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Test and Measurement Division

Quick Start Guide

R&S® ZVA-Z75, Z110, Z325 Converter WR15, WR10, WR03

ROHDE&SCHWARZ

This Quick Start Guide describes the following converter types:

- R&S® ZVA-Z75, stock no. 1307.7400.02
- R&S® ZVA-Z110, stock no. 1307.7000.02
- R&S® ZVA-Z325, stock no. 1307.7200.02

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The following abbreviations are used throughout this manual:
R&S® ZVA-Z75 is abbreviated as R&S ZVA-Z75, R&S® ZVA-Z110 as R&S ZVA-Z110, R&S® ZVA-Z325 as R&S ZVA-Z325, R&S® ZVA as R&S ZVA and R&S® ZVT as R&S ZVT.

Safety Instructions

This frequency converter 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.

CAUTION

General safety instructions

To maintain this condition and to ensure safe operation, you must observe all instructions and warnings given on this page and in Chapter 1 of this technical information.

ESD protective measures

To protect the frequency converter against 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 Quick Start Guide of your analyzer.

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 frequency converter mode ensures compatible source powers.
Before you connect your converter to the network analyzer, always activate the frequency converter mode using the Frequency Converter dialog (see section 2.2) and select the proper converter type and connecting diagram.

Protection of waveguide flanges

The waveguide flanges of the 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 converter by leaving a test port adapter mounted. When the converter is not in use attach one of the included protective caps to the adapter. Also attach protective caps to the second test port adapter. Avoid scratching the contact surfaces of the waveguide flanges.

Avoid heavy shocks

Heavy shocks can damage inner parts of the instrument. Shock-proof packing should therefore be used for storing or dispatching the frequency converter.

Opening the instrument

Do not open the instrument. Repair of the converter can only be done at the manufacturer's servicing department.

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.

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 ±10% shall apply to the nominal voltage and of ±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 thermically 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.

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_{rms} > 30 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.

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.

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. Nuestra sección de gestión de la seguridad de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el comprobante de conformidad adjunto según las normas de la CE 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 despreciando las informaciones de seguridad 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.

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado dentro de las instrucciones de la correspondiente documentación de 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 profundos y conocimientos básicas del idioma inglés. Por eso se debe tener en cuenta que el producto sólo pueda ser operado por personal especializado o personas minuciosamente instruidas con las capacidades correspondientes. Si fuera necesaria indumentaria de seguridad para el uso de productos de R&S, encontrará 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 entréguela a usuarios posteriores.

Símbolos y definiciones de seguridad

							
Ver documen-tación de producto	Informaciones para maquinaria con un peso de > 18kg	Peligro de golpe de corriente	¡Advertencia! Superficie caliente	Conexión a conductor protector	Conexión a tierra	Conexión a masa conductora	¡Cuidado! Elementos de construcción con peligro de carga electroestática

					
Potencia EN MARCHA/PARADA	Indicación Stand-by	Corriente continua DC	Corriente alterna AC	Corriente continua/-alterna DC/AC	El aparato está protegido en su totalidad por un aislamiento de doble refuerzo

Tener en cuenta las informaciones de seguridad sirve para tratar de evitar daños y peligros de toda clase. Es necesario de que se lean las siguientes informaciones de seguridad concienzudamente y se tengan en cuenta debidamente antes de la puesta en funcionamiento del producto. También deberán ser tenidas en cuenta las informaciones para la protección de personas que encontrarán en el capítulo correspondiente de la documentación de producto y que también son obligatorias de seguir. En las informaciones de seguridad actuales hemos juntado todos los objetos vendidos por el grupo de empresas Rohde & Schwarz bajo la denominación de „producto“, entre ellos también aparatos, instalaciones así como toda clase de accesorios.

Palabras de señal y su significado

PELIGRO	Identifica un peligro directo con riesgo elevado de provocar muerte o lesiones de gravedad si no se toman las medidas oportunas.
ADVERTENCIA	Identifica un posible peligro con riesgo medio de provocar muerte o lesiones (de gravedad) si no se toman las medidas oportunas.
ATENCIÓN	Identifica un peligro con riesgo reducido de provocar lesiones de gravedad media o leve si no se toman las medidas oportunas.
AVISO	Indica la posibilidad de utilizar mal el producto y a 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 de 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 malinterpretaciones y tener por consecuencia daños en personas u objetos.

Informaciones de seguridad elementales

1. El producto solamente debe ser utilizado según lo indicado por el fabricante referente a la situación y posición de funcionamiento sin que se obstruya la ventilación. Si no se convino de otra manera, es para los productos R&S 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, utilizar solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4.500 m sobre el nivel del mar.
   Se aplicará una tolerancia de ±10% sobre el voltaje nominal y de ±5% sobre la frecuencia nominal.
2. En todos los trabajos deberán ser tenidas en cuenta las normas locales de seguridad de trabajo y de prevención de accidentes. El producto solamente debe de ser abierto por personal especializado autorizado. Antes de efectuar trabajos en el producto o abrirlo deberá este ser desconectado de la corriente. El ajuste, el cambio de partes, la manutención y la reparación deberán ser solamente efectuadas por electricistas autorizados por R&S. Si se reponen partes con importancia para los aspectos de seguridad (por ejemplo el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada recambio de partes elementales para la seguridad deberá ser efectuado un control de seguridad (control a primera vista, control de conductor protector, medición de resistencia de aislamiento, medición de la corriente conductora, control de funcionamiento).

