

FED-STD-1045/46/49

MIL-STD-188-141

Conformance Certification by  
Defense Information Systems Agency (JITC)



## HF Transceiver Family R&S XK2000

### Advanced digital shortwave communications

With the HF Transceiver Family R&S XK2000, Rohde & Schwarz is continuing its long-standing tradition in the field of shortwave communications. The R&S XK2000 line includes transceiver systems for mobile and stationary use with powers of 150 W, 500 W and 1000 W.

**NEW**

The following devices are new:

- ◆ HF modem, up to 9.6 kbit/s
- ◆ Digital Voice Option R&S GN2120

The R&S XK2000 not only provides the full range of standard radiocommunication functions; it also offers a wide variety of applications:

- ◆ Shortwave telephone, fax and e-mail
- ◆ Transmission of picture and computer data with 9600 bit/s
- ◆ GMDSS for maritime applications
- ◆ LINK expandability
- ◆ Wireless TCP/IP expandability

Further advantages are:

- ◆ Optimum operating concept
- ◆ Plug-in options
- ◆ Fail-safe 24-hour operation
- ◆ EMC protection to MIL and EN
- ◆ Sturdy construction

Communication processors to international standards, fast and reliable data transmission as well as message handling (e.g. with PostMan|COM 2000) allow the R&S XK2000 to be integrated into modern multimedia systems, thus providing the basis for reliable, worldwide communications independent of existing infrastructures. It is possible to set up high-power broadband communications systems on the basis of the R&S XK2000 components for transmissions on multiple channels with low frequency separation and in different emission modes.



**ROHDE & SCHWARZ**

## Versatility built into the basic configuration

The R&S XK2000 in its basic configuration is capable of transmitting morse, speech and teletype data. All common classes of emission such as SSB (USB, LSB), ISB, AME, CW, FSK, AFSK, weather fax and FM are available. The system can thus be used both for high-quality SSB/AME/FM radiotelephony and for teletype and data transmissions with a rate up to 600 Bd. With a lower frequency limit of 1.5 MHz, radiocommunication via ground waves is possible, giving particularly reliable communication links. Completely new areas of application are opened up by a variety of **options**, provided mostly as **plug-in modules** for the basic unit.

## Options for versatile application

### Automatic link establishment (ALE)

The Data Link Processor R&S GS2200 automatically sets up the optimum radio-communication link using the adaptive Rohde & Schwarz ALIS procedure or FED-STD-1045A (MIL-STD-188-141A +B). As for ALIS, this procedure is 100% compatible with the R&S HF850 family of radio equipment.

### High-speed data transmission

The transmission rate can be markedly increased (up to 9600 bit/s) by means of the internal HF Modem R&S GM2200. This enables the transmission and reception of telefax messages, computer data, and colour video still pictures, for example. Connection between the data terminal (fax machine, video camera) and the R&S XK2000 is made by the MERLIN system processor from Rohde & Schwarz or an equivalent PC with the appropriate software. Alternatively, an external HF modem (e.g. R&S GM 857C4) can be connected via the Interface R&S GV2100.

### Shortwave telephone links

The optional Automatic Phone Patch (APP) R&S GN2100 allows a telephone to be linked to a private automatic branch exchange (PABX). The Data Link Processor R&S GS2200 establishes the radio link with the called subscriber, who can be dialled directly in half-duplex mode; transmit/receive switchover is voice-controlled by means of a VOX circuit. The R&S GN2100 automatically adapts itself to telephone lines of varying quality. Instead of the PABX, direct connection can be made to the public switched telephone network (PSTN), provided official regulations make allowance for this. As a matter of course, the R&S XK2000 offers all the amenities of a modern telephone set: short-code dialling memory, optional pulse or dual-tone multifrequency dialling (DTMF).

## High quality of speech and privacy

### Digital voice option

The R&S GN2120 is a plug-in vocoder module with integrated crypto processor for the R&S XK2000 HF equipment. It can be used together with the R&S XK2100 150 W transceivers, the R&S GX2900 excitors, the R&S EK2000 receivers or the R&S GP2000 remote control processors. The option considerably enhances the quality of voice links and, above all, provides digital ciphering of voice signals.

