

# HF Transceiver Family

## XK 2000



## VLF-HF Receiver R&S® EK 2000

For all modulation types used in military, government and civil radiocommunications



**ROHDE & SCHWARZ**



## Brief description

With the VLF-HF Receiver R&S®EK 2000 Rohde & Schwarz adds an attractive product to its R&S®XK 2000 family of shortwave radio equipment. This receiver is able to handle all modulation types relevant for professional use and includes a fast data modem (option). The R&S®EK 2000 moreover features a built-in power supply.

## Features and benefits

### Receiving characteristics

- ◆ Frequency range 10 kHz to 30 MHz
- ◆ 1 Hz frequency resolution
- ◆ Outstanding large-signal characteristics
- ◆ Immunity to input interference up to 200 V EMF
- ◆ 17 group-delay-compensated IF filter bandwidths from 50 Hz to 8 kHz
- ◆ Settable notch filter
- ◆ Passband tuning
- ◆ Syllabic squelch
- ◆ Noise blanker
- ◆ Digitally tuned RF selector modules as plug-ins, maximum attenuation 40 dB at 10% frequency offset (option)

### Signal processing

- ◆ Digital IF signal processing
- ◆ Data link operation in line with MIL-STD-188-203-1A (option)
- ◆ High-speed data reception in line with STANAG 4285, STANAG 4529 and MIL-STD-188-110A, MIL-STD-188-110B, App. C (option)

### Operation, benefits for customer

- ◆ Remote control via Control Unit R&S®GB 2000, PC or Remote Control Processor R&S®GP 2000
- ◆ Optimized graphical MMI
- ◆ 19" rackmount adapter available
- ◆ Built-in power supply with input voltage range 97 V to 253 V
- ◆ Easy upgrading to exciter by exchanging modules

## Applications

The R&S®EK 2000 is above all ideal for all applications and platforms in communications networks, but it is also suited for radio interception and radiomonitoring. Its excellent RF characteristics, its comprehensive remote control features and its high reliability even under difficult operating conditions make this receiver the first choice for navy vessels. In addition to classic reception modes, the R&S®EK 2000 also enables broadcast reception (e.g. BRASS = broadcast and ship to shore) and is often used in split-site configurations. The Remote Control Processor R&S®GP 2000 and the Remote Control Unit R&S®GB 2000 are available for controlling the R&S®EK 2000.

The use of sophisticated DSP technology throughout allows the R&S®EK 2000 to handle all types of modulation used in military, government and civil radiocommunications. For the reception of morse, speech, teletype and data signals, the R&S®EK 2000 can be operated in the SSB (USB/LSB), ISB, AME, CW, FSK, AFSK, F1C and FM modes.

An additional module makes it possible to achieve LINK-11/LINK-Y expandability.

The optional multistandard HF Modem R&S®GM 2200 enables the reception and demodulation of data signals transmitted in single-tone mode (PSK) in line with MIL-STD-188-110A, MIL-STD-188-110B, App. C, STANAG 4285 and STANAG 4529.

In the FSK and PSK modes (STANAG 4285, STANAG 4529 and MIL-STD-188-110A), the Receiver R&S®EK 2000 can also be used as a modulator for detached transmitters.

## Design

The R&S®EK 2000 is of modular design and is equipped with modules of the R&S®XK 2000 transceiver family. This ensures a uniform logistics concept and the convenient integration of the receiver into existing and new systems. The R&S®EK 2000 provides menu-guided operation and has versatile, flexible interfaces. The sturdy design and the water- and dust-proof front panel (protection class IP 42) allow use of the receiver even under adverse environmental conditions. The R&S®EK 2000 complies with the environmental specifications of MIL-STD-810E.

## Options for R&S®EK 2000 applications

The basic equipment sets of the R&S®EK 2000 are already factory-prepared and prewired to accept plug-in options. These internal options can be placed in specific slots on the mainboard (e.g. for VPU, HF modem, digital selection modules) and/or inserted as interface options at the rear of the units.

These interface options allow the simple connection of external system options or peripheral system equipment and accessories. They offer suitable matching and isolation as well as comprehensive EMC filtering and protection. The rear three-slot interface cabinet makes for the connection of an external HF modem, GMDSS-DSC set, DATA LINK modems, PABX/PSTN telephone facilities, remote control facilities, etc.

The full advantages of the mentioned applications are mostly a matter of detailed system knowledge, planning and engineering.

