

R&S[®] HMP Series Power Supplies Getting Started



1178.6791.02 – 02

This manual applies to the following models and options of the R&S®HMP series:

- R&S®HMP2020 Two-Channel Power Supply (3629.6718.02)
- R&S®HMP2030 Three-Channel Power Supply (3629.6718.03)
- R&S®HMP4030 Three-Channel Power Supply (3629.6776.03)
- R&S®HMP4030 Four-Channel Power Supply (3629.6776.04)

This manual describes firmware version FW V2.61 and later for the instruments of the of the R&S®HMP Series.

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Throughout this manual, products from Rohde & Schwarz are indicated without the ® symbol , e.g. R&S®HMP2020 is indicated as R&S HMP2020, or R&S HMP.

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.








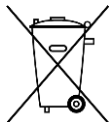



Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before and when using the product. It is also absolutely essential to observe the additional safety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

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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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- 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.

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

Transport

- 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.
- 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.




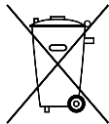

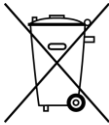

Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto. 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 señalar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.
6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.
7. 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.

Customer Support

Technical support – where and when you need it

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

Up-to-date information and upgrades

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

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1 Documentation Overview

This section provides an overview of the R&S HMP user documentation. Unless specified otherwise, you find the documents on the R&S HMP product page at:

www.rohde-schwarz.com/manual/hmp

1.1 Getting Started Manual

Introduces the R&S HMP and describes how to set up and start working with the product. Includes basic operations, and general information, e.g. safety instructions, etc. A printed version is delivered with the instrument.

1.2 User Manual

Contains the description of all instrument modes and functions. It also provides an introduction to remote control, a complete description of the remote control commands with programming examples, and information on maintenance and instrument interfaces. Includes the contents of the Getting Started manual.

1.3 Basic Safety Instructions

Contains safety instructions, operating conditions and further important information. The printed document is delivered with the instrument.

1.4 Brochure and Specifications

The brochure provides an overview of the instrument and deals with the specific characteristics. It contains the technical specifications of the R&S HMP, and provides ordering information for the base units, available options and accessories. See www.rohde-schwarz.com/brochure-datasheet/hmp.

1.5 Release Notes

The release notes list new features, improvements and known issues of the current firmware version, and describe the firmware installation.

The release notes are part of the download up-to-date firmware at www.rohde-schwarz.com/firmware/hmp.

1.6 Remote Control Drivers

The instrument drivers enable remote control via the corresponding interfaces. The drivers and installation instructions are available for download on the product page at www.rohde-schwarz.com/driver/hmp.

2 For Your Safety

The instruments of the R&S HMP series are designated for use in industrial, administrative, and laboratory environments, and residential, business, commercial and small business areas. The instruments comply with protection class II.

Use an R&S HMP only for its designated purpose. Observe the safety and usage instructions documented in the user manual, and operating conditions and performance limits stated in the data sheet.

The product documentation helps you to use the R&S HMP safely and efficiently. Keep the product documentation in a safe place and pass it on to the subsequent users.

Safety information is part of the product documentation. It warns you about the potential dangers and gives instructions how to prevent personal injury or damage caused by dangerous situations. Safety information is provided as follows:

- In the "Basic Safety Instructions", safety issues are grouped according to subjects. For example, one subject is electrical safety. The "Basic Safety Instructions" are delivered with the R&S HMP in different languages in print.
- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation. Always read the safety instructions carefully. Make sure to comply fully with them. Do not take risks and do not underestimate the potential danger of small details such as a damaged power cable.

3 Key Features

The R&S HMP Series power supplies sets standards in performance and usability. Outstanding key features are:

- High output power within a minimum space, high efficiency and low residual ripple.
- High programming and readback resolution for applications with the highest demands.
- Realtime voltage, current and power values.
- EasyArb function for programming voltage and current processes directly on the instrument.
- Individual electronic fuses freely combinable for all channels, with a fuse delay from 10 to 250 ms.
- Adjustable overvoltage protection (OVP) independently for each channel.
- Advanced parallel and serial operation via V/I tracking.
- Remote control via dual Ethernet/USB interface, USB/RS-232 dual interface or IEEE-488 (GPIB) using SCPI-based commands.

For a detailed specification, refer to the data sheet.

4 Preparing for Use

4.1 Putting into Operation

This section describes the basic steps to be taken when setting up the R&S HMP for the first time.

4.1.1 Safety

This instrument is built in compliance with DIN EN 61010-1 (VDE 0411 part 1), safety regulations for electrical measuring instruments, control units and Laboratory equipment. It has been tested and shipped from the plant in safe condition. It complies to the regulations of the European standard EN 61010-1 and the international standard IEC 61010-1.

