

# R&S® EPL1000 EMI TEST RECEIVER

Speed. Flexibility. Compliance.

**distrame**  
instruments de mesures électroniques



Product Brochure  
Version 01.00

**ROHDE & SCHWARZ**

Make ideas real



# AT A GLANCE

The R&S®EPL1000 is the perfect device for quick, precise and compliant EMI measurements up to 30 MHz. The R&S®EPL1000 fully complies with CISPR 16-1-1. With the added features of a spectrum analyzer and a signal and tracking generator, the R&S®EPL1000 is ideal for various lab applications.

With its very fast time domain scan, the R&S®EPL1000 can check all frequencies of a CISPR band A and B in a single shot, so measurements can be made quickly and large frequency segments can be checked gapless over extended periods of time, if necessary. Built-in preselection ensures a high dynamic range and enables the acquisition of short pulses. For detailed signal analysis, the R&S®EPL1000 offers a spectrogram function and IF analysis.

Automation simplifies measurements and ensures exact reproducibility of test sequences. For example, all lines connected to a Rohde&Schwarz LISN can be checked for CISPR band A and B at the push of a button. Comparing results to configured limit values is also automatic, and the R&S®EPL1000 displays the result of the entire measurement as PASS/FAIL. Using the integrated report generator, the result and the measurement details can easily be saved and printed.

With the optional integrated signal generator including a tracking generator function, the transfer functions of components used for measurements can be quickly and easily determined, without an additional device.

Battery operation, 12 V to 24 V DC input, a carrying bag and other accessories enable very flexible deployment of the R&S®EPL1000.

These and many more functions, as well as compliance with CISPR 16-1-1, make the R&S®EPL1000 the ideal instrument for conducted voltage and current measurements in the frequency range from 5 kHz to 30 MHz. Measuring radiated emissions is equally possible. Typical application areas are precompliance measurements, pre-certification and certification in line with IEC, EN, CISPR and FCC.



# KEY FEATURES

- ▶ Preselection filters
- ▶ Time domain scan
- ▶ Tracking generator
- ▶ Battery operation
- ▶ Pulse protected input

# BENEFITS

- Precise and standard-compliant EMI identification  
▶ [page 4](#)
- Fast measurements thanks to time domain scan  
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- Automation of measurements  
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- Comprehensive EMI analysis functions  
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- Simple integration into EMI test systems  
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- Versatile remote control functions  
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- For stationary, portable and outdoor use  
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# PRECISE AND STANDARD-COMPLIANT EMI IDENTIFICATION

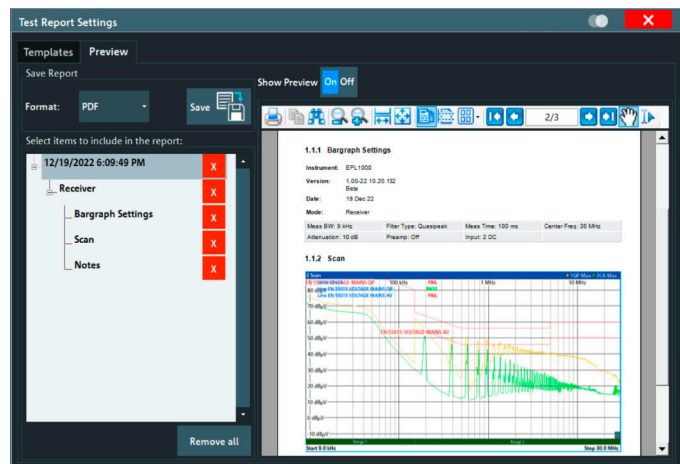
The R&S®EPL1000 meets the requirements of CISPR 16-1-1 and additionally supports the decadic 6 dB bandwidths required by MIL-STD-461 and DO-160. This allows the R&S®EPL1000 to be used during development and for certification of a wide range of electrical products.

