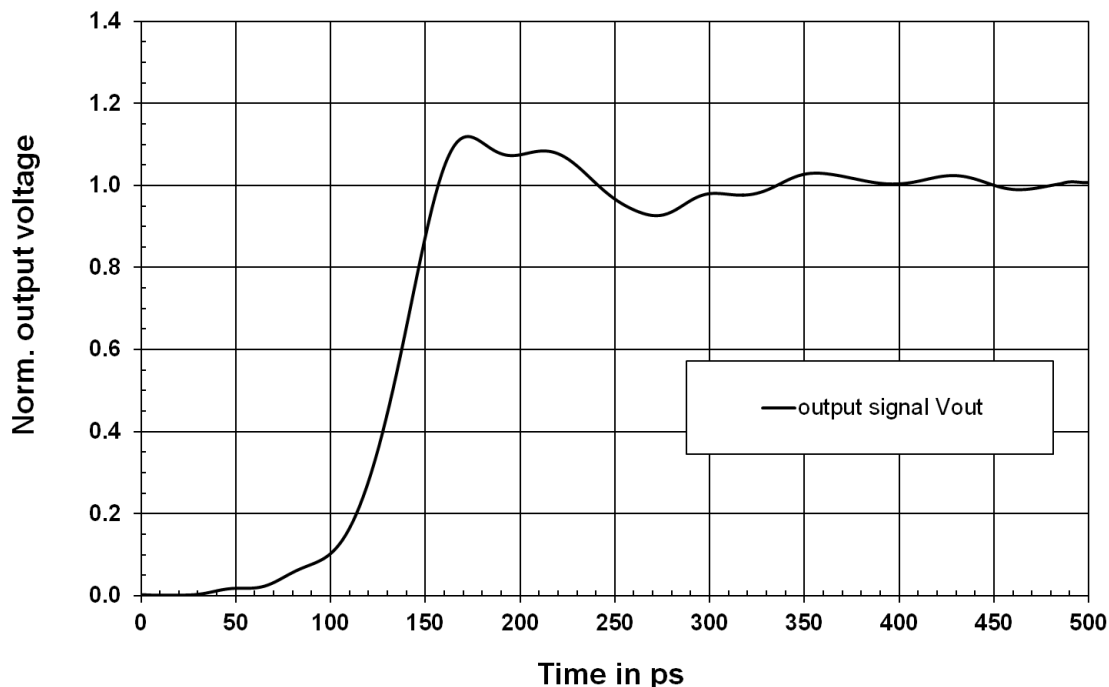


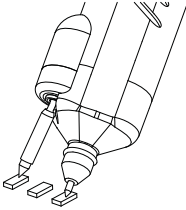
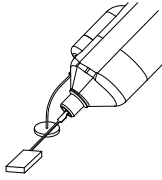
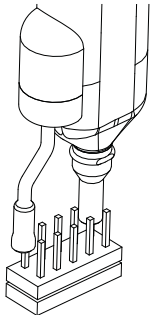
Figure 4-3: Step response of the R&S RT-ZZ80

In addition to bandwidth, a constant amplitude frequency response of the probe is decisive for high signal integrity. The [Figure 4-2](#) shows the typical amplitude frequency response of an R&S RT-ZZ80 transmission line probe.

4.1.2 Performance with different connection types

The [Table 4-2](#) shows three types of connection between probe and DUT as well as the associated rise times, bandwidths, input impedances and overshoots. The longer the connection to the DUT, the higher the connection inductance L_{con} .

Table 4-2: Typical rise time, bandwidth, input impedance and overshoot with different connection types

No	Connection Type	Connection			Rise time	Bandwidth	Min. input impedance $ Z_{\text{min}} $	Overshoot
		Signal socket	Ground socket					
1		signal pin	ground pin, pogo	wide spacing	55 ps	7.5 GHz	100 Ω	12 %
				narrow spacing	49 ps	9.5 GHz	80 Ω	24 %
2		signal pin, solder in	ground pin, solder in	short pins	54 ps	8 GHz	130 Ω	11 %
				long pins	53 ps	5 GHz	165 Ω	14 %
3		signal adapter, square pin	ground adapter, square pin	wide spacing	56 ps	8.5 GHz	100 Ω	12 %
				narrow spacing	49 ps	11 GHz	45 Ω	32 %