### Available options for the R&S®EK 2000

- ◆ HF Modem R&S®GM 2200
- ◆ Data Link Interface R&S®GV 2120
- ◆ Modem Data Interface R&S®GV 2130
- ◆ Modem Control Interface R&S®GS 2120
- ◆ Digitally Tuned RF Selectors R&S®FK 2020/FK 2040
- ◆ OCXO Frequency Standard R&S®GF 2010

For more information see the Transceiver Family R&S®XK 2000.

To install the R&S®EK 2000 in a 19" console or rack, the 19" Adapter Kit R&S®KA 2900 (model .03) is required.

## Specifications

<b>General</b>	
Frequency range	10 kHz to 30 MHz
Frequency steps	1 Hz
Channel memory	
User-programmable channels	401
Half-duplex channels	100 (transmit and receive frequencies separately programmable)
Fixed-programmed channels (ITU)	1839 (channel numbers between 401 and 2240, half duplex)
Frequency stability	
Standard TCXO	$<2 \times 10^{-8}/^{\circ}\text{C}$
Aging	$<1 \times 10^{-6}/\text{year}$
Option (OCXO)	$<1 \times 10^{-9}/^{\circ}\text{C}$
Aging	$<5 \times 10^{-9}/\text{day}$ $<1 \times 10^{-7}/\text{year}$
Connection for external frequency standard	1/5/10 MHz
Frequency change	$<50$ ms (without ATU and remote control, depending on baud rate)
<b>Receiver specifications</b>	
Frequency range	10 kHz to 30 MHz
Input impedance	50 $\Omega$ , VSWR $<3$
Input sensitivity (for S/N = 10 dB, f = 0.2 MHz to 30 MHz)	
Without preamplifier and preselection	
A1A (CW)	typ. 0.4 $\mu\text{V}$ EMF, bandwidth = 300 Hz
J3E (SSB), J7B	typ. 1.0 $\mu\text{V}$ EMF, bandwidth = 2.7 kHz
H3E (AME), 1 kHz, m = 60 %	typ. 2.7 $\mu\text{V}$ EMF, bandwidth = 6 kHz
With preamplifier, without preselection	
A1A (CW)	typ. 0.15 $\mu\text{V}$ EMF, bandwidth = 300 Hz
J3E (SSB), J7B	typ. 0.4 $\mu\text{V}$ EMF, bandwidth = 2.7 kHz
H3E (AME), 1 kHz, m = 60 %	typ. 1.0 $\mu\text{V}$ EMF, bandwidth = 6 kHz
Receiving bandwidths	
3 dB	$\pm 25$ Hz, $\pm 75$ Hz, $\pm 150$ Hz, $\pm 200$ Hz, $\pm 300$ Hz, $\pm 400$ Hz, $\pm 500$ Hz, $\pm 750$ Hz, $\pm 900$ Hz, $\pm 1050$ Hz, $\pm 1200$ Hz, $\pm 1350$ Hz, $\pm 1550$ Hz, $\pm 1850$ Hz, $\pm 2250$ Hz, $\pm 3000$ Hz, $\pm 4000$ Hz
60 dB	$\pm 125$ Hz, $\pm 150$ Hz, $\pm 215$ Hz, $\pm 335$ Hz, $\pm 430$ Hz, $\pm 650$ Hz, $\pm 770$ Hz, $\pm 1000$ Hz, $\pm 1440$ Hz, $\pm 1600$ Hz, $\pm 1760$ Hz, $\pm 1900$ Hz, $\pm 2100$ Hz, $\pm 2850$ Hz, $\pm 3220$ Hz, $\pm 4100$ Hz, $\pm 5100$ Hz
AGC	$<3$ dB (1 $\mu\text{V}$ to 1 V EMF)
Response to a 60 dB step variation	
Attack time	$<10$ ms
Decay time	25/150/500 ms, 1 s/3 s (selectable)
AF distortion	
Line output, 0 dBm	$<1\%$
Headphones, loudspeaker	$<3\%$ at rated power
Weighted S/N ratio (H3E)	$>46$ dB SINAD for 1 mV EMF, weighted with filter in line with ITU-T (0.41/P53)
<b>Nonlinearities</b>	1.5 MHz to 30 MHz, without preamplifier
Blocking	3 dB signal attenuation ( $\Delta f = 30$ kHz, useful signal 2 mV EMF, interfering signal 5 V EMF)
Desensitization	$>20$ dB SINAD ( $\Delta f > 30$ kHz, bandwidth = 2.7 kHz, useful signal 30 mV, interfering signal 100 mV)
Intercept point TOI	typ. 35 dBm ( $\Delta f > 30$ kHz, interfering signals $2 \times 0$ dBm)
Crossmodulation	$<10\%$ ( $\Delta f > 30$ kHz, useful signal 1 mV EMF, interfering signal 4 V EMF, 1 kHz, m = 30 %)
Inherent spurious signals	$<-113$ dBm, with few exceptions

