Test & Measurement
Value Instruments
Catalog 2012

R&S®RTM
Digital oscilloscope –
compact, precise, versatile

R&S®FSH4/FSH8
Handheld spectrum analyzer

R&S®SMB100A
RF and microwave signal generator

HAMEG HMO2024
Digital oscilloscope

ROHDE & SCHWARZ

Value Instruments
from Rohde & Schwarz

T & M instruments that meet your needs
Whether you work in a major electronics R & D facility or a small service lab, you are not always performing complex measurements and do not always need the ultimate in high-end T & M equipment. What you need are precise, reliable, universal measuring instruments. Thats exactly what you get with value instruments from Rohde & Schwarz: instruments that combine practical features with excellent measurement characteristics, instruments that are easy to use and easy on the budget.

Oscilloscopes　　Power sensors　　Multimeters　　Voltmeters

Spectrum analyzers　　EMC precompliance　　LCR bridges and meters

The photo shows a selection of value instruments described in this catalog.

Service that puts you first

As an electronics company with a successful history spanning almost 80 years, we have built a strong global presence that includes a worldwide service and sales network, 24-hour support and R & D centers at technology locations around the globe. No matter how you buy our products – through direct sales channels, from a distributor or from our R&S®Surf-In webstore that is now available in numerous countries – there's always a personal contact partner ready to help you. Worldwide at all times.

Frequency counters   Network analyzers   Power meters

Power supplies   Video and audio testers   Signal generators

Test & Measurement
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This catalog provides an overview of selected high-value Rohde & Schwarz test and measurement products with an attractive price/performance ratio. For detailed information, please visit our website www.rohde-schwarz.com and enter the type designation of the product as the search term.

On our website, this catalog is available as a PDF file for download. For convenience, this file has navigation functions as well as hyperlinks for quick access to the corresponding product pages on our website.

Example: R&S®FSC spectrum analyzer
▷ search term = FSC

About
Rohde & Schwarz

For more than 75 years, Rohde & Schwarz has stood for quality, precision and innovation in all fields of wireless communications. The privately owned company group has a global presence. It develops, produces and markets a wide range of electronic capital goods for industry, infrastructure operators and government agencies.

Rohde & Schwarz is among the market leaders in all of its business fields, including wireless communications and RF test and measurement, terrestrial TV broadcasting and technologies related to the interception and analysis of radio signals.

Numerous subsidiaries and representatives not only ensure quick, competent on-site support anywhere in the world, but also safeguard customer investments with comprehensive service and support offerings.

More information: www.rohde-schwarz.com

Our business fields

Test & measurement

T & M instruments and systems for wireless communications, electronics and microwave applications

Secure communications

(Radio) systems providing encrypted communications for armed forces, government agencies and industry

Radiomonitoring and radiolocation

Spectrum monitoring systems and radiomonitoring equipment for homeland and external security

Broadcasting

Sound and TV broadcasting and measuring equipment

Three questions regarding R&S®Surf-In

QUALITY ONLINE
www.rohde-schwarz.com/surf-in

What features does the new webstore offer? Is Rohde & Schwarz using it to replace its first-class sales network? Such questions are inevitable when a company launches a new online sales channel on the Internet. That's why we are confronting these very questions – and answering them for you.

Question 1:
What features does R&S®Surf-In offer?
R&S®Surf-In offers all the classic features of a webstore, including:
▪ User profile
  Enter your data in the customer profile so that you can simply refer to it for future orders
▪ Customize
  R&S®Surf-In automatically shows all the accessories available for a given product. You can select and order the options you need right away
▪ Certified pre-owned equipment
  An overview of our used instruments lets you purchase high-performance, high-quality Rohde & Schwarz products you are accustomed to, but at low prices
▪ Special promotions and PPA
  You can see instantly whether a given product group is on special promotion, and take direct advantage of these opportunities
▪ Localization
  Our webstore supports multiple languages and currencies, and conforms to the business processes customary in your country

▪ Cart
  Choose now, order later – no problem. And naturally you can change items in the cart
▪ Request a demo
  R&S®Surf-In is basically an anonymous online sales channel. But if you are not sure what you need, or if you want personal advice, get our local sales engineers involved and request a product demo
▪ Order overview
  A list of all your online orders is available under the order overview

Question 2:
How does R&S®Surf-In benefit me?
▪ R&S®Surf-In is primarily intended as a convenient way to order our lower-priced products. If you know exactly what you need, and want to place the order quickly and economically online, this is the way to do it
▪ If you first just want to get information on our products, R&S®Surf-In is an ideal place to get an overview, whenever and wherever you want

Question 3:
Can I still get expert support?
▪ Every customer is important to us. With R&S®Surf-In, we are where you are – online. Here as well, we want to satisfy your requirements and meet your expectations. This online sales tool lets us offer you support in even more ways
▪ But whenever you need it, our international sales team is available to advise on requirements and applications

It's easy …
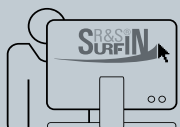
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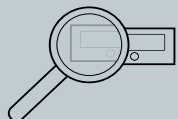
… check out
the specifications and
functions of products
you're interested in …

… check prices and
your budget …

… get advice from
local sales engineers
if needed …

… and place the order
quickly and easily.

Spectrum Analyzers

Type/designation	Frequency range	DANL (sensitivity)	TOI	RBW	Portability
R&S®FSC spectrum analyzer	9 kHz to 3/6 GHz (depending on model)	❚ < –141 dBm (1 Hz), typ. –146 dBm (1 Hz) ❚ < –161 dBm (1 Hz), typ. –165 dBm (1 Hz) with R&S®FSC-B22 preamplifier option	> 10 dBm, typ. 15 dBm (frequency = 1 GHz)	10 Hz to 3 MHz	❚ Compact dimensions ❚ Benchtop
R&S®FSH4/R&S®FSH8 handheld spectrum analyzer	9/100 kHz to 3.6/8 GHz (depending on model)	❚ < –141 dBm (1 Hz), typ. –146 dBm (1 Hz) ❚ < –161 dBm (1 Hz), typ. –165 dBm (1 Hz) with preamplifier	❚ > +10 dBm, typ. +15 dBm (300 MHz to 3.6 GHz) ❚ > +3 dBm, typ. +10 dBm (3.6 GHz to 8 GHz)	1 Hz to 3 MHz	❚ Handheld ❚ Ruggedized ❚ Low weight (3 kg/6.6 lb with battery) ❚ Up to 4.5 h battery-powered operation ❚ Ideal for field applications
R&S®FSL spectrum analyzer	9 kHz to 3/6/18 GHz (overrange 20 GHz) (depending on model)	❚ < –140 dBm (1 Hz) ❚ < –152 dBm (1 Hz), typ. –162 dBm (1 Hz) with preamplifier	typ. +18 dBm	❚ 300 Hz to 10 MHz (standard) ❚ 10 Hz to 10 MHz (with R&S®FSL-B7)	❚ Ruggedized housing ❚ Optional battery pack and DC power supply
HMS1000/HMS3000 1 GHz/3 GHz spectrum analyzer	100 kHz to 1/3 GHz (depending on model)	❚ HMS1000 ▪ –105 dBm, typ. –114 dBm (1 kHz RBW, 10 MHz to 1 GHz, without preamplifier) ▪ typ. –125 dBm (1 kHz RBW, with preamplifier) ❚ HMS3000 ▪ –105 dBm, typ. –114 dBm (1 kHz RBW, 10 MHz to 3 GHz, without preamplifier) ▪ typ. –135 dBm (100 Hz RBW, with preamplifier)	typ. +10 dBm	100 Hz to 1 MHz in 1/3 sequence, 200 kHz	Benchtop

R&S®FSC Spectrum Analyzer

| USB | USB Stick | TCP/IP | inclusive |

Professional spectrum analysis – compact and cost-efficient

The R&S®FSC is a compact, cost-efficient solution that offers all essential features of a professional spectrum analyzer with Rohde & Schwarz quality.

Key facts
▪ Frequency range from 9 kHz to 3 GHz or 6 GHz
▪ Resolution bandwidths from 10 Hz to 3 MHz
▪ High sensitivity (< –141 dBm (1 Hz), with optional preamplifier < –161 dBm (1 Hz))
▪ High third order intercept (> 10 dBm, typ. 15 dBm)
▪ Low measurement uncertainty (< 1 dB)
▪ Internal tracking generator (models .13/.16)
▪ Power meter and preamplifier option
▪ Storage of measurement results on USB stick
▪ LAN and USB interfaces for remote control and transfer of measurement data
▪ R&S®FSCView software for simple documentation of measurement results
▪ Compact dimensions
▪ Low power consumption (12 W)

Models		
Designation	**Type**	**Order No.**
Spectrum Analyzer, 9 kHz to 3 GHz	R&S®FSC3	1314.3006.03
Spectrum Analyzer, 9 kHz to 3 GHz, with tracking generator	R&S®FSC3	1314.3006.13
Spectrum Analyzer, 9 kHz to 6 GHz	R&S®FSC6	1314.3006.06
Spectrum Analyzer, 9 kHz to 6 GHz, with tracking generator	R&S®FSC6	1314.3006.16

Application	How the R&S®FSC meets your needs
General-purpose spectrum analysis	▪ Quick check of spectral characteristics (harmonics, AM modulation depth, ACLR, etc.) or for diagnostic applications ▪ Service and repair centers, training centers, universities or schools ▪ High measurement accuracy ▪ High sensitivity ▪ LAN and USB interfaces
Use in compact test systems	▪ Compact size allows installation of two R&S®FSC or one R&S®FSC and one R&S®SMC100A signal generator in a single 19" rack ▪ Remote control via USB/LAN ▪ Support of R&S®NRP-Zxx power sensors up to 67 GHz ▪ Only 12 W power consumption ▪ Passive cooling, i.e. no built-in fan
Power measurements	▪ Precision RF power meter up to 67 GHz with R&S®NRP-Zxx power sensors
Satellite monitoring	▪ Satellite dish positioning ▪ Link management
Universal instrument	▪ Determination of transmission characteristics of cables, filters and amplifiers, up to 90 dB dynamic range (model .13 or .16 required) ▪ Location of EMC problems with near-field probes

R&S®FSH4/R&S®FSH8
Handheld Spectrum Analyzer

| mini USB | USB Stick | SD Card | TCP/IP | inclusive |

Where mobility counts

The R&S®FSH4/R&S®FSH8 spectrum analyzer is rugged, handy and designed for use in the field.

Key facts

ı Spectrum analyzer, full two-port vector network analyzer, modulation analyzer and power meter in a single device
ı Frequency range from 9 kHz to 3.6 GHz or 8 GHz
ı Low measurement uncertainty (< 1 dB)
ı 20 MHz demodulation bandwidth for analyzing LTE signals
ı Support of LTE FDD, TD-LTE, 3GPP WCDMA and CDMA2000® 1xEV-DO downlink analysis
ı Support of all LTE signal bandwidths up to 20 MHz
ı Easy-to-replace lithium-ion battery for up to 4.5 h of operation
ı Rugged, splashproof housing for rough work in the field
ı Easy handling due to low weight (3 kg/6.6 lb with battery) and easy-to-reach function keys

Models		
Designation	**Type**	**Order No.**
Handheld Spectrum Analyzer, 9 kHz to 3.6 GHz, with preamplifier	R&S®FSH4	1309.6000.04
Handheld Spectrum Analyzer, 9 kHz to 3.6 GHz, with preamplifier and tracking generator	R&S®FSH4	1309.6000.14
Handheld Spectrum Analyzer, 100 kHz to 3.6 GHz, with preamplifier, tracking generator and internal VSWR bridge	R&S®FSH4	1309.6000.24
Handheld Spectrum Analyzer, 9 kHz to 8 GHz, with preamplifier	R&S®FSH8	1309.6000.08
Handheld Spectrum Analyzer, 9 kHz to 8 GHz, with preamplifier and tracking generator	R&S®FSH8	1309.6000.18
Handheld Spectrum Analyzer, 100 kHz to 8 GHz, with preamplifier, tracking generator and internal VSWR bridge	R&S®FSH8	1309.6000.28

Application	How the R&S®FSH4/R&S®FSH8 meets your needs
RF spectrum measurement	ı Various measurement functions (channel power, OBW, ACLR, SEM, etc.) ı High measurement accuracy and high sensitivity
Service and maintenance of transmitter stations	ı Interference hunting ı Cable and antenna testing ı Power measurements with external directional or terminating power sensors ı LTE FDD, TD-LTE, 3GPP WCDMA and CDMA2000® 1xEV-DO downlink analysis ı Internal SWR bridge with bias tee ı R&S®FSH4View software for easy documentation
Measurements of electromagnetic fields	ı Wide frequency range ı Support of isotropic antenna and directional antennas ı Results in dBµV/m and W/m² ı Channel power measurement function
Field use	ı Rugged housing, low weight and compact size ı Battery-operated with long battery operating time and easy-to-replace battery ı Easy to use ı SD memory card for storing thousands of measurement results ı Excellent handling in the field due to portrait form factor
Diagnostic applications in the lab or in service	ı Universal instrument for spectrum measurements, vector network analysis and precise power measurements ı Location of EMC problems with near-field probes ı High measurement accuracy and high sensitivity ı LAN/USB interface

R&S®FSL Spectrum Analyzer

| DVI Output | USB Stick | TCP/IP | optional IEEE-488 | inclusive |

High-end functions in an extremely lightweight, compact package

The R&S®FSL is an extremely lightweight, compact spectrum analyzer that is ideal for a large number of applications in development, service and production.

Key facts
▪ Cost-efficient spectrum analyzer with high-quality features
▪ Frequency range from 9 kHz to 3/6/18 GHz
▪ 3 GHz, 6 GHz and 18 GHz models with and without tracking generator
▪ Best RF characteristics in its class
▪ Wide I/Q demodulation bandwidth – up to 28 MHz
▪ Support for WLAN and WiMAX™ testing
▪ High measurement accuracy
▪ Portable for field applications
▪ Compact and lightweight (< 8 kg/18 lb)
▪ Optional battery operation
▪ Easy on-site upgradeability

Models		
Designation	**Type**	**Order No.**
Spectrum Analyzer, 9 kHz to 3 GHz	R&S®FSL3	1300.2502.03
Spectrum Analyzer, 9 kHz to 3 GHz, with tracking generator	R&S®FSL3	1300.2502.13
Spectrum Analyzer, 9 kHz to 6 GHz	R&S®FSL6	1300.2502.06
Spectrum Analyzer, 9 kHz to 6 GHz, with tracking generator	R&S®FSL6	1300.2502.16
Spectrum Analyzer, 9 kHz to 18 GHz (overrange 20 GHz)	R&S®FSL18	1300.2502.18
Spectrum Analyzer, 9 kHz to 18 GHz, with tracking generator	R&S®FSL18	1300.2502.28

Application	How the R&S®FSL meets your needs
Evaluation of broadband signals	Its widest-in-class I/Q demodulation bandwidth of 20/28 MHz allows engineers to measure broadband wireless signals using I/Q data
Insertion loss measurements	The tracking generator models of the R&S®FSL enable the analysis of insertion loss and bandwidth filter measurements
Power measurement option	The R&S®FSL-K9 option expands the spectrum analyzer to a high-precision RF power meter when used with the R&S®NRP-Zxx power sensors
Interference analysis	The spectrogram functionality of the R&S®FSL-K14 option enables unattended signal monitoring, providing versatile interference analysis
WiMAX™ design and production	The R&S®FSL provides demodulation capabilities for WiMAX™ signals in a design and production platform
WLAN production testing	The WLAN option creates the basis of a WLAN TX production tester at a very competitive price
Microwave applications	With its 9 kHz to 18 GHz frequency range, the R&S®FSL18 is ideal for commercial as well as aerospace and defense applications both in the lab and in the field, e.g. for installing and maintaining radar systems and microwave links, for satellite monitoring and production of RF and microwave components

