



Operating Manual

R&S[®] ENY81 Eight-Wire ISN in Line with CISPR 22

Grouped Safety Messages









Make sure to read through and observe the following safety instructions!







All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standard of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment required for them are designed and tested in accordance with the relevant safety standards. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed and tested in accordance with the EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards. To maintain this condition and to ensure safe operation, observe all instructions and warnings provided in this manual. If you have any questions regarding these safety instructions, the Rohde & Schwarz group of companies will be happy to answer them.

Furthermore, it is your responsibility to use the product in an appropriate manner. This product is designed for use solely in industrial and laboratory environments or, if expressly permitted, also in the field and must not be used in any way that may cause personal injury or property damage. You are responsible if the product is used for an intention other than its designated purpose or in disregard of the manufacturer's instructions. The manufacturer shall assume no responsibility for such use of the product.

The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits (see data sheet, documentation, the following safety instructions). Using the product requires technical skills and a basic knowledge of English. It is therefore essential that only skilled and specialized staff or thoroughly trained personnel with the required skills be allowed to use the product. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation. Keep the basic safety instructions and the product documentation in a safe place and pass them on to the subsequent users.

Symbols and safety labels

							
Observe product documentation	Weight indication for units >18 kg	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Attention! Electrostatic sensitive devices

					
Supply voltage ON/OFF	Standby indication	Direct current (DC)	Alternating current (AC)	Direct/alternating current (DC/AC)	Device fully protected by double/reinforced insulation

Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before putting the product into operation. It is also absolutely essential to observe the additional safety instructions on personal safety that appear in relevant parts of the product documentation. In these safety instructions, the word "product" refers to all merchandise sold and distributed by the Rohde & Schwarz group of companies, including instruments, systems and all accessories.

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Tags and their meaning

DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	CAUTION indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
NOTICE	NOTICE indicates a property damage message.

In the product documentation, the word ATTENTION is used synonymously.

These tags are in accordance with the standard definition for civil applications in the European Economic Area. Definitions that deviate from the standard definition may also exist in other economic areas or military applications. It is therefore essential to make sure that the tags described here are always used only in connection with the related product documentation and the related product. The use of tags in connection with unrelated products or documentation can result in misinterpretation and thus contribute to personal injury or material damage.

Basic safety instructions

1. The product may be operated only under the operating conditions and in the positions specified by the manufacturer. Its ventilation must not be obstructed during operation. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:
prescribed operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only in enclosed spaces, max. operation altitude 2000 m above sea level, max. transport altitude 4500 m above sea level.
A tolerance of $\pm 10\%$ shall apply to the nominal voltage and of $\pm 5\%$ to the nominal frequency.
2. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed. The product may be opened only by authorized, specially trained personnel. Prior to performing any work on the product or opening the product, the product must be disconnected from the supply network. Any adjustments, replacements of parts, maintenance or repair must be carried out only by technical personnel authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test).
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens, e.g. nickel) such as aluminum cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties), consult a physician immediately to determine the cause.
4. If products/components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled, e.g. for disposal purposes, by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.

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5. If handling the product yields hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation.
6. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn life requires increased protection, pregnant women should be protected by appropriate measures. Persons with pacemakers may also be endangered by electromagnetic radiation. The employer/operator is required to assess workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the danger.
7. Operating the products requires special training and intense concentration. Make certain that persons who use the products are physically, mentally and emotionally fit enough to handle operating the products; otherwise injuries or material damage may occur. It is the responsibility of the employer to select suitable personnel for operating the products.
8. Prior to switching on the product, it must be ensured that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
9. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with earthing contact and protective earth connection.
10. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
11. If the product has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases, it must be ensured that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If products without power switches are integrated in racks or systems, a disconnecting device must be provided at the system level.
12. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, ensure that the cable cannot be damaged and that no one can be hurt by e.g. tripping over the cable or suffering an electric shock.
13. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
14. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, this can result in sparks, fire and/or injuries.
15. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
16. For measurements in circuits with voltages $V_{\text{rms}} > 30 \text{ V}$, suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
17. Ensure that the connections with information technology equipment comply with IEC 950/EN 60950.
18. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
19. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a license electrician.