3. Como en todo producto de fabricación industrial no puede ser excluido en general de que se produzcan al usarlo elementos que puedan generar alergias, los llamados elementos alergénicos (por ejemplo el níquel). Si se producieran en el trato con productos R&S reacciones alérgicas, como por ejemplo urticaria, estornudos frecuentes, irritación de la conjuntiva o dificultades al respirar, se deberá consultar inmediatamente a un médico para averiguar los motivos de estas reacciones.
4. Si productos / elementos de construcción son tratados fuera del funcionamiento definido de forma mecánica o térmica, pueden generarse elementos peligrosos (polvos de sustancia de metales pesados como por ejemplo plomo, berilio, níquel). La partición elemental del producto, como por ejemplo sucede en el tratamiento de materias residuales, debe de ser efectuada solamente por personal especializado para estos tratamientos. La partición elemental efectuada inadecuadamente puede generar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes al tratamiento de materias residuales.
5. En el caso de que se produjeran agentes de peligro o combustibles en la aplicación del producto que debieran de ser transferidos a un tratamiento de materias residuales, como por ejemplo agentes refrigerantes que deben ser repuestos en periodos definidos, o aceites para motores, deberán ser tenidas en cuenta las prescripciones de seguridad del fabricante de estos agentes de peligro o combustibles y las regulaciones regionales para el tratamiento de materias residuales. Cuiden también de tener en cuenta en caso dado las prescripciones de seguridad especiales en la descripción del producto.
6. Ciertos productos, como por ejemplo las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. En vista a la protección de la vida en desarrollo deberían ser protegidas personas embarazadas debidamente. También las personas con un bypass pueden correr peligro a causa de la radiación electromagnética. El empresario/usuario está comprometido a valorar y señalar áreas de trabajo en las que se corra un riesgo aumentado de exposición a radiaciones para evitar riesgos.
7. La utilización de los productos requiere instrucciones especiales y una alta concentración en el manejo. Debe de ponerse por seguro de que las personas que manejen los productos estén a la altura de los requerimientos necesarios referente a sus aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario lleva la responsabilidad de seleccionar el personal usuario apto para el manejo de los productos.
8. Antes de la puesta en marcha del producto se deberá tener por seguro de que la tensión preseleccionada en el producto equivalga a la del la red de distribución. Si es necesario cambiar la preselección de la tensión también se deberán en caso dabo cambiar los fusibles correspondientes del producto.
9. Productos de la clase de seguridad I con alimentación móvil y enchufe individual de producto solamente deberán ser conectados para el funcionamiento a tomas de corriente de contacto de seguridad y con conductor protector conectado.
10. Queda prohibida toda clase de interrupción intencionada del conductor protector, tanto en la toma de corriente como en el mismo producto. Puede tener como consecuencia el peligro de golpe de corriente por el producto. Si se utilizaran cables o enchufes de extensión se deberá poner al seguro que es controlado su estado técnico de seguridad.
11. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de distribución como interruptor. En estos casos deberá asegurar de que el enchufe sea de fácil acceso y nabejo (según la medida del cable de distribución, 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 instalar el interruptor al nivel de la instalación.

12. No utilice nunca el producto si está dañado el cable eléctrico. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegure a través de las medidas de protección y de instalación adecuadas de que el cable de eléctrico no pueda ser dañado o de que nadie pueda ser dañado por él, por ejemplo al tropezar o por un golpe de corriente.
13. Solamente está permitido el funcionamiento en redes de distribución TN/TT aseguradas con fusibles de como máximo 16 A (utilización de fusibles de mayor amperaje sólo previa consulta con el grupo de empresas Rohde & Schwarz).
14. 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. Si no tiene en consideración estas indicaciones se arriesga a que se originen chispas, fuego y/o heridas.
15. No sobrecargue las tomas de corriente, los cables de extensión o los enchufes de extensión ya que esto pudiera causar fuego o golpes de corriente.
16. En las mediciones en circuitos de corriente con una tensión de entrada de U_{eff} > 30 V se deberá tomar las precauciones debidas para impedir cualquier peligro (por ejemplo medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
17. En caso de conexión con aparatos de la técnica informática se deberá tener en cuenta que estos cumplan los requisitos del estándar IEC950/EN60950.
18. 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 heridas, fuego o daños en el producto.
19. Si un producto es instalado fijamente en un lugar, se deberá primero conectar el conductor protector fijo con el conductor protector del aparato antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
20. En caso de que los productos que son instalados fijamente en un lugar sean sin protector implementado, autointerruptor o similares objetos de protección, el circuito de suministro de corriente deberá estar protegido de manera que usuarios y productos estén suficientemente protegidos.
21. Por favor, no introduzca ningún objeto que no esté destinado a ello en los orificios de la caja del aparato. No vierta nunca ninguna clase de líquidos sobre o en la caja. Esto puede producir cortocircuitos en el producto y/o puede causar golpes de corriente, fuego o heridas.
22. Asegúrese con la protección adecuada de que no pueda originarse en el producto una sobrecarga por ejemplo a causa de una tormenta. Si no se verá el personal que lo utilice expuesto al peligro de un golpe de corriente.
23. Los productos R&S no están protegidos contra líquidos si no es que exista otra indicación, ver también punto 1. Si no se tiene en cuenta esto se arriesga el peligro de golpe de corriente para el usuario o de daños en el producto lo cual también puede llevar al peligro de personas.
24. No utilice el producto bajo condiciones en las que pueda producirse y se hayan producido líquidos de condensación en o dentro del producto como por ejemplo cuando se desplaza el producto de un lugar frío a un lugar caliente.
25. Por favor no cierre ninguna ranura u orificio del producto, ya que estas son necesarias para la ventilación e impiden que el producto se caliente demasiado. No pongan el producto encima de materiales blandos como por ejemplo sofás o alfombras o dentro de una caja cerrada, si esta no está suficientemente ventilada.
26. No ponga el producto sobre aparatos que produzcan calor, como por ejemplo radiadores o calentadores. La temperatura ambiental no debe superar la temperatura máxima especificada en la hoja de datos.