R&S®FSL spectrum analyzer options

Designation	Type	Order No.	Comments
Hardware options			
OCXO Reference Frequency, aging 1×10^{-7}/year	R&S®FSL-B4	1300.6008.02	standard with the R&S®FSL18
Additional Interfaces	R&S®FSL-B5	1300.6108.02	video out, IF out, noise source control, AUX port, connector for R&S®NRP-Zxx power sensors
TV Trigger	R&S®FSL-B6	1300.5901.02	
Narrow Resolution Filters	R&S®FSL-B7	1300.5601.02	
Gated Sweep	R&S®FSL-B8	1300.5701.02	
GPIB Interface	R&S®FSL-B10	1300.6208.02	
RF Preamplifier (3/6 GHz)	R&S®FSL-B22	1300.5953.02	
DC Power Supply, 12 V to 28 V	R&S®FSL-B30	1300.6308.02	
NiMH Battery Pack	R&S®FSL-B31	1300.6408.02	requires R&S®FSL-B30
Firmware options			
AM/FM/φM Measurement Demodulator	R&S®FSL-K7	1300.9246.02	
Transmitter Measurements for Bluetooth® V2.0 and EDR	R&S®FSL-K8	1301.9398.02	
Power Sensor Support	R&S®FSL-K9	1301.9530.02	requires R&S®FSL-B5 or R&S®NRP-Z3/4 and R&S®NRP-Zxx power sensor
Spectrogram Measurements	R&S®FSL-K14	1302.0913.02	
Analog and Digital Cable TV Measurements	R&S®FSL-K20	1301.9675.02	
Application Firmware for Noise Figure and Gain Measurements	R&S®FSL-K30	1301.9817.02	requires R&S®FSL-B5 and preamplifier
3GPP FDD BTS Application Firmware	R&S®FSL-K72	1302.0620.02	
CDMA2000® Base Station Analysis	R&S®FSL-K82	1302.7803.02	
1xEV-DO Base Station Analysis	R&S®FSL-K84	1302.0159.02	
WLAN Transmitter Measurements for IEEE 802.11a, b, g, j	R&S®FSL-K91	1302.0094.02	
Upgrade of R&S®FSL-K91 to IEEE 802.11n	R&S®FSL-K91n	1308.7903.02	
WiMAX™ IEEE 802.16-2004 OFDM Application Firmware	R&S®FSL-K92	1302.0236.02	
WiMAX™ IEEE 802.16-2009 OFDM/OFDMA Application Firmware	R&S®FSL-K93	1302.0736.02	
Upgrade from R&S®FSL-K92 to R&S®FSL-K93	R&S®FSL-K92U	1302.0307.02	
EMI Software	R&S®ES-SCAN	1308.9270.02	

HMS1000/HMS3000
1 GHz/3 GHz Spectrum Analyzer

DVI Output | **USB** | **USB Stick** | optional **TCP/IP** | optional **IEEE‑488** | inclusive | 6,5" **VGA** 16,5cm
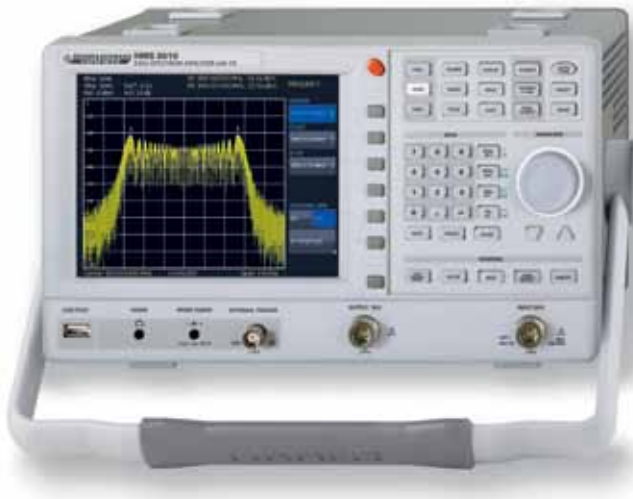
The digital spectrum analyzer from HAMEG

▮ Frequency range: 100 kHz to 1 GHz/3 GHz
▮ HMS1010/HMS3010 tracking generator:
  –20 dBm to 0 dBm
▮ Amplitude measurement range: –114 dBm to +20 dBm
▮ DANL: –125 dBm/–135 dBm with HO3011 preamplifier
  option
▮ Sweep time: 20 ms to 1000 s
▮ Resolution bandwidth: 100 Hz to 1 MHz in 1/3 steps,
  200 kHz (–3 dB); additionally (200 Hz), 9 kHz, 120 kHz,
  1 MHz (–6 dB)
▮ Spectral purity < –100 dBc (1 Hz) (at 100 kHz)
▮ Video bandwidth: 10 Hz to 1 MHz in 1/3 steps
▮ Integrated AM and FM demodulator
  (phone and internal speaker)
▮ Detectors: auto peak, min. peak, max. peak, sample,
  RMS, quasi-peak
▮ Eight markers with delta marker, miscellaneous peak
  functions
▮ Crisp 16.5 cm (6.5") TFT VGA display, DVI output
▮ 3 × USB for mass storage, printer and remote control,
  optional IEEE 488 (GPIB) or Ethernet/USB interface

Models/options	
Designation	**Type**
1 GHz Spectrum Analyzer	HMS1000
1 GHz Spectrum Analyzer with Tracking Generator	HMS1010
3 GHz Spectrum Analyzer	HMS3000
3 GHz Spectrum Analyzer with Tracking Generator	HMS3010
Dual Ethernet/USB Interface	HO730
IEEE 488 (GPIB) Interface, galvanically isolated	HO740
Preamplifier Option	HO3011

Application	How the HAMEG HMS1000/HMS3000 meets your needs
EMI precompliance measurements	▮ Free EMI software ▮ Easy-to-use optional near-field probe sets
RF measurements	▮ High accuracy ▮ High sensitivity
Filter characteristics, antennas	▮ Built-in tracking generator (HMS1010 and HMS3010) ▮ Optional VSWR bridge
Education and service	▮ Fast boot time ▮ Easy to use ▮ Lightweight ▮ DVI output as standard for connection to data projector or external monitor

Signal Generators

Type/designation	Frequency range	Max. specified output power	SSB phase noise	Nonharmonics	Modulation
R&S®SMC100A signal generator	9 kHz to 1.1/3.2 GHz (depending on RF path option)	+13 dBm (f = 200 kHz to 3.2 GHz)	< −105 dBc (typ. −111 dBc) (f = 1 GHz, carrier offset = 20 kHz, 1 Hz measurement bandwidth)	< −60 dBc (typ. −72 dBc) (carrier offset > 10 kHz, f ≤ 1600 MHz)	AM/FM/φM/pulse
R&S®SMB100A RF and microwave signal generator	▮ 9 kHz to 1.1/2.2/3.2/6 GHz ▮ 100 kHz to 12.75/20/40 GHz (depending on RF path option)	+18 dBm (1 MHz ≤ f < 12.75 GHz)	< −122 dBc (typ. −128 dBc) (f = 1 GHz, carrier offset = 20 kHz, 1 Hz measurement bandwidth)	< −70 dBc (typ. < −84 dBc) (carrier offset > 10 kHz, 23.4375 MHz < f ≤ 1500 MHz)	AM/FM/φM/pulse
HMF2525/HMF2550 25 MHz/50 MHz arbitrary function generator	10 µHz to 25/50 MHz		typ. < −115 dBc (1 Hz)	▮ −70 dBc (f < 1 MHz) ▮ −70 dBc + 6 dB/octave (1 MHz < f < 50 MHz)	AM, FM, pulse, PWM, FSK
HM8135 3 GHz RF synthesizer	1 Hz to 3 GHz	+13 dBm	≤ −95 dBc (1 Hz) (f = 1 GHz)	≤ −50 dBc (> 15 kHz from carrier)	AM, FM, φM, pulse, FSK, PSK

R&S®SMC100A Signal Generator

USB | USB Stick | TCP/IP | optional IEEE-488 | inclusive

Key facts
- Frequency range from 9 kHz to 1.1 GHz or 3.2 GHz
- Maximum output level of typ. > +17 dBm
- Low SSB phase noise of typ. –111 dBc (f = 1 GHz, 20 kHz carrier offset, 1 Hz measurement bandwidth)
- Wear-free electronic attenuator with integrated overvoltage protection
- AM/FM/φM/pulse modulation provided as standard
- Signal generator with the best price/performance ratio in its class
- Signal generator with the smallest size in its class (½ 19", 2 height units)
- Low total cost of ownership

Smallest size and best price/performance ratio in its class

The analog R&S®SMC100A sets new standards for attractively priced signal generators. It has the smallest size and the best price/performance ratio in its class.

Models/options

Designation	Type	Order No.
Signal Generator (base unit)	R&S®SMC100A	1411.4002.02
RF Path, 9 kHz to 1.1 GHz	R&S®SMC-B101	1411.6505.02
RF Path, 9 kHz to 3.2 GHz	R&S®SMC-B103	1411.6605.02
OCXO Reference Oscillator	R&S®SMC-B1	1411.6705.02
GPIB/IEEE 488 Interface	R&S®SMC-K4	1411.3506.02

Application	How the R&S®SMC100A meets your needs
Service and maintenance of RF components and modules	ı Good SSB phase noise and wideband noise ı Analog modulations included in the instrument ı Perfect for simple measurements such as gain, intermodulation and distortion measurements
RF tests in education	ı Cost-efficient instrument ı Easy to operate ı Good performance for RF experiments
Field use	ı Small size and low weight ı R&S®NRP-Zxx power sensors can be connected (no need for an additional power meter)
A&D development/service/maintenance	ı Sanitizing procedure for internal memory ı Support for self-maintainers
Simple production applications	ı Short frequency and level setting times ı Low total cost of ownership (TCO)

R&S®SMB100A RF and Microwave Signal Generator

Versatile, compact solution for signal generation up to 40 GHz

The analog R&S®SMB100A signal generator delivers excellent signal characteristics and high flexibility at low cost of ownership – the key criteria for a signal source.

Key facts

ı Wide frequency range from 9 kHz to 6 GHz or from 100 kHz to 40 GHz
ı Excellent signal characteristics with low SSB phase noise of typ. –128 dBc (at 1 GHz, 20 kHz offset)
ı High output power of up to +27 dBm
ı Wear-free electronic attenuator up to 12.75 GHz
ı Short setting times for frequency (< 3 ms) and level (< 2.5 ms) via remote control and < 1 ms in list mode
ı All important analog modulations with AM, FM/φM and pulse modulation supported
ı Optional pulse modulator with typ. > 90 dB on/off ratio (up to 11 GHz) and rise/fall time of typ. < 5 ns; pulse generator with minimum pulse width of 10 ns
ı Compact size with only two height units and low weight

Models/options

Designation	Type	Order No.
Signal Generator (base unit)	R&S®SMB100A	1406.6000.02
RF Path, 9 kHz to 1.1 GHz	R&S®SMB-B101	1407.2509.02
RF Path, 9 kHz to 2.2 GHz	R&S®SMB-B102	1407.2609.02
RF Path, 9 kHz to 3.2 GHz	R&S®SMB-B103	1407.2709.02
RF Path, 9 kHz to 6 GHz	R&S®SMB-B106	1407.2909.02
RF Path, 100 kHz to 12.75 GHz		
With electronic step attenuator	R&S®SMB-B112	1407.2109.02
Without step attenuator	R&S®SMB-B112L	1407.2150.02
RF Path, 100 kHz to 20 GHz		
With mechanical step attenuator	R&S®SMB-B120	1407.2209.02
Without mechanical step attenuator	R&S®SMB-B120L	1407.2250.02
RF Path, 100 kHz to 40 GHz		
With mechanical step attenuator	R&S®SMB-B140	1407.2309.02
Without mechanical step attenuator	R&S®SMB-B140L	1407.2350.02
OCXO Reference Oscillator	R&S®SMB-B1	1407.3005.02
OCXO High-Performance Reference Oscillator	R&S®SMB-B1H	1407.3070.02

Application	How the R&S®SMB100A meets your needs
Blocking/receiver tests	Can serve as a high-quality generator of transmitter or interference signals up to 12.75 GHz (as specified in 3GPP TS 25.141, for example)
Production testing	Compared with mechanical attenuators, the electronic attenuator eliminates wear caused by continuous switching; the modular design enables on-site instrument servicing and ensures fast level switching
Radar system measurements	Test of X-band radar (pulse train), earth exploration satellite, radio astronomy, space research; useful for aerospace and defense customers and research institutes, for example
Development of RF ICs	85 dB (typ.) suppression of unwanted and non-predictable spurs and low wideband noise of typ. –148 dBc meet most development needs
Car radio tests	Optional FM stereo coder with RDS signal generation capabilities (available for R&S®SMB-B101/-B102/-B103/-B106), can be used together with the R&S®UPV or R&S®UPP audio analyzer
EMC applications	Wide frequency range from 9 kHz to 6 GHz for wide coverage with only one source, for simplified EMC test setups
Test system integration	Offers multiple choices for remote interfaces: LAN, USB and GPIB
LO	LO substitution in various applications
General purpose	Test of components; R & D; laboratory equipment

R&S®SMB100A signal generator and options

Designation	Type	Order No.	Comments
Base unit			
Signal Generator Including power cable, quick start guide and CD-ROM (with operating and service manual)	R&S®SMB100A	1406.6000.02	base unit must be ordered together with an R&S®SMB-B101/-B102/-B103/-B106/-B112/-B112L/-B120/-B120L/-B140 or R&S®SMB-B140L frequency option
Options			
RF Path/Frequency Option			
9 kHz to 1.1 GHz	R&S®SMB-B101	1407.2509.02	
9 kHz to 2.2 GHz	R&S®SMB-B102	1407.2609.02	
9 kHz to 3.2 GHz	R&S®SMB-B103	1407.2709.02	
9 kHz to 6 GHz	R&S®SMB-B106	1407.2909.02	
100 kHz to 12.75 GHz, with electronic step attenuator	R&S®SMB-B112	1407.2109.02	
100 kHz to 12.75 GHz, without step attenuator	R&S®SMB-B112L	1407.2150.02	
100 kHz to 20 GHz, with mechanical step attenuator	R&S®SMB-B120	1407.2209.02	
100 kHz to 20 GHz, without step attenuator	R&S®SMB-B120L	1407.2250.02	
100 kHz to 40 GHz, with mechanical step attenuator	R&S®SMB-B140	1407.2309.02	
100 kHz to 40 GHz, without step attenuator	R&S®SMB-B140L	1407.2350.02	
OCXO Reference Oscillator	R&S®SMB-B1	1407.3005.02	only one of these options (R&S®SMB-B1 or R&S®SMB-B1H) can be installed
OCXO Reference Oscillator, high performance	R&S®SMB-B1H	1407.3070.02	
Stereo/RDS Coder	R&S®SMB-B5	1407.3205.02	only available with an R&S®SMB-B101, R&S®SMB-B102, R&S®SMB-B103 or R&S®SMB-B106 frequency option
Reverse Power Protection, 100 kHz to 12.75 GHz	R&S®SMB-B30	1407.1160.02	only available with an R&S®SMB-B112 or R&S®SMB-B112L frequency option
High Power Option			
10 MHz to 20 GHz (only available with R&S®SMB-B120/-B120L)	R&S®SMB-B31	1407.1260.02	
10 MHz to 40 GHz (only available with R&S®SMB-B140/-B140L)	R&S®SMB-B32	1407.1360.02	
Pulse Modulator for R&S®SMB-B112/-B112L/-B120/-B120L/-B140/-B140L	R&S®SMB-K21	1407.3811.02	
Pulse Modulator for R&S®SMB-B101/-B102/-B103/-B106	R&S®SMB-K22	1407.3770.02	
Pulse Generator	R&S®SMB-K23	1407.3786.02	
Pulse Train	R&S®SMB-K27	1407.3828.02	requires the R&S®SMB-K23 option; only available for instruments with serial number > 102400

HMF2525/HMF2550 25 MHz/50 MHz Arbitrary Function Generator

USB | RS-232 | USB Stick | optional TCP/IP | optional IEEE-488 | inclusive | Lab-VIEW

The new generation of HAMEG arbitrary function generators

▌ Frequency range: 10 µHz to 25/50 MHz
▌ Output voltage: 5 mV to 10 V (V_{pp}) (into 50 Ω), DC offset: ±5 mV to 5 V
▌ Arbitrary waveform generator: 250 Msample/s, 14 bit, 256 kpoint
▌ Sine, square, pulse, triangle, ramp, arbitrary waveforms incl. standard curves (white noise, cardiac, etc.)
▌ Total harmonic distortion of 0.04 % (f < 100 kHz)
▌ Burst, sweep, gating, external trigger
▌ Rise time < 8 ns, in pulse mode: 8 ns to 500 ns, variable edge time
▌ Pulse mode: frequency range from 100 µHz to 12.5/25 MHz, pulse width from 15 ns to 999 s, resolution of 5 ns
▌ Modulation modes: AM, FM, pulse, PWM, FSK (internal and external)
▌ 10 MHz timebase: ±1 ppm TCXO, rear I/O BNC connector
▌ Front USB connector: save and recall of waveforms and settings
▌ 8.9 cm (3.5") TFT: crisp representation of the waveform and all parameters
▌ USB/RS-232 dual interface, optionally Ethernet/USB or IEEE 488 (GPIB)