To maintain this condition and ensure safe operation, you must observe all instructions and warnings given in this user manual.

⚠ DANGER**Risk of electric shock**

Casing and all chassis parts are connected to a protective earth conductor. It is prohibited to disconnect the earthed protective connection inside or outside the instrument.

⚠ DANGER**Risk of electric shock due to exceeding low voltage protection**

For the series connection of all output voltages, it is possible to exceed the low voltage protection. In this case, any contact with live components is life-threatening. It is assumed that only qualified and trained personnel operate the power supplies and the connected loads.

⚠ WARNING**Risk of injury due to disregarding safety information**

Observe the information on appropriate operating conditions provided in the data sheet to prevent personal injury or damage to the instrument. Read and observe the basic safety instructions provided with the instrument, in addition to the safety instructions in the following sections. In particular:

- Do not open the instrument casing.
- Operate the instrument in the positions specified by the manufacturer without obstructing the ventilation of the product.

If the manufacturer's specifications are not observed, electric shock, fire, and / or serious injury, and even death can occur.

NOTICE**Risk of instrument damage due to inappropriate operating conditions**

Specific operating conditions are required to ensure accurate measurements and to avoid damage to the instrument. Observe the information on appropriate operating conditions provided in the basic safety instructions and the instrument's data sheet.

NOTICE**Risk of interference by electrostatic discharge**

When the front and rear connectors are connected simultaneously, interferences due to electrostatic discharge can occur. To prevent interferences, leave the output sockets at the front disconnected, when using the rear panel outputs.

NOTICE**Risk of instrument damage during operation**

An unsuitable operating site or test setup can damage the instrument and connected devices. Ensure the following operating conditions before you switch on the instrument:

- Make sure that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If you have a different line voltage, it can be necessary that you have to change the power fuse of the product.
- It is hazardous and not permitted to repair a defective fuse or to use other tools to bypass the fuse. Resulting damage to the instrument are not covered by the warranty.
- Never use the instrument in dusty or damp conditions, in an explosion hazard area, or near aggressive chemicals. The ambient temperature and humidity must not exceed the ranges specified in the data sheet.
- The instrument is dry and shows no sign of condensation.
- The instrument can only be used indoors and is positioned as described in the following sections, see [Chapter 4.1.4, "Placing or Mounting the Instrument"](#), on page 14.

Always position the instrument that you can disconnect the unit from the mains at any time and without restrictions.

- All fan openings are unobstructed and the airflow perforations are unimpeded. Make sure that there is sufficient space on both sides for the heat exchange.
If the temperature inside the instrument exceeds the value specified in the data sheet, the channel-specific overheat protections turn off the corresponding outputs.
- The ambient temperature does not exceed the range specified in the data sheet.
- The instrument can only be operated with a properly grounded safety socket outlet. Never use a cheater plug or other means to defeat or disconnect the protective ground lead.
- Check the power cable for damage, and replace it if necessary. The power cord must be plugged in before signal circuits are connected.
- Use the instrument only with authentic Rohde & Schwarz test accessories, signal cables and power cords. Never use power cords with insufficient ratings.

- Before each measurement, check the instrument for proper operation using a known signal source or sample.
- Signal levels at the input connectors are all within the specified ranges.
- Signal outputs are correctly connected and are not overloaded.

If it is assumed that a safe operation is no longer possible, the instrument must be shut down and secured against any unintended operation.

Note: To disconnect from the mains, unplug the IEC socket on the back panel.

Also remove the instrument from operation if:

- The instrument shows visible damage
- The instrument includes loose parts
- The cables show damage
- The fuse holder shows damage
- The instrument is no longer working
 - After an extended period of storage under unfavorable conditions (e.g. outdoors or in damp rooms)
 - After rough handling during transport (e.g. packaging that does not meet the minimum requirements by post office, railway or forwarding agency)



EMI impact on measurement results

Electromagnetic interference (EMI) can affect the measurement results.

To suppress the generated electromagnetic interference (EMI):

- Use suitable shielded cables of high quality which must not exceed the maximum cable length, and must not be outside of buildings.
We recommend that you use double-shielded data cables with a length of 3 m at a maximum, e.g. the IEEE bus data cable R&S HZ72 (GPIB-cable 2 m, Order No. 3594.4269.02).
 - Always terminate open cable ends.
 - Note the EMC classification in the data sheet.
-

4.1.2 Unpacking and Checking the Instrument

To remove the instrument from its packaging and check the equipment for completeness, proceed as follows:

- Check the package for damage.
- Carefully unpack the instrument and the accessories.
- Check the package contents for completeness using the delivery list see ([Chapter 4.1.3, "Delivery List"](#), on page 13) and package contents.
- Check the equipment for any visible shipping-related damage or other mechanical problems, e.g. loose parts inside.

