Y-образный эквивалент сети питания ENY81-CA6

R&S®ENY81-CA6 Coupling Network

At a glance

The R&S®ENY81-CA6 coupling network is used for performing disturbance and immunity measurements on unshielded symmetrical telecommunications ports for cable category Cat 6.

The coupling network complies with the following product standards:

- CISPR 22:2008 and EN 55022:2010 (Fig. D.3)
- CISPR 32 and EN 55032 (Fig. G.3)

The R&S®ENY81-CA6 coupling network is used for measuring asymmetrical (common-mode) disturbance voltage on unshielded symmetrical telecommunications ports of equipment under test (EUT). The coupling network has two RJ-45 ports for connecting the EUT and the associated equipment (AE).

At the EUT end, a longitudinal conversion loss (LCL) of 75 dB is implemented to simulate operation with a Cat 6 cable. Measurements can be performed in the frequency range from 150 kHz to 30 MHz and are in line with the CISPR 22:2008 and EN 55022:2010 as well as CISPR 32 and EN 55032 product standards.

The R&S®ENY81-CA6 can also be used for immunity measurements. These measurements are performed in line with CISPR 24 and EN 55024 as well as IEC 61000-4-6 in the frequency range from 150 kHz to 80 MHz.

The R&S®ENY81-CA6 is tested and calibrated in line with CISPR 16-1-2. The calibration data supplied with the unit is valid for a symmetrical impedance of 100 Ω.

Key facts

- Eight-wire network
- Disturbance measurements in line with CISPR 22:2008 and EN 55022:2010 as well as CISPR 32 and EN 55032 (150 kHz to 30 MHz)
- Immunity measurements in line with CISPR 24 and EN 55024 (150 kHz to 80 MHz)
- Compliance with CISPR 16-1-2
- 75 dB longitudinal conversion loss (LCL)
- High transmission bandwidth for wanted signal (250 MHz)

Nomenclature

In the CISPR 22:2008 and EN 55022:2010 product standards, this type of coupling network is referred to as an impedance stabilization network (ISN). In the CISPR 32 and EN 55032 product standards and the CISPR 16 basic standard, these networks are called asymmetrical artificial networks (AAN) and Y-networks. In the IEC 61000-4-6 basic standard, they are referred to as coupling/decoupling networks (CDN).

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Benefits and key features

Functional description

The R&S®ENY81-CA6 terminates the EUT interface with 150 Ω (asymmetrical or common-mode impedance) and couples the EUT's asymmetrical voltage to the test receiver with a voltage division factor of typ. 9.5 dB. The wanted symmetrical (differential-mode) signal passes through the coupling network almost without attenuation up to a bandwidth of 250 MHz (valid for a symmetrical impedance of 100 Ω). At the same time, the coupling network decouples the test circuit from disturbance effects (disturbance voltage, impedance) at the AE port.

Mechanical design

The R&S®ENY81-CA6 coupling network features bare threaded sockets for connecting it to a reference ground plane that is arranged either horizontally or vertically.

Disturbance measurements

In line with CISPR 22 and EN 55022 as well as CISPR 32 and EN 55032, disturbance voltage measurements 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); with four unshielded symmetrical wire pairs, an eight-wire ISN (R&S®ENY81 or R&S®ENY81-CA6) is needed. However, the design of the R&S®ENY81-CA6 also permits measurements on one or two wire pairs.

