



Version
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R&S® ENY81 Coupling Network

For radio disturbance measurements on unshielded, symmetrical telecommunications ports

- ◆ Eight-wire network
- ◆ Radio disturbance measurements in line with CISPR 22: 2005 and EN 55022: 2006 (150 kHz to 30 MHz)
- ◆ CISPR 16-1-2 complied with
- ◆ Adapter sets to meet standardized LCL requirements (55 dB and 65 dB) and to accommodate various telecommunications interfaces
- ◆ High transmission bandwidth for wanted signal (100 MHz)



ROHDE & SCHWARZ

At a glance

The R&S®ENY81 coupling network has been designed to measure the asymmetrical (common-mode) RFI voltage of unshielded, symmetrical telecommunications ports of EUTs. The measurements can be performed in the frequency range from 150 kHz to 30 MHz and are in line with the CISPR 22: 2005 and EN 55022: 2006 product standards.

The R&S®ENY81 can be used for disturbance measurements of the EUTs. The coupling network is tested and calibrated in line with CISPR 16-1-2. The calibration data supplied refers to a symmetrical impedance of 100 Ω .

Test methods

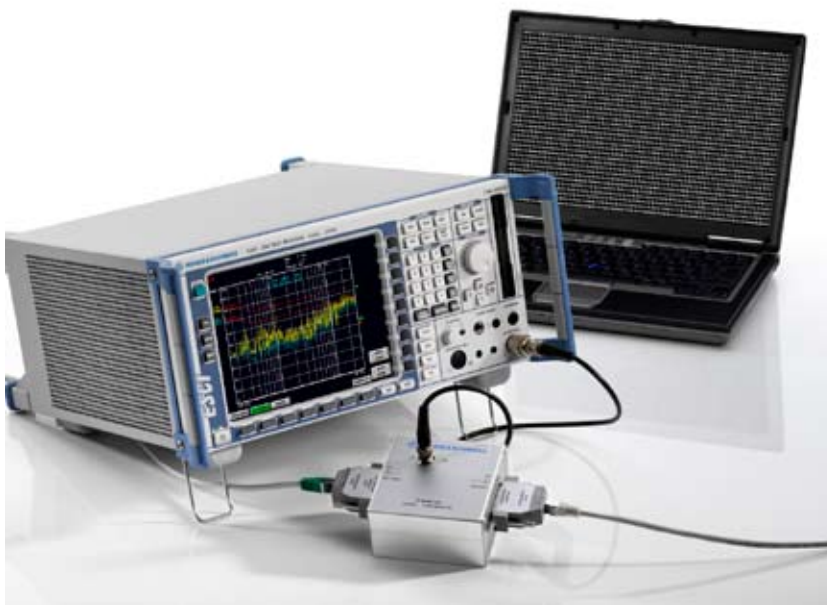
The R&S®ENY81 terminates the EUT's interface with 150 Ω (asymmetrical or common-mode impedance) and couples the EUT's asymmetrical impedance to the test receiver with a voltage division factor of typ. 10 dB. The wanted symmetrical (differential-mode) signal passes through the network almost without attenuation up to a bandwidth of 100 MHz (valid for a symmetrical impedance of 100 Ω). At the same time, the coupling network decouples the test circuit from disturbance effects (RFI voltage, impedance) at the associated equipment (AE) port.

Nomenclature

In the CISPR 22: 2005 and EN 55022: 2006 product standards, this type of coupling network is referred to as an impedance stabilization network (ISN). In basic standards, they are instead called asymmetrical artificial networks (AAN), Y-networks (CISPR 16), or coupling/decoupling networks (CDN), (IEC 61000-4-6).

In line with CISPR 22: 2005 and EN 55022: 2006, measurements of the RFI voltage on one unshielded symmetrical wire pair require the use of a two-wire ISN (R&S®ENY21). In the case of two unshielded symmetrical wire pairs, it is necessary to use a four-wire ISN (R&S®ENY41), and with four unshielded symmetrical wire pairs an eight-wire ISN (R&S®ENY81).

CISPR 22: 2005 and EN 55022: 2006 specify the following conformance test method:



Compact, cost-efficient test set consisting of the R&S® ESCI EMI test receiver and the R&S® ENY81 coupling network for semiautomatic measurement of the asymmetrical RFI voltage

The measurement of the EUT is to be performed with a suppression of the wanted symmetrical signal corresponding to the category of the connected cable (requirements for cable categories CAT3, CAT5, and CAT6 are defined in the standard).

In order to implement these test methods, the R&S®ENY81 consists of one high-symmetry basic network and a number of adapter sets for implementing the required longitudinal conversion losses (LCL). Each adapter set contains adapters for LCL values of 55 dB (for cable category CAT3) and 65 dB (for cable category CAT5).