Models/options	
Designation	**Type**
25 MHz Arbitrary Function Generator	HMF2525
50 MHz Arbitrary Function Generator	HMF2550
Dual Ethernet/USB Interface	HO730
IEEE 488 (GPIB) Interface, galvanically isolated	HO740

Application	How the HAMEG HMF2525/HMF2550 meets your needs
Analog circuit design	▌ Low-noise amplifier ▌ Many predefined curves including white and pink noise ▌ Up to 10 V (V_{pp}) into 50 Ω load
Mixed signal design and debugging	▌ Pulse mode with adjustable rise time ▌ Sweep, burst mode ▌ Several modulations: AM, FM, pulse, PWM, FSK
Education and service	▌ Fast boot time ▌ Easy to use ▌ Lightweight

HM8135 3 GHz RF Synthesizer

RF synthesizer from the 8100 programmable measuring instruments series

▮ Frequency range: 1 Hz to 3 GHz
▮ Output power: −135 dBm to +13 dBm
▮ Frequency resolution of 1 Hz (accuracy 0.5 ppm)
▮ Input for external timebase (10 MHz)
▮ Modulation modes: AM, FM, pulse, φM, FSK, PSK
▮ Rapid pulse modulation: typ. 200 ns
▮ Internal modulator (sine wave, square wave, triangle, sawtooth): 10 Hz to 200 kHz
▮ High spectral purity
▮ 10 configuration memories including turn-on configuration
▮ Standard: TCXO (temperature stability: $\pm0.5 \times 10^{-6}$) Optional: OCXO (temperature stability: $\pm1 \times 10^{-8}$)
▮ Galvanically isolated USB/RS-232 interface, optionally IEEE 488 (GPIB)

Models/options	
Designation	**Type**
3 GHz RF Synthesizer	HM8135
OCXO	HO85
IEEE 488 (GPIB) Interface, galvanically isolated	HO880

Application	How the HAMEG HM8135 meets your needs
Analog RF circuit design	▮ Low-noise amplifier, high dynamic range, up to +13 dBm output power ▮ Clean sine wave due to high spectral purity
RF system design	▮ Sweep mode ▮ Several internal modulation types: sine wave, square wave, triangle, sawtooth up to 150 kHz ▮ Internal offset correction
Education and service	▮ Fast boot time ▮ Easy to use

Oscilloscopes and Probes

Type/designation	Bandwidth (–3 dB)	Number of channels	Max. sampling rate (realtime)	Memory depth	Input sensitivity
R&S®RTO digital oscilloscope	❚ 4 GHz ❚ 2 GHz ❚ 1 GHz ❚ 600 MHz	❚ 4 channels ❚ 2 channels	❚ 10 Gsample/s per channel ❚ R&S®RTO1044: 10 Gsample/s per channel; 20 Gsample/s with two active channels	❚ 20 Msample per channel ❚ Optionally up to 100 Msample per channel	❚ 50 Ω: 1 mV/div to 1 V/div ❚ 1 MΩ: 1 mV/div to 10 V/div
R&S®RTM digital oscilloscope	500 MHz	❚ 4 channels ❚ 2 channels	❚ 2.5 Gsample/s per channel ❚ 5 Gsample/s interleaved	❚ 4 Msample per channel ❚ 8 Msample interleaved	❚ 50 Ω: 1 mV/div to 1 V/div ❚ 1 MΩ: 1 mV/div to 10 V/div
HMO722/HMO724/ HMO1022/HMO1024 digital oscilloscope	❚ 70 MHz ❚ 100 MHz	❚ 2 channels ❚ 4 channels	❚ 1 Gsample/s per channel ❚ 2 Gsample/s interleaved	❚ 1 Msample per channel ❚ 2 Msample interleaved	❚ 1 MΩ: 1 mV/div to 10 V/div
HMO1522/HMO1524/ HMO2022/HMO2024 digital oscilloscope	❚ 150 MHz ❚ 200 MHz	❚ 2 channels ❚ 4 channels	❚ 1 Gsample/s per channel ❚ 2 Gsample/s interleaved	❚ 1 Msample per channel ❚ 2 Msample interleaved	❚ 50 Ω: 1 mV/div to 1 V/div ❚ 1 MΩ: 1 mV/div to 10 V/div
HMO2524 digital oscilloscope	❚ 250 MHz	4 channels	❚ 1.25 Gsample/s per channel ❚ 2.5 Gsample/s interleaved	❚ 2 Msample per channel ❚ 4 Msample interleaved	❚ 50 Ω: 1 mV/div to 5 V/div ❚ 1 MΩ: 1 mV/div to 5 V/div
HMO3522/HMO3524 digital oscilloscope	❚ 350 MHz	❚ 2 channels ❚ 4 channels	❚ 2 Gsample/s per channel ❚ 4 Gsample/s interleaved	❚ 2 Msample per channel ❚ 4 Msample interleaved	❚ 50 Ω: 1 mV/div to 5 V/div ❚ 1 MΩ: 1 mV/div to 5 V/div
Oscilloscope probes	see page 27				

R&S®RTO Digital Oscilloscope

Key facts
- 600 MHz, 1 GHz, 2 GHz and 4 GHz bandwidth, up to 20 Gsample/s sampling rate, up to 80 Msample standard memory depth
- 2 and 4 channel models
- Low-noise frontend – best in its class
- Full bandwidth even at 1 mV/div
- Single-core ADC delivers industry best ENOB of > 7 bit
- 1 million waveforms/s even when performing measurements and analysis
- Hardware-accelerated measurements
- Industry best trigger jitter < 1 ps (RMS)
- Triggering and decoding of serial protocols: I^2C, SPI, RS-232, UART, CAN, LIN, FlexRay
- Mixed signal analysis with the MSO option
- Software interface for acquisition and downconversion of I/Q data

DVI Output	USB Stick	TCP/IP	optional IEEE-488	inclusive	Lab-VIEW

Scope of the art: created to be unique

The R&S®RTO oscilloscopes combine excellent signal fidelity, high acquisition rate and the world's first realtime digital trigger system with a compact device format in the 600 MHz to 4 GHz class.

Models/options

Designation	Type	Order No.
Digital Oscilloscope, 600 MHz, 2 channels	R&S®RTO1002	1316.1000.02
Digital Oscilloscope, 600 MHz, 4 channels	R&S®RTO1004	1316.1000.04
Digital Oscilloscope, 1 GHz, 2 channels	R&S®RTO1012	1316.1000.12
Digital Oscilloscope, 1 GHz, 4 channels	R&S®RTO1014	1316.1000.14
Digital Oscilloscope, 2 GHz, 2 channels	R&S®RTO1022	1316.1000.22
Digital Oscilloscope, 2 GHz, 4 channels	R&S®RTO1024	1316.1000.24
Digital Oscilloscope, 4 GHz, 4 channels	R&S®RTO1044	1316.1000.44

Application	How the R&S®RTO meets your needs
Embedded design and debugging	- High acquisition rate to identify rare signal faults fast - Innovative trigger system for high accuracy and trigger flexibility - Hardware-accelerated measurement and analysis functions (e.g. histogram, mask testing) - Full vertical resolution of ADC for multiple waveforms thanks to multigrid display - Advanced triggering and decoding (I^2C, SPI, RS-232, UART) option - Mixed signal analysis - Powerful and user-friendly FFT-based spectrum analysis: ideal for time-frequency correlated measurements and EMI debugging - History view function - Intuitive user interface for most efficient work - Active probes with innovative features such as micro button and R&S®ProbeMeter - Low weight; lowest acoustic noise; compact lab instrument
Signal validation	- High signal fidelity provides additional measurement margin - Digital trigger for lowest trigger jitter in realtime - Lowest noise floor in its class - Active probe with premium specifications - Full bandwidth also for amplitude ranges ≤ 10 mV/div enables true representation of weak signals
Automotive electronics	- High signal fidelity for trustable measurement results - Advanced trigger and decode option for CAN/LIN/FlexRay interfaces - High acquisition rate to identify rare signal faults fast
Manufacturing test	- Comprehensive set of automated measurement functions - Fast remote interface covers complete function set of instrument - Installation in standard 19" racks possible - LXI class C support

R&S®RTO digital oscilloscope options

Designation	Type	Order No.
Hardware options		
MSO Option, 400 MHz, scope of the art	R&S®RTO-B1	1304.9901.03
OCXO 10 MHz	R&S®RTO-B4	1304.8305.02
GPIB Interface	R&S®RTO-B10	1304.8311.03
Replacement Hard Disk incl. firmware	R&S®RTO-B19	1304.8328.02
Memory Upgrade, 50 Msample per channel	R&S®RTO-B101	1304.8428.02
Memory Upgrade, 100 Msample per channel	R&S®RTO-B102	1304.8434.02
Software options		
I²C/SPI Triggering and Decoding	R&S®RTO-K1	1304.8511.02
RS-232/UART Serial Decoding	R&S®RTO-K2	1304.8528.02
CAN/LIN Triggering and Decoding	R&S®RTO-K3	1304.8534.02
FlexRay Triggering and Decoding	R&S®RTO-K4	1304.8540.02
I/Q Software Interface	R&S®RTO-K11	1317.2975.02
Probes		
500 MHz, passive, 10 :1, 10 MΩ, 9.5 pF, max. 400 V	R&S®RT-ZP10	1409.7550.00
400 MHz, passive, high-voltage, 100:1, 50 MΩ, 7.5 pF, 1 kV (RMS)	R&S®RT-ZH10	1409.7720.02
400 MHz, passive, high-voltage, 1000:1, 50 MΩ, 7.5 pF, 1 kV (RMS)	R&S®RT-ZH11	1409.7737.02
1.0 GHz, active, 1 MΩ, 0.8 pF	R&S®RT-ZS10E	1418.7007.02
1.0 GHz, active, 1 MΩ, 0.8 pF, micro button	R&S®RT-ZS10	1410.4080.02
1.5 GHz, active, 1 MΩ, 0.8 pF, micro button	R&S®RT-ZS20	1410.3502.02
3.0 GHz, active, 1 MΩ, 0.8 pF, micro button	R&S®RT-ZS30	1410.4309.02
1.5 GHz, active, differential, 1 MΩ, 0.6 pF, micro button	R&S®RT-ZD20	1410.4409.02
3.0 GHz, active, differential, 1 MΩ, 0.6 pF, micro button	R&S®RT-ZD30	1410.4609.02
10 MHz, current, AC/DC, 0.01 V/A, 150 A (RMS)	R&S®RT-ZC10	1409.7750.02
100 MHz, current, AC/DC, 0.1 V/A, 30 A (RMS)	R&S®RT-ZC20	1409.7766.02
Near-Field Probe Set	R&S®HZ-15	1147.2736.02
Probe accessories		
Accessory Set for R&S®RT-ZP10/R&S®RTM-ZP10	R&S®RT-ZA1	1409.7566.00
Spare Accessory Set for R&S®RT-ZS10/R&S®RT-ZS10E/R&S®RT-ZS20/R&S®RT-ZS30	R&S®RT-ZA2	1416.0405.02
Pin Set for R&S®RT-ZS10/R&S®RT-ZS10E/R&S®RT-ZS20/R&S®RT-ZS30	R&S®RT-ZA3	1416.0411.02
Mini Clips	R&S®RT-ZA4	1416.0428.02
Micro Clips	R&S®RT-ZA5	1416.0434.02
Lead Set	R&S®RT-ZA6	1416.0440.02
Pin Set for R&S®RT-ZD20/R&S®RT-ZD30	R&S®RT-ZA7	1417.0609.02
N-Type Adapter for R&S®RT-Zxx Probes	R&S®RT-ZA9	1417.0909.02
SMA Adapter	R&S®RT-ZA10	1416.0457.02
Probe Power Supply	R&S®RT-ZA13	1409.7789.02
20 dB Preamplifier for R&S®HZ-15	R&S®HZ-16	1147.2720.02
Accessories		
Front Cover	R&S®RTO-Z1	1304.9101.02
Soft Case for R&S®RTO oscilloscopes and accessories	R&S®RTO-Z3	1304.9118.02
Rackmount Kit	R&S®ZZA-RTO	1304.8286.00

R&S®RTM Digital Oscilloscope

DVI Output | USB | USB Stick | TCP/IP | optional IEEE-488 | inclusive

Scope of the art: compact, precise, versatile

Due to its excellent measurement properties and wide variety of practical functions, the R&S®RTM oscilloscope facilitates daily work, both in product development and service.
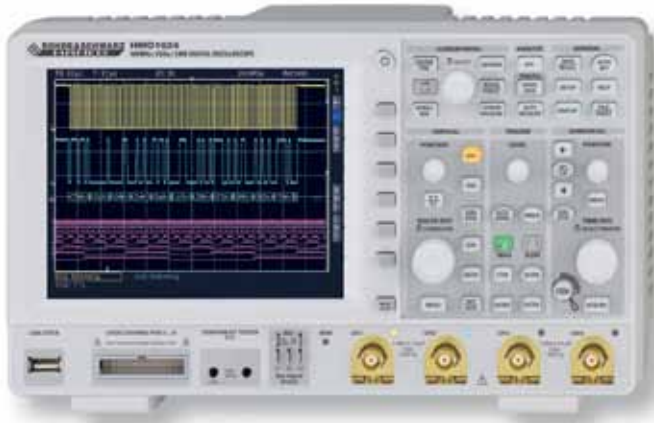
Key facts

- 500 MHz bandwidth, up to 5 Gsample/s sampling rate, up to 8 Msample memory depth
- 2 and 4 channel models
- Excellent measurement accuracy due to low-noise frontends
- Input sensitivity down to 1 mV/div at full bandwidth
- High-resolution XGA display
- QuickMeas – key results at the push of a button
- Extensive cursor-based measurement functions
- Triggering and decoding of serial protocols
- High-performance probes with extensive accessories

Models/options

Designation	Type	Order No.
Digital Oscilloscope, 2 channels	R&S®RTM1052	1305.0008.52
Digital Oscilloscope, 4 channels	R&S®RTM1054	1305.0008.54
Probes		
500 MHz, passive, 10:1, 10 MΩ, ~ 10 pF, max. 400 V	R&S®RTM-ZP10	1409.7708.02
1.0 GHz, active, 1 MΩ, 0.8 pF, R&S®ProbeMeter, micro button	R&S®RT-ZS10	1410.4080.02
1.0 GHz, active, 1 MΩ, 0.8 pF	R&S®RT-ZS10E	1418.7007.02

Application	How the R&S®RTM meets your needs
General debugging and analysis	- QuickMeas – key results at the push of a button - Extensive cursor-based measurements - Versatile selection of signal acquisition modes - "Smooth" mode for smoothing non-periodic signals - Extensive triggering options for keeping track of important signal events - Intuitive user interface for highest efficiency - Active probes with innovative features, e.g. micro button and R&S®ProbeMeter - Low weight/compact lab instrument
Signal validation	- Lowest noise floor in its class: excellent measurement accuracy - Full bandwidth even at an amplitude range of 1 mV/div enables true representation of weak signals - No crosstalk due to good channel-to-channel isolation - Active probes with premium specifications
Production testing	- Comprehensive set of automated measurement functions - Remote interface covering complete function set of instrument - Installation in standard 19" racks possible
Service, maintenance and education	- Ideal for general-purpose measurements - Simple operation - Lightweight and portable - Short start-up time
Embedded design	- Advanced trigger and decode (I^{2}C, SPI, RS-232, UART) options

HMO722/HMO724/HMO1022/HMO1024 70/100 MHz 2/4 Channel Digital Oscilloscope

DVI Output | USB | USB Stick | optional TCP/IP | optional IEEE-488 | inclusive | 6,5" VGA 16,5cm | Lab-VIEW

Digital mixed signal oscilloscope

▪ 2 Gsample/s realtime, low-noise flash A/D converter (reference class)
▪ 2 Mpoint memory, memory zoom up to 50 000:1
▪ Mixed signal option (HO3508) with 8 logic channels
▪ Serial bus trigger and hardware-accelerated decode option incl. list view, I²C, SPI, UART/RS-232, CAN, LIN
▪ Automatic search for user-defined events
▪ Pass/fail test based on masks
▪ Vertical sensitivity: 1 mV/div
▪ 12 division x-axis display range, 20 division y-axis display range (virtual screen)
▪ Trigger modes: slope, video, pulse width, logic, delayed, event
▪ Component tester, 6-digit counter, automeasurement: max. 6 parameters incl. statistic, formula editor, ratio cursor, FFT: 64 kpoint
▪ Crisp 16.5 cm (6.5") TFT VGA display, DVI output
▪ Lowest-noise fan
▪ 3 × USB for mass storage, printer and remote control, optionally IEEE 488 (GPIB) or Ethernet/USB