The relevant features include:

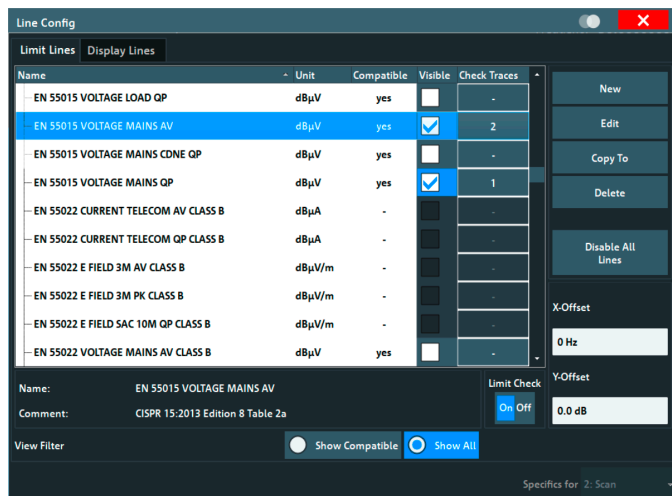
- ▶ EMI detectors: peak, quasi-peak, CISPR-average, RMS-average (CISPR 16-1-1)
- ▶ EMI bandwidth (6 dB)
  - 200 Hz, 9 kHz, 120 kHz and 1 MHz (CISPR 16-1-1)
  - 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz and 1 MHz (MIL-STD-461 and DO-160)
- ▶ Preselection to increase dynamic range (filters for CISPR band A and B)
  - Identify short pulses
  - Identify small signals in the presence of strong signals
- ▶ Transducer factors to include used accessory characteristics (for example cable attenuation or LISN characteristics)
  - Simple definition/quick import
  - Library covering most of the Rohde & Schwarz accessories
  - Record of new transducer factors with integrated tracking generator function (part of R&S®EPL1-B91 internal generator option)
  - Selection of one or more
- ▶ Signal level adaptation to correctly measure strong or weak signals
  - Pulse protected input
  - Attenuation up to 55 dB in 1 dB steps
  - Pre-amplifier with 20 dB gain

- Autoranging function for automated optimization of the signal adaptation to make maximum use of the dynamic range and to avoid overload within the signal processing chain
- ▶ Limit line display and checking to easily evaluate measurement results
  - Easy definition of limit lines
  - Library with more than 170 EMI limit lines based on the latest versions of common EMI standards (CISPR/EN, FCC, MIL-STD-461 and DO-160) for fast and accurate configuration of measurements
- ▶ Report generation to easily record, document and exchange results
  - User-defined layout and content definition through templates
  - On-screen display and save of reports (pdf and Word file format)

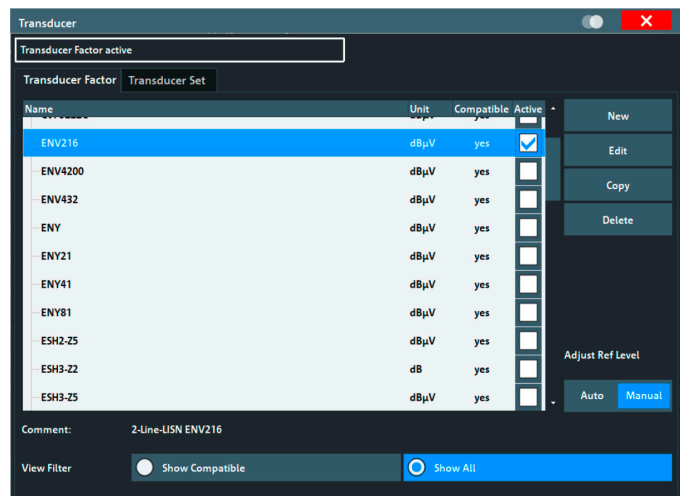
Layout definition and preview of test reports.



Selection of limit lines and assignment to individual traces.



Selection of one or more transducers.





