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## SWR Bridge R&S® ZRC

Measurement of reflection coefficient from 40 kHz to 4 GHz

- ◆ Very wide frequency range
- ◆ High directivity
- ◆ Good matching characteristics
- ◆ Rugged design
- ◆ Calibration accessories included
- ◆ Characteristic impedance 50  $\Omega$  or 75  $\Omega$  (up to 2.5 GHz)

The SWR Bridge R&S®ZRC is used to measure the magnitude and phase of the reflection coefficient of RF circuits and components such as filters, amplifiers, mixers and antennas. The output signal from the test generator is applied to the DUT via the SWR bridge. Depending on the reflection coefficient  $r$  of the DUT, part of the signal is reflected to the bridge and then routed to the receiver, where it is detected and displayed.

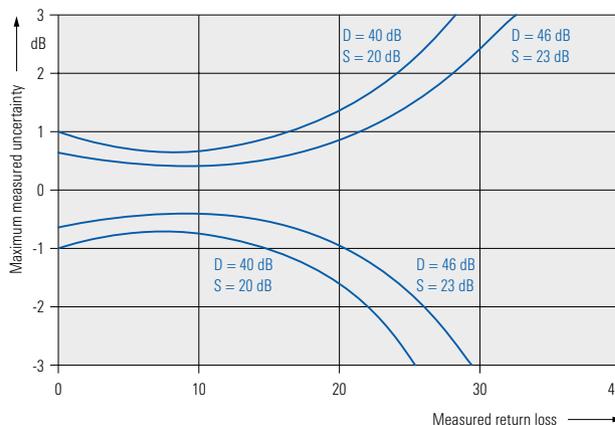
A shopen (short circuit/open circuit) and a match that can be used for calibration and verification of nominal data are part of the equipment supplied. A connector adapter that can directly connect the bridge to a test generator without the use of cables is also supplied.

## Measurement accuracy

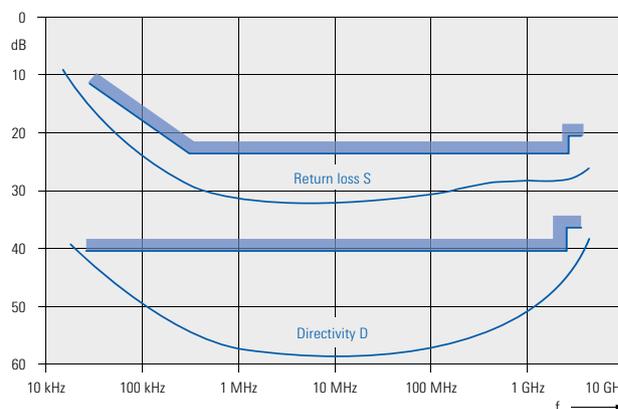
The accuracy of a bridge is generally defined by its directivity and by multiple reflections between the DUT and the measurement port. When measuring small reflection coefficients, the finite directivity is decisive. Reflection coefficients that are smaller than the directivity can no longer be measured directly.

The measurement accuracy of large reflection coefficients mainly depends on the port matching of the bridge. At a directivity of  $D = 40$  dB, for example, and a return loss of the measurement port of  $S = 23$  dB, the maximum absolute error as a function of the reflection coefficient to be measured is  $0.01 + 0.07 \cdot |r|^2$ .

The diagram above is ideal for assessing this quantitatively. The maximum positive and negative measurement uncertainty is plotted as a function of the measured return loss. The specified limit values of the R&S®ZRC are used here. For the center frequency range of approx. 1 MHz to 1 GHz, both the return loss at the measurement port (typ. >28 dB) and the directivity (typ. >50 dB) are higher than specified. The measurement uncertainties that arise are smaller than the limit values shown and usually negligible during practical measurements.



**Maximum measurement uncertainty for a return loss  $S$  of 20 dB and 23 dB at the test port and directivity  $D$  of 40 dB and 46 dB**



**Typical response and tolerance limits of return loss  $S$  at test port and directivity  $D$  of 50 Ω bridge**

## Specifications

Characteristic impedance	50 Ω	75 Ω
Frequency range	40 kHz to 4 GHz	40 kHz to 2.5 GHz
Directivity up to 2.5 GHz 2.5 GHz to 3 GHz 3 GHz to 4 GHz	≥40 dB ≥40 dB ≥36 dB	≥40 dB — —
Return loss at test port up to 400 kHz 400 kHz to 2.5 GHz 2.5 GHz to 3 GHz 3 GHz to 4 GHz	≥12 dB + 11 dB · log (f/40 kHz) ≥23 dB ≥23 dB ≥20 dB	≥8 dB + 12 dB · log (f/40 kHz) ≥20 dB — —
Measurement error up to 400 kHz 400 kHz to 2.5 GHz 2.5 GHz to 3 GHz 3 GHz to 4 GHz	$\leq 0.01 + s \cdot  r ^2$ $\leq 0.01 + 0.07 \cdot  r ^2$ $\leq 0.01 + 0.07 \cdot  r ^2$ $\leq 0.016 + 0.01 \cdot  r ^2$	$\leq 0.01 + s \cdot  r ^2$ $\leq 0.01 + 0.1 \cdot  r ^2$ — —
Insertion loss at 5 MHz Total Input → test port Test port → output	13 dB 7 dB 6 dB	

$s$  = reflection coefficient at test port ( $s = 10^{-a/20}$  dB)

$a$  = return loss at test port

$|r|$  = magnitude of reflection coefficient measured

## General data

Power-handling capacity	0.5 W
Operating temperature range	0 °C to +55 °C
Storage temperature range	−40 °C to +70 °C
Connectors	N female
Test port connector	N female or N male

Dimensions without connectors	72 mm × 77 mm × 23 mm
Length of connectors	female 17 mm, male 19 mm
Weight	340 g
Dimensions of case	264 mm × 172 mm × 48 mm
Total weight with accessories and case	980 g

## Ordering information

Designation	Order No.
SWR Bridge R&S®ZRC 50 Ω, test port connector, female	1039.9492.52
SWR Bridge R&S®ZRC 50 Ω, test port connector, male	1039.9492.55
SWR Bridge R&S®ZRC 75 Ω, test port connector, female	1039.9492.72
SWR Bridge R&S®ZRC 75 Ω, test port connector, male	1039.9492.75
Accessories supplied	shopen, match, connector adapter

## Accessories supplied

Shopen	50 Ω version phase difference between open-circuit and short-circuit $180^\circ \pm 5^\circ$ 75 Ω version phase difference between open-circuit and short-circuit $180^\circ \pm 10^\circ$
Match	return loss ≥46 dB (50 Ω), ≥40 dB (75 Ω)
Connector adapter	insertion loss ≤0.1 dB return loss ≥34 dB

Note: SWR bridge specifications can be affected by strong magnetic fields ( $B \geq 50$  mT at housing surface).

More information at  
[www.rohde-schwarz.com](http://www.rohde-schwarz.com)  
(search term: ZRC)



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