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20. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that suitable protection is provided for users and products.
21. Do not insert any objects into the openings in the housing that are not designed for this purpose. Never pour any liquids onto or into the housing. This can cause short circuits inside the product and/or electric shocks, fire or injuries.
22. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a thunderstorm) can reach the product. Otherwise the operating personnel will be endangered by electric shocks.
23. Rohde & Schwarz products are not protected against penetration of liquids, unless otherwise specified (see also safety instruction 1.). If this is not taken into account, there exists the danger of electric shock for the user or damage to the product, which can also lead to personal injury.
24. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product was moved from a cold to a warm environment.
25. Do not close any slots or openings on the product, since they are necessary for ventilation and prevent the product from overheating. Do not place the product on soft surfaces such as sofas or rugs or inside a closed housing, unless this is well ventilated.
26. Do not place the product on heat-generating devices such as radiators or fan heaters. The temperature of the environment must not exceed the maximum temperature specified in the data sheet.
27. Batteries and storage batteries must not be exposed to high temperatures or fire. Keep batteries and storage batteries away from children. Do not short-circuit batteries and storage batteries.
If batteries or storage batteries are improperly replaced, this can cause an explosion (warning: lithium cells). Replace the battery or storage battery only with the matching Rohde & Schwarz type (see spare parts list). Batteries and storage batteries must be recycled and kept separate from residual waste. Batteries and storage batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.
28. Please be aware that in the event of a fire, toxic substances (gases, liquids etc.) that may be hazardous to your health may escape from the product.
29. The product can be very heavy. Be careful when moving it to avoid back or other physical injuries.
30. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves).
31. Handles on the products are designed exclusively for personnel to hold or carry the product. It is therefore not permissible to use handles for fastening the product to or on means of transport such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport and for observing the safety regulations of the manufacturer of the means of transport. Noncompliance can result in personal injury or material damage.
32. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. The driver is always responsible for the safety of the vehicle. The manufacturer assumes no responsibility for accidents or collisions.
33. If a laser product (e.g. a CD/DVD drive) is integrated in a Rohde & Schwarz product, do not use any other settings or functions than those described in the product documentation. Otherwise this may be hazardous to your health, since the laser beam can cause irreversible damage to your eyes. Never try to take such products apart, and never look into the laser beam.
34. Prior to cleaning, disconnect the product from the AC supply. Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluent for cellulose lacquers.



Certificate No.: 2008-08

This is to certify that:

Equipment type	Stock No.	Designation
ENY21	1309.7507.03	2-Wire ISN
ENY41	1309.8003.03	4-Wire ISN
ENY81	1309.8503.03	8-Wire ISN

complies with the provisions of the Directive of the Council of the European Union on the approximation of the laws of the Member States

- relating to electrical equipment for use within defined voltage limits (2006/95/EC)

Conformity is proven by compliance with the following standards:

EN 61010-1 : 2001

Affixing the EC conformity mark as from 2008

ROHDE & SCHWARZ GmbH & Co. KG
Mühdorfstr. 15, D-81671 München

Munich, 2008-02-08

Central Quality Management MF-QZ / Radde

Certified Quality System

DIN EN ISO 9001 : 2000
DIN EN 9100 : 2003
DIN EN ISO 14001 : 2004

DQS REG. NO 001954 QM UM

QUALITÄTSZERTIFIKAT

Sehr geehrter Kunde,
Sie haben sich für den Kauf eines Rohde & Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Managementsystems entwickelt, gefertigt und geprüft.
Das Rohde & Schwarz Managementsystem ist zertifiziert nach:

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:2004

CERTIFICATE OF QUALITY

Dear Customer,
you have decided to buy a Rohde & Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards.
The Rohde & Schwarz quality management system is certified according to:

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DIN EN 9100:2003
DIN EN ISO 14001:2004

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vous avez choisi d'acheter un produit Rohde & Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité.
Le système de gestion qualité de Rohde & Schwarz a été homologué conformément aux normes:

DIN EN ISO 9001:2000
DIN EN 9100:2003
DIN EN ISO 14001:2004



ROHDE & SCHWARZ

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1 Safety Instructions

Impedance stabilization networks (ISN) can operate at dangerously high voltages.

DANGER**Improper or careless handling can be fatal!**

Use of the ISN is restricted to authorized and trained specialists for the applications described in this operating manual.