R&S®ENY81 with basic adapter set

Adapters

The R&S®ENY81 eight-wire ISN comes with two adapter sets (see table), i.e. with RJ-45 connector and with connectors for user-selectable wiring (1 mm banana jack).

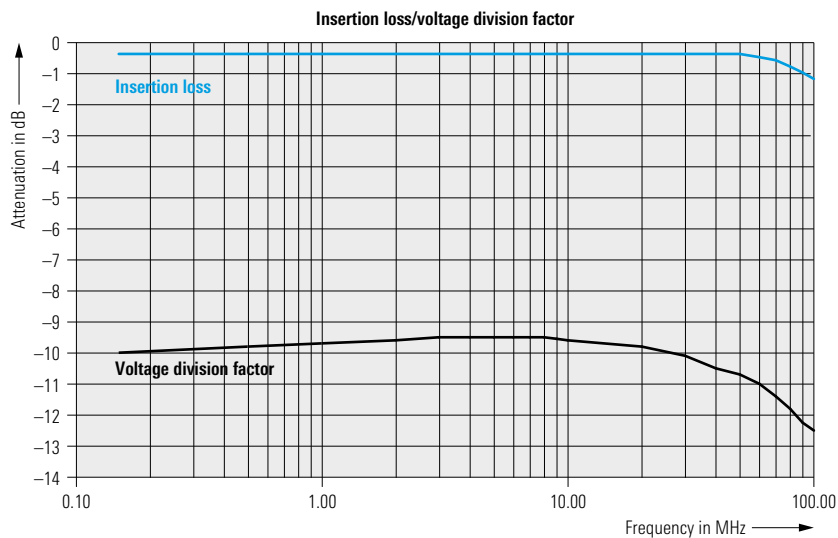
Functional testing and mechanical design

The R&S®ENY-FTS option in connection with a network analyzer allows the functional testing of the ISNs. This functional testing includes the verification of the asymmetrical impedance and phase, voltage division factor, and longitudinal conversion loss.

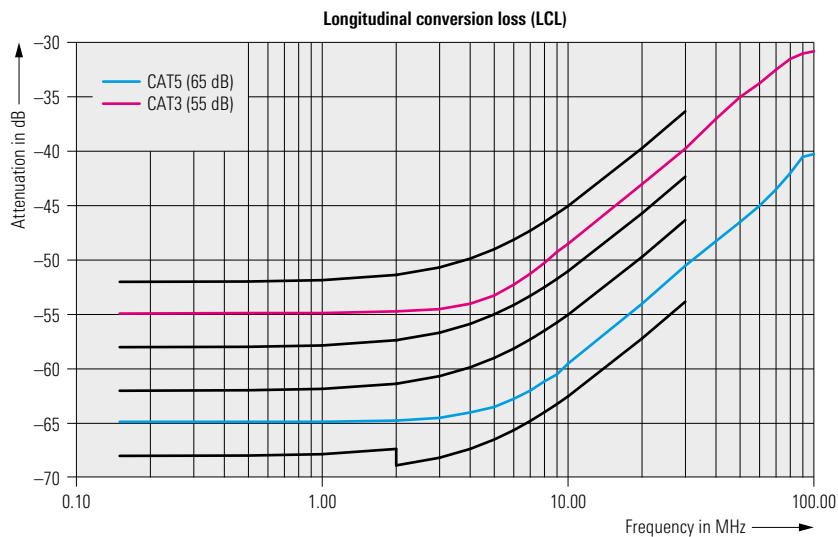
The R&S®ENY81 coupling network features bare threaded sockets for connecting it to a reference ground plane that is arranged either horizontally or vertically.

Type	Application	Pin assignment in line with EIA/TIA T568B				
		Connector	pair 1/pin 4, 5	pair 2/pin 1, 2	pair 3/pin 3, 6	pair 4/pin 7, 8
R&S®ENY81 basic adapter	Ethernet (100BaseT4, 1000BaseT)	RJ-45	×	×	×	×
	user-selectable pin assignment	RJ-11, RJ-45, and 1 mm				

