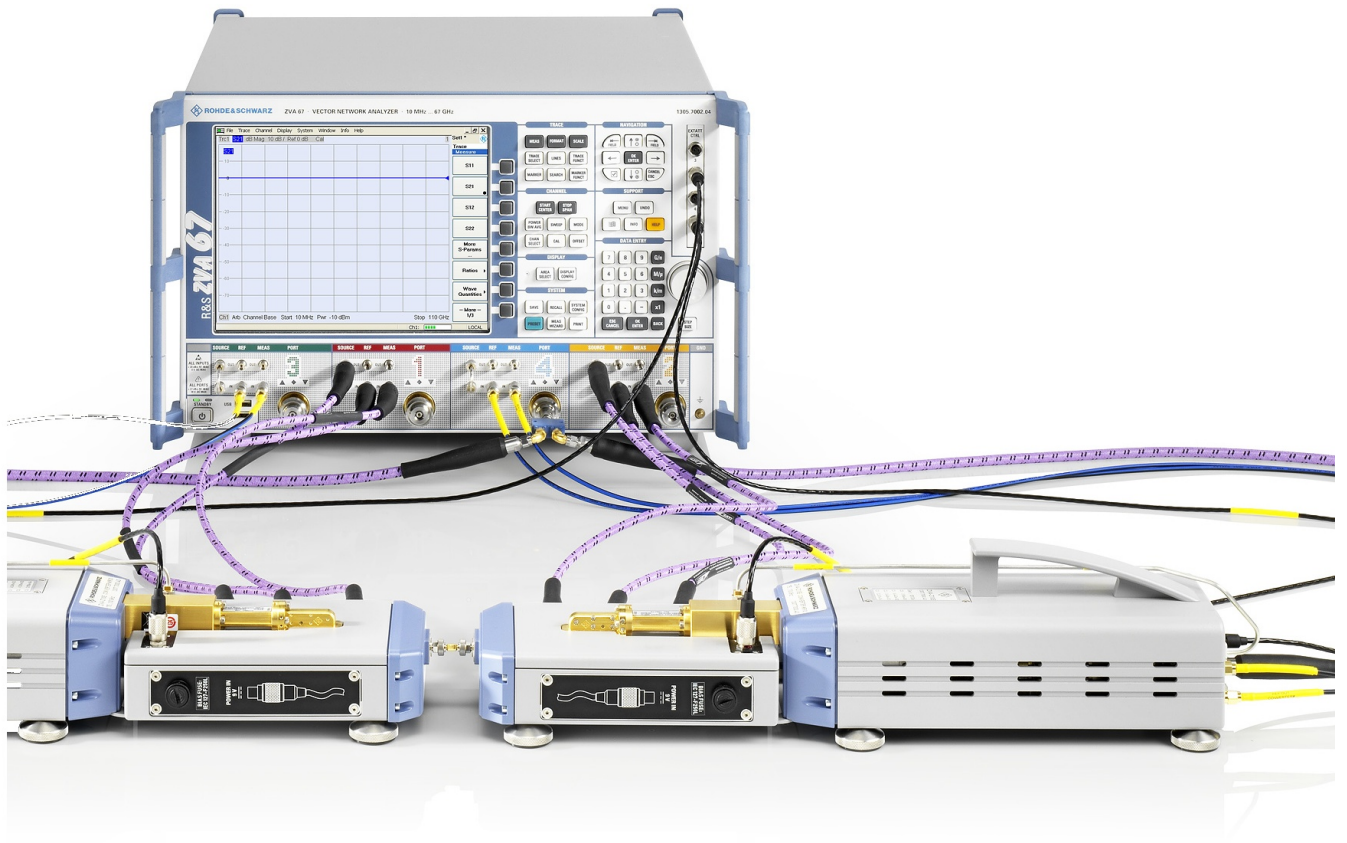


R&S® ZVA110

Broadband Measurements Using the 1 mm External Test Sets

Quick Start Guide



1314.4502.62 – 01

This Quick Start Guide describes the following network analyzer types:

- R&S® ZVA110, stock number 1312.7004.03, complete system (based on R&S®ZVA67)
- R&S® ZVA110, stock number 1312.7004.04, modular system

This guide complements the basic Quick Start Guide for all R&S®ZVA network analyzers, stock number 1145.1090.62 and the Quick Start Guide for frequency converters with electronic attenuators R&S®ZVA-ZxxxE, stock number 1307.7197.62. It describes the operation of the R&S®ZVA110 with external test sets.

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Muehldorfstr. 15, 81671 Munich, Germany

Phone: +49 89 41 29 - 0

Fax: +49 89 41 29 12 164

E-mail: info@rohde-schwarz.com

Internet: <http://www.rohde-schwarz.com>

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The following abbreviations are used throughout this guide: R&S®ZVAxx as R&S ZVAxx, R&S®ZVTxx as R&S ZVTxx, R&S®ZVA-BU as R&S ZVA-BU, R&S®ZVA-ZDxx as R&S ZVA-ZDxx, R&S®ZVA-Zxxx as R&S ZVA-Zxxx, R&S®ZV-Zxxx as R&S ZV-Zxxx, R&S®ZV-WRxx as R&S ZV-WRxx.

Basic Safety Instructions

Always read through and comply with the following safety instructions!

All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standards of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment they require are designed, built and tested in accordance with the safety standards that apply in each case. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed, built and tested in accordance with the attached 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, you must 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 any 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.

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 and when using the product. It is also absolutely essential to observe the additional safety instructions on personal safety, for example, 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.

Symbols and safety labels

							
Notice, general danger location Observe product documentation	Caution when handling heavy equipment	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Be careful when handling electrostatic sensitive devices

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

Tags and their meaning

The following signal words are used in the product documentation in order to warn the reader about risks and dangers.

	indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	indicates the possibility of incorrect operation which can result in damage to the product. 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 in personal injury or material damage.

Operating states and operating positions

The product may be operated only under the operating conditions and in the positions specified by the manufacturer, without the product's ventilation being obstructed. If the manufacturer's specifications are not observed, this can result in electric shock, fire and/or serious personal injury or death. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

1. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products: predefined operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only indoors, max. operating 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 $\pm 5\%$ to the nominal frequency.
2. 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). An installation that is not carried out as described in the product documentation could result in personal injury or death.
3. Do not place the product on heat-generating devices such as radiators or fan heaters. The ambient temperature must not exceed the maximum temperature specified in the product documentation or in the data sheet. Product overheating can cause electric shock, fire and/or serious personal injury or death.

Electrical safety

If the information on electrical safety is not observed either at all to the extent necessary, electric shock, fire and/or serious personal injury or death may occur.

1. Prior to switching on the product, always ensure 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.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with an earthing contact and protective earth connection.
3. 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.
4. If the product does not have a power switch for disconnection from the AC supply network, the plug of the connecting cable is regarded as the disconnecting device. In such cases, always ensure 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 network. If products without power switches are integrated into racks or systems, a disconnecting device must be provided at the system level.
5. 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, you can ensure that the cable will not be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.
6. 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).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. 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.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC60950-1/EN60950-1 or IEC61010-1/EN 61010-1 standards that apply in each case.
11. 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.
12. 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 licensed electrician.
13. 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 anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.

Basic Safety Instructions

14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1. Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.
2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).

Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.
2. Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts 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). This helps ensure the continued safety of the product.

Batteries and rechargeable batteries/cells

If the information regarding batteries and rechargeable batteries/cells is not observed either at all or to the extent necessary, product users may be exposed to the risk of explosions, fire and/or serious personal injury, and, in some cases, death. Batteries and rechargeable batteries with alkaline electrolytes (e.g. lithium cells) must be handled in accordance with the EN 62133 standard.

1. Cells must not be taken apart or crushed.
2. Cells or batteries must not be exposed to heat or fire. Storage in direct sunlight must be avoided. Keep cells and batteries clean and dry. Clean soiled connectors using a dry, clean cloth.
3. Cells or batteries must not be short-circuited. Cells or batteries must not be stored in a box or in a drawer where they can short-circuit each other, or where they can be short-circuited by other conductive materials. Cells and batteries must not be removed from their original packaging until they are ready to be used.
4. Keep cells and batteries out of the hands of children. If a cell or a battery has been swallowed, seek medical aid immediately.
5. Cells and batteries must not be exposed to any mechanical shocks that are stronger than permitted.
6. If a cell develops a leak, the fluid must not be allowed to come into contact with the skin or eyes. If contact occurs, wash the affected area with plenty of water and seek medical aid.
7. Improperly replacing or charging cells or batteries that contain alkaline electrolytes (e.g. lithium cells) can cause explosions. Replace cells or batteries only with the matching Rohde & Schwarz type (see parts list) in order to ensure the safety of the product.
8. Cells and batteries must be recycled and kept separate from residual waste. Rechargeable batteries and normal batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.

Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.

2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.
3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

Waste disposal

1. If products or their 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 by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
2. If handling the product releases 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. The improper disposal of hazardous substances or fuels can cause health problems and lead to environmental damage.

Informaciones elementales de seguridad

Es imprescindible leer y observar las siguientes instrucciones e informaciones de seguridad!

El principio del grupo de empresas Rohde & Schwarz consiste en tener nuestros productos siempre al día con los estándares de seguridad y de ofrecer a nuestros clientes el máximo grado de seguridad. Nuestros productos y todos los equipos adicionales son siempre fabricados y examinados según las normas de seguridad vigentes. Nuestro sistema de garantía de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el certificado de conformidad adjunto de la UE y ha salido de nuestra planta en estado impecable según los estándares técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, el usuario deberá atenerse a todas las indicaciones, informaciones de seguridad y notas de alerta. El grupo de empresas Rohde & Schwarz está siempre a su disposición en caso de que tengan preguntas referentes a estas informaciones de seguridad.

Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto está destinado exclusivamente al uso en la industria y el laboratorio o, si ha sido expresamente autorizado, para aplicaciones de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda sufrir daño. El uso del producto fuera de sus fines definidos o sin tener en cuenta las instrucciones del fabricante queda en la responsabilidad del usuario. El fabricante no se hace en ninguna forma responsable de consecuencias a causa del mal uso del producto.