# FAST MEASUREMENTS THANKS TO TIME DOMAIN SCAN

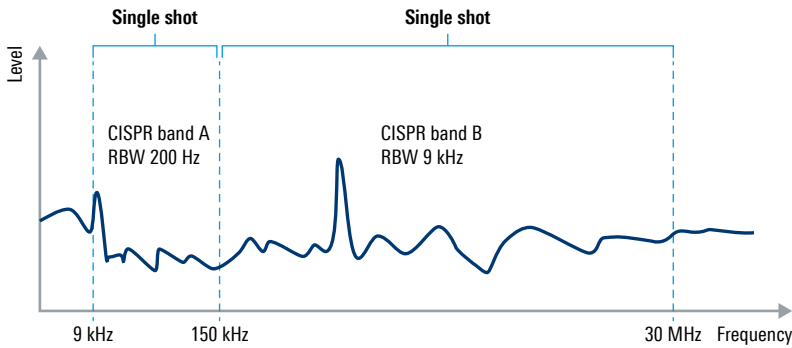
## Superfast measurement

The R&S®EPL1000 can measure an entire CISPR band (A or B) in a single measurement. This is done using FFT in full compliance with the requirements of CISPR 16-1-1. Larger frequency segments can be measured automatically in multiple steps using time domain scan (TDS). Up to three traces can be activated with different detectors, including CISPR detectors. This enables very fast standard-compliant EMI measurements directly with the detector required by the standard. Dividing the measurement into preview and final measurements is not necessary, but this is supported by the R&S®EPL1000 as an alternative method (automatic sequence of preview measurement, peak search and final measurement).

## Fast and reliable detection of sporadic emissions

Highly parallelized measurements enable long and gapless checking of relatively large frequency segments. Every emission in the measured frequency segment (e.g. CISPR band B) is detected, no matter how short. For measuring intermittent disturbances, the measurement time can be as long as 100 s. As all detected emissions of a measurement belong to the same time segment, any dependencies in the emissions can be easily recognized.

## Parallelization of the measurements within the CISPR bands by time domain scan



## Times for common detectors and measurement times for CISPR bands A and B with associated RBW

Detectors	Measurement time	Total time <sup>1)</sup>
Peak	0.1 s	0.5 s
	1 s	1.4 s
	15 s	15.4 s
Quasi-peak and CISPR-average	1 s	3 s
	15 s	17 s

<sup>1)</sup> Necessary settling times for a valid measurement are included and automatically considered by the R&S®EPL1000.



Checking a laptop power supply in CISPR band B. The measurement takes just 3 s for one line with a measurement time of 1 s. All signal components are captured seamlessly in the same time frame.

# AUTOMATION OF MEASUREMENTS

## Automatic measurement of multiple frequency segments with individual settings

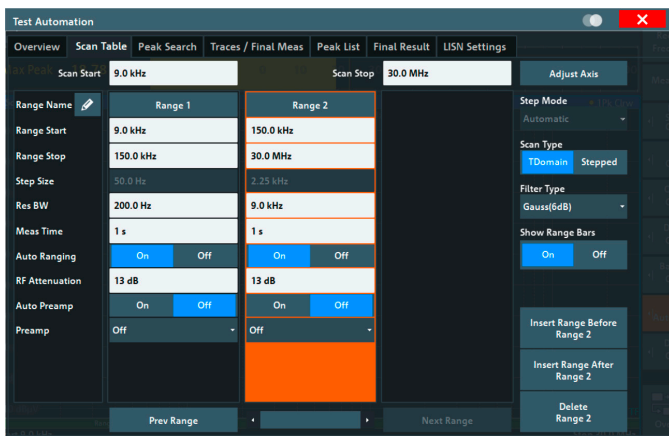
The scan table enables the definition of multiple frequency ranges with individual measurement settings. This way, for example, the RBW can be defined individually for CISPR band A and B. Using the configured settings, the R&S®EPL1000 automatically measures all defined frequency ranges sequentially.