If there is damage or anything missing, contact the supplier and the carrier who delivered the instrument.

Do not operate the instrument in this case.



Packing material

Retain the original packing material. If the instrument needs to be transported or shipped later, you can use the material to protect the control elements and connectors.

The instrument must be stored in dry, closed indoor premises. If the instrument was transported under extreme temperatures, it is recommended that you allow a minimum of two hours to reach the appropriate temperature before operating the instrument.

4.1.3 Delivery List

The instrument comes with the following components:

- R&S HMP power supply preloaded with two main fuses (230 V)
- Fuses for 115 V operation
- Universal cable set
- Getting Started manual
- Document folder containing safety instructions and information on the instruments calibration

4.1.4 Placing or Mounting the Instrument

The R&S HMP is designed for use under both, industry and laboratory conditions, either on a bench top or in a rack.

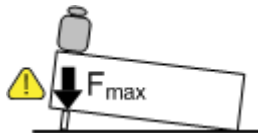
Bench Top Operation

If the R&S HMP is operated on a bench top, the surface must be flat. You can place the instrument horizontally, or in a slope position by unfolding the front feet.

⚠ WARNING**Risk of injury if feet are folded out**

The feet can fold in if they are not folded out completely or if the instrument is shifted. Collapsing feet can cause injury or damage the instrument.

- Fold the feet completely in or out to ensure stability of the instrument. Never shift the instrument when the feet are folded out.
- When the feet are folded out, do not work under the instrument or place anything underneath.
- The feet can break if they are overloaded. The overall load on the folded-out feet must not exceed 500 N.



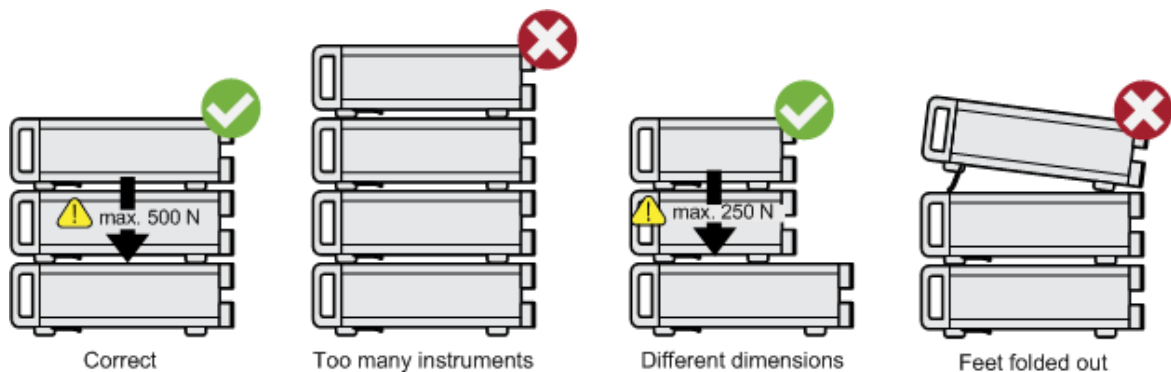
If the front support feet are folded in, it is possible to stack the instrument with other Rohde & Schwarz instruments securely.

⚠ WARNING**Risk of injury when stacking instruments**

A stack of instruments can tilt over and cause injury if not stacked correctly. Furthermore, the instruments at the bottom of the stack can be damaged due to the load imposed by the instruments on top.

Observe the following instructions when stacking instruments:

- Never stack more than three instruments. If you need to stack more than three instruments, install them in a rack.
- The overall load imposed on the lowest instrument must not exceed 500 N.
- It is best if all instruments have the same dimensions (width and length). If you need to stack smaller instruments on the top, the overall load imposed on the lowest instrument must not exceed 250 N.
- If the instruments have foldable feet, fold them in completely.



If multiple instruments are stacked, the collapsed support feet are positioned in the locking mechanism of the instrument beneath, preventing unintended movement.

Mounting in a Rack

You can install the R&S HMP in a rack using a rack adapter kit (R&S HZ42 for R&S HMP20xx instruments, and R&S HZP91 for R&S HMP40xx). The installation instructions are part of the adapter kit.

To prepare the R&S HMP for installation in a rack, you can remove the feet on the bottom:

1. Unscrew the mounting screws on the bottom of the instrument.

2. Remove the feet.

Tip: Save the feet with the screws if you want to operate the R&S HMP as bench top later.

NOTICE**Risk of instrument damage due to insufficient airflow in a rack**

If the instrument is run with insufficient airflow for a longer period, the instrument overheats, which can disturb the operation or turn off the R&S HMP.