Signal integrity of the transferred signal

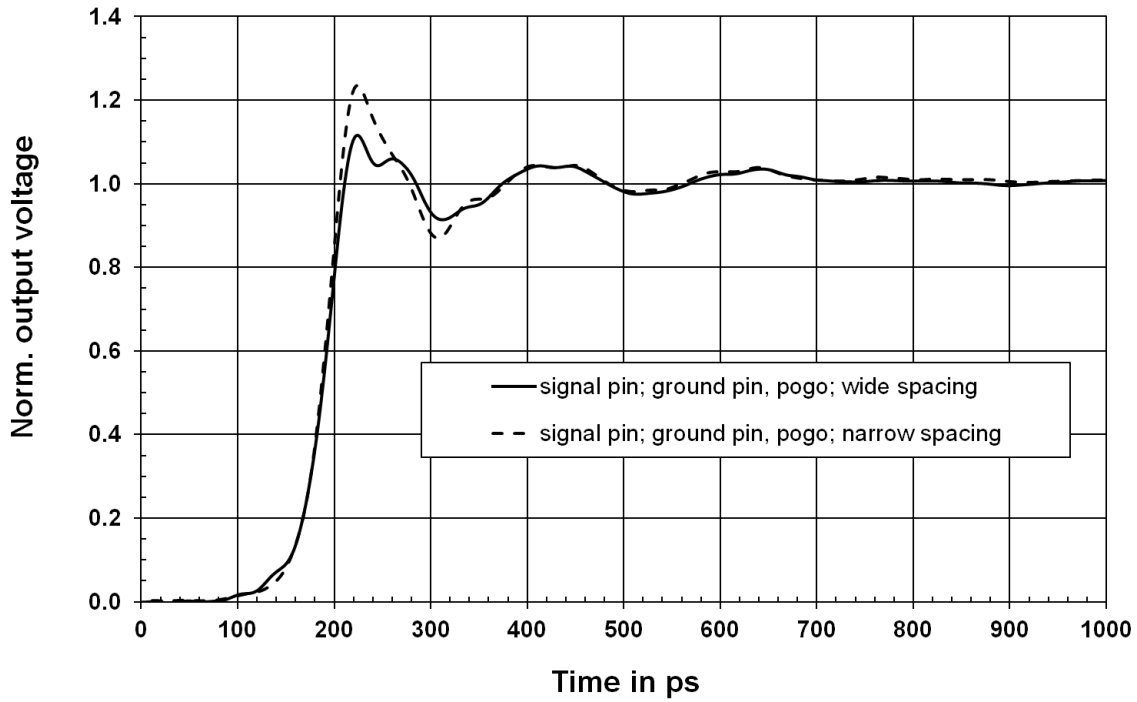


Figure 4-4: Step response of the R&S RT-ZZ80 with a type 1 connection

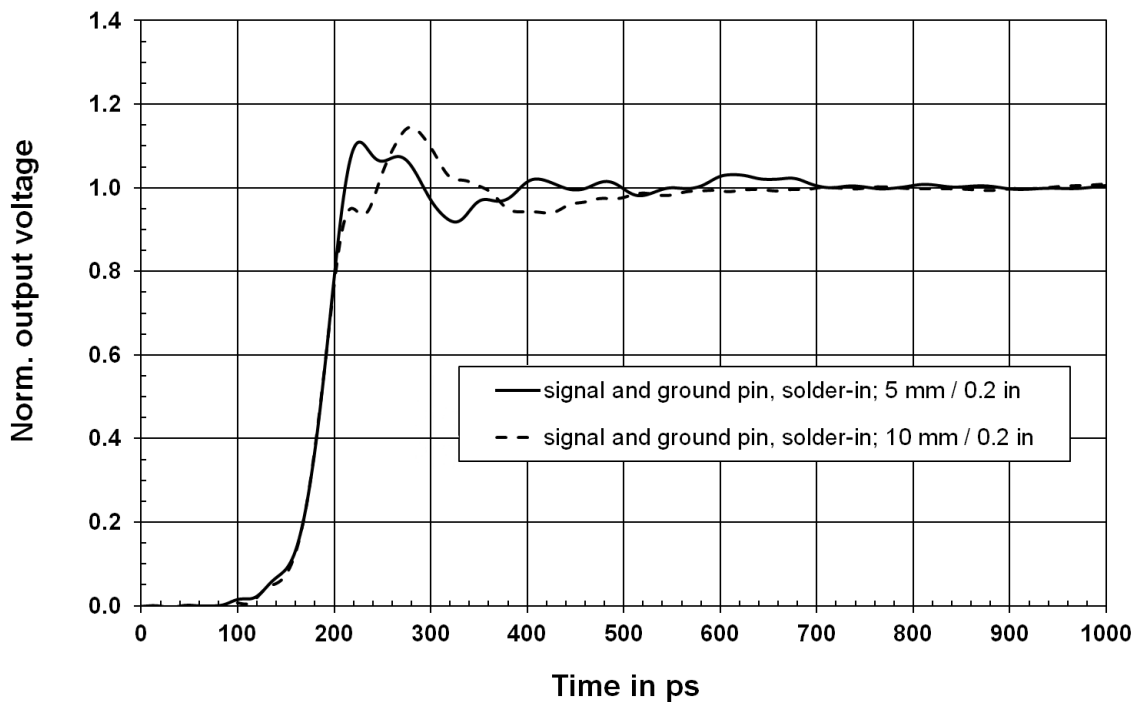


Figure 4-5: Step response of the R&S RT-ZZ80 with a type 2 connection

Signal loading of the input signal