27. Baterías y acumuladores no deben de ser expuestos a temperaturas altas o al fuego. Guardar baterías y acumuladores fuera del alcance de los niños. No cortocircuitar baterías ni acumuladores. Si las baterías o los acumuladores no son cambiados con la debida atención existirá peligro de explosión (atención células de litio). Cambiar las baterías o los acumuladores solamente por los del tipo R&S correspondiente (ver lista de piezas de recambio). Las baterías y acumuladores deben reutilizarse y no deben acceder a los vertederos. Las baterías y acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de evacuación y reciclaje.
28. Por favor tengan en cuenta que en caso de un incendio pueden desprenderse del producto agentes venenosos (gases, líquidos etc.) que pueden generar daños a la salud.
29. El producto puede poseer un peso elevado. Muévalo con cuidado para evitar lesiones en la espalda u otras partes corporales.
30. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptas para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (por ejemplo paredes y estantes).
31. Las asas instaladas en los productos sirven solamente de ayuda para el manejo que solamente está previsto para personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como por ejemplo grúas, carretillas elevadoras de horquilla, carros etc. El usuario es responsable de que los productos sean sujetados de forma segura a los medios de transporte y de que las prescripciones de seguridad del fabricante de los medios de transporte sean observadas. En caso de que no se tengan en cuenta pueden causarse daños en personas y objetos.
32. Si llega a utilizar el producto dentro de un vehículo, queda en la responsabilidad absoluta del conductor que conducir el vehículo de manera segura. Asegure el producto dentro del vehículo debidamente para evitar en caso de un accidente las lesiones u otra clase de daños. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Siempre queda en la responsabilidad absoluta del conductor la seguridad del vehículo. El fabricante no asumirá ninguna clase de responsabilidad por accidentes o colisiones.
33. Dado el caso de que esté integrado un producto de láser en un producto R&S (por ejemplo CD/DVD-ROM) no utilice otras instalaciones o funciones que las descritas en la documentación de producto. De otra manera pondrá en peligro su salud, ya que el rayo láser puede dañar irreversiblemente sus ojos. Nunca trate de descomponer estos productos. Nunca mire dentro del rayo láser.
34. Antes de proceder a la limpieza, desconecte el producto de la red. Realice la limpieza con un paño suave, que no se deshilache. No utilice de ninguna manera agentes limpiadores químicos como, por ejemplo, alcohol, acetona o nitrodiluyente.

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.

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:

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

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

ROHDE&SCHWARZ

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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.

USA & Canada

Monday to Friday (except US public holidays)
8:00 AM – 8:00 PM Eastern Standard Time (EST)

Tel. from USA	888-test-rsa (888-837-8772) (opt 2)
From outside USA	+1 410 910 7800 (opt 2)
Fax	+1 410 910 7801
E-mail	CustomerSupport@rohde-schwarz.com

East Asia

Monday to Friday (except Singaporean public holidays)
8:30 AM – 6:00 PM Singapore Time (SGT)

Tel.	+65 6 513 0488
Fax	+65 6 846 1090
E-mail	CustomerSupport@rohde-schwarz.com

Rest of the World

Monday to Friday (except German public holidays)
08:00 – 17:00 Central European Time (CET)

Tel. from Europe	+49 (0) 180 512 42 42*
From outside Europe	+49 89 4129 13776
Fax	+49 (0) 89 41 29 637 78
E-mail	CustomerSupport@rohde-schwarz.com

* 0.14 €/Min within the German fixed-line telephone network, varying prices for the mobile telephone network and in different countries.

ROHDE&SCHWARZ

1171.0200.22-02.00

Address List

Headquarters, Plants and Subsidiaries

Headquarters

ROHDE&SCHWARZ GmbH & Co. KG
Mühldorfstraße 15 · D-81671 München
P.O.Box 80 14 69 · D-81614 München

Phone +49 (89) 41 29-0
Fax +49 (89) 41 29-121 64
info.rs@rohde-schwarz.com

Plants

ROHDE&SCHWARZ Messgerätebau GmbH
Riedbachstraße 58 · D-87700 Memmingen
P.O.Box 16 52 · D-87686 Memmingen

Phone +49 (83 31) 1 08-0
+49 (83 31) 1 08-1124
info.rsmb@rohde-schwarz.com

ROHDE&SCHWARZ GmbH & Co. KG
Werk Teisnach
Kaikenrieder Straße 27 · D-94244 Teisnach
P.O.Box 11 49 · D-94240 Teisnach