Make sure that all fan openings are unobstructed, that the airflow perforations are unimpeded, and that the minimum distance from the wall is 10 cm.

4.1.5 Starting the Instrument

The R&S HMP is equipped with an AC power supply connector, which can be used with different AC power voltages. The voltage is adjusted by a switch. The AC power connector is located at the rear panel of the instrument.

Refer to the data sheet for the requirements of voltage and frequency.

4.1.5.1 Powering On

To connect the AC supply

Note: The instrument must only be connected to an outlet that has a ground contact

1. Check the available line voltage.
2. If necessary, adjust the line voltage with the voltage selector at the rear panel.

Notice:

When changing the line voltage, it is essential to check and replace the fuse if necessary. Otherwise the instrument can be destroyed.

3. Check the fuse type.
4. If necessary, replace the fuse type suitable for the line voltage (see ["To replace the fuses"](#) on page 17).
5. Connect the R&S HMP to the power source using the supplied power cable.

The instrument must only be connected to an outlet that has a ground contact, according to the specifications for safety class EN 61010.

Replacing the Fuses

The instrument has main power fuses, which are located on the rear panel of the unit. Depending on the line voltage setting, the fuses of the correct type must be installed.

WARNING

Risk of electric shock

The fuses are part of the main power supply. Therefore, handling the fuses while power is on can lead to electric shock. Before opening the fuse holder, make sure that the instrument is switched off and disconnected from all power sources.

Always use fuses supplied by Rohde & Schwarz as spare parts, or fuses of the same type and rating.

The nominal current of the fuse depends on the line voltage, and the R&S HMP model:

Table 4-1: Fuse types

Line Voltage	R&S HMP2020 / R&S HMP2030	R&S HMP4030 / R&S HMP4040
115 V	2 x T6.3H/250 V	2 x T10H/250 V
230 V	2 x T3.15H/250 V	2 x T5H/250 V

To replace the fuses

The instrument has an externally accessible fuse holder combined with the IEC socket at the rear panel.

1. Select the fuses according to the voltage of the AC line, see [Table 4-1](#).
2. Press the plastic locks on the sides of the fuse holder inwards using a screwdriver (with a blade width of approximately 2 mm).
The insertion points are marked by two slanted guides on the casing.
When unlocking the mechanism, the fuse holder is pushed outwards by compression springs.
3. Remove the fuse holder.

4. Exchange the fuses.
5. **Note:** The protruding contact springs must not be deformed, therefore: Align the fuse holder with the guide bar facing the socket.
6. Carefully slide the fuse holder against the spring pressure into the slot until both plastic locks latch.

4.1.6 Starting Up and Shutting Down



An instrument of the R&S HMP series saves all instrument settings (nominal values) in non volatile memory when it is turned off, and retrieved when it is powered on again.

To start up the instrument

1. Make sure that you have connected the R&S HMP to the AC power supply.
2. Turn on the instrument with the main Power key in the upper left corner at the front panel.

The R&S HMP starts up using the same operating mode that was in use at the time the unit was last turned off.

The instrument turns off the output signals at the beginning of operation. This function prevents a connected load from being supplied unintentionally at startup. It also prevents the load from being destroyed caused by an exceedingly high voltage or power, e.g due to the last instrument settings.

After booting, the instrument is ready for operation.

To shut down the instrument

- ▶ Press the Power key at the front panel.
All current settings are saved, and the firmware shuts down.

4.2 Setting Up a Network (LAN) Connection

If the R&S HMP is equipped with the combined LAN/USB network interface, you can connect it to a LAN (Ethernet). Provided the appropriate rights are assigned, you can use the interface for remote control and data transfer from a remote PC.

This section describes how to set up and configure the LAN interface.

For remote control via the alternative interfaces, refer to the user manual of the R&S HMP.

NOTICE**Risk of network failure**

Consult your network administrator before performing the following tasks:

- Connecting the instrument to the network
- Configuring the network
- Changing IP addresses
- Exchanging hardware

Errors can affect the entire network.

You can establish either a non-dedicated LAN connection from the instrument to an existing network, or a dedicated network connection between the instrument and a single computer.

For addressing, the instrument and the remote PC require an IP address, which is usually assigned automatically, depending on the network capabilities.

**Risk of network connection failure**

Network cables and cable connectors of poor quality, or failures in the auto-negotiation process, can cause network connection failures.

If the network connection to the instrument fails, check the network infrastructure and contact your network administrator.

To set up a network (LAN) connection

- ▶ Connect the instrument to the network or a single PC.

Depending on the network capacities, the TCP/IP address information for the instrument can be obtained in different ways.