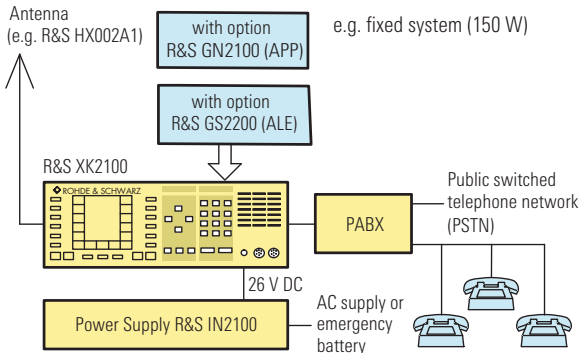
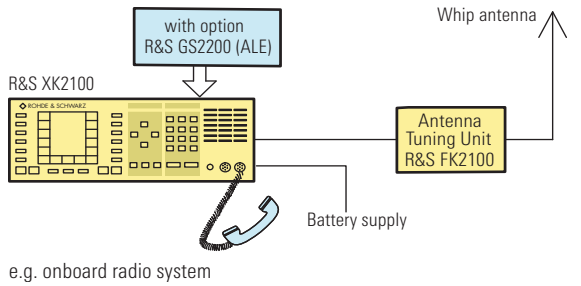
The COMSEC part of the R&S GN2120 is based on the SCR95 crypto algorithm. This strong algorithm uses key lengths of up to 256 bits (approx.  $10^{77}$  variants). Assuming even uninterrupted transmission, the same bit sequence would not be repeated for about  $2 \times 10^9$  years. The algorithm can be adapted to user requirements (option). With this concept, each user can benefit from a unique user key set. The keys required for ciphering are stored inside the module but can be distributed by appropriate hardware. A stored key set contains 4096 independent keys that can be selected from the keyset menu of the R&S XK2000 MMI. The R&S GN2120 supports plain override. This feature allows reception of analog voice on the currently selected channel with the transceiver set to digital operation. This prevents analog calls from being missed while working in digital voice mode. To answer an analog call, the operator simply has to switch to analog (SSB) mode temporarily.

### Voice Scrambler Option R&S GN2110

Using digital signal processing (DSP), the Digital Voice Processing Unit R&S GN2110 considerably improves speech intelligibility by suppressing noise and interference in the transmission or the reception mode. This option also allows voice control of squelch and VOX circuits. A speech scrambler can also be fitted to provide security against interception.



*Worldwide communication with high reliability and great ease of operation: HF Transceiver Family R&S XK2000.*



**Transceivers of the R&S XK2000 family (in this example R&S XK2100) can be connected to a private automatic branch exchange, allowing telephone communication via shortwave independent of the available infrastructure.**



### High RF selectivity

The optional Digital Selections R&S FK20XX with a tuning time of only 20 ms enable fast frequency changes. Selectivity is up to 40 dB at 10% frequency spacing in the transmission and reception mode, while far-off selectivity exceeds 70 dB. The input is protected against overvoltages up to 200 V EMF.

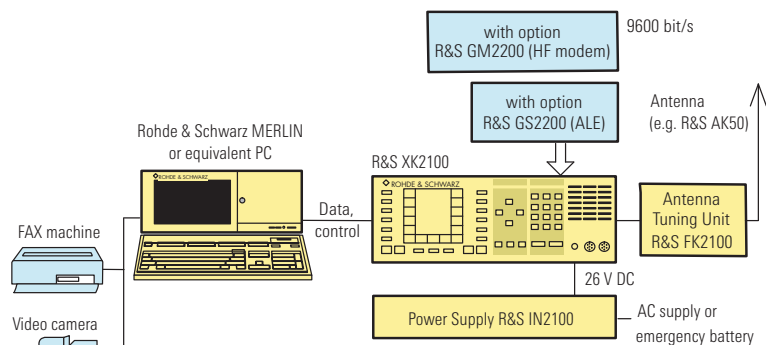
### Remote control facilities

One or more R&S XK2000 transceivers can be remotely controlled – over any distance and for all settings – from either the Remote Control Unit R&S GB2000, the RC Processor R&S GP2000 and/or from a PC.

Simultaneous connection of two remote control facilities (as above) is possible. Operating in addressed mode, up to 99 transceivers are controllable using the integrated (bus-capable) serial interface RS-485. On the Remote Control Unit R&S GB2000, various hardware- or software-configured AF (in/out) and PTT modes can be selected. This facilitates adaptations

and integration into existing voice/data/control (PTT) facilities. Full PC control of one or more R&S XK2000 transceivers from an IBM-compatible PC, e.g. MERLIN, can easily be implemented either with

Remote Control Software R&S XK2000S or with customer-written programs. The transparent ASCII command format required for the R&S XK2000 control will be accepted by any software language.



**With the optional HF modem fitted in the transceiver, transmission rates of up to 9600 bit/s can be achieved. This allows the transmission and reception of fax messages, video still pictures and computer data, for example.**

### Three power classes

The system is available in three versions with different output powers:

- ◆ R&S XK2100 with 150 W
- ◆ R&S XK2500 with 500 W
- ◆ R&S XK2900 with 1000 W

Each transceiver system comprises a receiver-exciter, an amplifier, a power supply, an antenna tuning unit, and internal and external options (see diagram below). All units are available as bench models or rackmounts.