Informaciones elementales de seguridad

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado conforme a las indicaciones de la correspondiente documentación del producto y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso del producto hace necesarios conocimientos técnicos y ciertos conocimientos del idioma inglés. Por eso se debe tener en cuenta que el producto solo pueda ser operado por personal especializado o personas instruidas en profundidad con las capacidades correspondientes. Si fuera necesaria indumentaria de seguridad para el uso de productos de Rohde & Schwarz, encontraría la información debida en la documentación del producto en el capítulo correspondiente. Guarde bien las informaciones de seguridad elementales, así como la documentación del producto, y entréguelas a usuarios posteriores.

Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto. Deberán tenerse en cuenta todas las demás informaciones de seguridad, como p. ej. las referentes a la protección de personas, que encontrarán en el capítulo correspondiente de la documentación del producto y que también son de obligado cumplimiento. En las presentes informaciones de seguridad se recogen todos los objetos que distribuye el grupo de empresas Rohde & Schwarz bajo la denominación de "producto", entre ellos también aparatos, instalaciones así como toda clase de accesorios.

Símbolos y definiciones de seguridad

							
Aviso: punto de peligro general Observar la documentación del producto	Atención en el manejo de dispositivos de peso elevado	Peligro de choque eléctrico	Advertencia: superficie caliente	Conexión a conductor de protección	Conexión a tierra	Conexión a masa	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)

					
Tensión de alimentación de PUESTA EN MARCHA / PARADA	Indicación de estado de espera (Standby)	Corriente continua (DC)	Corriente alterna (AC)	Corriente continua / Corriente alterna (DC/AC)	El aparato está protegido en su totalidad por un aislamiento doble (reforzado)

Palabras de señal y su significado

En la documentación del producto se utilizan las siguientes palabras de señal con el fin de advertir contra riesgos y peligros.



PELIGRO identifica un peligro inminente con riesgo elevado que provocará muerte o lesiones graves si no se evita.



ADVERTENCIA identifica un posible peligro con riesgo medio de provocar muerte o lesiones (graves) si no se evita.



ATENCIÓN identifica un peligro con riesgo reducido de provocar lesiones leves o moderadas si no se evita.



AVISO indica la posibilidad de utilizar mal el producto y, como consecuencia, dañarlo.

En la documentación del producto se emplea de forma sinónima el término CUIDADO.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el área económica europea. Pueden existir definiciones diferentes a esta definición en otras áreas económicas o en aplicaciones militares. Por eso se deberá tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación del producto y solamente en combinación con el producto correspondiente. La utilización de las palabras de señal en combinación con productos o documentaciones que no les correspondan puede llevar a interpretaciones equivocadas y tener por consecuencia daños en personas u objetos.

Estados operativos y posiciones de funcionamiento

El producto solamente debe ser utilizado según lo indicado por el fabricante respecto a los estados operativos y posiciones de funcionamiento sin que se obstruya la ventilación. Si no se siguen las indicaciones del fabricante, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte. En todos los trabajos deberán ser tenidas en cuenta las normas nacionales y locales de seguridad del trabajo y de prevención de accidentes.

1. Si no se convino de otra manera, es para los productos Rohde & Schwarz válido lo que sigue: como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, uso solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4500 m sobre el nivel del mar. Se aplicará una tolerancia de $\pm 10\%$ sobre el voltaje nominal y de $\pm 5\%$ sobre la frecuencia nominal.
2. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptos para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (p. ej. paredes y estantes). Si se realiza la instalación de modo distinto al indicado en la documentación del producto, pueden causarse lesiones o incluso la muerte.
3. No ponga el producto sobre aparatos que generen calor (p. ej. radiadores o calefactores). La temperatura ambiente no debe superar la temperatura máxima especificada en la documentación del producto o en la hoja de datos. En caso de sobrecalentamiento del producto, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

Seguridad eléctrica

Si no se siguen (o se siguen de modo insuficiente) las indicaciones del fabricante en cuanto a seguridad eléctrica, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.
2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de conexión como interruptor. En estos casos se deberá asegurar que el enchufe siempre sea de fácil acceso (de acuerdo con la longitud del cable de conexión, aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.
5. No utilice nunca el producto si está dañado el cable de conexión a red. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.
6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).
7. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.
8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.
9. En las mediciones en circuitos de corriente con una tensión $U_{\text{eff}} > 30 \text{ V}$ se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.
11. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar lesiones, fuego o daños en el producto.

12. Si un producto se instala en un lugar fijo, se deberá primero conectar el conductor de protección fijo con el conductor de protección del producto antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
13. En el caso de dispositivos fijos que no estén provistos de fusibles, interruptor automático ni otros mecanismos de seguridad similares, el circuito de alimentación debe estar protegido de modo que todas las personas que puedan acceder al producto, así como el producto mismo, estén a salvo de posibles daños.
14. Todo producto debe estar protegido contra sobretensión (debida p. ej. a una caída del rayo) mediante los correspondientes sistemas de protección. Si no, el personal que lo utilice quedará expuesto al peligro de choque eléctrico.
15. No debe introducirse en los orificios de la caja del aparato ningún objeto que no esté destinado a ello. Esto puede producir cortocircuitos en el producto y/o puede causar choques eléctricos, fuego o lesiones.
16. Salvo indicación contraria, los productos no están impermeabilizados (ver también el capítulo "Estados operativos y posiciones de funcionamiento", punto 1). Por eso es necesario tomar las medidas necesarias para evitar la entrada de líquidos. En caso contrario, existe peligro de choque eléctrico para el usuario o de daños en el producto, que también pueden redundar en peligro para las personas.
17. No utilice el producto en condiciones en las que pueda producirse o ya se hayan producido condensaciones sobre el producto o en el interior de éste, como p. ej. al desplazarlo de un lugar frío a otro caliente. La entrada de agua aumenta el riesgo de choque eléctrico.
18. Antes de la limpieza, desconecte por completo el producto de la alimentación de tensión (p. ej. red de alimentación o batería). Realice la limpieza de los aparatos con un paño suave, que no se deshilache. No utilice bajo ningún concepto productos de limpieza químicos como alcohol, acetona o diluyentes para lacas nitrocelulósicas.

Funcionamiento

1. El uso del producto requiere instrucciones especiales y una alta concentración durante el manejo. Debe asegurarse que las personas que manejen el producto estén a la altura de los requerimientos necesarios en cuanto a aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario u operador es responsable de seleccionar el personal usuario apto para el manejo del producto.
2. Antes de desplazar o transportar el producto, lea y tenga en cuenta el capítulo "Transporte".
3. Como con todo producto de fabricación industrial no puede quedar excluida en general la posibilidad de que se produzcan alergias provocadas por algunos materiales empleados, los llamados alérgenos (p. ej. el níquel). Si durante el manejo de productos Rohde & Schwarz se producen reacciones alérgicas, como p. ej. irritaciones cutáneas, estornudos continuos, enrojecimiento de la conjuntiva o dificultades respiratorias, debe avisarse inmediatamente a un médico para investigar las causas y evitar cualquier molestia o daño a la salud.
4. Antes de la manipulación mecánica y/o térmica o el desmontaje del producto, debe tenerse en cuenta imprescindiblemente el capítulo "Eliminación", punto 1.

5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.
6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.
7. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).

Reparación y mantenimiento

1. El producto solamente debe ser abierto por personal especializado con autorización para ello. Antes de manipular el producto o abrirlo, es obligatorio desconectarlo de la tensión de alimentación, para evitar toda posibilidad de choque eléctrico.
2. El ajuste, el cambio de partes, el mantenimiento y la reparación deberán ser efectuadas solamente por electricistas autorizados por Rohde & Schwarz. Si se reponen partes con importancia para los aspectos de seguridad (p. ej. el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada cambio de partes relevantes para la seguridad deberá realizarse un control de seguridad (control a primera vista, control del conductor de protección, medición de resistencia de aislamiento, medición de la corriente de fuga, control de funcionamiento). Con esto queda garantizada la seguridad del producto.

Baterías y acumuladores o celdas

Si no se siguen (o se siguen de modo insuficiente) las indicaciones en cuanto a las baterías y acumuladores o celdas, pueden producirse explosiones, incendios y/o lesiones graves con posible consecuencia de muerte. El manejo de baterías y acumuladores con electrolitos alcalinos (p. ej. celdas de litio) debe seguir el estándar EN 62133.

1. No deben desmontarse, abrirse ni triturarse las celdas.
2. Las celdas o baterías no deben someterse a calor ni fuego. Debe evitarse el almacenamiento a la luz directa del sol. Las celdas y baterías deben mantenerse limpias y secas. Limpiar las conexiones sucias con un paño seco y limpio.
3. Las celdas o baterías no deben cortocircuitarse. Es peligroso almacenar las celdas o baterías en estuches o cajones en cuyo interior puedan cortocircuitarse por contacto recíproco o por contacto con otros materiales conductores. No deben extraerse las celdas o baterías de sus embalajes originales hasta el momento en que vayan a utilizarse.
4. Mantener baterías y celdas fuera del alcance de los niños. En caso de ingestión de una celda o batería, avisar inmediatamente a un médico.
5. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.

Informaciones elementales de seguridad

6. En caso de falta de estanqueidad de una celda, el líquido vertido no debe entrar en contacto con la piel ni los ojos. Si se produce contacto, lavar con agua abundante la zona afectada y avisar a un médico.
7. En caso de cambio o recarga inadecuados, las celdas o baterías que contienen electrolitos alcalinos (p. ej. las celdas de litio) pueden explotar. Para garantizar la seguridad del producto, las celdas o baterías solo deben ser sustituidas por el tipo Rohde & Schwarz correspondiente (ver lista de recambios).
8. Las baterías y celdas deben reciclarse y no deben tirarse a la basura doméstica. Las baterías o acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de eliminación y reciclaje.