Phone +49 (99 23) 8 50-0
Fax +49 (99 23) 8 50-174
info.rsdts@rohde-schwarz.com

ROHDE&SCHWARZ závod
Vimperk, s.r.o.
Location Spidrova 49
CZ-38501 Vimperk

Phone +420 (388) 45 21 09
Fax +420 (388) 45 21 13

ROHDE&SCHWARZ GmbH & Co. KG
Dienstleistungszentrum Köln
Graf-Zeppelin-Straße 18 · D-51147 Köln
P.O.Box 98 02 60 · D-51130 Köln

Phone +49 (22 03) 49-0
Fax +49 (22 03) 49 51-229
info.rsdc@rohde-schwarz.com
service.rsdc@rohde-schwarz.com

Subsidiaries

R&S BICK Mobilfunk GmbH
Fritz-Hahne-Str. 7 · D-31848 Bad Münder
P.O.Box 20 02 · D-31844 Bad Münder

Phone +49 (50 42) 9 98-0
Fax +49 (50 42) 9 98-105
info.bick@rohde-schwarz.com

ROHDE&SCHWARZ FTK GmbH
Wendenschloßstraße 168, Haus 28
D-12557 Berlin

Phone +49 (30) 658 91-122
Fax +49 (30) 655 50-221
info.ftk@rohde-schwarz.com

ROHDE&SCHWARZ SIT GmbH
Am Studio 3
D-12489 Berlin

Phone +49 (30) 658 84-0
Fax +49 (30) 658 84-183
info.sit@rohde-schwarz.com

R&S Systems GmbH
Graf-Zeppelin-Straße 18
D-51147 Köln

Phone +49 (22 03) 49-5 23 25
Fax +49 (22 03) 49-5 23 36
info.rssys@rohde-schwarz.com

GEDIS GmbH
Sophienblatt 100
D-24114 Kiel

Phone +49 (431) 600 51-0
Fax +49 (431) 600 51-11
sales@gedis-online.de

HAMEG Instruments GmbH
Industriestraße 6
D-63533 Mainhausen

Phone +49 (61 82) 800-0
Fax +49 (61 82) 800-100
info@hameg.de

Locations Worldwide

Please refer to our homepage: www.rohde-schwarz.com

- Sales Locations
- Service Locations
- National Websites

ROHDE&SCHWARZ

EC Certificate of Conformity

CE

Certificate No.: 2007-76

This is to certify that:

Equipment type	Stock No.	Designation
ZVA-Z110	1307.7000.02	Frequency Converter WR10

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)
- relating to electromagnetic compatibility (2004/108/EC)

Conformity is proven by compliance with the following standards:

EN 61010-1 : 2001
EN 61326 : 1997 + A1 : 1998 + A2 : 2001 + A3 : 2003
EN 55011 : 1998 + A1 : 1999 + A2 : 2002, Klasse A
EN 61000-3-2 : 2000 + A2 : 2005
EN 61000-3-3 : 1995 + A1 : 2001

For the assessment of electromagnetic compatibility, the limits of radio interference for Class A equipment as well as the immunity to interference for operation in industry have been used as a basis.

Affixing the EC conformity mark as from 2007

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

Munich, 2007-08-03

Central Quality Management MF-QZ / Radde

Contents

1 Preparing for Use 1

1.1 Front and Top Elements 1

1.1.1 Test Port Adapter (Waveguide Flange) 1

1.1.2 Output Power Adjusting Screw 3

1.2 Rear Panel 3

1.2.1 Standby Switch 4

1.2.2 Power Supply Connector 5

1.2.3 Fuse Holder 5

1.2.4 RF Connectors – Input 5

1.2.5 IF Connectors – Output 6

1.3 Putting the Converter into Operation 7

1.3.1 Unpacking the Unit and Checking the Shipment 7

1.3.2 Setting up the Converter 8

1.3.3 Adjusting the Feet of the Instrument 8

1.3.4 Selecting and Mounting a Test Port Adapter 9

1.3.5 Connecting Cables to the IF and RF Connectors 9

1.3.6 Connecting the Converter to the DC Supply 10

1.3.7 Switching on the Instrument 11

1.3.8 Mounting a DUT 11

1.3.9 Replacing Fuses 11

1.4 Maintenance 12

1.4.1 Storing and Packing 12

2 Basic Operation 13

2.1 Measurement Principle 13

2.2 Activating the Frequency Converter Mode 13

2.3 Connecting the Frequency Converters 14

2.4 Calibration 14

2.5 Measurement 15
2.6 Equipment Required 16
2.7 Additional Information 17
Index 18

1 Preparing for Use

This chapter gives an overview of the controls and connectors of the frequency converter and provides all information that is required to put the converter into operation and connect external devices.

CAUTION

General safety instructions

Please observe the instructions of the following sections so that you cannot endanger people or cause damage to the converter. This is of particular importance when you use the instrument for the first time. Also observe the general safety instructions at the beginning of this manual.

Chapter 2 provides an introduction to the operation of the frequency converter. For a list of (additional) required equipment see section 2.6.

