

R&S®ZNL

Vector Network Analyzer

Service Manual



1178605602
Version 05

ROHDE & SCHWARZ
Make ideas real



This service manual describes the following signal and spectrum analyzer types:

- R&S®ZNL3, order no. 1323.0012.03
- R&S®ZNL4, order no. 1323.0012.04
- R&S®ZNL6, order no. 1323.0012.06

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1178.6056.02 | Version 05 | R&S®ZNL

The following abbreviations are used throughout this guide: R&S® ZNL is abbreviated as R&S ZNL, R&S® ZNL-xx as R&S ZNL-xx

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 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 purpose 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, in some cases, 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.

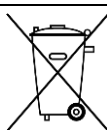
Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before and when using the product. It is also absolutely essential to observe the additional safety 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. For product-specific information, see the data sheet and the product documentation.

Safety labels on products

The following safety labels are used on products to warn against risks and dangers.

Symbol	Meaning	Symbol	Meaning
	Notice, general danger location Observe product documentation		ON/OFF Power
	Caution when handling heavy equipment		Standby indication
	Danger of electric shock		Direct current (DC)

Basic Safety Instructions

Symbol	Meaning	Symbol	Meaning
	Caution ! Hot surface		Alternating current (AC)
	Protective conductor terminal To identify any terminal which is intended for connection to an external conductor for protection against electric shock in case of a fault, or the terminal of a protective earth		Direct/alternating current (DC/AC)
	Earth (Ground)		Class II Equipment to identify equipment meeting the safety requirements specified for Class II equipment (device protected by double or reinforced insulation)
	Frame or chassis Ground terminal		EU labeling for batteries and accumulators For additional information, see section "Waste disposal/Environmental protection", item 1.
	Be careful when handling electrostatic sensitive devices		EU labeling for separate collection of electrical and electronic devices For additional information, see section "Waste disposal/Environmental protection", item 2.
	Warning! Laser radiation For additional information, see section "Operation", item 7.		

Signal words 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 information considered important, but not hazard-related, e.g. messages relating to property damage.

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

These signal words 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 signal words described here are always used only in connection with the related product documentation and the related product. The use of signal words in connection with unrelated products or documentation can result in misinterpretation and in personal injury or material damage.

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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, 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, overvoltage category 2, pollution degree 2.
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 even 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 even death.

Electrical safety

If the information on electrical safety is not observed either at all or 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 mains-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 a protective conductor contact and protective conductor.
3. Intentionally breaking the protective conductor 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 there is no power switch for disconnecting the product from the mains, or if the power switch is not suitable for this purpose, use the plug of the connecting cable to disconnect the product from the mains. In such cases, always ensure that the power plug is easily reachable and accessible at all times. For example, if the power plug is the disconnecting device, the length of the connecting cable must not exceed 3 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, the disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cables on a regular basis to ensure that they are 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, for example, tripping over the cable or suffering an electric shock.

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6. The product may be operated only from TN/TT supply networks fuse-protected 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 provided for this purpose. 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 $V_{rms} > 30$ V, suitable measures (e.g. appropriate measuring equipment, fuse protection, 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 IEC 60950-1 / EN 60950-1 or IEC 61010-1 / 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 protective conductor terminal on site and the product's protective 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 fuse-protected 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.
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.

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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/Environmental protection", 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. Laser products are given warning labels that are standardized according to their laser class. Lasers can cause biological harm due to the properties of their radiation and due to their extremely concentrated electromagnetic power. 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).
8. EMC classes (in line with EN 55011/CISPR 11, and analogously with EN 55022/CISPR 22, EN 55032/CISPR 32)
 - Class A equipment:
Equipment suitable for use in all environments except residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings
Note: Class A equipment is intended for use in an industrial environment. This equipment may cause radio disturbances in residential environments, due to possible conducted as well as radiated disturbances. In this case, the operator may be required to take appropriate measures to eliminate these disturbances.
 - Class B equipment:
Equipment suitable for use in residential environments and environments that are directly connected to a low-voltage supply network that supplies residential buildings

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.

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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, protective 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. Cells and batteries must not be exposed to any mechanical shocks that are stronger than permitted.
5. 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.
6. 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.
7. 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.
8. Follow the transport stipulations of the carrier (IATA-DGR, IMDG-Code, ADR, RID) when returning lithium batteries to Rohde & Schwarz subsidiaries.

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.

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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/Environmental protection

1. Specially marked equipment has a battery or accumulator that must not be disposed of with unsorted municipal waste, but must be collected separately. It may only be disposed of at a suitable collection point or via a Rohde & Schwarz customer service center.
2. Waste electrical and electronic equipment must not be disposed of with unsorted municipal waste, but must be collected separately.
Rohde & Schwarz GmbH & Co. KG has developed a disposal concept and takes full responsibility for take-back obligations and disposal obligations for manufacturers within the EU. Contact your Rohde & Schwarz customer service center for environmentally responsible disposal of the product.
3. 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.
4. 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.

For additional information about environmental protection, visit the Rohde & Schwarz website.

Instrucciones de seguridad elementales

¡Es imprescindible leer y cumplir 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 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.

Instrucciones de seguridad elementales

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.

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.

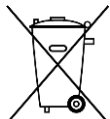
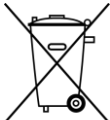
Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto. 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. Los datos específicos del producto figuran en la hoja de datos y en la documentación del producto.

Señalización de seguridad de los productos

Las siguientes señales de seguridad se utilizan en los productos para advertir sobre riesgos y peligros.

Símbolo	Significado	Símbolo	Significado
	Aviso: punto de peligro general Observar la documentación del producto		Tensión de alimentación de PUESTA EN MARCHA / PARADA
	Atención en el manejo de dispositivos de peso elevado		Indicación de estado de espera (standby)
	Peligro de choque eléctrico		Corriente continua (DC)
	Advertencia: superficie caliente		Corriente alterna (AC)
	Conexión a conductor de protección		Corriente continua / Corriente alterna (DC/AC)

Instrucciones de seguridad elementales

Símbolo	Significado	Símbolo	Significado
	Conexión a tierra		El aparato está protegido en su totalidad por un aislamiento doble (reforzado)
	Conexión a masa		Distintivo de la UE para baterías y acumuladores Más información en la sección "Eliminación/protección del medio ambiente", punto 1.
	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)		Distintivo de la UE para la eliminación por separado de dispositivos eléctricos y electrónicos Más información en la sección "Eliminación/protección del medio ambiente", punto 2.
	Advertencia: rayo láser Más información en la sección "Funcionamiento", punto 7.		

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.



Indica una situación de peligro que, si no se evita, causa lesiones graves o incluso la muerte.



Indica una situación de peligro que, si no se evita, puede causar lesiones graves o incluso la muerte.



Indica una situación de peligro que, si no se evita, puede causar lesiones leves o moderadas.



Indica información que se considera importante, pero no en relación con situaciones de peligro; p. ej., avisos sobre posibles daños materiales.

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.

Instrucciones de seguridad elementales

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, 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. Categoría de sobrecarga eléctrica 2, índice de suciedad 2.
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, se pueden causar lesiones o, en determinadas circunstancias, 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, o bien si el interruptor existente no resulta apropiado para la desconexión de la red, el enchufe del cable de conexión se deberá considerar como un dispositivo de desconexión. El dispositivo de desconexión se debe poder alcanzar fácilmente y debe estar siempre bien accesible. Si, p. ej., el enchufe de conexión a la red es el dispositivo de desconexión, la longitud del cable de conexión no debe superar 3 m). Los interruptores selectores o electrónicos no son aptos para el corte de la red eléctrica. Si se

Instrucciones de seguridad elementales

integran productos sin interruptor 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.

Instrucciones de seguridad elementales

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/protección del medio ambiente", 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 señalizar 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. Los productos con láser están provistos de indicaciones de advertencia normalizadas en función de la clase de láser del que se trate. Los rayos láser pueden provocar daños de tipo biológico a causa de las propiedades de su radiación y debido a su concentración extrema de potencia electromagnética. 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).
8. Clases de compatibilidad electromagnética (conforme a EN 55011 / CISPR 11; y en analogía con EN 55022 / CISPR 22, EN 55032 / CISPR 32)
 - Aparato de clase A:
Aparato adecuado para su uso en todos los entornos excepto en los residenciales y en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.
Nota: Los aparatos de clase A están destinados al uso en entornos industriales. Estos aparatos

Instrucciones de seguridad elementales

pueden causar perturbaciones radioeléctricas en entornos residenciales debido a posibles perturbaciones guiadas o radiadas. En este caso, se le podrá solicitar al operador que tome las medidas adecuadas para eliminar estas perturbaciones.

- Aparato de clase B:

Aparato adecuado para su uso en entornos residenciales, así como en aquellos conectados directamente a una red de distribución de baja tensión que suministra corriente a edificios residenciales.

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. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.
5. 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.
6. 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).
7. 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.

Instrucciones de seguridad elementales

8. En caso de devolver baterías de litio a las filiales de Rohde & Schwarz, debe cumplirse las normativas sobre los modos de transporte (IATA-DGR, código IMDG, ADR, RID).

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/protección del medio ambiente

1. Los dispositivos marcados contienen una batería o un acumulador que no se debe desechar con los residuos domésticos sin clasificar, sino que debe ser recogido por separado. La eliminación se debe efectuar exclusivamente a través de un punto de recogida apropiado o del servicio de atención al cliente de Rohde & Schwarz.
2. Los dispositivos eléctricos usados no se deben desechar con los residuos domésticos sin clasificar, sino que deben ser recogidos por separado.
Rohde & Schwarz GmbH & Co.KG ha elaborado un concepto de eliminación de residuos y asume plenamente los deberes de recogida y eliminación para los fabricantes dentro de la UE. Para desechar el producto de manera respetuosa con el medio ambiente, diríjase a su servicio de atención al cliente de Rohde & Schwarz.
3. 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.
4. 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.

Se puede encontrar más información sobre la protección del medio ambiente en la página web de Rohde & Schwarz.

Grundlegende Sicherheitshinweise

Lesen und beachten Sie unbedingt die nachfolgenden Anweisungen und Sicherheitshinweise!

Alle Werke und Standorte der Rohde & Schwarz Firmengruppe sind ständig bemüht, den Sicherheitsstandard unserer Produkte auf dem aktuellsten Stand zu halten und unseren Kunden ein höchstmögliches Maß an Sicherheit zu bieten. Unsere Produkte und die dafür erforderlichen Zusatzgeräte werden entsprechend der jeweils gültigen Sicherheitsvorschriften gebaut und geprüft. Die Einhaltung dieser Bestimmungen wird durch unser Qualitätssicherungssystem laufend überwacht. Das vorliegende Produkt ist gemäß beiliegender EU-Konformitätsbescheinigung gebaut und geprüft und hat das Werk in sicherheitstechnisch einwandfreiem Zustand verlassen. Um diesen Zustand zu erhalten und einen gefahrlosen Betrieb sicherzustellen, muss der Benutzer alle Hinweise, Warnhinweise und Warnvermerke beachten. Bei allen Fragen bezüglich vorliegender Sicherheitshinweise steht Ihnen die Rohde & Schwarz Firmengruppe jederzeit gerne zur Verfügung.

Darüber hinaus liegt es in der Verantwortung des Benutzers, das Produkt in geeigneter Weise zu verwenden. Das Produkt ist ausschließlich für den Betrieb in Industrie und Labor bzw., wenn ausdrücklich zugelassen, auch für den Feldeinsatz bestimmt und darf in keiner Weise so verwendet werden, dass einer Person/Sache Schaden zugefügt werden kann. Die Benutzung des Produkts außerhalb des bestimmungsgemäßen Gebrauchs oder unter Missachtung der Anweisungen des Herstellers liegt in der Verantwortung des Benutzers. Der Hersteller übernimmt keine Verantwortung für die Zweckentfremdung des Produkts.

Die bestimmungsgemäße Verwendung des Produkts wird angenommen, wenn das Produkt nach den Vorgaben der zugehörigen Produktdokumentation innerhalb seiner Leistungsgrenzen verwendet wird (siehe Datenblatt, Dokumentation, nachfolgende Sicherheitshinweise). Die Benutzung des Produkts erfordert Fachkenntnisse und zum Teil englische Sprachkenntnisse. Es ist daher zu beachten, dass das Produkt ausschließlich von Fachkräften oder sorgfältig eingewiesenen Personen mit entsprechenden Fähigkeiten bedient werden darf. Sollte für die Verwendung von Rohde & Schwarz-Produkten persönliche Schutzausrüstung erforderlich sein, wird in der Produktdokumentation an entsprechender Stelle darauf hingewiesen. Bewahren Sie die grundlegenden Sicherheitshinweise und die Produktdokumentation gut auf und geben Sie diese an weitere Benutzer des Produkts weiter.

Die Einhaltung der Sicherheitshinweise dient dazu, Verletzungen oder Schäden durch Gefahren aller Art auszuschließen. Hierzu ist es erforderlich, dass die nachstehenden Sicherheitshinweise vor der Benutzung des Produkts sorgfältig gelesen und verstanden sowie bei der Benutzung des Produkts beachtet werden. Sämtliche weitere Sicherheitshinweise wie z.B. zum Personenschutz, die an entsprechender Stelle der Produktdokumentation stehen, sind ebenfalls unbedingt zu beachten. In den vorliegenden Sicherheitshinweisen sind sämtliche von der Rohde & Schwarz Firmengruppe vertriebenen Waren unter dem Begriff „Produkt“ zusammengefasst, hierzu zählen u. a. Geräte, Anlagen sowie sämtliches Zubehör.

Grundlegende Sicherheitshinweise

Symbole und Sicherheitskennzeichnungen

Symbol	Bedeutung	Symbol	Bedeutung
	Achtung, allgemeine Gefahrenstelle Produktdokumentation beachten		EIN-/AUS (Versorgung)
	Vorsicht beim Umgang mit Geräten mit hohem Gewicht		Stand-by-Anzeige
	Gefahr vor elektrischem Schlag		Gleichstrom (DC)
	Warnung vor heißer Oberfläche		Wechselstrom (AC)
	Schutzleiteranschluss		Gleichstrom/Wechselstrom (DC/AC)
	Erdungsanschluss		Gerät entspricht den Sicherheitsanforderungen an die Schutzklasse II (Gerät durchgehend durch doppelte / verstärkte Isolierung geschützt).
	Masseanschluss des Gestells oder Gehäuses		EU - Kennzeichnung für Batterien und Akkumulatoren. Das Gerät enthält eine Batterie bzw. einen Akkumulator. Diese dürfen nicht über unsortierten Siedlungsabfall entsorgt werden, sondern sollten getrennt gesammelt werden. Weitere Informationen siehe Seite 7.
	Achtung beim Umgang mit elektrostatisch gefährdeten Bauelementen		EU - Kennzeichnung für die getrennte Sammlung von Elektro- und Elektronikgeräten. Elektroaltgeräte dürfen nicht über unsortierten Siedlungsabfall entsorgt werden, sondern müssen getrennt gesammelt werden. Weitere Informationen siehe Seite 7.
	Warnung vor Laserstrahl Produkte mit Laser sind je nach ihrer Laser-Klasse mit genormten Warnhinweisen versehen. Laser können aufgrund der Eigenschaften ihrer Strahlung und aufgrund ihrer extrem konzentrierten elektromagnetischen Leistung biologische Schäden verursachen. Für zusätzliche Informationen siehe Kapitel „Betrieb“ Punkt 7.		

Grundlegende Sicherheitshinweise

Signalworte und ihre Bedeutung

Die folgenden Signalworte werden in der Produktdokumentation verwendet, um vor Risiken und Gefahren zu warnen.



kennzeichnet eine unmittelbare Gefährdung mit hohem Risiko, die Tod oder schwere Körperverletzung zur Folge haben wird, wenn sie nicht vermieden wird.



kennzeichnet eine mögliche Gefährdung mit mittlerem Risiko, die Tod oder (schwere) Körperverletzung zur Folge haben kann, wenn sie nicht vermieden wird.



kennzeichnet eine Gefährdung mit geringem Risiko, die leichte oder mittlere Körperverletzungen zur Folge haben könnte, wenn sie nicht vermieden wird.



weist auf die Möglichkeit einer Fehlbedienung hin, bei der das Produkt Schaden nehmen kann.

Diese Signalworte entsprechen der im europäischen Wirtschaftsraum üblichen Definition für zivile Anwendungen. Neben dieser Definition können in anderen Wirtschaftsräumen oder bei militärischen Anwendungen abweichende Definitionen existieren. Es ist daher darauf zu achten, dass die hier beschriebenen Signalworte stets nur in Verbindung mit der zugehörigen Produktdokumentation und nur in Verbindung mit dem zugehörigen Produkt verwendet werden. Die Verwendung von Signalworten in Zusammenhang mit nicht zugehörigen Produkten oder nicht zugehörigen Dokumentationen kann zu Fehlinterpretationen führen und damit zu Personen- oder Sachschäden führen.

Betriebszustände und Betriebslagen

Das Produkt darf nur in den vom Hersteller angegebenen Betriebszuständen und Betriebslagen ohne Behinderung der Belüftung betrieben werden. Werden die Herstellerangaben nicht eingehalten, kann dies elektrischen Schlag, Brand und/oder schwere Verletzungen von Personen, unter Umständen mit Todesfolge, verursachen. Bei allen Arbeiten sind die örtlichen bzw. landesspezifischen Sicherheits- und Unfallverhütungsvorschriften zu beachten.

1. Sofern nicht anders vereinbart, gilt für R&S-Produkte folgendes:
als vorgeschriebene Betriebslage grundsätzlich Gehäuseboden unten, IP-Schutzart 2X, Verschmutzungsgrad 2, Überspannungskategorie 2, nur in Innenräumen verwenden, Betrieb bis 2000 m ü. NN, Transport bis 4500 m ü. NN, für die Nennspannung gilt eine Toleranz von $\pm 10\%$, für die Nennfrequenz eine Toleranz von $\pm 5\%$.
2. Stellen Sie das Produkt nicht auf Oberflächen, Fahrzeuge, Ablagen oder Tische, die aus Gewichts- oder Stabilitätsgründen nicht dafür geeignet sind. Folgen Sie bei Aufbau und Befestigung des Produkts an Gegenständen oder Strukturen (z.B. Wände und Regale) immer den Installationshinweisen des Herstellers. Bei Installation abweichend von der Produktdokumentation können Personen verletzt, unter Umständen sogar getötet werden.
3. Stellen Sie das Produkt nicht auf hitzeerzeugende Gerätschaften (z.B. Radiatoren und Heizlüfter). Die Umgebungstemperatur darf nicht die in der Produktdokumentation oder im Datenblatt spezifizierte Maximaltemperatur überschreiten. Eine Überhitzung des Produkts kann elektrischen Schlag, Brand und/oder schwere Verletzungen von Personen, unter Umständen mit Todesfolge, verursachen.

Elektrische Sicherheit

Werden die Hinweise zur elektrischen Sicherheit nicht oder unzureichend beachtet, kann dies elektrischen Schlag, Brand und/oder schwere Verletzungen von Personen, unter Umständen mit Todesfolge, verursachen.

1. Vor jedem Einschalten des Produkts ist sicherzustellen, dass die am Produkt eingestellte Nennspannung und die Netznennspannung des Versorgungsnetzes übereinstimmen. Ist es erforderlich, die Spannungseinstellung zu ändern, so muss ggf. auch die dazu gehörige Netzsicherung des Produkts geändert werden.
2. Bei Produkten der Schutzklasse I mit beweglicher Netzzuleitung und Gerätesteckvorrichtung ist der Betrieb nur an Steckdosen mit Schutzkontakt und angeschlossenem Schutzleiter zulässig.
3. Jegliche absichtliche Unterbrechung des Schutzleiters, sowohl in der Zuleitung als auch am Produkt selbst, ist unzulässig. Es kann dazu führen, dass von dem Produkt die Gefahr eines elektrischen Schlags ausgeht. Bei Verwendung von Verlängerungsleitungen oder Steckdosenleisten ist sicherzustellen, dass diese regelmäßig auf ihren sicherheitstechnischen Zustand überprüft werden.
4. Sofern das Produkt nicht mit einem Netzschalter zur Netztrennung ausgerüstet ist, beziehungsweise der vorhandene Netzschalter zu Netztrennung nicht geeignet ist, so ist der Stecker des Anschlusskabels als Trennvorrichtung anzusehen.
Die Trennvorrichtung muss jederzeit leicht erreichbar und gut zugänglich sein. Ist z.B. der Netzstecker die Trennvorrichtung, darf die Länge des Anschlusskabels 3 m nicht überschreiten.
Funktionsschalter oder elektronische Schalter sind zur Netztrennung nicht geeignet. Werden Produkte ohne Netzschalter in Gestelle oder Anlagen integriert, so ist die Trennvorrichtung auf Anlagenebene zu verlagern.
5. Benutzen Sie das Produkt niemals, wenn das Netzkabel beschädigt ist. Überprüfen Sie regelmäßig den einwandfreien Zustand der Netzkabel. Stellen Sie durch geeignete Schutzmaßnahmen und Verlegearten sicher, dass das Netzkabel nicht beschädigt werden kann und niemand z.B. durch Stolperfallen oder elektrischen Schlag zu Schaden kommen kann.
6. Der Betrieb ist nur an TN/TT Versorgungsnetzen gestattet, die mit höchstens 16 A abgesichert sind (höhere Absicherung nur nach Rücksprache mit der Rohde & Schwarz Firmengruppe).
7. Stecken Sie den Stecker nicht in verstaubte oder verschmutzte Steckdosen/-buchsen. Stecken Sie die Steckverbindung/-vorrichtung fest und vollständig in die dafür vorgesehenen Steckdosen/-buchsen. Missachtung dieser Maßnahmen kann zu Funken, Feuer und/oder Verletzungen führen.
8. Überlasten Sie keine Steckdosen, Verlängerungskabel oder Steckdosenleisten, dies kann Feuer oder elektrische Schläge verursachen.
9. Bei Messungen in Stromkreisen mit Spannungen $U_{\text{eff}} > 30 \text{ V}$ ist mit geeigneten Maßnahmen Vorsorge zu treffen, dass jegliche Gefährdung ausgeschlossen wird (z.B. geeignete Messmittel, Absicherung, Strombegrenzung, Schutztrennung, Isolierung usw.).
10. Bei Verbindungen mit informationstechnischen Geräten, z.B. PC oder Industrierechner, ist darauf zu achten, dass diese der jeweils gültigen IEC 60950-1 / EN 60950-1 oder IEC 61010-1 / EN 61010-1 entsprechen.
11. Sofern nicht ausdrücklich erlaubt, darf der Deckel oder ein Teil des Gehäuses niemals entfernt werden, wenn das Produkt betrieben wird. Dies macht elektrische Leitungen und Komponenten zugänglich und kann zu Verletzungen, Feuer oder Schaden am Produkt führen.

Grundlegende Sicherheitshinweise

12. Wird ein Produkt ortsfest angeschlossen, ist die Verbindung zwischen dem Schutzleiteranschluss vor Ort und dem Geräteschutzleiter vor jeglicher anderer Verbindung herzustellen. Aufstellung und Anschluss darf nur durch eine Elektrofachkraft erfolgen.
13. Bei ortsfesten Geräten ohne eingebaute Sicherung, Selbstschalter oder ähnliche Schutzeinrichtung muss der Versorgungskreis so abgesichert sein, dass alle Personen, die Zugang zum Produkt haben, sowie das Produkt selbst ausreichend vor Schäden geschützt sind.
14. Jedes Produkt muss durch geeigneten Überspannungsschutz vor Überspannung (z.B. durch Blitzschlag) geschützt werden. Andernfalls ist das bedienende Personal durch elektrischen Schlag gefährdet.
15. Gegenstände, die nicht dafür vorgesehen sind, dürfen nicht in die Öffnungen des Gehäuses eingebracht werden. Dies kann Kurzschlüsse im Produkt und/oder elektrische Schläge, Feuer oder Verletzungen verursachen.
16. Sofern nicht anders spezifiziert, sind Produkte nicht gegen das Eindringen von Flüssigkeiten geschützt, siehe auch Abschnitt "Betriebszustände und Betriebslagen", Punkt 1. Daher müssen die Geräte vor Eindringen von Flüssigkeiten geschützt werden. Wird dies nicht beachtet, besteht Gefahr durch elektrischen Schlag für den Benutzer oder Beschädigung des Produkts, was ebenfalls zur Gefährdung von Personen führen kann.
17. Benutzen Sie das Produkt nicht unter Bedingungen, bei denen Kondensation in oder am Produkt stattfinden könnte oder ggf. bereits stattgefunden hat, z.B. wenn das Produkt von kalter in warme Umgebung bewegt wurde. Das Eindringen von Wasser erhöht das Risiko eines elektrischen Schlages.
18. Trennen Sie das Produkt vor der Reinigung komplett von der Energieversorgung (z.B. speisendes Netz oder Batterie). Nehmen Sie bei Geräten die Reinigung mit einem weichen, nicht fasernden Staublappen vor. Verwenden Sie keinesfalls chemische Reinigungsmittel wie z.B. Alkohol, Aceton, Nitroverdünnung.

Betrieb

1. Die Benutzung des Produkts erfordert spezielle Einweisung und hohe Konzentration während der Benutzung. Es muss sichergestellt sein, dass Personen, die das Produkt bedienen, bezüglich ihrer körperlichen, geistigen und seelischen Verfassung den Anforderungen gewachsen sind, da andernfalls Verletzungen oder Sachschäden nicht auszuschließen sind. Es liegt in der Verantwortung des Arbeitsgebers/Betreibers, geeignetes Personal für die Benutzung des Produkts auszuwählen.
2. Bevor Sie das Produkt bewegen oder transportieren, lesen und beachten Sie den Abschnitt "Transport".
3. Wie bei allen industriell gefertigten Gütern kann die Verwendung von Stoffen, die Allergien hervorrufen - so genannte Allergene (z.B. Nickel) - nicht generell ausgeschlossen werden. Sollten beim Umgang mit R&S-Produkten allergische Reaktionen, z.B. Hautausschlag, häufiges Niesen, Bindehautreizung oder Atembeschwerden auftreten, ist umgehend ein Arzt aufzusuchen, um die Ursachen zu klären und Gesundheitsschäden bzw. -belastungen zu vermeiden.
4. Vor der mechanischen und/oder thermischen Bearbeitung oder Zerlegung des Produkts beachten Sie unbedingt Abschnitt "Entsorgung", Punkt 1.

Grundlegende Sicherheitshinweise

5. Bei bestimmten Produkten, z.B. HF-Funkanlagen, können funktionsbedingt erhöhte elektromagnetische Strahlungen auftreten. Unter Berücksichtigung der erhöhten Schutzwürdigkeit des ungeborenen Lebens müssen Schwangere durch geeignete Maßnahmen geschützt werden. Auch Träger von Herzschrittmachern können durch elektromagnetische Strahlungen gefährdet sein. Der Arbeitgeber/Betreiber ist verpflichtet, Arbeitsstätten, bei denen ein besonderes Risiko einer Strahlenexposition besteht, zu beurteilen und zu kennzeichnen und mögliche Gefahren abzuwenden.
6. Im Falle eines Brandes entweichen ggf. giftige Stoffe (Gase, Flüssigkeiten etc.) aus dem Produkt, die Gesundheitsschäden verursachen können. Daher sind im Brandfall geeignete Maßnahmen wie z.B. Atemschutzmasken und Schutzkleidung zu verwenden.
7. Falls ein Laser-Produkt in ein R&S-Produkt integriert ist (z.B. CD/DVD-Laufwerk), dürfen keine anderen Einstellungen oder Funktionen verwendet werden, als in der Produktdokumentation beschrieben, um Personenschäden zu vermeiden (z.B. durch Laserstrahl).
8. EMV Klassen (nach EN 55011 / CISPR 11; sinngemäß EN 55022 / CISPR 22, EN 55032 / CISPR 32)

Gerät der Klasse A:

Ein Gerät, das sich für den Gebrauch in allen anderen Bereichen außer dem Wohnbereich und solchen Bereichen eignet, die direkt an ein Niederspannungs-Versorgungsnetz angeschlossen sind, das Wohngebäude versorgt.

Hinweis: Diese Einrichtung kann wegen möglicher auftretender leitungsgebundener als auch gestrahlten Störgrößen im Wohnbereich Funkstörungen verursachen. In diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen.

Gerät der Klasse B:

Ein Gerät, das sich für den Betrieb im Wohnbereich sowie in solchen Bereichen eignet, die direkt an ein Niederspannungs-Versorgungsnetz angeschlossen sind, das Wohngebäude versorgt.

Reparatur und Service

1. Das Produkt darf nur von dafür autorisiertem Fachpersonal geöffnet werden. Vor Arbeiten am Produkt oder Öffnen des Produkts ist dieses von der Versorgungsspannung zu trennen, sonst besteht das Risiko eines elektrischen Schlages.
2. Abgleich, Auswechseln von Teilen, Wartung und Reparatur darf nur von R&S-autorisierten Elektrofachkräften ausgeführt werden. Werden sicherheitsrelevante Teile (z.B. Netzschalter, Netztrafos oder Sicherungen) ausgewechselt, so dürfen diese nur durch Originalteile ersetzt werden. Nach jedem Austausch von sicherheitsrelevanten Teilen ist eine Sicherheitsprüfung durchzuführen (Sichtprüfung, Schutzleitertest, Isolationswiderstand-, Ableitstrommessung, Funktionstest). Damit wird sichergestellt, dass die Sicherheit des Produkts erhalten bleibt.

Batterien und Akkumulatoren/Zellen

Werden die Hinweise zu Batterien und Akkumulatoren/Zellen nicht oder unzureichend beachtet, kann dies Explosion, Brand und/oder schwere Verletzungen von Personen, unter Umständen mit Todesfolge, verursachen. Die Handhabung von Batterien und Akkumulatoren mit alkalischen Elektrolyten (z.B. Lithiumzellen) muss der EN 62133 entsprechen.

1. Zellen dürfen nicht zerlegt, geöffnet oder zerkleinert werden.
2. Zellen oder Batterien dürfen weder Hitze noch Feuer ausgesetzt werden. Die Lagerung im direkten Sonnenlicht ist zu vermeiden. Zellen und Batterien sauber und trocken halten. Verschmutzte Anschlüsse mit einem trockenen, sauberen Tuch reinigen.

Grundlegende Sicherheitshinweise

3. Zellen oder Batterien dürfen nicht kurzgeschlossen werden. Zellen oder Batterien dürfen nicht gefahrbringend in einer Schachtel oder in einem Schubfach gelagert werden, wo sie sich gegenseitig kurzschließen oder durch andere leitende Werkstoffe kurzgeschlossen werden können. Eine Zelle oder Batterie darf erst aus ihrer Originalverpackung entnommen werden, wenn sie verwendet werden soll.
4. Zellen oder Batterien dürfen keinen unzulässig starken, mechanischen Stößen ausgesetzt werden.
5. Bei Undichtheit einer Zelle darf die Flüssigkeit nicht mit der Haut in Berührung kommen oder in die Augen gelangen. Falls es zu einer Berührung gekommen ist, den betroffenen Bereich mit reichlich Wasser waschen und ärztliche Hilfe in Anspruch nehmen.
6. Werden Zellen oder Batterien, die alkalische Elektrolyte enthalten (z.B. Lithiumzellen), unsachgemäß ausgewechselt oder geladen, besteht Explosionsgefahr. Zellen oder Batterien nur durch den entsprechenden R&S-Typ ersetzen (siehe Ersatzteilliste), um die Sicherheit des Produkts zu erhalten.
7. Zellen oder Batterien müssen wiederverwertet werden und dürfen nicht in den Restmüll gelangen. Akkumulatoren oder Batterien, die Blei, Quecksilber oder Cadmium enthalten, sind Sonderabfall. Beachten Sie hierzu die landesspezifischen Entsorgungs- und Recycling-Bestimmungen.
8. Bei Rücksendungen von Lithiumbatterien zu Rohde & Schwarz - Niederlassungen müssen die Transportvorschriften der Verkehrsträger (IATA-DGR, IMDG-Code, ADR, RID) befolgt werden.

Transport

1. Das Produkt kann ein hohes Gewicht aufweisen. Daher muss es vorsichtig und ggf. unter Verwendung eines geeigneten Hebemittels (z.B. Hubwagen) bewegt bzw. transportiert werden, um Rückenschäden oder Verletzungen zu vermeiden.
2. Griffe an den Produkten sind eine Handhabungshilfe, die ausschließlich für den Transport des Produkts durch Personen vorgesehen ist. Es ist daher nicht zulässig, Griffe zur Befestigung an bzw. auf Transportmitteln, z.B. Kränen, Gabelstaplern, Karren etc. zu verwenden. Es liegt in Ihrer Verantwortung, die Produkte sicher an bzw. auf geeigneten Transport- oder Hebemitteln zu befestigen. Beachten Sie die Sicherheitsvorschriften des jeweiligen Herstellers eingesetzter Transport- oder Hebemittel, um Personenschäden und Schäden am Produkt zu vermeiden.
3. Falls Sie das Produkt in einem Fahrzeug benutzen, liegt es in der alleinigen Verantwortung des Fahrers, das Fahrzeug in sicherer und angemessener Weise zu führen. Der Hersteller übernimmt keine Verantwortung für Unfälle oder Kollisionen. Verwenden Sie das Produkt niemals in einem sich bewegenden Fahrzeug, sofern dies den Fahrzeugführer ablenken könnte. Sichern Sie das Produkt im Fahrzeug ausreichend ab, um im Falle eines Unfalls Verletzungen oder Schäden anderer Art zu verhindern.

Entsorgung

1. Batterien bzw. Akkumulatoren, die nicht mit dem Hausmüll entsorgt werden dürfen, darf nach Ende der Lebensdauer nur über eine geeignete Sammelstelle oder eine Rohde & Schwarz-Kundendienststelle entsorgt werden.
2. Am Ende der Lebensdauer des Produktes darf dieses Produkt nicht über den normalen Hausmüll entsorgt werden, sondern muss getrennt gesammelt werden.
Rohde & Schwarz GmbH & Co.KG ein Entsorgungskonzept entwickelt und übernimmt die Pflichten der Rücknahme- und Entsorgung für Hersteller innerhalb der EU in vollem Umfang. Wenden Sie sich bitte an Ihre Rohde & Schwarz-Kundendienststelle, um das Produkt umweltgerecht zu entsorgen.

Grundlegende Sicherheitshinweise

3. Werden Produkte oder ihre Bestandteile über den bestimmungsgemäßen Betrieb hinaus mechanisch und/oder thermisch bearbeitet, können ggf. gefährliche Stoffe (schwermetallhaltiger Staub wie z.B. Blei, Beryllium, Nickel) freigesetzt werden. Die Zerlegung des Produkts darf daher nur von speziell geschultem Fachpersonal erfolgen. Unsachgemäßes Zerlegen kann Gesundheitsschäden hervorrufen. Die nationalen Vorschriften zur Entsorgung sind zu beachten.
4. Falls beim Umgang mit dem Produkt Gefahren- oder Betriebsstoffe entstehen, die speziell zu entsorgen sind, z.B. regelmäßig zu wechselnde Kühlmittel oder Motorenöle, sind die Sicherheitshinweise des Herstellers dieser Gefahren- oder Betriebsstoffe und die regional gültigen Entsorgungsvorschriften einzuhalten. Beachten Sie ggf. auch die zugehörigen speziellen Sicherheitshinweise in der Produktdokumentation. Die unsachgemäße Entsorgung von Gefahren- oder Betriebsstoffen kann zu Gesundheitsschäden von Personen und Umweltschäden führen.

Weitere Informationen zu Umweltschutz finden Sie auf der Rohde & Schwarz Home Page.

Consignes de sécurité fondamentales

Lisez et respectez impérativement les instructions et consignes de sécurité suivantes

Les usines et sites du groupe Rohde & Schwarz veillent à la conformité des produits du groupe avec les normes de sécurité en vigueur dans un souci constant de garantir aux clients le plus haut niveau de sécurité possible. Nos produits ainsi que les accessoires nécessaires sont fabriqués et testés conformément aux règles de sécurité en vigueur. Le respect de ces règles est vérifié régulièrement par notre système d'assurance qualité. Le présent produit a été fabriqué et contrôlé conformément au certificat de conformité CE ci-joint et a quitté l'usine dans un parfait état de sécurité. Pour le maintenir dans cet état et en garantir une utilisation sans danger, l'utilisateur doit respecter l'ensemble des consignes, remarques de sécurité et avertissements qui se trouvent dans ce manuel. Le groupe Rohde & Schwarz se tient à votre disposition pour toutes questions relatives aux présentes consignes de sécurité.

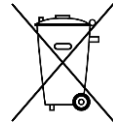
Il incombe à l'utilisateur d'employer ce produit de manière appropriée. Le produit est exclusivement destiné à l'utilisation en industrie et en laboratoire et/ou, si cela a été expressément autorisé, également aux travaux extérieurs ; il ne peut en aucun cas être utilisé à des fins pouvant causer des dommages corporels ou matériels. L'exploitation du produit en dehors de son utilisation prévue ou le non-respect des consignes du fabricant se font sous la responsabilité de l'utilisateur. Le fabricant décline toute responsabilité en cas d'utilisation non conforme du produit.

Le produit est présumé faire l'objet d'une utilisation conforme lorsqu'il est utilisé conformément aux consignes de la documentation produit correspondante et dans la limite de ses performances (voir fiche technique, documentation, consignes de sécurité ci-après). L'utilisation du produit exige des compétences en la matière et des connaissances de base de l'anglais. Par conséquent, le produit ne devra être utilisé que par un personnel qualifié ou des personnes formées de manière approfondie et possédant les compétences requises. Si, pour l'utilisation des produits Rohde & Schwarz, l'emploi d'un équipement personnel de protection s'avère nécessaire, il en est fait mention dans la documentation produit à l'emplacement correspondant. Conservez les consignes de sécurité fondamentales et la documentation produit dans un lieu sûr et transmettez ces documents aux autres utilisateurs du produit.

La stricte observation des consignes de sécurité a pour but d'exclure des blessures ou dommages causés par des dangers de toutes sortes. A cet effet, il est nécessaire de lire avec soin et de bien comprendre les consignes de sécurité ci-dessous avant l'utilisation du produit et de les respecter lors de l'utilisation du produit. Toutes les autres consignes de sécurité présentées à l'emplacement correspondant de la documentation produit, par exemple, celles concernant la protection des personnes, doivent également être impérativement respectées. Dans les présentes consignes de sécurité, toutes les marchandises commercialisées par le groupe Rohde & Schwarz, notamment les appareils, les systèmes ainsi que les accessoires, sont dénommés « produit ».

Consignes de sécurité fondamentales

Symboles et marquages de sécurité

Symbole	Signification	Symbole	Signification
	Avis, source générale de danger Se référer à la documentation produit		MARCHE / ARRET (tension d'alimentation)
	Attention lors de la manipulation d'appareils ayant un poids élevé		Indicateur de veille
	Risque de choc électrique		Courant continu (CC)
	Avertissement, surface chaude		Courant alternatif (CA)
	Borne de conducteur de protection		Courant continu/alternatif (CC/CA)
	Borne de mise à la terre		L'appareil est conforme aux exigences de sécurité du degré de protection II (appareil entièrement protégé par isolation double/renforcée).
	Borne de mise à la masse du bâti ou du boîtier		Marquage UE pour batteries et accumulateurs. L'appareil contient une batterie ou un accumulateur. Ces pièces ne peuvent pas être éliminées avec les déchets urbains non triés, mais doivent faire l'objet d'une collecte séparée. Pour plus d'informations, voir la page 7.
	Avis : prudence lors de la manipulation de composants sensibles aux décharges électrostatiques		Marquage UE pour la collecte séparée d'équipements électriques et électroniques. Les déchets d'équipements électriques et électroniques ne peuvent pas être éliminés avec les déchets urbains non triés, mais doivent faire l'objet d'une collecte séparée. Pour plus d'informations, voir la page 7.
	Avertissement, rayon laser Les produits laser sont munis d'avertissements normalisés d'après leur catégorie laser. En raison des caractéristiques de leur rayonnement ainsi que de leur puissance électromagnétique extrêmement concentrée, les lasers peuvent causer des dommages biologiques. Pour plus d'informations, voir le chapitre « Fonctionnement », point 7.		

Consignes de sécurité fondamentales

Mots d'alerte et significations

Les mots d'alerte suivants sont utilisés dans la documentation produit pour avertir des risques et dangers.



Indique une situation dangereuse immédiate qui, si elle n'est pas évitée, comporte un risque élevé de blessures graves ou mortelles.



Indique une situation dangereuse possible qui, si elle n'est pas évitée, comporte un risque modéré de blessures (graves) ou mortelles.



Indique une situation dangereuse qui, si elle n'est pas évitée, comporte un risque faible de blessures mineures ou modérées.



Indique la possibilité d'une fausse manœuvre susceptible d'endommager le produit.

Ces mots d'alerte correspondent à la définition habituelle utilisée pour des applications civiles dans l'espace économique européen. Des définitions divergentes peuvent cependant exister dans d'autres espaces économiques ou dans le cadre d'applications militaires. Il faut donc veiller à ce que les mots d'alerte décrits ici ne soient utilisés qu'en relation avec la documentation produit correspondante et seulement avec le produit correspondant. L'utilisation des mots d'alerte en relation avec des produits ou des documentations non correspondants peut conduire à des erreurs d'interprétation et par conséquent à des dommages corporels ou matériels.

États et positions de fonctionnement

L'appareil ne doit être utilisé que dans les états et positions de fonctionnement indiqués par le fabricant. Tout obstacle à la ventilation doit être empêché. Le non-respect des indications du fabricant peut provoquer des chocs électriques, des incendies et/ou des blessures graves pouvant éventuellement entraîner la mort. Pour tous les travaux, les règles locales et/ou nationales de sécurité et de prévention des accidents doivent être respectées.

1. Sauf stipulations contraires, les produits Rohde & Schwarz répondent aux exigences ci-après : faire fonctionner le produit avec le fond du boîtier toujours en bas, degré de protection IP 2X, degré de pollution 2, catégorie de surtension 2, utilisation uniquement à l'intérieur, fonctionnement à une altitude max. de 2000 m au-dessus du niveau de la mer, transport à une altitude max. de 4500 m au-dessus du niveau de la mer, tolérance de $\pm 10\%$ pour la tension nominale et de $\pm 5\%$ pour la fréquence nominale.
2. Ne jamais placer le produit sur des surfaces, véhicules, dépôts ou tables non appropriés pour raisons de stabilité ou de poids. Suivre toujours strictement les indications d'installation du fabricant pour le montage et la fixation du produit sur des objets ou des structures (par exemple parois et étagères). En cas d'installation non conforme à la documentation produit, il y a risque de blessures, voire de mort.
3. Ne jamais placer le produit sur des dispositifs générant de la chaleur (par exemple radiateurs et appareils de chauffage soufflants). La température ambiante ne doit pas dépasser la température maximale spécifiée dans la documentation produit ou dans la fiche technique. Une surchauffe du produit peut provoquer des chocs électriques, des incendies et/ou des blessures graves pouvant éventuellement entraîner la mort.

Consignes de sécurité fondamentales

Sécurité électrique

Si les consignes relatives à la sécurité électrique ne sont pas ou sont insuffisamment respectées, il peut s'ensuivre des chocs électriques, des incendies et/ou des blessures graves pouvant éventuellement entraîner la mort.

1. Avant chaque mise sous tension du produit, il faut s'assurer que la tension nominale réglée sur le produit correspond à la tension nominale du réseau électrique. S'il est nécessaire de modifier le réglage de la tension, il faut remplacer le fusible du produit, le cas échéant.
2. L'utilisation des produits du degré de protection I pourvus d'un câble d'alimentation mobile et d'un connecteur n'est autorisée qu'avec des prises munies d'un contact de protection et d'un conducteur de protection raccordé.
3. Toute déconnexion intentionnelle du conducteur de protection, dans le câble ou dans le produit lui-même, est interdite. Elle entraîne un risque de choc électrique au niveau du produit. En cas d'utilisation de câbles prolongateurs ou de multiprises, ceux-ci doivent être examinés régulièrement quant à leur état de sécurité technique.
4. Si le produit n'est pas doté d'un interrupteur d'alimentation pour le couper du réseau électrique ou si l'interrupteur d'alimentation disponible n'est pas approprié pour couper le produit du réseau électrique, le connecteur mâle du câble de raccordement est à considérer comme dispositif de séparation. Le dispositif de séparation doit être à tout moment facilement accessible. Si, par exemple, le connecteur d'alimentation sert de dispositif de séparation, la longueur du câble de raccordement ne doit pas dépasser 3 m.
Les commutateurs fonctionnels ou électroniques ne sont pas appropriés pour couper l'appareil du réseau électrique. Si des produits sans interrupteur d'alimentation sont intégrés dans des bâtis ou systèmes, le dispositif de séparation doit être reporté au niveau du système.
5. Ne jamais utiliser le produit si le câble d'alimentation est endommagé. Vérifier régulièrement le parfait état du câble d'alimentation. Prendre les mesures préventives appropriées et opter pour des types de pose tels que le câble d'alimentation ne puisse pas être endommagé et que personne ne puisse subir de préjudice, par exemple en trébuchant sur le câble ou par des chocs électriques.
6. L'utilisation des produits est uniquement autorisée sur des réseaux d'alimentation de type TN/TT protégés par des fusibles d'une intensité max. de 16 A (pour toute intensité supérieure, consulter le groupe Rohde & Schwarz).
7. Ne pas brancher le connecteur dans des prises d'alimentation sales ou poussiéreuses. Enfoncer fermement le connecteur jusqu'au bout de la prise. Le non-respect de cette mesure peut provoquer des étincelles, incendies et/ou blessures.
8. Ne pas surcharger les prises, les câbles prolongateurs ou les multiprises, cela pouvant provoquer des incendies ou chocs électriques.
9. En cas de mesures sur les circuits électriques d'une tension efficace > 30 V, prendre les précautions nécessaires pour éviter tout risque (par exemple équipement de mesure approprié, fusibles, limitation de courant, coupe-circuit, isolation, etc.).
10. En cas d'interconnexion avec des équipements informatiques comme par exemple un PC ou un ordinateur industriel, veiller à ce que ces derniers soient conformes aux normes IEC 60950-1 / EN 60950-1 ou IEC 61010-1 / EN 61010-1 en vigueur.
11. Sauf autorisation expresse, il est interdit de retirer le couvercle ou toute autre pièce du boîtier lorsque le produit est en cours de service. Les câbles et composants électriques seraient ainsi accessibles, ce qui peut entraîner des blessures, des incendies ou des dégâts sur le produit.

Consignes de sécurité fondamentales

12. Si un produit est connecté de façon stationnaire, établir avant toute autre connexion le raccordement du conducteur de protection local et du conducteur de protection du produit. L'installation et le raccordement ne peuvent être effectués que par un électricien ou électronicien qualifié.
13. Sur les appareils stationnaires sans fusible ni disjoncteur automatique ou dispositif de protection similaire intégrés, le circuit d'alimentation doit être sécurisé de sorte que toutes les personnes ayant accès au produit et le produit lui-même soient suffisamment protégés contre tout dommage.
14. Chaque produit doit être protégé de manière appropriée contre les éventuelles surtensions (par exemple dues à un coup de foudre). Sinon, les utilisateurs sont exposés à des risques de choc électrique.
15. Ne jamais introduire d'objets non prévus à cet effet dans les ouvertures du boîtier, étant donné que cela peut entraîner des courts-circuits dans le produit et/ou des chocs électriques, incendies ou blessures.
16. Sauf spécification contraire, les produits ne sont pas protégés contre l'infiltration de liquides, voir aussi la section « États et positions de fonctionnement », point 1. Il faut donc protéger les produits contre l'infiltration de liquides. La non-observation de cette consigne entraîne le risque de choc électrique pour l'utilisateur ou d'endommagement du produit, ce qui peut également mettre les personnes en danger.
17. Ne pas utiliser le produit dans des conditions pouvant occasionner ou ayant déjà occasionné, le cas échéant, des condensations dans ou sur le produit, par exemple lorsque celui-ci est déplacé d'un environnement froid dans un environnement chaud. L'infiltration d'eau augmente le risque de choc électrique.
18. Avant le nettoyage, débrancher le produit de l'alimentation (par exemple réseau électrique ou batterie). Pour le nettoyage des appareils, utiliser un chiffon doux non pelucheux. N'utiliser en aucun cas de produit de nettoyage chimique, tel que de l'alcool, de l'acétone ou un diluant nitrocellulosique.

Fonctionnement

1. L'utilisation du produit exige une formation spécifique ainsi qu'une grande concentration. Il est impératif que les personnes qui utilisent le produit présentent les aptitudes physiques, mentales et psychiques requises, vu qu'autrement des dommages corporels ou matériels ne peuvent pas être exclus. Le choix du personnel qualifié pour l'utilisation du produit est sous la responsabilité de l'employeur/l'exploitant.
2. Avant de déplacer ou de transporter le produit, lire et respecter la section « Transport ».
3. Comme pour tous les biens produits de façon industrielle, l'utilisation de matériaux pouvant causer des allergies (allergènes, comme par exemple le nickel) ne peut être totalement exclue. Si, lors de l'utilisation de produits Rohde & Schwarz, des réactions allergiques surviennent, telles qu'éruption cutanée, éternuements fréquents, rougeur de la conjonctive ou difficultés respiratoires, il faut immédiatement consulter un médecin pour en clarifier la cause et éviter toute atteinte à la santé.
4. Avant le traitement mécanique et/ou thermique ou le démontage du produit, il faut impérativement observer la section « Élimination des déchets », point 1.

Consignes de sécurité fondamentales

5. Selon les fonctions, certains produits, tels que des systèmes de radiocommunication RF, peuvent produire des niveaux élevés de rayonnement électromagnétique. Étant donné la vulnérabilité de l'enfant à naître, les femmes enceintes doivent être protégées par des mesures appropriées. Les porteurs de stimulateurs cardiaques peuvent également être menacés par les rayonnements électromagnétiques. L'employeur/l'exploitant est tenu d'évaluer et de repérer les lieux de travail soumis à un risque particulier d'exposition aux rayonnements et de prévenir les dangers éventuels.
6. En cas d'incendie, il se peut que le produit dégage des matières toxiques (gaz, liquides, etc.) susceptibles de nuire à la santé. Il faut donc, en cas d'incendie, prendre des mesures adéquates comme par exemple le port de masques respiratoires et de vêtements de protection.
7. Si un produit laser est intégré dans un produit Rohde & Schwarz (par exemple lecteur CD/DVD), il ne faut pas utiliser de réglages ou fonctions autres que ceux décrits dans la documentation produit pour éviter tout dommage corporel (par exemple causé par rayon laser).
8. Classes CEM (selon EN 55011 / CISPR 11 ; selon EN 55022 / CISPR 22, EN 55032 / CISPR 32 par analogie)
 - Appareil de la classe A :
Appareil approprié à un usage dans tous les environnements autres que l'environnement résidentiel et les environnements raccordés directement à un réseau d'alimentation basse tension qui alimente des bâtiments résidentiels.
Remarque : ces appareils peuvent provoquer des perturbations radioélectriques dans l'environnement résidentiel en raison de perturbations conduites ou rayonnées. Dans ce cas, on peut exiger que l'exploitant mette en œuvre des mesures appropriées pour éliminer ces perturbations.
 - Appareil de la classe B :
Appareil approprié à un usage dans l'environnement résidentiel ainsi que dans les environnements raccordés directement à un réseau d'alimentation basse tension qui alimente des bâtiments résidentiels.