Transporte

1. El producto puede tener un peso elevado. Por eso es necesario desplazarlo o transportarlo con precaución y, si es necesario, usando un sistema de elevación adecuado (p. ej. una carretilla elevadora), a fin de evitar lesiones en la espalda u otros daños personales.
2. Las asas instaladas en los productos sirven solamente de ayuda para el transporte del producto por personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como p. ej. grúas, carretillas elevadoras de horquilla, carros etc. Es responsabilidad suya fijar los productos de manera segura a los medios de transporte o elevación. Para evitar daños personales o daños en el producto, siga las instrucciones de seguridad del fabricante del medio de transporte o elevación utilizado.
3. Si se utiliza el producto dentro de un vehículo, recae de manera exclusiva en el conductor la responsabilidad de conducir el vehículo de manera segura y adecuada. El fabricante no asumirá ninguna responsabilidad por accidentes o colisiones. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Asegure el producto dentro del vehículo debidamente para evitar, en caso de un accidente, lesiones u otra clase de daños.

Eliminación

1. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polvos con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.
2. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

Kundeninformation zur Batterieverordnung (BattV)

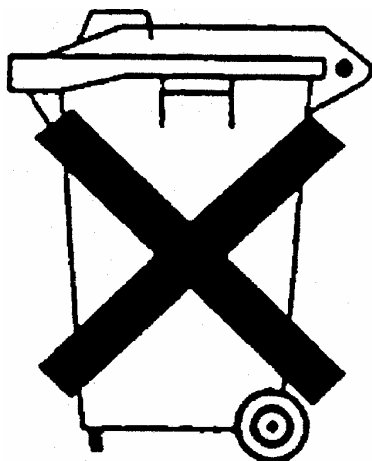
Dieses Gerät enthält eine schadstoffhaltige Batterie. Diese darf nicht mit dem Hausmüll entsorgt werden.

Nach Ende der Lebensdauer darf die Entsorgung nur über eine Rohde&Schwarz-Kundendienststelle oder eine geeignete Sammelstelle erfolgen.

Safety Regulations for Batteries (according to BattV)

This equipment houses a battery containing harmful substances that must not be disposed of as normal household waste.

After its useful life, the battery may only be disposed of at a Rohde & Schwarz service center or at a suitable depot.



Normas de Seguridad para Baterías (Según BattV)

Este equipo lleva una batería que contiene sustancias perjudiciales, que no se debe desechar en los contenedores de basura domésticos.

Después de la vida útil, la batería sólo se podrá eliminar en un centro de servicio de Rohde & Schwarz o en un depósito apropiado.

Consignes de sécurité pour batteries (selon BattV)

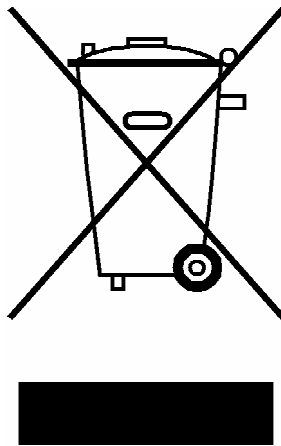
Cet appareil est équipé d'une pile comprenant des substances nocives. Ne jamais la jeter dans une poubelle pour ordures ménagères.

Une pile usagée doit uniquement être éliminée par un centre de service client de Rohde & Schwarz ou peut être collectée pour être traitée spécialement comme déchets dangereux.

Customer Information Regarding Product Disposal

The German Electrical and Electronic Equipment (ElektroG) Act is an implementation of the following EC directives:

- 2002/96/EC on waste electrical and electronic equipment (WEEE) and
- 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).



Product labeling in accordance with EN 50419

Once the lifetime of a product has ended, this product must not be disposed of in the standard domestic refuse. Even disposal via the municipal collection points for waste electrical and electronic equipment is not permitted.

Rohde & Schwarz GmbH & Co. KG has developed a disposal concept for the environmental-friendly disposal or recycling of waste material and fully assumes its obligation as a producer to take back and dispose of electrical and electronic waste in accordance with the ElektroG Act.

Please contact your local service representative to dispose of the product.



Qualitätszertifikat

Certificate of quality

Certificat de qualité

Certified Quality System
ISO 9001

Certified Environmental System
ISO 14001

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 Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde&Schwarz-Qualitätsmanagementsystem ist u.a. nach ISO9001 und ISO14001 zertifiziert.

Der Umwelt verpflichtet

- ▮ Energie-effiziente, RoHS-konforme Produkte
- ▮ Kontinuierliche Weiterentwicklung nachhaltiger Umweltkonzepte
- ▮ ISO 14001-zertifiziertes Umweltmanagementsystem

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 standards such as ISO9001 and ISO14001.

Environmental commitment

- ▮ Energy-efficient products
- ▮ Continuous improvement in environmental sustainability
- ▮ ISO 14001-certified environmental management system

Cher client,

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, entre autres, conformément aux normes ISO9001 et ISO14001.

Engagement écologique

- ▮ Produits à efficience énergétique
- ▮ Amélioration continue de la durabilité environnementale
- ▮ Système de gestion de l'environnement certifié selon ISO 14001

Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish. We will take care that you will get the right information.

Europe, Africa, Middle East

Phone +49 89 4129 12345
customersupport@rohde-schwarz.com

North America

Phone 1-888-TEST-RSA (1-888-837-8772)
customer.support@rsa.rohde-schwarz.com

Latin America

Phone +1-410-910-7988
customersupport.la@rohde-schwarz.com

Asia/Pacific

Phone +65 65 13 04 88
customersupport.asia@rohde-schwarz.com



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1 Safety Instructions

This vector network analyzer 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.

NOTICE

Risk of instrument damage

To prevent instrument damage make sure to read through and observe the following safety instructions.

ESD protective measures

To protect the network analyzer and the external test sets against damage due to Electrostatic Discharge (ESD) use the wrist strap and grounding cord supplied with the network analyzer and connect yourself to the GND connector at the front panel of the analyzer. For details refer to the R&S ZVA Quick Start Guide, stock no. 1145.1090.62.

Input powers RF IN and LO IN

The RF input power at the connectors RF IN and LO IN must not exceed the maximum values quoted in the data sheet. The maximum values are below the maximum RF source power of the network analyzer. The "ZVA110-BU" mode ensures compatible source powers.

Before you connect your external test set to the network analyzer, always activate the "ZVA110-BU" mode using the "Frequency Converter" dialog (see [chapter 3.3, "Activating the ZVA110-BU Measurement Mode"](#), on page 23).

Avoid heavy shocks

Heavy shocks can damage inner parts of the devices. Shock-proof packing should therefore be used for storing or dispatching the analyzer and the external test sets.

Opening the instrument

Do not open the frequency converter and diplexer elements of the external test sets. Repair can only be done at the manufacturer's servicing department.

Using frequency converters separately

The frequency converters may be dismantled from the external test sets and used separately; see [chapter 4, "Dismounting Frequency Converters"](#), on page 30. The waveguide flanges of the dismantled converters and of the test port adapters must be protected against mechanical damage. Furthermore the waveguides must be shielded from dust.

Protect the waveguide flange of the dismantled converter by leaving a test port adapter connected. When the converter is not in use attach one of the included protective caps to the adapter. Avoid scratching the contact surfaces of the waveguide flanges.

2 Preparing the Analyzer for Use

The R&S ZVA110 vector network analyzer supports two essentially different measurement modes:

- Measurements with internal test sets cover a frequency range between 10 MHz and approx. 67 GHz.
The R&S ZVA110 types 03 and 04 are based on a four-port R&S ZVA67 vector network analyzer. The DUT can be connected to any of the four test ports of the R&S ZVA67. One to four-port measurements are supported as described in the R&S ZVA Quick Start Guide, stock number 1145.1090.62, and in the network analyzer's help system.
- Measurements with external test sets cover an extended frequency range between 10 MHz and 110 GHz. The DUT is connected to the 1 mm connector(s) at the front of the diplexers R&S ZVA-ZD110. This measurement mode is described in the present manual.

This chapter describes the external test sets and their connection to the DUT and to the R&S ZVA110 vector network analyzer. A typical measurement example is presented in [chapter 3, "Basic Operation"](#), on page 23.



The measurement mode is selected in the "Frequency Converter" tab of the "System Configuration" dialog: "NONE" for measurements with internal test sets, "ZVA110-BU" for external test sets. See [chapter 3.3, "Activating the ZVA110-BU Measurement Mode"](#), on page 23.

2.1 Operation with External Test Sets

The external test sets enable a frequency range between 10 MHz and 110 GHz. The analyzer combines two different measurement methods to achieve this extended range.

- At frequencies below approx. 67 GHz (i.e. in "low frequency" mode), the frequency converter in the external test set is bypassed. The source signals from test ports PORT 1 / 2 of the vector network analyzer unit are directly fed to the 1 mm test port connectors of the diplexers. The network analyzer measures the a-waves (reference channels) from REF OUT and the b-waves (measurement channels) from MEAS OUT on the diplexers. The connector groups PORT 3 / 4 on the network analyzer and the RF connectors LO IN, RF IN, REF OUT, MEAS OUT on the rear panel of the converters are not used.
- To achieve frequencies above approx. 67 GHz (i.e. to measure in "high frequency" mode), the source signals from test ports PORT 1 / 2 of the network analyzer are fed to the frequency converters; the converted signals are routed to the 1 mm test port connectors of the diplexers. The frequency converters use frequency multipliers to transform the source signal into a high-frequency stimulus signal. An additional Local Oscillator (LO) signal from PORT 4 of the analyzer is used for down-conversion of the reference and measurement channels. A power divider feeds the LO signal to

both the left and the right converter. This test setup ensures a stable phase relationship between both LO signals.

The analyzer measures the a-waves from REF OUT and the b-waves from MEAS OUT on the converters. The RF connectors REF OUT, MEAS OUT on the rear panel of the diplexers are not used.

The network analyzer automatically switches between low frequency and high frequency mode, depending on the stimulus frequency; see [chapter 2.3.2, "H/L SWITCH Connector"](#), on page 9. There is no need to change the test setup and cabling.