For measurements in circuits with voltages which are above the following limits, additional measures must be taken to protect the user against direct or indirect contact. If the value for the voltage in accordance with a) is exceeded, the limits for the current in accordance with b) must not be exceeded.

- a) The limits for the voltage (safety extra low voltage, SELV) are as follows:
30 V_{rms} and 42 V peak level or 60 V DC.
- b) The limits for the current are:
0.5 mA_{rms} for sine wave signals, 0.7 mA peak value for non-sine wave signals or for mixed frequency and 2.0 mA for DC current.

DANGER**Improper or careless handling can be fatal!**

If the limits for the SELV voltage are exceeded, all contacts should be made in power OFF stage.

It is recommended to use a blocking loop to ensure automatic protection against accidental contact.

These operating instructions form an integral part of the equipment and must be available to the operating personnel at all times. All the safety instructions and advice notes are to be observed.

Neither Rohde & Schwarz GmbH Co. KG nor any of the subsidiary sales organizations or the manufacturer can accept any responsibility for personal injury or material damage that results from improper use of the equipment and accessories.



1.1 Installation

Before putting the instrument into operation, connect the ISN with the ground plane. Operation without earth leakage connection is prohibited. Operate the equipment only in dry surroundings (indoor use). Allow any condensation that occurs to evaporate before putting the instrument into operation. Do not exceed the permissible ambient temperature, humidity or air pressure. The instrument is not suitable for use in an explosive atmosphere. Only approved accessory items, connectors, adapters, etc. are to be used to ensure safe operation. Measurements of radio disturbances should preferably be performed in shielded rooms.

Circuits inside the ISN are not protected by fuses. Provide adequate arrangements to protect the ISN against overload.

1.2 Applicable Safety Standards

Development and manufacture of the instrument complies with ISO 9001. The product meets the requirements of the Low Voltage Directive (LVD) 2006/95/EC based on IEC/EN 61010-1:2001.

2 Operation

Impedance stabilization networks (ISN) are coupling/decoupling networks in line with CISPR 22 for measurements of conducted common-mode disturbances of information technology equipment (ITE). The ISN is inserted into the signal cable path between the equipment under test (EUT) and the associated equipment (AE) or load necessary for the operation of the EUT. The ISN establishes the common-mode termination impedance for the EUT's telecommunications port during measurement and emulates the unsymmetrical contribution (longitudinal conversion loss, LCL) of the connected line. The ISN must not affect the normal quality of the wanted symmetrical signal.

The R&S ENY81 ISN is designed for radio disturbance measurements on unshielded telecommunications lines with up to four symmetrical pairs as shown in Figure D.3 in CISPR 22, Ed.5.2, 2006 and EN 55022:2006 (IEC/CISPR 22:2005 modified).



Fig. 1 *Parts of the R&S ENY81 ISN*

2.1 Radio Disturbance Measurements in Line CISPR 22

The ISN consists of one basic network (eight-wire ISN) with D-Sub-25 connectors and special adapter sets for RJ-11/RJ-45 modular connectors. The adapters have two tasks, i.e. hardware adaptation to the respective telecommunications interface and definition of the longitudinal conversion loss (LCL) of the ISN.

A set of adapters consists of the following:

- ◆ Two LCL adapters to implement required the longitudinal conversion loss (LCL) for the EUT port in relation to the cable category of the connected telecommunications line (category 5 or 3)
- ◆ One connection adapter for the AE port

Together with the basic network, two different adapter sets are provided. One adapter set allows connection to RJ-45 sockets with pin assignments in line with EIA/TIA T568A or T568B, respectively. The other adapter set offers user-selectable pin assignments via 1 mm banana connectors. These connectors make it possible to implement each pin combination of the RJ-11/RJ-45 connectors including the reversion of polarity or direct connection. Table 1 gives an overview.

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	X	X	X	X
	User-selectable pin assignment	RJ-11, RJ-45 and 1 mm				

Table 1 Overview of adapters



Due to the high symmetry requirements, the LCL adapters can be delivered only together with the basic network.

2.1.2 Radio Disturbance Measurements at Unshielded Telecommunications Ports

The limits of conducted common-mode disturbance voltages at telecommunications ports are defined in CISPR 22.