- If the network supports dynamic TCP/IP configuration using the DHCP (Dynamic Host Configuration Protocol), the address information is assigned automatically.
- If the network does not support DHCP, you can set the IP address manually, see [To assign the IP address manually on the instrument](#).

To assign the IP address manually on the instrument

To assign the IP address, first select the interface. In addition, check if DHCP is not active. Otherwise, you cannot edit the IP address.

1. To disable DHCP, perform the following steps:

Tip: Skip these steps, if DHCP is not supported.

- a) Press the Menu key.
- b) Select "Interface > Interface Settings > Port Settings /DHCP".
- c) Select "DHCP: > OFF".
- d) Return with the left arrow key.

When DHCP is turned off, the instrument enables you to set the IP address manually.

2. To set the IP address, select "Interface > Select Interface > LAN".
3. Return with the left arrow key.
4. Select "Settings > IP Settings".
5. Assign the IP address.

The IP address is part of the VISA resource string used by the program to identify the instrument. The resource string has the form:

```
TCPIP::<IP_address>::<IP_port>::INSTR
```

The default port for socket communication is 5025.

Example: If the IP address of the instrument is 192.1.2.3, the valid resource string is: TCPIP::192.1.2.3::5025::INSTR

The R&S HMP displays the IP address and port number in the "IP Settings" dialog.

Switching to remote control

When you turn on the instrument, it always starts in manual operation state ("local" mode) to be operated via the front panel.

1. To establish communication via remote control, send a SCPI command.
The R&S HMP switches to remote control mode automatically. The Remote key illuminates.
The remote control mode disables all front panel keys on the instrument.
2. To return to local mode, press the Remote key.

Checking the LAN connection

To verify the connection, you can use the `ping` command.

- ▶ In the command prompt on the remote PC, enter `ping <ip_address>`

When the connection is working, the command returns the reply from the instrument.

5 Instrument Tour

The following sections explain the control elements and the connectors of the R&S HMP Series instruments by their front and rear views.



- The control elements on the front panel illuminate when you turn them on. In addition, the instrument illuminates keys for navigating or entering settings automatically if necessary.
- The channel keys also change their color. They indicate whether you are in setting mode, have the constant voltage supplied at the outputs, or the channel is in constant current mode.

See [Chapter 7.2, "Means of Manual Interaction"](#), on page 30 for details.

• Front Panel Views of the R&S HMP2030 and the R&S HMP2020	22
• Front Panel Views of the R&S HMP4040 and the R&S HMP4030	23
• Rear Panel Views of the R&S HMP2030 and the R&S HMP2020	24
• Rear Panel Views of the R&S HMP4030 and the R&S HMP4040	25

5.1 Front Panel Views of the R&S HMP2030 and the R&S HMP2020



For the R&S HMP2020, channel 3 is omitted.

Front Panel Views of the R&S HMP4040 and the R&S HMP4030



Figure 5-1: Front view of the R&S HMP2030

- 1 = Power key: Turning the instrument on and off
- 2 = Display (LCD): Parameter display
- 3 = Arrow keys and Rotary knob: Navigating on the display, setting and confirming the parameters
- 4 = Ch1, Ch2, Ch3 keys: Selecting Channels
- 5 = Output key: Turning on or off the selected channels
- 6 = Voltage key: Setting the output voltage
- 7 = Track key: Activating the tracking function
- 8 = Store key: Saving a measurement configuration
- 9 = Menu key: Accessing the list of functions
- 10 = Current key: Setting the current limit
- 11 = Fuse key: Activating the electronic fuse function
- 12 = Recall key: Loading a saved measurement configuration
- 13 = Remote key: Switching between manual and external control
- 14 = Ground socket: Reference potential connection (connected to protective earth)
- 15 = Ch1, Ch2, Ch3 sockets: Output channels; 0 V to 32 V / 5 A (HMP2020 0...32 V / 10 A)
- 16 = Sense sockets (2 x per channel): Compensating the lead resistances

5.2 Front Panel Views of the R&S HMP4040 and the R&S HMP4030



For the R&S HMP4030, channel 4 is omitted.