2.2 R&S ZVA110 Network Analyzer Connectors

The R&S ZVA110 is based on a four-port R&S ZVA67 vector network analyzer.

The front and rear panel controls and the connectors of the analyzer are described in the R&S ZVA Quick Start Guide, stock number 1145.1090.62 and in the analyzer's help system. The following sections describe special aspects for measurements with external test sets.

2.2.1 Test Port Connectors

The R&S ZVA67 of the R&S ZVA110 is equipped with four complete test port connector groups. The PORT 1 to PORT 4 connector groups are similar. Each of them consists of a bidirectional, ruggedized 1.85 mm connector and 3 pairs of 1.85 mm (V) connectors for direct generator and receiver access.



The connectors are used alternatively:

- The ruggedized 1.85 mm connector serves as a test port connector for one to four-port measurements with **internal** test set. In this operating mode, the three 1.85 mm connector pairs are generally not needed, however, they can provide an extended measurement functionality (see R&S ZVA Quick Start Guide, stock number 1145.1090.62, and the network analyzer's help system). Unused OUT/IN loops must be closed by means of jumpers as shown in the figure above.
- The SOURCE OUT connector provides the RF source signal for the **external** test set. SOURCE OUT is connected to the rear panel of the diplexer. In the low frequency range below approx. 67 GHz, REF IN and MEAS IN receive the reference waves and measured waves from the diplexer, respectively. The 1 mm connector of the diplexer

serves as a test port connector; the ruggedized 1.85 mm connectors at PORT 1 / 2 are not needed.

See also [chapter 2.1, "Operation with External Test Sets"](#), on page 6 and [chapter 2.5.6, "Connecting RF Cables"](#), on page 17.

NOTICE

Maximum input levels

The maximum RF input levels at the ruggedized 1.85 mm connectors and at all SOURCE, REF, and MEAS inputs according to the front panel labeling or the data sheet must not be exceeded. In addition, it is important that the signal fed in at the SOURCE, REF, and MEAS inputs contains no DC offset, as this may impair the measurements and even cause damage to the instrument.

2.3 Diplexer Connectors

The R&S ZVA110 is delivered with two fully assembled external test sets, each consisting of a diplexer R&S ZVA-ZD110 and a frequency converter R&S ZVA-Z110E.

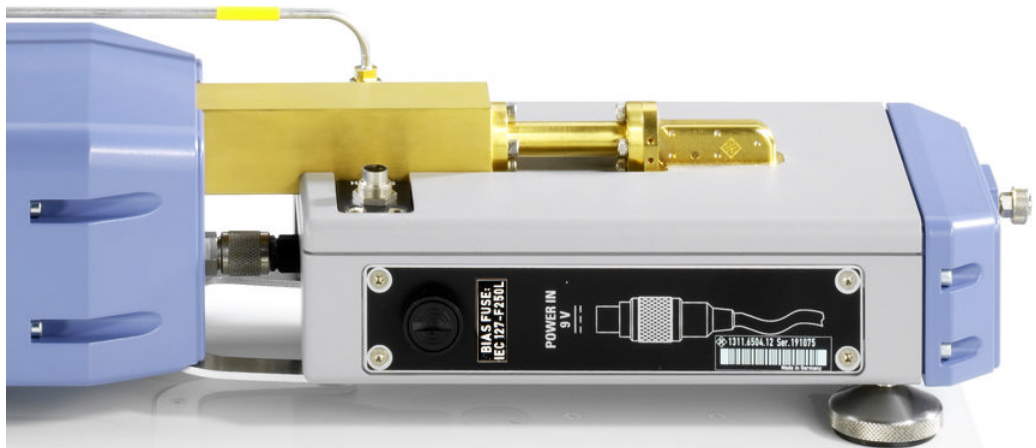


Fig. 2-1: Connection between diplexer (right) and frequency converter (left)

The connection of the diplexer and the frequency converter includes conducting lines for waves and power supply:

- The RF HIGH OUT connector on the top side of the diplexer is connected to RF IN on the rear panel of the converter using a semi-rigid RF cable.
- The waveguide connector on the top side of the diplexer is connected to the waveguide flange of the converter.
- The connection underneath the waveguide flange ensures the power supply of the diplexer.

An additional metal clamp at the bottom ensures mechanical stability.



Dismounting the frequency converter

The connection shown above is suitable for all operating modes and measurements. Only dismount the frequency converter from the diplexer if you want to use it separately; see [chapter 4, "Dismounting Frequency Converters"](#), on page 30.

2.3.1 Test Port



1 mm (m) connector, serves as an output for RF stimulus signals and as an input for the measured RF signals from the DUT (response signals).

- With a single external test set, it is possible to generate a stimulus signal and measure the response signal in reflection.
- With two external test sets, it is possible to perform full 2-port measurements.

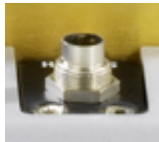
NOTICE

Maximum input level, mechanical damage

Do not exceed the maximum input level at the test port according to the data sheet, especially when using active DUTs or external amplifiers.

To avoid mechanical damage when connecting devices to the 1 mm connector, always use the torque wrench supplied with the R&S ZVA110.

2.3.2 H/L SWITCH Connector



The H/L SWITCH connectors on the top side of each diplexer are input connectors for the control signals from the USER CONTROL connector on the rear panel of the R&S ZVA110 network analyzer unit; see [chapter 2.5.4, "Connecting the Control Cable"](#), on page 16.

2.3.3 Rear Panel

The rear panel of the diplexer provides input and output connectors for RF signals and a DC input. Connectors labeled LOW are used in low frequency mode only; see [chapter 2.1, "Operation with External Test Sets"](#), on page 6.



Fig. 2-2: Rear panel of the diplexer

- MEAS OUT LOW is a 1.85 mm (V) female connector which provides the measured signal (b-wave) in low frequency mode.

- RF IN LOW / HIGH is a 1.85 mm (V) female connector which receives the RF source signal from the R&S ZVA110 network analyzer unit. This connector is used in low frequency and in high frequency mode.
- REF OUT LOW is a 1.85 mm (V) female connector which provides the reference signal (a-wave) in low frequency mode.
- BIAS is a BNC connector which serves as a DC bias input for the external test set. The BIAS input is protected by an exchangeable fuse; see [chapter 2.3.4, "Fuse Holder"](#), on page 10.

MEAS OUT, RF IN, and REF OUT are connected to the corresponding 1.85 mm connectors of PORT 1 / 2 at the R&S ZVA110 network analyzer unit. The complete RF connection of the external test set is described in [chapter 2.5.6, "Connecting RF Cables"](#), on page 17.

NOTICE

Maximum input power at RF IN

The RF input power at the RF IN connector must not exceed the maximum value quoted in the data sheet. The maximum value is below the maximum RF source power of the network analyzer. The "ZVA110-BU" mode ensures compatible source powers.

Before you connect your external test set to the network analyzer, always activate the "ZVA110-BU" mode using the "Frequency Converter" dialog (see [chapter 3.3, "Activating the ZVA110-BU Measurement Mode"](#), on page 23).

NOTICE

Maximum input voltage at BIAS and EMI suppression

The maximum nominal input voltage and current for the BIAS connector must not exceed the value quoted in the data sheet. Use a double-shielded cable and terminate open cable ends with 50 Ω to ensure successful control of electromagnetic radiation during operation.

The LED labeled ON lights when the diplexer is properly power-supplied. If the LED does not light, check the following:

- The power connection between the diplexer and the converter must be in place (see [figure 2-1](#)).
- The converter must be power-supplied and switched on.
- The fuse at the converter must be intact.

2.3.4 Fuse Holder



A fuse of type IEC 127-F250L at the front protects the diplexer from excess input current at the BIAS connector. The frequency converter is protected by a fuse of different type; see [chapter 2.4.2.3, "Fuse Holder"](#), on page 13.

For fuse replacement refer to [chapter 2.5.10, "Replacing Fuses"](#), on page 21.

2.4 Frequency Converter Connectors

The R&S ZVA110 is delivered with two fully assembled external test sets, as described in [chapter 2.3, "Diplexer Connectors"](#), on page 8. The open connectors of the converter are described in the following sections.

2.4.1 Waveguide Flange

For normal operation, the waveguide adapter with the precision waveguide flange mounted on top is connected to the diplexer. If the frequency converter is used separately, a DUT can be connected to the waveguide flange. Refer to the Quick Start Guide for frequency converters R&S ZVA-ZxxxE, stock no. 1307.7197.62, for detailed information and safety instructions. This Quick Start Guide is posted on the R&S internet.

See also [chapter 4, "Dismounting Frequency Converters"](#), on page 30.

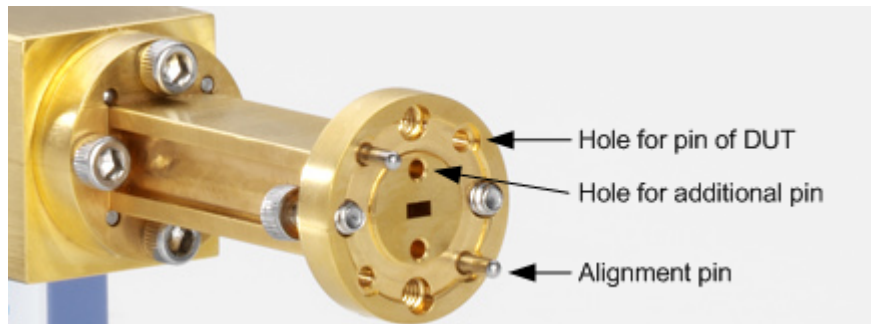


Fig. 2-3: Test port adapter of the frequency converter

2.4.2 Rear Panel

The rear panel of the frequency converter provides the connectors and control elements shown below.



Fig. 2-4: Rear view of the frequency converter

The connectors are described in the following sections.

2.4.2.1 Standby Switch

The standby toggle switch connects (ready state) or disconnects (standby state) the internal modules of the frequency converter from the power supply. This includes the output connector for the power supply connection to the diplexer (see [figure 2-1](#)).