The R&S XK2000 is used for reception in the range 10 kHz to 30 MHz and for transmission in the range 1.5 MHz to 30 MHz. Broadband antennas can be connected directly to the system. Optimum antenna matching is provided for each power class by means of the Antenna Tuning Units R&S FK2100, R&S FK855 and R&S FK2900M. The Antenna Tuning Unit R&S FK2100, which is used in the 150 W system (R&S XK2100), is connected via a sin-

gle coaxial cable, which carries at the same time the RF signal, the control data and the supply voltages.

### State-of-the-art technology

The HF Transceiver Family R&S XK2000 is in line with the very latest in technology both in terms of hardware and software. This includes, for example, digital signal processing (DSP) in the transmitting and receiving sections, and internal instrument control by means of a fast, serial control bus (Rohde & Schwarz SERBUS). This allows hardware extensions (options) to be integrated quickly and easily and software updates to be made conveniently via an RS-232-C interface. Plain-text display of faults down to the module level by means of the built-in test system (BIT) greatly facilitates troubleshooting and servicing.

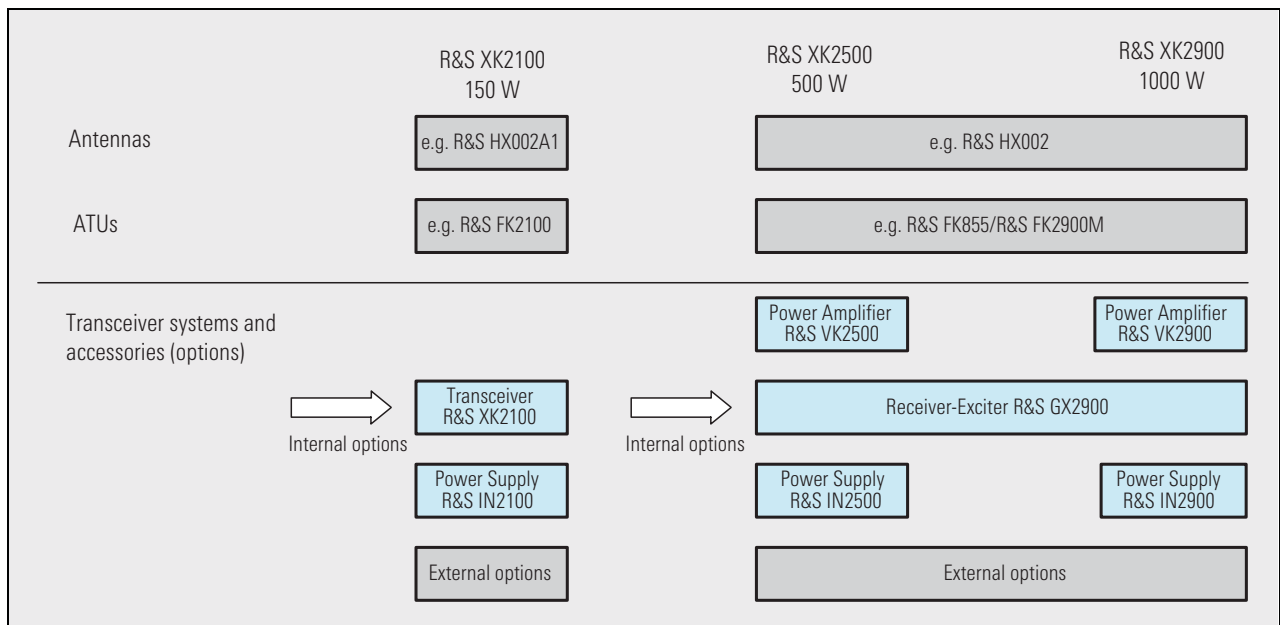
Great importance has been attached to electromagnetic compatibility (EMC). The relevant requirements of MIL-STD-461 and EN 50081/EN 50082 are fulfilled.

The R&S XK2000 is available in two versions: for local and remote control, and remote control only. Both versions can be operated from the Remote Control Unit R&S GB2000 and/or a commercial PC.

The integrated intercom system (service channel) allows direct voice communication between the transceiver and, for example, the Remote Control Unit R&S GB2000 or a PABX.

The core of the R&S XK2000 family is formed by the basic units R&S XK2100 (150 W transceiver) and R&S GX2900 (receiver-exciter for the 500 W and 1000 W versions). These units include, in their basic configuration, six exchangeable modules and a number of spare slots for options (see block diagram on page 6).

The options are detected by the unit upon plug-in and are immediately operational following a simple software update.



The HF Transceiver Family R&S XK2000 is available in three power classes: 150 W, 500 W and 1000 W. The diagram shows the basic system configuration with recommended ATUs and antennas.

The **central control unit** incorporates a powerful microprocessor that coordinates all internal control sequences for the modules via the SERBUS and communicates with external equipment via two data interfaces (RS-232-C, RS-485) and via the keypad, which can be used for making phone calls, for example. The microprocessor also generates the messages and indications output on the graphic display.

A total of approx. 1000 complete channel settings can be stored in an EEPROM without a buffer battery being required.