Réparation et service après-vente

1. Le produit ne doit être ouvert que par un personnel qualifié et autorisé. Avant de travailler sur le produit ou de l'ouvrir, il faut le couper de la tension d'alimentation ; sinon il y a risque de choc électrique.
2. Les travaux d'ajustement, le remplacement des pièces, la maintenance et la réparation ne doivent être effectués que par des électroniciens qualifiés et autorisés par Rohde & Schwarz. En cas de remplacement de pièces concernant la sécurité (notamment interrupteur d'alimentation, transformateur d'alimentation réseau ou fusibles), celles-ci ne doivent être remplacées que par des pièces d'origine. Après chaque remplacement de pièces concernant la sécurité, une vérification de sécurité doit être effectuée (contrôle visuel, vérification du conducteur de protection, mesure de la résistance d'isolement et du courant de fuite, essai de fonctionnement). Cela permet d'assurer le maintien de la sécurité du produit.

Consignes de sécurité fondamentales

Batteries et accumulateurs/cellules

Si les instructions concernant les batteries et accumulateurs/cellules ne sont pas ou sont insuffisamment respectées, cela peut provoquer des explosions, des incendies et/ou des blessures graves pouvant entraîner la mort. La manipulation de batteries et accumulateurs contenant des électrolytes alcalins (par exemple cellules de lithium) doit être conforme à la norme EN 62133.

1. Les cellules ne doivent être ni démontées, ni ouvertes, ni réduites en morceaux.
2. Ne jamais exposer les cellules ou batteries à la chaleur ou au feu. Ne pas les stocker dans un endroit où elles sont exposées au rayonnement direct du soleil. Tenir les cellules et batteries au sec. Nettoyer les raccords sales avec un chiffon sec et propre.
3. Ne jamais court-circuiter les cellules ou batteries. Les cellules ou batteries ne doivent pas être gardées dans une boîte ou un tiroir où elles peuvent se court-circuiter mutuellement ou être court-circuitées par d'autres matériaux conducteurs. Une cellule ou batterie ne doit être retirée de son emballage d'origine que lorsqu'on l'utilise.
4. Les cellules ou batteries ne doivent pas être exposées à des chocs mécaniques de force non admissible.
5. En cas de manque d'étanchéité d'une cellule, le liquide ne doit pas entrer en contact avec la peau ou les yeux. S'il y a contact, rincer abondamment à l'eau l'endroit concerné et consulter un médecin.
6. Il y a danger d'explosion en cas de remplacement ou chargement incorrect des cellules ou batteries qui contiennent des électrolytes alcalins (par exemple cellules de lithium). Remplacer les cellules ou batteries uniquement par le type Rohde & Schwarz correspondant (voir la liste des pièces de rechange) pour maintenir la sécurité du produit.
7. Il faut recycler les cellules ou batteries et il est interdit de les éliminer comme déchets normaux. Les accumulateurs ou batteries qui contiennent du plomb, du mercure ou du cadmium sont des déchets spéciaux. Observer les règles nationales d'élimination et de recyclage.
8. Lors des renvois de batteries au lithium à des filiales Rohde & Schwarz, il convient de respecter les prescriptions de transport (IATA-DGR, code IMDG, ADR, RID) fixées par les transporteurs.

Transport

1. Le produit peut avoir un poids élevé. Il faut donc le déplacer ou le transporter avec précaution et en utilisant le cas échéant un moyen de levage approprié (par exemple, chariot élévateur) pour éviter des dommages au dos ou des blessures.
2. Les poignées des produits sont une aide de manipulation exclusivement réservée au transport du produit par des personnes. Il est donc proscrit d'utiliser ces poignées pour attacher le produit à ou sur des moyens de transport, tels que grues, chariots et chariots élévateurs, etc. Vous êtes responsable de la fixation sûre des produits à ou sur des moyens de transport et de levage appropriés. Observer les consignes de sécurité du fabricant des moyens de transport ou de levage utilisés pour éviter des dommages corporels et des dégâts sur le produit.
3. L'utilisation du produit dans un véhicule se fait sous l'unique responsabilité du conducteur qui doit piloter le véhicule de manière sûre et appropriée. Le fabricant décline toute responsabilité en cas d'accidents ou de collisions. Ne jamais utiliser le produit dans un véhicule en mouvement si cela pouvait détourner l'attention du conducteur. Sécuriser suffisamment le produit dans le véhicule pour empêcher des blessures ou dommages de tout type en cas d'accident.

Consignes de sécurité fondamentales

Élimination des déchets

1. Au terme de leur durée de vie, les batteries ou accumulateurs qui ne peuvent pas être éliminés avec les déchets ménagers peuvent uniquement être éliminés par des points de collecte appropriés ou par un centre de service après-vente Rohde & Schwarz.
2. Au terme de sa durée de vie, un produit ne peut pas être éliminé avec les déchets ménagers normaux, mais doit être collecté séparément.
Rohde & Schwarz GmbH & Co. KG a développé un concept d'élimination des déchets et assume toutes les obligations en matière de reprise et d'élimination, valables pour les fabricants au sein de l'UE. Veuillez vous adresser à votre centre de service après-vente Rohde & Schwarz pour éliminer le produit de manière écologique.
3. Si les produits ou leurs composants sont travaillés mécaniquement et/ou thermiquement au-delà de l'utilisation prévue, ils peuvent, le cas échéant, libérer des substances dangereuses (poussières contenant des métaux lourds comme par exemple du plomb, du béryllium ou du nickel). Le démontage du produit ne doit donc être effectué que par un personnel qualifié et spécialement formé. Le démontage inadéquat peut nuire à la santé. Les règles nationales concernant l'élimination des déchets doivent être observées.
4. Si, lors de l'utilisation du produit, des substances dangereuses ou combustibles exigeant une élimination spéciale sont dégagées, comme par exemple liquides de refroidissement ou huiles moteurs qui sont à changer régulièrement, les consignes de sécurité du fabricant de ces substances dangereuses ou combustibles ainsi que les règles sur l'élimination en vigueur au niveau régional doivent être respectées. Les consignes de sécurité spéciales correspondantes dans la documentation produit doivent également être respectées, le cas échéant. L'élimination non conforme des substances dangereuses ou combustibles peut provoquer des atteintes à la santé et des dommages écologiques.

Pour plus d'informations concernant la protection de l'environnement, voir la page d'accueil de Rohde & Schwarz.

Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz product, contact our customer support center. A team of highly qualified engineers provides support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz products.

Contact information

Contact our customer support center at www.rohde-schwarz.com/support, or follow this QR code:



QR code to the Rohde & Schwarz support page

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1 Performance Test

1.1 Preliminary Remarks

- Allow for a minimum warm-up time of 30 minutes at ambient temperature.
- Carry out all internal adjustments.
- The values are specified in the data sheet. Additional uncertainties introduced by the measurement equipment must be taken into account when checking the rated values.
- Entries for the measurement are represented in the following way:

[<KEY>]	Press a front-panel key, e.g. [SPAN]
[<SOFTKEY>]	Press a softkey, e.g. [MARKER -> PEAK]
[<nn unit>]	Enter a value + terminate the entry with a unit, e.g. [12 kHz]
#	Represents the number of the PORT or DC Input under test , e.g. 1 for PORT 1 or DC Input1

Consecutive entries are separated with a [:], e.g. [Meas Bandwidth : 1 kHz]

- **The sequence of performance test must be followed because on some performance tests the R&S ZNL under test is used as test equipment as well. Because of this procedure no spectrum analyzer is necessary.**

Performance Test	Precondition: successful test of
Harmonics	• Accuracy of output power • Power measurement accuracy • Input linearity
Output linearity	• Accuracy of output power • Power measurement accuracy • Input linearity

1.2 Test Equipment VNA

Table 1-1: Recommended Test Equipment ZNL with SPA Option-B1

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S Order No.	Application
1.	Spectrum Analyzer	a) Counter mode: Min. resolution: 100 Hz Max. rel. frequency deviation: 10E-6 b) Linearity Max. departure from linearity: 0.06 dB c) Frequency response: 9 KHz to 4 GHz: < 1 dB 4 GHz to 8 GHz: < 1.5 dB 8 GHz to 8.5 GHz: < 2 dB > 8.5 GHz < 2.5 dB	FSW 26	FSW26: 1312.8000K26	Frequency uncertainty Harmonics Output linearity Input linearity
2.	Power sensor	5 kHz to 6 GHz	NRP-Z51 NRP18A	NRP-Z51: 1138.0005.03 NRP18A: 1412.6815K02	Max. output power Accuracy of output power Power measurement uncertainty
3.	Power meter	Suitable for power sensor	NRP2	1144.1374.02	Max. output power Accuracy of output power Power measurement uncertainty
4.	Calibration kit	N 50 Ohm, 5 kHz to 6 GHz	ZV-Z270	ZV-Z270: 5011.6536.02	Input linearity Uncorr. system performance test
5.	SHORT standards	For an n-port VNA: n simple SHORT with fitting gender for all test ports, need not be characterized. For 2-port VNAs, one may also use the calibration kit and change the gender of the "wrong" SHORT with the help of an adapter	-	-	Dynamic range
6.	Signal generator	5 kHz to 6 GHz	SMB100A	SMB100A: 1406.6000.02	Power measurement uncertainty
7.	Signal generator	5 kHz to 6 GHz	SMB100A with option SMB-B112L	SMB100A: 1406.6000.02 SMB-B112L: 1407.2150.02	IP3 measurement, only SPA Option -B1
8.	Step attenuator	0-50 dB	R&S RSC, alternatively the internal Step Attenuator of the generator can be calibrated using the power meter	1313.8004.03	Display Linearity only SPA Option -B1

Item	Type of equipment	Recommended characteristics or features	Recommended model	R&S Order No.	Application
9.	Power splitter	Suitable for frequency range and connector type of R&S ZNL Freq < 0.05 Output tracking < 0.2 dB	Weinschel 1870A		Power measurement uncertainty
10.	Power combiner	Suitable for frequency range and connector type of R&S ZNL	Weinschel 1506A		IP3 measurement, only SPA Option -B1
11.	Test cable	Suitable for frequency range and connector type of R&S ZNL, spectrum analyzer and signal generator Approx. 1.5 m If a SMA or 3.5 mm cable is used, the cable must be adapted to the N 50 Ohm (f) R&S ZNL test ports and if necessary also to the spectrum analyzer / signal generator	ZV-Z193	ZV-Z193: 1306.4520.60	Frequency uncertainty Harmonics Power measurement uncertainty Input linearity Trace Noise unidirectional devices
12.	Test cable	Approx. 0.6 m	ZV-Z91	ZV-Z91: 1301.7572.25	Uncorr. system performance test
13.	Test cable	Approx. 1.5 m BNC (m) – BNC (m)			Transmission of reference frequency within test setup
14.	LAN cable				R&S ZNL remote control
15.	GPIO cable				R&S ZNL remote control

1.3 Test Instructions VNA

The following sections describe the performance test sequences in detail. Test report tables appear in [Chapter 1.4, "Performance Test Report VNA"](#), on page 28.

Options

The following options are included in the performance test:

- ZNL3/4/6-B1 Spectrum Analysis. See: Test Description SPA
- ZNL-B6 Legacy Probe Connector. See: VNA, Checking the optional R&SZNL-B6 Legacy Probe Connector
- ZNL3/4/6-B22 Extended Power Range, 2 ports. See: VNA, Checking the Output Level Linearity
- ZNL3/4/6-B31 Receiver Step Attenuator for Port 1. See: VNA, Checking the Receiver Step Attenuator
- ZNL3/4/6-B32 Receiver Step Attenuator for Port 2. See: VNA, Checking the Receiver Step Attenuator
- FPL1-B4 Precision Frequency Reference (OCXO). See: VNA, Checking the Static Frequency Accuracy

- FPL1-B5 Additional Interfaces. See: Test Description Option -B5
- FPL1-B10 GPIB Interface. See: Checking the optional R&S FPL1-B10 GPIB Interface

1.3.1 Checking Selftest

Measurement

[**SETUP** : Service + Support : Selftest : Start Selftest]

Check: Selftest state:

PASSED -> is o.k.

1.3.2 Checking the Static Frequency Accuracy

Test equipment

Spectrum analyzer (see: Test Equipment),

Test cable (see: Test Equipment)

Test setup

Connect the spectrum analyzer to port 1.

Spectrum analyzer settings

1. [**Preset**]
2. [**FREQ** : 1 GHz]
3. [**SPAN** : 50 kHz]
4. [**BW** : RES BW MANUAL : 10 kHz]
5. [**MARKER** : MARKER MODE : FREQ COUNT]
6. [**Ampt** : REF LEVEL : +5 dBm]
7. [**Ampt** : RF ATTEN MANUAL : 15 dB]

R&S ZNL settings

1. [**Preset**]
2. [**SETUP** : Freq.Ref.: Internal]
3. [**Meas** : Wave Quantities: a1 Source Port 1]
4. [**Sweep** : Sweep Type : CW Mode]

5. [**CENTER** : CW Frequency : **1 GHz**; Power : **0 dBm**]

6. [**Sweep** : Sweep Control : Single : Restart Sweep]

Measurement

Read the frequency indicated by the marker of the Spectrum Analyzer.

Calculation

Frequency deviation = marker frequency – 1 GHz.

For tolerances see: [Chapter 1.4.2, "Table: Frequency Accuracy"](#), on page 29

1.3.3 Checking the Output Harmonics

Test equipment

Spectrum analyzer (see: Test Equipment)

Test cable (see: Test Equipment)

Test setup

Connect the spectrum analyzer to port # (# : port number; all ports have to be tested).



Make sure the R&S ZNL and the spectrum analyzer are synchronized by means of the 10 MHz Ref in/ Ref out

Spectrum analyzer settings

1. [**Preset**]
2. [**SPAN** : ZERO SPAN]
3. [**FREQ** : { f_{GEN} }*]
4. [**BW** : RES BW MANUAL : **1 kHz**]
5. [**Sweep** : SWEETIME MANUAL: **100 ms**]
6. [**Meas** : TIME DOM POWER : MEAN]
7. [**Ampt** : REF LEVEL : **+5 dBm**]
8. [**Ampt** : RF ATTEN MANUAL : **15 dB**]
9. [**Ampt** : RF INPUT : **DC**]

R&S ZNL settings

1. [**Preset**]
2. [**Meas** : Wave : a# Source Port #]

3. [**Sweep** : Sweep Type : CW Mode]
4. [**CENTER** : CW Frequency : $\{f_{\text{meas}}\}^*$]
5. [**POWER** : Power : -10 dBm]
6. [**Sweep** : Sweep Control : Single : Restart Sweep]

Measurement

1. Change frequency of Spectrum Analyzer to $f_{\text{SPA}} = f_{\text{meas}}^*$
2. Read out Spectrum Analyzer POWER MEAN value: L_{SPA}
3. Change frequency of Spectrum Analyzer to $f_{\text{SPA}} = 2x \{f_{\text{meas}}\}^*$
4. Read out Spectrum Analyzer POWER MEAN value: $L_{\text{SPA_2x}}$
5. Change frequency of Spectrum Analyzer to $f_{\text{SPA}} = 3x \{f_{\text{meas}}\}^*$ (only if 3.Harmonics shall be tested)*
6. Read out Spectrum Analyzer POWER MEAN value: $L_{\text{SPA_3x}}$ (only if 3.Harmonics shall be tested)*

Calculation

2.Harmonics [dBc] = $(L_{\text{SPA_2x}} + \text{cable loss (in dB@2x } f_{\text{meas}}) - (L_{\text{SPA}} + \text{cable loss (in dB@} f_{\text{GEN}}))$

3.Harmonics [dBc] = $(L_{\text{SPA_3x}} + \text{cable loss (in dB@3x } f_{\text{meas}}) - (L_{\text{SPA}} + \text{cable loss (in dB@} f_{\text{GEN}}))$ (only if 3.Harmonics shall be tested)*

The cable loss corresponds to the loss of the test cable used at the fundamental and the measured harmonic (cable loss is positive) .

* For test frequencies $\{f_{\text{GEN}}\}$, $2x \{f_{\text{meas}}\}$ and $3x \{f_{\text{meas}}\}$ see [Chapter 1.4.3, "Table: Output Harmonics"](#), on page 29.

1.3.4 Checking the Output Power Linearity

Test equipment

Spectrum analyzer (see: Test Equipment)

Test cable (see: Test Equipment)

Test setup

Connect spectrum analyzer to port # (# : port number; all ports have to be tested)



Make sure the R&S ZNL and the spectrum analyzer are synchronized by means of the 10 MHz Ref in/ Ref out

Spectrum analyzer settings

1. [**Preset**]
2. [**FREQ** : { f_{GEN} }*]
3. [**SPAN** : ZERO SPAN]
4. [**BW** : RES BW MANUAL : **100 Hz**]
5. [**Sweep** : SWEETIME MANUAL: **100 ms**]
6. [**Trace** : DETECTOR : DETECTOR RMS]
7. [**Meas** : TIME DOM POWER : MEAN]
8. [**Ampt** : REF LEVEL : **+5 dBm**]
9. [**Ampt** : RF ATTEN MANUAL : **15 dB**]
10. [**Ampt** : RF INPUT : **DC**]

R&S ZNL settings

1. [**Preset**]
2. [**Meas** : Wave : a# Source Port #]
3. [**Sweep** : Sweep Type : CW Mode]
4. [**Sweep** : Sweep Params : Number of Points 2]
5. [**POWER** : Bandwidth : 1 kHz]
6. [**POWER** : Power : -10dBm]
7. [**CENTER** : CW Frequency : { f_{GEN} }*]
8. [**Sweep** : Sweep Control : Single : Restart Sweep]
9. [**Sweep** : Sweep Control : Single : Restart Sweep]

Measurement

1. Read out Spectrum Analyzer POWER MEAN value: $L_{\text{SA-10dBm}}$
2. Change R&S ZNL power by { I_{step} }**
3. Read out Spectrum Analyzer POWER MEAN value: $L_{\text{SA}_I\text{step}}$

Calculation

The measured values are referred to the level at the R&S ZNL setting of –10 dBm.

$$\text{Level deviation [dB]} = (L_{\text{SA}_I\text{step}} - L_{\text{SA-10dBm}}) - \{I_{\text{step}}\}^{**}$$

* For test frequencies { f_{GEN} }, see [Chapter 1.4.6, "Table: Output Power Linearity"](#), on page 30.

** For source power change $\{l_{\text{step}}\}$, see [Chapter 1.4.6, "Table: Output Power Linearity"](#), on page 30.

1.3.5 Checking the Maximum Output Power

Test equipment

Power sensor or Power meter with power sensor (see: Test Equipment)

Test setup

Connect power sensor to port # (# : port number; all ports have to be tested)

Power sensor settings

For measurement frequencies $\{f_{\text{GEN}}\}$, see [Chapter 1.4.4, "Table: Output Power Maximum"](#), on page 29.

R&S ZNL settings

1. [**Preset**]
2. [**Meas** : Wave : a# Source Port #]
3. [**Sweep** : Sweep Type : CW Mode]
4. [**CENTER** : CW Frequency : $\{f_{\text{GEN}}\}^*$; Power : **10 dBm**]
5. [**Sweep** : Sweep Control : Single : Restart Sweep]

* For test frequencies $\{f_{\text{GEN}}\}$, see [Chapter 1.4.4, "Table: Output Power Maximum"](#), on page 29.

Measurement

Read the level indicated by the power meter [dBm].

1.3.6 Checking the Output Power Accuracy

Test equipment

Power sensor or Power meter with power sensor (see: Test Equipment)

Test setup

Connect power sensor to port # (# : port number; all ports have to be tested)

Power sensor settings

For test frequencies $\{f_{\text{GEN}}\}$, see [Chapter 1.4.5, "Table: Output Power Accuracy"](#), on page 30.

R&S ZNL settings

1. [**Preset**]
2. [**Meas** : Wave : a# Source Port #]
3. [**Sweep** : Sweep Type : CW Mode]
4. [**POWER** : Bandwidth : 1 kHz]
5. [**POWER** : Power : -10 dBm]
6. [**CENTER** : CW Frequency : $\{f_{\text{GEN}}\}^*$]
7. [**Sweep** : Sweep Control : Single : Restart Sweep]

* For test frequencies $\{f_{\text{GEN}}\}$, see [Chapter 1.4.5, "Table: Output Power Accuracy"](#), on page 30.

Measurement

Read the levels indicated by the power sensor: L_{PS}

Calculation

Level deviation [dB] = $L_{\text{PS}} - (-10 \text{ dBm})$

1.3.7 Checking the Input Power Measurement Accuracy

Test equipment

1. Power sensor or Power meter with power sensor (see: Test Equipment)
2. Signal generator (see: Test Equipment)
3. Power splitter (see: Test Equipment)
4. Power sensor (see: Test Equipment)
5. Test cable (see: Test Equipment)

Test setup

1. Connect the signal generator to the power splitter input using the test cable
2. Connect the power sensor to a power splitter output

3. Connect the other power splitter output to port # using an adapter from the calibration kit (# : port number; all ports have to be tested)



Make sure the R&S ZNL and the signal generator are synchronized by means of the 10 MHz Ref in/ Ref out

Signal Generator settings

1. [**Preset**]
2. [**FREQ** : {f_{GEN}}*]
3. [**LEVEL** : -4 dBm]

R&S ZNL settings

1. [**Preset**]
2. [**Meas** : Wave : b# Source Port 2] (for # = 1)
[**Meas** : Wave : b# Source Port 1] (for # ≠ 1)
3. [**POWER** : Power : RF Off All Channels]
4. [**Sweep** : Sweep Type : CW Mode]
5. [**Sweep** : Sweep Params : Number of Points 1001]
6. [**POWER** : Bandwidth : 10 kHz]
7. [**Trace CONFIG** : Trace statistics : Mean/Std Dev/RMS]
1. [**CENTER** : CW Frequency : {f_{GEN}}*]
2. [**Sweep** : Sweep Control : Single : Restart Sweep]

* For test frequencies, see [Chapter 1.4.7, "Table: Input Power Measurement Accuracy"](#), on page 31.

Measurement and calculation

1. Adjust the signal generator level so that the power meter reads -10 dBm +/- 0.5 dB
2. Determine the signal generator level that gives -10 dBm at the splitter output
Store this level as L(f)_{GEN_IPMA}. This level will be used in [Chapter 1.3.9, "Checking the Input Power Linearity \(low level \)"](#), on page 18
3. Read the power meter display (L_{PS}) and the R&S ZNL Statistics Mean values (L_{ZNx})
4. Deviation = L_{ZNx} - L_{PS}

1.3.8 Checking the Input Power Linearity (high level)

Test equipment

see Chapter: [Chapter 1.3.7, " Checking the Input Power Measurement Accuracy"](#), on page 15

Test setup

see Chapter: [Chapter 1.3.7, " Checking the Input Power Measurement Accuracy"](#), on page 15

Signal Generator settings

1. [**Preset**]
2. [**FREQ** : { f_{GEN} }*]
3. [**LEVEL** : -5 dBm]

R&S ZNL settings

1. [**Preset**]
2. [**Meas** : Wave : b# Source Port 2] (for # = 1)
[**Meas** : Wave : b# Source Port 1] (for # ≠ 1)
3. [**POWER** : Power : RF Off All Channels]
4. [**Sweep** : Sweep Type : CW Mode]
5. [**Sweep** : Sweep Params : Number of Points 101]
6. [**POWER** : Bandwidth : 10 kHz]
7. [**Trace CONFIG** : Trace statistics : Mean/Std Dev/RMS]
1. [**CENTER** : CW Frequency : { f_{GEN} }*]
2. [**Sweep** : Sweep Control : Single : Restart Sweep]

* For test frequencies, see [Chapter 1.4.9, "Table: Input Power Linearity \(high level \)"](#), on page 32.

Measurement

1. Adjust the signal generator level so that the power meter reads -10 dBm +/- 0.5 dB
2. Read the power meter display (L_{ref_PS}) and the R&S ZNL Statistics Mean values (L_{ref_ZNx})

3. Adjust the signal generator level so that the power meter reads $-15 \text{ dBm} \pm 0.5 \text{ dB}$
4. Read the power meter display ($L_{-5\text{dB_PS}}$) and the R&S ZNL Statistics Mean values ($L_{-5\text{dB_ZNx}}$)
5. Adjust the signal generator level so that the power meter reads $-5 \text{ dBm} \pm 0.5 \text{ dB}$
6. Read the power meter display ($L_{+5\text{dB_PS}}$) and the R&S ZNL Statistics Mean values ($L_{+5\text{dB_ZNx}}$)
7. Adjust the signal generator level so that the power meter reads $+0 \text{ dBm} \pm 0.5 \text{ dB}$
8. Read the power meter display ($L_{+10\text{dB_PS}}$) and the R&S ZNL Statistics Mean values ($L_{+10\text{dB_ZNx}}$)

Calculation

1. Deviation @-5dB = $(L_{-5\text{dB_ZNx}} - L_{-5\text{dB_PS}}) - (L_{\text{ref_ZNx}} - L_{\text{ref_PS}})$
2. Deviation @+5dB = $(L_{+5\text{dB_ZNx}} - L_{+5\text{dB_PS}}) - (L_{\text{ref_ZNx}} - L_{\text{ref_PS}})$
3. Deviation @+10dB = $(L_{+10\text{dB_ZNx}} - L_{+10\text{dB_PS}}) - (L_{\text{ref_ZNx}} - L_{\text{ref_PS}})$

1.3.9 Checking the Input Power Linearity (low level)

Test equipment

1. Signal generator (see: Test Equipment)
2. Spectrum Analyzer (see: Test Equipment)
3. 2x test cable 1.5 m (see: Test Equipment)
4. Power splitter (see: Test Equipment)

Test Setup

1. Connect the signal generator to the power splitter input using the test cable
2. Connect the spectrum analyzer to one power splitter output
3. Connect the other power splitter output to port # (#: port number; all ports have to be tested) using an adapter from the calibration kit



Make sure the R&S ZNL and the signal generator are synchronized by means of the 10 MHz Ref in/ Ref out

Signal Generator settings

1. [**Preset**]
2. [**FREQ** : 700.513 MHz]
3. [**LEVEL** : -5 dBm]

Settings for the Spectrum Analyzer

1. [**Preset**]
2. [**Ampt** : REF LEVEL : **+5 dBm**]
3. [**Ampt** : RF ATTEN MANUAL : **15 dB**]
4. [**FREQ** : CENTER : 700.513 MHz]
5. [**SPAN** : ZERO SPAN]
6. [**BW** : RES BW MANUAL : **2 kHz**]
7. [**Sweep** : SWEETIME MANUAL: **500 ms**]
8. [**Meas** : TIME DOM POWER : MEAN]

R&S ZNL settings

1. [**Preset**]
2. [**Meas** : Wave : b# Source Port 2 (for # = 1; #: port number; all ports have to be tested)]
[**Meas** : Wave : b# Source Port 1 (for # ≠ 1; #: port number; all ports have to be tested)]
3. [**POWER** : Power : -40 dBm]
4. [**POWER** : Power : RF Off All Channels]
5. [**POWER** : Bandwidth : 100 Hz]
6. [**Sweep** : Number of points : 6]
7. [**Trace CONFIG** : Trace statistics : Mean/Std Dev/RMS]
8. [**Sweep** : Sweep Type : CW Mode]
9. [**CENTER** : CW Frequency : 700.513 MHz]

Measurement

1. Set the signal generator level so that it provides -10 dBm +/- 0.5 dB at the splitter output. Use the value $L(f)_{\text{GEN_IPMA}}$ which is determined in Chapter [Chapter 1.3.7, "Checking the Input Power Measurement Accuracy"](#), on page 15.
2. Read out Spectrum Analyzer POWER MEAN value: $L_{\text{SA-10dBm}}$

3. Read out R&S ZNL Statistics Mean values: $L_{ZNX-10dBm}$
4. Reduce signal generator level by $\{I_{step}\}^* dB$
 Read out Spectrum Analyzer POWER MEAN value: L_{SA_Istep}
 Read out R&S ZNL Statistics Mean values: $L_{ZNX-Istep}$
 *for signal generator level decrement $\{I_{step}\} dB$, see [Chapter 1.4.8, "Table: Input Power Linearity \(low level \)"](#), on page 32

Calculation

Receiver Linearity Deviation @ $\{I_{step}\}^* dB = (L_{ZNX_Istep} - L_{ZNX-10dBm}) - (L_{SA_Istep} - L_{SA-10dBm})$

1.3.10 Checking the Input Attenuator

Test equipment

see Chapter: [Chapter 1.3.7, " Checking the Input Power Measurement Accuracy"](#), on page 15

Test setup

see Chapter: [Chapter 1.3.7, " Checking the Input Power Measurement Accuracy"](#), on page 15

Signal Generator settings

1. [**Preset**]
2. [**FREQ** : 100 MHz]
3. [**LEVEL** : -5 dBm]

R&S ZNL settings

1. [**Preset**]
2. [**Meas** : Wave : b# Source Port 2] (for # = 1) (# = Port 1 to 2)
 [**Meas** : Wave : b# Source Port 1] (for # ≠ 1)
3. [**POWER** : Power : RF Off All Channels]
4. [**Sweep** : Sweep Type : CW Mode]
5. [**Sweep** : Sweep Params : Number of Points 101]
6. [**POWER** : Bandwidth : 10 kHz]
7. [**Trace CONFIG** : Trace statistics : Mean/Std Dev/RMS]
1. [**CENTER** : CW Frequency : 100 MHz]
2. [**Sweep** : Sweep Control : Single : Restart Sweep]

Measurement

1. [**BW AVG POWER** : Step Attenuators b# 0dB]
2. [**Sweep** : Sweep Control : Single : Restart Sweep]
3. Adjust the signal generator level so that the power meter reads $-10 \text{ dBm} \pm 0.5 \text{ dB}$
4. [**Sweep** : Sweep Control : Single : Restart Sweep]
5. Read the power meter display ($L_{\text{ref_PS}}$) and the R&S ZNL Statistics Mean values ($L_{\text{ref_ZNx}}$)
6. [**BW AVG POWER** : Step Attenuators b# 10dB]
7. [**Sweep** : Sweep Control : Single : Restart Sweep]
8. Read the R&S ZNL Statistics Mean values ($L_{\text{ATT_10dB_ZNx}}$)
9. [**BW AVG POWER** : Step Attenuators b# 20dB]
10. [**Sweep** : Sweep Control : Single : Restart Sweep]
11. Read the R&S ZNL Statistics Mean values ($L_{\text{ATT_20dB_ZNx}}$)
12. [**BW AVG POWER** : Step Attenuators b# 30dB]
13. [**Sweep** : Sweep Control : Single : Restart Sweep]
14. Read the R&S ZNL Statistics Mean values ($L_{\text{ATT_30dB_ZNx}}$)

Calculation

1. Deviation Rf Att: 10dB = $L_{\text{ATT_10dB_ZNx}} - (L_{\text{ref_ZNx}} - L_{\text{ref_PS}})$
2. Deviation Rf Att: 20dB = $L_{\text{ATT_20dB_ZNx}} - (L_{\text{ref_ZNx}} - L_{\text{ref_PS}})$
3. Deviation Rf Att: 30dB = $L_{\text{ATT_30dB_ZNx}} - (L_{\text{ref_ZNx}} - L_{\text{ref_PS}})$

1.3.11 Checking the Trace Noise Magnitude**Test equipment**

Calibration kit (see: Test Equipment)

Test setup

Connect the OPEN / SHORT (gender fitting to test port) from the calibration kit to Port # (# : port number; all ports have to be tested)

R&S ZNL settings

1. [**Preset**]

2. [**Meas** : S##]
3. [**POWER** : Power : 0 dBm]
4. [**Sweep** : Sweep Type : CW Mode]
5. [**POWER** : Bandwidth : 1 kHz] (for $\{f_{\text{GEN}}\}^* < 100 \text{ kHz}$)
 [**POWER** : Bandwidth : 10 kHz] (for $\{f_{\text{GEN}}\}^* \geq 100 \text{ kHz}$)
6. [**CENTER** : CW Frequency : $\{f_{\text{GEN}}\}^*$]
7. [**Sweep** : Number of points : 2001]
8. [**Trace CONFIG** : Trace statistics : Mean/Std Dev/RMS]
9. [**Sweep** : Sweep Control : Single : Restart Sweep]

* For test frequencies $\{f_{\text{GEN}}\}$, see [Chapter 1.4.18, "Table: Trace Noise Magnitude"](#), on page 37.

Measurement

1. Connect OPEN to Port #
2. [**Sweep** : Sweep Control : Single : Restart Sweep]
3. [**Sweep** : Sweep Control : Single : Restart Sweep]
4. Read out R&S ZNL Statistics Std Dev value: SD_{OPEN}
5. Connect SHORT to Port #
6. [**Sweep** : Sweep Control : Single : Restart Sweep]
7. [**Sweep** : Sweep Control : Single : Restart Sweep]
8. Read out R&S ZNL Statistics Std Dev value: SD_{SHORT}

Evaluation

Record maximum of SD_{OPEN} and SD_{SHORT}



Only the evaluation result is documented, not the individual OPEN and SHORT measurements.

1.3.12 Checking the Trace Noise Phase

Test equipment

Calibration kit (see: Test Equipment)

Test setup

Connect the OPEN / SHORT (gender fitting to test port) from the calibration kit to Port # (# : port number; all ports have to be tested)

R&S ZNL settings

1. [**Preset**]
2. [**Meas** : S##]
3. [**POWER** : Power : 0 dBm]
4. [**SETUP** : System Config : User Interface : Trailing Digits : Degree : 3]
5. [**FORMAT** : unwr Phase]
6. [**Sweep** : Sweep Type : CW Mode]
7. [**POWER** : Bandwidth : 1 kHz] (for $\{f_{GEN}\}^* < 100 \text{ kHz}$)
 [**POWER** : Bandwidth : 10 kHz] (for $\{f_{GEN}\}^* \geq 100 \text{ kHz}$)
8. [**CENTER** : CW Frequency : $\{f_{GEN}\}^*$]
9. [**Sweep** : Number of points : 2001]
10. [**Trace CONFIG** : Trace statistics : Mean/Std Dev/RMS]
11. [**Sweep** : Sweep Control : Single : Restart Sweep]

* For test frequencies $\{f_{GEN}\}$, see [Chapter 1.4.19, "Table: Trace Noise Phase"](#), on page 37.

Measurement

1. Connect OPEN to Port #
2. [**Sweep** : Sweep Control : Single : Restart Sweep]
3. [**Sweep** : Sweep Control : Single : Restart Sweep]
4. Read out R&S ZNL Statistics Std Dev value: SD_{OPEN}
5. Connect SHORT to Port #
6. [**Sweep** : Sweep Control : Single : Restart Sweep]
7. [**Sweep** : Sweep Control : Single : Restart Sweep]
8. Read out R&S ZNL Statistics Std Dev value: SD_{SHORT}

Evaluation

Record maximum of SD_{OPEN} and SD_{SHORT}



Only the evaluation result is documented, not the individual OPEN and SHORT measurements.

1.3.13 Checking the Dynamic Range

Test equipment

Simple SHORTs (see: Test Equipment)

Test setup

Connect SHORTs to all test ports

R&S ZNL settings

1. [**Preset**]
2. [**Meas** : S21 (S12)
3. [**POWER** : Power : 0 dBm]
4. [**POWER** : Bandwidth : 10 Hz]
5. [**MARKER**]
6. [**Sweep** : Sweep Type : CW Mode]
7. [**CENTER** : CW Frequency : {**f_{GEN}**}*]
8. [**Sweep** : Number of points : 21]
9. [**Trace CONFIG** : Trace statistics : Mean/Std Dev/RMS]
10. [**Sweep** : Sweep Control : Single : Restart Sweep]

* For test frequencies {**f_{GEN}**}, see [Chapter 1.4.12, "Table: Dynamic Range"](#), on page 34.

Measurement

Read out R&S ZNL Statistics Mean values: L

Dynamic Range = – L

1.3.14 Checking the Input Noise Level

Test equipment

Calibration kit (see: Test Equipment)

Test setup

Connect the MATCH (gender fitting to test port) from the calibration kit to port # (# : port number;)

R&S ZNL settings

1. [**Preset**]
2. [**Meas** : Wave : b# Source Port 2] (for # = 1)
[**Meas** : Wave : b# Source Port 1] (for # ≠ 1)
3. [**POWER** : Power : RF Off All Channels]
4. [**POWER** : Bandwidth : 1 kHz]
5. [**Sweep** : Sweep Type : CW Mode]
6. [**CENTER** : CW Frequency : {f_{GEN}}*]
7. [**Sweep** : Number of points : 200]
8. [**Trace CONFIG** : Trace statistics : Mean/Std Dev/RMS]
9. [**Sweep** : Sweep Control : Single : Restart Sweep]

* For test frequencies {f_{GEN}}, see [Chapter 1.4.11, "Table: Input Noise Level"](#), on page 33.

Measurement

Read out R&S ZNL Statistics Mean values: L_{RBW=1kHz}

Calculation

Read out mean marker and correct the measurement value by –30 dB for the bandwidth ratio of 1 Hz / 1 kHz. This is done in order to save measurement time. The bandwidth scaling is allowed since both filters are implemented digitally and use the same hardware settings.

$$L_{RBW=1\text{ Hz}} = L_{RBW=1\text{ kHz}} - 30\text{ dB}$$

**Example**

If the measured noise level is –100 dBm at 1 kHz bandwidth, scaling to 1 Hz provides a level of –130 dBm.

1.3.15 Checking the Uncorrected System Performance**Test equipment**

1. Calibration kit (see: Test Equipment)

2. test cable 0.5 m (see: Test Equipment)

R&S ZNL settings

1. [**Preset**]
[**Setup** : Service + Support : Service function : 4.0.0.13.1]
2. [**Sweep** : Sweep Type : Define Segments]
[Add: Start 100 kHz : Stop 900 kHz : Points 9]
[Add: Start 1 MHz : Stop 10 MHz : Points 19]
[Add: Start 15 MHz : Stop 100 MHz : Points 18]
[Add: Start 200 MHz : Stop 3 GHz : Points 29] (only ZNL3, ZNLE3)
[Add: Start 200 MHz : Stop 4.5 GHz : Points 44](only ZNL4, ZNLE4)
[Add: Start 200 MHz : Stop 6 GHz : Points 59](only ZNL6, ZNLE6)
[O.K.]
Set segmented Frequency sweep active ? [Yes]
3. [**POWER** : Power : -10 dBm]
4. [**POWER** : Bandwidth : 1 kHz]
5. [**CAL** : Start Cal ... (Manual) : Port : P1; P2]
6. [Port : Port 1 active] and [Port : Port 2 active]
7. [Type : UOSM]
8. [Next]
9. Select for both ports [Cal Kit : (available Cal Kit see: Test Equipment)]
10. Select for both ports [Gender : Female]
11. [Start]
12. Perform a UOSM calibration on Port 1 <-> Port 2 using the cal kit and 0.5 m test cable as unknown reciprocal through.

Evaluation

Read the uncorrected system performance using the service functions.

1. [**Setup** : Service + Support : Service function : 4.0.1.10.X.Y.Z]
2. [**MARKER** : { f_{GEN} }*]
3. Read out Marker value

* For test frequencies { f_{GEN} }, see [Chapter 1.4.13, "Table: Uncorrected System Performance - Directivity"](#), on page 35.

Service function for indicating error terms of the user calibration

Parameter	Port 1 Service function	Port 2 Service function
Directivity	4.0.1.10.1.1.1	4.0.1.10.1.2.2
Reflection Tracking	4.0.1.10.2.1.1	4.0.1.10.2.2.2
Source Match	4.0.1.10.3.1.1	4.0.1.10.3.2.2
Load Match	4.0.1.10.4.2.1	4.0.1.10.4.1.2
Transmission Tracking	4.0.1.10.5.2.1	4.0.1.10.5.1.2

1.3.16 Checking the Reference Output Level**Test equipment**

Spectrum analyzer (see: Test Equipment), BNC test cable

Spectrum analyzer settings

1. [**Preset**]
2. [**Ampt** : REF LEVEL : **20 dBm**]
3. [**FREQ** : **10 MHz**]
4. [**SPAN** : **100 kHz**]
5. [**BW** : RES BW MANUAL : **10 kHz**]
6. [**MARK ->** : PEAK]

Test setup

Connect the spectrum analyzer to Ref Out

R&S ZNL settings

1. [**Preset**]
2. [**SETUP** : Freq.Ref.: Internal]

Measurement

Spectrum analyzer [**MARK ->** : PEAK]

Read the Level indicated by the marker of Spectrum Analyzer.

1.3.17 Checking the Optional FPL1-B5 Additional Interfaces

Measurement

[**SETUP** : System Config : Hardware Info]

Check: Additional Interfaces

1.4 Performance Test Report VNA

ROHDE & SCHWARZ, Performance Test Report R&S ZNL

Model:

Item No:

Serial No:

Tested by:

Date:

Signature:



Measurement Uncertainty {a}

Measurement uncertainty {a} is defined as: "No measurement uncertainty stated because the errors always add together. So it is sure that a measurement result evaluated as "PASS" is pass."

Measurement Uncertainty {c}

Measurement uncertainty {c} is defined as: "Functional Test, therefore no measurement uncertainty is stated."

1.4.1 Specified Frequency Range

Device	Specified frequency range
R&S ZNL3	5 kHz to 3 GHz
R&S ZNL4	5 kHz to 4.5 GHz
R&S ZNL6	5 kHz to 6 GHz

1.4.2 Table: Frequency Accuracy

Test sequence description see Chapter 1.3.2, "Checking the Static Frequency Accuracy" , on page 10.				
Parameter	Min. value	Max. value	Unit	Measurement tolerance
without option -B4 Frequency uncertainty @ 1 GHz	–1500	+1500	Hz	1 Hz
with option -B4 Frequency uncertainty @ 1 GHz	–150	+150	Hz	1 Hz

1.4.3 Table: Output Harmonics

Test sequence description see Chapter 1.3.3, "Checking the Output Harmonics" , on page 11.				
2nd and 3rd harmonic order				
Frequency range	Min. value	Max. value	Unit	Measurement tolerance
ZNL3/4/6				
100 kHz to 3 GHz		– 25	dBc	0.8 dB
ZNL4/6				
> 3 GHz to 4.5 GHz		– 25	dBc	0.8 dB
only ZNL6				
> 4.5 GHz to 6 GHz		– 25	dBc	0.8 dB

Test Frequencies:
ZNL3/4/6
100 kHz, 500 kHz, 1 MHz, 2 MHz, 5 MHz, 10 MHz, 20 MHz, 50 MHz, 100 MHz, 200 MHz, 500 MHz, 1 GHz, 1.5 GHz, 2 GHz, 2.5 GHz, 3 GHz
ZNL4/6
3.5 GHz, 4 GHz, 4.5 GHz
only ZNL6
5 GHz, 5.5 GHz, 6 GHz

1.4.4 Table: Output Power Maximum

Test sequence description see Chapter 1.3.5, "Checking the Maximum Output Power" , on page 14.			
Frequency range	Min. value	Unit	Measurement tolerance

ZNL3/4/6			
5 kHz to 50 kHz	-3	dBm	0.2 dB
>50 kHz to 6 GHz	0	dBm	0.2 dB

Test Frequencies:

Note: if some test frequencies are outside the specified frequency range of the ZNLx, these frequencies need not be taken into account. Specified frequency range see: [Chapter 1.4.1, "Specified Frequency Range"](#), on page 28.

5 kHz, 10 kHz, 20 kHz, 50 kHz, 100 kHz, 500 kHz, 1 MHz, 2 MHz, 5 MHz, 10 MHz, 20 MHz, 50 MHz, 100 MHz, 200 MHz, 500 MHz, [1 GHz to 6 GHz step 500 MHz]

1.4.5 Table: Output Power Accuracy

Test sequence description see [Chapter 1.3.6, "Checking the Output Power Accuracy"](#), on page 14.

Ref level –10 dBm Frequency range	Min. value	Max. value	Unit	Measurement tolerance
ZNL3/4/6				
5 kHz to 50 kHz	-3	+3	dB	0.2 dB
> 50 kHz to 6 GHz	-2	+2	dB	0.2 dB

Test Frequencies:

Note: if some test frequencies are outside the specified frequency range of the ZNLx, these frequencies need not be taken into account. Specified frequency range see: [Chapter 1.4.1, "Specified Frequency Range"](#), on page 28.

5 kHz, 10 kHz, 20 kHz, 50 kHz, 100 kHz, 500 kHz, 1 MHz, 2 MHz, 5 MHz, 10 MHz, 20 MHz, 50 MHz, 100 MHz, 200 MHz, 500 MHz, [1 GHz to 6 GHz step 500 MHz]

1.4.6 Table: Output Power Linearity

Test sequence description see [Chapter 1.3.4, "Checking the Output Power Linearity"](#), on page 12.