Fig. 2-5: Standby switch and LEDs

A green light-emitting diode (LED) next to the switch indicates that the instrument is in ready state. An orange LED further to the right indicates that the instrument is in standby state. These LEDs are only lit when the converter is properly connected to the power supply and the fuse of the instrument is intact.

2.4.2.2 Power Supply Connector



To supply the frequency converter, connect the external DC power supply provided with the converter to the 9 V / 1.1 A DC input. For details see [chapter 2.5.7](#), "Connecting the Converter to the DC Supply", on page 20.

Always switch the instrument to standby state before removing the power supply.

NOTICE**Risk of instrument damage**

The input voltage and current must not exceed the maximum values according to the rear panel labeling or the data sheet.

Always use the DC power supply included in the delivery to power your frequency converter.

2.4.2.3 Fuse Holder

A fuse of type IEC60127 T1 L/H protects the frequency converter from excess input voltages at the power supply connector. The diplexer is protected by a fuse of different type; see [chapter 2.3.4, "Fuse Holder"](#), on page 10.

For fuse replacement see [chapter 2.5.10, "Replacing Fuses"](#), on page 21.

2.4.2.4 RF Connectors – Input

Two 3.5 mm input connectors:

- RF IN receives the RF source signal from the diplexer. A semi-rigid cable connects RF IN to the RF HIGH OUT connector on the top side of the diplexer.
- LO IN receives the local oscillator signal from the R&S ZVA110 network analyzer unit.

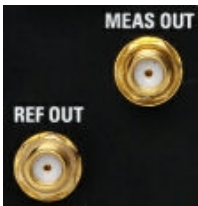
Both input connectors are only used in high frequency mode. The complete RF connection of the external test set is described in [chapter 2.5.6, "Connecting RF Cables"](#), on page 17.

NOTICE**Risk of instrument damage**

The RF input power at the connectors RF IN and LO IN must not exceed the maximum values quoted in the data sheet. The maximum values are below the maximum RF source power of the network analyzer. The "ZVA110-BU" mode ensures compatible source powers.

Before you connect your external test set to the network analyzer, always activate the "ZVA110-BU" mode using the "Frequency Converter" dialog (see [chapter 3.3, "Activating the ZVA110-BU Measurement Mode"](#), on page 23).

2.4.2.5 IF Connectors – Output



Two SMA output connectors:

- MEAS OUT provides the measured signal (b-wave) for the R&S ZVA110 network analyzer unit.
- REF OUT provides the reference signal (a-wave) for the R&S ZVA110 network analyzer unit.

The output connectors are connected to the corresponding SMA connectors of PORT 3 / 4 at the R&S ZVA110 network analyzer unit. Both are only used in high frequency mode. The complete RF connection of the external test set is described in [chapter 2.5.6, "Connecting RF Cables"](#), on page 17.

2.4.2.6 Power Control Connector



The three-pin power control connector receives the control signal for the source power of the vector network analyzer. The control signal is used in the high frequency range above approx. 67 GHz.

For correct connection read [chapter 2.5.4, "Connecting the Control Cable"](#), on page 16.

2.5 Putting the Analyzer into Operation

The basic steps to be taken when setting up the R&S ZVA110 network analyzer unit for the first time are described in the R&S ZVA Quick Start Guide, stock number 1145.1090.62 and in the network analyzer's help system. This section gives additional information related to operation with external test sets.

2.5.1 Unpacking and Checking the Instrument

The R&S ZVA110 network analyzer unit is shipped in a cardboard box; for unpacking instructions refer to the R&S ZVA Quick Start Guide, stock number 1145.1090.62. Each of the two external test sets is shipped in a separate wooden case. The external test sets are fully mounted and accompanied by the necessary cables and additional equipment.

When you receive the shipment, please take the following steps:

1. Unpack the test sets and the other contents of the wooden case.
2. Check the contents of the cases against the list of accessories to ensure that all items are included.
3. Remove the protective caps from the 1 mm test ports at the front of the diplexer elements and carefully inspect the converters and diplexers to make sure that they were not damaged during shipment.

Should the external test sets be damaged, immediately notify the forwarder who shipped them to you. External test sets returned to Rohde & Schwarz or sent in for repair must be packed in the original wooden cases. The cases should also be kept for storing the test sets and the accessories.

See also [chapter 2.7, "Storing and Packing"](#), on page 21 and [chapter 4.1, "Service Re-Calibration"](#), on page 31.

2.5.2 Positioning the Instrument

The R&S ZVA110 is designed for use under laboratory conditions on a bench top. The surface of the bench top should be flat. The external test sets must be used in horizontal position.

The general ambient conditions required at the operating site are as follows:

- The ambient temperature must be in the ranges specified for operation and for compliance with specifications (see data sheet).
- All ventilation openings must be unobstructed.

NOTICE

Risk of instrument and DUT damage

To avoid damage of electronic components of the DUT and the R&S ZVA110, the operating site must be protected against electrostatic discharge (ESD).

To prevent ESD damage use the wrist strap and grounding cord supplied with the network analyzer and connect yourself to the GND connector at the front panel of the analyzer. For details refer to the R&S ZVA Quick Start Guide.

2.5.3 Adjusting the Feet of the Test Set

The frequency converter can be used with three or four feet attached to the bottom side. It is recommended to use three feet: two in front and one in the middle of the rear. Two additional feet support the diplexer.

In most cases the external test set can be aligned as follows: Screw the diplexer feet and the front feet into the instrument as far as possible and use the rear foot to align the entire test set parallel to the surface of the bench top. When you connect a DUT in-between two test sets (see [chapter 2.5.9, "Mounting a DUT"](#), on page 21) use the diplexer feet for further alignment.



Fig. 2-6: Setup with one rear foot (left) and two rear feet (right)

2.5.4 Connecting the Control Cable

Switchover between low frequency and high frequency mode is automatically controlled from the R&S ZVA110 network analyzer unit. If you operate your R&S ZVA110 in high frequency mode, use the "H/L Switch" cable supplied with the R&S ZVA110 to connect the USER CONTROL connector on the rear panel of the network analyzer unit to the H/L SWITCH connectors on the top side of each diplexer. The cable end labeled H/L SWITCH PORT 1 is intended for the "left" diplexer (connected to the analyzer ports 1 and 3); the cable end labeled H/L SWITCH PORT 2 is for the "right" diplexer (connected to ports 2 and 4).

The H/L switch mechanism is controlled by the drive port bits no. 1 and 2 (pins no. 16 and 17) of the USER CONTROL connector. For a detailed description of the connector refer to the help system of your network analyzer.



Low frequency mode

The control cable is not needed in low frequency mode. It is recommended to remove the control cable if no frequencies above approx. 67 GHz are measured, even if the DUT is connected to the 1 mm test port connectors of the diplexers.

2.5.5 Connecting the Power Control Cable

The source power of the vector network analyzer is controlled from the R&S ZVA67 vector network analyzer. Connect the 3-pin control connector at the rear panel of the converter to the output connector of option R&S ZVA-B8 (EXTATT CTRL) at the top right of the R&S ZVA front panel using the control cable supplied with the converter.



The numbers below the EXTATT CTRL connectors denote the controlled analyzer ports. Control connector numbers and analyzer port numbers must always be the same.

2.5.6 Connecting RF Cables

The R&S ZVA110 is delivered with two fully assembled external test sets, each consisting of a diplexer R&S ZVA-ZD110 and a frequency converter WR10 R&S ZVA-Z110E. The "internal" connection between the diplexers and frequency converters is described in [chapter 2.3, "Diplexer Connectors"](#), on page 8. The left test set is intended for PORT 1 / PORT 3 of the R&S ZVA67 network analyzer; the right test set for PORT 2 / PORT 4. Connection of the two test sets is analogous.

NOTICE

Risk of instrument damage

The RF input power at the RF IN and LO IN connectors must not exceed the maximum value quoted in the data sheet. The maximum value is below the maximum RF source power of the network analyzer. The "ZVA110-BU" mode ensures compatible source powers.

Before you connect your external test set to the network analyzer, always activate the "ZVA110-BU" mode using the "Frequency Converter" dialog (see [chapter 3.3, "Activating the ZVA110-BU Measurement Mode"](#), on page 23).

NOTICE

Connecting cables, risk of damage

A full set of connecting cables including the necessary adapters (for instrument types 03 and 04) is supplied with the R&S ZVA110. It is strictly recommended to use these high-quality cables for the RF connection. For accurate measurement results, RF cables must have a low attenuation and an excellent phase stability.

Tightening the cable connectors too much may cause damage. Loose connections can result in inaccurate measurement results. For these reasons always use appropriate torque wrenches, suitable for the different connectors types. A torque wrench for the delicate 1 mm connector is supplied with the R&S ZVA110.

Some of the RF connections are only used while the network analyzer operates in the low frequency range (below approx. 67 GHz) or in the high frequency range (above approx. 67 GHz). It is strongly recommended though to establish all RF connections, as this ensures full flexibility and maximum accuracy .

1. Ensure that the converter is in standby state or disconnected from the power supply (see [chapter 2.4.2.1, "Standby Switch"](#), on page 12).
2. Ensure that the "ZVA110-BU" mode is activated at the network analyzer (see [chapter 3, "Basic Operation"](#), on page 23).
3. Connect the RF input and output connectors of the diplexers and the frequency converters as shown below.

The following figure shows the cabling of the left test set to the R&S ZVA67 network analyzer. Notice that the test port connector PORT 4 provides the LO IN signal for both

the left and the right converters. An appropriate RF power divider R&S ZV-Z1227 is supplied with the R&S ZVA110.

