

## SWR Bridge 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 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 - eg the tracking generator of the Spectrum & Network Analyzer FSBS or the scalar network analyzer Polyskop ZWOBS\*) from Rohde & Schwarz - is applied to the device under test via the SWR bridge. Depending on the reflection coefficient  $r$  of the device under test, part of the signal is reflected to the bridge and then routed to the receiver, eg to the test input of the FSBS or to the

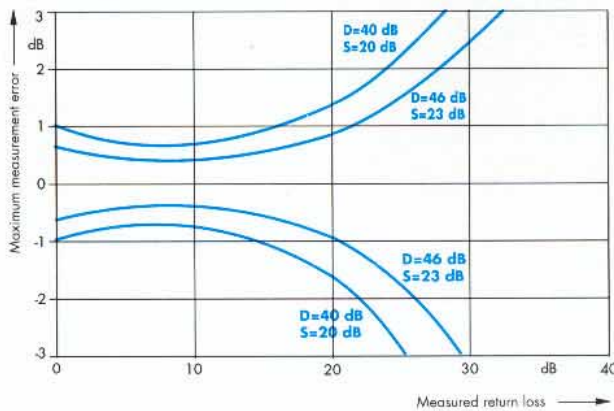
measuring head of the ZWOBS, where it is detected and displayed.

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

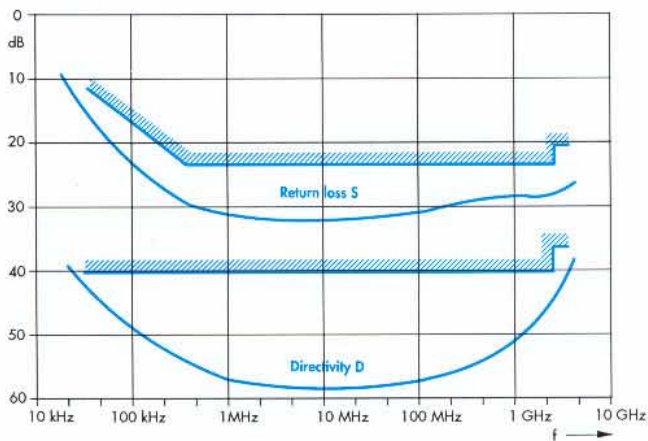
\*) data sheets PD 756.9216 and PD 756.9716

## Measurement accuracy

The accuracy of the bridge is limited by its directivity as well as by multiple reflections between the device under test and test port. The measurement of small reflection coefficients is affected by the finite directivity. Reflection coefficients that are smaller than the directivity cannot be measured directly. In measurements of large reflection coefficients, the accuracy depends primarily on the matching of the test port of the bridge. With a directivity of  $D=40$  dB and a test port return loss of  $S=23$  dB for example, the maximum



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



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

absolute error as a function of the reflection coefficient to be measured is  $0.01 + 0.07 \cdot |r|^2$ .

The diagram below shows the maximum positive and negative measurement error as a function of the measured return loss. It is to be noted that these values are the specified limit val-

ues of the ZRC. For the middle frequency range from about 1 MHz to 1 GHz both the return loss at the test port (typ.  $>28$  dB) and the directivity (typ.  $>50$  dB) are higher than shown. Any measurement uncertainty that then occurs is lower than the limits shown and can in most cases be neglected in practice.

## Specifications

Characteristic impedance	<b>50 <math>\Omega</math></b>	<b>75 <math>\Omega</math></b>
Frequency range	40 kHz to 4 GHz	40 kHz to 2.5 GHz
Directivity	up to 2.5 GHz $\geq 40$ dB 2.5 to 3 GHz $\geq 40$ dB 3 to 4 GHz $\geq 36$ dB	$\geq 40$ dB — —
Return loss at test port	up to 400 kHz $\geq 12$ dB + 11 dB $\cdot \log(f/40 \text{ kHz})$ 400 kHz to 2.5 GHz $\geq 23$ dB 2.5 to 3 GHz $\geq 23$ dB 3 to 4 GHz $\geq 20$ dB	$\geq 8$ dB + 12 dB $\cdot \log(f/40 \text{ kHz})$ $\geq 20$ dB — —
Measurement error	up to 400 kHz $\leq 0.01 + s \cdot  r ^2$ 400 kHz to 2.5 GHz $\leq 0.01 + 0.07 \cdot  r ^2$ 2.5 to 3 GHz $\leq 0.01 + 0.07 \cdot  r ^2$ 3 to 4 GHz $\leq 0.016 + 0.1 \cdot  r ^2$	$\leq 0.01 + s \cdot  r ^2$ $\leq 0.01 + 0.1 \cdot  r ^2$ — —
$s$ = reflection coefficient at test port ( $s = 10^{-\alpha/20}$ dB), $\alpha$ = return loss at test port, $ r $ = magnitude of reflection coefficient measured		
Insertion loss at 5 MHz		
Total		13 dB
Input $\rightarrow$ test port		7 dB
Test port $\rightarrow$ output		6 dB
Power-handling capacity		0.5 W
Accessories supplied		
Shopen		phase difference between open-circuit and short-circuit $180^\circ \pm 5^\circ$
Termination		return loss $\geq 46$ dB
Connector adapter		insertion loss $\leq 0.1$ dB, return loss $\geq 34$ dB

## General data

Nominal temperature range	0 to +55°C
Storage temperature range	-40 to +70°C
Connectors	N female
Test port connector	N female or N male
Dimensions without connectors	72 mm x 77 mm x 23 mm
Length of connectors	female 17 mm, male 19 mm
Weight	340 g
Dimensions of case	264 mm x 172 mm x 48 mm
Total weight with accessories and case	980 g

## Ordering information

<b>Order designation</b>	SWR Bridge ZRC
50 $\Omega$ , test port connector, female	1039.9492.52
50 $\Omega$ , test port connector, male	1039.9492.55
75 $\Omega$ , test port connector, female	1039.9492.72
75 $\Omega$ , test port connector, male	1039.9492.75

**Accessories supplied** shopen, termination, connector adapter

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



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