## Automatic measurement of multiple lines connected to a LISN

Line impedance stabilization networks (LISNs) from Rohde&Schwarz connected to the R&S®EPL1000 with an R&S®EZ-21 control cable can be remotely controlled by the R&S®EPL1000, including selection of the line to be measured by the R&S®EPL1000. This function allows all lines connected to a LISN to be measured automatically. On the R&S®EPL1000 GUI, the user simply selects the lines to be measured automatically.

## Preview and final measurement

The R&S®EPL1000 also supports conventional level determination with only one frequency measured at a time (stepped scan). To reduce the total time, the measurement can be divided into preview and final measurement with peak search. With this method, final measurement is usually performed only for critical frequency points (peaks) using a detector required by the standard with a longer measurement time, allowing the total time to be considerably reduced. Preview measurement, peak search and final measurement with evaluation can be completely automated in the R&S®EPL1000.



Scan table with two segments for CISPR bands A and B.



The result of automatic measurement of a LED lamp in line with EN 55015. CISPR bands A and B are fully measured with quasi-peak and CISPR-average detectors on the neutral and live lines. The results are evaluated using the associated limit lines. The result is indicated as PASS/FAIL. The entire measurement is made at the push of a button in just about 13 s (1 s measurement time plus required settling time per segment and line).

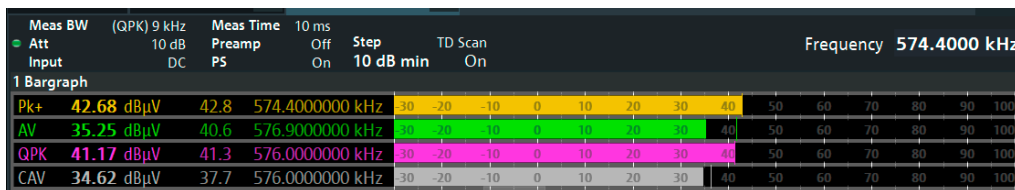
# COMPREHENSIVE EMI ANALYSIS FUNCTIONS

## Level at a frequency: bargraph display

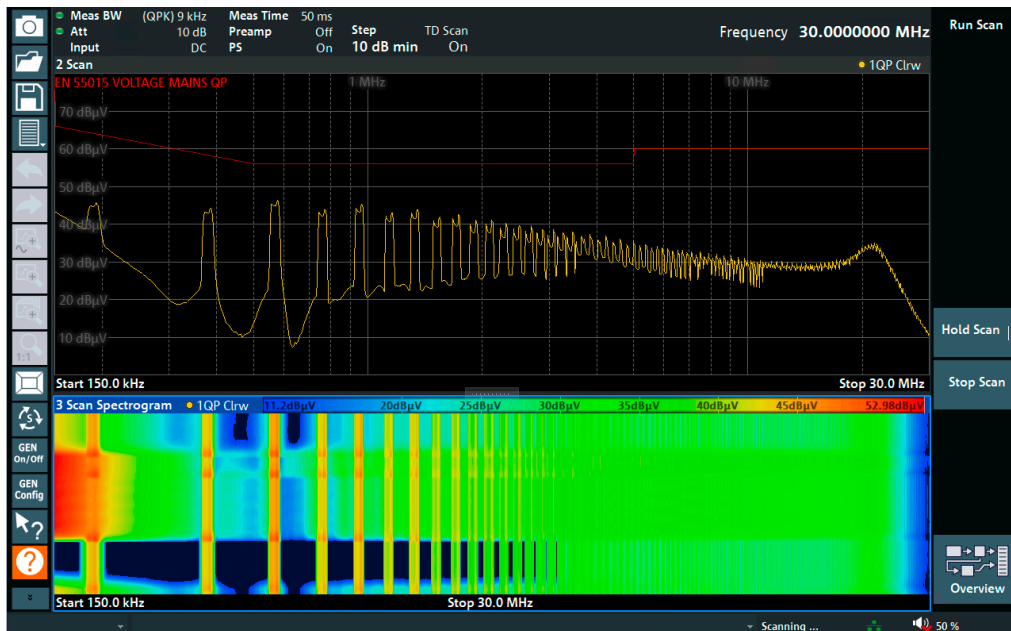
The bargraph display visualizes the level at a selected frequency. Instantaneous and maximum values are also displayed. Up to four graphs, each with its own detector, can be displayed at the same time. This function enables quick and easy analysis of the level at a frequency.