Ref level –10 dBm Test level	Min. value	Max. value	Unit	Measurement tolerance
10 dB	-1	+1	dB	0.1 dB
7 dB	-1	+1	dB	0.1 dB
5.1 dB	-1	+1	dB	0.1 dB
4.9 dB	-1	+1	dB	0.1 dB
0.1 dB	-1	+1	dB	0.1 dB

only ZNL3/4/6-B22				
-4.9 dB	-1	+1	dB	0.1 dB
-5.1 dB	-1	+1	dB	0.1 dB
-9.9 dB	-1	+1	dB	0.1 dB
-10.1 dB	-1	+1	dB	0.1 dB
-14.9 dB	-1	+1	dB	0.1 dB
-15.1 dB	-1	+1	dB	0.1 dB
-19.9 dB	-1	+1	dB	0.1 dB
-20.1 dB	-1	+1	dB	0.1 dB
-24.9 dB	-1	+1	dB	0.1 dB
-25.9 dB	-1	+1	dB	0.1 dB
-30 dB	-1	+1	dB	0.1 dB

Test Frequencies:
ZNL3/4/6
100 kHz, 1 MHz, 10 MHz, 50 MHz, 100 MHz, 500 MHz, 1 GHz, 2 GHz, 3 GHz
ZNL4/6
4 GHz
only ZNL4
4.5 GHz
only ZNL6
5 GHz, 6 GHz

1.4.7 Table: Input Power Measurement Accuracy

Test sequence description see Chapter 1.3.7, "Checking the Input Power Measurement Accuracy" , on page 15.				
Ref level –10 dBm	Min. value	Max. value	Unit	Measurement tolerance
Frequency range				
ZNL3/4/6				
5 kHz to 100 kHz	-2	+2	dB	0.2 dB
100 kHz to 3 GHz	-1.5	+1.5	dB	0.2 dB
ZNL4/6				
> 3 GHz to 4.5 GHz	-1.5	+1.5	dB	0.2 dB

only ZNL6				
> 4.5 GHz to 6 GHz	-1.5	+1.5	dB	0.2 dB

Test Frequencies:
ZNL3/4/6
10 kHz, 20 kHz, 50 kHz, 100 kHz, 200 kHz, 500 kHz, 1 MHz, 2 MHz, 5 MHz, 10 MHz, 20 MHz, 50 MHz, 100 MHz, 200 MHz, 500 MHz, 1 GHz, 1.5 GHz, 2 GHz, 2.5 GHz, 3 GHz
ZNL4/6
3.5 GHz, 4 GHz, 4.5 GHz
only ZNL6
5 GHz, 5.5 GHz, 6 GHz

1.4.8 Table: Input Power Linearity (low level)

Test sequence description see Chapter 1.3.9, "Checking the Input Power Linearity (low level)" , on page 18.				
Ref level –10 dBm Test level	Min. value	Max. value	Unit	Measurement tolerance
10dB	-0.25	+0.25	dB	0.02 dB
5dB	-0.15	+0.15	dB	0.02 dB
-5dB	-0.15	+0.15	dB	0.02 dB
-10dB	-0.15	+0.15	dB	0.02 dB
-15dB	-0.15	+0.15	dB	0.02 dB
-20dB	-0.15	+0.15	dB	0.02 dB
-25dB	-0.15	+0.15	dB	0.02 dB
-30dB	-0.15	+0.15	dB	0.02 dB
-35dB	-0.15	+0.15	dB	0.02 dB
-40dB	-0.15	+0.15	dB	0.02 dB

1.4.9 Table: Input Power Linearity (high level)

Test sequence description see Chapter 1.3.8, "Checking the Input Power Linearity (high level)" , on page 17.				
Ref level –10 dBm Test level	Min. value	Max. value	Unit	Measurement tolerance
10dB	-0.25	+0.25	dB	0.02 dB

5dB	-0.25	+0.25	dB	0.02 dB
-5dB	-0.15	+0.15	dB	0.02 dB

Test Frequencies:
ZNL3/4/6
10 MHz, 50 MHz, 100 MHz, 500 MHz, 1 GHz, 2 GHz, 3 GHz
ZNL4/6
4 GHz
only ZNL4
4.5 GHz
only ZNL6
5 GHz, 6 GHz

1.4.10 Table: Input Attenuator

Test sequence description see Chapter 1.3.6, "Checking the Output Power Accuracy" , on page 14.				
Step Attenuator	Min. value	Max. value	Unit	Measurement tolerance
0 dB (reference)				
10 dB	-0.2	+0.2	dB	0.03 dB
20 dB	-0.2	+0.2	dB	0.03 dB
30 dB	-0.2	+0.2	dB	0.03 dB

1.4.11 Table: Input Noise Level

Test sequence description see Chapter 1.3.14, "Checking the Input Noise Level" , on page 24.				
Frequency range	Min. value	Max. value	Unit	Measurement tolerance
ZNL3/4/6				
5 kHz to 100 kHz		-95	dBm	
100 kHz to 50 MHz		-120	dBm	
50 MHz to 3 GHz		-130	dBm	
ZNL4/6				
3 GHz to 4.5 GHz		-130	dBm	

only ZNL6				
4.5 GHz to 6 GHz		-125	dBm	

Test Frequencies:
ZNL3/4/6
5 kHz, 10 kHz, 20 kHz, 50 kHz, 100 kHz, 500 kHz, 1 MHz, 2 MHz, 5 MHz, 10 MHz, 20 MHz, 50 MHz, 100 MHz, 200 MHz, 500 MHz, 1 GHz, 1.5 GHz, 2 GHz, 2.5 GHz, 3 GHz
ZNL4/6
3.5 GHz, 4 GHz, 4.5 GHz
only ZNL6
5 GHz, 5.5 GHz, 6 GHz

1.4.12 Table: Dynamic Range

Test sequence description see Chapter 1.3.13, "Checking the Dynamic Range" , on page 24.				
Frequency range	Min. value	Max. value	Unit	Measurement tolerance
ZNL3/4/6				
5 kHz to 100 kHz	85		dB	0.01 dB
100 kHz to 10 MHz	100		dB	0.01 dB
10 MHz to 50 MHz	110		dB	0.01 dB
50 MHz to 3 GHz	120		dB	0.01 dB
ZNL4/6				
3 GHz to 4.5 GHz	120		dB	0.01 dB
only ZNL6				
4.5 GHz to 6 GHz	115		dB	0.01 dB

Test Frequencies:
ZNL3/4/6
5 kHz, 10 kHz, 20 kHz, 50 kHz, 100 kHz, 500 kHz, 1 MHz, 2 MHz, 5 MHz, 10 MHz, 20 MHz, 50 MHz, 100 MHz, 200 MHz, 500 MHz, 1 GHz, 1.5 GHz, 2 GHz, 2.5 GHz, 3 GHz
ZNL4/6
3.5 GHz, 4 GHz, 4.5 GHz
only ZNL6
5 GHz, 5.5 GHz, 6 GHz

1.4.13 Table: Uncorrected System Performance - Directivity

Test sequence description see Chapter 1.3.15, "Checking the Uncorrected System Performance" , on page 25.				
Frequency range	Min. value	Max. value	Unit	Measurement tolerance
ZNL3/4/6				
100 kHz to 3 GHz		-20	dB	0.12 dB
ZNL4/6				
> 3 GHz to 4.5 GHz		-20	dB	0.12 dB
only ZNL6				
> 4.5 GHz to 6 GHz		-20	dB	0.12 dB

Test Frequencies: see Test Instruction, frequency setting

1.4.14 Table: Uncorrected System Performance - Source Match

Test sequence description see Chapter 1.3.15, "Checking the Uncorrected System Performance" , on page 25.				
Frequency range	Min. value	Max. value	Unit	Measurement tolerance
ZNL3/4/6				
100 kHz to 3 GHz		-20	dB	0.12 dB
ZNL4/6				
> 3 GHz to 4.5 GHz		-20	dB	0.12 dB
only ZNL6				
> 4.5 GHz to 6 GHz		-20	dB	0.12 dB

Test Frequencies: see Test Instruction, frequency setting

1.4.15 Table: Uncorrected System Performance - Load Match

Test sequence description see Chapter 1.3.15, "Checking the Uncorrected System Performance" , on page 25.				
Frequency range	Min. value	Max. value	Unit	Measurement tolerance
ZNL3/4/6				

100 kHz to 3 GHz		-14	dB	0.1 dB
ZNL4/6				
> 3 GHz to 4.5 GHz		-12	dB	0.1 dB
only ZNL6				
> 4.5 GHz to 6 GHz		-12	dB	0.1 dB

Test Frequencies: see Test Instruction, frequency setting

1.4.16 Table: Uncorrected System Performance - Reflection Tracking

Test sequence description see Chapter 1.3.15, "Checking the Uncorrected System Performance" , on page 25.				
Frequency range	Min. value	Max. value	Unit	Measurement tolerance
ZNL3/4/6				
100 kHz to 3 GHz	-1	+1	dB	0.001 dB
ZNL4/6				
> 3 GHz to 4.5 GHz	-1	+1	dB	0.001 dB
only ZNL6				
> 4.5 GHz to 6 GHz	-1	+1	dB	0.001 dB

Test Frequencies: see Test Instruction, frequency setting

1.4.17 Table: Uncorrected System Performance - Transmission Tracking

Test sequence description see Chapter 1.3.15, "Checking the Uncorrected System Performance" , on page 25.				
Frequency range	Min. value	Max. value	Unit	Measurement tolerance
ZNL3/4/6				
100 kHz to 3 GHz	-1	+1	dB	0.001 dB
ZNL4/6				
> 3 GHz to 4.5 GHz	-1.5	+1.5	dB	0.001 dB
only ZNL6				
> 4.5 GHz to 6 GHz	-1.5	+1.5	dB	0.001 dB

Test Frequencies: see Test Instruction, frequency setting

1.4.18 Table: Trace Noise Magnitude

Test sequence description see Chapter 1.3.11, "Checking the Trace Noise Magnitude" , on page 21.					
Frequency range	Res.BW	Min. value	Max. value	Unit	Measurement tolerance
ZNL3/4/6					
100 kHz to 10 MHz	10 kHz		0.0035	dB	
10 MHz to 3 GHz	10 kHz		0.0025	dB	
ZNL4/6					
> 3 GHz to 4.5 GHz	10 kHz		0.0025	dB	
only ZNL6					
> 4.5 GHz to 6 GHz	10 kHz		0.0025	dB	

Test Frequencies:
ZNL3/4/6
5 kHz, 10 kHz, 20 kHz, 50 kHz, 100 kHz, 500 kHz, 1 MHz, 2 MHz, 5 MHz, 10 MHz, 20 MHz, 50 MHz, 100 MHz, 200 MHz, 500 MHz, 1 GHz, 1.5 GHz, 2 GHz, 2.5 GHz, 3 GHz
ZNL4/6
3.5 GHz, 4 GHz, 4.5 GHz
only ZNL6
5 GHz, 5.5 GHz, 6 GHz

1.4.19 Table: Trace Noise Phase

Test sequence description see Chapter 1.3.12, "Checking the Trace Noise Phase" , on page 22.					
Frequency range	Res.BW	Min. value	Max. value	Unit	Measurement tolerance
ZNL3/4/6					
100 kHz to 10 MHz	10 kHz		0.05	deg	
10 MHz to 3 GHz	10 kHz		0.03	deg	
ZNL4/6					
> 3 GHz to 4.5 GHz	10 kHz		0.03	deg	

only ZNL6					
> 4.5 GHz to 6 GHz	10 kHz		0.03	deg	

Test Frequencies:
ZNL3/4/6
5 kHz, 10 kHz, 20 kHz, 50 kHz, 100 kHz, 500 kHz, 1 MHz, 2 MHz, 5 MHz, 10 MHz, 20 MHz, 50 MHz, 100 MHz, 200 MHz, 500 MHz, 1 GHz, 1.5 GHz, 2 GHz, 2.5 GHz, 3 GHz
ZNL4/6
3.5 GHz, 4 GHz, 4.5 GHz
only ZNL6
5 GHz, 5.5 GHz, 6 GHz

1.4.20 Table: Reference Output Level

Test sequence description see Chapter 1.3.16, "Checking the Reference Output Level" , on page 27.					
Parameter	Min. value	Actual value	Max. value	Unit	Measurement tolerance
Reference frequency output level	+ 2 dBm		+ 10 dBm	dBm	0.3 dB

1.5 Test Equipment SPA (Option -B1)

Test Equipment for SPA Option see: (see: Test Equipment))

1.6 Test Instructions SPA (Option -B1)

1.6.1 Self Alignment

Test setup

N/A

Alignment

[Setup:Spectrum Setup: Alignment: Start Self Alignment]

Evaluation

Result of Alignment: passed

1.6.2 Third Order Intercept Point**Test equipment**

2x Signal generator (see: Test Equipment)

6dB Power combiner (see: Test Equipment)

Test setup

Connect RF outputs of the Signal Generator to the inputs of the power combiner.

Connect output of the coupler to the RF input of the R&S ZNL.

Signal generator settings

Frequency: Signal generator 1 $f_{g1} = f_{in} - 500 \text{ kHz}$

Frequency: Signal generator 2 $f_{g2} = f_{in} + 500 \text{ kHz}$

Adjust the level so that each input of the R&S ZNL is -20 dBm.

To eliminate modulation between the transmitters, the the automatic level control (ALC) must be switched off.

R&S ZNL settings

1. [**Preset**]
2. [**Mode** : Spectrum]
3. [**AMPT** : RF ATTEN MANUAL : 0 dB]
4. [**AMPT** : -13 dBm]
5. [**SPAN** : 4 MHz]
6. [**BW** : RES BW MANUAL : 30 kHz]
7. [**BW** : Video BW MANUAL : 1 kHz]
8. [**FREQ** : CENTER : f_{in}]

For test frequencies and limits see: Performance Test Report SPA

Measurement

[**MEAS** : : Third Order Intercept]

Evaluation

The third-order intercept point (IP3) with respect to the input signal is indicated by [TOI] in the Marker Info field

1.6.3 Phase Noise

Test equipment

Signal generator (see: Test Equipment)

Test setup

Connect Signal Generator to Port 2 / RF input of the R&S ZNL.

Signal generator settings

Frequency: 1000 MHz

Level: apply -13 dBm to the input of the R&S ZNL

R&S ZNL settings

1. [**PRESET**]
2. [**Mode** : Spectrum]
3. [**SETUP** : REFERENCE INT / EXT]
Switch to internal reference (INT).
4. [**FREQ** : CENTER : **1000 MHz**]
5. [**AMPT** : **-13 dBm**]
6. [**AMPT** : RF ATTEN MANUAL : **0 dB**]
7. [**SPAN** : {**1 MHz**}]
8. [**TRACE** : DETECTOR: **RMS**]
9. [**SWEEP** : Single Sweep]
The counter must be used to count the frequency of the generator in order to correct the center frequency of the R&S ZNL accordingly (resolution is 1 Hz).
10. Marker Count -> Fcenter
[**FREQ** : CENTER : **Fcenter**]
11. Activate the phase noise marker
[**MKR FCTN**: PHASE NOISE]
12. Refer to the table below for the offset values.
[**AMPT** : RF ATTEN MANUAL : { a_{ZNL} }]
Refer to the table below for the values of a_{ZNL} , which are dependent on the offset values.

13. Set the phase noise marker
 [**MKR** DELTA : {Offset}]
 Refer to the table below for the offset values.

Evaluation

The phase noise is indicated in the marker info field by 'Delta 1 [T1 NOI]'.
Table 1-2: Phase noise measurement settings

Offset	Span	RBW / Sweep time	Reference level	a _{ZNL}
10 kHz	40 kHz	3 kHz / 500 ms	-13 dBm	0 dB
100 kHz	400 kHz	30 kHz / 200 ms	-13 dBm	0 dB
1 MHz	4 MHz	300 kHz / 100 ms	-13 dBm	0 dB

1.6.4 Residual Spurious Response

Test equipment

50 Ohm Load (see: Test Equipment)

Test setup

Connect 50 Ohm Load to Port2 / RF Input of R&S ZNL.

R&S ZNL settings

1. [**PRESET**]
2. [**Mode** : Spectrum]
3. [**AMPT** : -30 dBm]
4. [**AMPT** : RF ATTEN MANUAL : 0 dB]
5. [**BW** : RBW MANUAL : 1 kHz]
6. [**FREQ** : START : 1 MHz]
7. [**FREQ** : STOP : 3000 MHz](only ZNL3)
 [**FREQ** : STOP : 4500 MHz](only ZNL4)
 [**FREQ** : STOP : 6000 MHz](only ZNL6)

Measurement

[**MKR** ⇒ : PEAK]

Read Marker

For test frequencies and limits see: Performance Test Report SPA

1.6.5 Local Oscillator Related Spurious

Test equipment

Signal generator (see: Test Equipment)

Test setup

Connect the generator to Port2 / RF Input of R&S ZNL.

Generator settings

Frequency f_{meas}

Level -13 dBm

R&S ZNL settings

1. [**PRESET**]
2. [**Mode** : Spectrum]
3. [**AMPT** : -13 dBm]
4. [**AMPT** : RF ATTEN MANUAL : 0 dB]
5. [**BW** : RBW MANUAL : 300 Hz]
6. [**BW** : Sweep Time Manual : 800 ms]
7. [**SWEEP** : Sweep Config : Sweep Points : 10001]
8. [**FREQ** : CENTER : { f_{meas} }]
9. [**TRACE 1** : RMS]
10. [**SPAN** : 1MHz]

Measurement

Zunächst wird geprüft, ob ein Spur mit 6dB Peak Excursion vorhanden ist:

[Mkr : Marker Config : Marker Functions : Marker Peak List]

Maximum Number of Peaks: 2

Peak Excursion 6.0 dB

State On

Wird neben dem Träger ein zweiter Peak gefunden, lautet das Messergebnis:

Spur_Suppression = Lpeak1 – Lpeak2

Wird kein weiterer Peak gefunden, wird die Peak Excursion auf 0.0 dB reduziert und so das Trace Maximum ermittelt:

[Mkr : Marker Config : Marker Functions : Marker Peak List]

Peak Excursion 0.0 dB

Das Ergebnis lautet in diesem Fall $\text{Spur_Suppression} = „> \{L_{\text{peak1}} - L_{\text{peak2}}\}“$

For test frequencies f_{meas} and limits see: Performance Test Report SPA

Hint

To avoid errors due to noise, a second measurement with SPAN = 30 kHz is recommended

1.6.6 Displayed Average Noise Level

Test equipment

50 Ohm Load (see: Test Equipment)

Test setup

Connect 50 Ohm Load to Port2 / RF Input of R&S ZNL.

R&S ZNL settings

1. [**Preset**]
2. [**Mode** : Spectrum]
3. [**Ampt** : -60 dBm]
4. [**Ampt** : RF Atten Manual : 0 dB]
5. [**Meas** : : Time Domain Power : RMS]
6. [**Trace** : : Trace Config : Detector Type RMS]
7. [**Bw** : Res BW Manual : 1 kHz]
8. [**Bw** : Sweep Time Manual : 1 s]
9. [**Sweep** : Single Sweep]
10. [**Freq** : Center : $\{f_{\text{in}}\}$]

Measurement

Start Single Sweep and Read out TD Pow RMS

Calculation

Displayed Average Noise Level (Hz) = TD Pow RMS - 30dB.

For test frequencies and limits see: Performance Test Report SPA

Hint

If there are spurious at 9 kHz caused by measurement equipment, it is possible to increase RF ATT up to 20 dB

[**Ampt** : RF Atten Manual : 20 dB]

In this case the value of 20 dB has to be taken into account.

1.6.7 Display Linearity**Test equipment**

Signal generator (see: Test Equipment)

Calibrated RF Attenuator

Test setup

Connect the RF output of the Signal Generator to the RF input of the R&S ZNL.

Signal generator settings

Frequency: 700.513 MHz

Level: adjust so that -10 dBm is applied to the input of the R&S ZNL

R&S ZNL settings

1. [**PRESET**]
2. [**Mode** : Spectrum]
3. [**AMPT** : RF ATTEN MANUAL : **10 dB**]
4. [**AMPT** : **0 dBm**]
5. [**FREQ** : CENTER : **700.513 MHz**]
6. [**SPAN** : **0 Hz**]
7. [**BW** : RES BW MANUAL : **30 kHz**]
8. [**TRACE** : DETECTOR: **AV**]
9. [**SWEEP** : SWEEP TIME MANUAL: **xx ms**]
 The sweep time is set as follows, depending on the attenuation a_{ATT} of the external RF Attenuator:

a_{ATT}	sweep time xx ms
$a_{ATT} \leq 50$ dB	200 ms

[**MEAS**: Time Domain Power: RMS]

Reference measurement

Read out result for the reference measurement (mean value indicated in the marker field)

Use the measured value as a reference.

Signal generator settings

Switch the level from 0 to -70 dBm (at the R&S ZNL) in 10 dB increments. The level may differ by ± 1 dB from the nominal value, but must be included in the calculation of the linear error with its exact value (given in the cal).

Analysis

The difference between the level of the R&S ZNL input signal and the reference (approx. 10 dB below the reference) is indicated in the marker info field.

For limits see: Performance Test Report SPA

1.6.8 Display Linearity (alternative measurement for Service using a Power Meter)

Test equipment

Signal generator (see: Test Equipment)

Power Meter: NRP-Z91: 1168.8004.02 or NRP18T: 1424.6115K02

Power Splitter

Test setup

Connect the RF output of the Signal Generator to the input of the Power Splitter.

Connect the R&S ZNL and the Power Meter to the outputs of the Power Splitter.

Execute the 'ZERO' Function of the Power Meter while no signal is present. (Generator output switched off)

Signal generator settings

Frequency: 700.513 MHz

Level: adjust so that -10 dBm is applied to the input of the Power Meter

R&S ZNL settings

1. [**PRESET**]
2. [**Mode** : Spectrum]
3. [**AMPT** : RF ATTEN MANUAL : **10 dB**]
4. [**AMPT** : **0 dBm**]

5. [**FREQ** : CENTER : **700.513 MHz**]
6. [**SPAN** : **0 Hz**]
7. [**BW** : RES BW MANUAL : **30 kHz**]
8. [**TRACE** : DETECTOR: **AV**]
9. [**SWEEP** : SWEEP TIME MANUAL: **200 ms**]

[**MEAS**: Time Domain Power: RMS]

Part 1: 0 - 30 dB below reference level

Reference measurement

Read out result for the Time Domain Power measurement.

Use the difference between the R&S ZNL and the Power Meter measurement as a reference value:

$$\text{Ref}_{0\text{dBm}} = L_{\text{ZNL}} - L_{\text{PM}}$$

Signal generator settings

Level: adjust so that 0, -5, -15, -20, -25 and -30 dBm are applied to the input of the Power Meter.

Analysis

For each level calculate the difference between the level error and the reference value:

$$\text{Linearity Error} = (L_{\text{ZNL}} - L_{\text{PM}}) - \text{Ref}_{0\text{dBm}}$$

For limits see: Performance Test Report SPA

Part 1: 30 - 50 dB below reference level

R&S ZNL settings

1. [**AMPT** : RF ATTEN MANUAL : **30 dB**]
2. [**AMPT** : **20 dBm**]

Signal generator settings

Level: adjust so that -10 dBm is applied to the input of the Power Meter

Reference measurement

Read out result for the Time Domain Power measurement.

Use the difference between the R&S ZNL and the Power Meter measurement as a reference value:

$$\text{Ref}_{20\text{dBm}} = (L_{\text{ZNL}} - L_{\text{PM}}) - \text{Linearity Error}\{30\text{dBm}\}$$

Signal generator settings

Level: adjust so that -15, -20, -25 and -30 dBm are applied to the input of the Power Meter.

Analysis

For each level calculate the difference between the level error and the reference value:

$$\text{Linearity Error} = (L_{\text{ZNL}} - L_{\text{PM}}) - \text{Ref}_{20\text{dBm}}$$

For limits see: Performance Test Report SPA

1.6.9 RF Attenuator**Test equipment**

Signal generator (see: Test Equipment)

Powermeter (see: Test Equipment)

6dB Power Splitter (see: Test Equipment)

Test setup

Connect the RF output of the Signal Generator to the input of the 6dB Power Splitter

Connect output 1 of the 6dB Power Splitter to the Powermeter

Connect output 2 of the 6dB Splitter Splitter to Port 2 / RF input of the R&S ZNL.

Signal generator settings

Frequency: 50 MHz

Level: adjust so that -25 dBm is applied to the input of the R&S ZNL

R&S ZNL settings

1. [**PRESET**]
2. [**Mode** : Spectrum]
3. [**FREQ** : CENTER : **50 MHz**]
4. [**SPAN** : **500 Hz**]
5. [**BW** : RES BW MANUAL : **1 kHz**]
6. [**TRACE** : DETECTOR: **RMS**]
7. [**BW** : VIDEO BW MANUAL : **30 Hz**]
8. [**SWEEP** : SWEEP TIME MANUAL: **100 ms**]
9. [**AMPT** : RF ATTEN MANUAL : **10 dB**]

10. [**AMPT** : 0 dBm]**Reference measurement**

Set marker to the maximum of the signal

[**MKR** ⇒ : PEAK]

The difference to the indication of the power meter is used as a reference.

Measurement**Input level**

Set according to the table below.

R&S ZNL settings

1. [**AMPT** : Rf Atten Manual : { a_{ZNL} }]
2. [**AMPT** : Ref Level { -10 dBm + a_{ZNL} } dBm]
3. [**MKR** ⇒ : PEAK]

Refer to the table below for more information about a_{ZNL} and reference levels.

Analysis

The level difference between the R&S ZNL and the power meter is measured. The deviation from the reference value at 10 dB attenuation reflects the attenuation error of the RF Attenuator.

L_{IN}	-35 dBm	-25 dBm	-15 dBm	-5 dBm
a_{ZNL}	0 dB	10 dB	20 dB	30 dB

For limits see: Performance Test Report SPA

1.6.10 Level Accuracy and Frequency Response

Test equipment and Test setup

see: Rf Attenuator

Determination of the absolute error at 50 MHz**Signal generator settings**

Frequency 50 MHz

Level -10 dBm

Measurement

Determine the output power of the Signal Generator with the power meter.

Connect RF output of the Signal Generator to the RF input of the R&S ZNL.

R&S ZNL settings

1. [**PRESET**]
2. [**Mode** : Spectrum]
3. [**AMPT** : RF ATTEN MANUAL : **10 dB**]
4. [**AMPT** : Ref Level : **-10 dBm**]
5. [**SPAN** : **30 kHz**]
6. [**BW** : RES BW MANUAL : **10 kHz**]
7. [**TRACE** : DETECTOR : RMS]
8. [**FREQ** : CENTER : **50 MHz**]
9. [Sweeptime AUTO]
10. Set marker to the maximum of the signal
[**MKR** ⇒ : PEAK]

Analysis

The deviation between the signal levels between the power meter and the R&S ZNL (level of marker 1) indicates the absolute level error of the R&S ZNL. It can be calculated as follows:

$$\text{Absolute error}_{50\text{MHz}} = L_{\text{ZNL}} - L_{\text{power meter}}$$

For limits see: Performance Test Report SPA

Test RF Frequency Response

Signal generator settings

Frequency 50 MHz

Adjust the level so that -10 dBm is applied to the RF input of the R&S ZNL.

R&S ZNL settings

1. [**PRESET**]
2. [**Mode** : Spectrum]
3. [**AMPT** : RF ATTEN MANUAL : **10 dB**]
4. [**AMPT** : Ref Level : **-10 dBm**]
5. [**SPAN** : **0 Hz**]

6. [**BW** : RES BW MANUAL : **10 kHz**]

7. [**TRACE** : DETECTOR : RMS]

8. [**FREQ** : CENTER : **50 MHz**]

Reference measurement

Determine power level $L_{\text{power meter}}$

Set marker to the maximum of the signal

[**MKR** ⇒ : PEAK]

$\text{Error}_{50\text{MHz}} = L_{\text{ZNL}} - L_{\text{power meter}}$

Signal generator settings

Frequency f_{resp}

Power meter settings

Determine power level $L_{\text{power meter}}$

In order to achieve a higher accuracy, it is recommended to compensate the frequency response of the Powermeter

R&S ZNL settings

[**FREQ** : CENTER : {fresp}]

Measurement

The power level L_{ZNL} is indicated by marker 1.

For test frequencies and limits see: Performance Test Report SPA

Measurement should be done at RF ATT: 0 dB, 10 dB, 20 dB, 30 dB

Analysis

The frequency response can be calculated as follows:

$\text{Frequency response} = L_{\text{ZNL}} - L_{\text{power meter}} - \text{Error}_{50\text{MHz}}$

1.6.11 IF Filter Switching Error

Test equipment

Signal generator (see: Test Equipment)

Test setup

Connect Signal Generator to Port 2 / RF input of the R&S ZNL.



Make sure the R&S ZNL and the signal generator are synchronized by means of the 10 MHz Ref in/ Ref out

Signal generator settings

Frequency: 50 MHz

Level: -20 dBm

R&S ZNL settings

1. [**Preset**]
2. [**Mode** : Spectrum]
3. [**Freq** : Center : 50 MHz]
4. [**Ampt** : -10 dBm]
5. [**Ampt** : RF Atten Manual : 10 dB]
6. [**Meas** : Time Domain Power : RMS]
7. [**Trace** : Trace Config : Detector Type RMS]
8. [**Bw** : Res BW Manual : 10 kHz]
9. [**Bw** : Sweep Time Manual : 100 ms]
10. [**Sweep** : Single Sweep]

Measurement

Start Single Sweep and Read out TD Pow RMS: L_{Ref}

Set RBW according to Performance Test, start Single Sweep and Read out TD Pow RMS: L_{RBW}

For RBW settings and limits see: Performance Test Report SPA

Analysis

The error is indicated bei the difference [$L_{RBW} - L_{Ref}$]

1.6.12 IF Frequency Response

Test setup

Connect the RF output of the Signal Generator to the input of the 6dB Power Splitter

Connect output 1 of the 6dB Power Splitter to the Powermeter

Connect output 2 of the 6dB Power Splitter to the RF input of the R&S ZNL.

Signal generator settings

Frequency f_{test}

Adjust the level so that -10 dBm is applied to the RF input of the R&S ZNL.

R&S ZNL settings

1. [**PRESET**]
2. [**AMPT** : RF ATTEN MANUAL : **10 dB**]
3. [**AMPT** : **-3 dBm**]
4. [**MODE** : **IQ Analyzer**]
5. [**MEAS** : **Spectrum**]
6. [**FREQ** : CENTER : f_{test}]
7. [Service Function : 2.3.16.20.1] (Force Syncon Mode)
8. [**BW** : RES BW MANUAL : **10 kHz**]
9. [Data Acquisition : RBW : Auto]
10. [Data Acquisition : Recordlength 16384]

IF wide measurement**R&S ZNL settings**

- [Data Acquisition : ABW : **40 MHz**]

The power level L_{ZNL} is indicated by marker 1.

Reference measurement at the center frequency

Frequency f_{test}

Determine the power level L_{ref} at f_{test} means of the marker.

Measurement

Increase the generator frequency from $(f_{\text{test}} - 20 \text{ MHz})$ to $(f_{\text{test}} + 20 \text{ MHz})$ 1 MHz steps and calculate the frequency response via $L_{\text{ZNL}} - L_{\text{ref}}$

For limits see: Performance Test Report SPA

IF narrow measurement**R&S ZNL settings**

- [Data Acquisition : ABW : **5 MHz**]

The power level L_{ZNL} is indicated by marker 1.

Signal generator settingsFrequency f_{test}

Adjust the level so that -10 dBm is applied to the RF input of the R&S ZNL.

Reference measurement at the center frequencyFrequency f_{testZ} Determine the power level L_{ref} at f_{test} by means of the marker.**Measurement**Increase the generator frequency from $(f_{\text{test}} - 2.5 \text{ MHz})$ to $(f_{\text{test}} + 2.5 \text{ MHz})$ in 200 kHz steps and calculate the frequency response via $L_{\text{ZNL}} - L_{\text{ref}}$ For f_{test} and limits see: Performance Test Report SPA

1.7 Performance Test Report SPA (Option -B1)

ROHDE & SCHWARZ, Performance Test Report R&S ZNL

Model:

Item No:

Serial No:

Tested by:

Date:

Signature:

1.7.1 Table: IF Image and IF Suppression

Test sequence description see: Test Instructions SPA (Option -B1)						
Characteristic	Frequency ZNL f_{ZNL}	Generator Frequency f_{GEN}	Min. value	Max. value	Unit	Measurement tolerance
2nd Image	101 MHz	1741.8 MHz		-80	dBc	0.5 dB
2nd Image (only ZNL4/6)	3001 MHz	6273.91666 MHz		-80	dBc	0.5 dB
3rd Image	1001 MHz	1041.8 MHz		-80	dBc	0.5 dB
3rd Image	2901 MHz	2941.8 MHz		-80	dBc	0.5 dB
3rd Image (only ZNL4/6)	3949 MHz	4015.6666 MHz		-80	dBc	0.5 dB

3rd Image (only ZNL6)	5599 MHz	5558.2 MHz		-80	dBc	0.5 dB
2nd IF	101 MHz	820.4 MHz		-80	dBc	0.5 dB
2nd IF	2499 MHz	820.4 MHz		-80	dBc	0.5 dB
2nd IF (only ZNL4/6)	3949 MHz	1636.458333 MHz		-80	dBc	0.5 dB
2nd IF (only ZNL6)	5599 MHz	820.4 MHz		-80	dBc	0.5 dB
3rd IF	101 MHz	20.4 MHz		-80	dBc	0.5 dB
3rd IF	2499 MHz	20.4 MHz		-80	dBc	0.5 dB
3rd IF (only ZNL4/6)	3949 MHz	33.333 MHz		-80	dBc	0.5 dB
3rd IF (only ZNL6)	5599 MHz	20.4 MHz		-80	dBc	0.5 dB

1.7.2 Table: Third Order Intercept Point

Test sequence description see: Test Instructions SPA (Option -B1)			
Frequency range	Min. value	Unit	Measurement tolerance
ZNL3/4/6			
10 MHz to 300 MHz	13	dBm	0.42 dB
300 MHz to 3 GHz	16	dBm	0.42 dB
ZNL4/6			
> 3 GHz to 4.5 GHz	13	dBm	0.42 dB
ZNL6			
> 4.5 GHz to 6 GHz	13	dBm	0.42 dB

Test Frequencies:
ZNL3/4/6
10.5 MHz, 30 MHz, 500 MHz, 1000 MHz, 2000 MHz, 2999 MHz
ZNL4/6
3001 MHz, 4000 MHz, 4499 MHz
ZNL6
4501 MHz, 5000 MHz, 5999 MHz

1.7.3 Table: IF Filter Switching Error

Test sequence description see: Test Instructions SPA (Option -B1)						
Characteristic: IF BW	FFT Mode	Min. value	Max. value	Unit	Measurement tolerance	
10 MHz	off	-0.3	+0.3	dB	0.01 dB	
5 MHz	off	-0.3	+0.3	dB	0.01 dB	
3 MHz	off	-0.3	+0.3	dB	0.01 dB	
2 MHz	off	-0.3	+0.3	dB	0.01 dB	
1 MHz	off	-0.3	+0.3	dB	0.01 dB	
500 kHz	off	-0.2	+0.2	dB	0.01 dB	
300 kHz	off	-0.2	+0.2	dB	0.01 dB	
200 kHz	off	-0.2	+0.2	dB	0.01 dB	
100 kHz	off	-0.2	+0.2	dB	0.01 dB	
50 kHz	on	-0.1	+0.1	dB	0.01 dB	
30 kHz	on	-0.1	+0.1	dB	0.01 dB	
20 kHz	on	-0.1	+0.1	dB	0.01 dB	
10 kHz reference	on					
5 kHz	on	-0.1	+0.1	dB	0.01 dB	
3 kHz	on	-0.1	+0.1	dB	0.01 dB	
2 kHz	on	-0.1	+0.1	dB	0.01 dB	
1 kHz	on	-0.1	+0.1	dB	0.01 dB	
500 Hz	on	-0.1	+0.1	dB	0.01 dB	
300 Hz	on	-0.1	+0.1	dB	0.01 dB	
200 Hz	on	-0.1	+0.1	dB	0.01 dB	
100 Hz	on	-0.1	+0.1	dB	0.01 dB	

1.7.4 Table: Displayed Average Noise Level

Test sequence description see: Test Instructions SPA (Option -B1)			
Frequency range	Max. value	Unit	Measurement tolerance
100 kHz to <5 MHz	-135	dBm	0.2 dB
5 MHz to 4.5 GHz	-140	dBm	0.2 dB
>4.5 GHz to 6 GHz	-137	dBm	0.2 dB

Test Frequencies:
ZNL3/4/6
1005 kHz, 10,01 MHz, 50,01 MHz, 199,99 MHz, 499.99 MHz, 999.99 MHz, 1499.99 MHz, 1999.99 MHz, 2499.99 MHz, 2999.99 MHz
ZNL4/6
3001.99 MHz, 3499.99 MHz, 3999.99 MHz, 4499.99 MHz
ZNL6
4999.99 MHz, 5499.99 MHz, 5999.99 MHz

1.7.5 Table: Residual Spurious Response

Test sequence description see: Test Instructions SPA (Option -B1)					
Start Frequency	Stop Frequency	Min. value	Max. value	Unit	Measurement tolerance
ZNL3					
1 MHz	3 GHz	-120	-90	dBc	0.2 dB
ZNL4					
1 MHz	4.5 GHz	-120	-90	dBc	0.2 dB
ZNL6					
1 MHz	6 GHz	-120	-90	dBc	0.2 dB

1.7.6 Table: IF Frequency Response Wide

Test sequence description see: Test Instructions SPA (Option -B1)	
Frequency range	Result
ZNL	
$f_{\text{test}} = 500 \text{ MHz}$ Offset Frequency: -20 MHz to +20 MHz	IF measured value is greater than -0.4 dB AND less than +0.4 dB write "PASS" else write "FAIL" ENDIF
only ZNL4/6 $f_{\text{test}} = 3100 \text{ MHz}$ Offset Frequency: -20 MHz to +20 MHz	IF measured value is greater than -0.8 dB AND less than +0.8 dB write "PASS" else write "FAIL" ENDIF

1.7.7 Table: IF Frequency Response Narrow

Test sequence description see: Test Instructions SPA (Option -B1)	
Frequency range	Result
ZNL	
$f_{\text{test}} = 500 \text{ MHz}$ Offset Frequency: -2.5 MHz to +2.5 MHz	IF measured value is greater than -0.4 dB AND less than +0.4 dB write "PASS" else write "FAIL" ENDIF
only ZNL4/6 $f_{\text{test}} = 3100 \text{ MHz}$ Offset Frequency: -2.5 MHz to +2.5 MHz	IF measured value is greater than -0.8 dB AND less than +0.8 dB write "PASS" else write "FAIL" ENDIF

1.7.8 Table: Level Accuracy and Frequency Response

Determination of the absolute error at 50 MHz				
Test sequence description see: Chapter 1.6.10, "Level Accuracy and Frequency Response" , on page 48				
Test Frequency	Min. value	Max. value	Unit	Measurement tolerance
50 MHz	-0.5	+0.5	dB	0.05 dB

Test RF Frequency Response				
Test sequence description see: Chapter 1.6.10, "Level Accuracy and Frequency Response" , on page 48				
Frequency range	Min. value	Max. value	Unit	Measurement tolerance
only ZNL3				
3 MHz to 3 GHz	-0.8	+0.8	dB	0.05 dB
ZNL4/6				
10 MHz to 2.9 GHz	-0.8	+0.8	dB	0.05 dB
> 2.9 GHz to 4.5 GHz	-1.3	+1.3	dB	0.05 dB
only ZNL6				
> 4.5 GHz to 6 GHz	-1.3	+1.3	dB	0.05 dB

Test Frequencies:
only ZNL3
10 MHz, 100 MHz, 500 MHz, 1 GHz, 1.5 GHz, 2 GHz, 2.5 GHz, 3 GHz
ZNL4/6

10 MHz, 100 MHz, 500 MHz, 1 GHz, 1.5 GHz, 2 GHz, 2.5 GHz, 2.9 GHz,
3 GHz, 3.5 GHz, 4 GHz, 4.5 GHz

only ZNL6

5 GHz, 5.5 GHz, 6 GHz

1.7.9 Table: Display Linearity

Test sequence description see: Test Instructions SPA (Option -B1)						
Characteristic:		Min. value	Max. value	Unit	Measurement tolerance	
Input level step						
0 dB		-0.2	+0.2	dB	0.07 dB	
10 dB reference						
20 dB		-0.2	+0.2	dB	0.05 dB	
30 dB		-0.2	+0.2	dB	0.05 dB	
40 dB		-0.2	+0.2	dB	0.05 dB	
50 dB		-0.2	+0.2	dB	0.05 dB	

1.7.10 Table: RF Attenuator

Test sequence description see: Test Instructions SPA (Option -B1)						
Characteristic:	Rf Input Level nom.	Min. value	Max. value	Unit	Measurement tolerance	
Rf Attenuator						
0 dB	-35 dBm	-0.3	+0.3	dB	0.044 dB	
10 dB reference	-25 dBm					
20 dB	-15 dBm	-0.3	+0.3	dB	0.044 dB	
30 dB	-5 dBm	-0.3	+0.3	dB	0.044 dB	

1.7.11 Table: Phase Noise

Test sequence description see: Test Instructions SPA (Option -B1)						
Characteristic:	Frequency ZNL	Min. value	Max. value	Unit	Measurement tolerance	
phase noise, frequency offset						
ZNL3/4/6						
10 kHz	1000 MHz		-103	dBc	0.5 dB	

Performance Test Report SPA (Option -B1)

100 kHz	1000 MHz		-110	dBc	0.5 dB	
1 MHz	1000 MHz		-128	dBc	0.5 dB	

2 Adjustment

The following manual alignments or corrections can be performed on the R&S ZNL:

1. Alignment of the 10-MHz reference oscillator which determines the frequency accuracy of the R&S ZNL
2. Recording the correction values for the generators and the receivers which determine the measurement accuracy of the R&S ZNL's absolute values

The alignments must be performed within an ambient temperature range of +22 °C to +24 °C after the appropriate warm-up time.

NOTICE

The steps described in the following shall be performed only by appropriately skilled personnel since any changes made have a profound effect on the measurement accuracy of the instrument.

2.1 Installing the Service Tool

Correction data is recorded by means of the ZNL-Service Tool. An installer for this software can be downloaded from R&S Extranet (GLORIS): Support and Services: Firm-/Software: Software- by type. Search for ZNL. Download the latest version of the installer. Along with the service tool, an operating manual (ZNL-Service-e.doc) will be saved in the installation directory (Default: C:\Program Files\Rohde&Schwarz\ZNL-Service). In this manual, the necessary test equipment for the service tool is listed.

If the service tool has already been installed before and the installer is started once more, only the installed version of the service tool will be removed. One will have to start the .exe again to install the new program version.

2.2 Recording Correction Data and Performing Alignments

The analyzer must be allowed to warm up for at least 30 minutes before correction data can be recorded.

Follow the instructions given in the operating manual of the service tool in order to record power correction data, perform the factory system error calibration, trim the frequency reference.

3 Repair

This chapter describes the R&S ZNL's construction, including simple procedures for repairs, troubleshooting and board replacement. A self test that checks the diagnostic voltages of the boards and that indicates limit violations is provided for troubleshooting and diagnostics.

Installation of options is described in [Chapter 4, "Software Update / Installing Options"](#), on page 104.

3.1 Functional Description

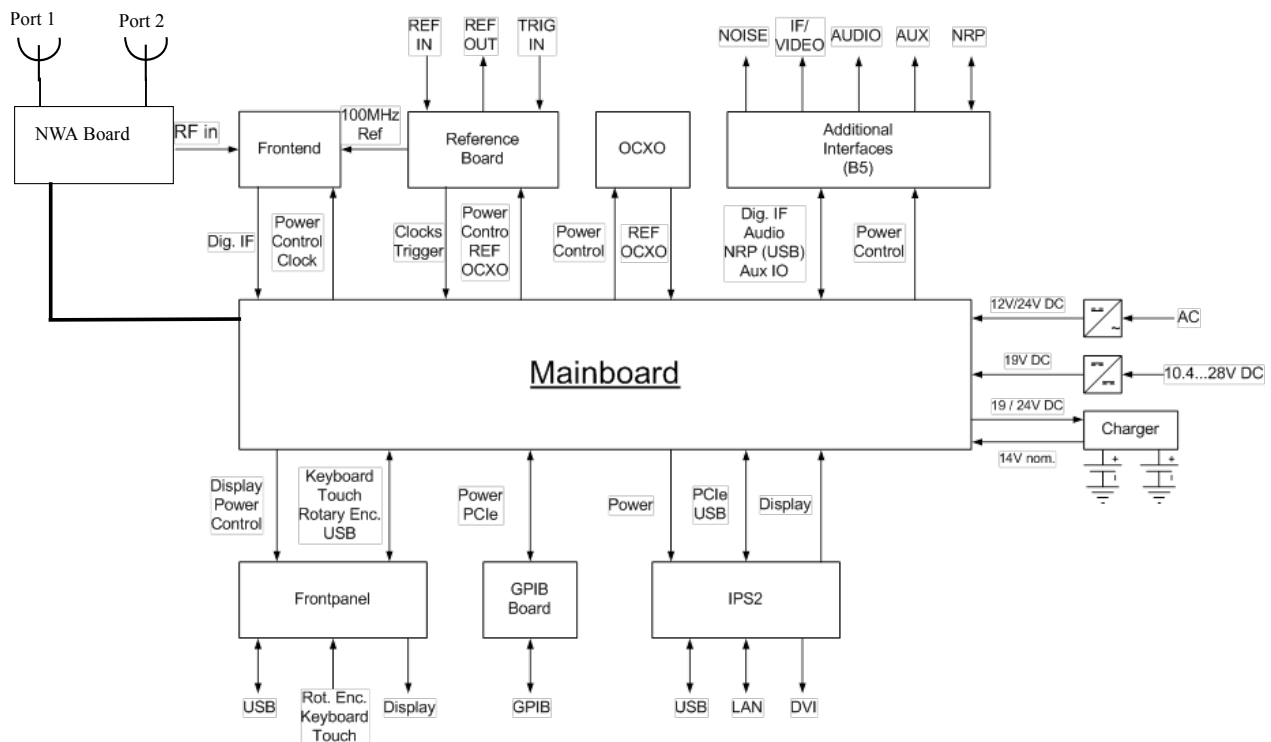
3.1.1 Overview ZNL

The following figure shows a block diagram of the R&S ZNL.

The R&S ZNL is a 2-port vector network analyzer covering 5 kHz to 3/6 GHz. It is equipped with a single NWA Board that contains: Source and Local Synthesizers, Bridge, RF-Amplifier, Mixer, AD-Converter and Control-Logic.

The FPGA on the frontend is connected to the motherboard FPGA by two digital high-speed interfaces. One interface is used to transfer the sampled digital IF data and the other one for hardware settings.

The digital signal processing is done on the motherboard FPGA and the raw measurement data is transferred to the host CPU by a PCIe interface.



3.1.2 Frontend

Only Option ZNL-B1 (SPA)

The Frontend converts the receive frequency in the range of 5 kHz to 3/6 GHz to an IF3 of 21.5 MHz. The IF1 is 4021.5 MHz and the IF2 821.5 MHz. The IF3 is then digitized by a 14 bit 100 Msamples/s ADC. Receive frequencies between 5 kHz and 2 MHz are directly fed to the ADC. The necessary local oscillators are included in the frontend.

The following figure shows a block diagram of the R&S ZNL frontend.

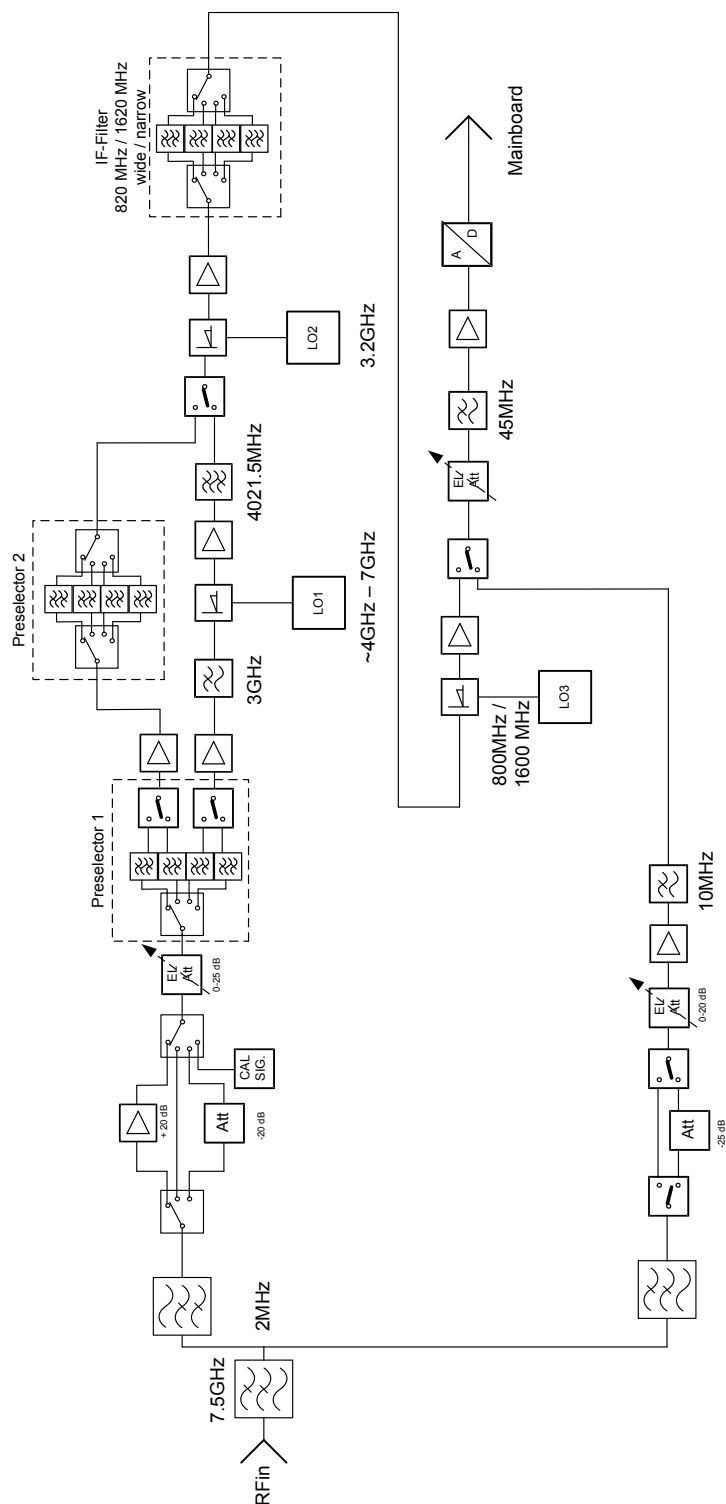
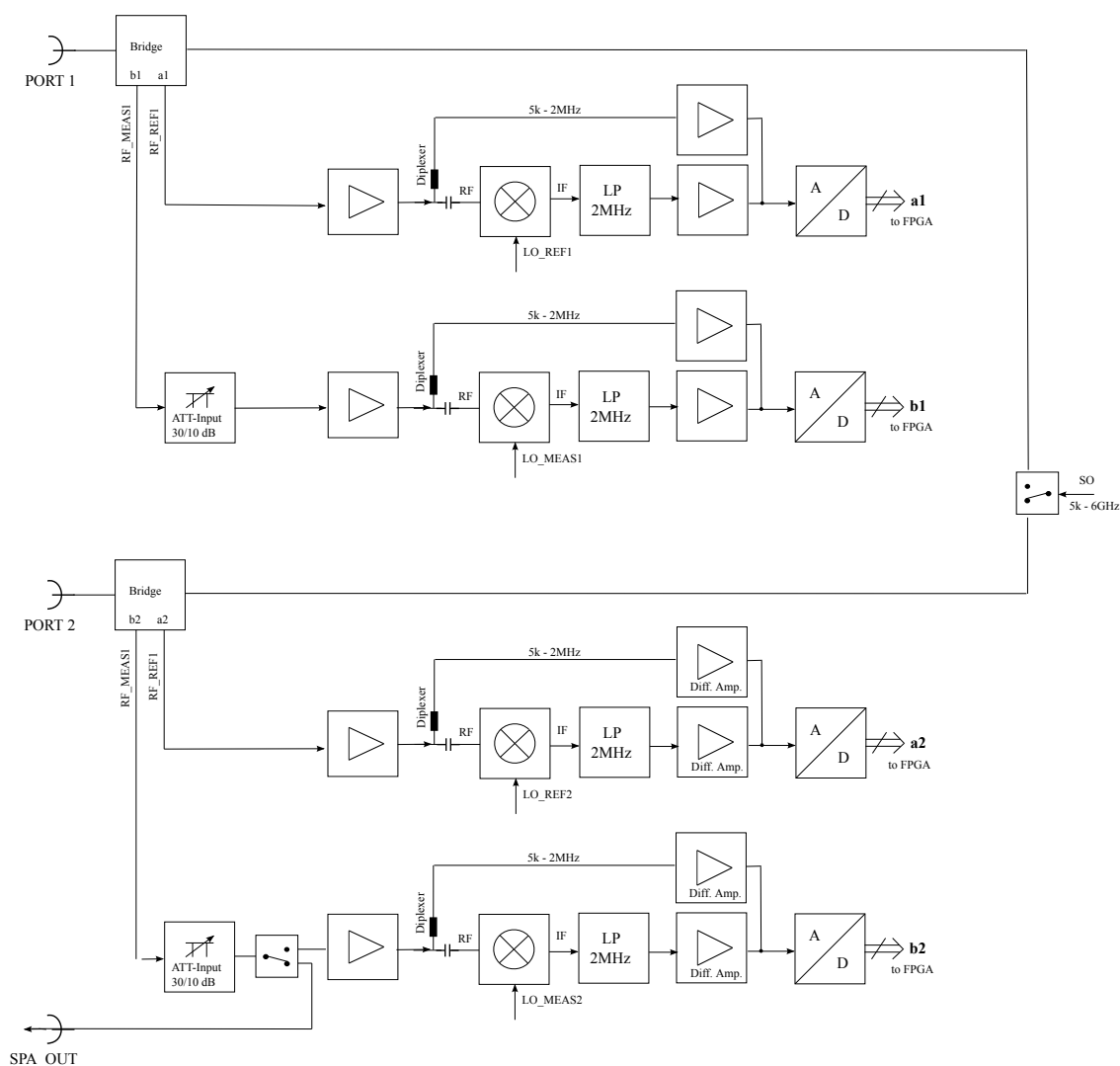


Figure 3-1: Block diagram of the R&S ZNL frontend

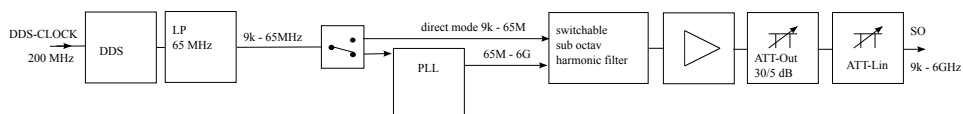
3.1.3 NWA Board

The NWA Boards contains: Source and Local Synthesizers, Bridge, RF-Amplifier, Mixer, AD-Converter and Control-Logic.