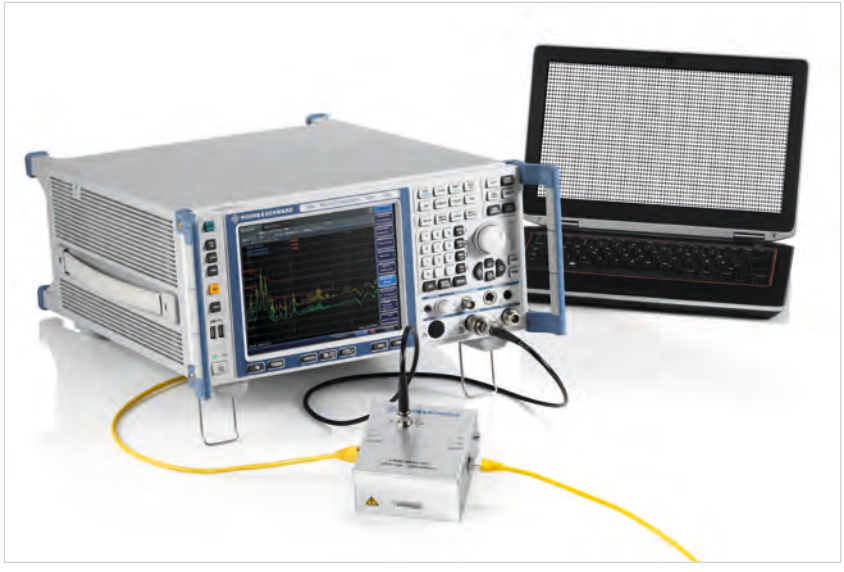
CISPR 22 and EN 55022 as well as CISPR 32 and EN 55032 specify the following conformance test method: The EUT is to be measured with a suppression of the wanted symmetrical signal corresponding to the category of the connected cable (requirements for cable categories Cat 3, Cat 5, and Cat 6 are defined in the standard). In order to implement these test methods, the R&S®ENY81-CA6 consists of a high-symmetry basic network with a longitudinal conversion loss of 75 dB for cable category Cat 6. The LCL is internally implemented at the EUT end. For cable categories Cat 3 and Cat 5, the R&S®ENY81 eight-wire coupling network is to be used.

Immunity measurements

For immunity tests, a 150 Ω to 50 Ω adapter (100 Ω series resistor in line with IEC 61000-4-6) is required in order to calibrate the test system. This series or terminating resistor as well as various adapters for connecting the ISN are included in the R&S®ENY-ITS immunity test set, which is available as an option.

Functional testing

A functional test of the ISNs can be performed using the R&S®ENY-FTS option and a network analyzer. The functional test includes verification of the asymmetrical impedance and phase, the voltage division factor, the longitudinal conversion loss and the decoupling attenuation.



Compact test setup consisting of the R&S®ESR EMI test receiver and the R&S®ENY81-CA6 coupling network for the semi-automatic measurement of the asymmetrical disturbance voltage.

Ordering information

Designation	Type	Order No.
Base unit		
Eight-Wire ISN, in line with CISPR 22:2008 and CISPR 32 for Cat 6	R&S®ENY81-CA6	1309.8526.03
Options		
Functional Test Set, including adapters for the R&S®ENY81-CA6	R&S®ENY-FTS	1309.8703.13
Immunity Test Set, including adapters for the R&S®ENY81-CA6	R&S®ENY-ITS	1309.8955.13
Accessories supplied		
Plastic carrying case lined 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.

R&S®ENY81-CA6 base unit in carrying case.

Specifications

Specifications		
Frequency range		
Disturbance measurements		150 kHz to 30 MHz
Immunity measurements		150 kHz to 80 MHz
Asymmetrical impedance		
Impedance	0.15 MHz to 30 MHz	150 Ω ±20 Ω
	> 30 MHz to 80 MHz	150 Ω ±40 Ω
Phase angle	0.15 MHz to 30 MHz	0° ±20°
Voltage division factor in asymmetrical circuit		
150 kHz to 30 MHz	calibration data supplied[1)]	typ. 9.5 dB ±1 dB
> 30 MHz to 80 MHz		typ. 9.5 dB ±2 dB
Transmission bandwidth (3 dB)	for 100 Ω source and load impedance	> 250 MHz
Longitudinal conversion loss (LCL)		
LCL		$75 - 10\log(1+(f/5)^2)$ dB
Tolerance	for f < 2 MHz	±3 dB
	for 2 MHz ≤ f ≤ 30 MHz	–3 dB/+6 dB
Decoupling attenuation		
150 kHz to 1.5 MHz	linear increase with logarithmic frequency	> 35 dB to 55 dB
1.5 MHz to 30 MHz		> 55 dB
Crosstalk (PSELFEXT, EUT/AE)		
1 MHz to 250 MHz	linear decrease with logarithmic frequency	≥ 61 dB to ≥ 15 dB
Power-handling capacity		
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	forward and reverse current on one wire pair or multiple wire pairs	600 mA
Connectors		
Output to test receiver/input from signal generator		BNC female
Connectors for EUT and AE		RJ-45 female
General data		
Operating temperature range		+5 °C to +40 °C
Storage temperature range		–20 °C to +70 °C
Dimensions, base unit	overall dimensions, W × H × D	105 mm × 65 mm × 110 mm
Weight		
Base unit		500 g
Carrying case with base unit		1900 g

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