Models/options

Designation	Type
70 MHz 2 Channel Digital Oscilloscope	HMO722
70 MHz 4 Channel Digital Oscilloscope	HMO724
100 MHz 2 Channel Digital Oscilloscope	HMO1022
100 MHz 4 Channel Digital Oscilloscope	HMO1024
Serial Bus Trigger and Hardware-Accelerated Decode Option, I²C, SPI, UART/RS-232 on logic channels and analog channels	HOO10
Serial Bus Trigger and Hardware-Accelerated Decode Option, I²C, SPI, UART/RS-232 on analog channels	HOO11
Serial Bus Trigger and Hardware-Accelerated Decode Option, CAN, LIN on logic channels and analog channels	HOO12
Dual Ethernet/USB Interface	HO730
IEEE 488 (GPIB) Interface, galvanically isolated	HO740

Application	How the HAMEG HMO722/HMO724/HMO1022/HMO1024 meets your needs
Analog circuit design	▪ Low-noise amplifier and A/D converter ▪ 1 mV/div sensitivity
Embedded design and debugging	▪ Up to 8 logic channels ▪ Option for triggering and decoding of I²C, SPI, UART/RS-232, CAN, LIN serial protocols
Power analysis	▪ Advanced math as standard, math on math possible
Education and service	▪ Fast boot time ▪ Easy to use ▪ Lightweight ▪ DVI output as standard for connection to data projector or external monitor

HMO1522/HMO1524/HMO2022/HMO2024 150/200 MHz 2/4 Channel Digital Oscilloscope

| DVI Output | USB | USB Stick | optional TCP/IP | optional IEEE-488 | inclusive | 6,5" VGA 16,5cm | Lab-VIEW |

Digital mixed signal oscilloscope

- 2 Gsample/s realtime, low-noise flash A/D converter (reference class)
- 2 Mpoint memory, memory zoom up to 50 000:1
- Mixed signal option (HO3508) with 8 logic channels
- Serial bus trigger and hardware-accelerated decode option incl. list view, I²C, SPI, UART/RS-232, CAN, LIN
- Automatic search for user-defined events
- Pass/fail test based on masks
- Vertical sensitivity: 1 mV/div, offset control: ±0.2 V to ±20 V
- 12 division x-axis display range, 20 division y-axis display range (virtual screen)
- Trigger modes: slope, video, pulse width, logic, delayed, event
- Component tester, 6-digit counter, automeasurement: max. 6 parameters incl. statistic, formula editor, ratio cursor, FFT: 64 kpoint
- Crisp 16.5 cm (6.5") TFT VGA display, DVI output
- Lowest-noise fan
- 3 × USB for mass storage, printer and remote control, optionally IEEE 488 (GPIB) or Ethernet/USB
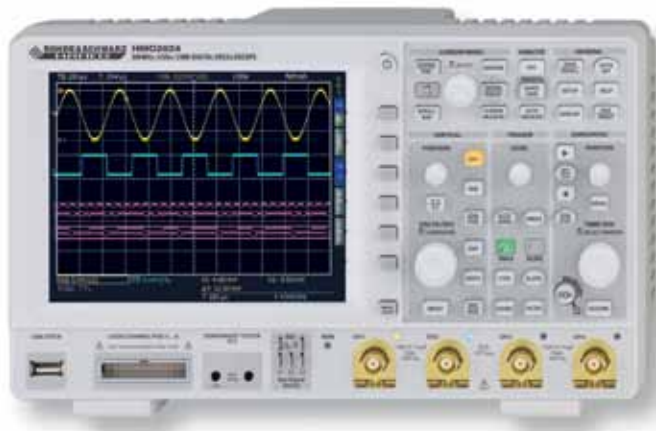
Models/options	
Designation	**Type**
150 MHz 2 Channel Digital Oscilloscope	HMO1522
150 MHz 4 Channel Digital Oscilloscope	HMO1524
200 MHz 2 Channel Digital Oscilloscope	HMO2022
200 MHz 4 Channel Digital Oscilloscope	HMO2024
Serial Bus Trigger and Hardware-Accelerated Decode Option, I²C, SPI, UART/RS-232 on logic channels and analog channels	HOO10
Serial Bus Trigger and Hardware-Accelerated Decode Option, I²C, SPI, UART/RS-232 on analog channels	HOO11
Serial Bus Trigger and Hardware-Accelerated Decode Option, CAN, LIN on logic channels and analog channels	HOO12
Dual Ethernet/USB Interface	HO730
IEEE 488 (GPIB) Interface, galvanically isolated	HO740

Application	How the HAMEG HMO1522/HMO1524/HMO2022/HMO2024 meets your needs
Analog circuit design	- Low-noise amplifier and A/D converter - 1 mV/div sensitivity
Embedded design and debugging	- Up to 8 logic channels - Option for triggering and decoding of I²C, SPI, UART/RS-232, CAN, LIN serial protocols
Power analysis	- Advanced math as standard, math on math possible
Education and service	- Fast boot time - Easy to use - Lightweight - DVI output as standard for connection to data projector or external monitor

HMO2524
250 MHz 4 Channel Digital Oscilloscope

| DVI Output | USB | USB Stick | optional TCP/IP | optional IEEE-488 | inclusive | 6,5" VGA 16,5cm | Lab-VIEW |

Digital mixed signal oscilloscope

▮ 2.5 Gsample/s realtime, 25 Gsample/s random sampling, low-noise flash A/D converter (reference class)
▮ 4 Mpoint memory, memory zoom up to 100 000:1
▮ Mixed signal option (HO3508/HO3516) with 8/16 logic channels
▮ Serial bus trigger and hardware-accelerated decode option incl. list view, I²C, SPI, UART/RS-232, CAN, LIN
▮ Automatic search for user-defined events
▮ Pass/fail test based on masks
▮ Vertical sensitivity: 1 mV/div, offset control: ±0.2 V to ±20 V
▮ 12 division x-axis display range, 20 division y-axis display range (virtual screen)
▮ Trigger modes: slope, video, pulse width, logic, delayed, event
▮ Component tester, 6-digit counter, automeasurement: max. 6 parameters incl. statistic, formula editor, ratio cursor, FFT: 64 kpoint
▮ Crisp 16.5 cm (6.5") TFT VGA display, DVI output
▮ Lowest-noise fan
▮ 3 × USB for mass storage, printer and remote control, optionally IEEE 488 (GPIB) or Ethernet/USB

Models/options	
Designation	**Type**
250 MHz 4 Channel Digital Oscilloscope	HMO2524
Serial Bus Trigger and Hardware-Accelerated Decode Option, I²C, SPI, UART/RS-232 on logic channels and analog channels	HOO10
Serial Bus Trigger and Hardware-Accelerated Decode Option, I²C, SPI, UART/RS-232 on analog channels	HOO11
Serial Bus Trigger and Hardware-Accelerated Decode Option, CAN, LIN on logic channels and analog channels	HOO12
Dual Ethernet/USB Interface	HO730
IEEE 488 (GPIB) Interface, galvanically isolated	HO740

Application	How the HAMEG HMO2524 meets your needs
Analog circuit design	▮ Low-noise amplifier and A/D converter ▮ 1 mV/div sensitivity
Embedded design and debugging	▮ Up to 16 logic channels ▮ Option for triggering and decoding of I²C, SPI, UART/RS-232, CAN, LIN serial protocols
Power analysis	▮ Advanced math as standard, math on math possible
Education and service	▮ Fast boot time ▮ Easy to use ▮ Lightweight ▮ DVI output as standard for connection to data projector or external monitor

HMO3522/HMO3524
350 MHz 2/4 Channel Digital Oscilloscope

| DVI Output | USB | USB Stick | optional TCP/IP | optional IEEE-488 | inclusive | 6,5" VGA 16,5cm | Lab-VIEW |

Digital mixed signal oscilloscope

▮ 4 Gsample/s realtime, 50 Gsample/s random sampling, low-noise flash A/D converter (reference class)
▮ 4 Mpoint memory, memory zoom up to 100 000:1
▮ Mixed signal option (HO3508/HO3516) with 8/16 logic channels
▮ Serial bus trigger and hardware-accelerated decode option incl. list view, I²C, SPI, UART/RS-232, CAN, LIN
▮ Automatic search for user-defined events
▮ Pass/fail test based on masks
▮ Vertical sensitivity: 1 mV/div, offset control: ±0.2 V to ±20 V
▮ 12 division x-axis display range, 20 division y-axis display range (virtual screen)
▮ Trigger modes: slope, video, pulse width, logic, delayed, event
▮ Component tester, 6-digit counter, automeasurement: max. 6 parameters incl. statistic, formula editor, ratio cursor, FFT: 64 kpoint
▮ Crisp 16.5 cm (6.5") TFT VGA display, DVI output
▮ Lowest-noise fan
▮ 3 × USB for mass storage, printer and remote control, optionally IEEE 488 (GPIB) or Ethernet/USB

Models/options	
Designation	**Type**
350 MHz 2 Channel Digital Oscilloscope	HMO3522
350 MHz 4 Channel Digital Oscilloscope	HMO3524
Serial Bus Trigger and Hardware-Accelerated Decode Option, I²C, SPI, UART/RS-232 on logic channels and analog channels	HOO10
Serial Bus Trigger and Hardware-Accelerated Decode Option, I²C, SPI, UART/RS-232 on analog channels	HOO11
Serial Bus Trigger and Hardware-Accelerated Decode Option, CAN, LIN on logic channels and analog channels	HOO12
Dual Ethernet/USB Interface	HO730
IEEE 488 (GPIB) Interface, galvanically isolated	HO740

Application	How the HAMEG HMO3522/HMO3524 meets your needs
Analog circuit design	▮ Low-noise amplifier and A/D converter ▮ 1 mV/div sensitivity
Embedded design and debugging	▮ Up to 16 logic channels ▮ Option for triggering and decoding of I²C, SPI, UART/RS-232, CAN, LIN serial protocols
Power analysis	▮ Advanced math as standard, math on math possible
Education and service	▮ Fast boot time ▮ Easy to use ▮ Lightweight ▮ DVI output as standard for connection to data projector or external monitor

Oscilloscope Probes

	Scope series	R&S®RTO				R&S®RTM	HMO					
	Model	1044	1022/4	1012/4	1002/4	1052/4	3522/4	2524	2022/4	1522/4	1022/4	722/4
	Bandwidth	4 GHz	2 GHz	1 GHz	600 MHz	500 MHz	350 MHz	250 MHz	200 MHz	150 MHz	100 MHz	70 MHz
Passive probes												
R&S®RT-ZP10	500 MHz	■	■	■	■	○	○	○	○	○	○	○
R&S®RTM-ZP10	500 MHz	○	○	○	○	■	○	○	○	○	○	○
HZ355	500 MHz	○	○	○	○	○	●	●	○	○	○	○
HZ350	350 MHz	○	○	○	○	○	■	■	○	○	○	○
HZO10	250 MHz	○	○	○	○	○	○	○	■	■	○	○
HZ52	250 MHz	○	○	○	○	○	○	○	○	○	○	○
HZ51	150 MHz	○	○	○	○	○	○	○	○	○	○	○
HZ154	10/100 MHz	○	○	○	○	○	○	○	○	○	■	■
Active probes												
R&S®RT-ZS30	3 GHz	○	●	○	○	○						
R&S®RT-ZS20	1.5 GHz	○	○	●	○	○						
R&S®RT-ZS10	1 GHz	○	○	○	●	●						
R&S®RT-ZS10E	1 GHz	○	○	○	●	●						
HZO30	1 GHz						●	●	●	●	●	●
Differential probes												
R&S®RT-ZD40	4.5 GHz	●	○	○	○	○						
R&S®RT-ZD30	3 GHz	○	●	○	○	○						
R&S®RT-ZD20	1.5 GHz	○	○	●	●	●						
HZO41	800 MHz	○	○	○	○	○	●	●	●	○	○	○
HZO40	200 MHz	○	○	○	○	○	○	○	○	●	●	○
HZ109	30/40 MHz	○	○	○	○	○	○	○	○	○	○	●
High-voltage probes												
R&S®RT-ZH11	1000x	●	●	●	●	●	○	○	○	○	○	○
R&S®RT-ZH10	100x	●	●	●	●	●	○	○	○	○	○	○
HZO20	1000x	○	○	○	○	○	●	●	●	●	●	●
HZ53	100x	○	○	○	○	○	●	●	●	●	●	●
High-voltage differential probes												
HZ115	1000 V (V_{diff})	○	○	○	○	○	●	●	●	●	●	●
HZ100	700 V (V_{diff})	○	○	○	○	○	●	●	●	●	●	●
Current probes												
R&S®RT-ZC10 [1]	±150 A (RMS)	●	●	●	●	●	○	○	○	○	○	○
R&S®RT-ZC20 [1]	±30 A (RMS)	●	●	●	●	●	○	○	○	○	○	○
HZO51	±100 A (RMS)	○	○	○	○	○	●	●	●	●	●	●
HZO50	±20 A (RMS)	○	○	○	○	○	●	●	●	●	●	●
EMI probe sets												
R&S®HZ-15	30 MHz to 3 GHz	●	●	●	●							

■ Standard delivery. One probe per oscilloscope channel.
● Recommended. Available as an option.
○ Compatible. System bandwidth may be limited on probe or base unit. Manual configuration on oscilloscope may be necessary for compensation.

[1] R&S®RT-ZA13 power supply necessary.

Power Meters and Voltmeters

Type/designation	Frequency range	Power range	Accuracy
R&S®NRP2 **power meter**	DC to 67 GHz (depending on sensor)	–67 dBm to +45 dBm (depending on sensor)	
Universal power sensors			
R&S®NRP-Z11	10 MHz to 8 GHz	200 pW to 200 mW (–67 dBm to +23 dBm)	0.058 dB
R&S®NRP-Z21	10 MHz to 18 GHz	200 pW to 200 mW (–67 dBm to +23 dBm)	0.058 dB
R&S®NRP-Z31	10 MHz to 33 GHz	200 pW to 200 mW (–67 dBm to +23 dBm)	0.149 dB
R&S®NRP-Z22	10 MHz to 18 GHz	2 nW to 2 W (–57 dBm to +33 dBm)	0.085 dB
R&S®NRP-Z23	10 MHz to 18 GHz	20 nW to 15 W (–47 dBm to +42 dBm)	0.087 dB
R&S®NRP-Z24	10 MHz to 18 GHz	60 nW to 30 W (–42 dBm to +45 dBm)	0.088 dB
Thermal power sensors			
R&S®NRP-Z51	DC to 18 GHz	1 µW to 100 mW (–30 dBm to +20 dBm)	0.061 dB
R&S®NRP-Z52	DC to 33 GHz	300 nW to 100 mW (–35 dBm to +20 dBm)	0.068 dB
R&S®NRP-Z55	DC to 40 GHz	300 nW to 100 mW (–35 dBm to +20 dBm)	0.068 dB
R&S®NRP-Z56	DC to 50 GHz	300 nW to 100 mW (–35 dBm to +20 dBm)	0.055 dB
R&S®NRP-Z57	DC to 67 GHz	300 nW to 100 mW (–35 dBm to +20 dBm)	0.055 dB
Wideband power sensors			
R&S®NRP-Z81	50 MHz to 18 GHz	1 nW to 100 mW (–60 dBm to +20 dBm)	0.13 dB
R&S®NRP-Z85	50 MHz to 40 GHz	1 nW to 100 mW (–60 dBm to +20 dBm)	0.13 dB
R&S®NRP-Z86	50 MHz to 40 GHz	1 nW to 100 mW (–60 dBm to +20 dBm)	0.13 dB
Average power sensors			
R&S®NRP-Z91	9 kHz to 6 GHz	200 pW to 200 mW (–67 dBm to +23 dBm)	0.058 dB
R&S®NRP-Z92	9 kHz to 6 GHz	2 nW to 2 W (–57 dBm to +33 dBm)	0.085 dB
Basic power meter			
HM8115-2	DC to 1 kHz	1 mW to 8 kW	n.a.