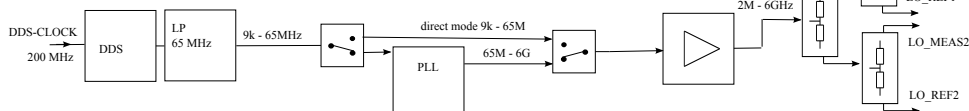
Functional Description



Source Synthesizer



Local Synthesizer



3.1.4 Motherboard

The motherboard provides slots for the modules. It contains the voltage regulators and the main signal processing FPGA.

3.1.5 Reference Board

The reference board provides all necessary reference frequencies and clocks needed:

- 100 MHz as frontend LO reference
- 200 MHz as FPGA and ADC clock

The 100 MHz is directly fed to the frontend via a coaxial cable, the 200 MHz clocks are distributed via the motherboard.

Both frequencies are derived by PLLs from a 10 MHz reference that either comes from an internal TCXO (or OCXO if option B4 is installed) or from an external reference source by the REF IN connector. The 10 MHz reference is also available at the REF OUT connector to serve as reference signal for other external devices.

Additionally a trigger input is provided.

3.1.6 IPS2

The IPS2 is an integrated PC board. It contains the CPU, RAM and the SSD mass storage. It provides LAN, USB and DVI as external interfaces and is connected to the main signal processing FPGA via PCIe.

The IPS2 can be removed from the R&S ZNL to prevent sensitive data from leaving a protected area, e.g., if the instrument is sent to a service facility. No user data is stored on any other memory component within the R&S ZNL.

3.1.7 Front Unit

The front unit consists of an aluminum case panel and a mounting plate which accommodates the LCD with touch screen, the touch screen controller, the keyboard mat with the membrane, the rotary knob and the front connector board with additional USB sockets.

An LED behind the power button indicates the standby mode:

- Green: Instrument power-on
- Yellow: Instrument is in standby mode
- Yellow flashing: Instrument is in standby mode and the battery is charging (only with option B31)

3.1.8 Power Supply

The power supply module provides a DC voltage for the voltage regulators on the motherboard. Two different models are used:

- 12V / 75W as standard
- 24V / 300W if option B31 (Battery Pack) or B1 (SPA-Option) is installed

The power supply can be switched off by the power switch on the rear panel.

3.1.9 Options

3.1.9.1 OCXO R&S FPL1-B4

The R&S FPL1-B4 option contains an oven-controlled crystal oscillator (OCXO). This OCXO generates a 10 MHz signal, which is routed to the reference board and used as a reference signal.

3.1.9.2 Additional Interfaces R&S FPL1-B5

The R&S FPL1-B5 option contains the IF/Video output, audio output, speaker, aux port, NRP power sensor port and a switched 28 V noise source power supply.

3.1.9.3 DC Power Supply R&S FPL1-B30

With the optional DC Power Supply adapter (R&S FPL1-B30) installed, the instrument can operate from a 10.4 V to 28 V DC source.

3.1.9.4 Battery Option R&S FPL1-B31

Option R&S FPL1-B31 consists of two internal swappable batteries and an internal battery charger. The batteries can be charged with AC supply or DC supply, if option R&S FPL1-B30 is installed. With the battery pack, the instrument can operate independently from any stationary power source.

3.1.9.5 Battery Charger R&S FSV-B34

The optional battery charger R&S FSV-B34 is used to charge the four batteries for the R&S FPL1-B31 battery pack.

3.1.9.6 GPIB Interface R&S FPL1-B10

Option R&S FPL1-B10 provides a GPIB interface used for remote control of the instrument.

3.1.9.7 Internal Generator R&S FPL1-B9

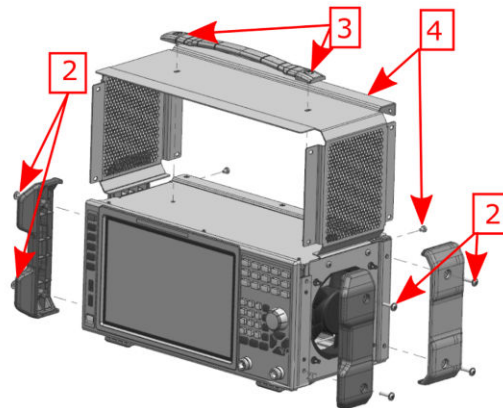
Option R&S FPL-B9 adds an internal generator to the R&S FPL1000. The generator can either be used as an independent CW source or as a Tracking Generator.

3.2 Opening the Instrument

3.2.1 Removing the Housing



- Illustrations may be different depending on the variant of the device.
- The stock numbers for ordering spare parts and corresponding drawings are attached under [Chapter 5, "Documents"](#), on page 107.
See ST 1323.0012.01, D 1323.0012.01, and D 1323.1031.01.

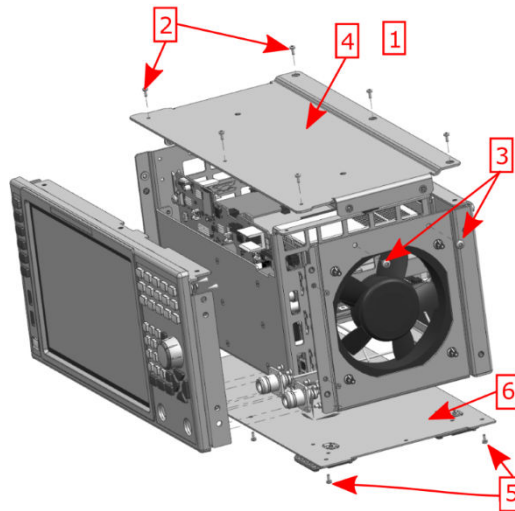


1. Switch off the instrument and disconnect the power plug.
2. Unscrew four screws on each side and remove the four bumpers.
3. Unscrew the two screws on top and remove the handle.
4. Remove two screws on the back and remove the lens tube (750).

3.2.2 Unmounting the EMC-Cover and Front-Unit

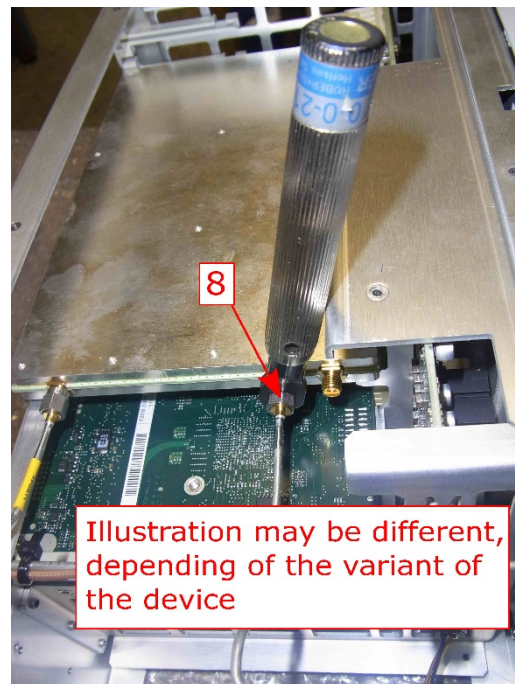
1. Remove the housing from the instrument as described in [3.2.1](#).
2. Unscrew the six screws on the top.
3. Unscrew four screws on each side.

4. Remove Cover EMC-Top ZNL.
5. Remove 8 screws on the bottom.
6. Remove EMV-Cover Bottom.

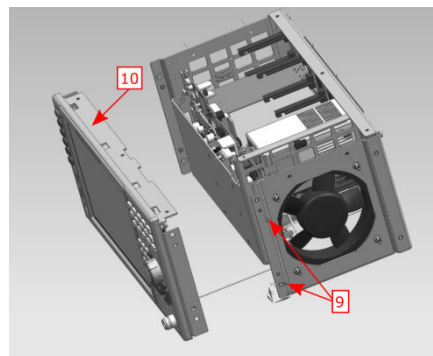


7. Disconnect the cable flex strip W500 from the Front unit to the motherboard.
8. Disconnect RF-Cable from Frontend from the bottom side.





9. Remove four Screws which fix the frontpanel to the housing.
10. Remove Front Unit as shown, watch the RF-Cable.



3.2.3 Front Unit

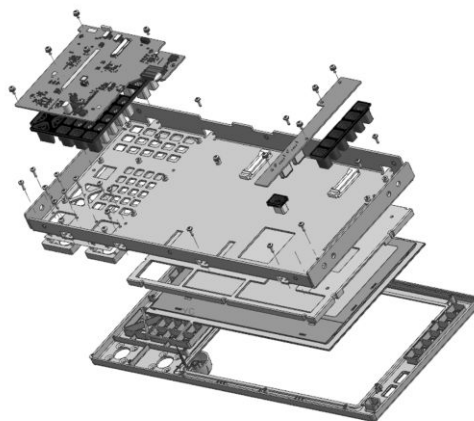
1. Remove the housing from the instrument as described in Chapters [3.2.1](#) and [3.2.2](#).
2. See explosion drawing 1323.1031.01 Page 1 and 2.
3. Unmount and mount as shown in drawing.

NOTICE**Risk of damaging R&S ZNL front unit**

Tighten the screws with a torque of 30 Ncm. A stronger torque can damage the instrument's front unit.

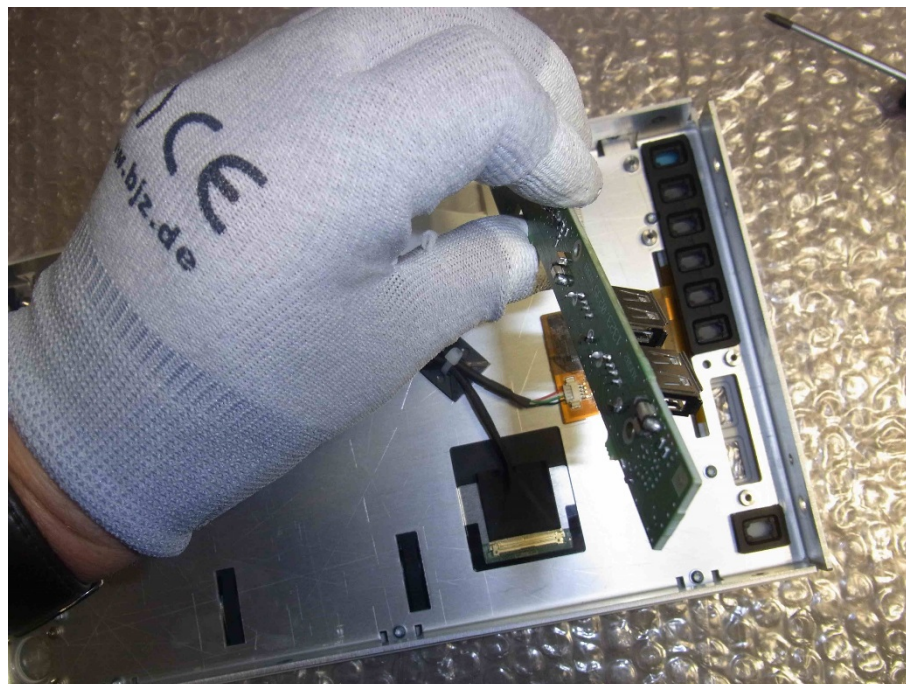
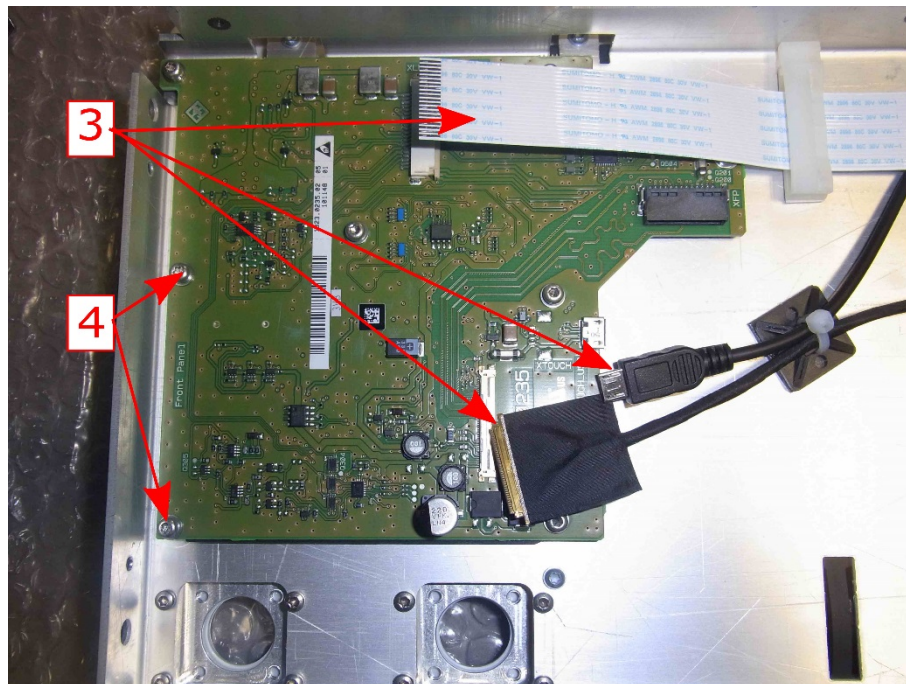


For changing Frontboard, Silicone Mat Set, Display or RF-Cable see following chapters.

**3.2.3.1 Front Unit / Front Board**

1. Frontboard pos. 2470/1323.0235.02 are both boards together in Front Unit. Always change both: Left and Right.
2. See drawing 1323.1031.01 Page 2.
3. Unplug all cable from the Frontpanel Board (W610/W620/W630 – Pos2500/2510/2520).
4. Unscrew 8x left side and 4x right side the Screws Pos2500.
5. Unmount Frontboard, NOTE: Knob 25/30 pos. 2545/2550 has to unmount.
6. Mount the new Frontboard the reverse way.

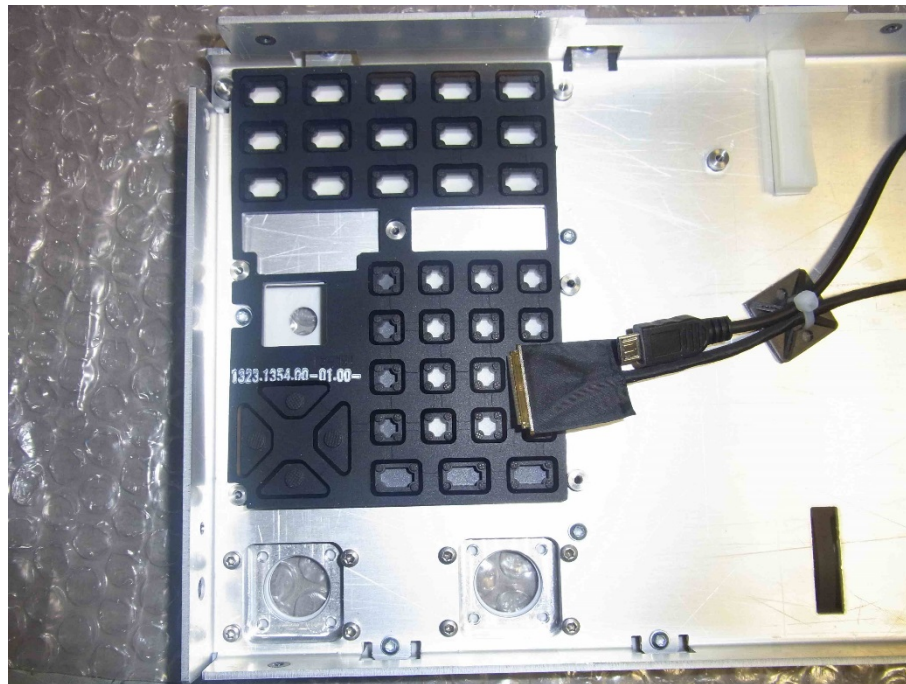
Note: When changing the Frontboard, Metal Shaft 6x13.5 (pos. 2550) must be replaced.



3.2.3.2 Front Unit / Silicone Mat Set

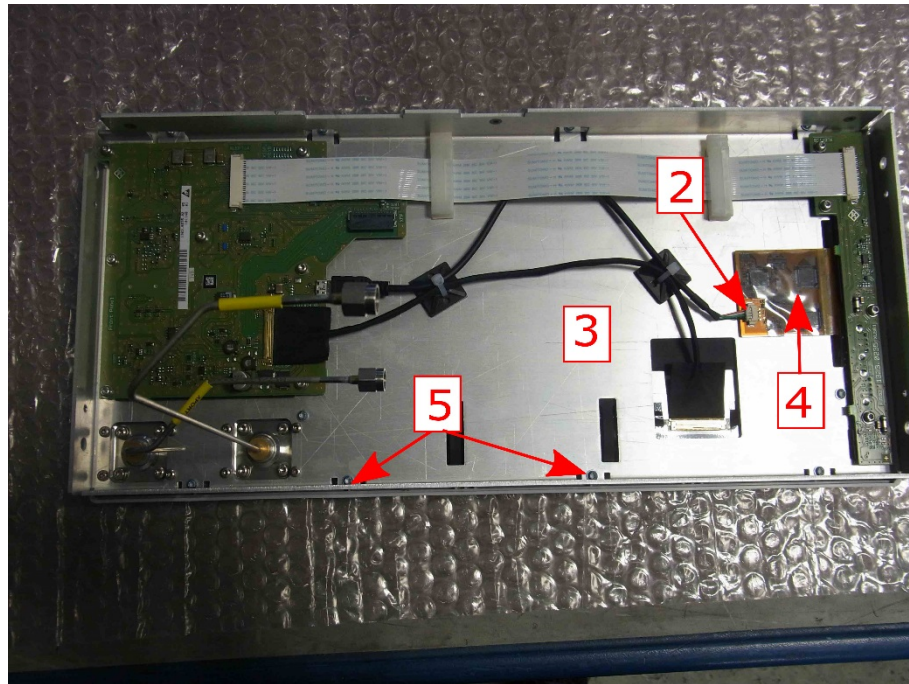
1. To change Keypad, pos. 2480/2490 remove Front Board as described in chapter [3.2.3.1](#).
2. Change Silicone Mat Set.

Note: Silicone Mat Set is always for both sides.



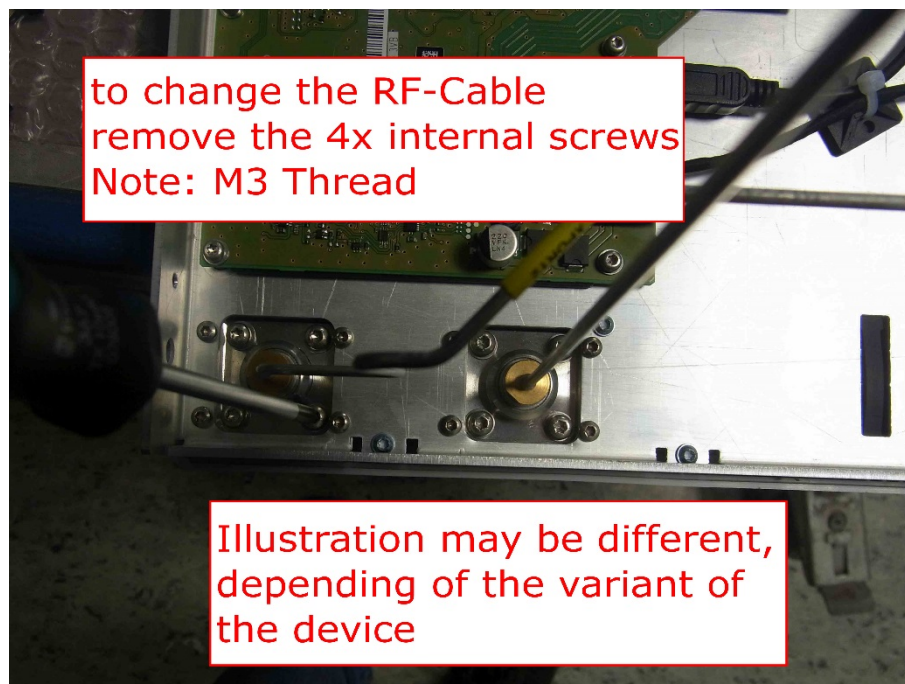
3.2.3.3 Front Unit / Display

1. To change Display, pos. 2430, remove Front Board and Silicone Mat as described in chapters 3.2.3.1 and 3.2.3.2.
2. Remove the touch cable W630 / pos. 2520 from the touch controller board.
3. Remove display cable W620 / pos. 2510 from display.
4. Carefully remove touch controller board from the mounting panel (pos. 2420).
Note: The controller is glued with adhesive tape. Use a sharp cutter.
5. Unscrew 13x Delta PT Screw / pos. 2560 (see Drawing 1323.1031.01).
6. Remove Mounting Panel Front and change Display, pos. 2430, when changing Display also change Display bracket pos. 2440.
7. When change new Display make sure that the Display Bracket sits properly in the front unit.
8. Mount as seen in Drawing 1323.1031.01.



3.2.3.4 Front Unit / RF Cable

1. To change RF-Cable remove Front Unit as described in [3.2.3](#).
2. Unmount the 4 Screws and remove RF-Cable to backside of the panel.
3. Insert new Cable and mount with 4 screws.



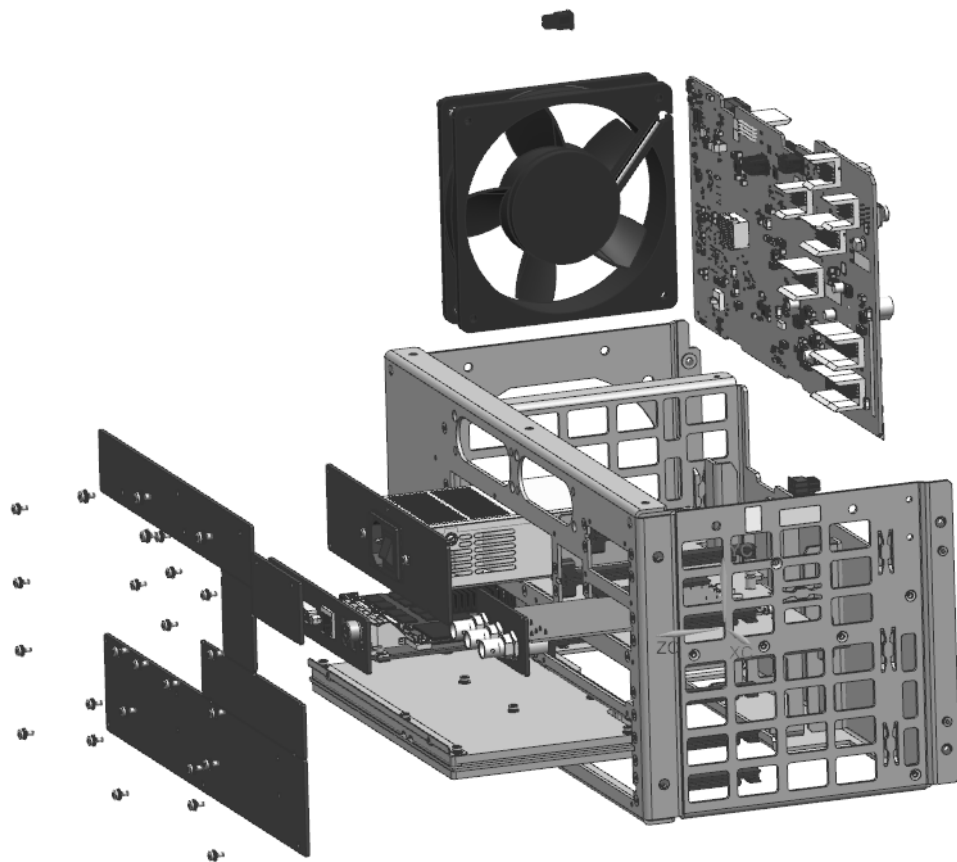
3.2.4 Unmounting Components

The following chapter will describe how to change Power Supply [1], PC [2], Harddisk [2], REF Board [3], Frontend [4], Air Fan (not shown), SIM Card (not shown) and Motherboard (not shown).

NOTICE

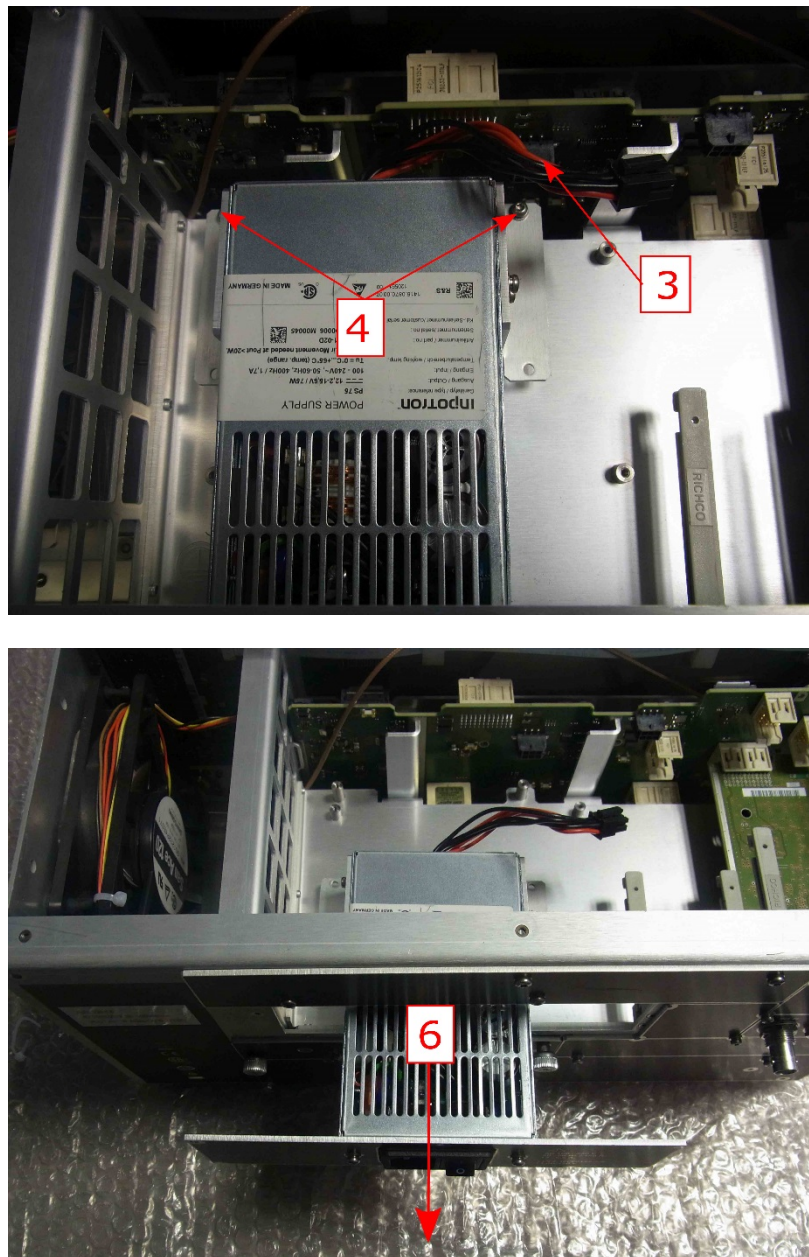
Be careful when screwing on the backwall screws! Tighten all screws perpendicular and only hand-tight. Threads in the housing might be damaged!





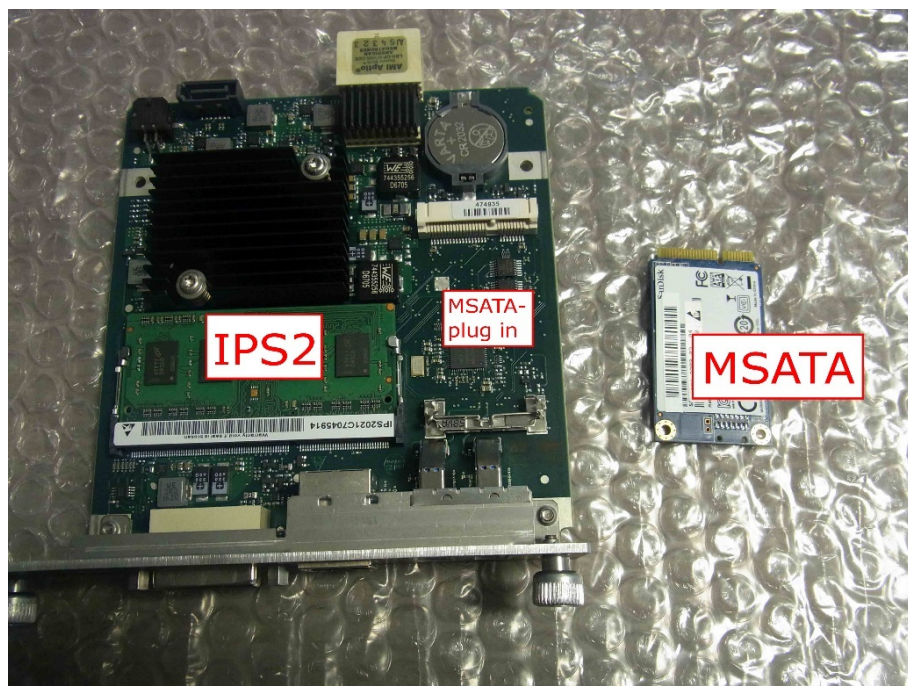
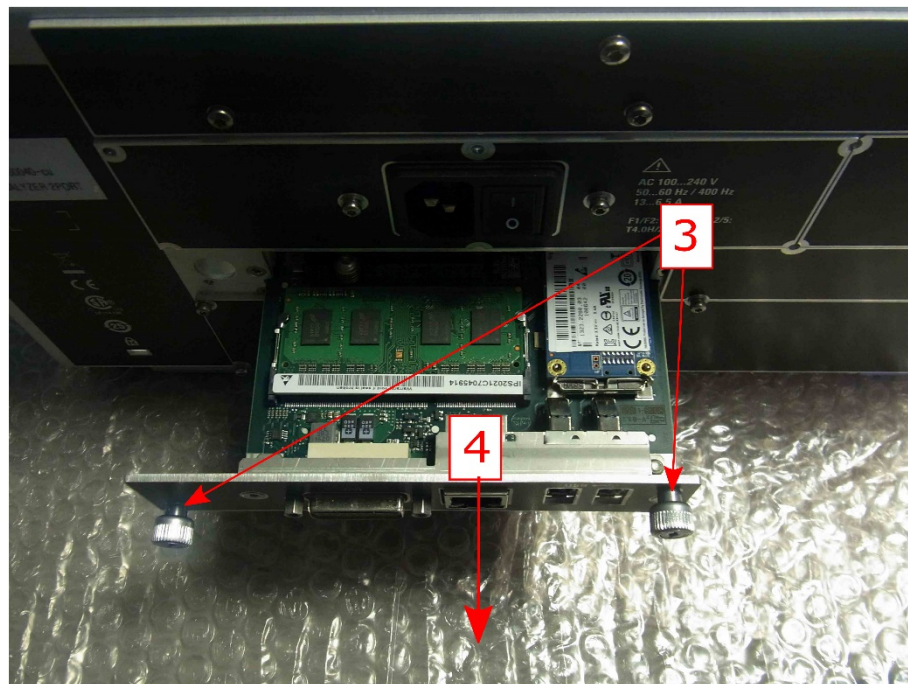
3.2.4.1 Power Supply

1. Switch off the instrument and disconnect the power plug.
2. Remove Housing and EMC-Cover Top as described in chapters [3.2.1](#) and [3.2.2](#). You only have to remove Cover EMC-Top until step 4 in [3.2.2](#).
3. Disconnect Power Supply from Motherboard plugged in XPS1.
4. Unscrews Screws on each side of the Power Supply in the housing.
5. Unscrews related screws on the backside of the device.
6. Remove Power Supply out to the back.



3.2.4.2 IPS 2 and SSD-MSATA

1. See Drawing 1323.2296.01.
2. Switch off the instrument and disconnect the power plug.
3. Open the two knurled head screws from the PC.
4. Pull out the PC.
5. Change PC or MSATA Memory Card.



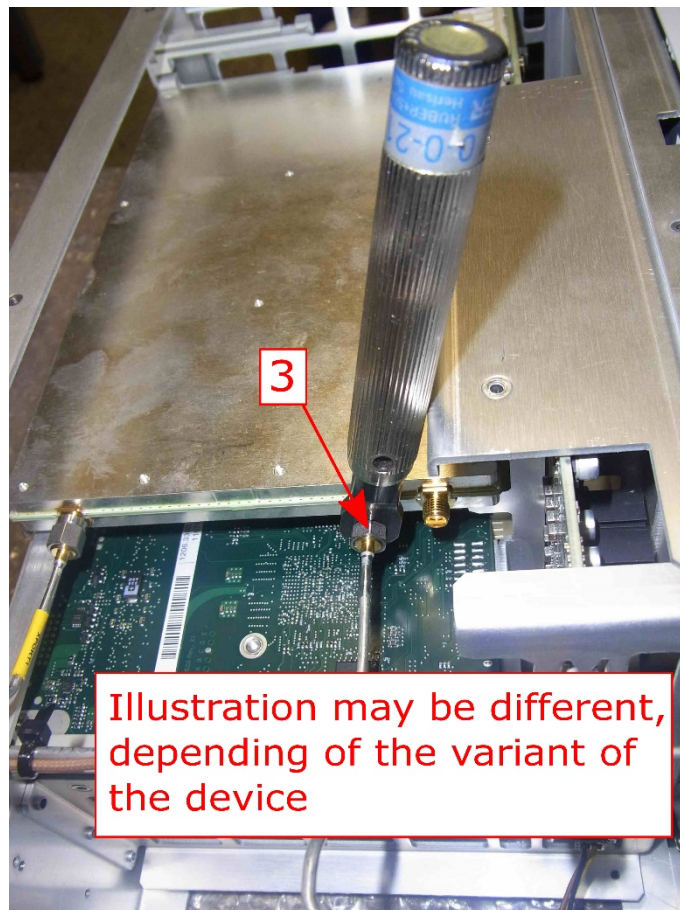
3.2.4.3 REF-Board

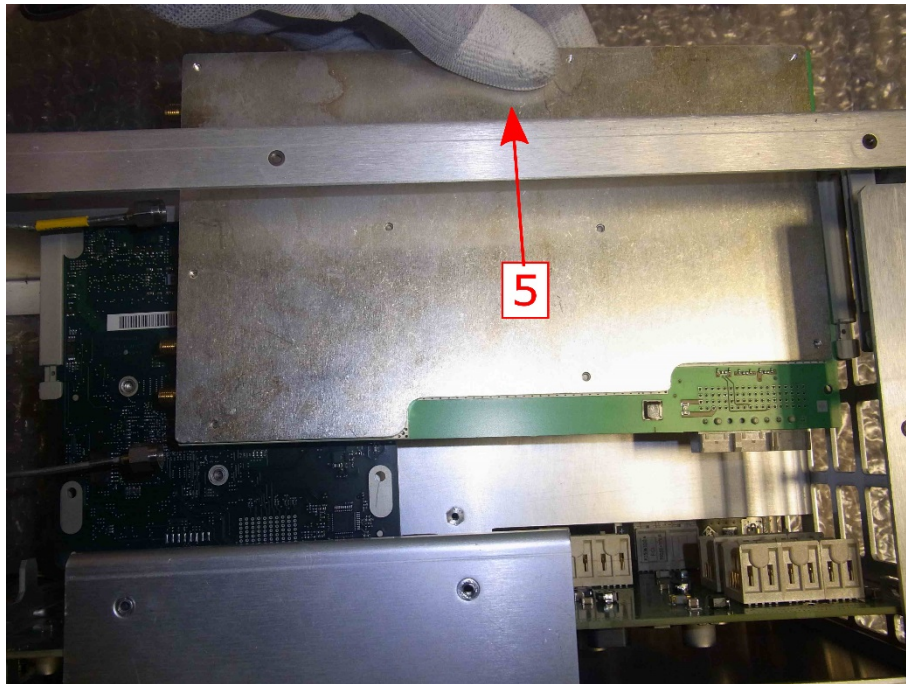
1. Switch off the instrument and disconnect the power plug.
2. Unscrew related screws on the backside of the device.
3. Remove REF-Board out to the back.

4. Exchange REF-Board and mount the other way back.

3.2.4.4 Frontend

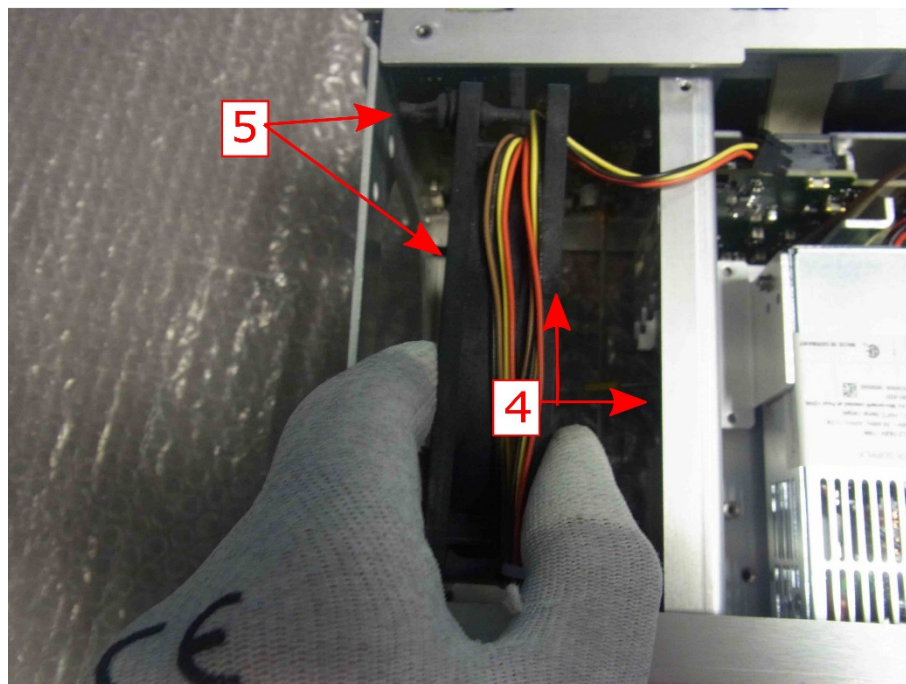
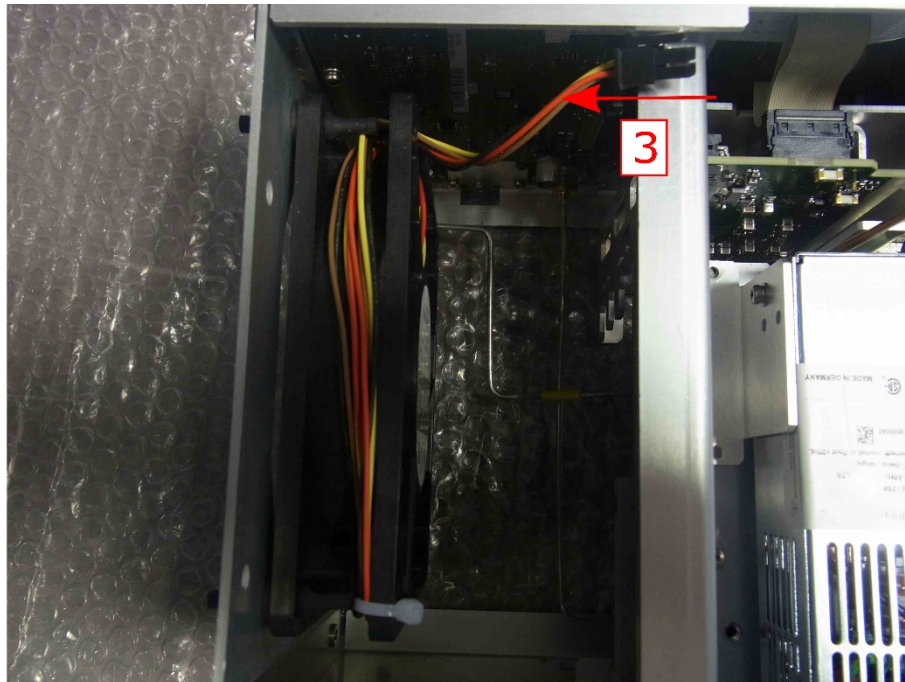
1. Switch off the instrument and disconnect the power plug.
2. Remove EMC-Cover Bottom as described in 3.2.2, point 6.
3. Disconnect all RF-Cable from Frontend from the bottom side.
4. Unscrew related screws on the backside of the device.
5. Remove Frontend out to the back.
6. Exchange Frontend and mount the other way back.





3.2.4.5 Air Fan

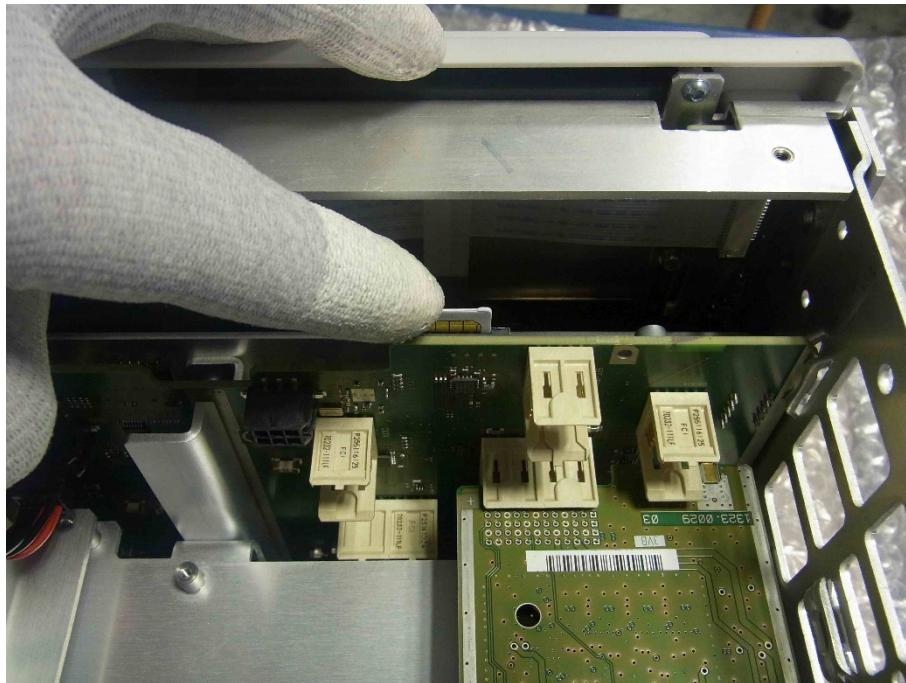
1. Switch off the instrument and disconnect the power plug.
2. Remove Housing and EMC-Cover Top as described in chapters [3.2.1](#) and [3.2.2](#).
You only have to remove Cover EMC-Top until step 4 in [3.2.2](#).
3. Disconnect the fan from the Motherboard.
4. Remove the fan from the housing.
5. When replacing the fan use 4x new Rubber Pin pos. 580.
6. Exchange the Air Fan the other way round.



3.2.4.6 SIM CARD

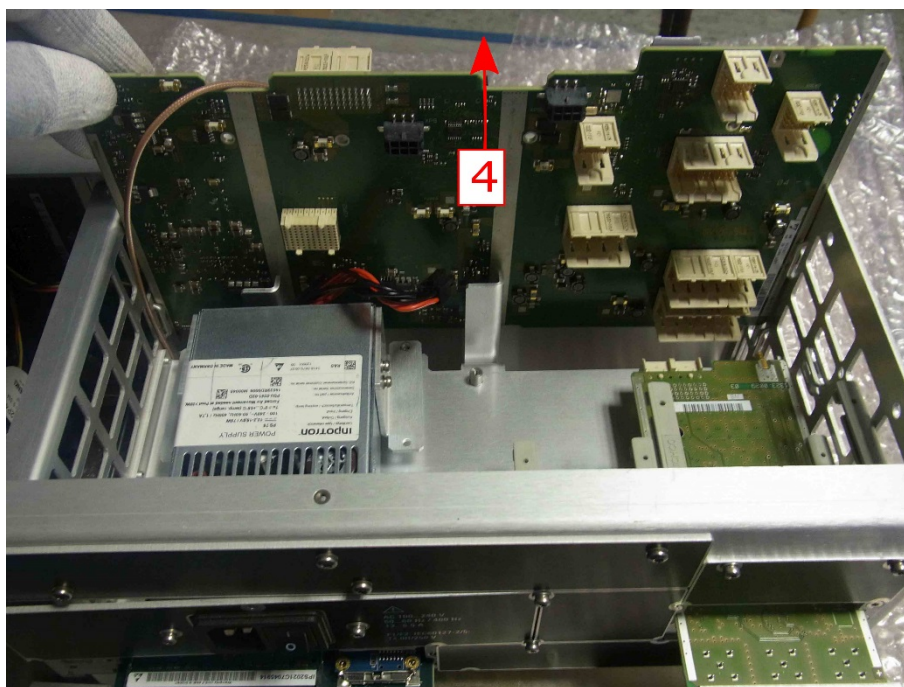
1. Switch off the instrument and disconnect the power plug.
2. Remove Housing and EMC-Cover Top as described in chapters [3.2.1](#) and [3.2.2](#). You only have to remove Cover EMC-Top until step 4 in [3.2.2](#).

3. Remove SIM CARD, by Push-In the card it is unlocked.
4. Attention: SIM Card is clued to the card reader, if the card will be reinstalled it has to be clued again. See therefore Drawing 1323.0012.01.page 4

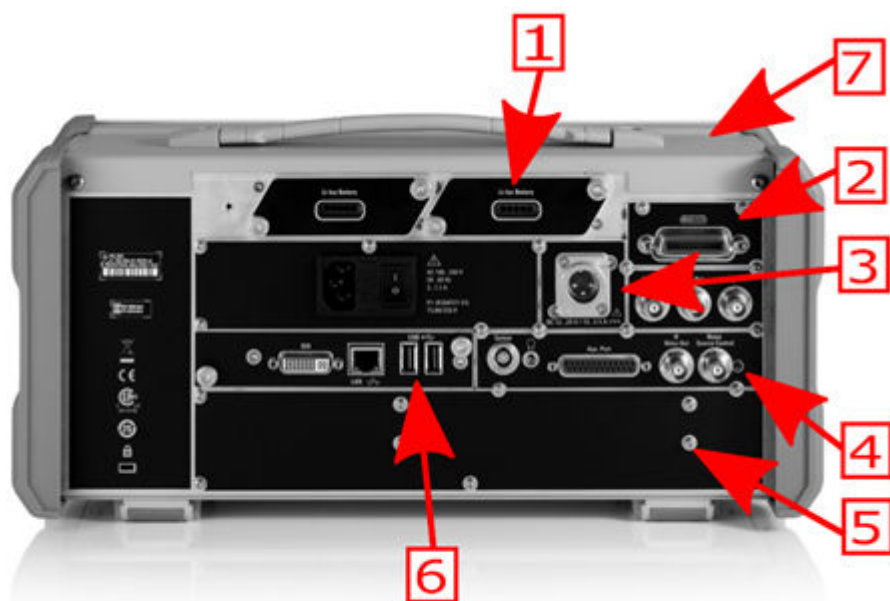


3.2.4.7 Motherboard

1. Switch off the instrument and disconnect the power plug.
2. Remove Housing and EMC-Cover Top as described in chapters [3.2.1](#) and [3.2.2](#). You only have to remove Cover EMC-Top until step 4 in [3.2.2](#).
3. In order to remove the motherboard all built-in modules must be plugged out.
4. To plug out all modules see chapter [3.2.4.1](#) to [3.2.4.6](#).
5. Plug out Front Unit Cable from the Motherboard and remove Cable REF-to-Frontend from Frontend.
6. Make sure all components are unplugged.
7. Remove Motherboard towards the top.
8. Exchange the motherboard the other way round.