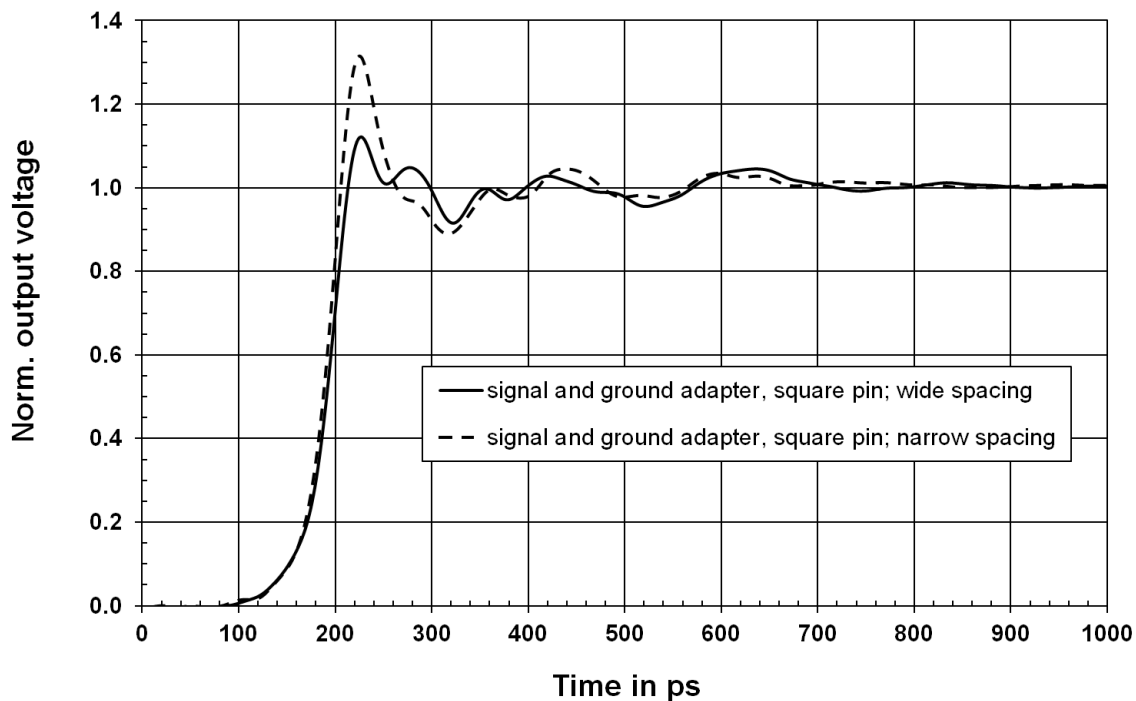


Figure 4-6: Step response of the R&S RT-ZZ80 with a type 3 connection

4.2 Signal loading of the input signal

The previous section dealt with the transfer function and step response of the probe. This section describes how the probe influences the input signal.