R&S®NRP Power Meter Family

The ultimate solution for power measurements
The R&S®NRP power meter family is ideal for a vast number of applications in R&D, production, maintenance and calibration laboratories.

Accurate determination of RF power is one of the most challenging tasks in the field of electrical test and measurement. The R&S®NRP2 power meter is ideal for a vast number of applications in R&D, production, maintenance and calibration labs. In addition to the R&S®NRP2 base unit, there are a number of sensors available to perform diverse measurements. Complex signals with digital modulation (e.g. as required by advanced mobile radio standards such as WCDMA and WiMAX™) are handled as easily as are CW signals, carriers with analog modulation (e.g. AM, FM) and pulsed RF.

Each R&S®NRP-Zxx sensor is an independent test instrument and can be operated directly via USB. The sensors are typically connected using the R&S®NRP-Z4 passive USB adapter. Regardless of the type, no calibration is required prior to making measurements, since calibration data is stored directly in the sensor at the factory.

Key facts
- Power measurements with a base unit or with the cost-efficient USB power sensors alone
- Average, peak and peak-to-average power measurements from DC to 67 GHz
- Versatile USB power sensors with superior performance
- Accurate measurements for GSM/EDGE, 3G, WLAN, WiMAX™, LTE and beyond
- Solutions for radar and EMC applications
- Ultrafast statistical analysis
- Flexible use with Rohde&Schwarz signal generators, signal analyzers and network analyzers

R&S®NRP2 Power Meter

USB | TCP/IP | IEEE-488

Versatile and user-friendly
The R&S®NRP2 base unit was designed to be as versatile and easy to operate as possible.

Key facts
- Small, lightweight, ruggedized base unit for production, laboratory and mobile applications
- Simple operation due to window-based graphical user interface
- Presets for fast, standard-compliant measurements
- Simultaneous operation of up to four sensors (with the R&S®NRP-B2 and R&S®NRP-B5 options)
- Remote operation via Ethernet, GPIB or USB
- Sensor check source (R&S®NRP-B1 option)

Models/options

Designation	Type	Order No.
Power Meter (base unit)	R&S®NRP2	1144.1374.02
Sensor Check Source	R&S®NRP-B1	1146.9008.02
Second Sensor Input (B)	R&S®NRP-B2	1146.8801.02
3rd and 4th Sensor Inputs (C, D)	R&S®NRP-B5	1146.9608.02
Rear-Panel Sensor Inputs A and B	R&S®NRP-B6	1146.9908.02

Applications	How the R&S®NRP-Zxx meet your needs
- Power measurements on base stations and mobile equipment - Measurement of pulsed radar signals - EMC applications - Design and production of components (e.g. power amplifiers) - Statistical analysis of signals - Antenna measurements - Calibration of test and measurement equipment - External level correction for signal generators	- Rohde&Schwarz is the world's most experienced supplier of USB power sensors – this means reliable, mature products that also meet future needs, and less investment risk - USB sensors without compromises – the R&S®NRP-Zxx power sensors are USB sensors that can be used standalone and have no downside in terms of versatility, accuracy and functionality - R&S®Smart Sensor Technology™ makes it possible to achieve higher accuracy compared to classic designs for sensor and base unit - Wide variety of sensors – the right sensor for every application - Measurements that are both fast and accurate – high throughput paired with measurement results that can be trusted

R&S®NRP-Z11/-Z2x/-Z31
Universal Power Sensors

R&S®NRP-Z23 universal power sensor.

R&S®NRP-Z22 universal power sensor.

True universal power sensors for a vast number of applications

With a dynamic range of up to 90 dB for measurements of CW and modulated signals and a maximum power of up to +23 dBm, the R&S®NRP-Z11/-Z2x/-Z31 universal power sensors are very useful instruments for a vast number of measurement tasks.

Key facts
ı Innovative three-path diode power sensor with enhanced inter-range performance
ı 90 dB dynamic range for CW and modulated signals
ı Continuous average, burst average, timeslot average, time gating and trace mode supported (video bandwidth 100 kHz)
ı Automatic burst detection and acquisition
ı Up to 1500 measurements/s (buffered mode)
ı Low sensitivity to harmonics

Models/options		
Designation	**Type**	**Order No.**
Universal Power Sensors		
200 pW to 200 mW, 10 MHz to 8 GHz	R&S®NRP-Z11	1138.3004.02
200 pW to 200 mW, 10 MHz to 18 GHz	R&S®NRP-Z21	1137.6000.02
2 nW to 2 W, 10 MHz to 18 GHz	R&S®NRP-Z22	1137.7506.02
20 nW to 15 W, 10 MHz to 18 GHz	R&S®NRP-Z23	1137.8002.02
60 nW to 30 W, 10 MHz to 18 GHz	R&S®NRP-Z24	1137.8502.02
200 pW to 200 mW, 10 MHz to 33 GHz	R&S®NRP-Z31	1169.2400.02
USB Adapter (active)	R&S®NRP-Z3	1146.7005.02
USB Adapter (passive)	R&S®NRP-Z4	1146.8001.02
USB Sensor Hub	R&S®NRP-Z5	1146.7740.02

R&S®NRP-Z5x Thermal Power Sensors

R&S®NRP-Z55 thermal power sensor.

Highly accurate continuous average power measurements

The R&S®NRP-Z5x thermal power sensors with their outstanding accuracy (linearity uncertainty < 0.007 dB) are ideal for very demanding reference applications independent of the signal modulation type.

Key facts
ı Ideal for very demanding reference applications
ı Industry-proven DC-coupled thermoelectric test cell
ı Level range from –35 dBm to +20 dBm
ı Linearity uncertainty < 0.007 dB

Models/options		
Designation	**Type**	**Order No.**
Thermal Power Sensors		
1 µW to 100 mW, DC to 18 GHz	R&S®NRP-Z51	1138.0005.02
300 nW to 100 mW, DC to 33 GHz	R&S®NRP-Z52	1138.0505.02
300 nW to 100 mW, DC to 40 GHz	R&S®NRP-Z55	1138.2008.03
300 nW to 100 mW, DC to 50 GHz	R&S®NRP-Z56	1171.8201.02
300 nW to 100 mW, DC to 67 GHz	R&S®NRP-Z57	1171.8401.02
USB Adapter (active)	R&S®NRP-Z3	1146.7005.02
USB Adapter (passive)	R&S®NRP-Z4	1146.8001.02
USB Sensor Hub	R&S®NRP-Z5	1146.7740.02

R&S®NRP-Z8x Wideband Power Sensors

R&S®NRP-Z81 wideband power sensor.

Peak power measurements of radar and wireless communications signals

The R&S®NRP-Z8x wideband power sensors are ideal for the time domain analysis of pulses. With their 30 MHz bandwidth and typical rise time of 11 ns, they can easily handle steep edges.

Key facts

❚ Automatic burst detection and acquisition
❚ Ultrafast statistical analysis (one-million point CCDF within < 25 ms)
❚ Accurate continuous power measurements on modulated and unmodulated signals in the range from –60 dBm to +20 dBm
❚ High measurement repeatability due to very low zero drift of < 150 nW for single-shot events and statistics, < 2 nW for repetitive measurements

Models/options		
Designation	**Type**	**Order No.**
Wideband Power Sensors, 1 nW to 100 mW		
50 MHz to 18 GHz	R&S®NRP-Z81	1137.9009.02
50 MHz to 40 GHz (2.92 mm)	R&S®NRP-Z85	1411.7501.02
50 MHz to 40 GHz (2.40 mm)	R&S®NRP-Z86	1417.0109.40
USB Adapter (active)	R&S®NRP-Z3	1146.7005.02
USB Adapter (passive)	R&S®NRP-Z4	1146.8001.02
USB Sensor Hub	R&S®NRP-Z5	1146.7740.02

R&S®NRP-Z9x Average Power Sensors

R&S®NRP-Z91 average power sensor.

Specially designed for EMC applications

Covering the measurement ranges that are used in radiotelecommunications (up to 6 GHz) as well as the important lower frequency bands (down to 9 kHz), the R&S®NRP-Z9x average power sensors are the ideal solution for EMC applications.

Key facts

❚ Measurement of continuous average power
❚ 90 dB dynamic range for CW and modulated signals
❚ Low sensitivity to harmonics

Models/options		
Designation	**Type**	**Order No.**
Average Power Sensors		
200 pW to 200 mW, 9 kHz to 6 GHz	R&S®NRP-Z91	1168.8004.02
2 nW to 2 W, 9 kHz to 6 GHz	R&S®NRP-Z92	1171.7005.02
USB Adapter (active)	R&S®NRP-Z3	1146.7005.02
USB Adapter (passive)	R&S®NRP-Z4	1146.8001.02
USB Sensor Hub	R&S®NRP-Z5	1146.7740.02

HM8115-2 8 kW Power Meter

Key facts
- Wide measurement range from 1 mW to 8 kW
- Voltage range from 100 mV to 500 V, current range from 1 mA to 16 A
- Frequency range from DC to 1 kHz
- Software for remote control and data acquisition included
- Galvanically isolated USB/RS-232 interface, optionally IEEE 488 (GPIB)

Models

Designation	Type
8 kW Power Meter	HM8115-2

Application	How the HAMEG HM8115-2 meets your needs
▪ Engineering lab ▪ Production environment	▪ Simultaneous voltage, current and power display ▪ Display of apparent, active and reactive power ▪ Power factor display ▪ Autoranging, simple operation ▪ Monitor output (BNC) representing the instantaneous power ▪ Suitable for measurements on frequency converters

Network Analyzers

Type/designation	Frequency range	Dynamic range	SPA functionality	Key aspects	Portability
R&S®ZVL vector network analyzer	❚ 9 kHz to 3/6/13.6 GHz (specified, depending on model) ❚ 5 kHz to 3/6/15 GHz (unspecified, depending on model)	❚ Dynamic range > 115 dB, typ. 123 dB [1] ❚ Receiver step attenuators 0 dB to 30 dB (5 dB steps)	❚ Switching between VNA, SPA and other modes with a key-stroke ❚ VNA, SPA and power measurements in a single instrument ❚ Checking of a high number of parameters without disconnecting and reconnecting ❚ AM/FM/φM demodulation ❚ Noise measurements ❚ Spectrogram ❚ Cable TV ❚ 3GPP, WLAN, WiMAX™ ❚ Various interfaces ❚ Displayed average noise level (DANL) 　・ < –140 dBm (1 Hz, preamplifier off) [1] 　・ < –156 dBm (1 Hz, preamplifier on) [1] 　・ typ. –163 dBm (1 Hz, preamplifier on) [1]	❚ High number of traces and channels ❚ 2 to 4001 data points (per trace) ❚ Output power (typ.) –60 dBm to +10 dBm [1] ❚ Measurement bandwidth (IFBW) 10 Hz to 500 kHz	❚ Portable ❚ Battery pack ❚ 12 V to 28 V power supply ❚ Low weight (< 7 kg/15.4 lb) ❚ Small and compact (37 cm/14.6 in depth) ❚ Optional internal battery or 12 V car supply system ❚ Shock-resistant housing and ergonomic carrying handle
R&S®ZVH cable and antenna analyzer	100 kHz to 3.6/8 GHz (depending on model)	❚ < –141 dBm (1 Hz), typ. –146 dBm (1 Hz) ❚ < –161 dBm (1 Hz), typ. –165 dBm (1 Hz) with preamplifier	❚ > +7 dBm (f < 300 MHz) ❚ > +10 dBm (300 MHz to 3.6 GHz) ❚ > +3 dBm (3.6 GHz to 8 GHz)	1 Hz to 3 MHz in 1/3 sequence	❚ Handheld ❚ Ruggedized ❚ Low weight (3 kg/ 6.6 lb with battery) ❚ Up to 4.5 h battery-powered operation ❚ Ideal for field applications

[1] In selected frequency subrange, depending on model.

R&S®ZVL Vector Network Analyzer

The cost-efficient compact class in network analysis

The R&S®ZVL is a compact, powerful network analyzer that also meets future needs and is therefore ideal for use in development, production and service.

Key facts

- Network analyzer, spectrum analyzer and power meter in a single box
- Digital communications standards
- Bidirectional test set for displaying all four S-parameters
- R&S®ZVL3-75: 75 Ω vector network analyzer for TV and CATV measurements
- Multitrace display for displaying all relevant parameters
- Distance-to-fault measurement for detecting cable faults
- Time domain analysis
- Operation with mouse or hardkeys/softkeys; convenient user interface with wizards and context menus
- Undo/Redo softkey for reversing up to six preceding operating steps
- USB connector for R&S®NRP-Zxx power sensors for precise power measurements
- DVI-D connector for external monitor

Models/options

Designation	Type	Order No.
Vector Network Analyzer		
3 GHz, 2 ports, 50 Ω	R&S®ZVL3	1303.6509.03
6 GHz, 2 ports, 50 Ω	R&S®ZVL6	1303.6509.06
13.6 GHz, 2 ports, 50 Ω	R&S®ZVL13	1303.6509.13
3 GHz, 2 ports, 75 Ω	R&S®ZVL3-75	1303.6509.75
OCXO Reference Frequency	R&S®FSL-B4	1300.6008.02
Additional Interfaces	R&S®FSL-B5	1300.6108.02
GPIB Interface	R&S®FSL-B10	1300.6208.02
Spectrum Analysis	R&S®ZVL-K1	1306.0301.02
Power Sensor Support	R&S®FSL-K9	1301.9530.02

Application	How the R&S®ZVL meets your needs
Measurements on filters, cables and amplifiers	∎ Full two-port bidirectional test set to display all four S-parameters of a two-port DUT for complete device characterization ∎ Power range (typ.) from –60 dBm to +10 dBm ∎ Noise figure measurement option ∎ Time domain and distance-to-fault option ∎ Spectrum analysis function to measure output spectrum, TOI and ACP
Measurement on TV and CATV 75 Ω components and signals	∎ R&S®ZVL3-75: 75 Ω vector network analyzer with easy exchange of damaged inner conductors of test ports ∎ Cable TV measurement option to analyze analog and digital TV signals on TV networks and transmitters
EMC, wireless communications and satellite applications	∎ With its frequency range from 9 kHz to 13.6 GHz (typ. 5 kHz to 15 GHz), the R&S®ZVL covers the frequency range for EMC, wireless communications and satellite applications
Power measurement	∎ The R&S®FSL-K9 option expands the R&S®ZVL to a high-precision RF power meter when used with R&S®NRP-Zxx power sensors
Full spectrum analysis	∎ Spectrum analyzer option with a wide scope of functions
Field use	∎ Ruggedized housing ∎ Compact size, low weight ∎ Easy to use ∎ Battery-operated with easy-to-replace battery ∎ SD memory card for storing thousands of measurements results ∎ Excellent handling in the field due to portrait form factor

R&S®ZVH
Cable and Antenna Analyzer

Key facts
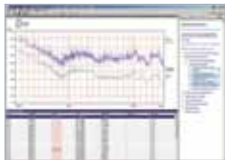
- Perfect tool for cable and antenna installation
- Frequency range from 100 kHz to 3.6 GHz or 8 GHz
- Easy operation with user-configurable test sequences (wizard)
- 100 dB (typ.) dynamic range for filter and antenna isolation measurements
- Built-in DC voltage supply (bias) for active components such as amplifiers
- Distance-to-fault, reflection and cable loss measurements
- Vector network analyzer, vector voltmeter, transmission measurement, spectrum analyzer and power meter option
- Saving of measurement results on SD memory card or USB memory stick
- Easy-to-replace lithium-ion battery for up to 4.5 h of operation
- Rugged, splashproof housing for rough work in the field
- Easy handling due to low weight (3 kg/6.6 lb with battery) and easy-to-reach function keys

Models		
Designation	**Type**	**Order No.**
Cable and Antenna Analyzer, 100 kHz to 3.6 GHz	R&S®ZVH4	1309.6800.24
Cable and Antenna Analyzer, 100 kHz to 8 GHz	R&S®ZVH8	1309.6800.28

The new benchmark for efficiency in the field

The R&S®ZVH cable and antenna analyzer is rugged, handy and designed for use in the field. Its low weight and simple operation make it indispensable for anyone who needs an efficient measuring instrument outdoors for the installation and maintenance of antenna systems.