3.2.5 Unmounting Options

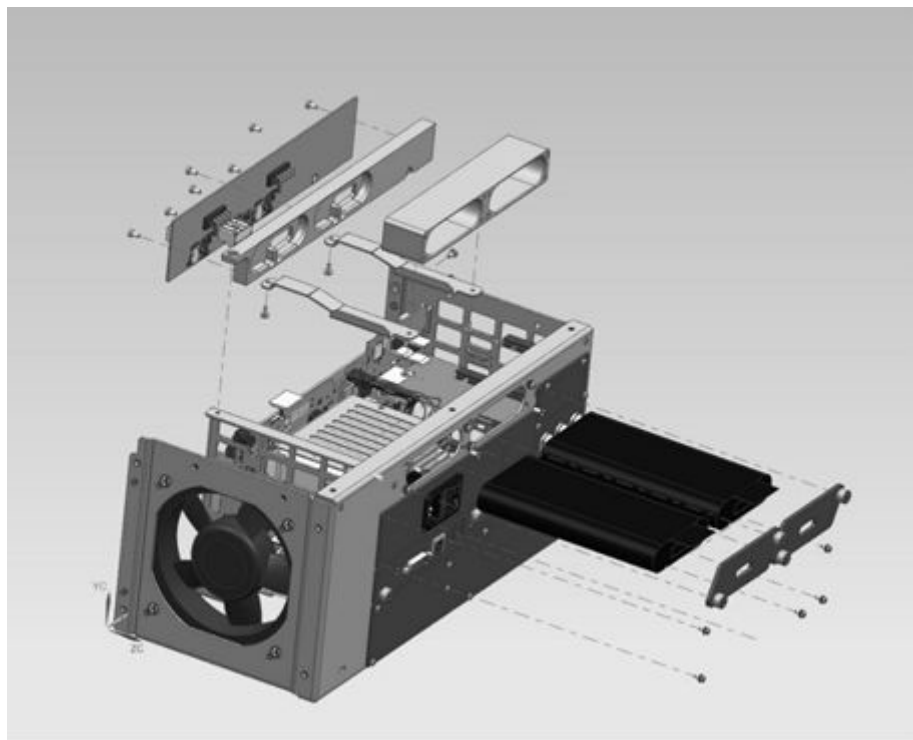


- 1 = 1323.1725.02 FPL1-B31 Battery Pack with Control
- 2 = 1323.1890.02 FPL1-B10 GPIB Interface
- 3 = 1323.1877.02 FPL1-B30 DC Power Supply 12/24V
- 4 = 1323.1883.02 FPL1-B5 Additional Interfaces or 1323.3170.02 ZNL-B6 Legacy Probe Connector

- 5 = 1323.1802.02 / 1323.2067.02 ZNL3/6-B1 Spectrumanalysis (ONLY ZNL3/6) / 1323.1925.03/07 FPL1-B9 Internal Generator
6 = 1323.2938.02 / 1323.2944.02 ZNL-B19 / ZNLE-B19 Second Hard Disc / 1304.0427.02 FPL1-B19 Second Hard Disc
7 = 1323.1902.02 FPL1-B4 OCXO Frequency Reference

3.2.5.1 FPL1-B31 Battery Pack with Control

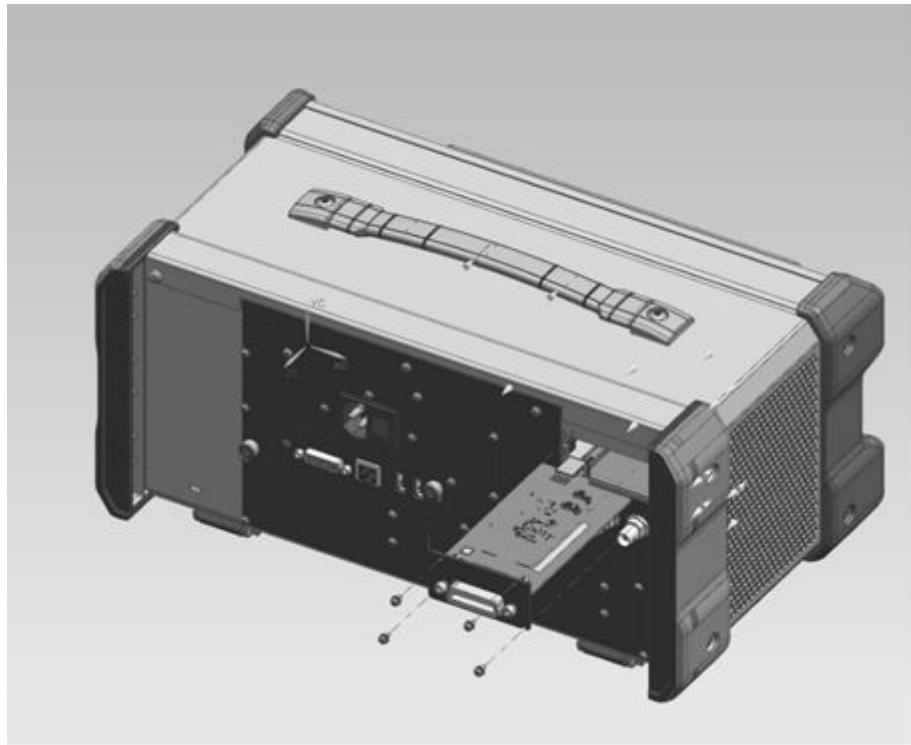
1. See Drawing 1323.2721.00
2. Switch off the instrument, disconnect the power plug and remove batteries.
3. Remove Housing and EMC-Cover Top as described in [Chapter 3.2.1, "Removing the Housing"](#), on page 68 and [Chapter 3.2.2, "Unmounting the EMC-Cover and Front-Unit"](#), on page 68. You only have to remove Cover EMC-Top till step 4 in [Chapter 3.2.2](#)
4. Remove and exchange parts as described in drawing
5. Be careful when screwing on the backwall screws! Tighten all screws perpendicular and only hand-tight. Threads in the housing might be damaged



3.2.5.2 FPL1-B10 GPIB Interface

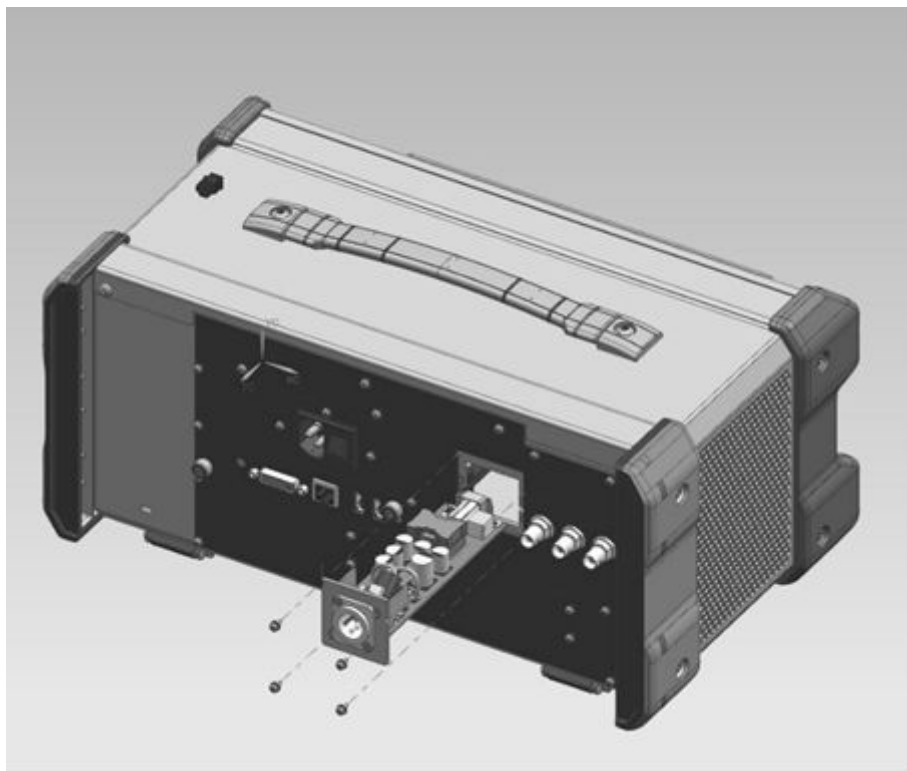
1. See Drawing 1323.2444.00

2. Switch off the instrument and disconnect the power plug
3. Remove device to the back and exchange it
4. Be careful when screwing on the backwall screws! Tighten all screws perpendicular and only hand-tight. Threads in the housing might be damaged



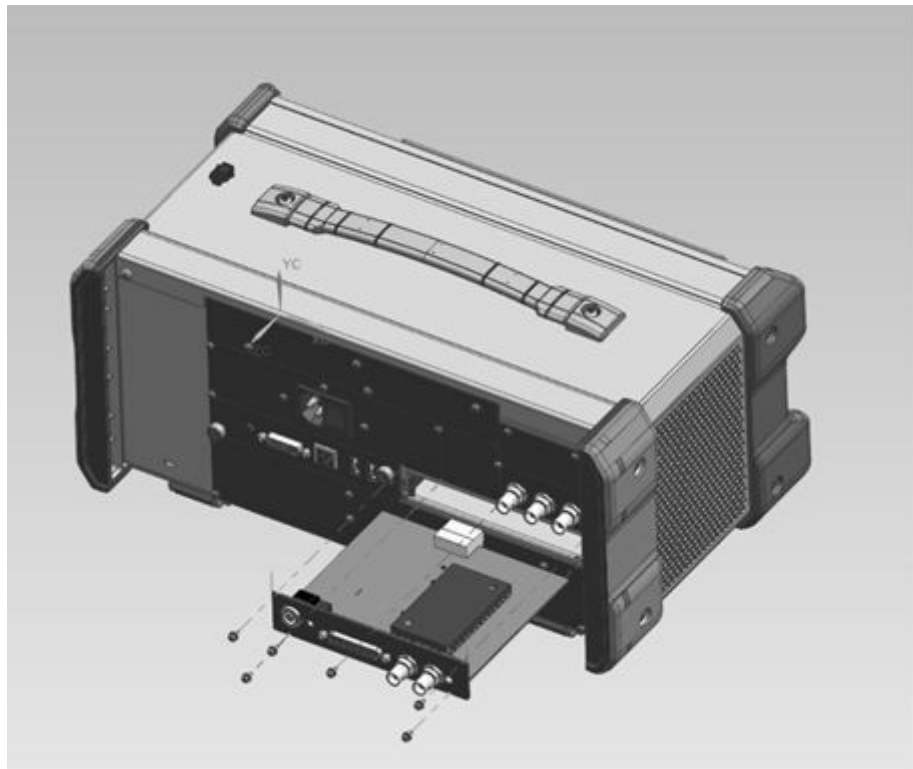
3.2.5.3 FPL1-B30 DC Power Supply 12/24V

1. See drawing 1323.2450.00
2. Switch off the instrument and disconnect the power plug
3. Remove device to the back and exchange it, carefully use needle-nose pliers, don't pick at the contact, pick on housing
4. Be careful when screwing on the backwall screws! Tighten all screws perpendicular and only hand-tight. Threads in the housing might be damaged



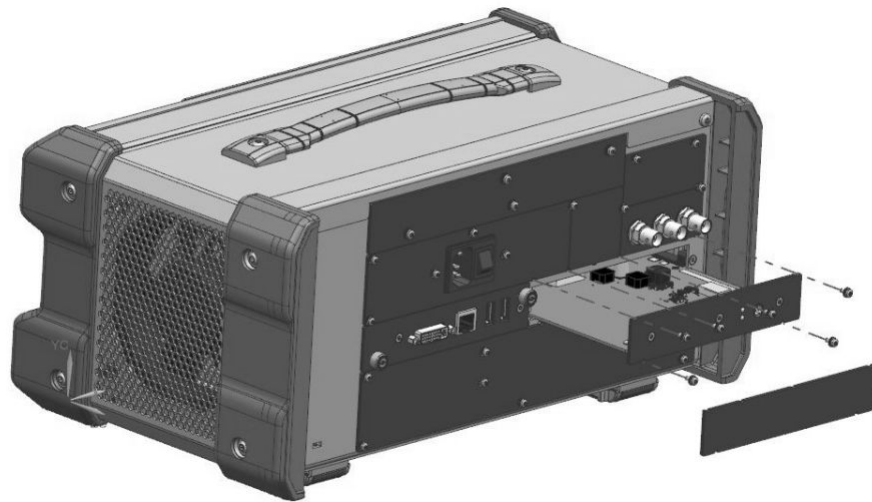
3.2.5.4 FPL1-B5 Additional Interfaces

1. See drawing 1323.2421.00
2. Switch off the instrument and disconnect the power plug
3. Remove device to the back and exchange it
4. Be careful when screwing on the backwall screws! Tighten all screws perpendicular and only hand-tight. Threads in the housing might be damaged



3.2.5.5 ZNL-B6 Legacy Probe Connector

1. See drawing 1303.9343.00.
2. Switch off the instrument and disconnect the power plug
3. Remove device to the back and exchange it
4. Be careful when screwing on the backwall screws! Tighten all screws perpendicular and only hand-tight. Threads in the housing might be damaged



3.2.5.6 ZNL3/6-B1 Spectrum Analysis

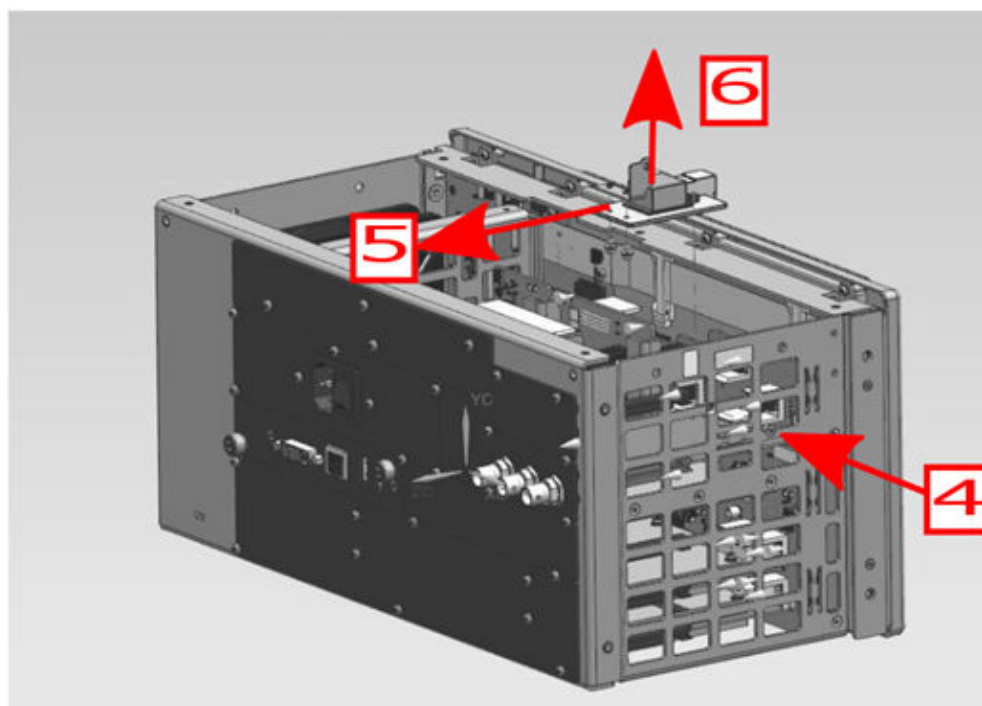
See [Chapter 3.2.4.4, "Frontend"](#), on page 79 and drawing: 1323.2815.00.

3.2.5.7 ZNL-B19 / ZNLE-B19 Second Hard Disc / FPL1-B19 Second Hard Disc

See chapter [Chapter 3.2.4.2, "IPS 2 and SSD-MSATA"](#), on page 77.

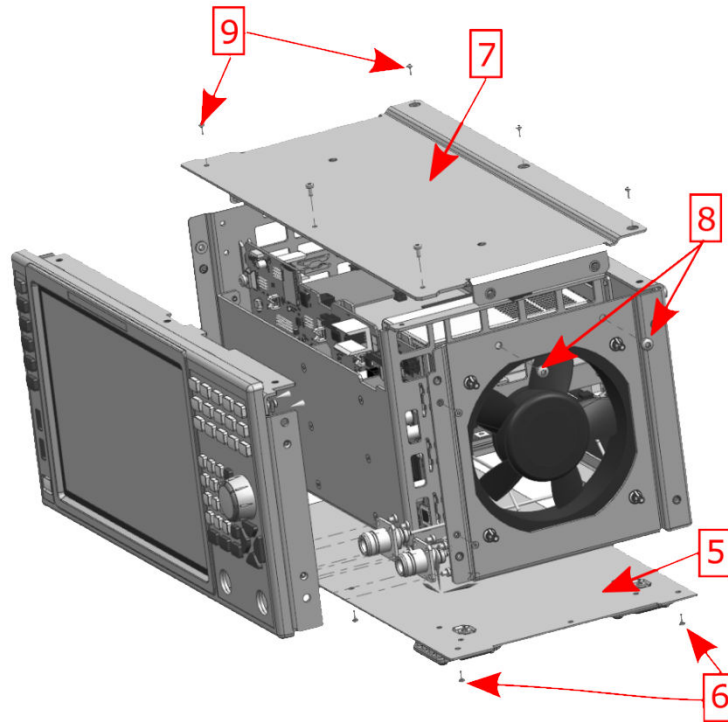
3.2.5.8 FPL1-B4 OCXO Frequency Reference

1. See drawing 1323.2438.00
2. Switch off the instrument, disconnect the power plug and remove batteries.
3. Remove Housing and EMC-Cover Top as described in [Chapter 3.2.1, "Removing the Housing"](#), on page 68 and [Chapter 3.2.2, "Unmounting the EMC-Cover and Front-Unit"](#), on page 68. You only have to remove Cover EMC-Top till step 4 in [Chapter 3.2.2](#)
4. Unscrew Screw on the left side
5. Pull out OCXO-Device from Motherboard
6. Take it out of the device
7. Exchange the OCXO the other way round

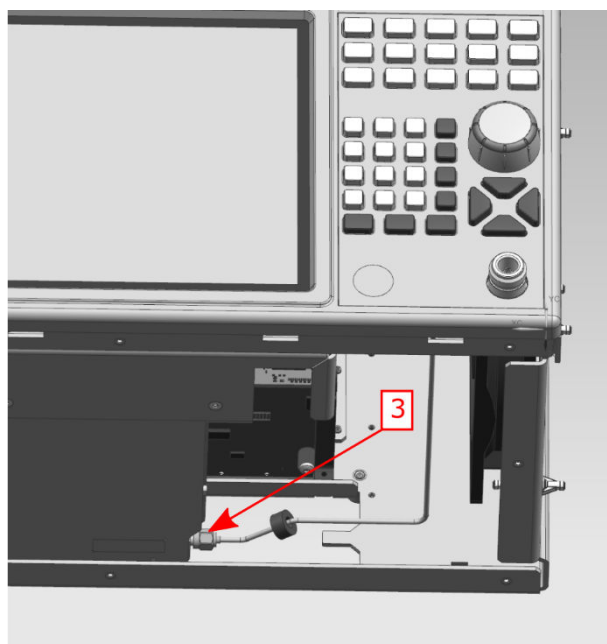


3.3 Completing the Instrument

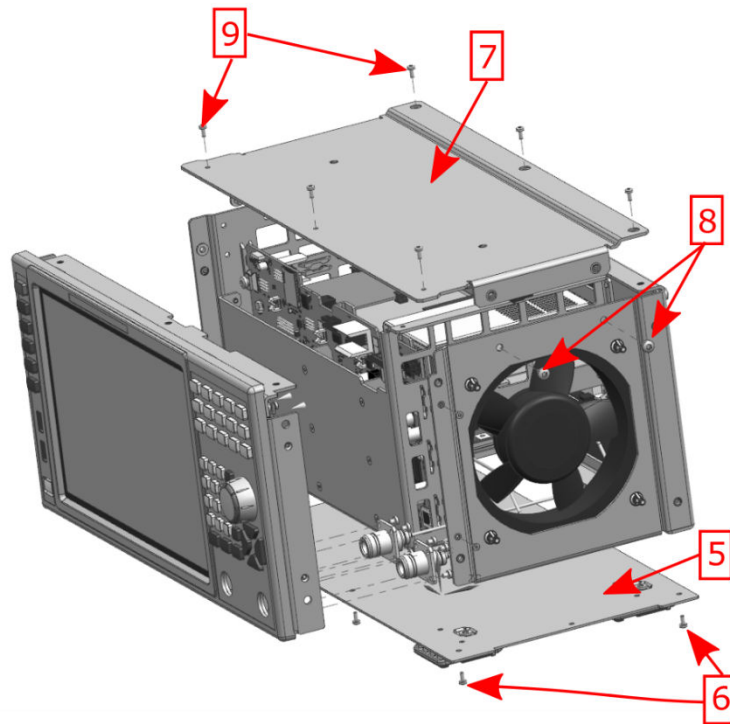
3.3.1 Mounting the Front Unit and Housing



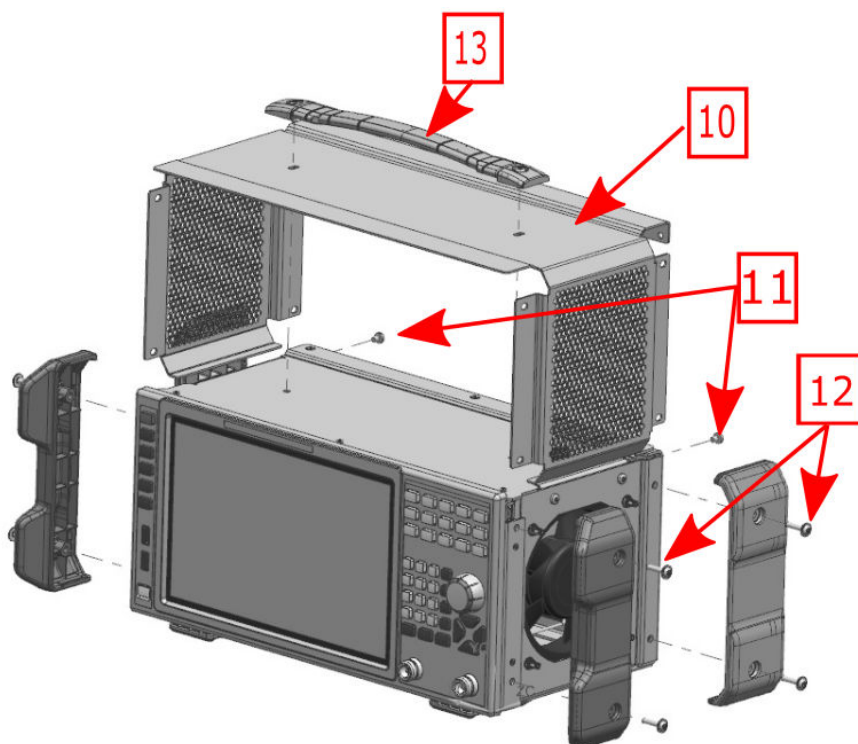
1. Assemble Front on housing from the front side, watch the RF-cable.
2. Fix it with 4 Counter-Sunk-Screws to the housing.
3. Connect RF-Cable to the Frontend.



4. Connect Frontcable to Motherboard.
5. Mount Cover Bottom.
6. Screw Cover Bottom with 8 Screws.
7. Mount Cover EMC-Top ZNL.
8. Screw from both side 2 times M4-Screws.
9. Screw six screws from top.



10. Mount Lens Tube from the top.
11. Screw from back with two screws.
12. Mount 4 bumpers watch right and left and back and front (labeled inside).
13. Mount handle with cover and screws.



Note: Risk of damage to the instrument. Make sure you route the cables properly.

3.4 Module Replacement

⚠ WARNING

Danger of injury during module replacement

Any adjustments, replacement of parts, maintenance or repair must be carried out exclusively by technical personnel authorized by Rohde & Schwarz.

Observe the safety instructions for units with a removable casing.

Follow the step-by-step instructions for module replacement carefully to avoid injury and to help ensure safe operation.



Risk of electrostatic discharge

Protect the work area against electrostatic discharge to avoid damage to electronic components in the modules. For details, refer to the safety instructions at the beginning of this manual.

3.4.1 Overview of the Required Tests and Adjustments after Replacing Modules



Performance test

It is highly recommended that you perform a performance test according to [Chapter 1, "Performance Test"](#), on page 7 every time the instrument is opened in addition to the tests and adjustments mentioned in the table below to ensure accurate measurements.

Module	Required tests and adjustments after replacement		
	Function tests and system error correction	Adjustment	Other
RF Input Cable W1	SELFTEST / SELF ALIGNMENT	Frequency response	
Frontend	SYSTEM INFO/SELFTEST / SELF ALIGNMENT	Frequency response	
NWA Board	SYSTEM INFO/SELFTEST / SELF ALIGNMENT	Frequency response	
motherboard	SYSTEM INFO / SELFTEST / SELF ALIGNMENT	Frequency response	Program EEPROM
IPS2	SYSTEM INFO / SELFTEST		BIOS Update, Time Control Management
Power Supply	SELFTEST		
Hard Drive with SW	SYSTEM INFO / SELFTEST / SELF ALIGNMENT	Touch Screen	FW Update
Front Unit	SELFTEST	Touch Screen / Frequency response	Check Keyboard and front USB ports
Fan	SELFTEST		
OCXO FPL1-B4	SYSTEM INFO / SELFTEST / SELF ALIGNMENT	Ref. Freq.	
Additional Interface FPL1-B5	SYSTEM INFO / SELFTEST / SELF ALIGNMENT		Program EEPROM
GPIO FPL1-B10	SYSTEM INFO / SELFTEST		Ext. Contrl. Functional Check
Internal Generator FPL1-B9	SYSTEM INFO / SELFTEST / SELF ALIGNMENT	Frequency response	

3.4.2 Lithium Battery on the Controller

See [Chapter 5.1, "Spare Parts"](#), on page 107, item 159, and explosion drawings 1307.9002.01 sheet 1.

The lithium battery is located on the controller.

 WARNING**Risk of intoxication and explosion**

Risk of intoxication and explosion

Observe the safety regulations for batteries in the Grouped Safety Messages at the beginning of the manual.

3.4.2.1 Removing the Lithium Battery

1. Open the instrument as described in [Chapter 3.2.1, "Removing the Housing"](#), on page 68.
2. Unmount the front unit as described in [Chapter 3.2.3, "Front Unit"](#), on page 70.
3. Carefully push the contact springs of the battery holder up and remove the battery (159).

3.4.2.2 Installing the New Battery

1. Carefully push the contact springs of the battery holder up and insert battery into the holder beneath the springs.

Note: The plus pole (+) of the battery points upwards.

Risk of damage to the instrument. Do not short-circuit the battery.

2. Mount the front unit as described in [Chapter 3.3.1, "Mounting the Front Unit and Housing"](#), on page 90

3.4.2.3 Putting into Operation

1. Connect the instrument to the mains and switch on its power switch. The instrument is now in standby mode.
2. After starting the instrument, check hardware info:
[SETUP : MORE : SYSTEM INFO : HARDWARE INFO]
3. Start selftest and check results:
[SETUP : MORE : SERVICE : SELFTEST], then [SELFTEST RESULTS]
4. Start alignment and check the result:
[SETUP : ALIGNMENT : SELF ALIGNMENT], then [SHOW ALIGN RESULTS]
5. Perform a frequency response correction using the correction software.
6. Adjust the instrument as described in [Chapter 2, "Adjustment"](#), on page 60.

**Risk of losing important information**

Important information about the type of instrument, installed hardware, options, etc., is stored both on the motherboard and on the hard drive. This information is required to restore the instrument in case of errors. Thus, do not replace the motherboard and the hard drive at the same time, as doing so will cause this information to be lost. If the instrument does not function after the hard drive has been replaced, do not replace the motherboard. Instead, re-install the old hard drive and then replace the motherboard.

3.5 Troubleshooting

Malfunctions may have simple causes but also may be caused by faulty components.

These troubleshooting instructions enable you to locate error causes down to board level and make the instrument ready for use again by means of board replacement.

We recommend that the instrument be shipped to our experts in the service centers (see address list) for module replacement and further error elimination.

**WARNING****Shock hazard**

Before opening the casing, make sure that the instrument is switched off and disconnected from all power supplies.

Read all safety instructions at the beginning of this manual carefully!

**Risk of damage to the boards**

Be careful not to cause short circuits when measuring voltages at pins placed close together!

Utilities provided in the R&S ZNL for diagnostic purposes:

- Self test
- System error correction

**Frequent cause of problems: connections**

When problems occur, first check whether any cables, plug-in connections of boards, etc. are damaged and whether they are connected properly.

3.5.1 Measuring Equipment and Accessories

Item	Type of equipment	Specifications recommended	Equipment recommended	Use
1	DC meter	0...24V	-	Troubleshooting Start Up
2	Spectrum Analyzer	≥ 1 GHz	R&S FPL, R&S FSV3000, R&S FSW	Troubleshooting Frontend

3.5.2 Startup Problems

3.5.2.1 Device Does Not Start Properly

Error:

Power LED stays dark (using AC power)

Test equipment:

DC meter

R&S ZNL setting:

-

Input:

Connect power to the AC input. Ensure the power switch is turned on.

Output:

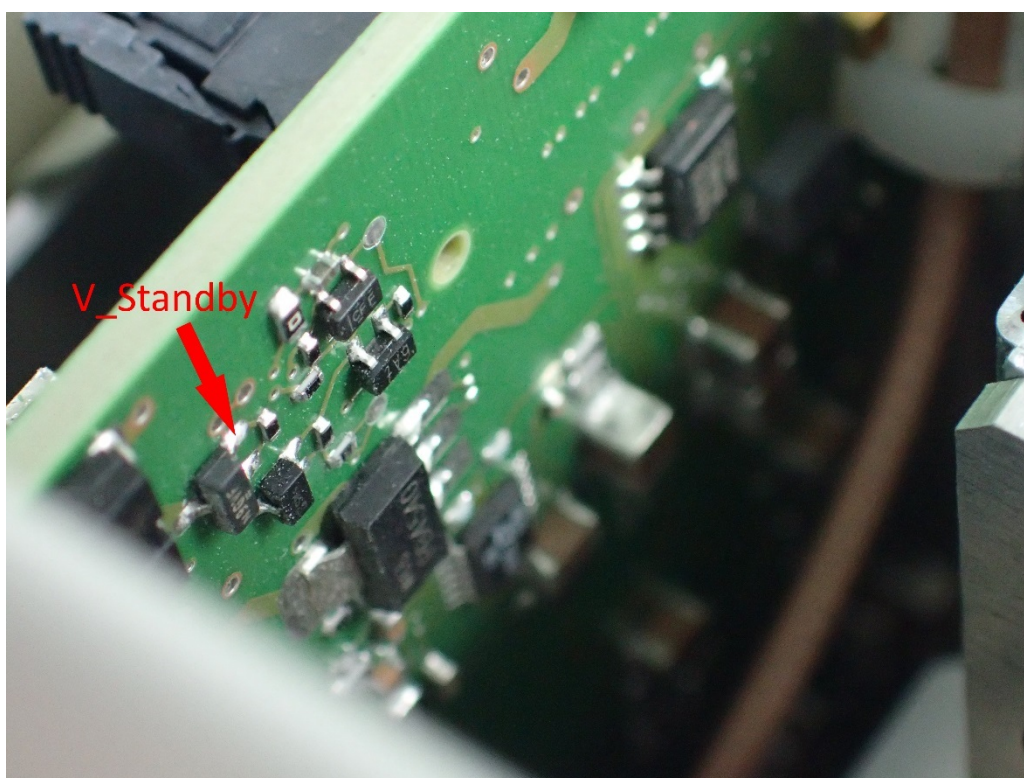
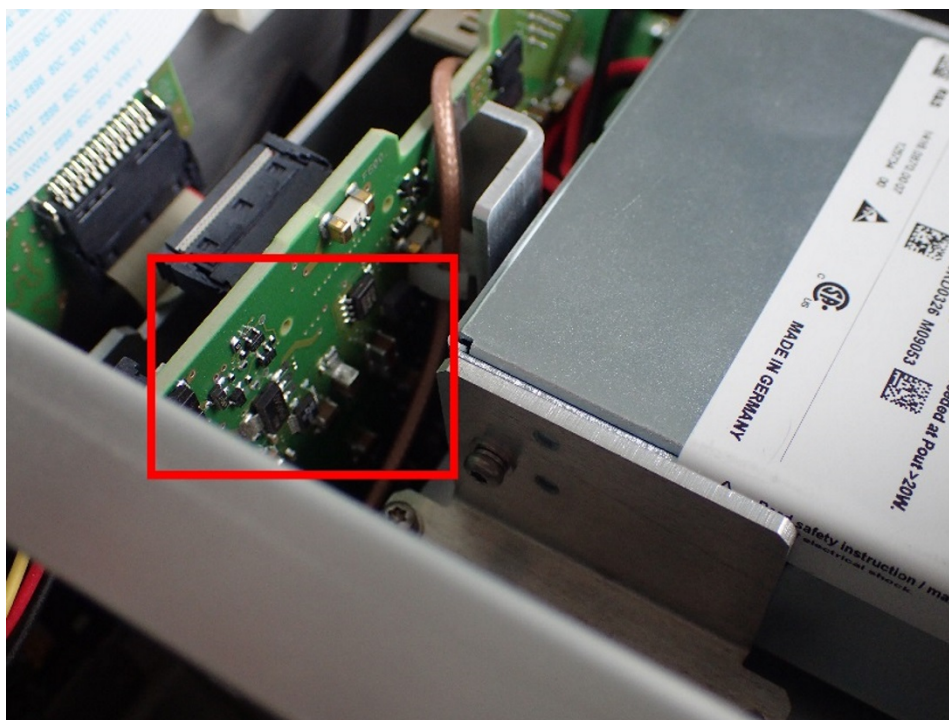
Measure Power Supply output voltage.

**Check level:**

75 W model: +12 V +/- 5 %, 300 W model: +24 V +/- 5 %

Check failed: PSU defective.

Check ok: Check Standby Voltage:



Check level: +12 V +/- 5 %

Check failed: motherboard defective.

Check ok: Frontpanel defective.

Error:

Power LED turns green but display stays black.

Test equipment:

-

R&S ZNL setting:

Connect an external display to the R&S ZNL.

Check:

- External display also stays black -> IPS2 is defective.
- External display show correct screen -> Frontpanel is defective.

Error:

Display shows distorted colors.

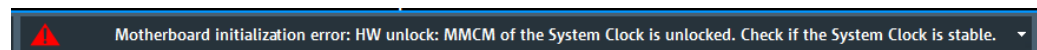
Failure:

IPS2 is defective. This might happen, when the IPS2 is pulled while the R&S ZNL is running.

3.5.2.2 Device Boots, but the Firmware Does Not Start Properly

Error:

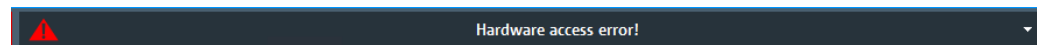
Firmware shows MMCM unlock error.

**Failure:**

The FPGA is not clocked properly. The Reference Board might be defective.

Error:

Firmware shows Hardware access error.

**Failure:**

The FPGA configuration seems to be corrupted. Reinstall Firmware.

3.5.3 Hardware Communication Problems

During operation, if the firmware observes a serious unexpected disturbance (e.g. due to ESD), it resets all hardware components to ensure proper instrument functioning. It then restores the user settings to the state before the disturbance and indicates the foregone hardware reset by an information popup with the following text:

"Hardware communication problem detected. Hardware was reset. Measurement data of this sweep may be incorrect. Please contact Rohde & Schwarz if this problem persists."

The firmware also generates a service level 2 error log entry "Hardware reset is caused by the following error(s): <error cause>", where <error cause> indicates a board or module in the instrument.

- If the same error occurs repeatedly in the logfile, this indicates a hardware defect of the related board or module.
- If the error occurs with different error causes, this typically indicates an ESD problem.

3.5.4 Determining defective boards

The table below lists boards that are probably defective based on the faults that occurred during performance test.

	Defective board	
Problem with	Probable	Also possible
Frequency Accuracy	Frequency Reference	
Output Harmonics	NWA_Board	
Output Power Linearity	Correction data (recorded by service tool)	NWA_Board
Maximum Output Power	Correction data (recorded by service tool)	NWA_Board
Accuracy of Output Power	Correction data (recorded by service tool)	NWA_Board
Input Power Measurement Accuracy	Correction data (recorded by service tool)	NWA_Board
Input Power Linearity (Low or High Level)	Correction data (recorded by service tool)	NWA_Board
Trace Noise Magnitude or Phase	Correction data (recorded by service tool)	NWA_Board

Dynamic Range	internal Connector / RF-Cable	NWA_Board
Input Noise Level	NWA_Board	
Uncorrected System Performance - Directivity, Source or Load Match, Reflection or Transmission Tracking	Correction data (recorded by service tool)	NWA_Board

If possible, a board test should be performed before the board that appears to be defective is replaced.

3.5.5 Problems with the Frontend

3.5.5.1 LO Unlock

Error:

LO unlocks are shown.

Test equipment:

Spectrum analyzer

R&S ZNL setting:

-

Input:

-

Output:

Connect the spectrum analyzer to the frontend side of the reference cable.

Check level and frequency:

>5dBm, 100MHz

3.5.6 Problems with the Reference Board and OCXO

3.5.6.1 NO REF Using Internal Reference

Error:

NO REF errors are shown when using internal reference.

Test equipment:

Spectrum analyzer

R&S ZNL setting:

-

Input:

-

Output:

Connect the spectrum analyzer XREFO

Check level and frequency:

>5 dBm, 100 MHz

If an OCXO is installed, remove it. If this clears the error, exchange the OCXO, otherwise the Reference Board is defective.

3.5.7 Problems with the Battery

3.5.7.1 One or both Battery Packs Do Not Charge or Discharge

Test equipment:

Spectrum analyzer

Check:

Remove the battery packs. Check the voltage of the packs, it should be between 10 V and 16.8 V.

Hint:

If a battery pack was discharged very deep, recharging might take longer than usual.

4 Software Update / Installing Options

This chapter contains information on installing/updating the firmware, restoring the operating-system and installing options on the R&S ZNL. For a complete list of R&S ZNL options refer to the "Ordering Information" section at the end of the product brochure or the data sheet.

4.1 Installation of new R&S ZNL Firmware

For information on updating firmware refer to the release notes. The most recent version is provided on our Internet site at www.rohde-schwarz.com.

Upgrade versions of the 64 bit analyzer firmware are supplied as single setup files *.msi, the file name is _xxyy_x64.msi.

You need administrator right to install the firmware. In the factory configuration, "894129" is preset as the password for both user accounts "Administrator" and "Instrument".

To perform a firmware update

1. Copy the setup file to any storage medium accessible from the analyzer. This may be the internal hard disk, an external storage medium (USB memory stick, CD-ROM with external drive) or a network connection (LAN, GPIB bus).
2. Double-click the setup file and follow the instructions of the setup wizard.

4.2 Restoring the Operation System

The operating system can be restored from a bootable USB recovery device, prepared using the *Recovery Flash Drive Tool*. See the corresponding documentation for details.

4.3 Installing Options

4.3.1 General Instructions

A list of all available hardware and software options is provided on our Internet site at www.rohde-schwarz.com. You can also follow the link on the CD supplied with the instrument.

For retrofitting, note the mounting instructions enclosed with the options.

 WARNING**Shock hazard**

Before opening the housing, ensure that the instrument is switched off and disconnected from the power supply by removing the plug from the AC and DC power connector. Read all safety instructions at the beginning of this manual carefully!

**Risk of electrostatic discharge**

Protect the operational site against electrostatic discharge to avoid damage to electronic components of the modules. For details refer to the safety instructions at the beginning of this manual.

When installing hardware options, note the following

1. Switch off the instrument and disconnect the power supply cables.
2. Unscrew that part of the rear-panel where the option has to be inserted.
3. Plug in the option and fix it using the screws you previously removed.
4. Switch on the R&S ZNL.
5. Install additional software, if supplied, according to the instructions enclosed with the option.
6. If an adjustment is required for this option, the appropriate notes can be found in the installation instructions for the option.

4.3.2 Installing Option ZNL3/6-B1

For retrofitting, note the mounting instructions enclosed with the options.

1. Switch off the ZNL3/6
2. Install hardware option Spectrumanalysis
1323.1802.02 ZNL3-B1 for ZNL3
1323.2067.02 ZNL6-B1 for ZNL6
See Assembly Instruction 1323.2815.00 ZNL-B1
3. Switch on the ZNL3/6
4. Install software option Spectrumanalysis
select [SETUP] > System Config > Versions + Options > Install Option
Enter keycode for Spectrumanalysis
5. Switch off the ZNL3/6
6. Switch on the ZNL3/6
7. Check installation of software option Spectrumanalysis

select [SETUP] > System Config > Versions + Options
Check item "SPECTRUM ANALYSIS"

8. To adjust frequency response, run alignment tool "ZNL-Service"

4.4 Options Overview



5 Documents

This chapter contains the spare parts list and the documents for the complete R&S ZNL unit. For general information about spare parts for our products please refer to the sheet "Procedure in Case of Service and Ordering of Spare Parts" at the beginning of this manual.

5.1 Spare Parts

The stock numbers necessary for ordering replacement parts and modules can be found in the component lists further down.

CAUTION

Risk of shock hazard and instrument damage

When replacing a module please note the safety instructions and the repair instructions given in [Chapter 3, "Repair"](#), on page 61 and at the beginning of this service manual.

When shipping a module be careful to provide for sufficient mechanical and antistatical protection.

5.1.1 Available Power Cables

Rohde & Schwarz provides power cables with different properties, to be used in different countries.

Table 5-1: List of power cables available

Stock No.	Earthed-contact connector	Preferably used in
DS 0006.7013.00	BS1363: 1967' 10 A 250 V complying with IEC 83: 1975 standard B2	Great Britain
DS 0006.7020.00	Type 12 , 10 A 250 V complying with SEV-regulation 1011.1059, standard sheet S 24 507	Switzerland
DS 0006.7036.00	Type 498/13 10 A 250 V complying with US-regulation UL 498, or with IEC 83	USA/Canada
DS 0041.4752.00	GB2099 , GB1002 10 A 250 V approvals CCC	China
DS 0041.6232.00	JIS C 8303 7A 125V AC approvals PSE (JET)	Japan
DS 0006.7107.00	Type SAA3 10 A, 250 V complying with AS C112-1964 Ap.	Australia

Stock No.	Earthed-contact connector	Preferably used in
DS 0025.2365.00	DIN 49 441, 10 A, 250 V, straight approvals VDE, ÖVE, CEBEC, KEMA, S, D, N, FI, LCIE, IMQ, UCIEE	Europe (except Switzerland)
DS 0086.4400.00	DIN 49 441, 10 A, 250 V, angular approvals VDE, ÖVE, CEBEC, KEMA, S, D, N, FI, LCIE, IMQ, UCIEE	

Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG +EXPLANATION OF VARIANTS *VAR03=ZNL3 - 1323.0012.03 +VAR03=ZNL3 - 1323.0012.03 *VAR04=ZNL4 - 1323.0012.04 +VAR04=ZNL4 - 1323.0012.04 *VAR06=ZNL6 - 1323.0012.06 +VAR06=ZNL6 - 1323.0012.06 *VAR53=ZNLE3 - 1323.0012.53 +VAR53=ZNLE3 - 1323.0012.53 *VAR54=ZNLE4 - 1323.0012.54 +VAR54=ZNLE4 - 1323.0012.54 *VAR56=ZNLE6 - 1323.0012.56 +VAR56=ZNLE6 - 1323.0012.56					
10	0	S		PH BEMERKUNG NOTE Ersatzteilliste für 1323.0012.01 Spare Part List for 1323.0012.01		0999.9610.00		B	O
50	1	S		MM BW2010 GERAETEFUSS 12MM KOMPL. BW2010 FOOT 12MM COMPL.		1174.2227.00		B	O
70	0	S		ZN TUBUS LENS TUBE	Z	1323.1231.00		M	
80	0	S		MM STOSSECKE LINKS ZNL FNL BUMPER LINKS ZNL FNL		1323.1419.00		B	O
90	0	S		MM STOSSECKE RECHTS ZNL FNL BUMPER RIGHT ZNL FNL		1323.1402.00		B	O
100	0	S		MM FUSS LINKS ZNL FNL STAND LEFT ZNL FNL		1323.1390.00		B	O
110	0	S		MM FUSS RECHTS ZNL FNL STAND RIGHT ZNL FNL		1323.1383.00		B	O
120	1	S		MM BW2010 3E ABDECKUNG TRAGEGRIFF BW2010 3E COVER HANDLE	Z	1174.6397.00		B	T
130	0	S		MM BW2010 3E TRAGEGRIFF T350 BW2010 3E HANDLE T350	Z	1174.6300.00		B	O
160	1	S		VS SCHRAUBE M4 X 18 ISR PA SCREW M4 X 18 ISR PA		1096.4944.00		B	O
505	0	S	AMD1	EE NWA_BOARD NWA_BOARD wird ersetzt durch Pos:507 1323.2967.02	Z	1323.0070.02		M	B
507	1	S	AMD1	ED NWA_BOARD NWA_BOARD	Z	1323.2967.02		M	
510	1	S	APS1	ZM NETZTEIL KPL POWER UNIT COMPL	Z	1323.1590.00		M	
520	1	S	AREFB	EE REF BOARD REF BOARD	Z	1323.0029.02		M	P
540	1	S	W200	DW HF-KABEL W200 RF CABLE W200	Z	1323.1577.00		M	
545	1	S	W300	DW HF-KABEL W300 RF CABLE W300	Z	1323.1583.00		M	
550	1	S	AMB	ED MB ZNL FPL MB ZNL FPL	Z	1323.0041.02		M	B



ROHDE & SCHWARZ

Benennung/Designation

**ERSATZTEILSTUECKLISTE ZNL/ZNLE
SPARE PARTS ZNL/ZNLE**

Sprach./Lang
de en

Ä.I. / C.I.
11.00

Blatt/Sheet
1 of 3

Dokument Nr. / Document No.

1323.2809.01 ST

ZNL

Datum/
Date

2020-07-21

Abt. /
Dept.