4.2.1 Transmission line probes

Traditional passive probes have a high input impedance at DC (typically from 1 M Ω to 10 M Ω) that quickly decreases with rising frequency. For DC, the load of the DUT is usually negligible, but high-frequency signals are loaded all the more.

On the contrary, transmission line probes have a very low input impedance at DC, typically from a few 100 Ω to 1 k Ω . This results in a significant higher load of the DUT at DC than the load caused by a traditional passive probe and can lead to a malfunction of the circuit.

Application range of transmission line probes

Use the R&S RT-ZZ80 only for measurements of low-impedance sources, preferably in 50 Ω or 75 Ω impedance-controlled environments.

The advantage of transmission line probes is the nearly constant input impedance over the frequency range, even at very high frequencies. Thus, transmission line probes are qualified also for measurements of very broadband signals, which cannot be measured using traditional passive probes.

4.2.2 Input impedance

The input signal loading caused by the probe is determined by its input impedance Z_{in} . The [Figure 4-1](#) presents an equivalent circuit model.

Z_{in} consists of the following probe-specific parameters.

- Input resistance R_{in}
- Input capacitance C_{in}
- Minimum input impedance $|Z_{min}|$

The resulting input impedance versus frequency is indicated in [Figure 4-7](#). The trace shows three characteristic areas that can be assigned to R_{in} , C_{in} , and $|Z_{min}|$. The resulting loading of a step signal at the input of the probe is given in [Figure 4-8](#).

The connection inductance L_{con} has only a minor effect on the signal loading and is therefore not considered in the following.

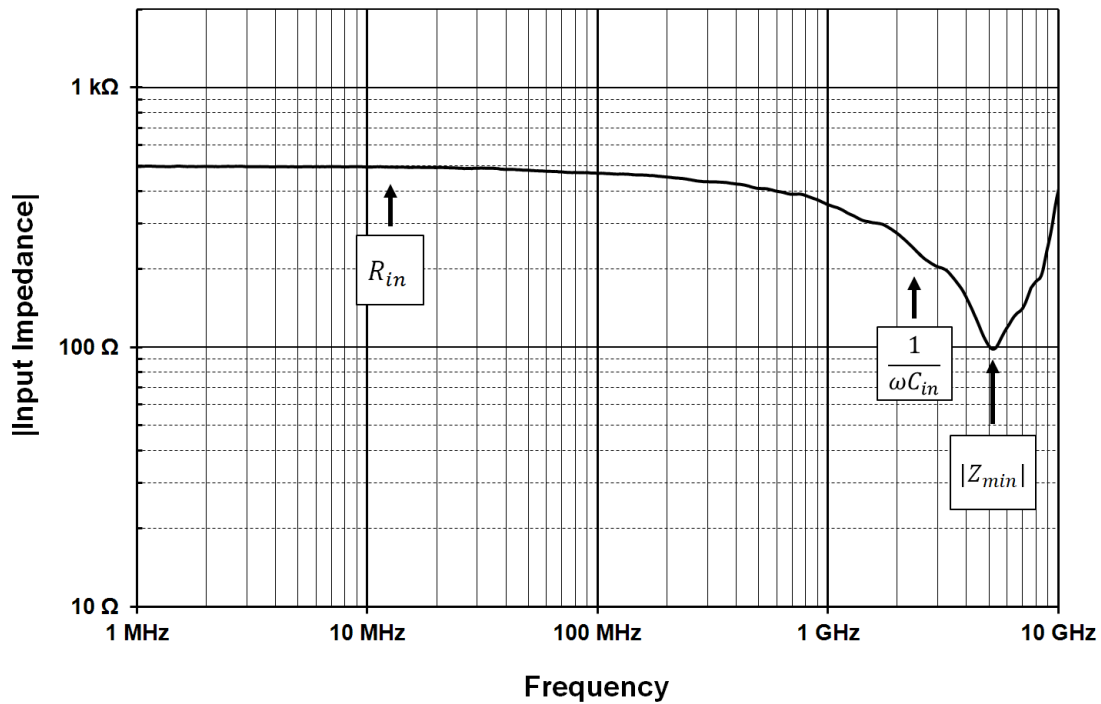


Figure 4-7: Magnitude of the input impedance of the R&S RT-ZZ80 probe as a function of frequency