1.1 Front and Top Elements

Two elements are described below:

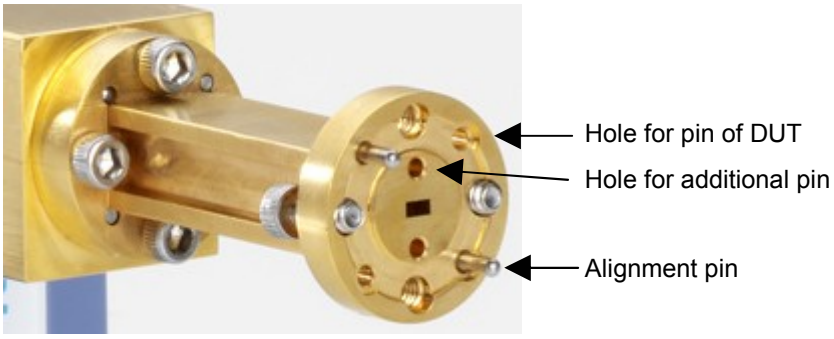
- the test port adapter (waveguide flange) at the front of the instrument
- the output power adjusting screw at the top of the instrument

1.1.1 Test Port Adapter (Waveguide Flange)

The test port with a mounted test port adapter is located at the front of the instrument. The device under test (DUT) has to be connected to the test port adapter.

Front of the instrument R&S ZVA-Z110 (the other models are similar in design)

The precision waveguide flange of the test port adapter is equipped with two alignment pins and two holes receiving the alignment pins of the DUT (see figure below). Two additional holes in the middle allow to insert additional alignment pins (delivered with the instrument). Additional pins should be used if the flange of the DUT also has holes for receiving these pins and the accuracy of the connection shall be enhanced.
The R&S ZVA-Z325 converter is delivered with a standard test port adapter, while the R&S ZVA-Z110 converter is delivered with a standard adapter plus an alternative adapter. The two adapters differ in the size of the holes receiving the alignment pins of the flange of the DUT. The standard test port adapter has holes with a diameter of 1.565 mm at both ends. The alternative adapter has holes with a diameter of 1.605 mm at the DUT side. The DUT side is marked by the label “HP/A”, indicating that this side is HP/A compatible (i.e. supports thicker pins). The R&S ZVA-Z75 converter is delivered with the HP/A compatible adapter.



Test port adapter of R&S ZVA-Z110

ATTENTION

Protection of waveguide flanges

The waveguide flanges of the 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 converter by leaving a test port adapter mounted. When the converter is not in use attach one of the included protective caps to the adapter. Also attach protective caps to the second test port adapter. Avoid scratching the contact surfaces of the waveguide flanges.

1.1.2 Output Power Adjusting Screw

The output power of the converter can not be adjusted via the network analyzer. When the frequency converter mode is activated at the network analyzer, the output power of the analyzer is set to a fixed value optimized for the selected type of frequency converter.
The screw at the top of the converter allows to adjust the output power of the waveguide test port. Turning the screw clockwise reduces the output power while turning the screw counter-clockwise increases the output power. Adjusting the screw to 0 mm results in minimum power while maximum power is reached at about 2 mm.
If you accidentally unscrew the knob completely, simply screw it on again.
If you readjust the screw after calibration, the power calibration is still valid but the system error correction has to be repeated (see section 2.4).

1.2 Rear Panel

The rear panel of the frequency converter provides the following elements described below:

- Standby Switch
- Power Supply Connector
- Fuse Holder
- RF Connectors – Input (RF IN, LO IN)
- IF Connectors – Output (MEAS OUT, REF OUT)

1.2.1 Standby Switch

The standby toggle switch connects (ready state) or disconnects (standby state) the internal modules of the frequency converter from the power supply.
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.

1.2.2 Power Supply Connector

To supply the frequency converter, connect the external DC power supply provided with the converter to the *9 V / 0.8 A* DC input. For details see section 1.3.6.
Always switch the instrument to standby state before removing the power supply.

ATTENTION

Supply voltage and power
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.

1.2.3 Fuse Holder

The power supply connector at the rear panel is protected by a fuse of type IEC60127 T1 L/H. For fuse replacement see section 1.3.9.

1.2.4 RF Connectors – Input

Two input connectors of Type 3.5 mm are available:

- RF IN (RF source signal input)
- LO IN (local oscillator signal input)

For correct cabling please refer to section 1.3.5.

ATTENTION

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 frequency converter mode ensures compatible source powers.

Before you connect your converter to the network analyzer, always activate the frequency converter mode using the Frequency Converter dialog (see section 2.2) and select the proper converter type and connecting diagram.

1.2.5 IF Connectors – Output

Two SMA connectors are available:

- MEAS OUT (measurement signal output)
- REF OUT (reference signal output)

For correct cabling please refer to section 1.3.5.

1.3 Putting the Converter into Operation

This section describes the basic steps to be taken when setting up the frequency converter for the first time.

ATTENTION

Ambient conditions

Before turning on the converter, please make sure that the following conditions are fulfilled:

- Converter covers are in place and all fasteners are tightened.
- Ventilation openings are unobstructed.
- The converter is dry and shows no condensation.

Non-observance may cause damage to the converter!

1.3.1 Unpacking the Unit and Checking the Shipment

1. Unpack the converter and the other contents of the shipping container.
2. Check the shipment against the list of accessories to ensure that all items are included.
3. Remove the protective cap from the test port adapter at the front of the instrument and carefully inspect the frequency converter to make sure that it was not damaged during shipment.

Should the converter be damaged, immediately notify the forwarder who shipped the converter to you and keep the container and packing material.
Equipment returned or sent in for repair must be packed in the original container or packing.

ATTENTION

Protection of waveguide flanges

The waveguide flanges of the 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 converter by leaving a test port adapter mounted. When the converter is not in use attach one of the included protective caps to the adapter. Also attach protective caps to the second test port adapter.