Rear Panel Views of the R&S HMP2030 and the R&S HMP2020

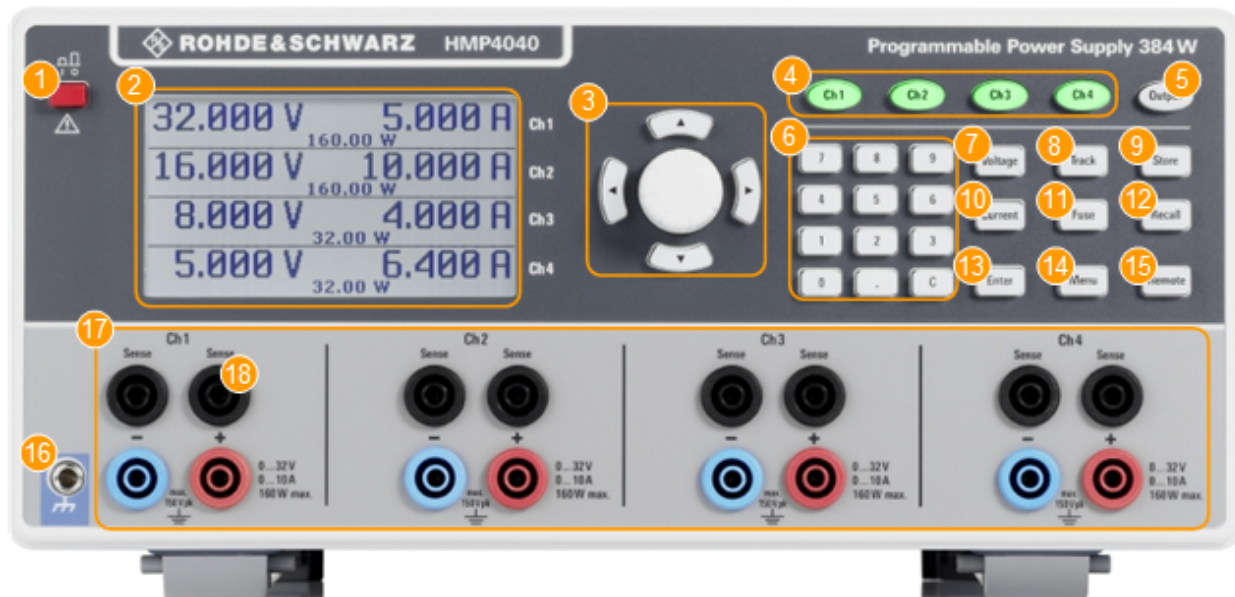


Figure 5-2: Front view of the R&S HMP4040

- 1 = Power key: Turning the instrument on and off
- 2 = Display (LCD): Parameter display
- 3 = Arrow keys and Rotary knob: Navigating on the display, setting and confirming the parameters
- 4 = Ch1, Ch2, Ch3, Ch4 keys: Selecting Channels
- 5 = Output key: Turning on or off the selected channels
- 6 = Keypad keys: Setting the nominal values
- 7 = Voltage key: Setting the output voltage
- 8 = Track key: Activating the tracking function
- 9 = Store key: Saving a measurement configuration
- 10 = Current key: Setting the current limit
- 11 = Fuse key: Activating the electronic fuse function
- 12 = Recall key: Loading a saved measurement configuration
- 13 = Enter key: Confirming values via keypad
- 14 = Menu key: Accessing the list of functions
- 15 = Remote key: Switching between manual and external control
- 16 = Ground socket: Reference potential connection (connected to protective earth)
- 17 = Ch1, Ch2, Ch3, Ch4 sockets: Output channels; 0 V to 32 V / 5 A
- 18 = Sense sockets (2 x per channel): Compensating the lead resistances

5.3 Rear Panel Views of the R&S HMP2030 and the R&S HMP2020

The interface for remote control varies depending on the equipped option.

Rear Panel Views of the R&S HMP4030 and the R&S HMP4040



Figure 5-3: Rear view of the HMP20x0 series

17 = Interface: Ethernet / USB dual interface R&S HO732 (default for all instruments of the R&S HMP series)

18 = Output connector: Rear panel outputs for integration into rack systems (2 to 3 channels)

19 = Voltage selector: Selecting the line voltage 115 V or 230 V

20 = Power supply connector: IEC socket and fuse holder

5.4 Rear Panel Views of the R&S HMP4030 and the R&S HMP4040

The interfaces on the rear panel vary depending on the instrument model.



Figure 5-4: Rear view of the HMP40x0 series

Rear Panel Views of the R&S HMP4030 and the R&S HMP4040

- 19 = Interface: Ethernet / USB dual interface R&S HO732 (default for all instruments of the R&S HMP series)
- 20 = Output connectors: Rear panel outputs for integration into rack systems (3 to 4 channels, depending on the R&S HMP40x0 model)
- 21 = Power supply connector: IEC socket and fuse holder
- 22 = Voltage selector: Selecting the line voltage 115 V or 230 V

NOTICE**Risk of interference by electrostatic discharge**

When the front and rear connectors are connected simultaneously, interferences due to electrostatic discharge can occur. To prevent interferences, leave the output sockets at the front disconnected, when using the rear panel outputs.