Application	How the R&S®ZVH meets your needs
Installation of transmit systems (for mobile radio, broadcasting or radiocommunications)	- Cable and antenna testing - Wizard and reporting tool for optimized workflow - Return loss and distance-to-fault measurements - Two-port transmission test capability (S_{21}) for testing cables, filters and amplifiers - Built-in DC voltage supply for measuring active components such as tower mounted amplifiers (TMA) - Position finding using GPS receiver
Maintenance of transmit systems	- Cable and antenna testing - Full two-port network analysis - Interference hunting with spectrogram - Power measurements with R&S®NRP-Zxx power sensors - Support of directional power sensors to measure transmitter output power and antenna matching simultaneously - RF spectrum measurements (channel power, OBW, harmonics, AM modulation depth, ACLR, etc.) - Position finding using GPS receiver - R&S®ZVHView software for easy documentation
Field use	- Rugged housing, compact size and low weight - Easy to use - SD memory card or USB memory stick for storing thousands of measurement results - Excellent handling in the field due to portrait form factor - Battery-operated with long battery operating time and easy-to-replace battery

EMC Precompliance

Type/designation	Frequency range	Frequency accuracy	Measurement time	RBW	DANL (sensitivity)
R&S®ESL **EMI test receiver** 	9 kHz to 3/6 GHz (depending on model)	▮ 1×10^{-6} (standard) ▮ 1×10^{-7} (with R&S®FSL-B4 OCXO option)	▮ Selectable from 100 µs to 100 s (receiver mode/scan, per frequency step) ▮ Selectable from 2.5 ms to 16 000 s, zero span 1 µs to 16 000 s (analyzer mode/sweep time)	▮ 10 Hz to 10 MHz in 1/3 sequence (3 dB) ▮ 200 Hz, 9 kHz, 120 kHz (6 dB), 1 MHz (impulse)	Preamplifier on (R&S®FSL-B22 option), normalized to 1 Hz ▮ typ. –130 dBm (9 kHz < f < 3 MHz) ▮ typ. –162 dBm (f = 500 MHz) ▮ typ. –158 dBm (f = 3 GHz)
R&S®ES-SCAN **EMI software** 	User-friendly, cost-effective Windows application for EMI testing in line with commercial standards				
EMC-PCS **EMC precompliance set 1 GHz/3 GHz** 	100 kHz to 1000 MHz (100 kHz to 3000 MHz)	n.a.	20 ms to 1000 s	1 kHz (100 Hz) to 1 MHz in 1/3 steps, 200 kHz (–3 dB), additionally 9 kHz, 120 kHz, 1 MHz (–6 dB)	–115 dBm, typ. –124 dBm; –135 dBm with optional preamplifier

R&S®ESL EMI Test Receiver

| DVI Output | USB Stick | TCP/IP | optional IEEE-488 | inclusive |

Compact, cost-effective measuring receiver

The R&S®ESL EMI test receiver combines two instruments in one, measuring EMC disturbances in line with commercial standards and also serving as a full-featured spectrum analyzer for diverse lab applications. The R&S®ESL is designed to meet the needs of cost-conscious users who want to perform diagnostic and precompliance EMI measurements up to 3 GHz or 6 GHz.

Key facts

▮ Frequency range from 9 kHz to 3/6 GHz covering almost all commercial EMC standards
▮ First-ever combination of an EMI test receiver and spectrum analyzer in the entry-level class
▮ All major functions of an advanced EMI test receiver, including fully automated test sequences
▮ Weighting detectors: min. peak, max. peak, average, RMS, quasi-peak, average with meter time constant (CISPR-average) and RMS-average
▮ Compact, lightweight instrument, can be battery-powered for mobile applications

Models/options		
Designation	**Type**	**Order No.**
EMI Test Receiver, 9 kHz to 3 GHz	R&S®ESL3	1300.5001.03
EMI Test Receiver, 9 kHz to 3 GHz, with tracking generator	R&S®ESL3	1300.5001.13
EMI Test Receiver, 9 kHz to 6 GHz	R&S®ESL6	1300.5001.06
EMI Test Receiver, 9 kHz to 6 GHz, with tracking generator	R&S®ESL6	1300.5001.16
OCXO Reference Frequency, aging 1×10^{-7}/year	R&S®FSL-B4	1300.6008.02
Additional Interfaces	R&S®FSL-B5	1300.6108.02
GPIB Interface	R&S®FSL-B10	1300.6208.02
RF Preamplifier (3/6 GHz)	R&S®FSL-B22	1300.5953.02
AM/FM/φM Measurement Demodulator	R&S®FSL-K7	1300.9246.02
Power Sensor Support	R&S®FSL-K9	1301.9530.02
Noise Figure and Gain Measurements	R&S®FSL-K30	1301.9817.02

Application	How the R&S®ESL meets your needs
EMI measurements of commercial products in engineering and EMC labs for EMC problem detection and EMC troubleshooting during the design phase and for preparation of final certification (precertification)	▮ Very good RF characteristics ▮ Frequency range covering the most important EMI measurements in commercial product standards ▮ All IF bandwidth and weighting detectors in line with the latest CISPR 16 basic standard ▮ All major functions of an advanced EMI test receiver, including fully automated EMI test sequences ▮ Low investment costs ▮ Cost-saving plug & play options
Mobile use	▮ Rugged case as standard ▮ Compact size ▮ Lightweight ▮ Optional battery operation for installation, maintenance and on-site applications
Standard RF spectrum measurements	▮ Complete functionality of an R&S®FSL3/R&S®FSL6 spectrum analyzer included

R&S®ES-SCAN EMI Software
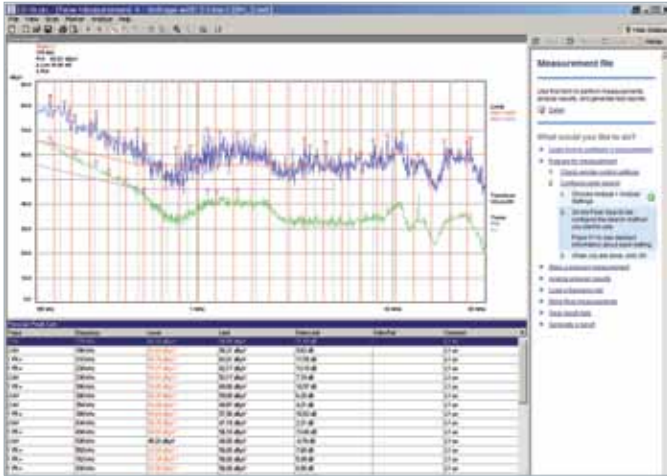
User-friendly software for EMI measurements

R&S®ES-SCAN is a cost-efficient and user-friendly Windows software application that has been developed for Rohde & Schwarz EMI test receivers and spectrum analyzers. The main requirements of EMI measurements in line with commercial standards have been combined in an easy-to-use application: measurement settings and storage, scan data acquisition and display with automatic data reduction, peak search with acceptance limit and selection of subranges, final measurement with worst-case selection, report generation and measurement data storage.

Key facts

- Menu-controlled configuration of test receiver/spectrum analyzer and storage of settings on controller, including limit lines and transducer factors
- Reliable acquisition, evaluation and documentation of measurement data
- Graphical display of scan data with automatic data reduction
- Marker function, including marker to peak and tune to marker frequency
- Automatic peak search with selectable acceptance limit and selectable subranges
- Editable frequency list for semi-automatic and manual final measurements
- Fine tuning function for fast detection of local maxima
- Flexible configuration of report generation for different report layouts
- For use with the R&S®ESCI, R&S®ESPI and R&S®ESL EMI test receivers, the R&S®FSP and R&S®FSL spectrum analyzers, the R&S®FSV signal and spectrum analyzer and the R&S®FSVR real-time spectrum analyzer

Application	How R&S®ES-SCAN meets your needs
Remote-controlled EMI measurements in line with commercial standards for EMC diagnosis and precompliance	■ Works with the R&S®ESL and R&S®ESPI EMI test receivers, the R&S®FSL and R&S®FSP spectrum analyzers, the R&S®FSV signal and spectrum analyzer and the R&S®FSVR real-time spectrum analyzer ■ Remote control via GPIB and LAN ■ Full on-screen configuration of Rohde & Schwarz EMI receivers/spectrum analyzers and setup storage on the PC ■ Predefined standard limit lines, transducers and measurement setups ■ Flexible generation of meaningful test reports with different layouts ■ Help sidebar provides operational assistance for less experienced and occasional users
Small system solutions without remote control of antenna mast, turntable and slideway and without fully automated test routines	■ Cost-effective tool for EMI diagnostics and development testing in line with commercial standards ■ Combines the basic requirements of EMI measurements in an easy-to-use application
Remote-controlled conducted emission measurements in line with commercial standards for EMC certification	■ Support of the R&S®ESCI/ESCI7 EMI test receivers for full compliance testing ■ Remote control of Rohde & Schwarz line impedance stabilization networks (LISN) (via test receiver user port) ■ Semi-automated measurement routines ■ Flexible generation of meaningful test reports with different layouts

EMC-PCS EMC Precompliance Set

USB | RS-232 | IEEE-488 | Lab-VIEW | inclusive | DVI Output | USB Stick

Key facts

The EMC-PCS EMC precompliance set includes the modern HMS1000/HMS3000 spectrum analyzers, the HM6050-2 line impedance stabilization network, the HZ530/HZ540 probe set and the HM Explorer software for Windows:

❚ HMS1000
  ▪ 1 GHz spectrum analyzer
  ▪ Frequency range from 100 kHz to 1 GHz
  ▪ Sweep time from 20 ms to 1000 s
  ▪ Resolution bandwidth from 1 kHz to 1 MHz in 1/3 steps, 200 kHz (–3 dB), additionally 9 kHz, 120 kHz, 1 MHz (–6 dB)
  ▪ Video bandwidth from 10 Hz to 1 MHz in 1/3 steps

❚ HMS3000
  ▪ 3 GHz spectrum analyzer
  ▪ Frequency range from 100 kHz to 3 GHz
  ▪ Sweep time from 20 ms to 1000 s
  ▪ Resolution bandwidth from 1 kHz to 1 MHz in 1/3 steps, 200 kHz (–3 dB), additionally 9 kHz, 120 kHz, 1 MHz (–6 dB)
  ▪ Video bandwidth from 10 Hz to 1 MHz in 1/3 steps
❚ HM6050-2
  ▪ Line impedance stabilization network
  ▪ 9 kHz to 30 MHz (CISPR 16)
❚ HZ530
  ▪ H-field probe
  ▪ High-impedance probe
  ▪ E-field probe
❚ HZ540
  ▪ H-field probe
  ▪ High-impedance probe
  ▪ E-field probe
❚ HM PreCom EMC
  ▪ Spectrum analyzer software for EMI precompliance measurements (supports standard HO720 RS-232/USB interface and Windows 32 bit)

Models/options	
Designation	**Type**
EMC Precompliance Set, including HMS1000, HM6050-2, HZ530, HM PreCom EMC	EMC-PCS1
EMC Precompliance Set, including HMS3000, HM6050-2, HZ540, HM PreCom EMC	EMC-PCS3
Preamplifier	HO3011

Application	How the HAMEG EMC-PCS meets your needs
EMI precompliance measurements	❚ Consists of all necessary instruments and software to measure typical EMI problems ❚ Measurement of line-conducted interference from 9 kHz to 30 MHz (CISPR 16), switchable transient limiter ❚ HZ530/HZ540 probe set consists of 3 active broadband probes for EMI diagnosis

Video and Audio Testers

Type/designation	Broadcasting standards	Transport stream formats	Video/audio formats	Instrument functions	Frequency range	Power range
R&S®SFC-U compact USB modulator	▮ Terrestrial: DVB-T2, DVB-T, DVB-H, DTMB, CMMB, T-DMB, ISDB-T, ISDB-T$_B$, ATSC/8VSB, ATSC-M/H ▮ Cable: DVB-C2, DVB-C, J.83/B, ISDB-C, analog TV ▮ Satellite: DVB-S2, DVB-S, DIRECTV ▮ Audio: DAB, DAB+, ISDB-T$_{SB}$, FM radio	MPEG-2 TS, ETI NA, ETI NI, MFS/PMS, DIRECTV	n.a.	▮ Modulator with realtime coder ▮ Transport stream player ▮ Analog A/V generator ▮ AWGN generator	30 MHz to 3000 MHz	–110 dBm to 0 dBm
R&S®SFC compact modulator	▮ Terrestrial: DVB-T2, DVB-T, DVB-H, DTMB, CMMB, T-DMB, ISDB-T, ISDB-T$_B$, ATSC/8VSB, ATSC-M/H ▮ Cable: DVB-C2, DVB-C, J.83/B, ISDB-C, analog TV ▮ Satellite: DVB-S2, DVB-S, DIRECTV ▮ Audio: DAB, DAB+, ISDB-T$_{SB}$, FM radio	MPEG-2 TS, ETI NA, ETI NI, MFS/PMS, DIRECTV	n.a.	▮ Modulator with realtime coder ▮ Transport stream player ▮ Analog A/V generator ▮ AWGN generator	30 MHz to 3000 MHz	–110 dBm to 0 dBm
R&S®EFL240/ R&S®EFL340 portable TV test receiver	▮ Terrestrial: DVB-T2 [1], DVB-T, DVB-H ▮ Cable: DVB-C, analog TV ▮ Satellite: DVB-S2, DVB-S ▮ Audio: FM radio	n.a.	▮ MPEG-2, MPEG-4, SD, HD (1080p) ▮ MPEG-1 L2, Dolby, AC3, AAC, DD+ ▮ PAL, SECAM, NTSC	▮ TV test receiver ▮ Spectrum analyzer ▮ MPEG decoder ▮ Video/audio decoder	5 MHz to 2500 MHz	15 dBµV to 130 dBµV

[1] R&S®EFL340 only.

R&S®SFC-U Compact USB Modulator

USB | **Lab-VIEW** | **inclusive**

Test signals for TV and audio broadcasting – handy and economical

The R&S®SFC-U compact USB modulator is an economical multistandard signal source. It supports realtime coding for all conventional digital and analog TV and audio broadcasting standards. The R&S®SFC-U is a USB device designed for use with a PC, enabling plug & play test signal generation.

Key facts
❙ High precision modulator with MER > 40 dB
❙ VHF and UHF frequency range, optionally up to 3 GHz
❙ Level range from 0 dBm to –31.5 dBm, optionally to –110 dBm
❙ Terrestrial TV standards: DVB-T2, DVB-T, DVB-H, DTMB, CMMB, T-DMB, ISDB-T, ISDB-T$_B$, ATSC/8VSB, ATSC-M/H
❙ Cable TV standards: DVB-C2, DVB-C, J.83/B, ISDB-C
❙ Satellite TV standards: DVB-S2, DVB-S, DIRECTV
❙ Analog TV standards: B/G, D/K, I, M/N, L
❙ Audio broadcasting standards: DAB, DAB+, ISDB-T$_{SB}$, AM/FM/RDS
❙ Transport stream player and analog audio/video generator integrated in PC software
❙ Optional transport stream libraries and test pattern libraries supported
❙ Integrated AWGN generator
❙ ASI transport stream input

Models/options		
Designation	**Type**	**Order No.**
Compact USB Modulator, base unit	R&S®SFC-U	2115.3540.02
Option Package Terrestrial TV (includes DVB-T, DVB-H, ISDB-T, ISDB-T$_B$, ISDB-T$_{SB}$, DTMB, CMMB, ATSC/8VSB, ATSC-M/H)	R&S®SFC-U-PK1	2115.5888.02
Option Package Cable TV (includes DVB-C, J.83/B, ISDB-C)	R&S®SFC-U-PK2	2115.5894.02
Option Package Satellite TV (includes DVB-S2, DVB-S, DIRECTV, R&S®SFC-U-K83)	R&S®SFC-U-PK3	2115.5907.02
Option Package T2/C2 (includes DVB-T2, DVB-C2)	R&S®SFC-U-PK4	2115.5913.02

Models/options		
Designation	**Type**	**Order No.**
Option Package Audio Broadcasting (includes DAB, DAB+, T-DMB, AM/FM/RDS) [1]	R&S®SFC-U-PK5	2115.5920.02
Option Package Analog TV (includes standards B/G, D/K, I, M/N, L)	R&S®SFC-U-PK6	2115.5936.02
Frequency Extension, 30 MHz to 3 GHz	R&S®SFC-U-K83	2115.5742.02
Electronic Attenuator, 0 dB to +110 dB	R&S®SFC-U-K84	2115.5720.02
AWGN Noise Generator	R&S®SFC-U-K40	2115.5788.02
Digital I/Q Input	R&S®SFC-U-K80	2115.5765.02

[1] DAB, DAB+ and T-DMB might require the R&S®SFC-K83 frequency extension.