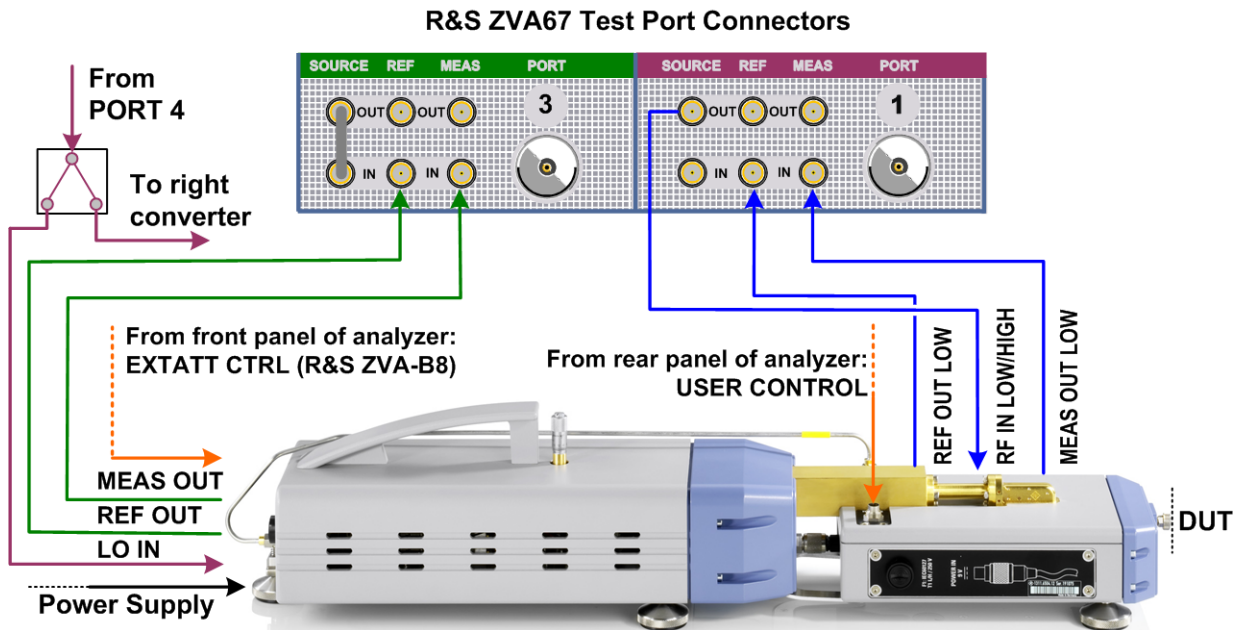


Fig. 2-7: Connection of left test set

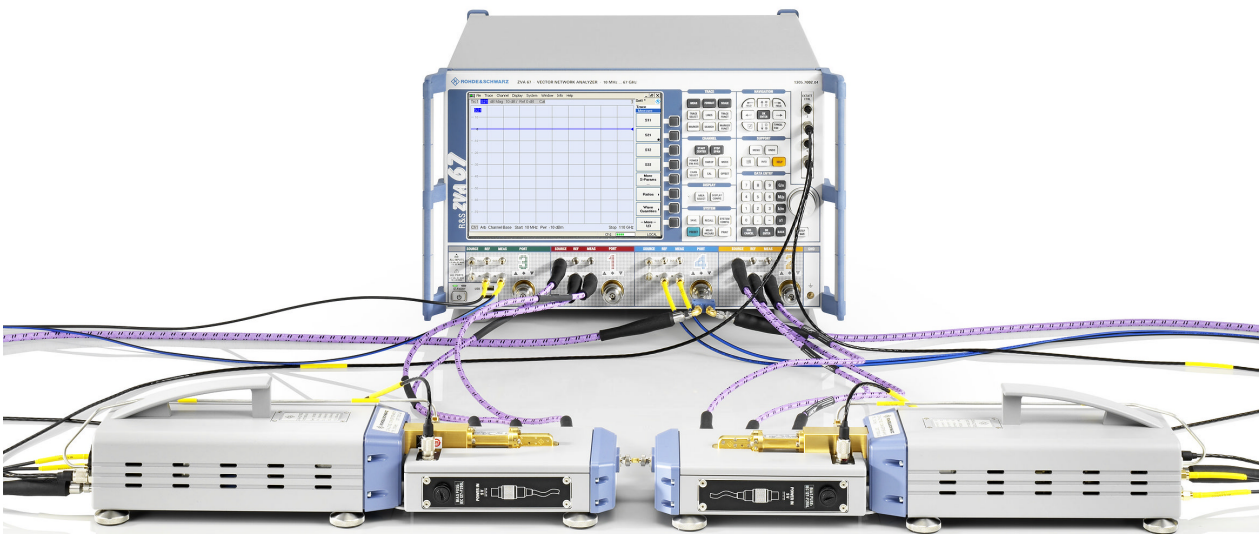
Table 2-1: RF connection for left external test set

R&S ZVA67 connector	Ext. test set connector	Cable	Used at frequencies
PORT 1 – SOURCE OUT	Diplexer – RF IN	R&S ZV-Z196 67 GHz, 1.85 mm (M) – 1.85 mm (M), 0.6 m	LOW / HIGH
PORT 1 – REF IN	Diplexer – REF OUT	R&S ZV-Z196 67 GHz, 1.85 mm (M) – 1.85 mm (M), 0.6 m	LOW
PORT 1 – MEAS IN	Diplexer – MEAS OUT	R&S ZV-Z196 67GHz, 1.85 mm (M) – 1.85 mm (M), 0.6 m	LOW
PORT 3 – SOURCE OUT must be connected to PORT 3 – SOURCE IN ¹⁾	–	–	–
PORT 3 – REF IN	Converter – REF OUT	CABLE MEAS, 1.55 m	HIGH
PORT 3 – MEAS IN	Converter – MEAS OUT	CABLE REF, 1.55 m	HIGH

1) The output signal at the ruggedized test port PORT 3 can be used as an auxiliary signal, e.g. an LO signal for a mixer under test.

Table 2-2: RF connection for right external test set

R&S ZVA67 connector	Ext. test set connector	Cable	Used at frequencies
PORT 2 – SOURCE OUT	Diplexer – RF IN	R&S ZV-Z196, 1.85 mm (M) – 1.85 mm (M), 0.6 m	LOW / HIGH
PORT 2 – REF IN	Diplexer – REF OUT	R&S ZV-Z196, 1.85 mm (M) – 1.85 mm (M), 0.6 m	LOW
PORT 2 – MEAS IN	Diplexer – MEAS OUT	R&S ZV-Z196, 1.85 mm (M) – 1.85 mm (M), 0.6 m	LOW
PORT 4 – ruggedized connector	Power divider to both converter – LO IN connectors	R&S ZV-Z193, 3.5 mm (M) – 3.5 mm (M), 1.5 m R&S ZV-Z1227, POWER DIVIDER	HIGH
PORT 3 – SOURCE OUT must be connected to PORT 3 – SOURCE IN	–	–	–
PORT 4 – REF IN	Converter – REF OUT	CABLE MEAS, 1.55 m	HIGH
PORT 4 – MEAS IN	Converter – MEAS OUT	CABLE REF, 1.55 m	HIGH

**Fig. 2-8: Complete test setup for 2-port transmission measurement**

Right and left diplexers and converters

A label on the rear panel of the network analyzer shows the two diplexer and converter units with their position. The label contains the following information.

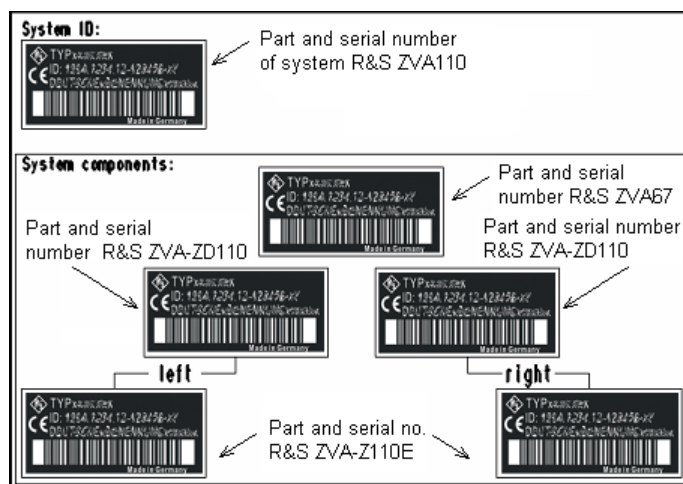


Fig. 2-9: System component information



Compliance with rated specifications

The "left" external test set (consisting of one diplexer R&S ZVA-ZD110 plus one converter R&S ZVA-Z110E) is connected to the analyzer ports 1 and 3; the "right" external test set to the analyzer ports 2 and 4. Compliance with the rated specifications requires a system setup according to the rear panel labeling. Never interchange the left and right diplexer and converter units, and never interchange diplexers and converters from different R&S ZVA110 systems.

2.5.7 Connecting the Converter to the DC Supply

An external DC power supply and several plug adapters are provided with each of the external test sets. Select the appropriate adapter and attach it to the power supply. To remove a mounted adapter press the small button next to the adapter and push the adapter away from the button.

Connect the power supply to the 9 V / 1.1 A DC input at the rear panel of the frequency converter (see [chapter 2.4.2.2, "Power Supply Connector"](#), on page 12) and to a power outlet. The power supply supports input AC voltages between 100 V and 240 V and frequencies between 47 Hz and 63 Hz.

A lit LED next to the standby switch indicates that the power supply operates appropriately. If neither of the two LEDs is lit, check the fuse of the instrument (see [chapter 2.5.10, "Replacing Fuses"](#), on page 21).

2.5.8 Switching on the External Test Set

The standby toggle switch is located at the rear panel (see [chapter 2.4.2.1, "Standby Switch"](#), on page 12). To switch the external test set to ready state, press the key. The green LED next to the switch must be lit now.

After switching the external test set to the ready state a warm-up time of one hour is required to ensure accurate measurements. The instrument is only warmed-up in ready state, not in standby state.

2.5.9 Mounting a DUT

The DUT must be screwed to the 1 mm test port connector at the front of the diplexer. A tight connection is very important to ensure precise calibration and measurement results. Depending on the connectors of the DUT, additional adapters may be required.