Immunity to interference	
Image-frequency rejection	typ. 90 dB
IF rejection	typ. 90 dB
Oscillator reradiation	<10 $\mu$ V (at antenna input)
Protection of receiver input	up to 100 V EMF (f < 30 MHz)
With digital selection	up to 200 V EMF (f < 30 MHz)
<b>Classes of emission</b>	A1A (CW), J3E (SSB), (USB/LSB selectable), H3E (AME, USB), J7B data, data transmission (J3E), B8E (ISB), F1B (FSK, AFSK, 50 baud to 600 baud, shift 42.5 Hz to 425 Hz), F3E (FM), F1C, A3E (AM) (reception only), MIL-STD-188-203-1A (optional)
<b>Maintenance</b>	
Built-in test equipment (BITE)	selectable, display of control unit or front panel with plain-text error readout (English), localization down to module level
<b>Inputs/outputs, interfaces</b>	
AF interfaces	
Inputs/outputs (2, optionally 3)	selectable on symmetrical (floating) front panel or control unit, configurable, 0 dBm, 600 $\Omega$ , adjustable from -10 dBm to +10 dBm
AF output for loudspeaker	3 W into 4 $\Omega$ , selectable, on/off, short-circuit-proof
AF output for headset	50 mW into 300 $\Omega$ , adjustable
Microphone inputs (2)	15 mV (1 V to 30 mV), 150 $\Omega$ 150 mV (10 V to 300 mV), 150 $\Omega$
Teleprinter connection ports (2)	V28, selectable via front panel of remote control unit
Control interface	
Squelch (output)	open collector (30 V, 50 mA)
Receiver inhibiting	muting of receiver via contact to ground
Serial interfaces	
Computer control	RS-422, RS-485 or RS-232-C
Remote control	RS-232-C
RF interfaces	
RF input	N female connector, 50 $\Omega$
Receive antenna (separate)	BNC female connector
External frequency standard	BNC female connector, 1/5/10 MHz selectable, 0 dBm/50 $\Omega$ $\pm$ 3 dB
<b>General data</b>	
Power supply	97 V to 246 V AC, 47 Hz to 440 Hz and/or 19 V to 31 V DC, I < 2 A (without options)
<b>Environmental conditions</b>	
Operating temperature range	-25 $^{\circ}$ C to +55 $^{\circ}$ C
Storage temperature range	-40 $^{\circ}$ C to +85 $^{\circ}$ C
Altitude	max. 3 000 m, max. +35 $^{\circ}$ C (operation) max. 10 000 m (transport)
Humidity	in line with MIL-STD-810E, meth. 507.3
Vibration	
Sinusoidal	3 Hz to 10 Hz/2 mm; 10 Hz to 150 Hz, 1 g const., 3 axes
Random	in line with MIL-STD-T28800 (0.01 g <sup>2</sup> /Hz, 10 Hz to 300 Hz, 1.9 g rms)
Shock	in line with MIL-STD-810E, meth. 516.4, proc. I
Safety	in line with EN 60950-1/VDE 0805
MTBF	>14 000 h
MTTR	0.5 h (module exchange)
Int. protection code	in line with EN 60529/IP43
EMC	in line with MIL-STD-461B, part 4 (CE03, RE02, CS02, CS06) EN 50081-1 EN 50082-2

## Mechanical data

Dimensions (W × H × D)	483 mm × 132 mm × 340 mm (19", 3 height units)
Weight	approx. 13 kg (without options)

## Ordering information

Designation	Type	Order No.
VLF-HF Receiver	R&S® EK 2000	6093.6002.02
19" Adapter Kit	R&S® KA 2900	6072.6010.03



More information at  
[www.rohde-schwarz.com](http://www.rohde-schwarz.com)  
(search term: EK2000)



# ROHDE & SCHWARZ

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

Europe: +49 1805 12 4242, [customersupport@rohde-schwarz.com](mailto:customersupport@rohde-schwarz.com)  
USA and Canada: +1-888-837-8772, [customer.support@rsa.rohde-schwarz.com](mailto:customer.support@rsa.rohde-schwarz.com)  
Asia: +65 65 130 488, [customersupport.asia@rohde-schwarz.com](mailto:customersupport.asia@rohde-schwarz.com)