Application	How the R&S®SFC-U meets your needs
Software development for TV receivers	❙ Easy and convenient operation from PC ❙ Generates test signals for various TV standards ❙ Test signals can include EPG and data services ❙ Libraries with various test sequences available as options ❙ Playout of transport streams with encrypted content ❙ Endless and seamless transport stream playout ❙ Easy and convenient operation from PC ❙ Generates test signals for various TV standards
Product presentation and demonstration	❙ Small, easy-to-use signal source ❙ Generates test signals for various TV standards
Set-top box service: test, repair and firmware update	❙ Generates standard compliant test signal for simple Go/NoGo test ❙ Playout of special transport streams for firmware update of set-top boxes ❙ Easy-to-use signal source for operation by unskilled workers
Testing multiplex configurations for broadcasting networks	❙ Playout of transport streams with any multiplex configuration to be verified ❙ Generates standard-compliant test signal to verify mux settings with TV receivers
Routine functional check of TV test equipment	❙ High accuracy of signal level and frequency ❙ Generates test signals for cable, satellite and terrestrial TV standards

R&S®SFC Compact Modulator

DVI Output	USB Stick	TCP/IP	Lab-VIEW

Test signals for TV and audio broadcasting – handy and economical

The R&S®SFC compact modulator is an economical multistandard signal source. It supports realtime coding for all conventional digital and analog TV and audio broadcasting standards. The R&S®SFC is equipped with a built-in computer, making it ideal for standalone operation and for integration into a signal generation system with multiple generators.

Key facts

❙ High precision modulator with MER > 40 dB
❙ VHF and UHF frequency range, optionally up to 3 GHz
❙ Level range from 0 dBm to –31.5 dBm, optionally to –110 dBm
❙ Terrestrial TV standards: DVB-T2, DVB-T, DVB-H, DTMB, CMMB, T-DMB, ISDB-T, ISDB-T$_B$, ATSC/8VSB, ATSC-M/H
❙ Cable TV standards: DVB-C2, DVB-C, J.83/B, ISDB-C
❙ Satellite TV standards: DVB-S2, DVB-S, DIRECTV
❙ Analog TV standards: B/G, D/K, I, M/N, L
❙ Audio broadcasting standards: DAB, DAB+, ISDB-T$_{SB}$, AM/FM/RDS
❙ Integrated transport stream player and analog audio/video generator
❙ Transport stream libraries and test pattern libraries supported
❙ Integrated AWGN generator
❙ ASI transport stream input
❙ Digital I/Q input to connect to other Rohde & Schwarz broadcasting signal generators

Models/options		
Designation	**Type**	**Order No.**
Compact Modulator, base unit	R&S®SFC	2115.3510.02
Frequency Extension, 30 MHz to 3 GHz	R&S®SFC-K83	2115.5759.02
Electronic Attenuator, 0 dB to +110 dB	R&S®SFC-K84	2115.5736.02
AWGN Noise Generator	R&S®SFC-K40	2115.5794.02
Digital I/Q Input	R&S®SFC-K80	2115.5771.02
Coder Extension Board	R&S®SFC-B15	2115.5836.02
Realtime coders for the broadcasting standards and transport stream libraries are available as individual software options.		
Please visit our website for a complete list of options and order numbers.		

Application	How the R&S®SFC meets your needs
Use in central signal generation systems (transmitter room systems)	❙ Generates test signals for various TV standards ❙ Integrated computer enables standalone operation ❙ Automatic booting and start-up after power-on ❙ Full remote control via LAN ❙ R&S®Central TX System Control software controls and monitors many R&S®SFC
General-purpose broadcasting signal generator	❙ High accuracy of signal level and frequency ❙ Small, easy-to-use signal source ❙ Generates test signals for various TV standards
2nd RF output for R&S®SFU broadcast test system	❙ Digital I/Q input to connect to other Rohde & Schwarz broadcast signal generators ❙ Extends R&S®SFU broadcast test system to a two-channel generator ❙ Enables MISO and diversity reception scenarios

R&S®EFL240/R&S®340 Portable TV Test Receiver

USB | SD Card | inclusive | HDMI

Professional installation of cable and satellite TV systems and antennas

The R&S®EFL240 and R&S®EFL340 are compact, portable TV test receivers for satellite, cable and terrestrial television. The R&S®EFL340 includes DVB-T2. Their versatile measurement functions and their operating convenience are ideal for the installation of cable TV systems, satellite receiver systems, in-building distribution systems and antennas. The favorable price makes the R&S®EFL240 and R&S®EFL340 extremely attractive for these applications.

Key facts

- Multistandard TV test receiver
- Frequency range from 5 MHz to 2500 MHz
- Ergonomic design and easy operation
- More than 4 hours of battery operation
- Analysis of DVB-T2 [1], DVB-T, DVB-H, DVB-C, DVB-S and DVB-S2
- Measurement of constellation, MER(f) and echoes
- MPEG-2 and MPEG-4 decoding, SD and HD video display
- Common interface for encrypted programs
- PAL, SECAM, NTSC and FM radio reception
- Combo mode for simultaneous display of video, spectrum and measurement results
- Automated measurements simplify routine work
- R&S®EFL-Suite software for transferring measurement results to a PC
- Accessories included: soft bag, carrying straps, RF adapter set, power supply, car adapter, SD card, cables, CD ROM with manuals and R&S®EFL-Suite software

Models/options

Designation	Type	Order No.
Portable TV Test Receiver	R&S®EFL240	2116.8980.02
Portable TV Test Receiver	R&S®EFL340	2116.9070.02
Rain Cover	R&S®EFL-Z1	2116.9087.00

Application	How the R&S®EFL240/R&S®EFL340 meets your needs
Analysis of reception problems in terrestrial TV networks	▪ Echo measurement without receiver lock to analyze multipath propagation under poor reception conditions ▪ Pre-echo and post-echo measurement to analyze SFN configuration ▪ MER(f) measurement to detect narrowband interference effects and co-channel interference
Installation of cable TV systems	▪ Measurement of digital and analog cable TV signals ▪ Automatic scan & log function simplifies measurements in a fully loaded cable TV network ▪ Spectrum analyzer with zoom function
Installation of satellite TV receivers	▪ Antenna positioning function simplifies dish alignment ▪ Satellite identifier function ▪ Transponder lists of many satellites pre-installed ▪ Realtime FFT spectrum display in combo mode
Field use	▪ Handy, lightweight portable instrument ▪ Exceptionally long battery operation of more than four hours ▪ Soft bag with all necessary accessories
On-site support for TV tuners	▪ Reference receiver for troubleshooting of TV tuners ▪ Combo mode provides a quick overview of signal quality ▪ Supports all relevant TV standards

Power Supplies

Type/designation	V$_{max}$	I$_{max}$	P$_{max}$	Overvoltage protection	Resolution	Special features	Remote control
R&S®NGMO programmable single/ dual-channel DC analyzer/power supply	15 V per channel	▮ 5 A at 0 V to 5 V ▮ 2.5 A at > 5 V to 15 V per channel	37.5 W per channel	1.5 V to 22 V, adjustable; OCP on/off per channel	▮ Setting [1]: 1 mV/1 mA ▮ Readback [1]: 1 mV/200 µA/ 10 µA/0.1 µA	▮ Sink capability up to 5 A ▮ Battery emulation ▮ Fast sample buffer (5000 sample) ▮ Fast transient response ▮ Measurement trigger ▮ Output inhibit ▮ Auxiliary DVM input	▮ RS-232, GPIB
HMP2020/HMP2030 programmable 2/3 channel high-performance power supply	▮ 2 × 32 V (HMP2020) ▮ 3 × 32 V (HMP2030)	▮ 1 × 10 A/1 × 5 A (HMP2020) ▮ 3 × 5 A (HMP2030)	188 W	adjustable for each channel	▮ 1 mV ▮ 0.2 mA (I < 1 A), 1 mA (I ≥ 1 A) (HMP2020) ▮ 0.1 mA (I < 1 A), 1 mA (I ≥ 1 A) (HMP2030)		▮ USB/RS-232 ▮ optional: Ethernet/ USB, IEEE 488 (GPIB)
HMP4030/HMP4040 programmable 3/4 channel high-performance power supply	▮ 3 × 32 V (HMP4030) ▮ 4 × 32 V (HMP4040)	▮ 3 × 10 A (HMP4030) ▮ 4 × 10 A (HMP4040)	384 W	adjustable for each channel	▮ 1 mV ▮ 0.2 mA (I < 1 A), 1 mA (I ≥ 1 A)		▮ USB/RS-232 ▮ optional: Ethernet/ USB, IEEE 488 (GPIB)

[1] Models with increased resolution on request.

R&S®NGMO Programmable Single/Dual-Channel DC Analyzer/Power Supply

R&S®NGMO1 programmable DC analyzer/power supply.

IEEE-488   RS-232   Lab-VIEW

Key facts

❚ R&S®NGMO1: 1 × 15 V/2.5 A (5 A);
  R&S®NGMO2: 2 × 15 V/2.5 A (5 A)
❚ High resolution; setting: 1 mV/1 mA;
  readback: 1mV/200 µA/10 µA/0.1 µA
❚ Fast output response, selectable
❚ Sink capability up to 5 A
❚ Fast measurement sample buffer (up to 5000 sample) per channel
❚ Battery emulation per channel
❚ OVP, OCP
❚ Measurement trigger and output inhibit inputs per channel
❚ Measurement complete and four relays outputs
❚ Auxiliary DVM per channel
❚ Optional R&S®Current Sniffer for power consumption analysis
❚ GPIB and RS-232 interface

The superior test tool for battery-powered portable devices

The R&S®NGMO is a programmable high-speed precision power supply with extended measurement and emulation capabilities. It is an ideal tool for the development, service and production of battery-powered electronic devices.

Models/options

Designation	Type	Order No.
Programmable DC Analyzer/Power Supply	R&S®NGMO1	0192.1500.21
Programmable Dual-Channel DC Analyzer/Power Supply	R&S®NGMO2	0192.1500.24
Front-Panel Output Connectors for R&S®NGMO2 desktop use	R&S®NGMO2-B0	0192.1500.10
19" Rack Adapter for 1 HU	R&S®NGMO2-B1	0192.1500.11
19" Rack Adapter for 2 HU	R&S®NGMO2-B2	0192.1500.12
Hardware-Software Extension for R&S®NGMO2	R&S®NGMO2-B5	0192.1500.05
R&S®Current Sniffer Software	R&S®NGMO2-K10	0192.1500.04

Application	How the R&S®NGMO meets your needs
Mobile phone and portable device development, production and service	❚ Precise, fast-response, reproducible battery replacement for testing DUT's behavior at its DC supply limit lines ❚ Sinking for charger test ❚ Simulation of different battery charges and states of health ❚ High-resolution current measurement for power consumption tests in different DUT operation states ❚ High-resolution, fast low-current measurement ❚ Accurate fast sensing ❚ Simple manual and remote-controlled operation
Active component (e.g. PA) DC characterization	❚ Lowest ripple and noise and high regulation dynamic due to linear regulation concept ❚ High-resolution, fast current measurement ❚ R&S®NGMO2 with two equivalent channels ❚ Fast GPIB remote control ❚ Fast on/off switching for pulsed DC supply of power components
Battery life test of mobile communications devices	❚ Optional R&S®Current Sniffer software or GSMA DG.09 battery life test software
Universal test system power supply	❚ 1/2 19" 2 HU with rear panel outputs ❚ Fast GPIB remote control ❚ Auxiliary DVM inputs ❚ Additional I/Os (measurement trigger, measurement complete, fault, 4 × OC relays controls, output inhibit) ❚ Sinking capability for fast downprogramming and DUT sinking

HMP2020/HMP2030
Programmable 2/3 Channel
High-Performance Power Supply

Key facts
- HMP2020: 1 × 0 V to 32 V/0 A to 10 A; 1 × 0 V to 32 V/ 0 A to 5 A; max. 188 W
- HMP2030: 3 × 0 V to 32 V/0 A to 5 A; max. 188 W
- 188 W output power through intelligent power management
- Low residual ripple: < 150 µV (RMS) due to linear postregulators
- High setting and read-back resolution of 1 mV up to 0.1 mA
- Galvanically isolated, earth-free and short-circuit-protected output channels
- Advanced parallel and serial operation via V/I tracking
- EasyArb function for user-definable V/I characteristics
- FuseLink: individual channel combination of electronic fuses
- User-adjustable overvoltage protection (OVP) for all outputs
- All parameters clearly displayed via LCD/illuminated buttons
- Rear connectors for all channels, including sense
- USB/RS-232 interface, optionally Ethernet/USB or IEEE 488 (GPIB)

Models/options	
Designation	**Type**
Programmable 2 Channel High-Performance Power Supply	HMP2020
Programmable 3 Channel High-Performance Power Supply	HMP2030
Dual Ethernet/USB Interface	HO730
IEEE 488 (GPIB) Interface, galvanically isolated	HO740

Application	How the HAMEG HMP2020/HMP2030 meets your needs
Power supply in engineering labs	- Up to 32 V and up to 10 A per channel - Low residual ripple - Sense inputs - Overvoltage protection
Power supply in production environment	- All outputs and sense inputs available on rear of unit - Remote control using USB/RS-232 interface standard, Ethernet or GPIB as an option
Simulation of charging processes of batteries	- Easy-to-program arbitrary V/I curves

HMP4030/HMP4040
Programmable 3/4 Channel
High-Performance Power Supply

USB | RS-232 | optional TCP/IP | optional IEEE-488 | inclusive | Lab-VIEW

Key facts

- HMP4030: 3 × 0 V to 32 V/0 A to 10 A; max. 384 W
- HMP4040: 4 × 0 V to 32 V/0 A to 10 A; max. 384 W
- 384 W output power through intelligent power management
- Low residual ripple: < 150 µV (RMS) due to linear postregulators
- High setting and read-back resolution of 1 mV up to 0.2 mA
- Keypad for direct parameter entry
- Galvanically isolated, earth-free and short-circuit-protected output channels
- Advanced parallel and serial operation via V/I tracking
- EasyArb function for user-definable V/I characteristics
- FuseLink: individual channel combination of electronic fuses
- User-adjustable overvoltage protection (OVP) for all outputs
- All parameters clearly displayed via LCD/illuminated buttons
- Rear connectors for all channels, including sense
- USB/RS-232 interface, optionally Ethernet/USB or IEEE 488 (GPIB)

Models/options

Designation	Type
Programmable 3 Channel High-Performance Power Supply	HMP4030
Programmable 4 Channel High-Performance Power Supply	HMP4040
Dual Ethernet/USB Interface	HO730
IEEE 488 (GPIB) Interface, galvanically isolated	HO740

Application	How the HAMEG HMP4030/HMP4040 meets your needs
Power supply in engineering labs	▪ Up to 32 V and up to 10 A per channel ▪ Low residual ripple ▪ Sense inputs ▪ Overvoltage protection
Power supply in production environment	▪ All outputs and sense inputs available on rear of unit ▪ Remote control using USB/RS-232 interface standard, Ethernet or GPIB as an option
Simulation of charging processes of batteries	▪ Easy-to-program arbitrary V/I curves

LCR Bridges/Meters

HM8118 200 kHz LCR Bridge/Meter

USB | RS-232 | optional IEEE-488

Key facts
- Basic accuracy: 0.05 %
- Measurement functions: L, C, R, |Z|, X, |Y|, G, B, D, Q, Φ, Δ, M, N
- Test frequencies: 20 Hz to 200 kHz
- Up to 12 measurements per second
- Parallel and serial mode
- HO118 binning interface (optional) for automatic sorting of components
- Internal programmable voltage and current bias
- Transformer parameter measurement
- External capacitor bias up to 40 V
- Kelvin cable and 4-wire SMD test adapter included
- Galvanically isolated USB/RS-232 interface, optionally IEEE 488 (GPIB)

Models/options

Designation	Type
200 kHz LCR Bridge/Meter	HM8118
Binning Interface, for automatic sorting of components	HO118
IEEE 488 (GPIB) Interface, galvanically isolated	HO880

Application	How the HAMEG HM8118 meets your needs
Component incoming inspection	∎ High accuracy and automatic modes ensure reliable, reproducible results
Component validation (variation/quality)	∎ Easy-to-use one-button user interface ∎ Fast measurements shorten test time ∎ Optional accessories make transformer measurements possible
Test of SMD components	∎ Standard test fixture for SMD components allows out-of-the-box measurements
Easy integration into factory lines using optional HO118 binning interface	∎ Binning interface can control handler/sorter in factory line ∎ Fast measurement mode and remote control using USB/RS-232 or optional GPIB interface