*Receiver-Exciter R&S GX2900 can be operated up to 65 m from the amplifier and power supply.*

The channel memory is allocated as follows:

- ◆ 401 user-programmable channels, including 100 frequency pairs for half-duplex operation
- ◆ Fixed-programmed ITU channels with allocated numbers between 401 and 2240
- ◆ 120 half-duplex channels for operation using automatic link establishment (ALE)

The use of digital signal processing in the **IF/AF processor** affords a number of special features:

- ◆ **Variety of classes of emission** such as
  - AME, CW, SSB (USB and LSB)
  - ISB (two independent sidebands)
  - FM, FSK, AFSK (deviation/shift and baud rate can be optimally matched in the receive mode)
- ◆ **17 bandwidths** from 50 Hz to 8 kHz with group-delay-equalized filters for data transmission

- ◆ **Five decay time constants** between 25 ms and 3 s
- ◆ **Passband tuning** (with bargraph indication)
- ◆ **Notch filter** (with bargraph indication)
- ◆ **Noise blanker** (interference suppression)
- ◆ **Syllabic squelch** (no threshold setting)
- ◆ **Voice compression** (increase of output power for voice transmission)

Excellent large-signal characteristics are obtained by means of a high-power mixer stage in the **RF/synthesizer section**. Intercept points are typically at +70 dBm (IP2) and +35 dBm (IP3); crossmodulation is 10% with an interference source of +20 dBm.

The sensitivity of the receiving section is considerably increased by means of a switchable preamplifier, yielding a noise figure of 9 dB. This ensures good reception also with short rod or whip antennas. The unit will withstand overvoltages up to 100 V EMF for an indefinite period of time owing to an input voltage protection circuit.



*1000 W Amplifier R&S VK2900 and Power Supply R&S IN2900 as bench models.*

The **amplifier** incorporated in the R&S XK2100 outputs a transmit signal of 150 W (PEP) or 100 W in the CW mode. For CW and data operation, it is mandatory to use a blower unit (option). In the R&S GX2900 for the 500 W and 1000 W systems, the 150 W amplifier is replaced by an amplifier interface for connecting the Power Amplifiers R&S VK2500/2900. The interface provides a control power of 20 mW.

The Receiver-Exciter R&S GX2900 may be operated up to 65 m from the amplifier and power supply.

The power will automatically be cut back in the event of mismatch or thermal overload in all three power classes of the transceiver. If one of the 500 W output stages fails in systems with the Power Amplifier R&S VK2900, transmission can be continued with an output power of 500 W.

The R&S ZW2900 option can be integrated into the R&S VK2500/2900 to provide additional overvoltage protection for the receiver input. In conjunction with the optional Digital Selections R&S FK20XX, the R&S ZW2900 enables operation with voltages up to 100 V RMS.

Where a transmitting power of 1000 W is not sufficient, e.g. in maritime applications, power can be combined by means of HF broadband couplers, which are available on request.

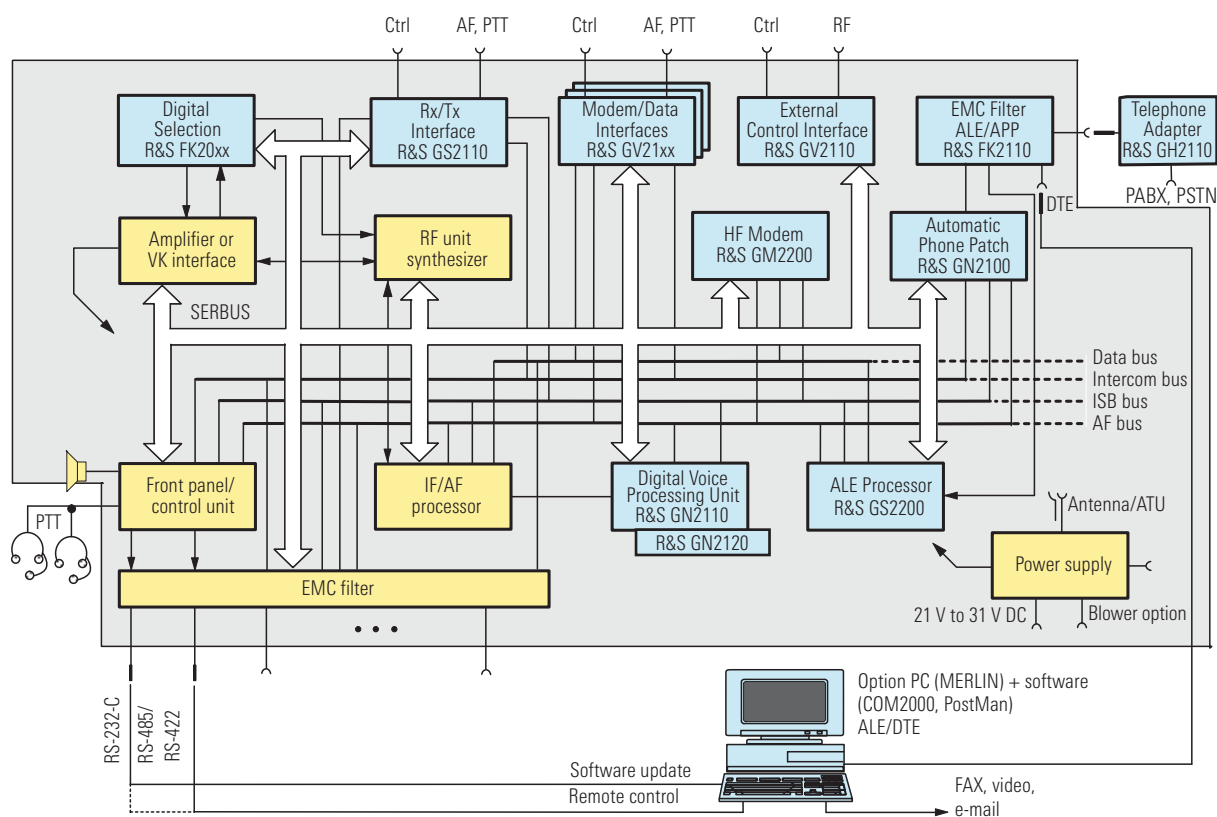
All interface lines pass through an integrated **EMC filter**. Radiated and conducted interference is effectively suppressed by filters and protective diodes.