6 Trying Out the Instrument

This chapter describes the first steps with the R&S HMP. It shows a simple configuration for providing the power at the output. For basics on operating the instrument, see [Chapter 7, "Instrument Control"](#), on page 30.

The complete description of the functionality and its usage is given in the R&S HMP user manual.

Prerequisites

- The instrument is set up, connected to the mains, and started up as described in [Chapter 4.1.6, "Starting Up and Shutting Down"](#), on page 18.
- Before you connect and activate a load:
 - Make sure that you have deactivated the corresponding output of the R&S HMP to prevent unintended transient currents. Follow this order to get an optimal transition behavior when activating the output.
 - Set the current limit to prevent damage to the test circuit in case any error occurs (e.g. as a short circuit), see ["Setting the current limit"](#) on page 28.
- Make sure to operate highly sensitive semiconductors, such as laser diodes, only as specified by the manufacturer.
- Before trying out the instrument, note the maximum voltage, current and power ranges given in the data sheet.

We recommend that you follow the sequence of steps given in this description before you activate an output.

The instructions describe the manual control with the rotary knob and the arrow keys, setting the channel 1. For information on alternative controls, see [Chapter 7.2, "Means of Manual Interaction"](#), on page 30. Before trying out, observe the safety instructions and maximum specification.

For information on the settings and the corresponding remote control commands, see the user manual of the R&S HMP Series.

Selecting the channels

- ▶ Press the channel key, e.g. Ch1.
An active channel key is illuminated in green.

Selecting the output voltage

1. Press the Voltage key.
The Voltage key and the arrow keys are illuminated, indicating that they are active.
2. Press the channel key, e.g. Ch1.
Activates the voltage setting. The Ch1 key illuminates blue.
3. Set the output voltage value by turning the rotary knob.
The R&S HMP applies the setting immediately.
4. To terminate the setting, press the Voltage key.
The Ch1 key illuminates green again.

Tip: If you do not terminate with the Voltage key, the instrument exits the setting mode after the key fallback time has elapsed. See Chapter "Instrument Functions > Basic Functions > Key Fallback Time" in the user manual.

Setting the current limit

1. Press the Current key.
2. Press the Ch1 key.
The current setting in the display is in edit mode.
3. Set the current limit value.
The R&S HMP applies the setting immediately.
4. Press the Current key to terminate the setting mode.
If you do not press the Current key, the instrument automatically exits the setting mode after the key fallback time expires.
See Chapter "Instrument Functions > Basic Functions > Key Fallback Time" in the user manual.

Activating the fuse

The R&S HMP series includes an electronic fuse function that enables you to protect a connected sensitive test circuit even better from damage.

1. Press the Fuse key.
The R&S HMP activates the fuse function.
2. Press the Ch1 key to activate the fuse.

The R&S HMP immediately applies the setting and indicates the activated fuse in the display.

After the fallback time has elapsed, the instrument exits the setting mode.

See Chapter "Instrument Functions > General Functions > Key Fallback Time" in the user manual.

3. Repeat step 1 and step 2 to disable the fuse function.

Activating the output

You can turn on and off the output voltages regardless of the operating mode the instrument is in.

1. Press the Ch1 key.
2. Press the Output key.

The Output key turns on the outputs of all activated channels and supplies the connected loads.

Saving instrument settings

You can save up to 10 measurement configurations in the memory locations provided by the instrument.

1. Press the Store key.
The "Store Settings" dialog opens.
2. Use the rotary knob to select the memory location.
3. Confirm with the rotary knob.
4. Return with the Store key.

The R&S HMP saves the settings. Previous settings are overwritten.

Recalling instrument settings

To retrieve a saved configuration:

1. Press the Recall key.
2. Use the rotary knob to select the memory location.
3. Press the rotary knob again to load the configuration.
4. To exit the "Recall Settings" dialog, press the Recall key.

7 Instrument Control

This chapter provides an overview on how to work with the R&S HMP. It covers the following topics:

- [Ways to Operate the Instrument](#)..... 30
- [Means of Manual Interaction](#)..... 30
- [Remote Control](#)..... 33

7.1 Ways to Operate the Instrument

You can operate an R&S HMP in two ways:

- **Manual operation**
Use the front panel controls to configure your test setup. The principles of manual operation are explained in [Chapter 7.2, "Means of Manual Interaction"](#), on page 30.
- **Remote control**
Create programs to automatize repeating settings, tests and measurements. The instrument is connected to a computer running the program. [Chapter 7.3, "Remote Control"](#), on page 33 provides a brief overview of the interfaces provided for remote control.
See [Chapter 4.2, "Setting Up a Network \(LAN\) Connection"](#), on page 18 and the user manual, chapter "Network and Remote Control".