1EC4

Name /
Name

KK

Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
560	0	S	AFAN1	ZM FRONTEINHEIT ZNL FRONT UNIT ZNL	Z	1323.1031.03		M	
570	0	S		MT LUEFTER 119X119X25 BEARBEITET FAN 119X119X25 MACHINED	Z	1303.9014.00		M	
580	1	S		EV GUMMI-MONTAGESTOPFEN RUBBER PIN		1316.0010.00		B	O
590	0	S		KB BLINDPLATTE AKKUS BEDRUCKT BLIND PANEL BATTERY PRINTED	Z	1323.2073.00		M	
600	0	S		KB BLINDPLATTE DC IN BEDRUCKT BLIND PANEL DC IN PRINTED	Z	1323.2109.00		M	
610	0	S		KB BLINDPLATTE GPIB BEDRUCKT BLIND PANEL GPIB PRINTED	Z	1323.2115.00		M	
620	0	S		KB BLINDPLATTE FRONTEND BEDRUCKT BLIND PANEL FRONTEND PRINTED	Z	1323.2096.00		M	
700	0	S	W500	DY KABEL W500 CABLE W500	Z	1323.1983.00		M	
710	0	S		ZM CHIPCARD SERVICE KIT CHIPCARD SERVICE KIT	Z	1201.5610.04		M	
990	0	S		OS ZNL SCHILDERSATZ ZNL FRONT LABELS		1303.9595.00		B	
1000	0	S		OS ZNLE SCHILDERSATZ ZNLE FRONT LABELS		1303.9608.00		B	
2410	0	S	ADISP	KB FRONTHAUBE BEDRUCKT FRONT PANEL PRINTED #used in #Pos 560: 1323.1031.03	Z	1323.2150.00		M	
2430	1	S		ND TOUCH 10.1 INCH CAPACITIVE USB TOUCHSCREEN 10.1 INCH CAPACITIVE #used in #Pos 560: 1323.1031.03		5810.1121.00		B	A
2440	0	S		MM DISPLAYHALTERUNG 10.1 DISPLAY BRACKET 10.1 #used in #Pos 560: 1323.1031.03		1323.1277.00		B	O
2470	1	S	AFP	ED FRONT BOARD FRONT BOARD #used in #Pos560: 1323.1031.03 #additionally required: Pos 2550 1323.1560.00 METAL SHAFT	Z	1323.0235.02		M	
2490	1	S		SF SILIKONMATTENSATZ ZNL SILICONE MAT SET #used in #Pos 560: 1323.1031.03		1323.1354.00		B	O
2500	1	S	W610	DF FLEX STRIP 20P R=1.0 L=345 FLEX STRIP 20P R=1.0 L=345 #used in #Pos 560: 1323.1031.03		3588.7574.00		B	O
2510	1	S	W620	DR DISPLAYKABEL DISPLAYCABLE #used in #Pos 560: 1323.1031.03		1323.1431.00		B	O
2520	1	S	W630	DL TOUCH KABEL MICRO-USB RTS / WFLX TOUCH CABLE MICRO-USB RTS / WFLX #used in #Pos 560: 1323.1031.03		5810.2034.00		B	O
 ROHDE&SCHWARZ				Benennung/Designation ERSATZTEILSTUECKLISTE ZNL/ZNLE SPARE PARTS ZNL/ZNLE			Sprach./Lang de en	Ä.I. / C.I 11.00	Blatt/Sheet 2 of 3
ZNL				Datum/ Date	2020-07-21	Abt. / Dept.	1EC4	Name / Name	KK
						Dokument Nr. / Document No. 1323.2809.01 ST			

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Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
10	0	S		ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDVARIANTE +VAR02=BASIC MODEL PH BEMERKUNG NOTE Ersatzteilstückliste für 1323.1802.01 und 1323.2067.01 und 1303.8099.01 Spare Part List for 1323.1802.01 and 1323.2067.01		0999.9610.00		B	O
20	0	S		ED SPA_FRONTEND SPA_FRONTEND is replaced by Pos.25: 1304.0504.02	Z	1304.0040.02		M	B
25	1	S		ED SPA_FRONTEND 7G SPA_FRONTEND 7G for Option ZNL3-B1 and ZNL4-B1 and ZNL6-B1	Z	1304.0504.02		M	
30	0	S		DW HF-KABEL W700 RF CABLE W700	Z	1323.2409.00		M	
40	0	S		DV HF KABEL REF ZU FRONTEND RF CABLE REF TO FRONTED	Z	1323.1360.00		M	
80	1	S		NJ EPP-300-24 NETZTEIL 300W 24V DC EPP-300-24 POWER SUPPLY 300W 24V DC		3625.6565.00		B	O
150	1	S		MZ ISOLIERFOLIE 24V NETZTEIL INSULATING FOIL 24V SUPPLY		1323.2415.00		M	
160	1	S		SS SCHMELZS. 5A T IEC60127-2/V FUSE 5A T IEC60127-2/V		0099.6735.00		B	O
170	0	S		DX KABEL W410 DC OUTPUT CABLE W410 DC OUTPUT	Z	1323.2373.00		M	
180	0	S		DX KABEL W400 AC INPUT CABLE W400 AC INPUT	Z	1323.2367.00		M	
190	0	S		DX KABEL W405 AC INPUT PE CABLE W405 AC INPUT PE	Z	1323.2615.00		M	



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Printed documents are not subject to revision

Pos.-Nr. <i>ItemNo</i>	Menge <i>Quantity</i>	ME <i>Unit</i>	El.Kennz <i>Ref.Des.</i>	Benennung / Bezeichnung <i>Designation</i>	Z	Sachnummer <i>Stock No.</i>	Ersatzteil <i>Subst.part</i>	BA	VH
10	0	S		ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLÄRUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDVARIANTE +VAR02=BASIC MODEL PH BEMERKUNG NOTE Ersatzteilliste für 1323.1883.01 Spar Part List for 1323.1883.01		0999.9610.00		B	O
20	1	S		ED AUX BOARD AUX BOARD	Z	1323.0212.02		M	
 ROHDE&SCHWARZ			Benennung/ <i>Designation</i> ERSATZTEILSTÜCKLISTE FPL-B5 SPARE PARTS FPL1-B5			Sprach./Lang de en	Ä.I. / C.I 02.00	Blatt/Sheet 1 of 1	
			Datum/ <i>Date</i>	2017-01-16	Abt. / <i>Dept.</i>	1ENK	Name / <i>Name</i>	KK	Dokument Nr. / Document No. 1323.2738.01 ST

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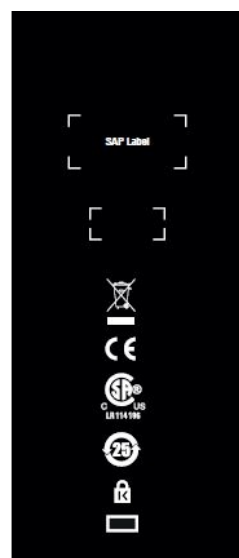


Pos.-Nr. <i>ItemNo</i>	Menge <i>Quantity</i>	ME <i>Unit</i>	El.Kennz <i>Ref.Des.</i>	Benennung / Bezeichnung <i>Designation</i>	Z	Sachnummer <i>Stock No.</i>	Ersatzteil <i>Subst.part</i>	BA	VH
10	0	S		ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDVARIANTE +VAR02=BASIC MODEL PH BEMERKUNG NOTE Ersatzteilliste für 1323.1890.01 Spare Part List for 1323.1890.01		0999.9610.00		B	O
20	1	S		ED GPIB BOARD GPIB BOARD	Z	1323.1160.02		M	
 ROHDE & SCHWARZ			Benennung/ <i>Designation</i> ERSATZTEILSTÜCKLISTE FPL-B10 SPARE PARTS FPL1-B10			Sprach./Lang de en	Ä.I. / C.I 02.00	Blatt/Sheet 1 of 1	
			Datum/ Date	2017-01-16	Abt. / Dept.	1ENK	Name / Name	KK	Dokument Nr. / Document No. 1323.2750.01 ST

Pos.-Nr. <i>ItemNo</i>	Menge <i>Quantity</i>	ME <i>Unit</i>	El.Kennz <i>Ref.Des.</i>	Benennung / Bezeichnung <i>Designation</i>	Z	Sachnummer <i>Stock No.</i>	Ersatzteil <i>Subst.part</i>	BA	VH
				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLÄRUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDVARIANTE +VAR02=BASIC MODEL *VAR03=ERSATZTEILLISTE FÜR ZNL-B19 +VAR03=SPAREPARTLIST FOR ZNL-B19 *VAR04=ERSATZTEILLISTE FÜR ZNLE-B19 +VAR04=SPAREPARTLIST FOR ZNLE-B19					
10	0	S		PH BEMERKUNG NOTE Ersatzteilliste für 1304.0427.01 und 1323.2938.01 und 1323.2944.01		0999.9610.00		B	O
20	0	S		ZM IPS2 KPL FPL MIT RÜCKWAND IPS2 COMPL FPL WITH BACK PANEL VAR 02	Z	1323.2296.02		M	
30	0	S		ZM IPS2 KPL ZNL MIT RÜCKWAND IPS2 COMPL ZNL WITH BACK PANEL VAR 03 04	Z	1323.2296.03		M	
 ROHDE & SCHWARZ			Benennung/Designation ERSATZTEILSTÜCKLISTE FPL/ZNL-B19 SPARE PARTS FPL/ZNL-B19			Sprach./Lang de en	Ä.I. / C.I 03.00	Blatt/Sheet 1 of 1	
			Datum/ Date	2017-08-17	Abt. / Dept.	1ENK	Name / Name	KK	Dokument Nr. / Document No. 1323.2909.01 ST

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Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG +EXPLANATION OF VARIANTS *VAR02=GRUNDVARIANTE +VAR02=BASIC MODEL					
5	0	S		PH BEMERKUNG NOTE Ersatzteilstückliste für 1323.1725.01 Spare part list for 1323.1725.01		0999.9610.00		B	O
30	1	S		GO MNT-BP89W LITHIUM IONEN AKKU PACK MNT-BP89W LITHIUM ION BATTERY PACK		1321.3772.00		B	O
40	1	S		NJ EPP-300-24 NETZTEIL 300W 24V DC EPP-300-24 POWER SUPPLY 300W 24V DC		3625.6565.00		B	O
80	0	S		MZ RUECKWAND AKKU KPL REAR PANEL AKKU COMPL	Z	1323.1302.00		M	
150	1	S		MZ ISOLIERFOLIE 24V NETZTEIL INSULATING FOIL 24V SUPPLY		1323.2415.00		M	
160	1	S		SS SCHMELZS. 5A T IEC60127-2/V FUSE 5A T IEC60127-2/V		0099.6735.00		B	O
170	0	S		DX KABEL W410 DC OUTPUT CABLE W410 DC OUTPUT	Z	1323.2373.00		M	
180	0	S		DX KABEL W400 AC INPUT CABLE W400 AC INPUT	Z	1323.2367.00		M	
190	0	S		DX KABEL W405 AC INPUT PE CABLE W405 AC INPUT PE	Z	1323.2615.00		M	



Maßstab Scale	Toleranz Tol.	Werkstoff Material						
ROHDE&SCHWARZ	Benennung / Designation ZNL VECT. NETW. ANALYZER ZNL VECT. NETW. ANALYZER					Sprache / Lang. de en	Arz. / C.I. 03.00	Blatt / Sh. 1
						Zeichn.Nr. / Drawing No. 1323.0012.01 D		
	ZNL	Datum Date 2018-01-30	Abteilung Dept. 1ENK	Name Name KK				

NX

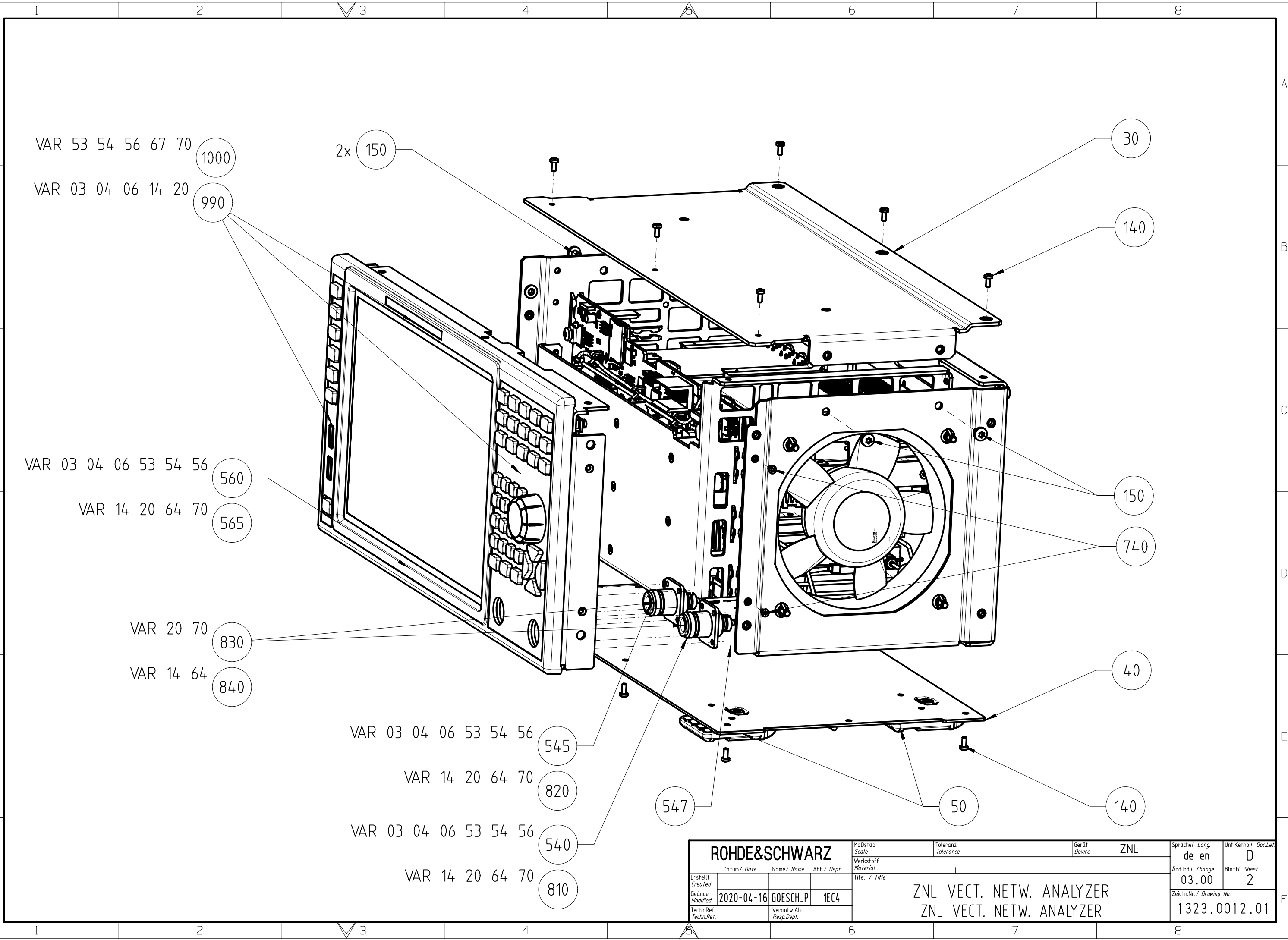
COMPANY RESTRICTED

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Maßeinheit
Measuring
Unit
[mm]

Projektions-
methode
Projection
Method

ISO
A3



ROHDE&SCHWARZ				Maßstab Scale	Toleranz Tolerance	Gerät Device	ZNL	Sprache / Lang.	Unt.Kennb./ Doc.Let.
Datum / Date				Werkstoff Material				de en	D
Erstellt Created				Titel / Title				Änd./ Change	Blatt/ Sheet
Geändert Modified								03.00	2
Techn.Ref.				Verantw./ Abt. Resp. Dept.				Zeichn.Nr. / Drawing No.	
								1323.0012.01	

ZNL VECT. NETW. ANALYZER
ZNL VECT. NETW. ANALYZER

COMPANY RESTRICTED

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Maßeinheit
Measuring Unit
[mm]

Projektions-
methode
Projection
Method

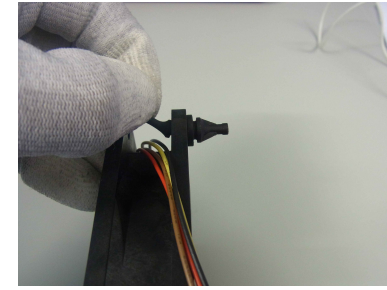
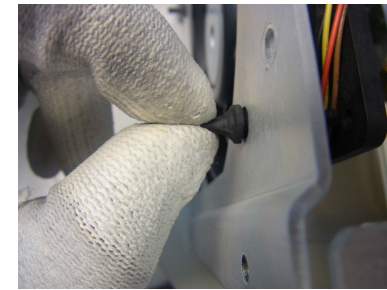
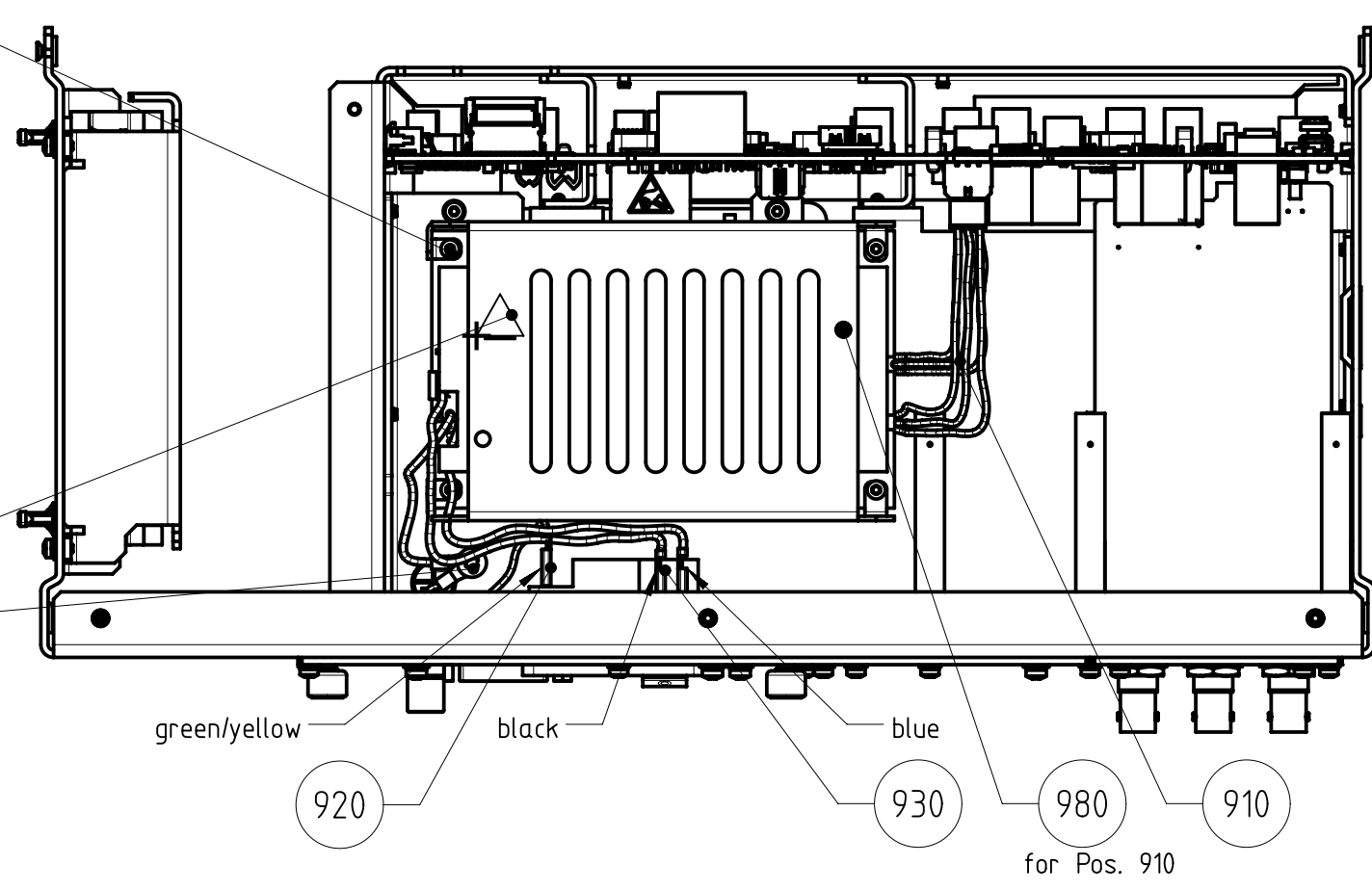
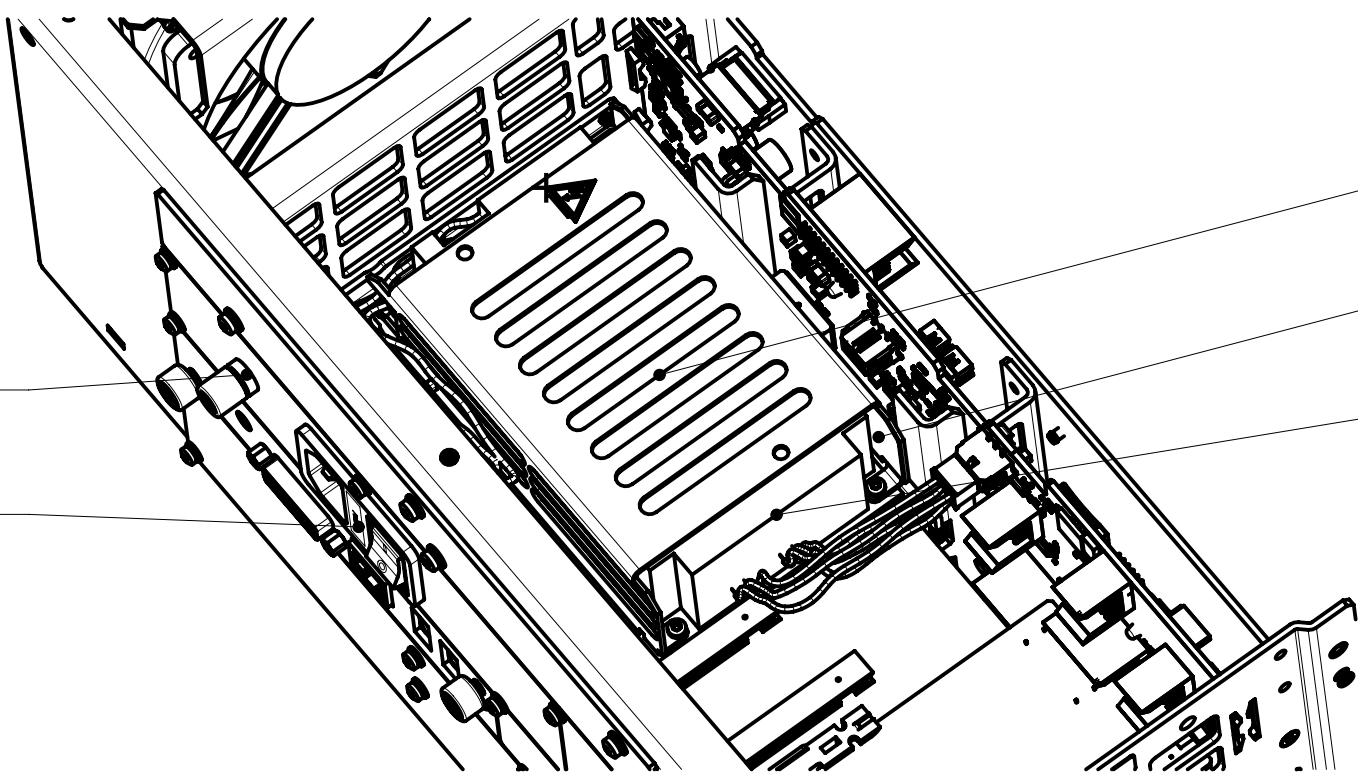
ISO
A2

VAR 14 20 64 70

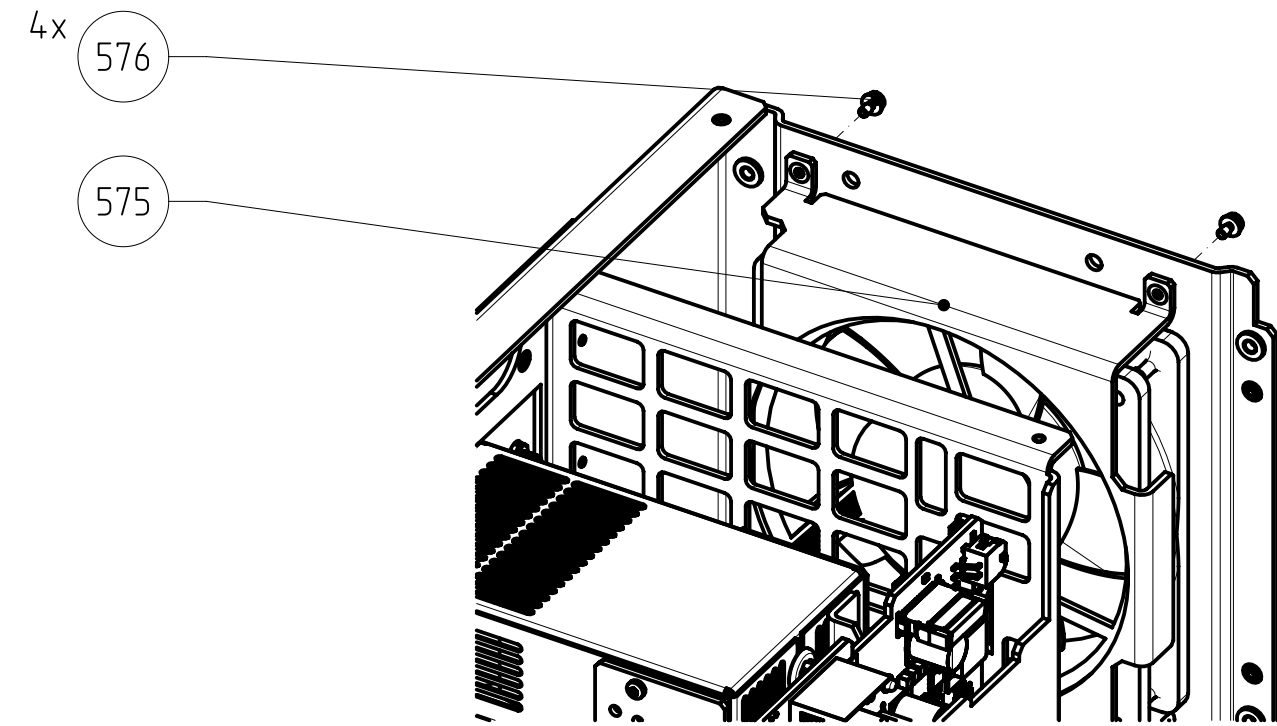
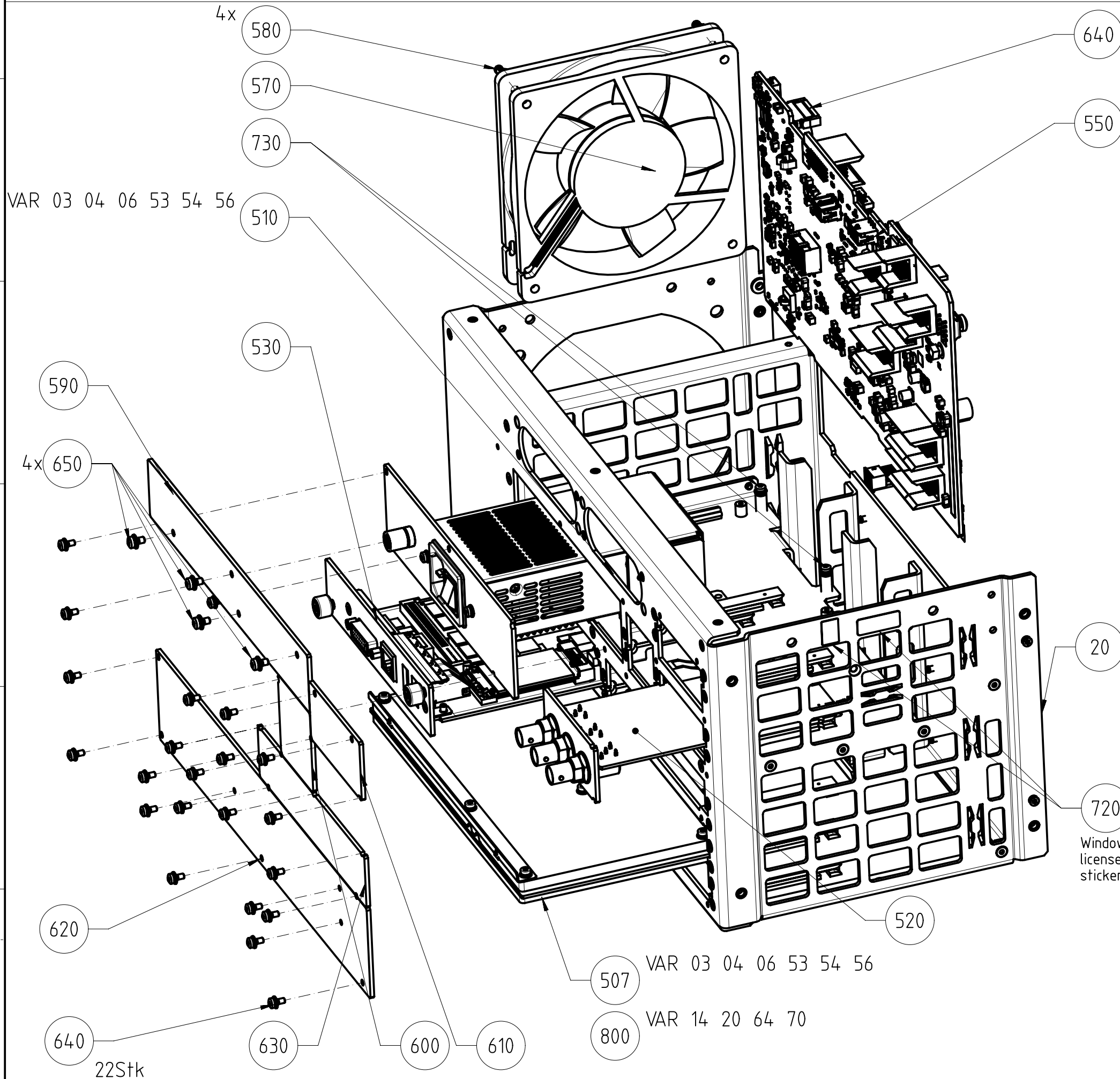
VAR 03 04 06 53 54 56

VAR 03 04 06 53 54 56

VAR 14 20 64 70



Make sure to install Pos.580 Rubber Pin
correct to Pos 570 (Fan) and to the housing.
Do not damage the rubber by pulling to far.
In case of damaging or changing the fan
use always new Rubber pins



Airblowing
direction

make sure there is
no pulling force
on the cable



Montage von Pos. 600, 610, 620, 630
mit Pos.640 nach Endprüfung zulässig
Assembly of Pos 600, 610, 620, 630
and Pos.640 after final ispection permitted

turn cable tie end
towards the inside
of the fan

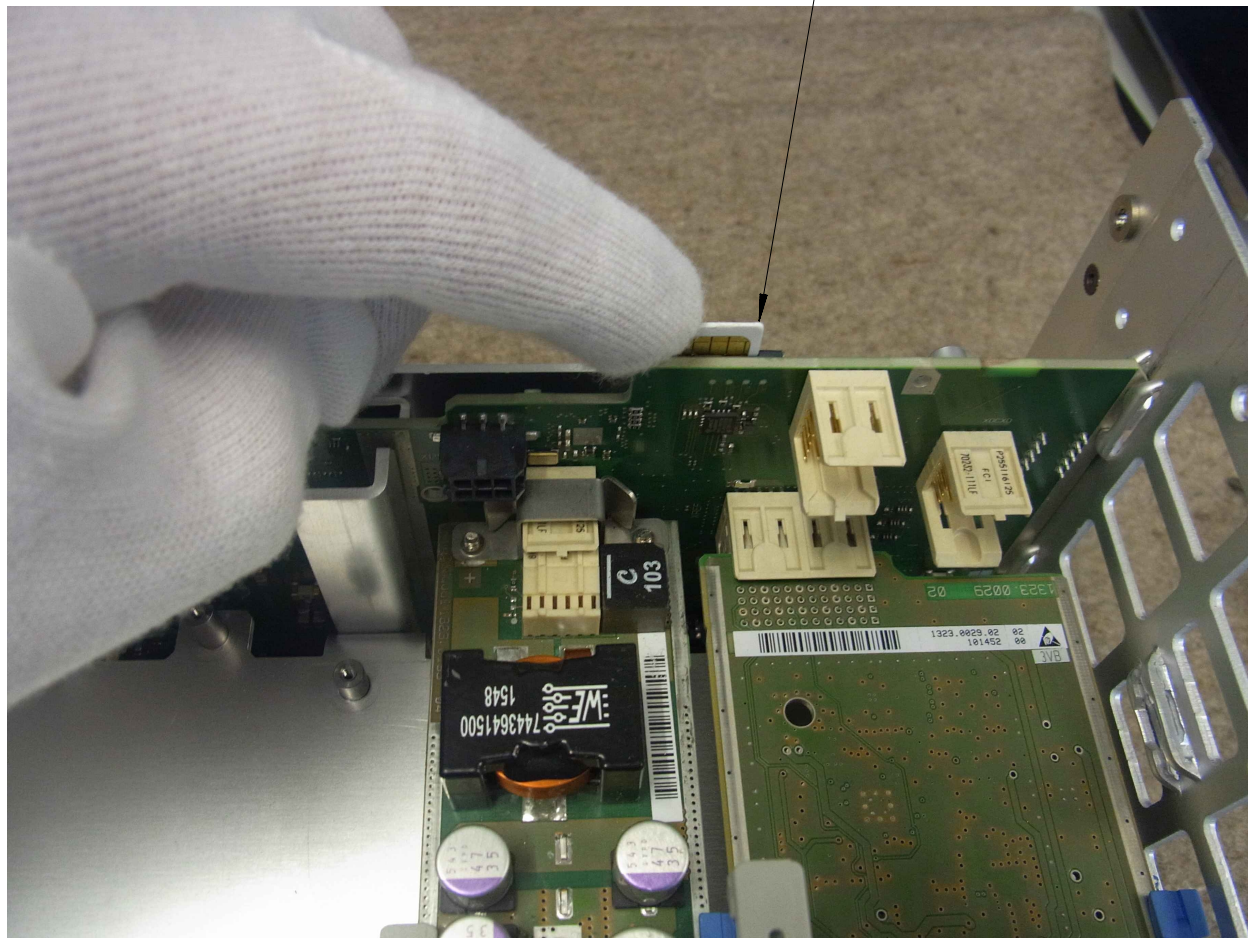
ROHDE&SCHWARZ				Maßstab Scale	Toleranz Tolerance	Gerät Device	ZNL	Sprache Lang.	Unit	Kennt. Doc.
	Datum / Date	Name / Name	Abt. / Dept.	Werkstoff Material				de en	D	
Erstellt Created				Titel / Title				Änd.Nr. / Change	Blatt / Sheet	
Geändert Modified	2020-04-17	GOESCH.P	1EC4	ZNL VECT. NETW. ANALYZER				12.00	3	
Techn.Ref. Tech.Ref.		Verantw.Abt. Responsible Dept.		ZNL VECT. NETW. ANALYZER				Zeich.Nr. / Drawing No.		
								1323.0012.01		

NX

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Maßinheit
Measuring
Unit
[mm]
Projektions-
methode
Projection
Method

ISO
A3



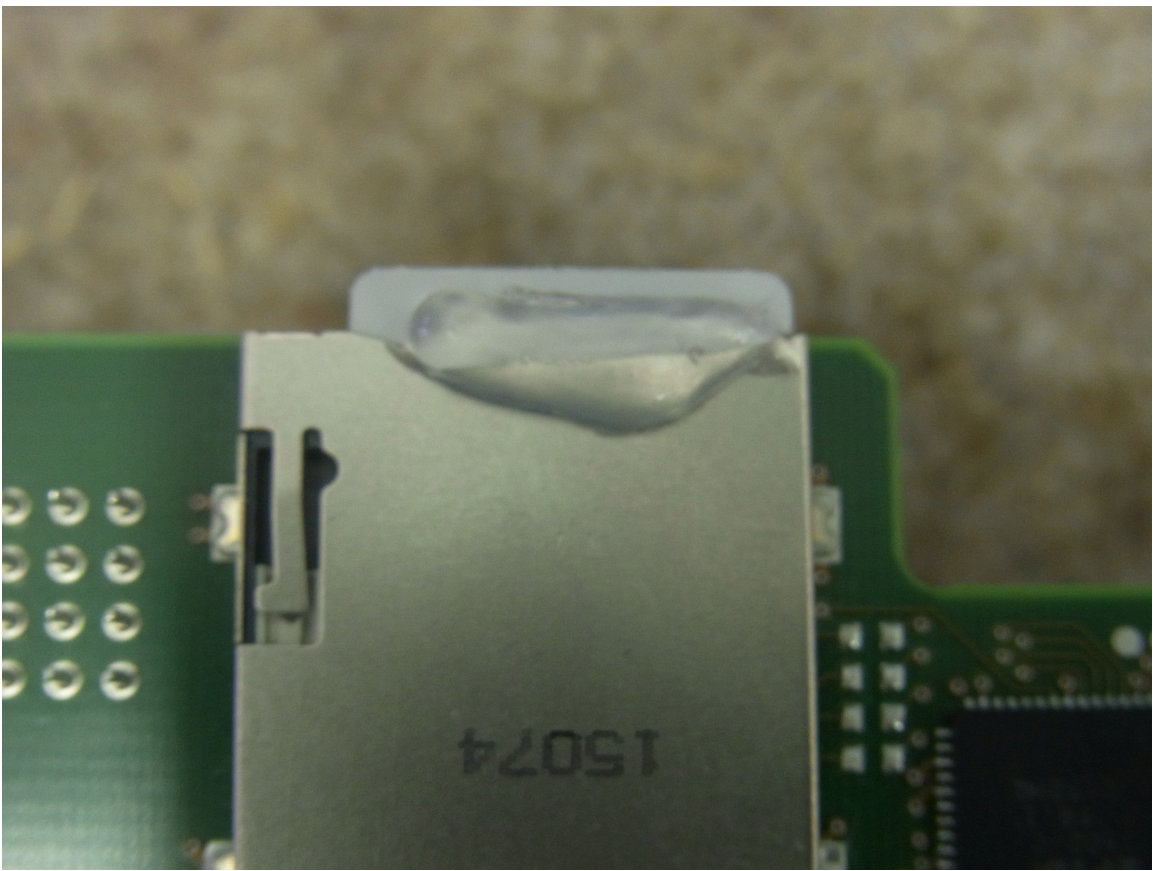
Step 1: install SIM-Card to reader

Use 0088.3152.00 Adhesive Silicon Dow Corning 3145 RTV

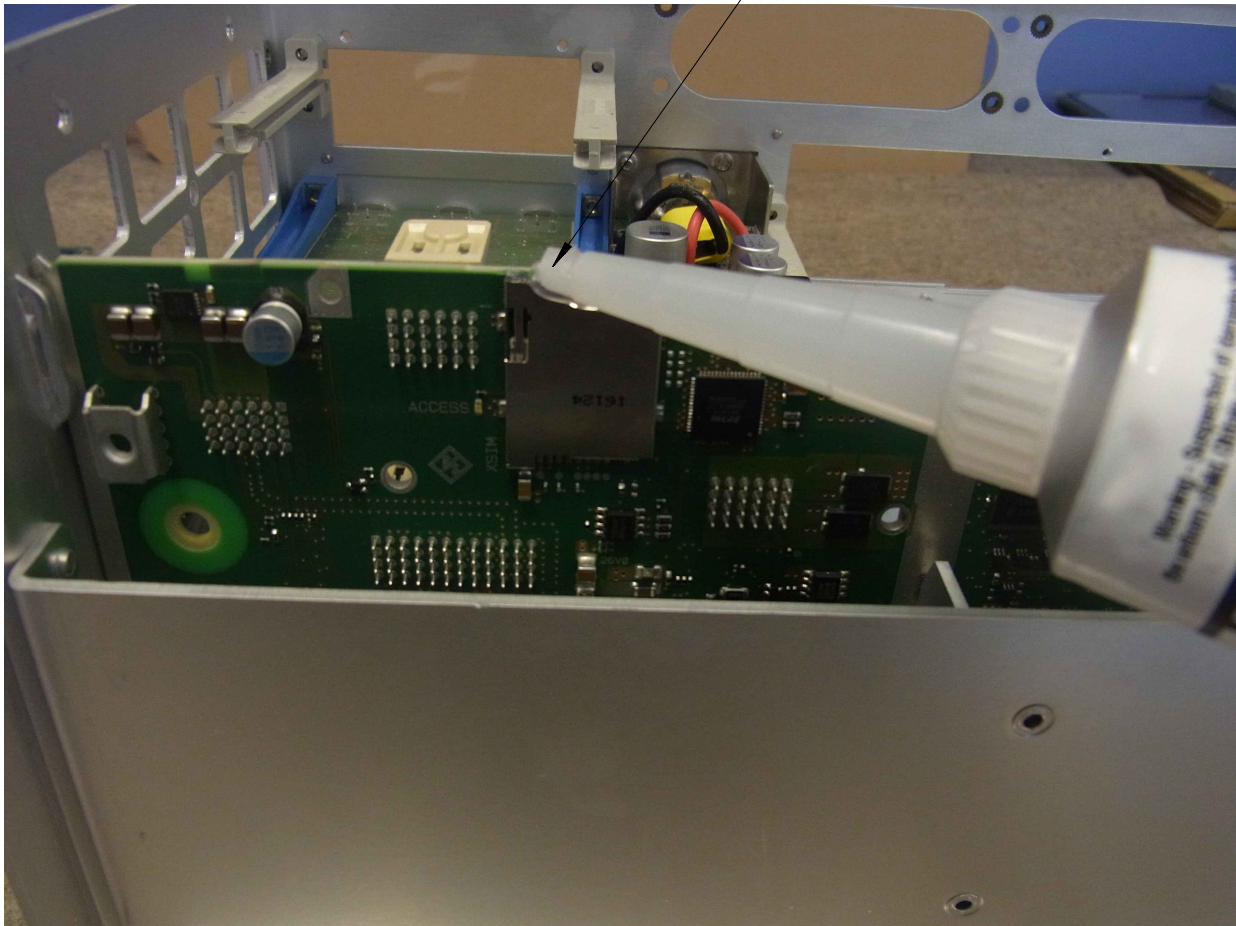


Attention:
watch out that there is no glue on the circuit board side!
No glue between SIM-Card and circuit board!
The contact of the SIM-Card must be free.

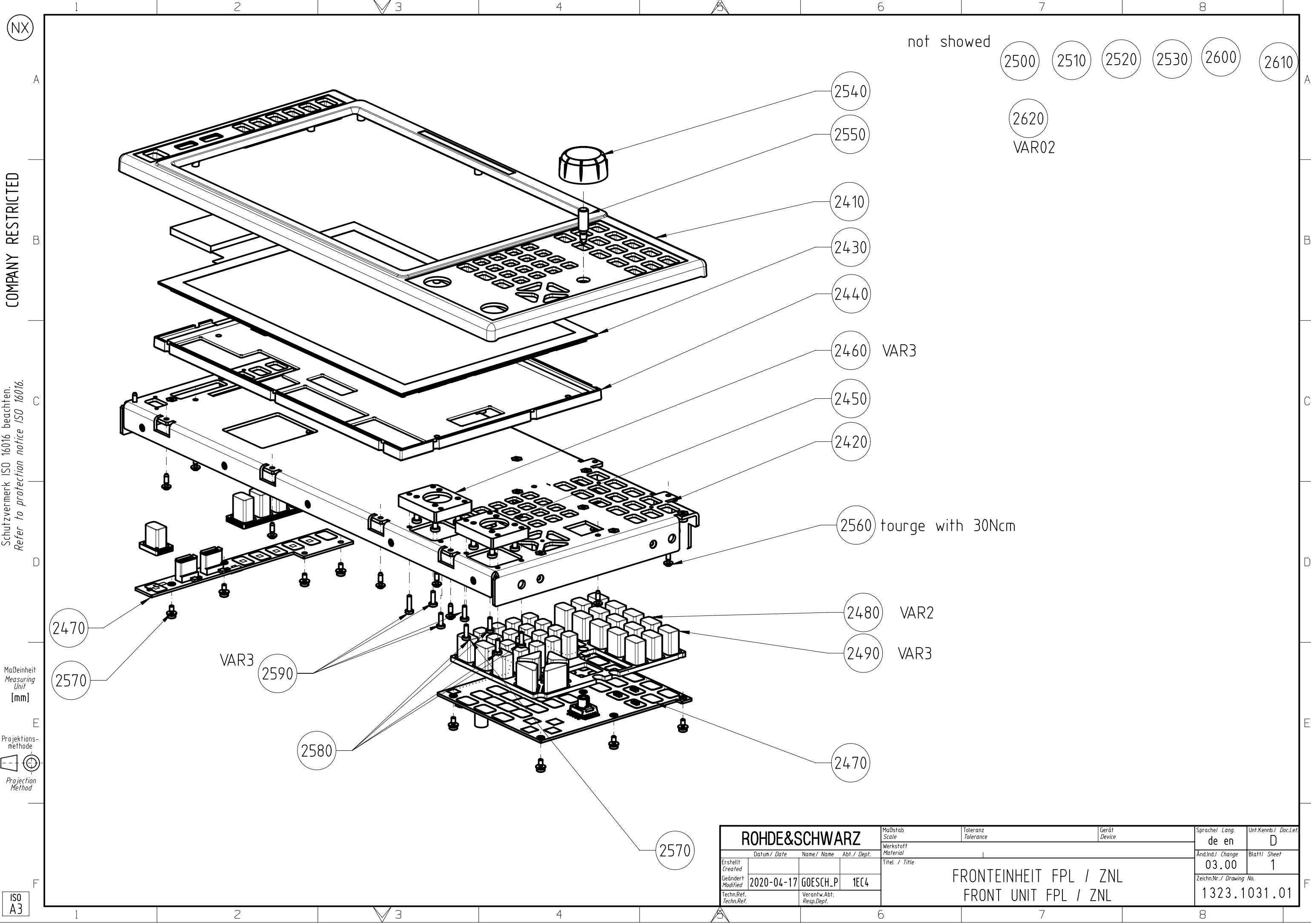
The glue must be on Card and housing of the reader



Step 2: glue SIM-Card with a small robe from the top side.



Maßstab Scale	Toleranz Tol.	Werkstoff Material			
Benennung / Designation			Sprache / Lang.	Ärl. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ			de en	01.00	4
ZNL			Zeichn.Nr. / Drawing No.		
Datum Date			Abteilung Dept.	Name Name	
2018-02-27			1ENK	KK	
			1323.0012.01		
			D		



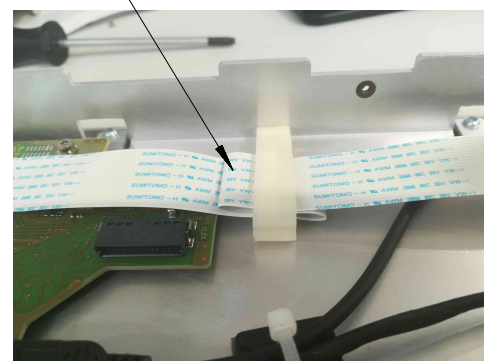
ROHDE&SCHWARZ				Maßstab Scale	Toleranz Tolerance	Gerät Device	Sprache / Lang. de en	Unt.Kennb./ Doc.Let. D
Datum / Date				Name / Name	Abt. / Dept.	Werkstoff Material	Änd./ Ind./ Change	Blatt/ Sheet
Erstellt Created				Titel / Title			03.00	1
Geändert Modified	2020-04-17	GOESCH_P	1EC4	FRONTEINHEIT FPL / ZNL FRONT UNIT FPL / ZNL			Zeichn.Nr. / Drawing No. 1323.1031.01	
Techn.Ref. Techn.Ref.		Verantw.Abt. Resp.Dept.						

(NX)

- 1 Step: Assemble Pos. 2450/Holder N-Connector on Pos 2420/Mounting Panel Front
- 2 Step: Assemble Pos 2430/Touchscreen 10.1 with Pos 2440/Displaybracket. Take sure Displaybracket fits into Pos. 2410/Frontpanel printed
- 3 Step: Assemble Pos. 2420/ Mounting Panel Front and screw with Pos 2560/Delta PT Screw (30Ncm) in order shown in the ballons

Pos. 2650

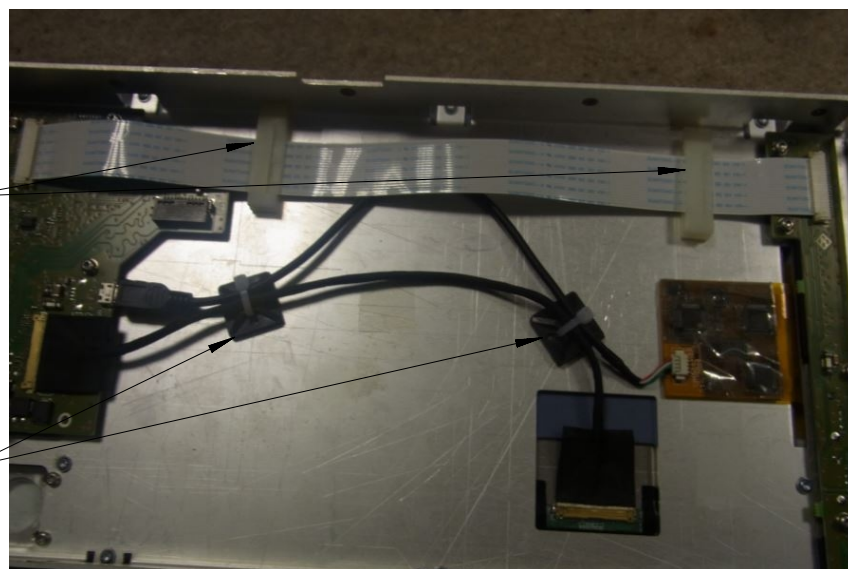
Pos.2500
folded cable



- 4.Step: Assemble Pos2480 or Pos 2490/Silicone Mat Set as ordered
- 5.Step: Assemble Pos2470/Front Board XNL with Pos 2580/M2.5x6
- 6.Step: place Pos.2600, Pos.2610, Pos.2640 and Pos.2650 as defined
- 7.Step: Connect cable W610 W620 W630 (Pos2500/2510/2520)
- 8.Step: stick Frontlabel Pos2620 or 2630 as ordered
- 9.Step: mount Pos.2550/Metal Shaft 6x13.5mm and Pos 2540 or Pos.2545 as ordered

Pos 2610

Pos 2600
Pos 2640



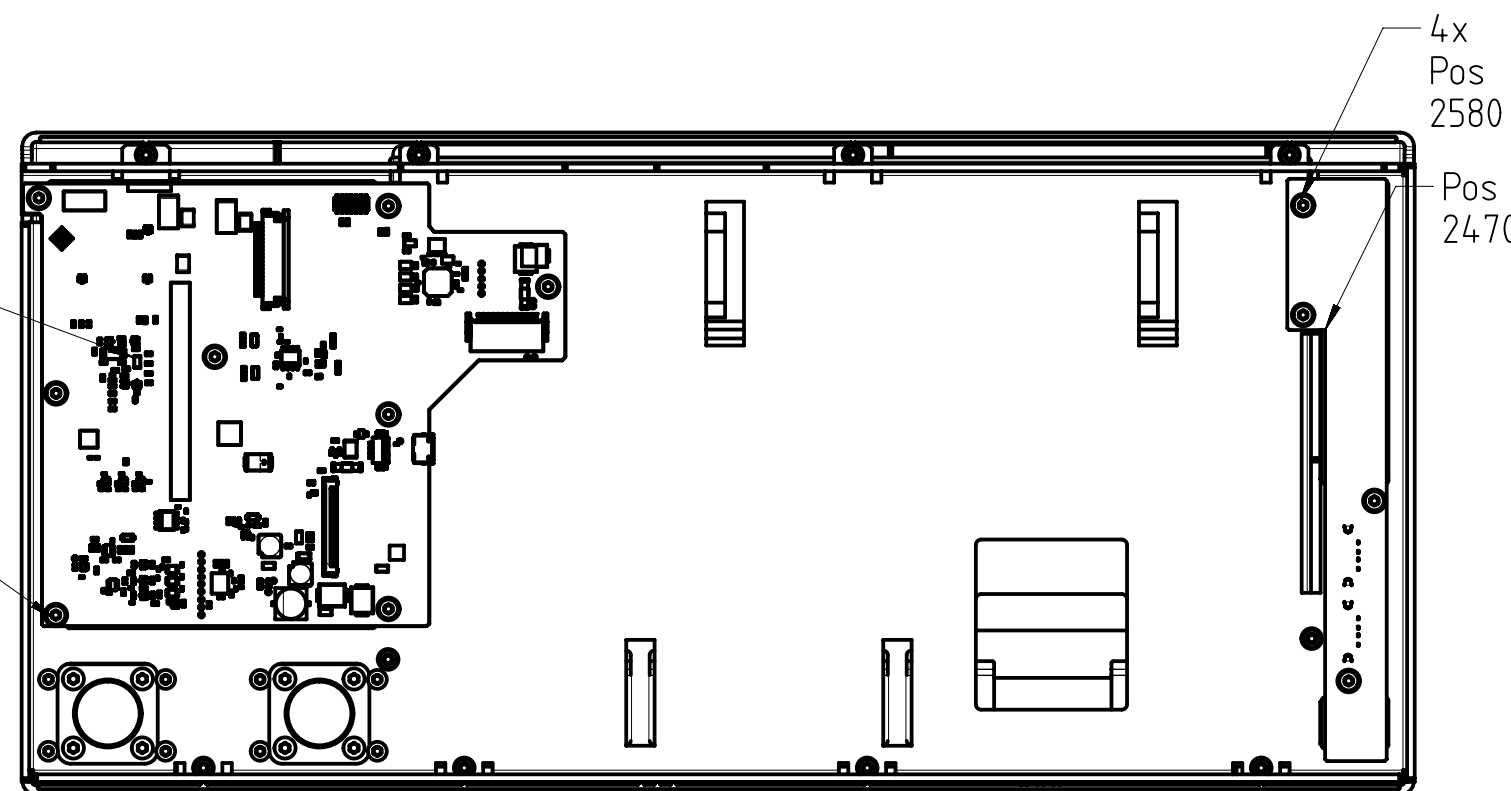
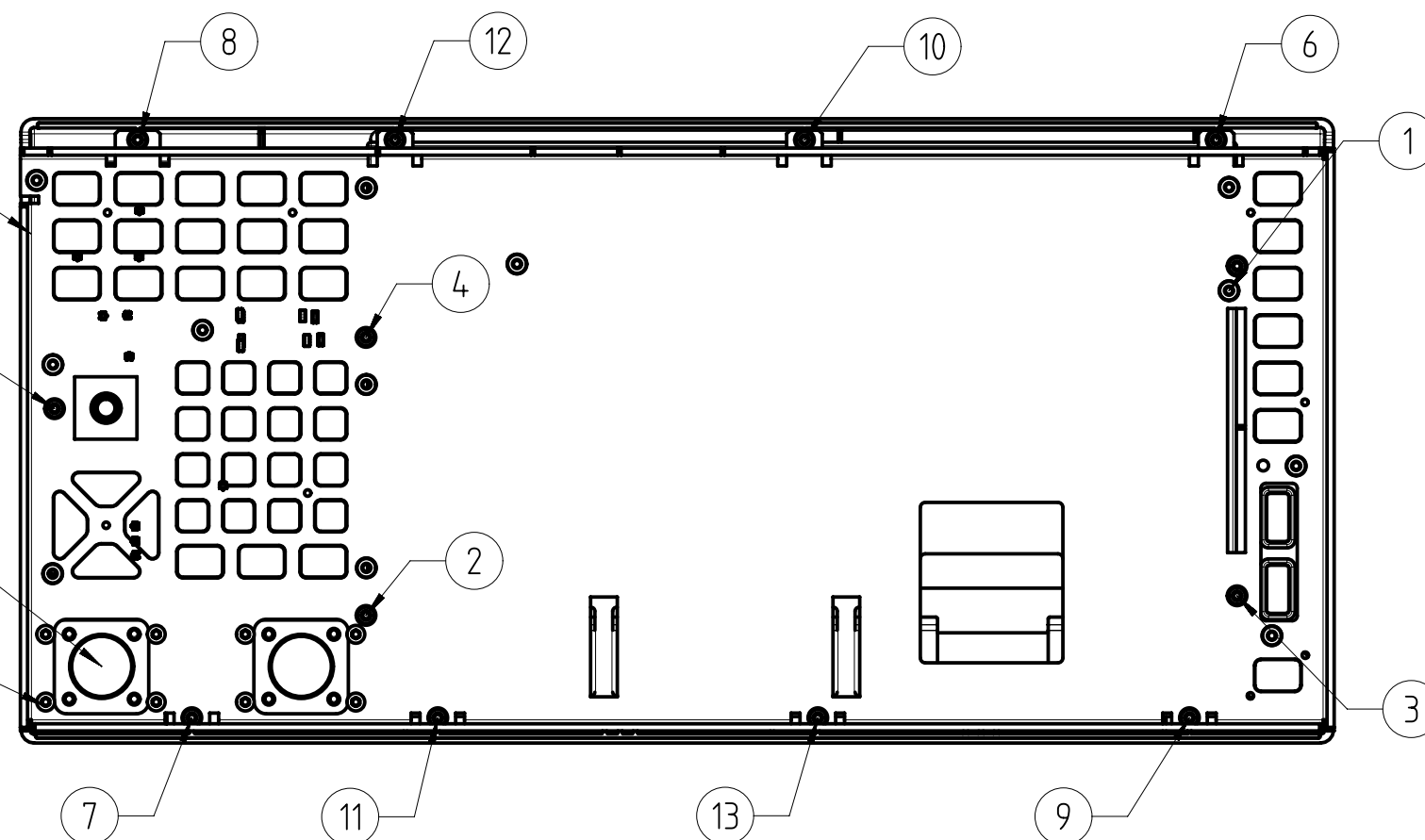
Pos.
2420