## User-friendly operation

The HF Transceiver Family R&S XK2000 is outstanding for its high user-friendliness, featuring menu guidance on high-contrast, large-size LC graphic display and providing a number of convenient controls and displays such as:

- ◆ Softkeys
- ◆ Cursor keys
- ◆ Step keys (rollkey editor)
- ◆ Message, selection and editing windows
- ◆ Numeric editor
- ◆ Icons for menu and system status indication

In addition to plain-text messages, bar-graphs are used to indicate the receive field strength, output power, etc. The control functions are logically combined in the menus and can thus be found easily.



**Block diagram of R&S XK2100 and R&S GX2900: the basic units of the R&S XK2000 systems are fitted with six standard modules and provide spare slots for options (blue). The modules are internally controlled via the Rohde & Schwarz SERBUS. Software updates are conveniently performed from a PC via the RS-232-C interface.**

The clear-cut display makes operation of the R&S XK2000 easy even for the non-specialist. Users with expertise can go to a more complex menu level upon entering a password and configure the equipment as required to suit a wide variety of applications.

### Suitable for use in harsh environments

The HF Transceiver Family R&S XK2000 was designed for operation under adverse environmental conditions and can be used not only in fixed stations but also on vehicles and ships. Shock absorbers are available to protect the units in applications involving extremely high levels of shock and vibration. Proper operation of the system will not be impaired by varying climatic conditions, problematic EMC environments or supply voltage fluctuations.

### Optimum matching

Optimum matching of the antennas is achieved by means of the R&S FK855/R&S FK2900M for the 500 W and the 1000 W systems, and by means of the R&S FK2100/R&S FK2100M for the 150 W system.

The Antenna Tuning Unit R&S FK2100/R&S FK2100M provides automatic matching of antennas, in particular of very short antennas. The sturdy and waterproof plastic casing of the R&S FK2100 is shock- and UV-resistant and thus ideally suited for mobile applications. The R&S FK2100M, which is a seawater- and drop-resistant version, is especially designed for shipboard applications and can match antennas with very low ohmic resistance.

Both ATUs are fully arc-protected against direct lightning strokes. They are tested to withstand arcs of 10 kV/10 kA. Automatic BIT (built-in test) provides fault detection and reporting to the R&S XK2100 transceiver.

The microprocessor-controlled tuning allows self-learning of a maximum of 1500 settings which together with the channels stored in the Transceiver R&S XK2100 (including ALE, APP, ITU and 100 silent channels) are retained in non-volatile memory. In the R&S FK2100M, up to 1500 silent-tuned channels are provided additionally to the learn channels. The stored channels can be called up with very short setting times both in the R&S FK2100 and R&S FK2100M.

The software (R&S FK2100S) can be easily loaded, changed and updated into the ATU's internal FLASHROM from the transceiver.

With a single cable between the transceiver and the ATU carrying RF, supply voltage and all bidirectional control data, the R&S FK2100 is highly installation-friendly and able to cope better with EMC problems.

### Protection against power failure

The External Power Supplies R&S IN2000 are intended for stationary applications.



**Antenna Tuning Unit R&S FK2100.**

They are in the form of a primary switched-mode power supply for all three power classes of the transceiver and comply with the relevant safety and EMC regulations.

The R&S IN2500 and R&S IN2900 were designed for single- or three-phase operation. For special AC supply voltages, e.g. in maritime applications, the Transformer

R&S BV2900 is available as an option, which can be incorporated in the transceiver rack.