## Level versus frequency and time: spectrogram function

The spectrogram function is ideal for capturing and analyzing signal properties over both time and frequency. The user can select either 2D or 3D presentation and quickly measure results with markers. This function is especially helpful when the signal or sporadic signal components need to be analyzed over time.



Bargraph display with four detectors.



Analysis of the emissions of a LED lamp while changing the brightness levels. The measurement was made with a quasi-peak detector.

### Level at a frequency versus time: zero span

The level over time at a selected frequency is displayed as a trace. Level and time values can be determined quickly and exactly using markers. This can for example be helpful to determine the period of periodic interferers to specify an appropriate measurement time.

### IF analysis (R&S®EPL1-K56 option)

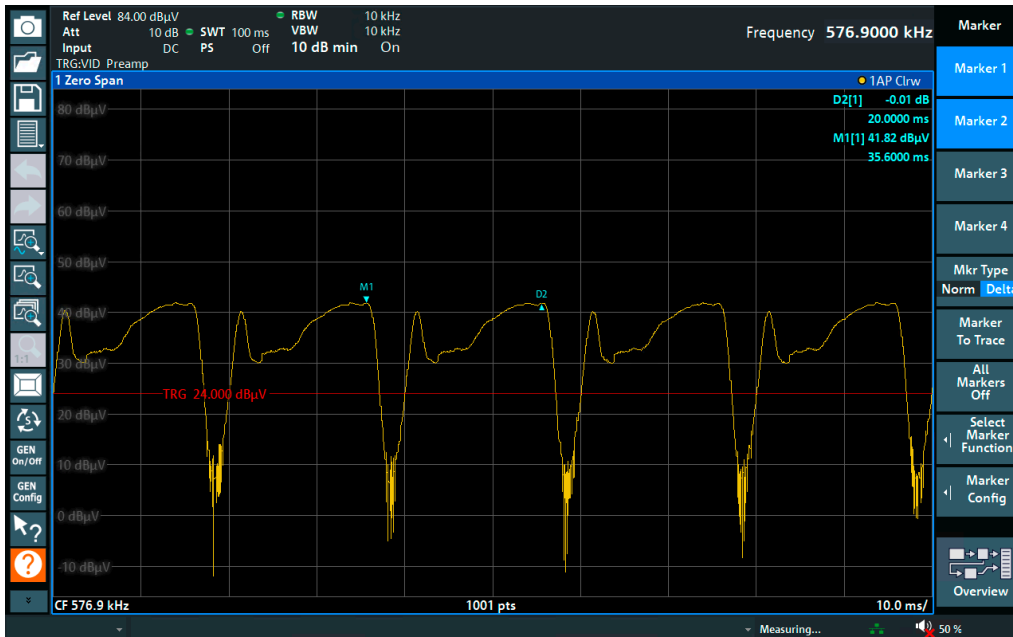
The R&S®EPL1000 offers IF analysis as an option. This can be combined with the bargraph display and a spectrogram function. Marker functions enable precise measurement.

### AM/FM audio output

AM and FM audio output can help understand the characteristic of an interferer or to easily identify ambient interferers, for example during open area testing. Audio output is possible via the integrated loudspeaker or the headphone output. Comprehensive analysis functions for the modulation parameters of AM, FM and PM signals can be activated with the R&S®FPL1-K7 keycode option.

### Spectrum analysis

In addition to the various EMI-specific measurement functions, the R&S®EPL1000 includes spectrum analysis functions, equivalent to those offered by a modern spectrum analyzer.