Pos.
2450

4x
Pos.
2580

Pos
2470

8x
Pos
2580



Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Maßinheit
Measuring
Unit
[mm]

Projektions-
methode
Projection
Method

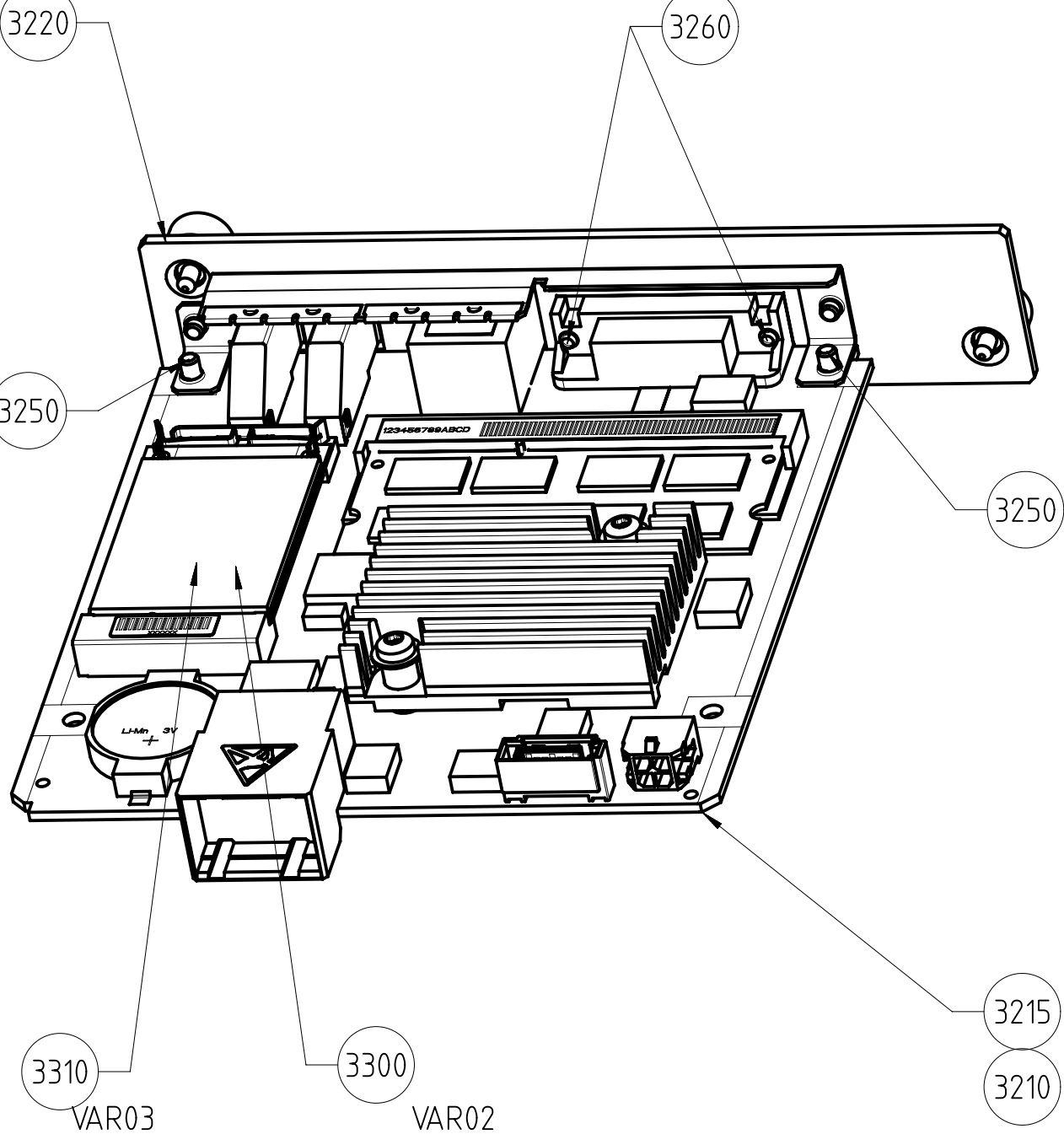
ISO
A3

Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Ael. / C.I.	Blatt / Sh.
Benennung / Designation	FRONTEINHEIT FPL / ZNL FRONT UNIT FPL / ZNL			de en	04.00	2
Datum Date	2019-09-02	Abteilung Dept.	1EC4	Name Name	KK	1323.1031.01 D

NX

1 2 3 4

mount from outside
save with loctite 222
(red) 0088.7370.00



Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Maßeinheit
Measuring
Unit
[mm]

Projektions-
methode
Projection
Method

ROHDE&SCHWARZ

Maßstab
Scale 1:1

Toleranz
Tolerance

Gerät
Device ZNL

Sprache/ Lang.
de en

Unt.Kennb./ Doc.Lef.
D

	Datum / Date	Name / Name	Abt. / Dept.
Erstellt Created	2016-05-25	KK	1ENK
Geändert Modified	2020-02-19	KLEY	1EC4

Werkstoff
Material

Titel / Title

IPS2 KPL MIT RÜCKWAND
IPS2 COMPL WITH BACKPANEL

Änd./ Change
07.00

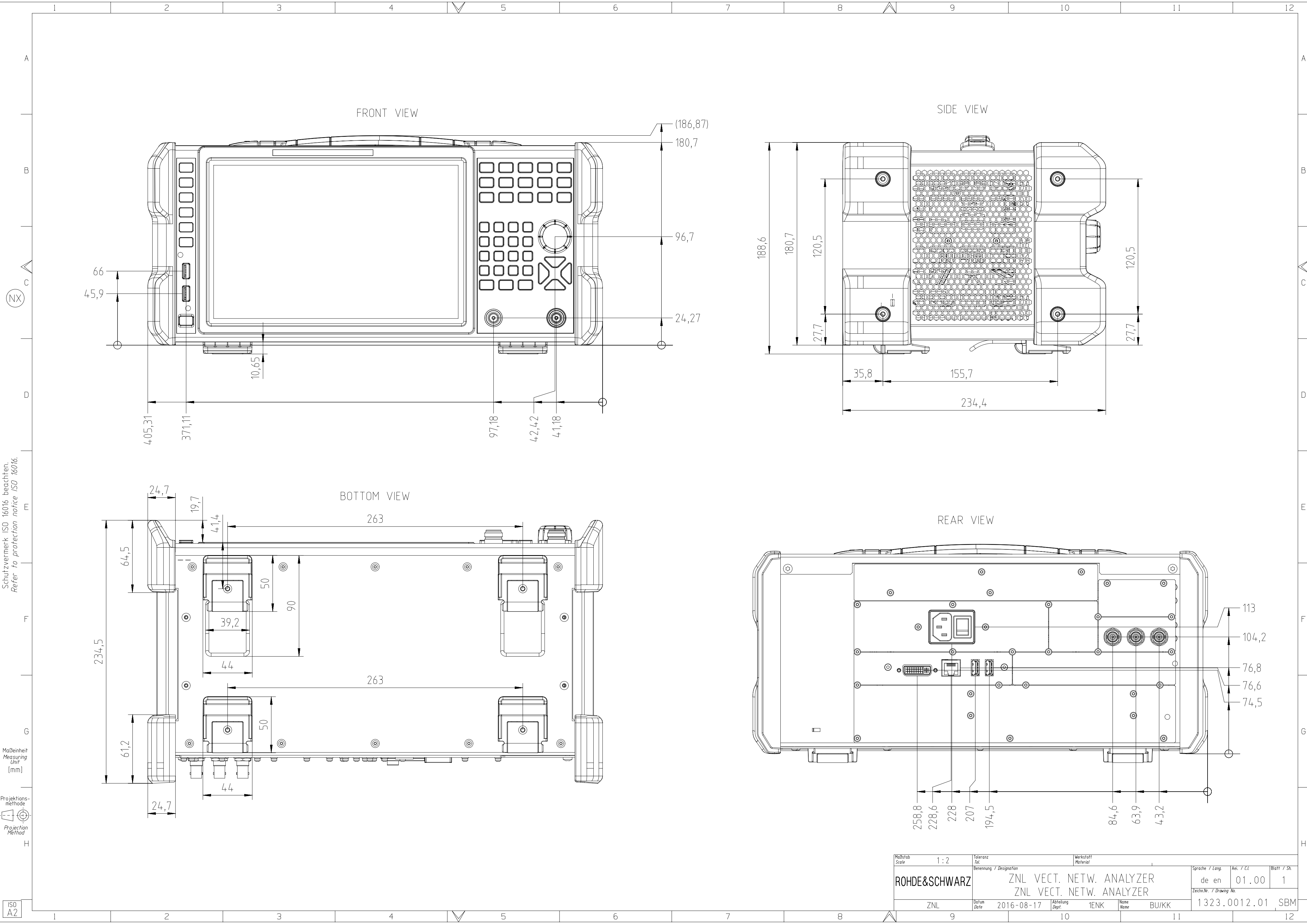
Blatt/ Sheet
1

Zeichn.Nr./ Drawing No.

1323.2296.01

ISO
A4

1 2 3 4



Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Maßeinheit
Measuring Unit
[mm]

Projektions-
methode
Projection
Method

ISO
A2

Maßstab Scale		1:2		Toleranz Tol.		Werkstoff Material											
ROHDE&SCHWARZ				Benennung / Designation		ZNL VECT. NETW. ANALYZER ZNL VECT. NETW. ANALYZER				Sprache / Lang.		Aes. / CL		Blatt / Sh.			
										de en		01.00		1			
				ZNL				Datum Date		2016-08-17		Abteilung Dept.		1ENK		Name Name	
9				10				11				12					

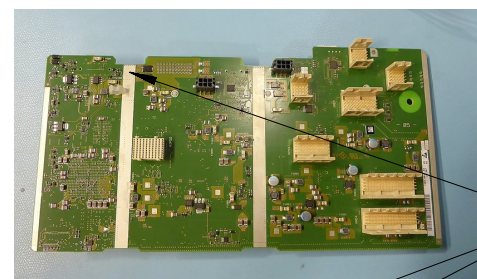
NX

For installation of ZNL-B1 see first drawing side 4 and service manual

1.0 Installation of SPA Frontend:

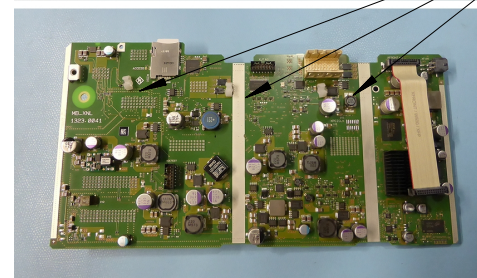
- 1.1. Remove the instrument casing acc. service manual chapter 3.2.1
- 1.2. Remove Motherboard acc. to description in the service manual chapter 3.2.4.7 and insert cable holders and cable
- 1.3. Install cable and cable holder as shown in the picture
- 1.4. Install Motherboard back to instrument case and connecting all cables
- 1.5 Insert SPA frontend (pos. 20) and connect the cables (pos. 30 & 40)

- 1.3 for install cable press in Cable Holder (Pos.50) into Motherboard

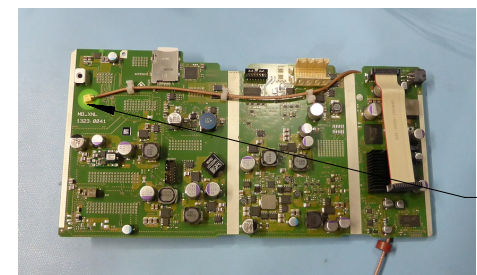


50

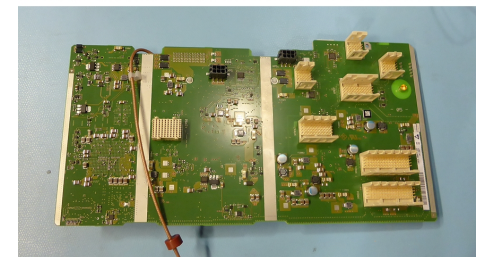
4x



- 1.3 linstall cable (Pos. 40) as shown



watch a proper installation



- 1.4/1.5 mount SPA-Frontboard and cables as shown



40

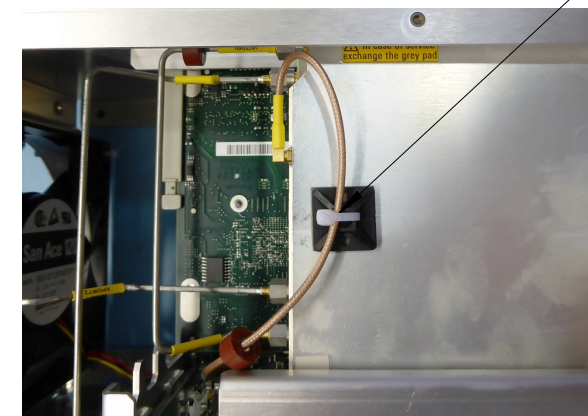
30



fix cable as shown

60

70



Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

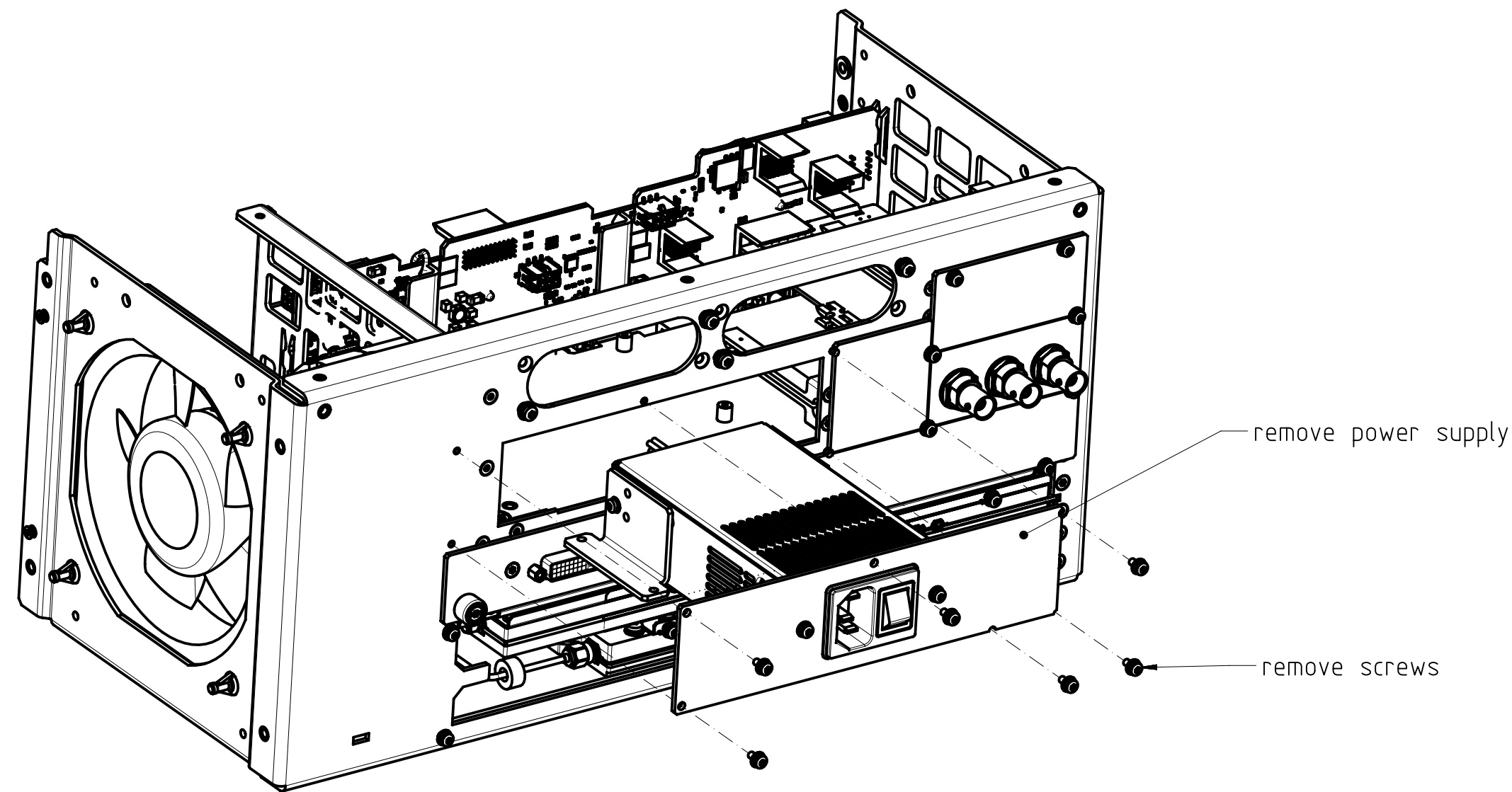
Maßinheit
Measuring
Unit
[mm]

Projektions-
methode
Projection
Method

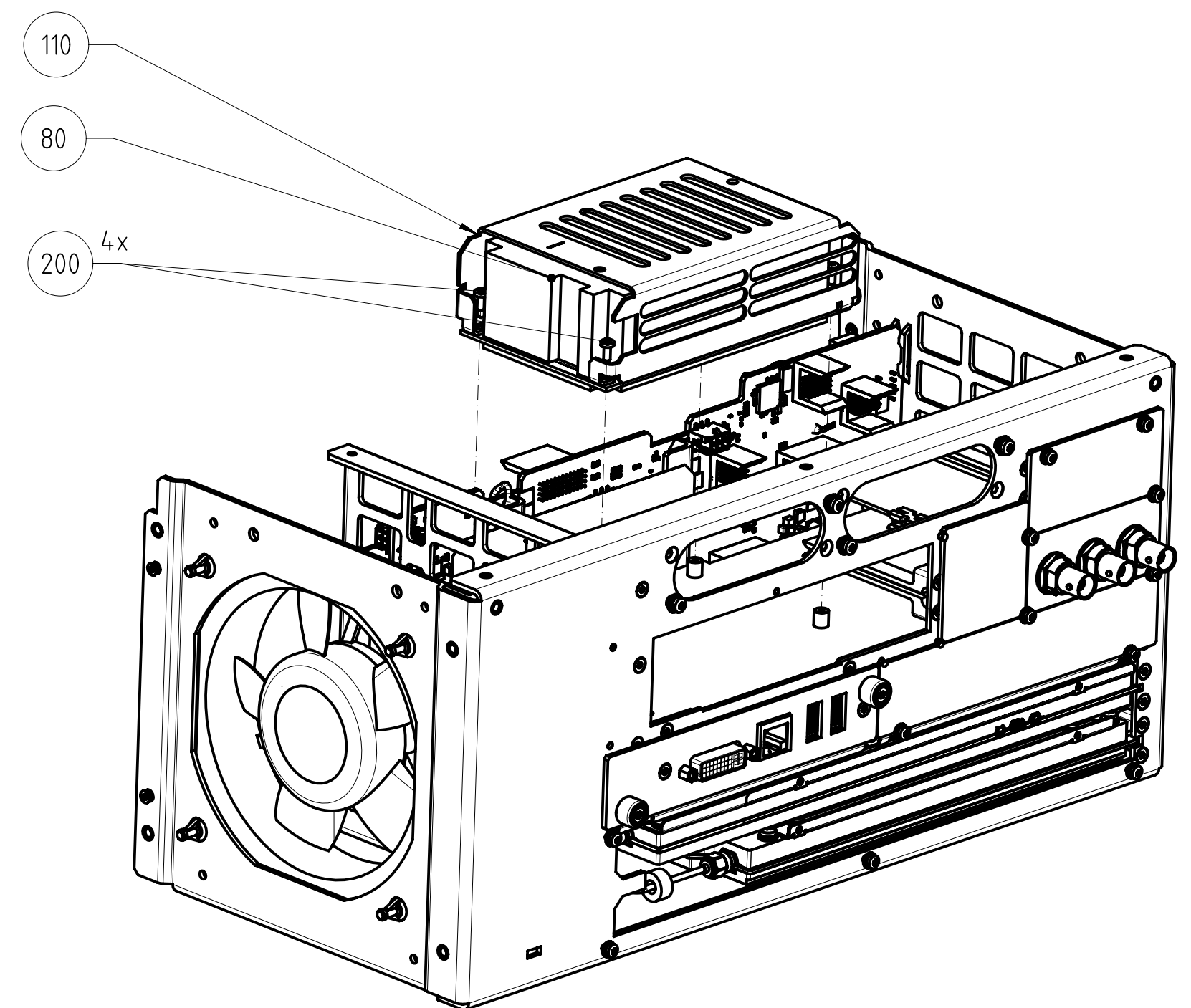
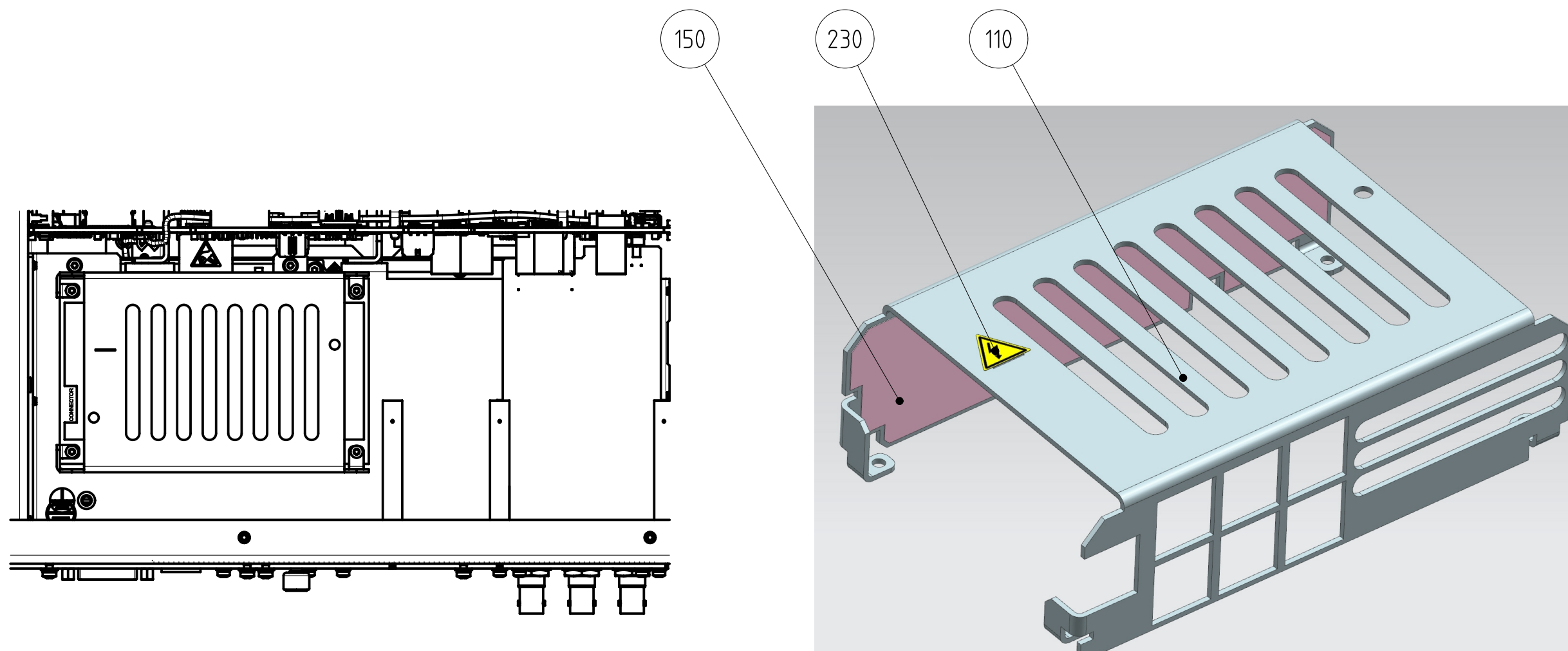
ISO
A3

Maßstab Scale	Toleranz Tol.	Werkstoff Material	Sprache / Lang.	Ael. / C.I.	Blatt / Sh.
ROHDE&SCHWARZ	Benennung / Designation	EINBAUANWEISUNG ZNL-B1 ASSEMBLY INSTRUCTION ZNL-B1	de en	05.00	1
ZNL	Datum Date	2019-05-09	Abteilung Dept.	1EC4	Name Name
				KK	Zeichn.Nr. / Drawing No.
					1323.2815.00

2.0 remove Power supply 12V
(if upgrade Option ZNL-B1)



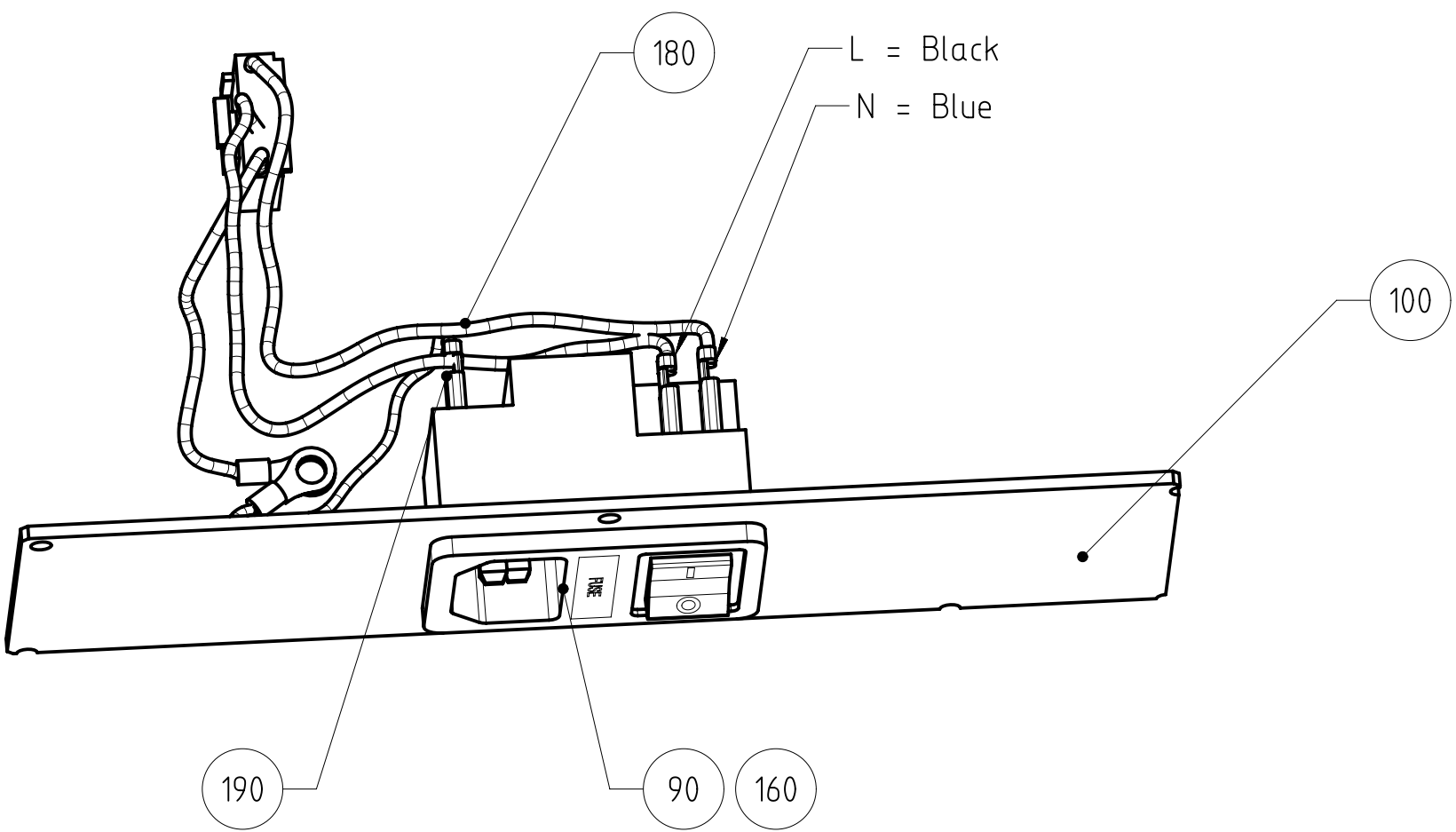
2.1. install 23 power supply with cover and insulating foil



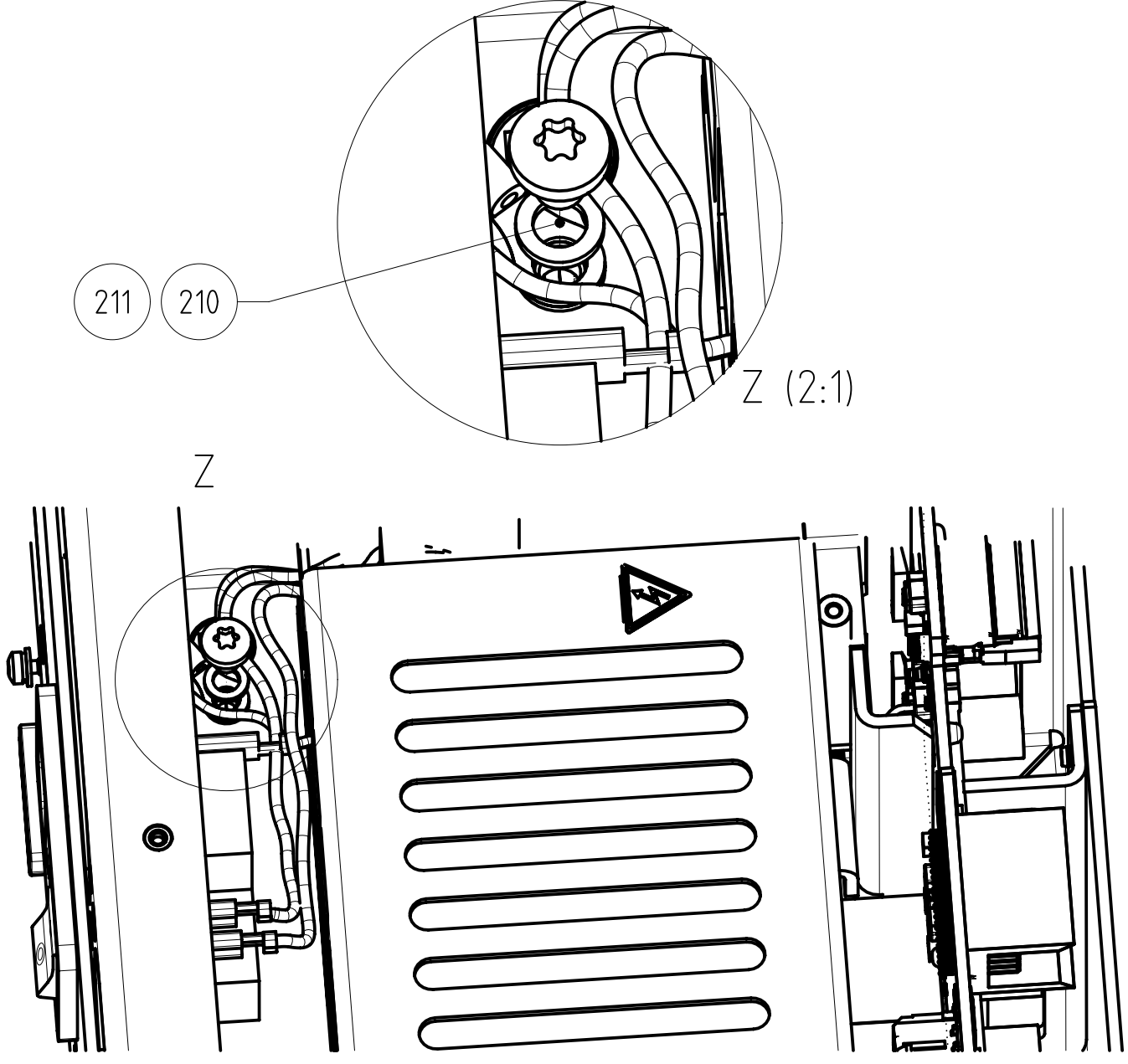
Maßstab Scale	1:2	Toleranz Tol.		Werkstoff Material		Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
ROHDE&SCHWARZ		BENENNUNG / Designation		EINBAUANWEISUNG ZNL-B1 ASSEMBLY INSTRUCTION ZNL-B1		de en	03.00	2
ZNL		Datum Date	2018-07-10	Abteilung Dept.	1EC4	Name Name	Wn	1323.2815.00 D

2.2. Insert the mains filter (pos.90) to the printed rear panel (pos.100) and connect the mains cables (pos.180 & 190) to the main filter (see page 3)

2.3. Insert the fuse (pos. 160) to the main filter



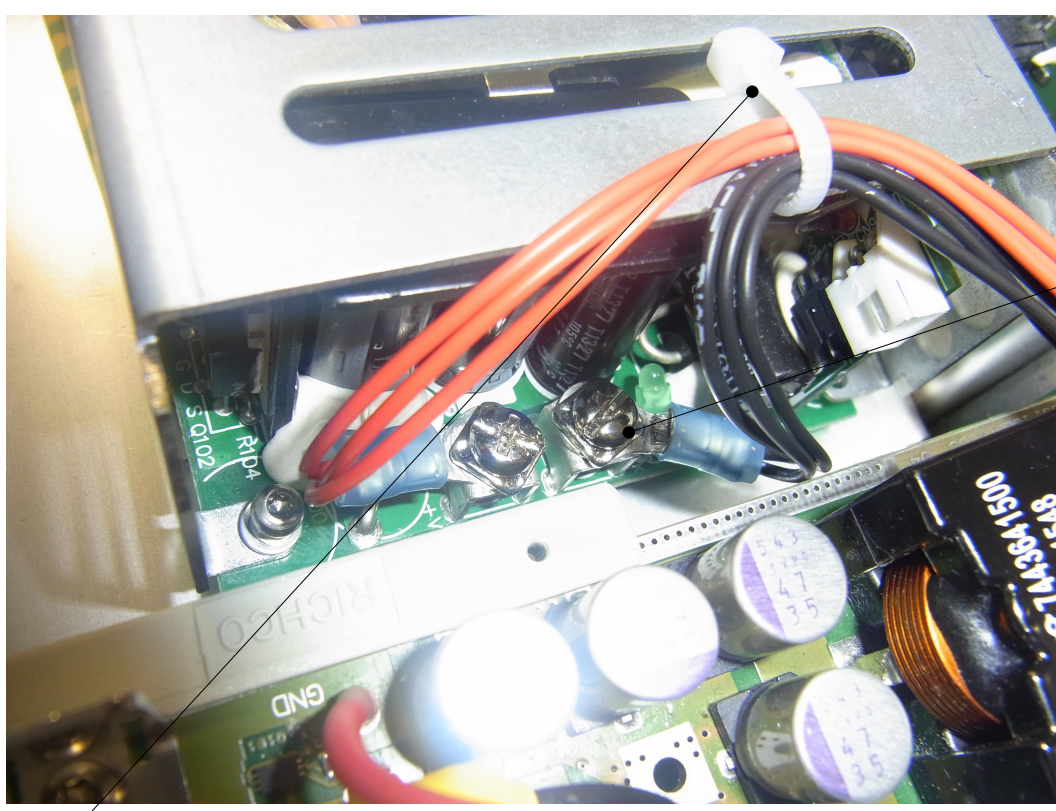
2.4. ground the grounding cable to instrument case



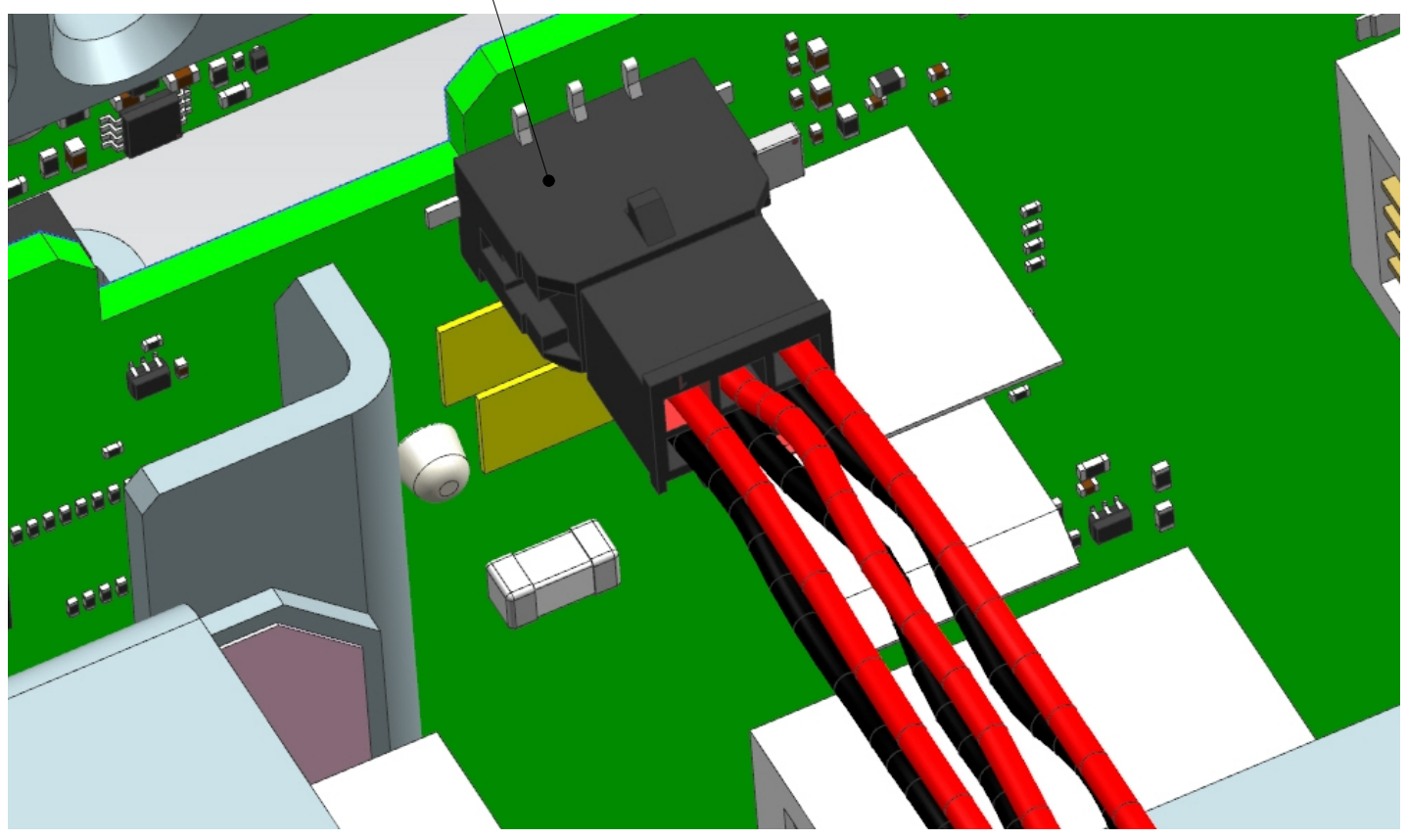
2.4. Connect the cable (Pos.180) to 24V power supply (pos.80)



2.5. Screw the power cable (pos. 170) to 24V power supply and connect it to the motherboard



connect to motherboard XPS2 170



170
fix cable as seen
red left
black right

through the hole 240

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Maßeinheit
Measuring Unit
[mm]

Projektions-
methode
Projection
Method

ISO
A2

Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material										
ROHDE&SCHWARZ	Benennung / Designation		EINBAUANWEISUNG ZNL-B1 ASSEMBLY INSTRUCTION ZNL-B1					Sprache / Lang.		Aes. / C.C.		Blatt / Sh.	
								de en		02.00		3	
			Zeichn.Nr. / Drawing No.		1323.2815.00								
ZNL	Datum Date	2019-05-09	Abteilung Dept.	1EC4	Name Name	KK							

(NX)

Installation Instruction of ZNL3/6-B1:

- 1.0 Installation of SPA Frontend: see drawing page 1
 - 1.1. Remove the instrument casing acc. service manual chapter 3.2.1
 - 1.2. Remove Motherboard acc. to description in the service manual chapter 3.2.4.7
 - 1.3. Install cable and cable holder as shown in the picture
 - 1.4. Install Motherboard back to instrument case and connecting all cables
 - 1.5 Insert SPA frontend (pos. 20) and connect the cables (pos. 30 & 40)
- 2.0 Remove the existing 12 V power supply: see drawing page 2 and 3:
 - 2.1. Install 24V power supply (pos.80) with cover and label (pos.110 & 230) incl. in option B1
 - 2.2. Insert the mains filter (pos.90) to the printed rear panel (pos.100) and connect the mains cables (pos.180 & 190) to the main filter (see page 3)
 - 2.3. Insert the fuse (pos. 160) to the main filter
 - 2.4. Connect the mains cables to 24V power supply (pos.80) and ground the grounding cable to instrument case (see page 3)
 - 2.5. Screw the power cable (pos. 170) to 24V power supply and connect it to the motherboard
- 3.0 Entering the spectrum analysis SW option keycode:
 - 3.1 Select [SETUP] - System Config - Versions + Options - Install Option
 - 3.2. Enter keycode for Spectrum analysis
 - 3.3. Switch off the ZNL3/6
 - 3.4. Switch on the ZNL3/6
 - 3.5. Check installation of SW option Spectrum analysis
 - Select [SETUP] - System Config - Versions + Options
 - Check item "SPECTRUM ANALYSIS"
- 4.0 Performing frequency response correction using "ZNL-Service-Tool".

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

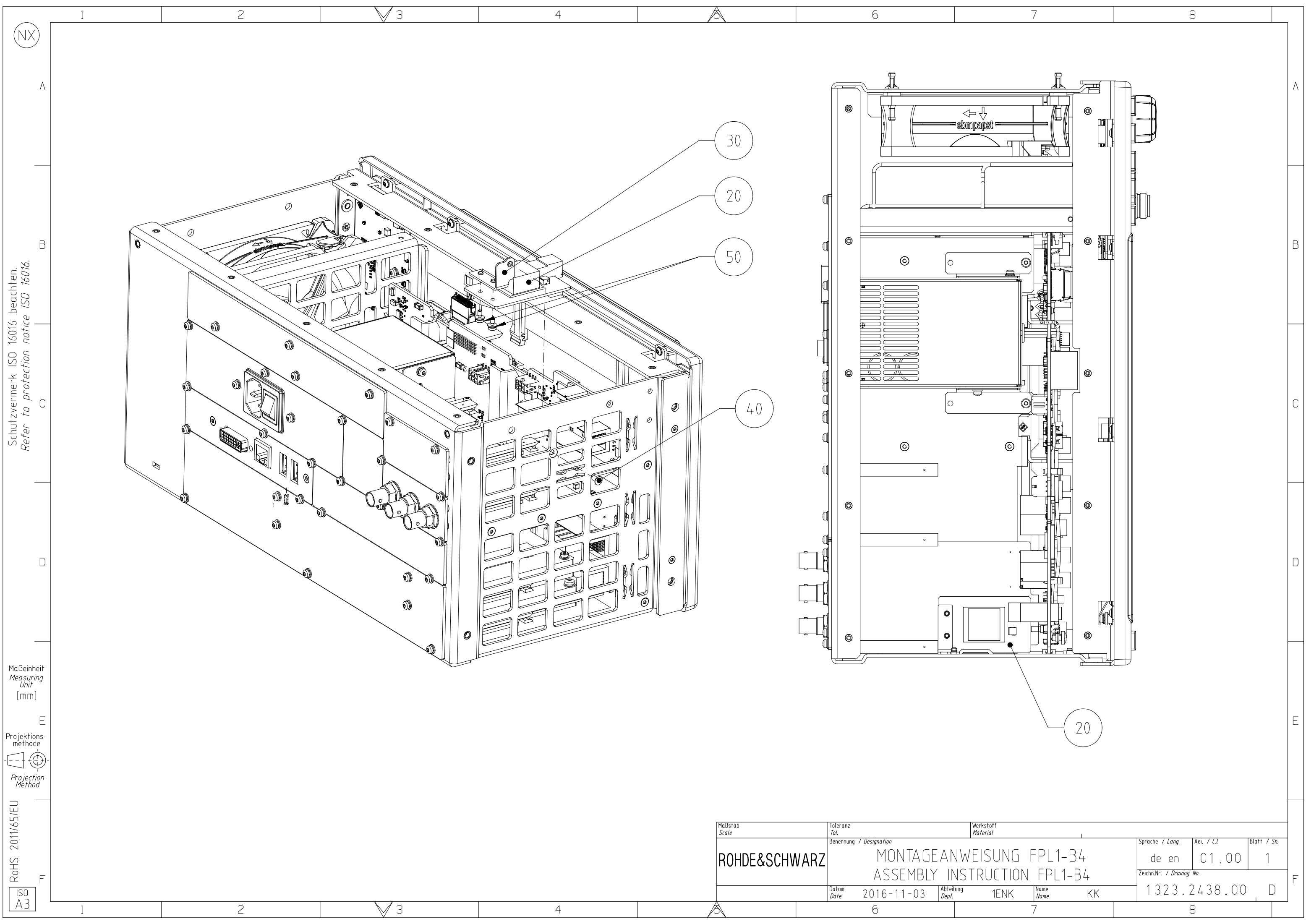
Maßeinheit
Measuring
Unit
[mm]

Projektions-
methode

Projection
Method

Maßstab Scale	Toleranz Tol.		Werkstoff Material					
ROHDE&SCHWARZ	Benennung / Designation				Sprache / Lang.		Änd.Ind. / C.I.	Blatt / Sh.
	EINBAUANWEISUNG ZNL-B1				de en		01.00	4
	ASSEMBLY INSTRUCTION ZNL-B1				Zeichn.Nr. / Drawing No.			
ZNL	Datum Date	2019-05-09	Abteilung Dept.	1EC4	Name Name	KK		1323.2815.00 D

ISO
A4



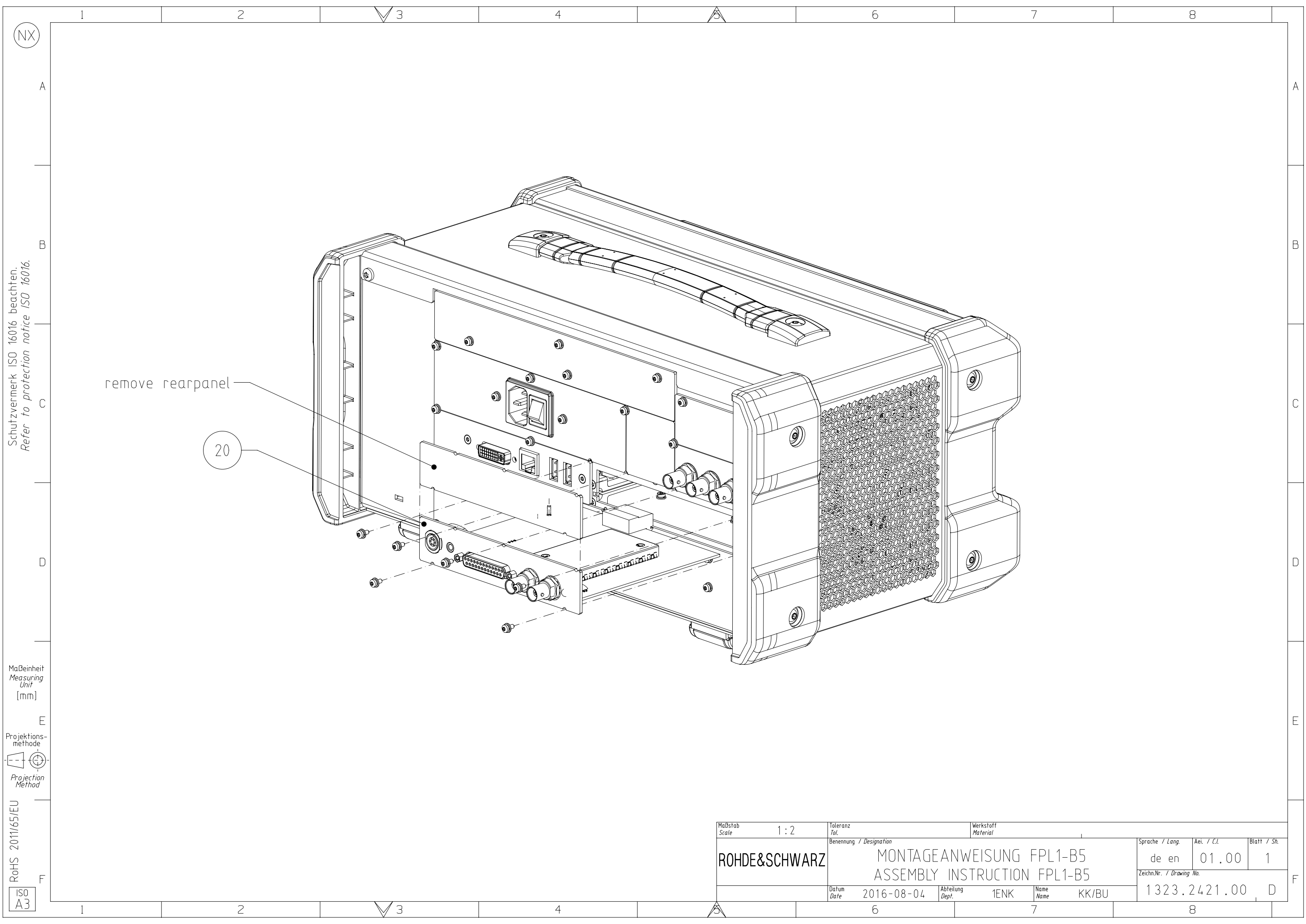
Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Maßeinheit
Measuring
Unit
[mm]

Projektions-
methode
Projection
Method

RoHS 2011/65/EU
ISO
A3

Maßstab Scale	Toleranz Tol.		Werkstoff Material						
ROHDE&SCHWARZ	Benennung / Designation					Sprache / Lang.		Aei. / C.I.	Blatt / Sh.
	MONTAGEANWEISUNG FPL1-B4 ASSEMBLY INSTRUCTION FPL1-B4					de en		01.00	1
						Zeichn.Nr. / Drawing No.			
	Datum Date	2016-11-03	Abteilung Dept.	1ENK	Name Name	KK	1323.2438.00 D		