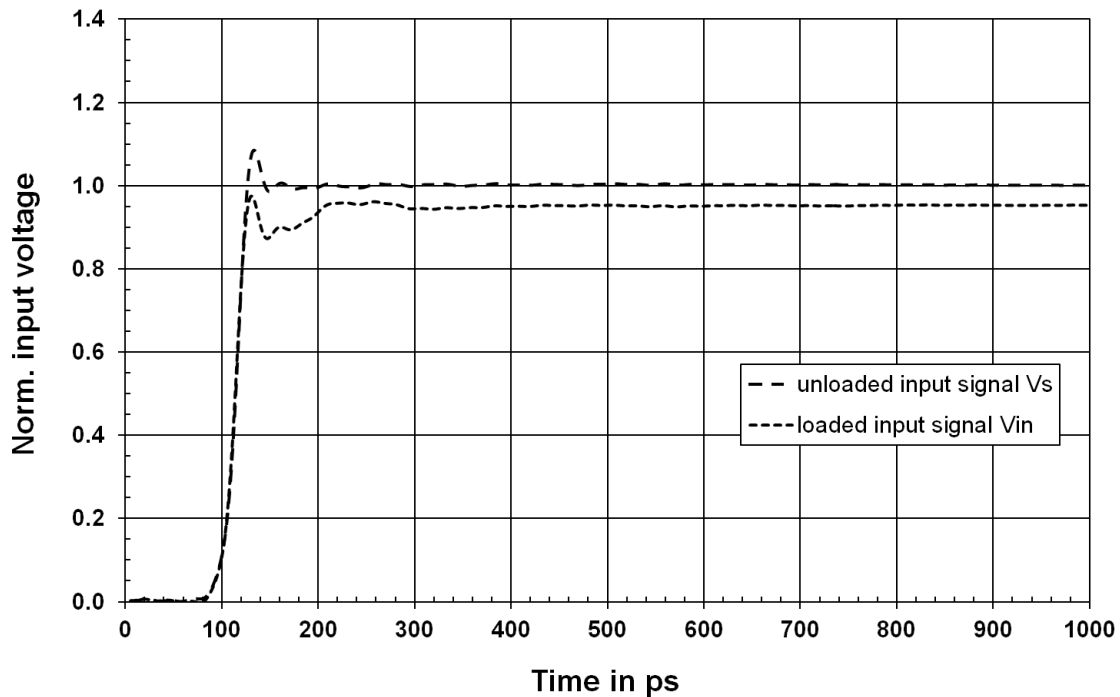


Figure 4-8: Signal loading caused by the R&S RT-ZZ80 probe at an effective source impedance of 25 Ω

Attenuation dependence on source impedance

4.2.2.1 Input resistance R_{in}

The input resistance determines the loading of the DUT at DC and frequencies up to 1 GHz. In this area, the input impedance is near-constant. For DC signals, the input resistance is 500 Ω .

4.2.2.2 Input capacitance C_{in} and minimum input impedance $|Z_{min}|$

The input capacitance C_{in} causes the input impedance to decrease for high frequencies above 1 GHz. C_{in} is very low - typically under 300 fF. This low input capacitance minimizes the load of high-frequency signals.

The minimum input impedance $|Z_{min}|$ mainly depends on the connection inductance and the connection type. An overview is given in [Table 4-2](#).

4.3 Attenuation dependence on source impedance

The previous sections made clear that probes exert a load on the signal to be measured and change its characteristic. The signal at the test point where the probe makes contact (V_{in}) is therefore different from the signal that was present before the probe was connected (V_S).

In contrast to most other probes, the load of the R&S RT-ZZ80 is not negligible for DC and low-frequency signals. Therefore, the attenuation of the probe depends on the impedance of the signal source. The [Figure 4-9](#) shows the unloaded and loaded input voltages as well as the output voltage of the probe in a 50 Ω environment.

For the R&S RT-ZZ80, the output signal is a good representation of the loaded input signal. The loaded input signal differs from the unloaded signal mainly by a lower voltage swing, while the shapes of both signals are almost identical.