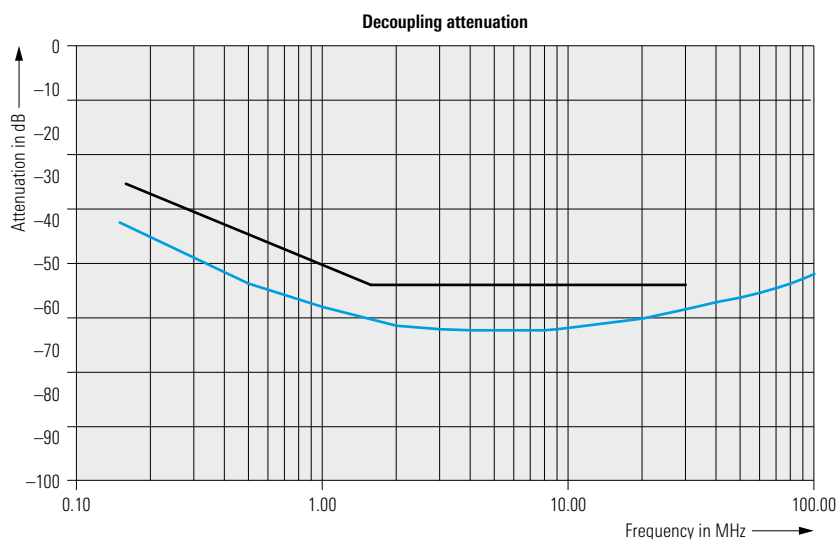
Overview of the adapter sets for the R&S®ENY81 eight-wire ISN



The typical insertion loss of the symmetrical circuit – measured with a line impedance of $100\ \Omega$ (upper curve) – determines the transmission bandwidth of the coupling network for the wanted signal; the typical voltage division factor (lower curve) is to be added to the measured voltage for the frequency range 150 kHz to 30 MHz for comparison with the disturbance limit



Typical longitudinal conversion losses (LCL) as required by CISPR 22: 2005 and EN 55022: 2006 for the CAT3 and CAT5 cable categories; all curves are valid for the frequency range from 150 kHz to 30 MHz



Typical decoupling attenuation between AE port and receiver port with EUT port short

Specifications

Frequency range	
Radio disturbance measurements	150 kHz to 30 MHz
Asymmetrical impedance	
Impedance (0.15 MHz to 30 MHz)	$150\ \Omega \pm 20\ \Omega$
Phase angle (0.15 MHz to 30 MHz)	$0^\circ \pm 20^\circ$
Voltage division factor in asymmetrical circuit	
150 kHz to 30 MHz	typ. 10 dB $\pm$ 1 dB (calibration data supplied ¹⁾)
>30 MHz to 80 MHz	typ. 10 dB $\pm$ 2 dB
Transmission bandwidth (3 dB)	>100 MHz (for 100 Ω source and load impedances)
Longitudinal conversion loss (LCL)	
55 dB adapter	
LCL (dB)	$55 - 10 \log(1 + (f/5)^2)$ dB
Tolerance	± 3 dB, for $0.15\ \text{MHz} \leq f \leq 30\ \text{MHz}$
65 dB adapter	
LCL (dB)	$65 - 10 \log(1 + (f/5)^2)$ dB
Tolerance	± 3 dB, for $f < 2\ \text{MHz}$, –3/+4.5 dB, for $2\ \text{MHz} \leq f \leq 30\ \text{MHz}$
Decoupling attenuation	
150 kHz to 1.5 MHz	>35 dB to 55 dB (linear increase with logarithmic frequency)
1.5 MHz to 30 MHz	>55 dB
Crosstalk (PSELFEXT, EUT/AE)	
1 MHz to 100 MHz	≥ 61 dB to ≥ 21 dB (linear increase with logarithmic frequency)
Maximum values	
Max. permissible RF input voltage	<15 V
Max. permissible DC voltage between line and ground	100 V
Max. permissible AC voltage between line and ground	63 V
Max. permissible DC current	400 mA (current on each individual wire of one pair or on different pairs)
Connectors	
Output to test receiver/input from signal generator	BNC female
Connectors for EUT and AE	adapter with 1 mm connectors and RJ-11 or RJ-45 connectors

General data	
Operating temperature range	+5 °C to 40 °C
Storage temperature range	–20 °C to +70 °C
Overall dimensions (W × H × D)	
Basic unit	105 mm × 65 mm × 110 mm (4.1 in × 2.6 in × 4.3 in)
Basic unit with adapters	105 mm × 65 mm × 190 mm (4.1 in × 2.6 in × 7.5 in)
Weight	
Basic unit with adapters	520 g (1.1 lb)
Carrying case with basic adapter set	1640 g (3.6 lb)

Ordering information

Designation	Type	Order No.
Base units		
Eight-Wire ISN in line with CISPR 22: 2005	R&S®ENY81	1309.8503.03
Options		
Functional Test Set	R&S®ENY-FTS	1309.8703.03
Accessories supplied		
Plastic carrying case with foam material, calibration data ¹⁾		

¹⁾ The calibration data includes asymmetrical impedance and phase, voltage division factor, decoupling attenuation, longitudinal conversion loss (LCL), transmission bandwidth, and crosstalk.



More information at
www.rohde-schwarz.com
(search term: ENY)



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