For two-port measurements involving two external test sets connected to one DUT, the test sets and the DUT must be aligned accurately, using the adjustable feet of the test sets.

2.5.10 Replacing Fuses

The frequency converter is protected by a fuse of type IEC60127 T1 L/H, the diplexer by a fuse of type IEC127-F250L. To replace a fuse open the fuse holder by slightly turning the lid counter-clockwise, preferably using a small coin. Replacement fuses are provided with the instrument.

2.6 Maintenance

The external test sets do not require any special maintenance. Make sure that the air vents of the frequency converters are not obstructed. The outside is suitably cleaned using a soft, line-free dust cloth.

NOTICE

Risk of damage

Cleaning agents contain substances that may damage the external test set, e.g. the front panel labeling or plastic parts.

Never use cleaning agents such as solvents (thinners, acetone etc.), acids, bases or other substances.

For our support center address and a list of useful R&S contact addresses refer to the pages at the beginning of this guide.

2.7 Storing and Packing

The R&S ZVA110 network analyzer unit and the external test sets can be stored in the temperature range quoted in the data sheet. When stored for a longer period of time the devices should be protected against dust.

It is strongly recommended to transport and store the external test sets in the original wooden case. The 1 mm test port of the diplexer should be protected by its cap; see also [chapter 2.5.1, "Unpacking and Checking the Instrument"](#), on page 14.

The waveguide flanges of dismantled frequency converters must be protected against mechanical damage and shielded from dust; see [chapter 4, "Dismounting Frequency Converters"](#), on page 30.

3 Basic Operation

This chapter describes the use of an R&S ZVA110 vector network analyzer with two external test sets for 2-port transmission measurements.

One-port reflection measurements can be performed in a similar way using a single external test set.

3.1 Required Equipment

The R&S ZVA110 system is delivered with all measurement equipment needed. An additional 1 mm calibration kit is required for system error correction (calibration).

3.2 Measurement Principle

The principle of the measurement with external test sets is described at the beginning of this guide; refer to [chapter 2.1, "Operation with External Test Sets"](#), on page 6.

The measurement involves the following steps:

1. Activation of the "ZVA110-BU" mode for measurements with external test set
2. Entry of power coefficients (when an external test set is used for the first time).
3. Connection of the external test sets
4. Power and frequency settings
5. Power calibration using an appropriate external power meter
6. System error correction (calibration) using a suitable calibration kit
7. Connection of the DUT and measurement

3.3 Activating the ZVA110-BU Measurement Mode

After a factory preset, the R&S ZVA67 is configured for measurements using the internal test sets. You have to activate the "ZVA110-BU" mode explicitly before you connect the external test sets.

To (re-)activate the "ZVA110-BU" mode,

1. Click "System > System Config ..." and open the "Frequency Converter" tab of the "System Configuration" dialog.
2. Select "Type : ZVA110-BU".
3. Click "Apply" to activate the mode.

4. If you use your vector network analyzer for the first time, click "Coefficients" to enter the power coefficients; see [chapter 3.4, "Entering Power Coefficients"](#), on page 24.
5. "Close" the "System Configuration" dialog.



Analyzer settings with active "ZVA110-BU" mode

In "ZVA110-BU" mode, the frequency and level settings of the network analyzer are automatically set to be compatible with the external test sets. "Low Phase Noise" is enabled, Automatic Level Control (ALC) is disabled. The frequency and levels of all ports are displayed in the "Port Configuration" dialog ("Channel > Mode > Port Config ...").

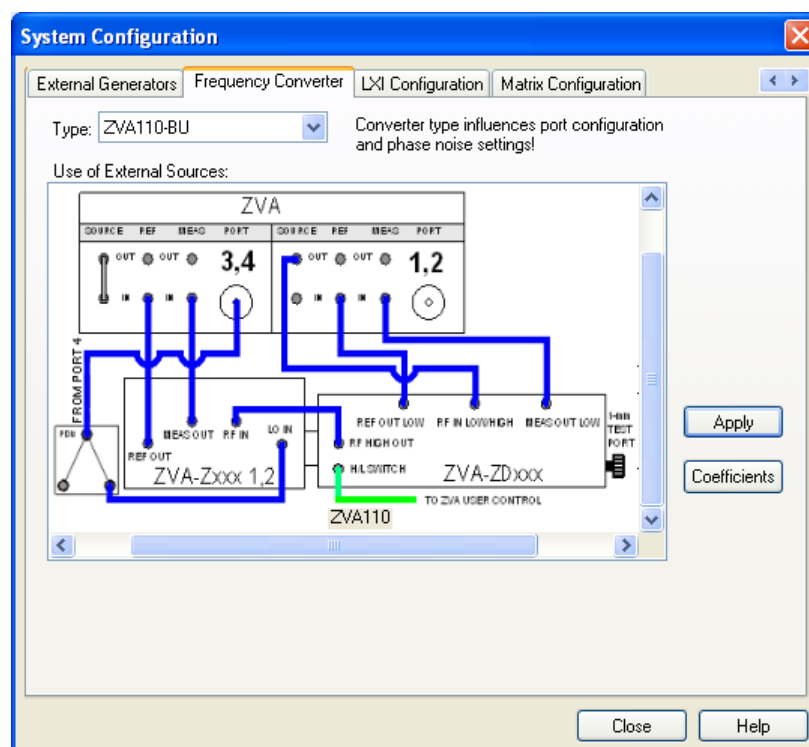


Fig. 3-1: Frequency Converter dialog

3.4 Entering Power Coefficients

For accurate control of the converter output power, the R&S ZVA67 analyzer must know the (non-linear) current-power characteristic of the frequency converters. The characteristic is sufficiently described by a third-order polynomial. A label with the four polynomial coefficients c_0 , c_1 , c_2 , and c_3 is affixed to each converter.

When the R&S ZVA110 is used for the first time, it is recommended to check whether the power coefficients on the converter labels correspond to the entries in the analyzer dialog. Proceed as follows:

1. Activate the "ZVA110-BU" mode following the first steps in [chapter 3.3, "Activating the ZVA110-BU Measurement Mode"](#), on page 23.
2. In the "Frequency Converter" dialog, press "Coefficients".
3. In the "Power Coefficients" dialog opened, clear "Use default coefficients". Adjust the coefficients in the dialog to the converter coefficients, if necessary.

The numbers of the table rows in the dialog denote the analyzer ports for the converters.

4. Repeat the last step for both frequency converters/external test sets.

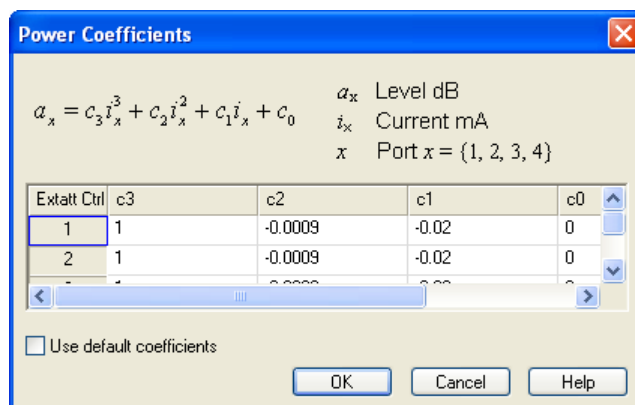


Fig. 3-2: Entry of power coefficients for analyzer port 1

3.5 Connecting the External Test Sets

Each of the external test sets must be connected to the R&S ZVA110 base unit, the power supply and the DUT. Please refer to the following sections for details.

- Power control connection: See [chapter 2.5.5, "Connecting the Power Control Cable"](#), on page 16
- H/L SWITCH (control connection): [chapter 2.5.4, "Connecting the Control Cable"](#), on page 16
- RF connection: See [chapter 2.5.6, "Connecting RF Cables"](#), on page 17
- Power supply: See [chapter 2.5.7, "Connecting the Converter to the DC Supply"](#), on page 20
- DUT (usually connected after calibration): See [chapter 2.5.9, "Mounting a DUT"](#), on page 21

3.6 Power and Frequency Settings

While the "ZVA110-BU" mode is active, the "Channel > Stimulus" settings of the network analyzer control the frequency and power range of the converters. The "Channel > Mode > Port Configuration" dialog shows an additional row for each converter. The "Power" and "Frequency" settings in the "Source" section of the dialog serve different purposes:

- The "Power" setting defines the output power for each external test set. After a source power calibration of the converter ports 1 and 2, the analyzer will generate the selected source powers at the 1 mm test port connectors of the external test sets; see [chapter 3.7, "Calibration"](#), on page 26.
Port 4 provides the local oscillator signal for the converters. The default source power setting ensures a suitable input level of approx. 7 dBm at the LO IN connectors.
- The source frequencies at the 1 mm test ports are essentially determined by the port frequencies of the analyzer: The "Port 1" and "Port 2" source frequencies define the source frequencies of the left and right external test sets, respectively.
The "Converter Port 1" and "Converter Port 2" frequency settings in the "Port Configuration" dialog define the frequency axes for the source power calibrations, but do not affect the source frequencies at the 1 mm test ports. For best accuracy, ensure that the correct converter frequencies are set, especially if the test setup contains additional frequency-converting components.

Example:

In the example below, the frequency at the NWA "Port 1" has been increased by a 1 GHz offset. The same offset has been entered for "Converter Port 1". This ensures a correct frequency axis during the power calibration.