Attenuation dependence on source impedance

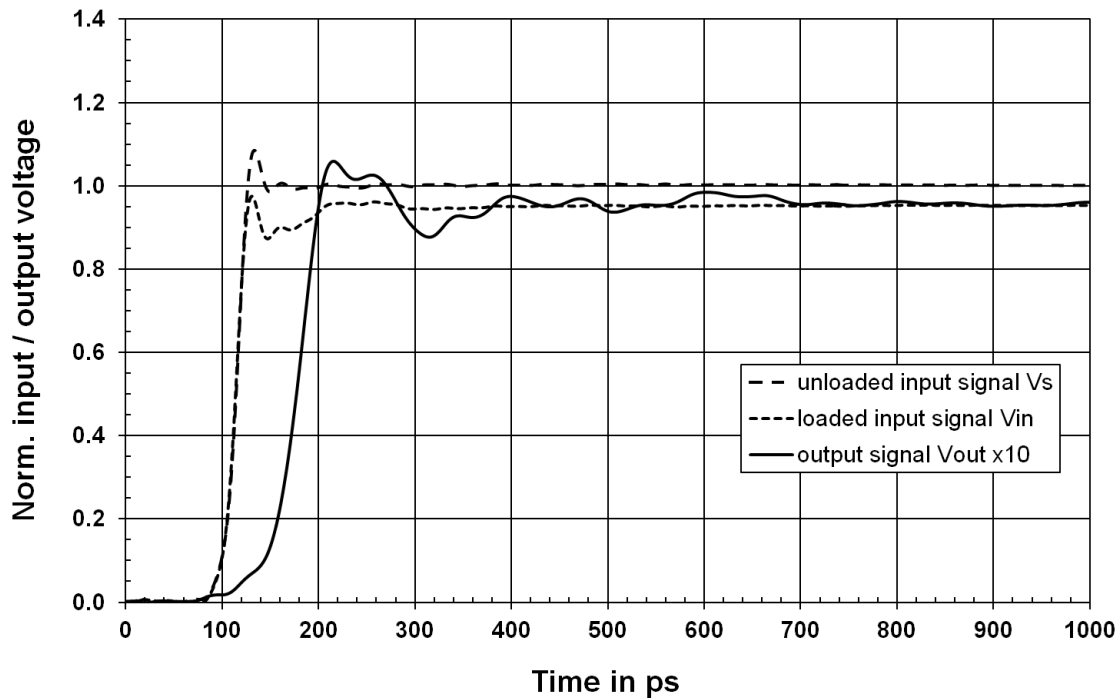


Figure 4-9: Input and output signals at an effective source impedance of 25Ω

To calculate the exact attenuation of the probe, use the following equation:

$$\frac{U_{out}}{U_{in}} = \frac{50 \Omega}{Z_{in} + R'_s}$$

U_{out} : output voltage
 U_{in} : unloaded input voltage
 Z_{in} : input impedance of R&S RT-ZZ80
 R'_s : effective source impedance

Example for a 50Ω environment:

$$\frac{U_{out}}{U_{in}} = \frac{50 \Omega}{500 \Omega + 25 \Omega} \approx 0.0952$$

5 Maintenance and service

Like all Rohde & Schwarz products, Rohde & Schwarz probes and adapters are of high quality and require only minimum service and repair. However, if service or calibration is needed, contact your Rohde & Schwarz service center. Return a defective product to the Rohde & Schwarz service center for diagnosis and exchange.

5.1 Cleaning

1. Clean the outside of the product using a soft cloth moistened with either distilled water or isopropyl alcohol. Keep in mind that the casing is not waterproof.
Note: Do not use cleaning agents. Solvents (thinners, acetone), acids and bases can damage the labeling or plastic parts.
2. Dry the product completely before using it.

5.2 Contacting customer support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz product, contact our customer support center. A team of highly qualified engineers provides support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz products.

Contact information

Contact our customer support center at www.rohde-schwarz.com/support, or follow this QR code:



Figure 5-1: QR code to the Rohde & Schwarz support page

5.3 Returning for servicing

Use the original packaging to return your R&S RT-ZZ80 to your Rohde & Schwarz service center. A list of all service centers is available on:

www.services.rohde-schwarz.com

If you cannot use the original packaging, consider the following:

1. Use a sufficiently sized box.
2. Protect the product from damage and moisture (e.g. with bubble wrap).
3. Use some kind of protective material (e.g. crumpled newspaper) to stabilize the product inside the box.
4. Seal the box with tape.
5. Address the package to your nearest Rohde & Schwarz service center.