When an emergency power supply (e.g. a 24 V battery) is used, AC supply/battery switchover will be effected instantaneously in the event of a power failure, thus ensuring uninterrupted radiocommunication.<sup>1)</sup>

<sup>1)</sup> At reduced power with 500 W and 1000 W systems.

### System expansion options

The basic Transceivers R&S XK2100 as well as the Receiver/Exciter R&S GX2900 are already fully prepared to accommodate optional interfaces which are available as plug-in units and are located at the rear of the equipment. Various interface options are available for easy matching and proper connection of external (e.g. customer-provided) HF modems, link processors, data terminal sets, or system processors, encryption devices, etc. as well as for the control and operation of system-specific options such as RF filters, power selectors, duplex receivers, naval distress and alarm facilities (DSC/GMDSS), and remote control units.

For HF telephone operation along with the integrated ALE and APP options, direct connection of a PABX or a PSTN line is possible using the ALE/APP interface option.

Up to four interface options can be accommodated at a time.

#### Note

For details, please refer to the catalog titled »The World of Radio Communications« (edition 2000/2001).

## External control interface

The External Control Interface R&S GV2110 is used to control external options/peripheral equipment, e.g. motor-tuned selectors, high-power transmit filters or selective/active antennas. It always requires always an Option Interface R&S GV2000 at the external option.

## Various high-speed data mode interfaces

Depending on the system configuration, either with integrated or external ALE and/or HF modem, various interface options such as the Modem Data Interface R&S GV2130 or the Modem Interface R&S GV2100 are available for connection to external HF modems, data sources, data-protection or link processors.

## Data link interface

The Data Link Interface R&S GV2120 is provided for connecting an external DTS (data terminal set) which complies with MIL-STD-188-203-1A.

## Full-duplex or split-site operation

The Rx/Tx Interface R&S GS2110 is available for full-duplex operation (controlling an external receiver or transmitter) and for the control and operation of an external DSC (GMDSS) emergency system in naval applications.

For operations at different sites, a Split Site Controller R&S GP2000 is available to control separate transmitter and receiver sites from one center, also allowing ALE, fast data, and HF telephone modes.

## Standard cable sets

Standard cable sets (R&S XK2000C) are available from Rohde & Schwarz for system applications of the Transceiver Family R&S XK2000 with external components. These applications encompass fast data modes, extended Tx/Rx operation, ATU control and remote control.



## Specifications

### Transmission

	R&S XK2100	R&S XK2500	R&S XK2900
Frequency range	1.5 to 30 MHz	1.5 to 30 MHz	1.5 to 30 MHz
Output power into 50 Ω, VSWR ≤1.5	150 W ±1 dB PEP, 100 W ±1 dB CW	500 W ±1 dB PEP or CW (400 W ±1 dB with ATU FK855)	1000 W ±1 dB PEP or CW
Power levels	10/30/100 W	40/100/500 W	100/500/1000 W
Spurious suppression	>70 dB	>70 dB	>70 dB
Harmonics suppression	typ. 60 dB	typ. 60 dB	typ. 60 dB
Intermodulation products (referenced to PEP)	>32 dB	>36 dB	>36 dB
S/N ratio	>150 dBc	>150 dBc	>150 dBc
Carrier suppression	typ. 70 dB	typ. 70 dB	typ. 70 dB
Suppression of unwanted sidebands	>60 dB	>60 dB	>60 dB
Voice compression (VC)	built-in, power increase with radiotelephony		

Frequency setting	decadic in 1 Hz steps
Channel memory	
User-programmable channels including half-duplex channels	401
Fixed-programmed channels (ITU)	100 (transmit and receive frequencies separately programmable)
Additional channels for ALE	channel numbers between 401 and 2240 (half-duplex)
Additional channels for ALE	120 (half-duplex)
Frequency error	
Standard (TCXO)	<2x 10 <sup>-8</sup> /°C
Optional (OCXO)	<1x 10 <sup>-9</sup> /°C, <1x 10 <sup>-9</sup> /day
Aging	
Standard (TCXO)	<1x 10 <sup>-6</sup> /year
Optional (OCXO)	<1x 10 <sup>-7</sup> /year
Classes of emission	A1A (CW), J3E (SSB), (USB/LSB selectable), H3E (AME, USB), J7B (A7J), data transmission (J3E), B8E (ISB), F1B (FSK, AFSK, 50 to 600 Bd, shift 42.5 to 425 Hz), F3E (FM), F1C, A3E (AM) (reception only), MIL-STD-188-203-1A (optional)