7.2 Means of Manual Interaction

To configure the R&S HMP manually, use the front panel controls, see [Chapter 5, "Instrument Tour"](#), on page 22. The display shows the current settings, menus and dialogs, when you perform your settings.

This section briefly explains the controls and some additional features, e.g.:

- The use of the arrow keys or alternatively the rotary knob to adjust settings.
- The meaning of the color of the channel keys (Ch1, ...).

Understanding the display information

Brief overview of the displayed elements:

- **Home screen:** Displays the channel parameters.
- **Menus:** Lists functions leading to the setting dialogs.
- **Dialogs:** Provide the settings of the specific functions.

Illuminated keys

The illuminated front panel keys provide access to the instrument settings and to activate functions and operating modes. The channel keys illuminate in varying colors indicating their current activities or states.

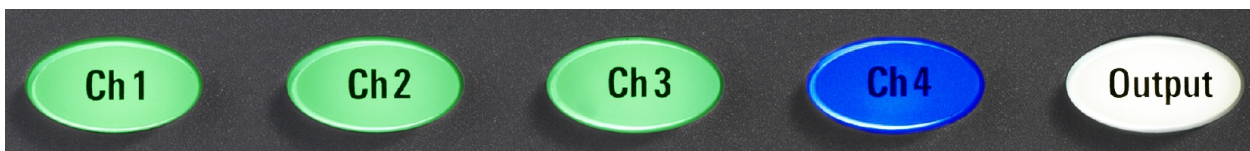


Figure 7-1: Example of the illuminated channel and output keys of the R&S HMP4040

Meaning of the key colors:

- **White:** the function or operating mode is activated.
- **Green** (channel key): the channel is in constant voltage mode (CV).
- **Red** (channel key): the channel is in constant current mode (CC), i.e. the current limit is active.
- **Blue** (channel key): the channel is in setting mode, i.e. a function is activated.
- **Flashing** (channel key): if the Output key and the Voltage key are active, and you change a setting of a channel, the color changes depending on the operating mode:
 - **Blue / Green** flashing: CV = constant voltage.
 - **Blue / Red** flashing: CC = constant current.
- **Off:** the channel, function, or operating mode are not active.

The navigation controls include a rotary knob and arrow keys. They allow you to navigate within a setting, menus or dialogs.

- Rotary knob

The rotary knob has several functions:

- Moves the selection, e.g. to a parameter in a settings dialog
- Activates the edit mode of a parameter

- Increments (clockwise direction) or decrements (counterclockwise direction) the instrument parameter at a defined step size in the case of a numeric entry
- Acts like the Enter key, when it is pressed
- Arrow keys
 - Move the selection up and down, or forward and backward, e.g. to a parameter in a settings dialog
 - Return to a previous menu level (left arrow key)
 - In a numeric entry field, increase or decrease the value, or move between the digits.

Settings controls

Alternative methods for setting parameters:

- Rotary knob, Arrow keys

The rotary knob and arrow keys also enable you to set nominal values by:

- Navigating to the corresponding parameter and activating the edit mode
- Increasing or decreasing the value.

Note: If you enter the voltage or current limit value using the rotary knob, the R&S HMP immediately applies the set value. You can terminate the entry by pressing the corresponding key, e.g. Voltage, but for these parameters, the instrument also exits the setting mode after the fallback time has elapsed. See the user manual, chapter Instrument Functions > General Functions > Key Fallback Time .

Settings in menus are not affected by the fallback time. Either you confirm a setting, or return using the arrow keys.

- Numerical Keypad (R&S HMP40x0 only), enables you to:
 - Directly enter values ("0...9")
 - Insert a decimal point (".")
 - Delete a value ("C")

Note: If you enter a value using the keypad, you must press Enter to confirm your entry. Otherwise, the instrument disables the edit mode without the changes taking effect.



Throughout the user documentation, the instructions for configuring settings use the rotary knob and arrow keys. The alternative operating methods are only noted here.

7.3 Remote Control

In addition to operating the R&S HMP directly on the instrument, it is also possible to operate and control it from a remote PC.

Remote Control Interfaces

The R&S HMP supports various interfaces for remote control:

- Dual interface Ethernet / USB (standard)
- Dual interface USB / RS232 (option)
- GPIB Interface IEEE-488 (option)

Remote control via USB / RS232 or GPIB Interface IEEE-488 requires that the corresponding options are installed. Drivers and information on their installation are provided for download on the product pages www.rohde-schwarz.com/product/hmp and www.rohde-schwarz.com/product/hmp4000.

See [Chapter 4.2, "Setting Up a Network \(LAN\) Connection"](#), on page 18 for an example on how to set up a remote control connection via LAN.

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