To determine the radio disturbance characteristics with the unshielded telecommunications line intended for operation, the EUT must be operated with an LCL which corresponds to the cable category specified by the equipment manufacturer. For this purpose, 55 dB adapters (for cable of category 3) and 65 dB adapters (for cable of category 5) are used.

For the measurement of the asymmetric (common-mode) disturbance voltage, the output level at the receiver port (BNC connector) is measured with a test receiver in line with CISPR 16-1-1. The R&S ENY81 comes with a table containing the voltage division factor. The magnitude of the voltage division factor in dB must be added to the measured output voltage to obtain the common-mode voltage at the EUT port. For this purpose, the frequency response of the voltage division factor can be entered in the test receiver or – if suitable test software is used – in the processor and used as transducer factor.

2.2 Immunity Testing in Line with IEC 61000-4-6

Due to its internal design, the basic network is generally not suitable for immunity testing in line with IEC 61000-4-6.

2.3 Connection Terminals

Fig. 3 shows the pin assignment of the D-Sub-25 connectors of an R&S ENY81 ISN basic network with four symmetrical pairs. The drawing in the middle shows an RJ-45 jack with EIA/TIA T568B pin assignment. The 1 mm socket area shown on the right can be used for any desired assignment of the RJ-11/RJ-45 jacks.

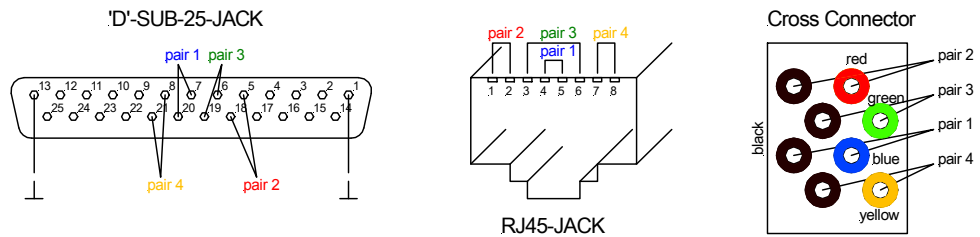


Fig. 3 Connector assignments

3 Functional Test of the R&S ENY81

Asymmetrical impedance and phase, voltage division factor, longitudinal conversion loss and decoupling attenuation can be measured using a vector network analyzer and the R&S ENY-FTS functional test set (order no. 1309.8703.03). If impedance is not measured, a test receiver with a tracking generator together with the R&S ENY-FTS functional test set will be sufficient. The R&S ENY-FTS comes with a detailed description of the calibration and test procedure.

4 Maintenance

The ISN including the accessories does not require special maintenance. Users need only take care to keep the equipment clean and protect the components against mechanical damage. The connectors, especially the modular components, have only a limited number of insertion/withdrawal cycles. If the connectors show signs of wear, you should have Rohde & Schwarz Service replace the connectors. Since replacement may require a general adjustment of the network, you should always send the complete ISN to the service department.

Users are not permitted to modify the ISN or its accessories. It is recommended to have the instrument calibrated once a year.

Clean the instrument housing using a dry cloth. For heavy dirt, use a damp cloth with a mild, non-abrasive household cleanser if necessary. Do not let liquid enter the housing of the ISN or the adapters. No chemicals may be used for cleaning purposes.

4.1 Spare parts

For the ISN R&S ENY81 the following spare parts are available:

1309.8510.03	ENY81 8-WIRE ISN (Basic Unit)
1309.8532.00	LCL Adapter 55/40dB CAT3, RJ45
1309.8549.00	LCL Adapter 55/40dB CAT3, 1mm Banana
1309.8555.00	LCL Adapter 65/50dB CAT5, RJ45
1309.8561.00	LCL Adapter 65/50dB CAT5, 1mm Banana
1309.8578.00	Connecting Adapter, RJ45
1309.8584.00	Connecting Adapter, 1mm Banana
1309.7565.00	Adapter RJ11 to 1mm Banana (6pol)
1309.7571.00	Adapter RJ45 to 1mm Banana (8pol)
1309.8610.00	Case with Inlay



Due to the high symmetry requirements, a re-calibration is always required if a new basic unit or a new LCL adapter shall be used together with existing units!



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