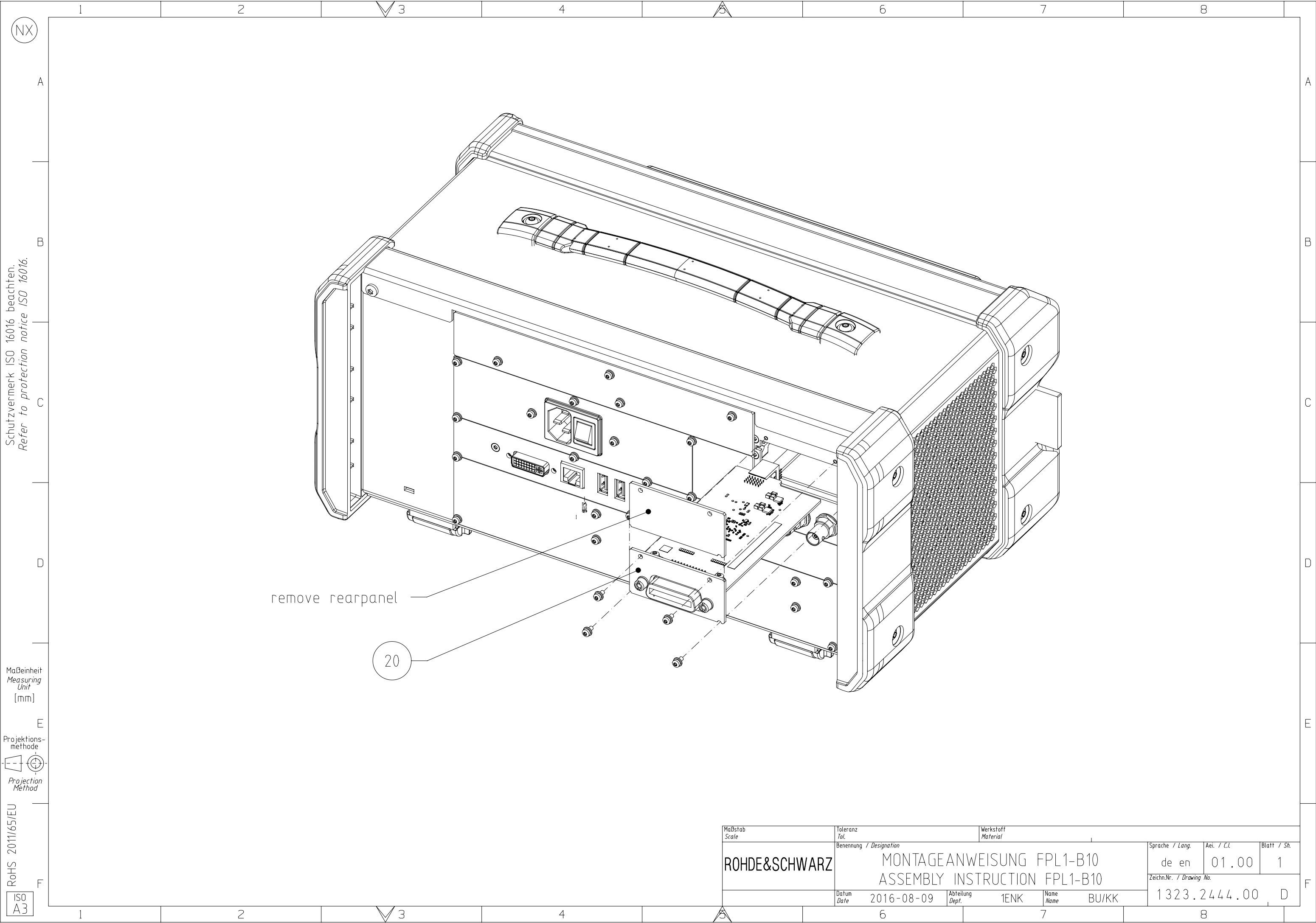
Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Maßeinheit
Measuring
Unit
[mm]

Projektions-
methode
Projection
Method

RoHS 2011/65/EU
ISO A3

Maßstab Scale	1 : 2	Toleranz Tol.	Werkstoff Material		
Benennung / Designation		MONTAGEANWEISUNG FPL1-B5 ASSEMBLY INSTRUCTION FPL1-B5			
Datum Date		2016-08-04	Abteilung Dept.	1ENK	Name Name KK/BU
Sprache / Lang.		de en	Aei. / C.I.	01.00	Blatt / Sh. 1
Zeichn.Nr. / Drawing No.		1323.2421.00		D	



Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Maßeinheit
Measuring
Unit
[mm]

Projektions-
methode

Projection
Method

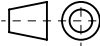
RoHS 2011/65/EU

ISO
A3

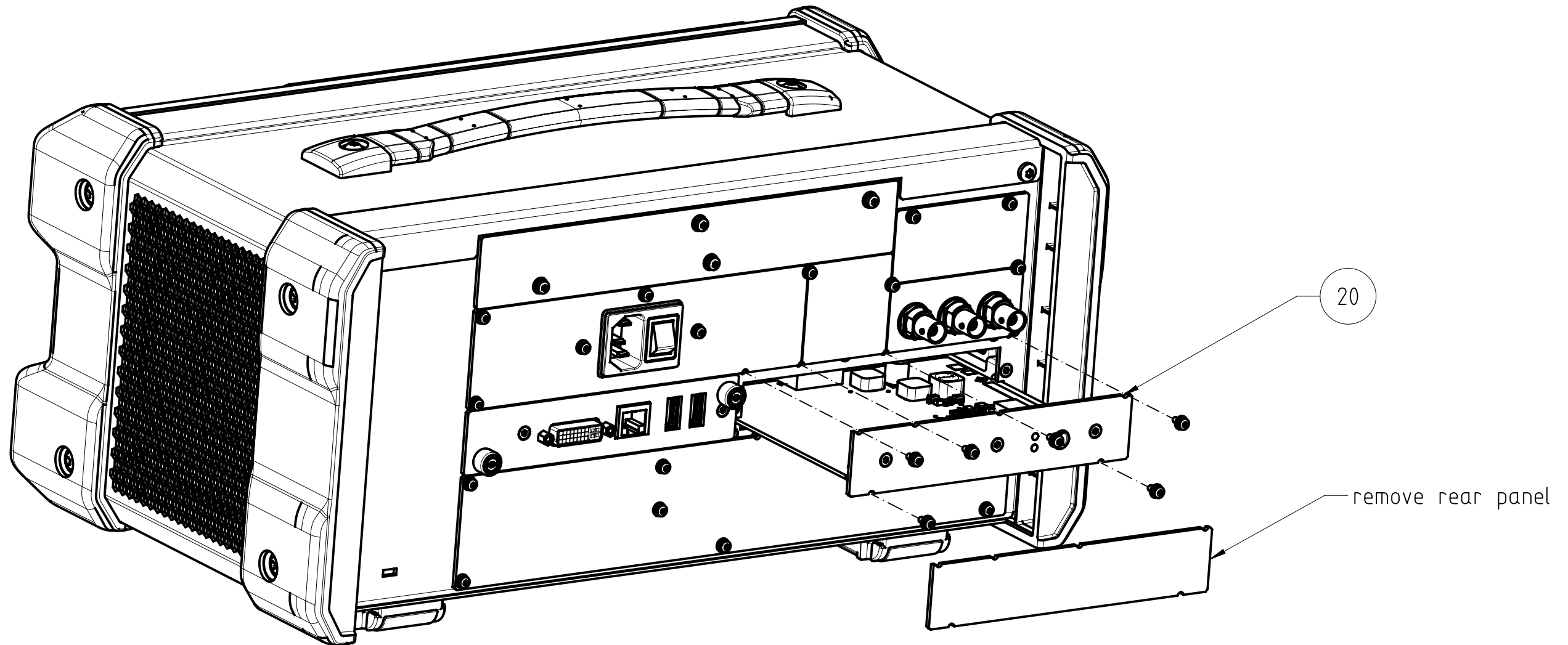
Maßstab Scale	Toleranz Tol.	Werkstoff Material		
ROHDE&SCHWARZ	Benennung / Designation			Sprache / Lang.
	MONTAGEANWEISUNG FPL1-B10			de en
	ASSEMBLY INSTRUCTION FPL1-B10			01.00
Datum Date		2016-08-09	Abteilung Dept.	1ENK
			Name Name	BU/KK
Zeichn.Nr. / Drawing No.				1323.2444.00
				D

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

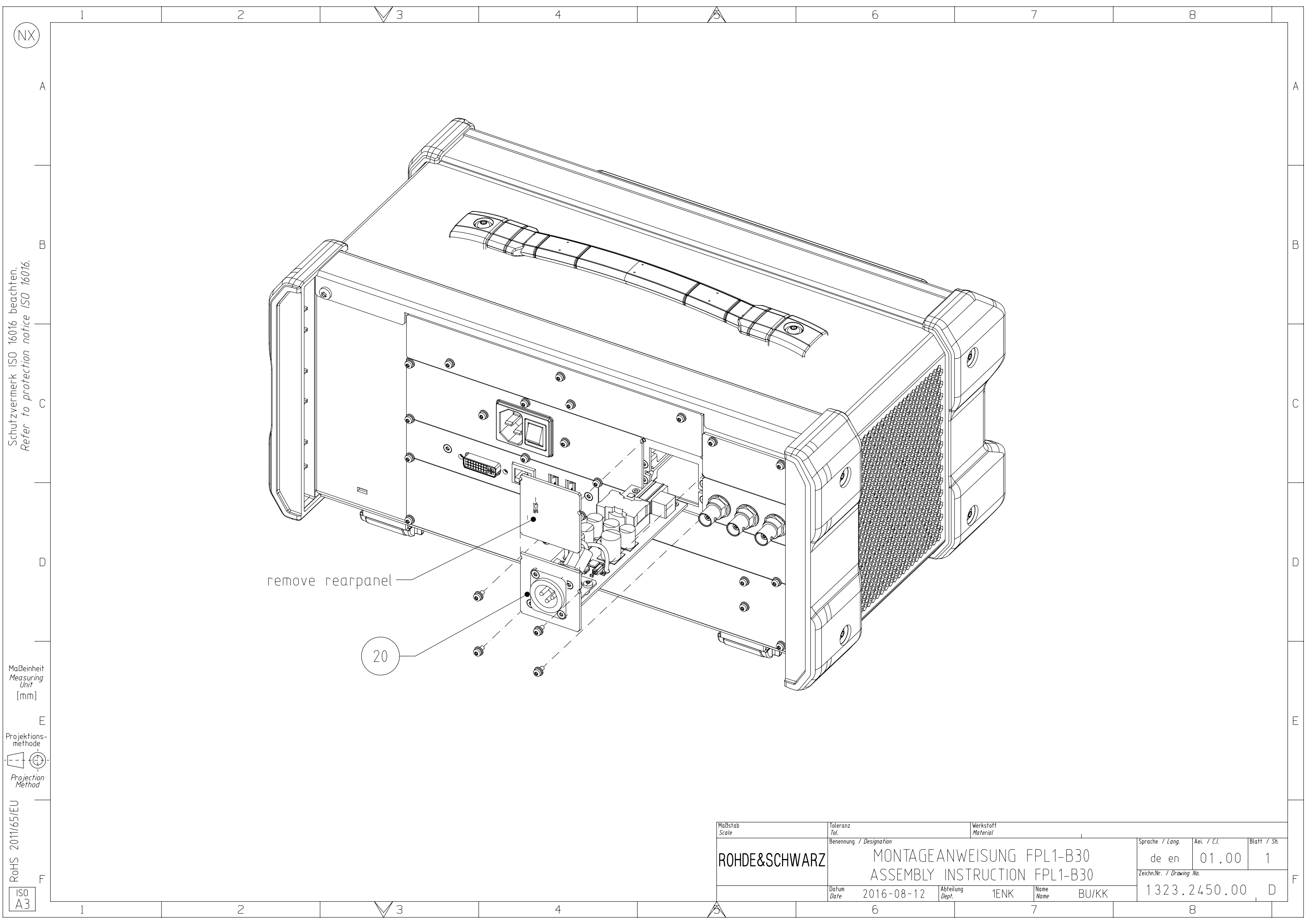
Maßeinheit
Measuring
Unit
[mm]

Projektions-
methode

Projection
Method

ISO
A3



Maßstab Scale	Toleranz Tol.	Werkstoff Material			
ROHDE&SCHWARZ	Benennung / Designation		Sprache / Lang.		And.Ind. / C.I.
	MONTAGEANWEISUNG ZNL-B6		de en		01.00
	ASSEMBLY INSTRUCTION ZNL-B6		Zeichn.Nr. / Drawing No.		1
ZNL	Datum Date	2019-05-15	Abteilung Dept.	1EC4	Name Name
					KK
			1303.9343.00		D



Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

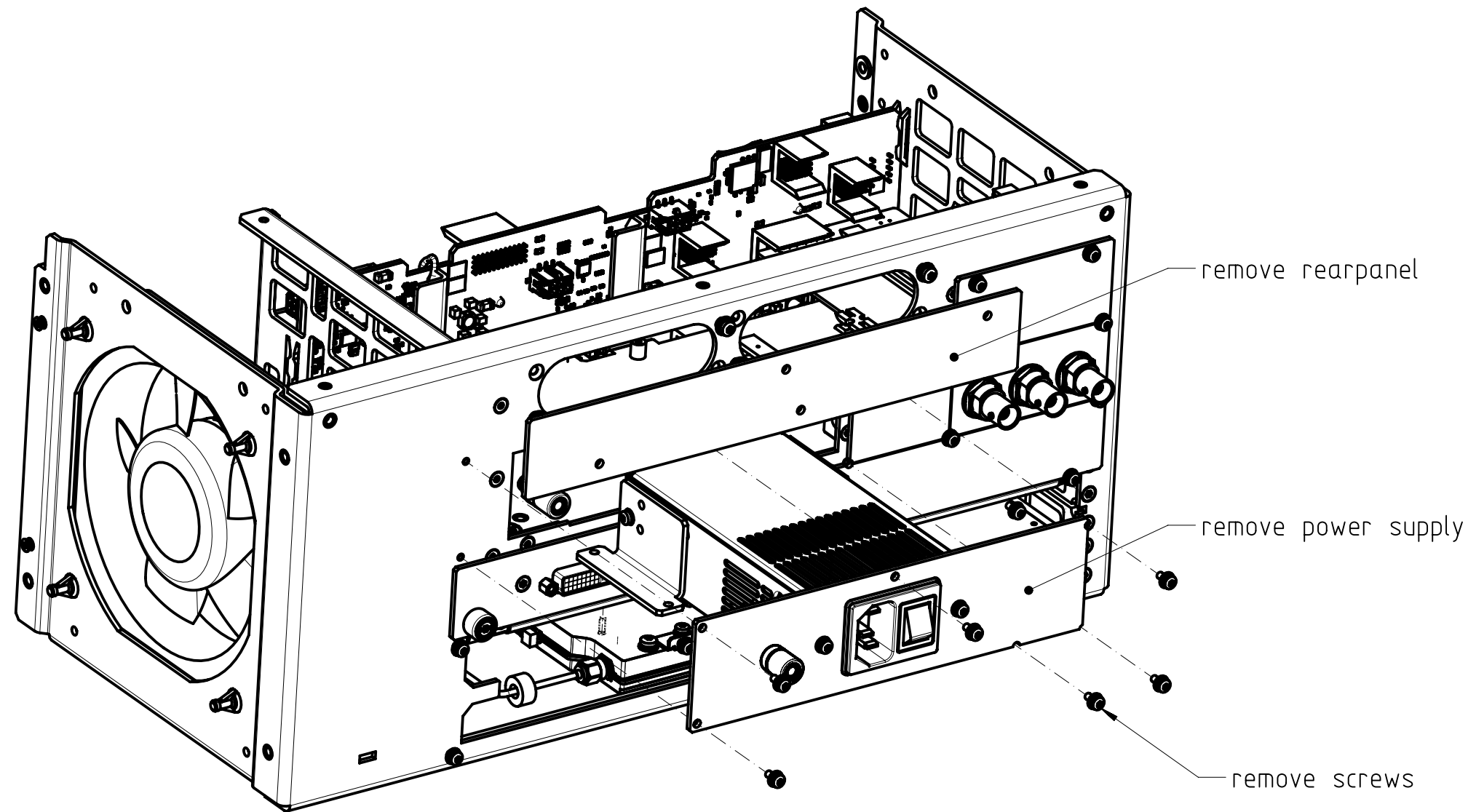
Maßeinheit
Measuring Unit
[mm]

Projektions-
methode
Projection
Method

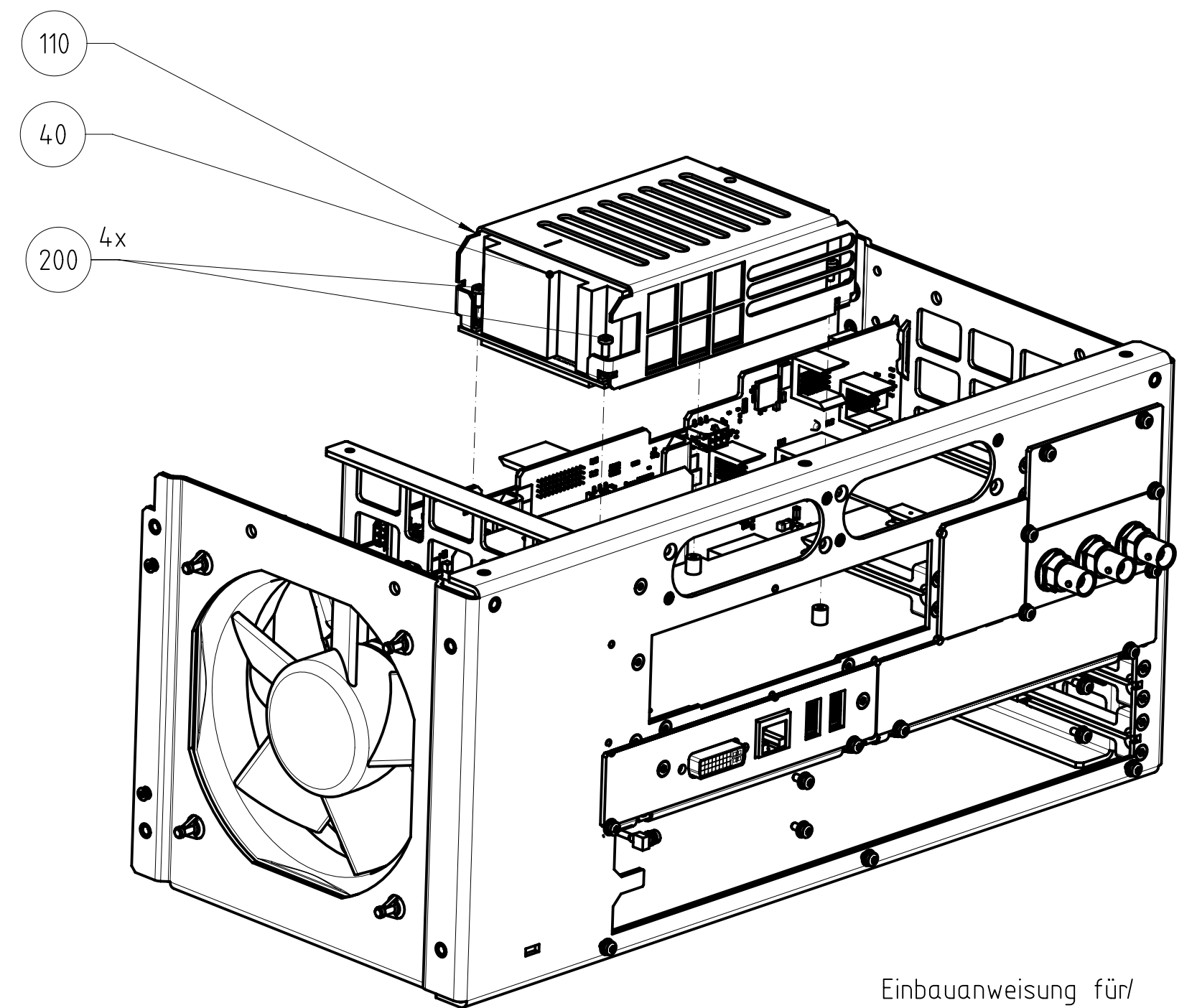
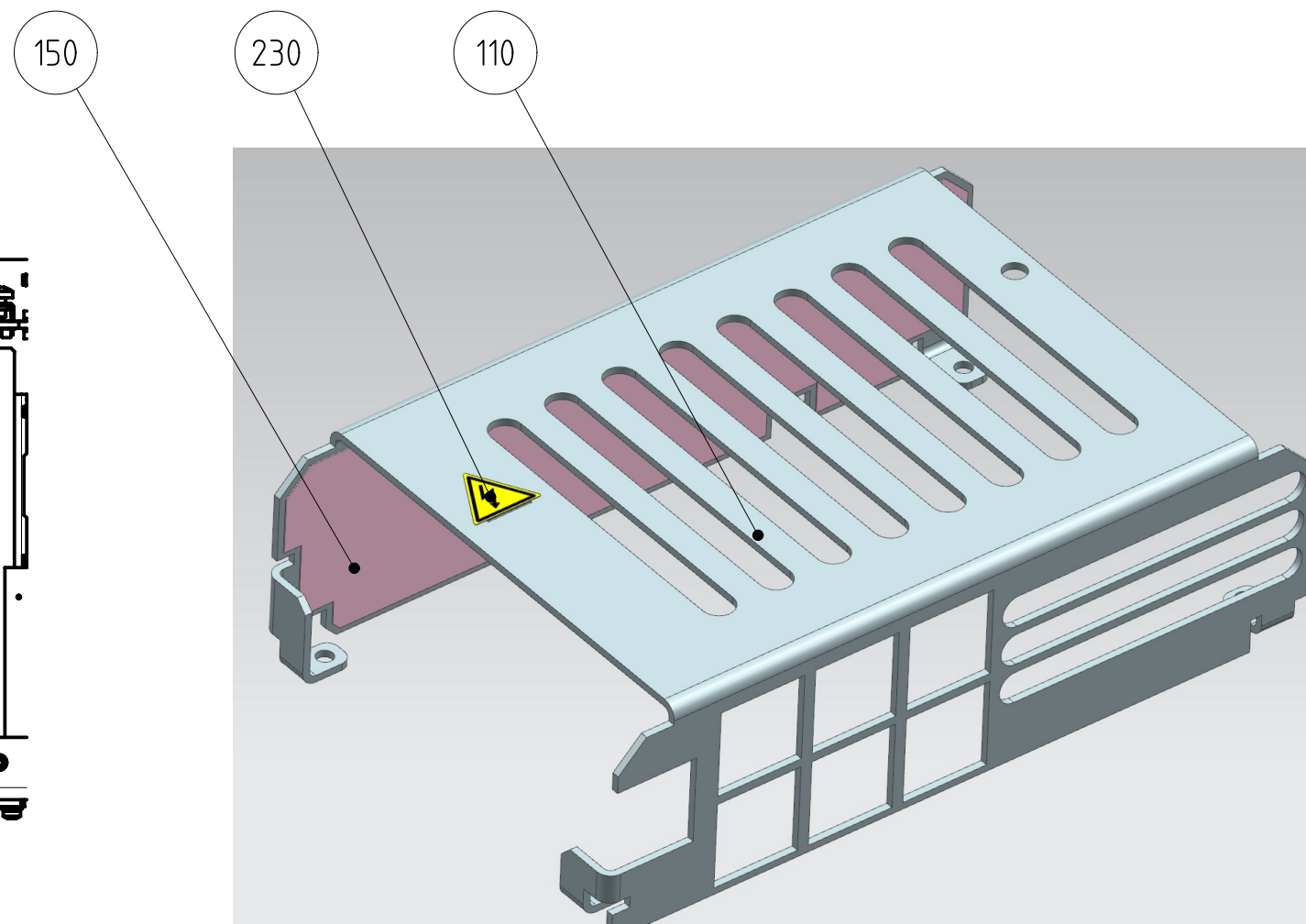
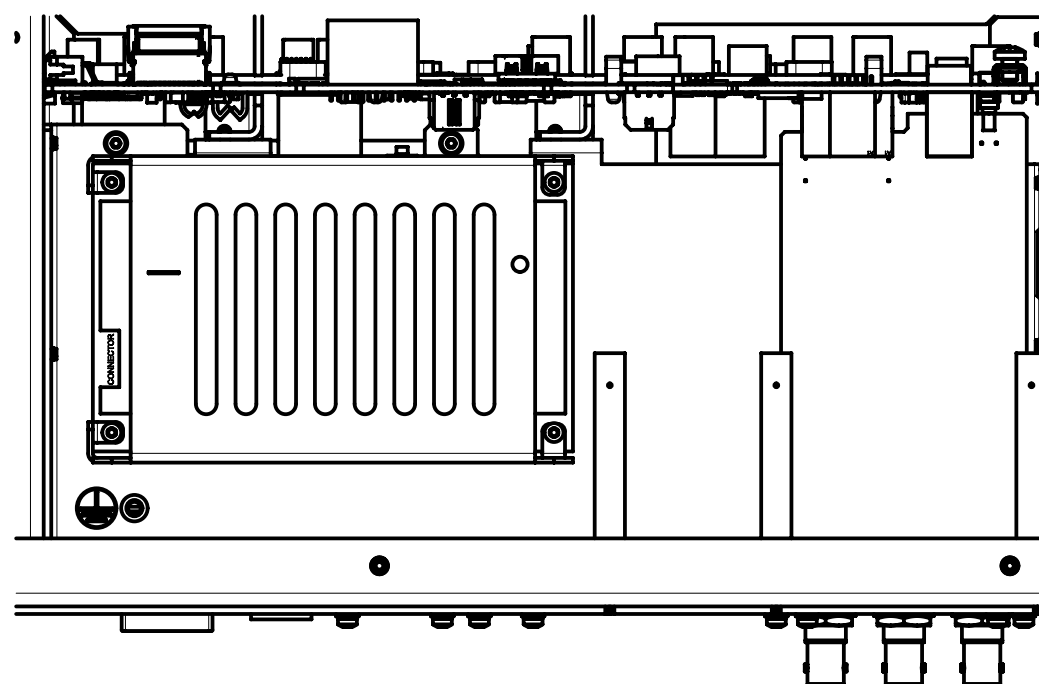
RoHS 2011/65/EU
ISO A3

Maßstab Scale	Toleranz Tol.		Werkstoff Material						
ROHDE&SCHWARZ	Benennung / Designation					Sprache / Lang.		Aei. / C.I.	Blatt / Sh.
	MONTAGEANWEISUNG FPL1-B30 ASSEMBLY INSTRUCTION FPL1-B30					de en		01.00	1
						Zeichn.Nr. / Drawing No.			
Datum Date	2016-08-12	Abteilung Dept.	1ENK	Name Name	BU/KK	1323.2450.00 D			

1st step



2nd step

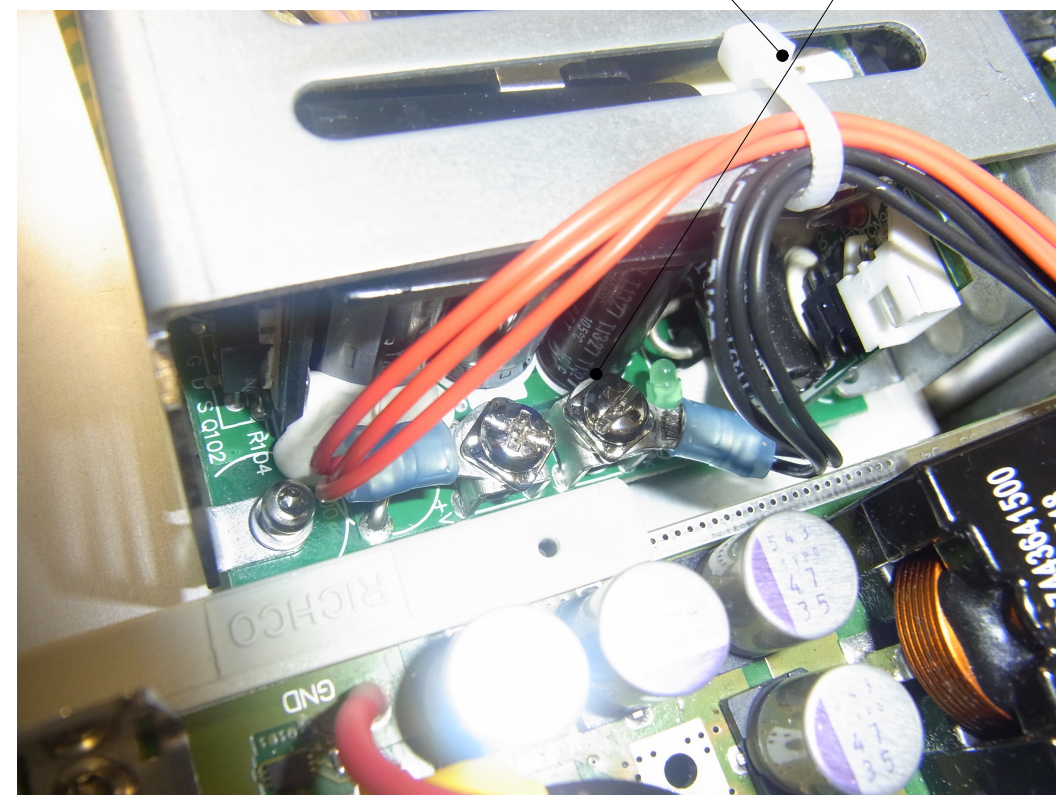
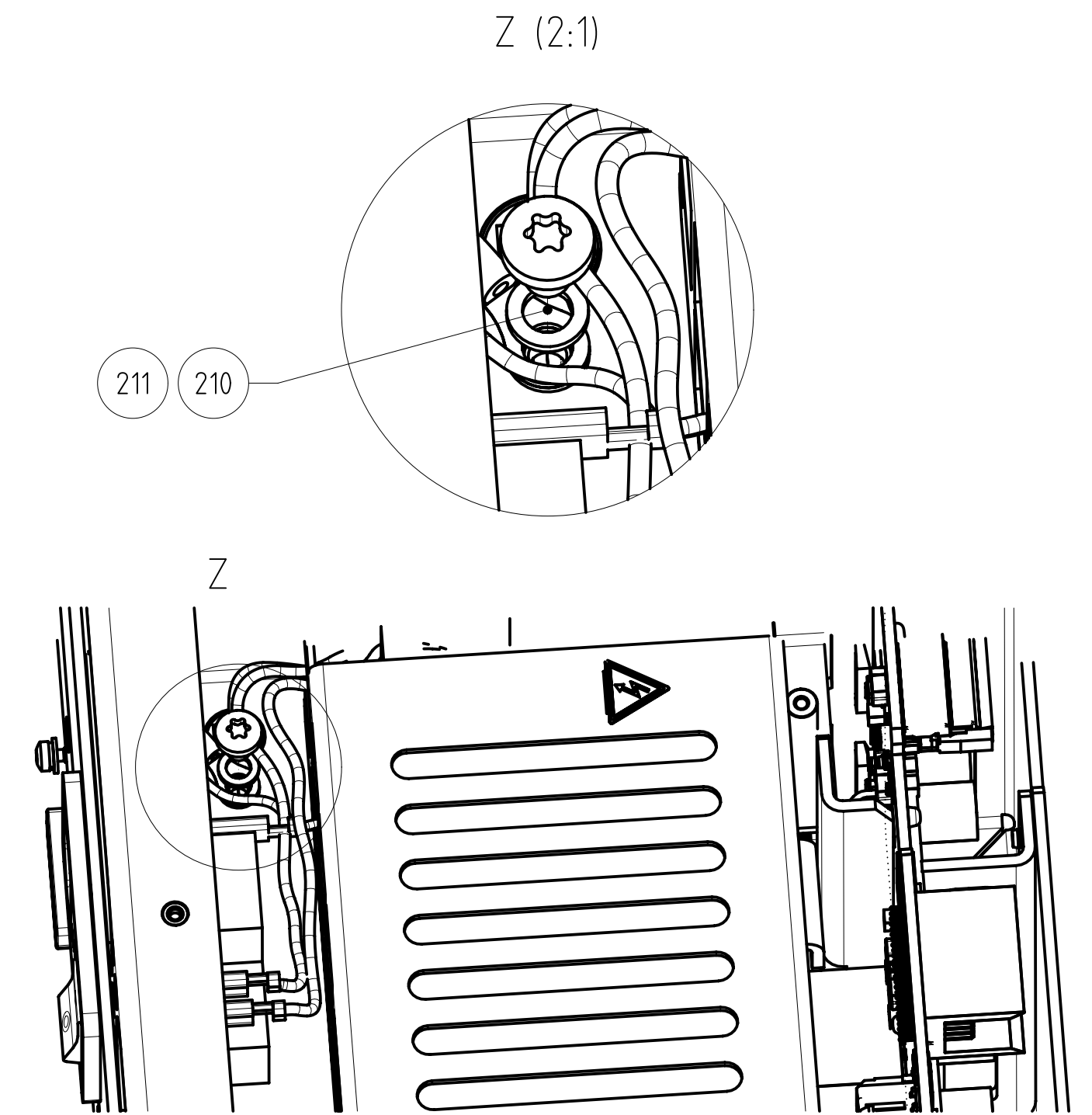
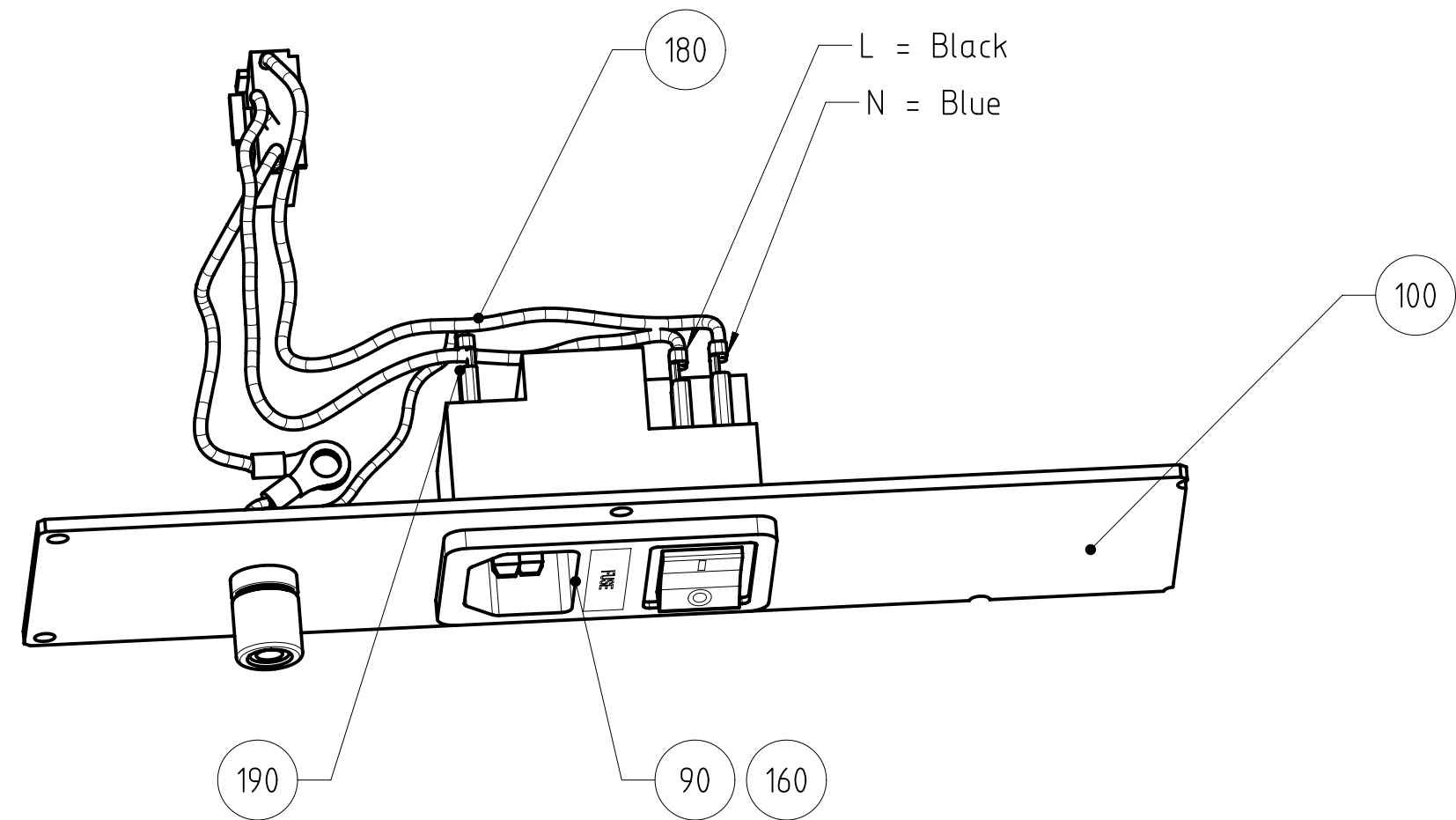


Einbauanweisung für/
assembly instruction for:
1323.1725.01 FPL1-B31

Maßstab Scale	1:2	Toleranz Tol.	Benennung / Designation	Werkstoff Material	Sprache / Lang.	Aes. / C.C.	Blatt / Sh.
ROHDE&SCHWARZ			MONTAGEANWEISUNG FPL1-B31 ASSEMBLY INSTRUCTION FPL1-B31		de en	04.00	1
NEPTUN	Datum Date	2019-10-21	Abteilung Dept.	1EC4	Name Name	KK	Zeichn.Nr. / Drawing No.
							1323.2721.00 D

3rd step

prepare the cabels as seen



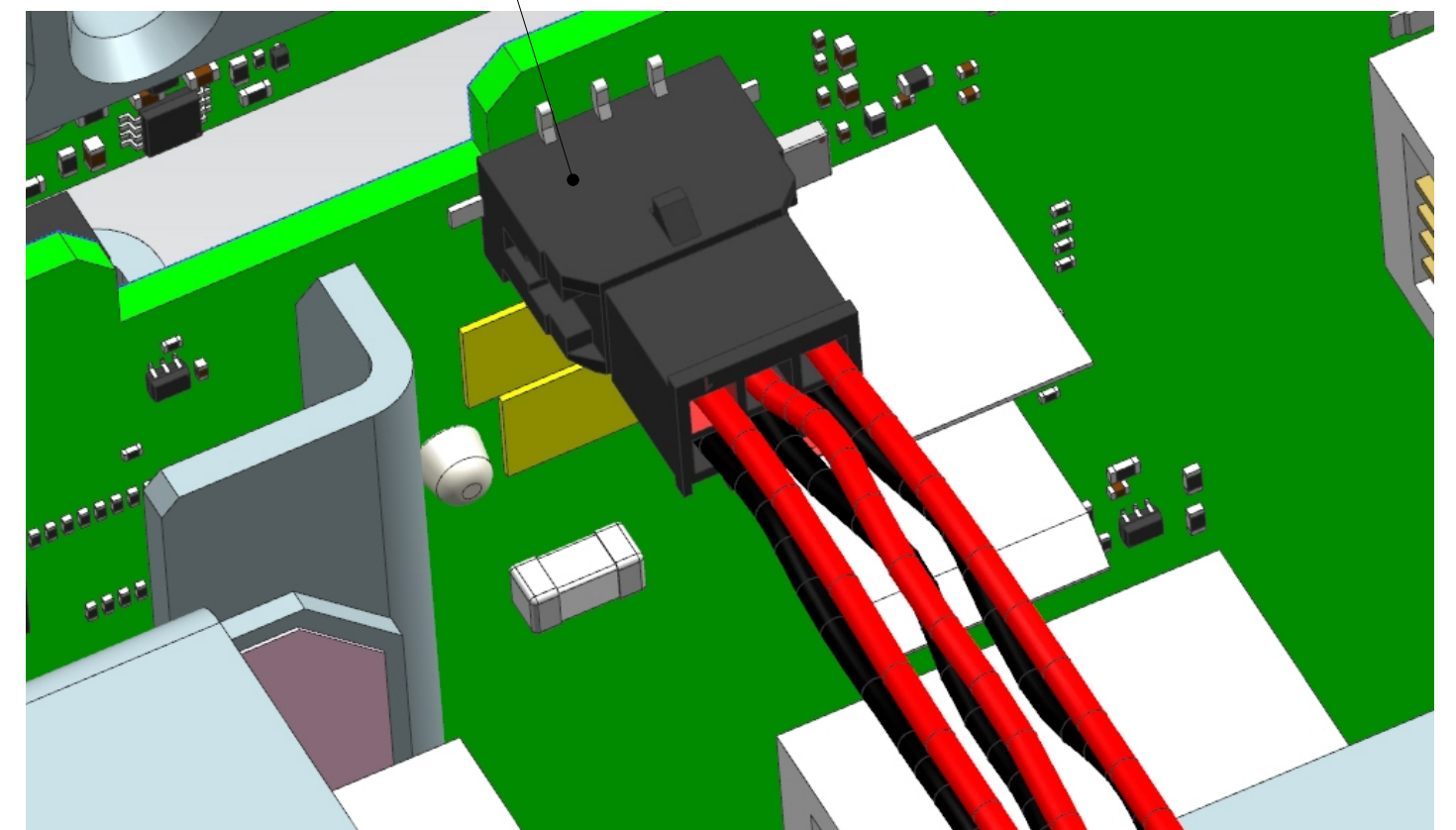
240

through the hole

170

fix cable as seen
red left
black right

connect to motherboard XPS2 170



Einbauanweisung für/
assembly instruction for:
1323.1725.01 FPL1-B31

Maßstab Scale	1:2	Toleranz Tol.		Werkstoff Material		Sprache / Lang.	de en	Aes. / C.C.	04.00	Blatt / Sh.	2
ROHDE&SCHWARZ		MONTAGEANWEISUNG FPL1-B31 ASSEMBLY INSTRUCTION FPL1-B31				Zeichn.Nr. / Drawing No.		1323.2721.00			D
NEPTUN		Datum Date	2019-10-21	Abteilung Dept.	1EC4	Name Name	KK				

NX

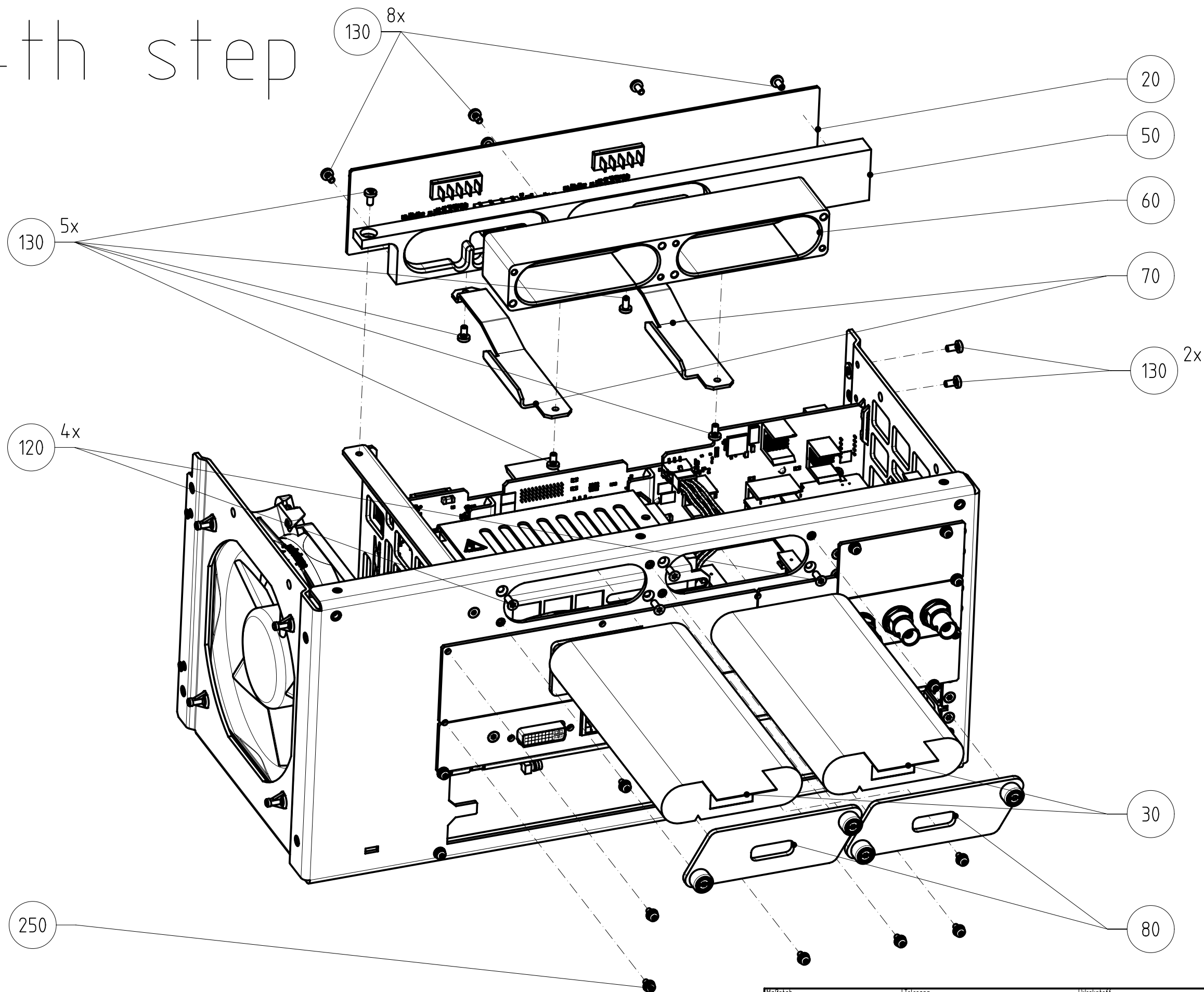
4th step

Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

Maßeinheit
Measuring
Unit
[mm]

Projektions-
methode
Projection
Method

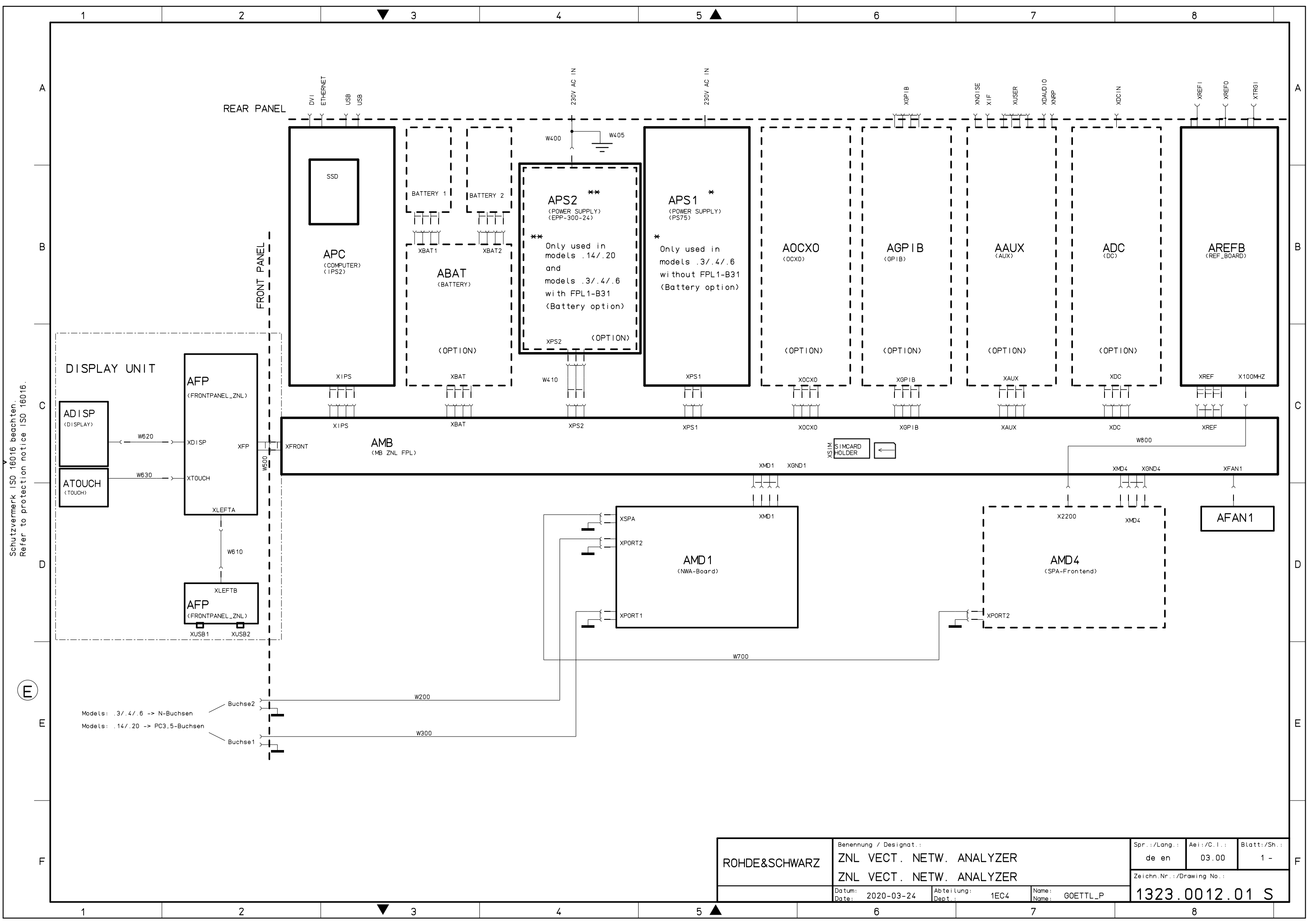
ISO
A3



The tab of the battery must be bent once so it does not obscure the battery indicator when closed

Einbauanweisung für/
assembly instruction for:
1323.1725.01 FPL1-B31

Maßstab Scale	1:2	Toleranz Tol.	Werkstoff Material			
Benennung / Designation		MONTAGEANWEISUNG FPL1-B31			Sprache / Lang.	Blatt / Sh.
ROHDE&SCHWARZ		ASSEMBLY INSTRUCTION FPL1-B31			de en	03.00 3
Datum Date		2018-06-18	Abteilung Dept.	1ENK	Name Name	SU/KK
						1323.2721.00 D



Schutzvermerk ISO 16016 beachten.
Refer to protection notice ISO 16016.

E

ROHDE&SCHWARZ	Benennung / Designat.: ZNL VECT. NETW. ANALYZER ZNL VECT. NETW. ANALYZER			Spr.:/Lang.: de en	Aei./C.I.: 03.00	Blatt:/Sh.: 1 -
	Datum: Date: 2020-03-24			Abteilung: Dept.: 1EC4	Name: Name: GOETTL_P	1323.0012.01 S

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