Analysis of the emissions of a LED lamp at 576 kHz versus time. The trigger function ensures a stable display. A period of 20 ms was measured using the marker functions.



Analysis of the emissions of a LED lamp at 576 kHz using bargraph display in combination with IF spectrum and spectrogram function. The dynamic behavior of the signal, especially in the range of 560 kHz to 585 kHz, is clearly visible.



# SIMPLE INTEGRATION INTO EMI TEST SYSTEMS

## Integration into networks

The R&S®EPL1000 can be integrated into TCP/IP networks via its Ethernet interface. A GPIB interface (R&S®FPL1-B10) can additionally be integrated as an option.

## Integration into any desired software applications via SCPI command set

Using SCPI commands, the functions of the R&S®EPL1000 can be controlled and measurement results can be retrieved. This enables integration into EMC measurement system software as well as any other software applications.

## Integration into ELEKTRA EMC test software

R&S®ELEKTRA EMC test software is a complete solution that controls EMC test systems. The R&S®ELEMI-E essential EMI test software as base option for EMI measurements helps users define, perform, evaluate and archive EMI measurements in line with current EMI standards. Users can quickly generate correct and reproducible results. R&S®ELEKTRA also supports the R&S®EPL1000.

For more information, see the R&S®ELEMI-E essential EMI test software product brochure (PD 3607.6021.12) and the R&S®ELEKTRA EMC test software product brochure (PD 5216.3695.12).

## Use of R&S®EPL1000 with R&S®ELEKTRA



# VERSATILE REMOTE CONTROL FUNCTIONS

## Remote control of R&S®LISNs

R&S®LISNs, such as the R&S®ENV216, can be remotely controlled via a proprietary interface integrated in the R&S®EPL1000. This way, the line to be measured can be selected on the R&S®EPL1000. This is especially helpful when the LISN and the R&S®EPL1000 are not in the same location. Suitable cables are available with lengths of 3 m or 10 m (R&S®EZ-21).

## Remote control via remote desktop (Microsoft)

The R&S®EPL1000 can easily be operated remotely with a remote desktop connection. The R&S®EPL1000 screen display, along with an interactive visual simulation of the R&S®EPL1000 controls, is displayed on the client computer. This allows remote operation in the usual way as if the user was sitting directly at the device.

## Access via web server

A connection with the web server integrated in the R&S®EPL1000 can be established by simply entering the IP address in the browser. This allows the instrument to be used remotely, just like with remote desktop. Multiple users can access the instrument at the same time from different computers and see the same user interface. The web server also supports simple data exchange with the R&S®EPL1000.

# FOR STATIONARY, PORTABLE AND OUTDOOR USE

## Operation in a rack, in the lab or on the go

Fold-out feet on the bottom and a carrying handle on the top of the R&S®EPL1000 enable flexible deployment in the lab. Professional installation in a 19" rack is easy using the R&S®EPL1-Z6 rackmount kit. The R&S®EPL1-Z1 protective hard cover for the front of the instrument and the R&S®EPL1-Z2 carrying bag – a perfect fit for the R&S®EPL1000 – make transportation easy and safe. A Kensington lock can be used to secure the instrument.

## Flexible power supply, including an integrated rechargeable battery

With an input voltage range of 110 V to 240 V, the R&S®EPL1000 can be connected to all customary AC power sources. If an AC power source is not available, the integrable 12 V to 24 V DC input (R&S®FPL1-B30) can be used as an alternative. And if no external power source is available, the R&S®EPL1000 is still usable thanks to the integrated rechargeable battery (R&S®FPL1-B31). For an especially long operating time, the batteries can be exchanged (R&S®FPL1-Z4/R&S®FSV-B34). This makes outdoor measurements far away from power sources easy (such as in-situ measurements).

## Use in direct sunlight

The R&S®FPL1-Z5 antiglare display film noticeably reduces reflections from the screen. This is especially helpful for use in direct sunlight.