The wooden box should be kept and used for storage of the instrument and the accessories.

1.3.2 Setting up the Converter

The frequency converter is designed for use under laboratory conditions on a bench top. The surface of the bench top should be flat. The converter 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.

ATTENTION **Electrostatic discharge**

To avoid damage of electronic components of the DUT and the frequency converter, 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 Quick Start Guide of your analyzer.

1.3.3 Adjusting the Feet of the Instrument

The instrument can be used with three or four feet attached to the bottom side. It is recommended to use three feet: two in the front and one in the middle of the rear. In most cases a suitable start setup for instrument alignment is as follows: Screw the front feet into the instrument as far as possible and use the rear foot to align the instrument parallel to the surface of the bench top. When you mount a DUT to two instruments (see section 1.3.8) use the feet for further alignment.

Setup with three feet (left) and four feet (right)

1.3.4 Selecting and Mounting a Test Port Adapter

Depending on the instrument model one or two test port adapters are available (see section 1.1.1). Select the appropriate adapter depending on the DUTs to be measured:

- Standard adapter (R&S ZVA-Z325 and Z110):
  Use this adapter if you want to measure DUTs with thin pins only.
- HP/A compatible adapter (R&S ZVA-Z75 and Z110):
  Use this adapter if you want to measure DUTs with thick pins.
  DUTs with thin pins can also be connected (useful if you have both types of DUT). But the connection of DUTs with small pins is more accurate if the standard adapter is used. The reduced alignment condition can typically be compensated using two additional pins above and below the waveguide cross-section.

Mount the selected adapter to the waveguide flange of the instrument using the delivered screws and the included hex ball driver. A tight and accurate connection is very important to ensure precise calibration and measurement results.

1.3.5 Connecting Cables to the IF and RF Connectors

The connectors RF IN, LO IN, MEAS OUT and REF OUT have to be connected to a network analyzer (LO IN alternatively to an external generator).

ATTENTION **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 frequency converter mode ensures compatible source powers.

Before you connect your converter to the network analyzer, always activate the frequency converter mode using the Frequency Converter dialog (see section 2.2) and select the proper converter type and connecting diagram.

ATTENTION **Tightening cables**

Tightening the cables overly may damage cables and connectors. Tightening them not enough yields inaccurate measurement results.

For these reasons always use an appropriate torque wrench, suitable for the type of connector.

Connecting the input connectors (RF IN, LO IN)

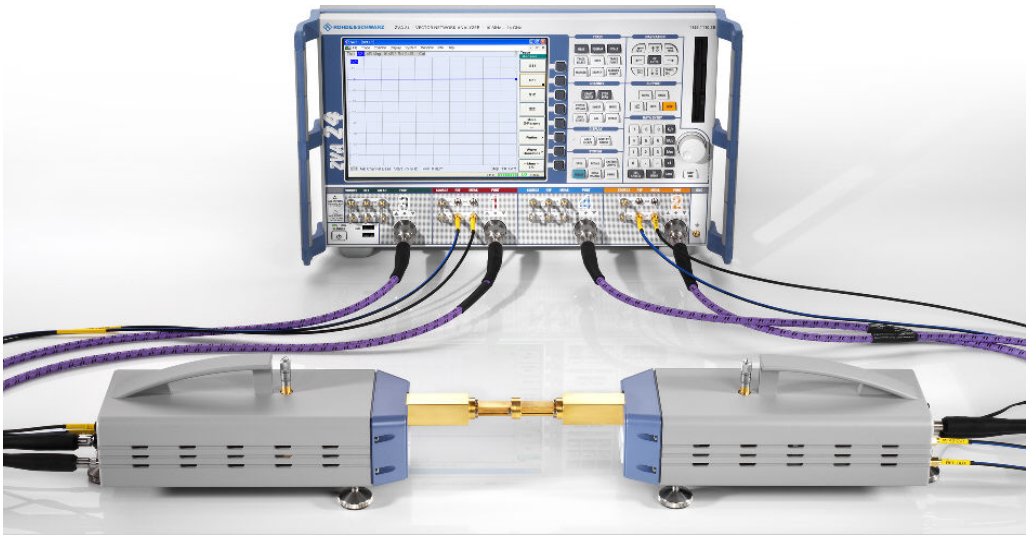
The type of cable required for connecting the input connectors depends on the type of the network analyzer/external generator: Different instruments may require different connectors. At the converter side 3.5 mm connectors are used.
For a complete test setup for a 2-port transmission measurement as shown in the figure below, a cable length of 1 m is recommended. For a setup with only one converter shorter cables may be sufficient. Always use cables with low attenuation and excellent phase stability.

1. Ensure that the converter is in standby state or disconnected from the power supply.
2. Ensure that the frequency converter mode is activated at the network analyzer (see section 2.2).
3. Connect port 1 or port 2 of the analyzer to RF IN of the converter.
4. Connect port 3 or port 4 of the analyzer to LO IN of the converter.
   Alternative: Connect an external generator signal to LO IN.

Connecting the output connectors (MEAS OUT, REF OUT)

Suitable cables for connecting the output connectors to the network analyzer are included in the delivery. The ends of these cables are labeled accordingly. Depending on the type of the analyzer an additional adapter kit may be required to connect the cables.