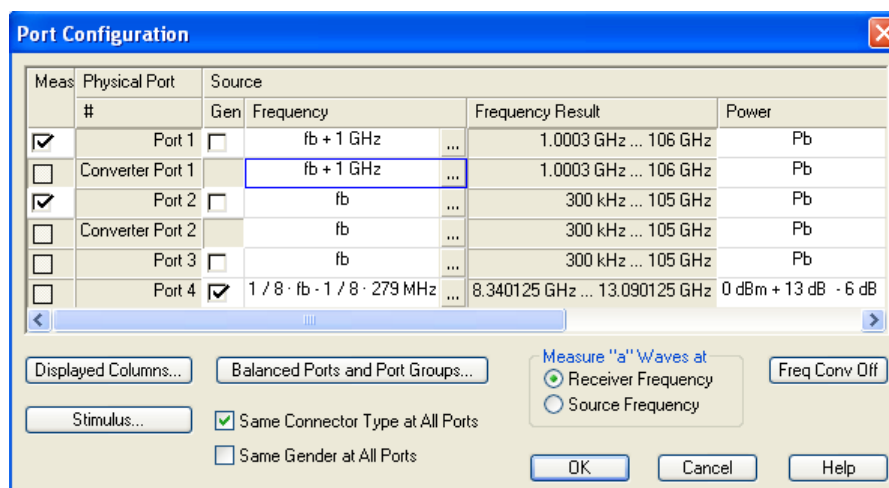


Fig. 3-3: Converter frequency and power settings

3.7 Calibration

A source power calibration for an external test set requires an appropriate external power meter, to be connected to the converter's 1 mm test port connector. The power meter is

configured in the ordinary way using the "System Configuration > External Power Meters" tab.

To perform the source power calibration, proceed as follows:

1. Connect the power meter and open the "Channel > Calibration > Start Power Cal > Source Power Cal" dialog.
2. Select your converter and source port from the "Source" pull-down list (e.g. "Conv 1" for the left external test set connected to Ports 1 and Port 3).
3. Click "Modify Settings" and ensure that both "Flatness Cal" and "Reference Receiver Cal" are checked.
4. If your test setup causes strong nonlinear effects, you can choose a "Convergence Factor" different from one.
5. Start the calibration sweep.



To ensure an accurate source power calibration and quick convergence, use the correct power coefficients; see [chapter 3.7, "Calibration"](#), on page 26.

A receiver power calibration of the b-waves (without external power meter, using the "Receiver Power Calibration" dialog) is possible after completed source power calibration.

After the power calibration procedure a system error correction is recommended. Measurements with external test sets require a 1 mm calibration kit for system error correction.

3.8 Measurement

After power calibration and system error correction, the millimeter wave measurement can be performed like any other network analyzer measurement. The analyzer may perform a frequency or power sweep. The "Port Configuration" settings (together with the "Stimulus" settings), determine the sweep range of the converted signals (for a frequency sweep, the input and output frequencies at the DUT ports). All measured quantities (S-parameters, wave quantities, ratios etc.) and other trace settings are available.

The following example shows a transmission measurement on a through connection in the frequency range between 10 MHz and 110 GHz.

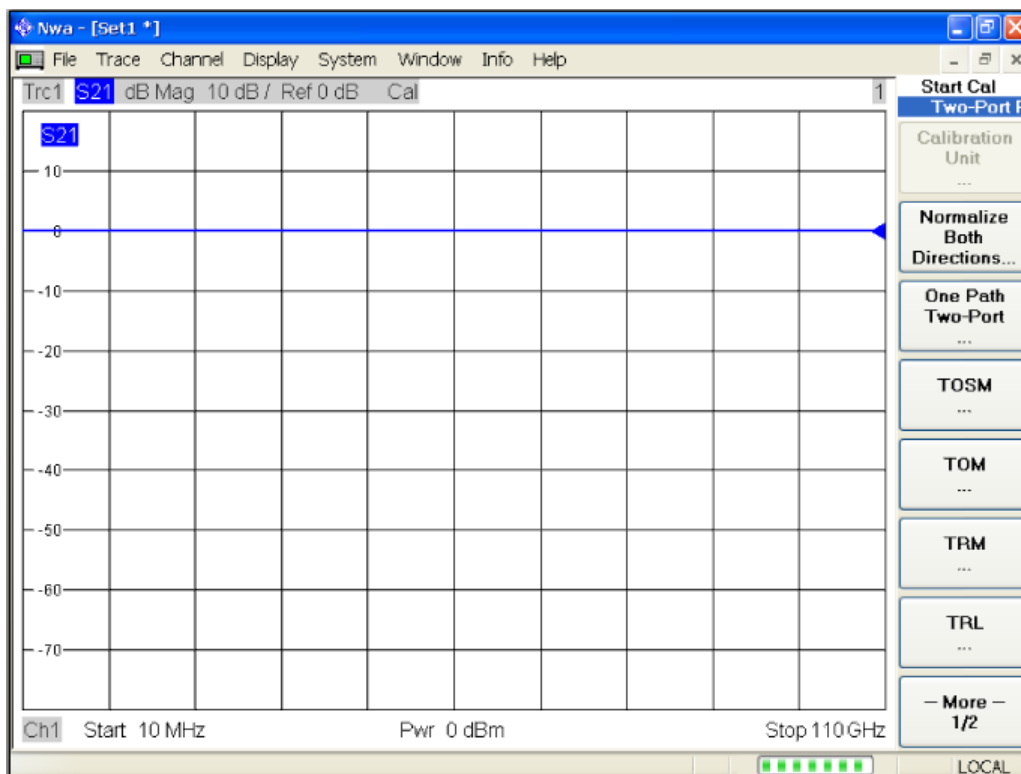


Fig. 3-4: Transmission measurement with an R&S ZVA110



For best measurement accuracy, observe the following rules:

- Enter the correct power coefficients of all frequency converters; see [chapter 3.4, "Entering Power Coefficients"](#), on page 24.
- Perform a source power calibration; see [chapter 3.7, "Calibration"](#), on page 26. Using output powers at the 1 mm connectors outside the calibrated range generally impairs the measurement accuracy. The effect is enhanced if the power coefficients are not correct.
- Perform a system error correction for the power-calibrated test setup using an appropriate calibration kit.

3.9 Troubleshooting

The table below lists possible errors and remedies.

Error	Possible cause	Remedy
No output signal, LED next to the mains switch on the rear of the converter panel off.	Converter not power-supplied	Check power supply and fuse (see chapter 2.5.8, "Switching on the External Test Set" , on page 20).
Switchover between low frequency and high frequency mode fails	Control connection not established or Port 1 and Port 2 connectors interchanged	Check connecting "H/L Switch" cable (see chapter 2.5.4, "Connecting the Control Cable" , on page 16).

Error	Possible cause	Remedy
Inconclusive measurement results	REF and MEAS cables at the diplexer or at the converter are interchanged	See figure 2-7 .
Measurement shows noise only	No supply power at the diplexer unit	See chapter 2.3, "Diplexer Connectors" , on page 8.
Power control fails, external test sets operate at maximum output power.	Power control connection not established	Check connecting cables and port assignment of control connectors.
Inaccurate source levels at the 1 mm ports	Insufficient settling time, especially for fast sweep and strong power variations	Increase sweep time ("Channel > Sweep > Sweep Time").
Inaccurate source levels, even at reduced speed	Power coefficients entered and converters do not match, e.g. the coefficients of port 1 and port 2 are interchanged	Make sure that all coefficients are correct and assigned to the right analyzer ports (see chapter 3.4, "Entering Power Coefficients" , on page 24).

3.10 Additional Information

For a comprehensive description of R&S ZVA analyzers including frequency conversion and remote control refer to the R&S ZVA help system or to the printable operating manual, which is available for download at <http://www.rohde-schwarz.com/product/zva>.

Application notes related to frequency converters are also available for download, see <http://www.rohde-schwarz.com/product/zva-z>.

The text book "Fundamentals of Vector Network Analysis" by Michael Hiebel is an ideal complement for the information given in the user documentation. The book combines theoretical background and practical measurements on an R&S ZVA network analyzer. In case of interest please contact your local R&S office.

4 Dismounting Frequency Converters

The frequency converters may be dismantled from the external test sets and used separately. They can be used in combination with any network analyzer R&S ZVA or R&S ZVT which has an upper frequency limit of 20 GHz or higher (R&S ZVT 20, R&S ZVA 24, R&S ZVA 40 ...) and is equipped with option R&S ZVA-B8.

The frequency converters provide:

- A frequency range between 75 GHz and 110 GHz
- Direct connection of DUTs with waveguide flanges
- System error correction using waveguide calibration kits (e.g. R&S ZV-WR10)

For detailed information about measurements with external frequency converters refer to the Quick Start Guide R&S ZVA-Z90E / -Z110E, stock no. 1307.7197.62, which is posted on the R&S internet, and to your network analyzer's help system.

Dismounting the converter

To detach the frequency converter from the diplexer:

1. Unscrew the semi-rigid RF cable between the RF HIGH OUT connector on the top side of the diplexer and the RF IN connector on the rear panel of the converter.
2. Turn the external test set by 90 deg so that the diplexer connectors point in upward direction.
3. Open the corrugated union screw of the power supply cable between the converter the diplexer manually, leaving the cable attached to the diplexer.
4. Open two screws at the U-shaped metal clamp, leaving the clamp attached to either the converter or the diplexer.
5. Put the external test set back on its feet.
6. Use the hexball driver supplied with the R&S ZVA110 to open all screws at the waveguide flange, leaving the adapter attached to the converter.
7. Carefully detach the two devices in horizontal direction.

NOTICE

Risk of damaging waveguide flanges

The waveguide flanges of the dismantled converter and of the test port adapters must be protected against mechanical damage. Furthermore the waveguides must be shielded from dust.

Protect the waveguide flange of the dismantled converter by leaving a test port adapter connected. When the converter is not in use attach one of the included protective caps to the adapter. Avoid scratching the contact surfaces of the waveguide flanges.

Re-mounting the converter

To re-mount the converter, perform the steps described above in reverse order. Use a torque wrench to tighten the semi-rigid RF cable to the SMA connectors and notice that the RF cables of the left and right test sets are not identical.

4.1 Service Re-Calibration

For accurate measurements the R&S ZVA110 must be re-calibrated by Rohde & Schwarz after the calibration interval in the data sheet has elapsed. Calibration involves all components of the test system, including the R&S ZVA67 network analyzer and both external test sets.

To help us carry out your order as quickly as possible, please always return the complete test system. Observe the label on the rear panel of the network analyzer to ensure that all components belong together.

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