### Reception

Frequency range	10 kHz to 30 MHz
Input impedance	50 Ω, VSWR <3
Input sensitivity (for S/N = 10 dB, f = 0.2 to 30 MHz)	
Without preamplifier and preselection	
A1A (CW)	typ. 0.4 μV EMF, BW = 300 Hz <sup>1)</sup>
J3E (SSB), J7B	typ. 1.0 μV EMF, BW = 2.7 kHz <sup>2)</sup>
H3E (AME), 1 kHz, m = 60%	typ. 2.7 μV EMF, BW = 6 kHz <sup>2)</sup>
With preamplifier, without preselection	
A1A (CW)	typ. 0.15 μV EMF, BW = 300 Hz <sup>1)</sup>
J3E (SSB), J7B	typ. 0.4 μV EMF, BW = 2.7 kHz <sup>2)</sup>
H3E (AME), 1 kHz, m = 60%	typ. 1.0 μV EMF, BW = 6 kHz <sup>2)</sup>

<sup>1)</sup>At 10 dB S/N.

<sup>2)</sup>At 10 dB SINAD.

Receiving bandwidths	
3 dB	±25 Hz, ±75 Hz, ±150 Hz, ±200 Hz, ±300 Hz, ±400 Hz, ±500 Hz, ±750 Hz, ±900 Hz, ±1050 Hz, ±1200 Hz, ±1350 Hz, ±1550 Hz, ±1850 Hz, ±2250 Hz, ±3000 Hz, ±4000 Hz
60 dB	±125 Hz, ±150 Hz, ±215 Hz, ±335 Hz, ±430 Hz, ±650 Hz, ±770 Hz, ±1000 Hz, ±1440 Hz, ±1600 Hz, ±1760 Hz, ±1900 Hz, ±2100 Hz, ±2850 Hz, ±3220 Hz, ±4100 Hz, ±5100 Hz
AGC	<3 dB (1 μV 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 to CCITT (O.41/P53)
Nonlinearities (1.5 to 30 MHz, without preampl.)	
Blocking	3 dB signal attenuation (Δf = 30 kHz, useful signal 2 mV EMF, interfering signal 5 V EMF)
Desensitization	>20 dB SINAD (Δf >30 kHz, BW = 2.7 kHz, useful signal 30 μV, interfering signal 100 mV)
Intercept point IP3	typ. 35 dBm (Δf >30 kHz, interfering signals 2x 0 dBm)
Crossmodulation	<10% (Δf >30 kHz, useful signal 1 mV EMF, interfering signal 4 VEMF, 1 kHz, m = 30%)
Noise figure	
without preamplifier	17 dB
with preamplifier	9 dB
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 μV (at antenna input)
Protection of receiver input	
With digital selection	up to 100 V EMF (f <30 MHz) up to 200 V EMF (f <30 MHz)

### Options

Digital Selection R&S FK2020	attenuation >20 dB at a spacing of >10% from nominal frequency
Noise figure	typ. 13 dB
IP <sub>3</sub> (Δf >30 kHz)	>35 dBm
Insertion loss	0 dB
Data Link Processor R&S GS2200	automatic link establishment (ALE) to ALIS for speech and data transmission, or to FED-STD-1045A (Info PD 0756.5562); always to be ordered with suitable software (R&S GS2200S to R&S GS2211S)
Automatic Phone Patch R&S GN2100	call transfer to private automatic branch exchange (PABX) with automatic line matching

HF Modem R&S GM2200	advanced multimode HF modem with selectable waveforms to either Rohde & Schwarz standard (single tone up to 5400 bit/s, short sync time, high redundancy) or Rohde & Schwarz advanced (up to 9600 bit/s)
Digital Voice Processing Unit R&S GN2110	noise and interference suppression, speech squelch, VOX with digital signal processing, speech scrambler available as a suboption
Blower R&S KL2100 (R&S XK2100)	required for cont. data transmission
Remote Control Unit R&S GB2000	up to 50 m; with modems for distances >50 m; class of protection IP42 to DIN 40050 (IP54 as an option)
EMC Filter ALE/APP R&S FK2110	APP interface to PABX interface, ALE-DTE interface (FED-STD-1045A) and ALIS 2000
Modem Interface R&S GV2100	AF, PTT, data and DTE (V.10)
External Control Interface R&S GV2110	for control of external R&S FK2850, R&S FK2101X, R&S AK001 options (via Option Interface R&S GV2000) output: serial control bus RS-485 + 4 RF I/Os
Option Interface R&S GV2000	external interface unit: serial control bus (RS-485), output: parallel (BCD) control commands + 4 RF I/Os, to e.g. R&S FK2850, R&S FK2101X or R&S AK001 option
Rx/Tx Interface R&S GS2110	for duplex receiver, external transceiver, GMDSS-DSC (NMEA 183) and system applications, i.e. serial control (RS-232-C), AF & PTT
Test interface	for output of fault histogram (ASCII, 5 V CMOS)