5.4 Calibration interval

The recommended calibration interval for R&S RT-ZZ80 transmission line probe is two years. For servicing, send the probe to your nearest Rohde & Schwarz service center (see [Chapter 5.3, "Returning for servicing"](#), on page 34).

5.5 Storage and transport

Protect the product against dust. Ensure that the environmental conditions, e.g. temperature range and climatic load, meet the values specified in the data sheet.

Store the product in a shock-resistant case, e.g. in the shipping case.

Unless otherwise specified in the data sheet, the maximum transport altitude without pressure compensation is 4500 m above sea level.

5.6 Disposal

Rohde & Schwarz is committed to making careful, ecologically sound use of natural resources and minimizing the environmental footprint of our products. Help us by disposing of waste in a way that causes minimum environmental impact.

Disposing electrical and electronic equipment

A product that is labeled as follows cannot be disposed of in normal household waste after it has come to the end of its service life. Even disposal via the municipal collection points for waste electrical and electronic equipment is not permitted.



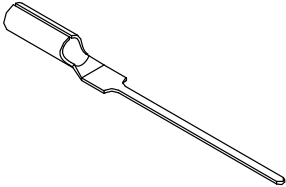
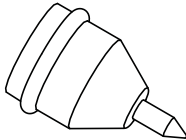
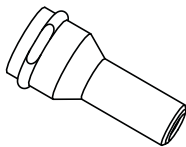
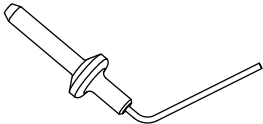
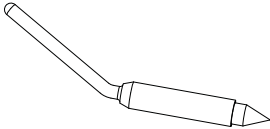
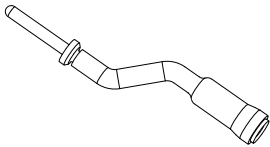
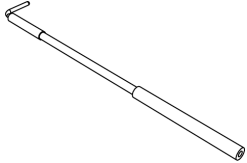
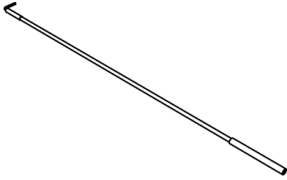
Figure 5-2: Labeling in line with EU directive WEEE

Rohde & Schwarz has developed a disposal concept for the eco-friendly disposal or recycling of waste material. As a manufacturer, Rohde & Schwarz completely fulfills its obligation to take back and dispose of electrical and electronic waste. Contact your local service representative to dispose of the product.

5.7 Spare parts

You can order the following accessories from the Rohde & Schwarz service center. Use the order numbers provided in the following table.

Table 5-1: Accessory spare parts

Pos.	Item	Description	Material number
1		Signal pin, solder in (50)	1417.0838.00
2		Signal pin	1175.7651.00
3		Signal adapter, square pin	1175.7668.00
4		Ground pin, solder in	1417.0538.00
5		Ground pin, pogo	1175.7716.00
6		Ground adapter, square pin	1175.7597.00
7		Lead, 6 cm / 2.4 in	1416.0128.00
8		Lead, 15 cm / 5.9 in	1416.0134.00

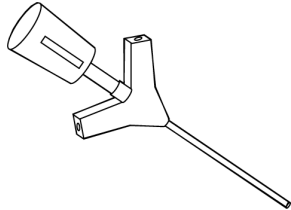
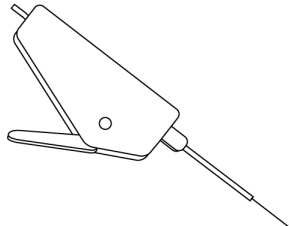
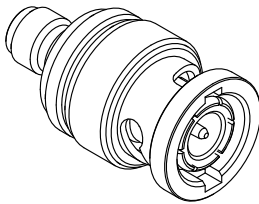
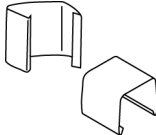
Pos.	Item	Description	Material number
9		Mini clip	1416.0105.00
10		Micro clip	1416.0111.00
11		R&S RT-ZA10 SMA (female) to BNC (male) adapter	1316.0762.00
12		Marker band kit	1416.0205.00
13	R&S RT-ZK2	R&S RT-ZK2 service kit	1410.5305.02

Table 5-2: Parts for ESD prevention

Pos.	Item	Material number
1	ESD wrist strap	0008.9959.00
2	ESD grounding cable	1043.4962.00