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SWR Bridge R&S ZRA

40 kHz to 150 MHz

- Small low-end cutoff frequency
- High directivity
- Excellent matching
- High power-handling capacity
- Rugged construction

The SWR Bridge R&S ZRA is used to measure the magnitude and phase of the reflection coefficient of RF circuits and components, e.g. filters, amplifiers, mixers or antennas. The output signal a from the signal source, e.g. a signal generator, is applied to the DUT via the SWR bridge. Depending on the reflection coefficient r of the DUT, part of this signal is reflected to the SWR bridge an then routed to the receiver, which may be a voltmeter, power meter, spectrum or network analyzer that is connected to the bridge output. The output signal b is a measure of the complex reflection coefficient r of the DUT. Some of the measuring instruments convert the measured reflection coefficient into other parameters, e.g. into the impedance or admittance of the DUT. In this case, magnitude and phase as well as real and imaginary components can be displayed. The reflection coefficient stated in percent can also be converted into the return loss in dB or the standing-wave ratio SWR.

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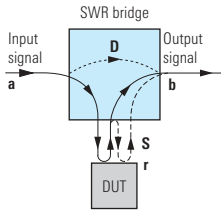
Measurement uncertainty

The accuracy of the SWR bridge is limited by its directivity D and the return loss S of the test port. The finite directivity D causes an error signal (dotted signal path D), which passes from the input of the SWR bridge directly to its output without reaching the DUT. The finite return loss S causes multiple reflections between test port and DUT. For estimating the error, it is sufficient to investigate a single reflection only (dashed signal path S).



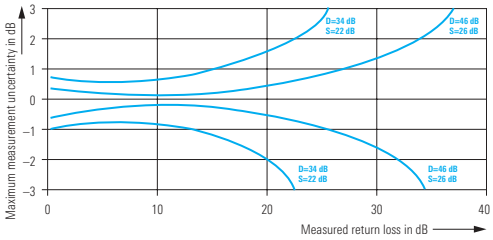
Taking into account the insertion loss T of the SWR bridge, the approximate relationship between input signal a and output signal b is:

$$b = T \times (r + D + S \times r^2) \times a$$

This equation shows that measurement of small reflection coefficients r is impaired by the finite directivity D of the SWR bridge. The relative measurement uncertainty increases with decreasing reflection coefficient. Reflection coefficients that are smaller than the directivity of the bridge cannot be measured directly. When large reflection coefficients are measured, the accuracy mainly depends on the return loss S of the test port.

With a directivity of 40 dB and a return loss at the test port of 26 dB for example, the maximum absolute error as a function of the reflection coefficient to be measured is $0.01 + 0.05 \times |r|^2$.

The diagram, which shows the maximum positive and negative measurement uncertainty as a function of the measured return loss, allows a quantitative evaluation of this relationship. It should be noted that these values are the specified limit values of the R&S ZRA. In the lower and middle frequency range, both the directivity (50 dB typ.) and the return loss at the test port (36 dB typ.) are better than the specified values. Any measurement uncertainties occurring then are smaller than the limits shown and can usually be neglected for practical measurements.



Maximum measurement uncertainty with assumed directivity of 35 dB and 45 dB and return loss at test port of 25 dB and 30 dB

Specifications

Impedance	50 Ω
Frequency range	40 kHz to 150 MHz
Directivity up to 1 MHz up to 150 MHz	 ≥45 dB ≥40 dB
Test port matching up to 200 kHz 0.2 MHz to 50 MHz up to 150 MHz	 ≥20 dB ≥30 dB ≥20 dB
Insertion loss[1)]	7.5 dB + 6 dB
Power-handling capacity	0.5 W
Rated temperature range	0 °C to +50 °C
Storage temperature range	–40 °C to +70 °C
Connectors (input, output, test port)	N female
Weight	190 g
Dimensions (W x H x D, without connectors)	52 mm x 52 mm x 41 mm

1) Attenuation: input ----> test port + test port ---> output.

Certified Quality System
ISO 9001
DQS REG. NO 1954

Certified Environmental System
ISO 14001
REG. NO 1954

Ordering information

SWR Bridge	R&S ZRA	1052.3607.52

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Printed in Germany 0402 (U ko)