1. Ensure that the converter is in standby state or disconnected from the power supply.
2. Ensure that the frequency converter mode is activated at the network analyzer (see section 2.2).
3. Connect MEAS OUT of the converter to the MEAS IN connector of the analyzer, using the port providing the RF source signal (port 1 or port 2, see step 3 above).
4. Connect REF OUT of the converter to the REF IN connector of the same analyzer port.



Test setup for 2-port transmission measurement with R&S ZVA-Z110 (similar for the other models)

1.3.6 Connecting the Converter to the DC Supply

An external DC power supply and several plug adapters are provided with the instrument. 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 / 0.8 A DC input at the rear panel (see section 1.2.2) 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 section 1.3.9).

1.3.7 Switching on the Instrument

The standby toggle switch is located at the rear panel (see section 1.2.1).
To switch the instrument to ready state, press the key. The green LED next to the switch must be lit now.
After switching the instrument 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.

1.3.8 Mounting a DUT

The DUT has to be screwed to the test port adapter at the front of the instrument. Mount the DUT using the delivered screws and the included hex ball driver. A tight and accurate connection is very important to ensure precise results of calibration and measurements. Depending on the type of waveguide flange of the DUT it may be required to exchange the test port adapter (see section 1.3.4).
For a test setup involving two frequency converters connected to one DUT the converters and the DUT have to be aligned accurately, using the adjustable instrument feet.

1.3.9 Replacing Fuses

The power supply connector at the rear panel is protected by a fuse of type IEC60127 T1 L/H.
To replace the fuse open the fuse holder by slightly turning the lid counter-clockwise, preferably using a small coin. A replacement fuse is provided with the instrument.

1.4 Maintenance

The frequency converter does not require any special maintenance. Make sure that the air vents are not obstructed. The outside of the instrument is suitably cleaned using a soft, line-free dust cloth.

ATTENTION

Instrument damage caused by cleaning agents
Cleaning agents contain substances that may damage the instrument, e.g. solvent-containing cleaning agents may damage 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 document.

1.4.1 Storing and Packing

The converter can be stored at the temperature range quoted in the data sheet. When it is stored for a longer period of time the instrument should be protected against dust. The original packing should be used, particularly the protective cap and the wooden box (see section 1.3.1), when the instrument is to be transported or dispatched.

2 Basic Operation

This chapter describes the use of an R&S ZVA vector analyzer and two frequency converters for transmission measurements.

2.1 Measurement Principle

The frequency converters use frequency multipliers to transform the RF source signal from one of the network analyzer ports into a high-frequency stimulus signal. A second signal (Local Oscillator, LO) is used for down-conversion of the reference and measurement channels. The LO signal can be provided either by a second analyzer port or by an external generator.
The measurement involves the following steps:

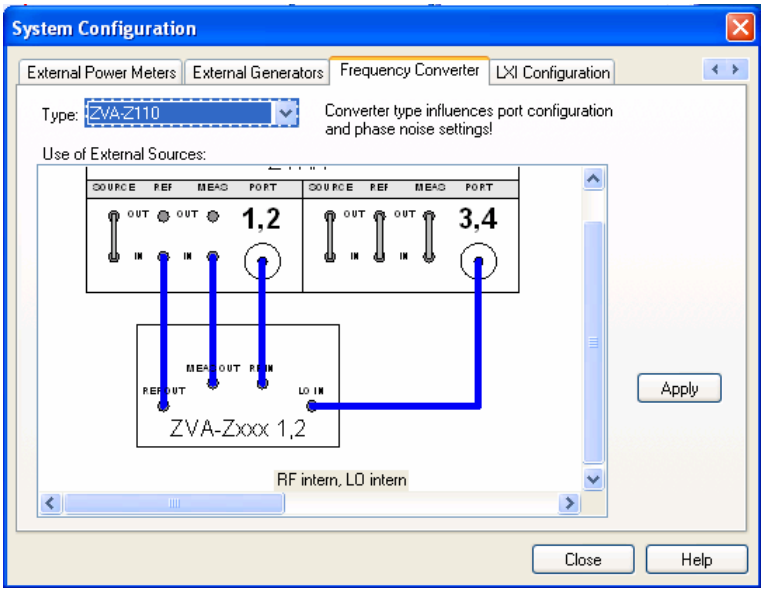
1. Selection of the converter and test setup, activation of the converter mode
2. Connection of the frequency converters
3. Calibration using a suitable waveguide calibration kit
4. Connection of the DUT and measurement

2.2 Activating the Frequency Converter Mode

To activate the converter mode for a setup without external generator,

1. Click “System > System Config ...” and open the “Frequency Converter” tab of the “System Configuration” dialog.
2. Select correct type: “ZVA-Z75” or “ZVA-Z110” or “ZVA-Z325”
3. Select a test setup with an analyzer port as external source, click “Apply” to activate the frequency converter mode and “Close”.

Analyzer settings with active frequency converter
In frequency converter mode, the frequency and level settings of the network analyzer are automatically set to be compatible with the selected frequency converters. “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 …”).



Frequency Converter dialog with "ZVA-Z110" selected

2.3 Connecting the Frequency Converters

Each frequency converter must be connected to the analyzer ports, the power supply and the DUT. Please refer to the following sections for details.
Connection to:

- Analyzer ports: section 1.3.5
- Power supply: section 1.3.6
- DUT (usually connected after calibration): section 1.3.8

2.4 Calibration

The output power of the frequency converter can be set manually (at the converter) only, therefore the standard source power calibration eliminating frequency response errors in the signal path between the source and the reference plane (external power meter) is not possible. A power calibration of the reference receiver (a-wave) using an external power meter, however, is possible and recommended for measurements concerning the wave quantities a and b. Proceed as follows:

1. Ensure that the output power of the frequency converter is not attenuated (adjust the knurled knob at the top of the converter to 2 mm).
2. Connect an appropriate external waveguide power meter to the waveguide flange and open the "Channel > Calibration > Start Power Cal > Source Power Cal" dialog.