Frequency Counters

HM8123 3 GHz Programmable Counter

USB | **RS-232** | **optional IEEE-488** | **Lab-VIEW**

3 GHz counter from the 8100 programmable measuring instruments series

❚ Measurement range: 0 Hz to 3 GHz
❚ 2 measurement inputs: DC to 200 MHz, 1 measurement input: 100 MHz to 3 GHz
❚ Input impedance A/B: 1 MΩ/50 Ω (switchable), sensitivity 25 mV (RMS)
❚ Input impedance C: 50 Ω, sensitivity 30 mV (RMS)
❚ 400 MHz timebase with 0.5 ppm stability
❚ 10-digit resolution at 10 s gate time
❚ 9 measurement functions, external gate and arming
❚ Input for external timebase (10 MHz)
❚ Standard: TCXO (temperature stability: $\pm 0.5 \times 10^{-6}$), optional: OCXO (temperature stability: $\pm 1 \times 10^{-8}$)
❚ Intuitive one-pushbutton operation, each function directly addressable
❚ Galvanically isolated USB/RS-232 interface, optionally IEEE 488 (GPIB)

Models/options	
Designation	**Type**
3 GHz Programmable Counter	HM8123
Test Cable BNC/BNC	HZ33, HZ34
19" Rackmount Kit, 2 HU	HZ42
Adapter, BNC to 4 mm banana	HZ20
OCXO (installation only at the factory)	HO85
IEEE 488 (GPIB) Interface, galvanically isolated	HO880

Application	How the HAMEG HM8123 meets your needs
Analog RF circuit design	❚ High sensitivity and frequency range up to 3 GHz ❚ 10-digit resolution for precise measurement results ❚ Optional OCXO for even higher accuracy
Development of clock and clock distribution systems	❚ Interchannel measurements: frequency/period/time interval/phase A:B ❚ Burst measurements
Education and service	❚ Fast boot time ❚ Easy to use due to one-pushbutton operation

Multimeters

HM8112-3 Digit Multimeter

USB | RS-232 | optional IEEE-488 | Lab-VIEW

Key facts

◻ 6 ½-digit display (1 200 000 counts)
◻ Resolution: 100 nV, 100 pA, 100 µΩ, 0.01 °C/F
◻ Basic DC accuracy: 0.003 %
◻ Measurement intervals adjustable from 0.1 s to 60 s
◻ Offset correction
◻ Galvanically isolated USB/RS-232 interface, optionally IEEE 488 (GPIB)
◻ HM8112-3S: HM8112-3 incl. scanner card (8 + 1 channels, each 2- and 4-wire)
◻ DC to 300 kHz

Models/options	
Designation	**Type**
Digit Multimeter	HM8112-3
Digit Multimeter with Scanner Card (8 + 1 channels, each 2- and 4-wire)	HM8112-3S

Application	How the HAMEG HM8112-3 meets your needs
◻ Engineering lab ◻ Production environment	◻ 2-/4-wire measurements ◻ True RMS measurement, AC and DC + AC ◻ Up to 100 measurements per second transmitted to PC ◻ Mathematic functions: limit testing, minimum/maximum, average and offset ◻ Temperature measurements with platinum (PT100/PT1000) and Ni (K and J types) sensors ◻ Internal data logger for up to 32 000 measurement results

Appendix
Service and Support

We are here to assist you – live with real experts.
At Rohde & Schwarz you talk to people.

Rohde & Schwarz worldwide

Headquarters

At company headquarters in Munich, around 2000 employees work in research and development, central sales and service, marketing and administration.

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Sales

For the addresses of the local sales companies in more than 70 countries, visit www.sales.rohde-schwarz.com

Customer support – worldwide live support
Whatever problem you have, our support center is there to help you. Your question will be dealt with fast and in detail. There are three support centers in three different time zones: Munich, Washington and Singapore. Support is available 24 hours a day, Monday through Friday excluding public holidays. The staff of our support center is optimally trained to assist you in solving your problems. Our regional support centers will be glad to answer any questions regarding our products and service:

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Service you can rely on

Dear Customer,

At first glance, tradition and high-tech don't really seem to fit together. Rohde & Schwarz, however, has shown that these two concepts can make a perfect match: For more than 75 years, it has been the company's tradition to explore the limits of what is physically feasible in generating and measuring electronic signals. As a manufacturer, we have always proved that our products comply with the relevant specifications. We provide this proof with the calibration certificate issued by our service centers. As a matter of course, we apply the same high technological and quality standards that we demand of our products. We know that low calibration costs are the crucial factor when it comes to total cost of ownership. And we are also aware of the high demands placed on our equipment and the necessary scope of measurements. Moreover, we will not accept compromises on quality for the sake of costs. This is why we offer efficient, favorably priced calibration solutions to our customers. These solutions are implemented in the test procedures running on our automatic test systems worldwide. Our driving force is your satisfaction over the complete lifecycle of our products. This is yet another tradition at Rohde & Schwarz.

Dr. Klaas Hoekstein
Director of International Service

Contractually assured services
Rohde & Schwarz offers full-range service at your command. You can mix and match our services according to your technical and budgetary requirements.

Service contracts
As the original equipment manufacturer (OEM), we provide the most qualified, responsive and thorough service available. Customer care is especially important to us. We support you with services tailored to your needs:
▪ Short and reliable turnaround times
▪ Efficient logistics for pickup and return of your equipment
▪ High spare-part availability
▪ Flexible adjustment of terms during the contract period
▪ Services tailored to your needs

Service options
Service options are powerful service contracts that are offered exclusively when you purchase a new product. Taking advantage of a service option ensures optimum performance and availability of your Rohde & Schwarz product at low, predictable operating costs.

Asset management
Our service portal allows you to manage all your measurement instruments serviced by Rohde & Schwarz. Register for your secure account at http://www.rohde-schwarz.com/service_portal and request access to the service portal. Once your request is processed, you can access the key data of your instruments and check the status of current service jobs.

Calibration | Repair

Factory standard calibration ▪ Full calibration (ISO 17025 conformant), returning the instrument to the same state as when it originally left the factory ▪ Traceability to national/international standards ▪ Certificate and test report ▪ Software updates and hardware modifications included ▪ Instrument adjustment	**Accredited calibration** ▪ Same features as factory standard calibration ▪ Directly traceable calibration in accordance with ISO 17025 ▪ Controlled by national accreditation authority (NIST, DKD/DAkkS) ▪ Certificate and test report ▪ Software updates and hardware modifications ▪ Instrument adjustment	**Performance calibration (only available under service contract)** ▪ Competitive price ▪ Complete measurement of all specifications as with factory standard calibration ▪ Certificate and test report ▪ Quality-related software updates and hardware modifications ▪ No instrument adjustments	**Adjustment** ▪ Includes adjustment and incoming equipment test report ▪ Can only be ordered in connection with performance calibration
Standard price repair ▪ Fixed repair price which covers the cost of materials and work performed ▪ Twelve-month service warranty on the entire equipment (does not apply in case of improper handling or alteration of the equipment) ▪ Calibration in line with ISO 9001 including documentation of test results ▪ Latest hardware and software updates	▪ Pickup and return of the equipment (only for shipping by a Rohde & Schwarz logistics partner in the country of the Rohde & Schwarz service organization) ▪ If it turns out that only little work and material are needed to eliminate the fault, you pay merely a small lump sum instead of the standard price	**Time and material repair** ▪ Repair based on the amount of material and work required to repair the equipment ▪ Twelve-month service warranty on the work performed	

Rohde & Schwarz service offers you further advantages

Service request
Service from the start – higher efficiency, smooth handling and greater visibility through on-line tracking. Just call or visit our website at http://rohde-schwarz.com/RMA to register your instrument. You will immediately receive shipping instructions, the service reference number, preliminary service pricing options and the estimated turnaround time via e-mail.

Service for third party maintenance (TPM) products
Rohde & Schwarz also offers the services mentioned here for TPM products.

On-site calibration
You can opt for on-site calibration of your Rohde & Schwarz equipment and TPM products. On-site calibration is convenient and reduces downtime to the absolute minimum. Various calibrations and minor repairs can be performed at your company; minimum quantities apply.

Pickup service
On request we pick up your equipment at your company. We can also arrange for the packaging.
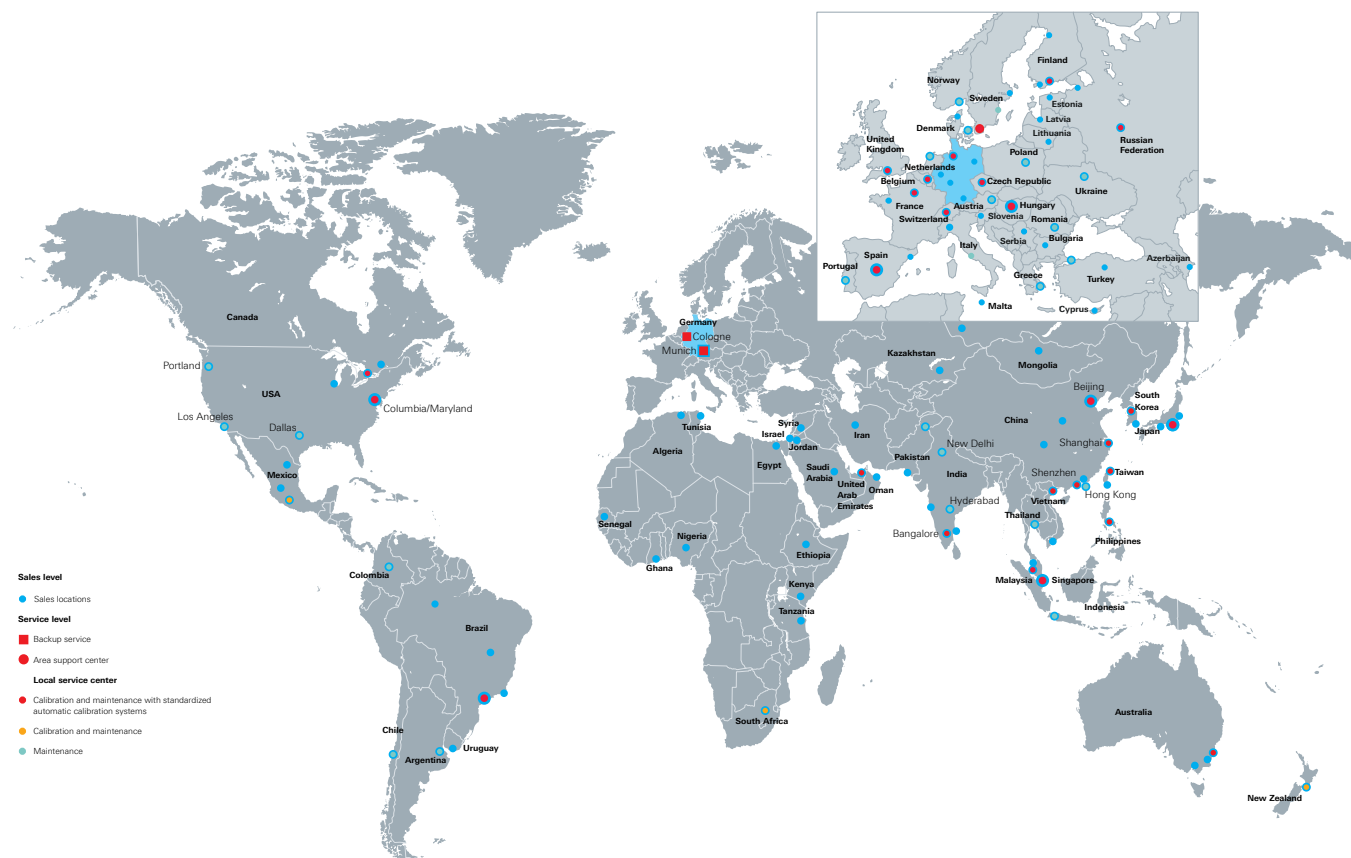
Loan equipment
Your local service center can offer a loaner to bridge the repair time – subject to availability.

Service order tracking
The www.servicestatus.rohde-schwarz.com portal allows you to verify the repair or calibration status of your instrument. Service order tracking provides effective transparency. You only need the service reference number and the serial number of your equipment to track its status.

Global sales and service locations

Sales level
- Sales locations

Service level
- Backup service
- Area support center

Local service center
- Calibration and maintenance with standardized automatic calibration systems
- Calibration and maintenance
- Maintenance

Trademarks
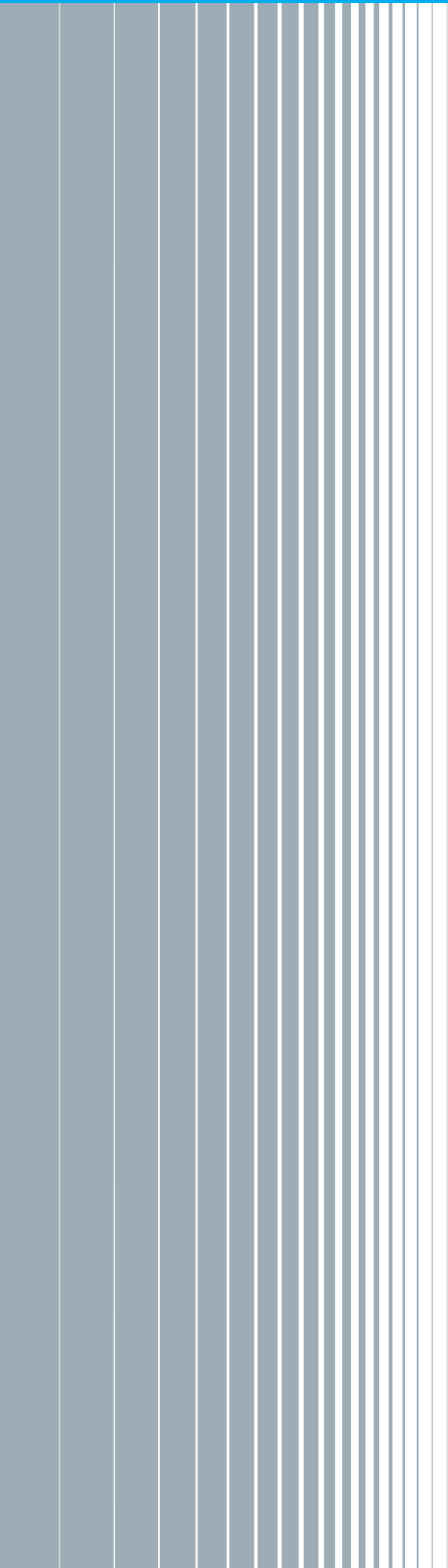
Trade names are trademarks of the owners

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Explanation of icons

In this catalog, the instrument interfaces are represented by icons underneath the picture of the respective instrument. These icons are explained below.

Icon	Explanation
DVI Output	**DVI output** An external monitor can be connected via a digital visual interface (DVI).
USB	**USB** The instrument can be connected to a computer via universal serial bus (USB) using a USB cable with a standard-B type plug.
mini USB	**Mini USB** The instrument can be connected to a computer via universal serial bus (USB) using a USB cable with a mini-B type plug.
RS-232	**RS-232** The instrument is equipped with an RS-232 interface.
USB Stick	**USB stick** The instrument is equipped with a universal serial bus (USB) upstream interface that can be used to connect a USB flash drive or other USB mass storage devices with a standard-A type plug.
SD Card	**SD card** An SD memory card can be inserted, e.g. for saving measurement results.
TCP/IP	**TCP/IP** The instrument is equipped with an Ethernet interface that can be connected to a local area network (LAN).
optional TCP/IP	**Optional TCP/IP** An option is available that upgrades the instrument with an Ethernet interface so that it can be connected to a local area network (LAN).
IEEE-488	**IEEE-488** The instrument is equipped with an IEEE-488 interface, also referred to as general-purpose interface bus (GPIB). This bus is widely used for controlling instruments in laboratories.
optional IEEE-488	**Optional IEEE-488** An option is available that upgrades the instrument with an IEEE-488 interface, also referred to as general-purpose interface bus (GPIB). This bus is widely used for controlling instruments in laboratories.
inclusive	**Software inclusive** The instrument is shipped with a CD or DVD that contains PC software for controlling the instrument or processing measurement results.
Lab-VIEW	**LabVIEW** The instrument can be controlled using the LabVIEW software from National Instruments.
6,5" VGA 16,5cm	**VGA screen** Settings, results, etc. are shown on the integrated 6.5" (16.5 cm) display with VGA resolution (640 pixel × 480 pixel).

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