## Data protection when the instrument is used at different locations or by different users

The memory pack (SSD) of the R&S®EPL1000, together with the associated controller unit, can easily be exchanged (R&S®EPL1-B19). This allows easy and very reliable removal of sensitive measurement data from the instrument. If the R&S®EPL1000 is transferred without a memory pack, no data can be handed over with the instrument. After the recipient inserts a replacement SSD including controller unit, the R&S®EPL1000 is again fully ready to use.



# SPECIFICATIONS IN BRIEF

Specifications in brief		
RF input		50 Ω, N connector (female); integrated pulse limiter
Frequency range		5 kHz to 30 MHz
Attenuator setting range		0 dB to 55 dB, in 1 dB steps
Preselection bandwidths (–6 dB), nominal	10 Hz to 150 kHz	fixed lowpass filter
	150 kHz to 30 MHz	38 MHz, fixed bandpass filter
Preamplifier	switchable	20 dB (nom.); located between preselection and first mixer
EMI filters (–6 dB)		10/100/200 Hz, 1/9/10/100/120 kHz, 1 MHz
Noise indication (receiver mode)	termination = 50 Ω, average detector (AV), RF attenuation = 0 dB, preamplifier on/off	
	9 kHz ≤ f < 100 kHz, bandwidth = 200 Hz	< –25 dBμV/–15 dBμV
	100 kHz ≤ f < 150 kHz, bandwidth = 200 Hz	< –25 dBμV/–15 dBμV
	150 kHz ≤ f < 1 MHz, bandwidth = 9 kHz	< –9 dBμV/+1 dBμV
	1 MHz ≤ f < 10 MHz, bandwidth = 9 kHz	< –16 dBμV/–4 dBμV
	10 MHz ≤ f < 30 MHz, bandwidth = 9 kHz	< –12 dBμV/–4 dBμV
Detectors	standard	min. peak, RMS and average
	CISPR in line with CISPR 16-1-1:2019	max. peak, quasi-peak, CISPR-average and RMS-average
Maximum number of traces		6
Time domain scan examples for total time		see table on page 5
IF analysis	R&S®EPL1-K56	
Span		max. 10 MHz
Resolution bandwidths		10 Hz to 100 kHz in 1/2/3/5 sequence
Detector		sample
Internal generator	R&S®FPL1-B91	50 Ω, N connector (female)
Operating modes		tracking generator, CW generator, power sweep
AF demodulation types		AM and FM (loudspeaker and phone jack)
Display		21 cm LC TFT color display (10.1"), 1280 × 800 pixel (WXGA resolution)
Remote control interfaces		
LAN interface		10/100/1000BASE-T, RJ-45
GPIB interface (IEC/IEEE bus control)	R&S®FPL1-B10	interface in line with IEC 625-2 (IEEE 488.2); 24 pin Amphenol connector (female)
User port (LISN remote control)		25 pin D-Sub (female)
USB interfaces	front	2 ports, type A plug, version 2.0
	rear	2 ports, type A plug, version 3.1
Power supply		
AC supply		100 V to 240 V ± 10%, 50 Hz to 60 Hz ± 5%
DC power input voltage range	R&S®FPL1-B30	12 V to 24 V (nom.), 10.4 V to 28 V
Battery operating time	R&S®FPL1-B31	2 h (nom.)
Dimensions	W × H × D	408 mm × 186 mm × 235 mm (16.06 in × 7.32 in × 9.25 in)
Net weight (nom.)	without options	6.9 kg (15.2 lb)
	with internal battery	8.6 kg (18.95 lb)
Recommended calibration interval		1 year