3. Click “Modify Settings” and disable “Flatness Cal”, leaving “Reference Receiver Cal” checked.
4. Start the calibration sweep.

This power calibration procedure ensures a reasonable accuracy of the reference power readings over a wide range of converter output powers (i.e. even if the adjusting screw is used to reduce the powers).

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

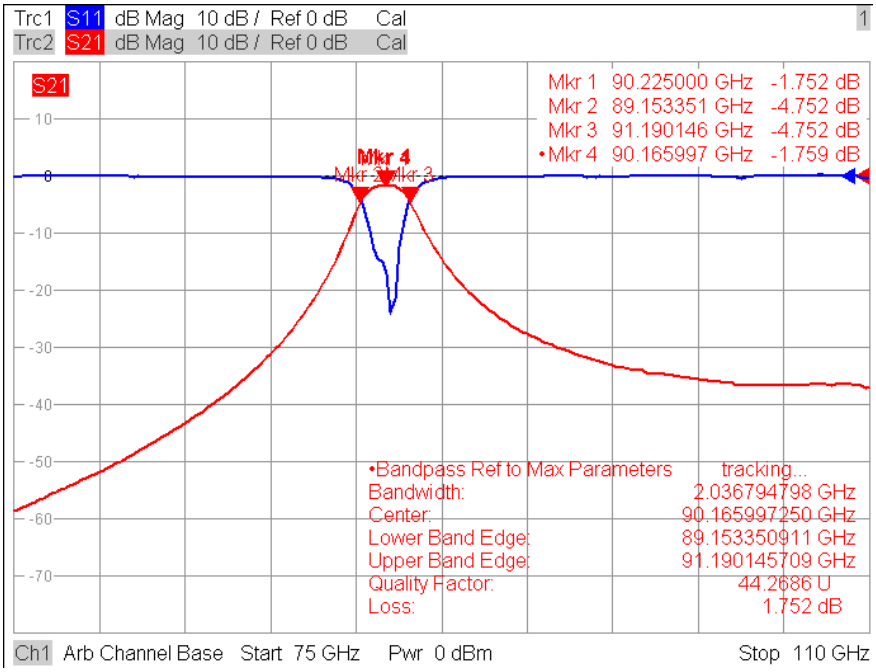
Subsequent to the completed power calibration procedure a system error correction can be performed. Due to the physical properties of the mm-waves and the waveguides, measurements with frequency converters require a special calibration kit for system error correction. Rohde & Schwarz offers kits for this purpose, e.g. the calibration kits R&S ZV-WR03, WR10, and WR15. The standards in the calibration kit allow all one-port and two-port calibration types supported by the network analyzer except TNA. Refer to the documentation of the calibration kit for instructions on how to perform a system error correction.

2.5 Measurement

After power calibration and system error correction, the mm-wave measurement can be performed like any other network analyzer measurement. The *Stimulus* settings determine the sweep range of the converted signals (i.e. 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 restrictions hold for measurements with external frequency converters:

- The measurement is performed at fixed RF source and LO power. No power sweep is possible.
- To adjust the actual output power of the converters (e.g. for measuring wave quantities or testing compression effects), use the adjusting knob on top of the converters (see section 0).

The following example shows the transmission and reflection coefficients of a bandpass filter in the frequency range between 75 GHz and 110 GHz, applicable to R&S ZVA-Z110.



Transmission and reflection of a bandpass filter measured with an R&S ZVA-Z110

2.6 Equipment Required

Measurements using the converters can be carried out with the following equipment:

- Vector network analyzer R&S ZVA or R&S ZVT supporting a frequency range up to 20 GHz or higher. The required firmware version depends on the frequency converter model:
  - R&S ZVA-Z75: at least version 2.47
  - R&S ZVA-Z110: at least version 2.20
  - R&S ZVA-Z325: at least version 2.45
- One or more frequency converters, depending on the test setup.
- Option R&S ZVA-K8, “Converter Control”.
- Option R&S ZVA<n>-B16, “Direct Generator/Receiver Access”
- A suitable set of calibration standards.

2.7 Additional Information

For a comprehensive description of the frequency converter mode including remote control refer to the R&S ZVA/ZVT online 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 the frequency converter are also available for download, see http://www.rohde-schwarz.com/product/zvaz110.
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.

Index

A

Adjusting screw....2

C

Calibration....14

D

DC power....11
DUT....11

F

Feet....8
Frequency converter mode....13
Fuse....5
Fuses (replace)....11

I

IF connector outputs....6
Input powers....5
Instrument setup....8

L

LO IN....5

M

Maintenance....12
MEAS OUT....6
Measurement....15

P

Power adjusting screw....2
Power on....11
Power supply connector....4
Preparing for use....1

R

Rear panel....3
REF OUT....6
Replacing fuses....11
Required equipment....16
RF connector inputs....5
RF IN....5

S

Standby switch....4
Storing the instrument....12

T

Test port....1
Test port adapter....1

U

Unpacking....7

W

Waveguide flange....1