# ORDERING INFORMATION

Designation	Type	Order No.	Retrofitted by
<b>Base unit</b>			
EMI test receiver, 5 kHz to 30 MHz	R&S®EPL1000	1350.4444.10	
<b>Hardware options</b>			
Internal generator, 5 kHz to 30 MHz	R&S®EPL1-B91	1350.4073.02	factory only
Replacement SSD, including controller unit	R&S®EPL1-B19	1350.4450.02	user
OCXO, precision frequency reference	R&S®FPL1-B4	1323.1902.02	service only
GPIB interface	R&S®FPL1-B10	1323.1890.02	user
DC power supply for 12 V/24 V supply voltage	R&S®FPL1-B30	1323.1877.02	user
Lithium-ion battery pack, with controller unit for internal battery slot	R&S®FPL1-B31	1323.1725.02	service only
<b>Keycode options</b>			
IF analysis	R&S®EPL1-K56	1350.4067.02	user (keycode)
Modulation analysis application (AM, FM, PM)	R&S®FPL1-K7	1323.1731.02	user (keycode)

Designation	Type	Order No.
<b>EMC test software</b>		
Essential EMI test software	R&S®ELEMI-E	5601.0030.02
License dongle	R&S®EMCPC	5601.0018.02
<b>Recommended extras</b>		
Soft carrying bag for transport and outdoor operation	R&S®EPL1-Z2	1350.4309.02
H-style shoulder harness (requires R&S®FPL1-Z2 option)	R&S®EPL1-Z3	1350.4315.02
Spare lithium-ion battery pack	R&S®FPL1-Z4	1323.1677.02
Antiglare display film for outdoor operation	R&S®FPL1-Z5	1323.1690.02
19" rackmount kit	R&S®EPL1-Z6	1350.4321.02
Lithium-ion battery charger for charging spare batteries	R&S®FSV-B34	1321.3950.02
Control cable for R&S®ENV216/R&S®ENV432/R&S®ENV420		
Length: 3 m	R&S®EZ-21	1107.2087.03
Length: 10 m	R&S®EZ-21	1107.2087.10
<b>Calibration</b>		
Accredited calibration	R&S®ACAEPL1000	3599.0699.03
Documentation of calibration values	R&S®DCV-2	0240.2193.09

Service options		
Extended warranty, one year	R&S®WE1	Contact your local Rohde & Schwarz sales office for more information.
Extended warranty, two years	R&S®WE2	
Extended warranty, three years	R&S®WE3	
Extended warranty, four years	R&S®WE4	
Extended warranty with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	
Extended warranty with calibration coverage, three years	R&S®CW3	
Extended warranty with calibration coverage, four years	R&S®CW4	
Extended warranty with accredited calibration coverage, one year	R&S®AW1	
Extended warranty with accredited calibration coverage, two years	R&S®AW2	
Extended warranty with accredited calibration coverage, three years	R&S®AW3	
Extended warranty with accredited calibration coverage, four years	R&S®AW4	



# FROM PRESALES TO SERVICE. AT YOUR DOORSTEP.

The Rohde & Schwarz network in over 70 countries ensures optimum on-site support by highly qualified experts.

User risks are reduced to a minimum at all project stages:

- ▶ Solution finding/purchase
- ▶ Technical startup/application development/integration
- ▶ Training
- ▶ Operation/calibration/repair



## Service at Rohde & Schwarz You're in great hands

- ▶ Worldwide
- ▶ Local and personalized
- ▶ Customized and flexible
- ▶ Uncompromising quality
- ▶ Long-term dependability

## Rohde & Schwarz

The Rohde&Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test&measurement, technology systems and networks&cybersecurity. Founded more than 85 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and has an extensive sales and service network with locations in more than 70 countries.

[www.rohde-schwarz.com](http://www.rohde-schwarz.com)

## Sustainable product design

- ▶ Environmental compatibility and eco-footprint
- ▶ Energy efficiency and low emissions
- ▶ Longevity and optimized total cost of ownership

Certified Quality Management

**ISO 9001**

## Rohde & Schwarz training

[www.training.rohde-schwarz.com](http://www.training.rohde-schwarz.com)

## Rohde & Schwarz customer support

[www.rohde-schwarz.com/support](http://www.rohde-schwarz.com/support)



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