### Serial interfaces

RS-485/RS-422	for remote control over long distances, bus-compatible, suitable for Remote Control Unit R&S GB2000
RS-232-C	for remote control and software updates (direct connection of PC), suitable for Remote Control Unit R&S GB2000
Transmission rates	110/230/300/600/1200/2400/4800/9600 Bd
Antenna	N socket, 50 Ω, incl. supply for ATU
Separate receiving antenna	BNC female
External frequency control	BNC female, 1/5/10 MHz programmable, 0 dBm, 50 Ω

### Antenna tuning units (ATUs) and antennas

	R&S XK2100	R&S XK2500	R&S XK2900
Frequency range	1.5 to 30 MHz		
Recommended ATUs	R&S FK2100 R&S FK2100M	R&S FK2900M R&S FK855	R&S FK2900M R&S FK855
Recommended antennas (see catalog PD 0756.9800)	R&S HX002A1 R&S AK503	R&S HX002, R&S AK471 with Line Flattener FR&S K859C1	

### General data (without Power Supplies IN<sup>o</sup>)

	R&S XK2100	R&S XK2500	R&S XK2900
Temperature range	to MIL-STD-810E, Methods 501.3 and 502.3		
Operation	-25 to 55 °C		
Storage	-40 to 85 °C		
Humidity	MIL-STD-810E, Method 507.3		
Mechanical test			
Vibration	DIN IEC 68, 5 to 55 Hz, 0.2 mm amplitude		
Random	MIL-STD-T-28800		
EMC	MIL-STD-461E (CE102, CS101, CS114, RE101, RE102, RS101, RS103), EN 50081/50082		
MTBF	>9600 h (R&S XK2100R)	>5500 h	>5000 h
Class of protection	IP 43/32	IP 43/20	IP 43/20
Dimensions W x H x D in mm (without options)	R&S XK: 443 x 127 x 386 R&S IN: 400 x 82 x 350	R&S GX: 483 x 132 x 340 R&S VK: 483 x 281 x 570 R&S IN: 483 x 192 x 570	R&S GX: 483 x 132 x 340 R&S VK: 483 x 281 x 570 R&S IN: 483 x 192 x 570
Weight (without options)	R&S XK: 15 kg R&S IN: 9 kg	R&S GX: 13 kg R&S VK: 34 kg R&S IN: 27 kg	R&S GX: 13 kg R&S VK: 42 kg R&S IN: 32 kg

### Power supplies

	R&S IN2100	R&S IN2500	R&S IN2900
Input AC supply voltage	88 to 264 V AC	230 V +10/-15 % Phases: 1/3	
Battery	24-V DC emergency supply		
Power consumption	max. 0.8 kVA	1.5 kW	3.5 kW
AC supply/battery switchover	instantaneous, by means of diodes		
Output I	24 to 28 V, 19 A, 26.5 V nominal	54 V, 35 A	54 V, 35 A
Output II	24 to 28 V, 1 A, decoupled	28 V	54 V, 35 A
Output III	—	—	28 V
Overload protection	sustained short-circuit proof, automatic restart, current limiting to prevent overload, switch-on current limiting		
Operating temperature range	0 to +50 °C	-25 to +55 °C	-25 to +55 °C
Storage temperature range	-40 to +85 °C		
Safety standards	VDE 0866, IEC 950, EN 60950, UL 1950, CSA 22.2	VDE 866, 804, 805, EN 60950	
RFI	MIL-STD-461E, VDE 0875, Part 3, 1988, degree B, CE conformity mark, EN 50081, 50082	MIL-STD-461E, EN 50081, 50082, VDE 160	
Class of protection	IP 32	IP 20	

## Ordering information

<b>HF Transceiver 150 W</b>		
Bench model Local and remote control Antenna Tuning Unit	R&S XK2100L R&S FK2100	6033.0508.02 6046.8948.02
Rackmount 19" Adapter R&S XK... R&S IN...	R&S KA2900 R&S KA2120	6072.6010.03 6064.0751.02
Standard Software	R&S XK2101S	6090.2758.02
Naval Software	R&S XK2101S	6090.2758.07
<b>HF Transceiver 500 W</b>		
Bench model Local and remote control Remote control only	R&S XK2500L R&S XK2500R	6071.0518.02 6071.0760.02
Rackmount Local and remote control Remote control only	R&S XK2500L R&S XK2500R	6071.0518.12 6071.0760.12
Standard Software	R&S GX2901S	6090.2506.02
Naval Software	R&S GX2901S	6090.2506.07
<b>HF Transceiver 1000 W</b>		
Bench model Local and remote control Remote control only	R&S XK2900L R&S XK2900R	6057.9992.02 6058.0247.02
Rackmount Local and remote control Remote control only	R&S XK2900L R&S XK2900R	6057.9992.12 6058.0247.12
Standard Software	R&S GX2901S	6090.2506.02
Naval Software	R&S GX2901S	6090.2506.07

### Options

Remote Control Processor	R&S GP2000	6092.3000.02
Data Link Processor	R&S GS2200	6091.5009.02
Software for R&S GS2200		
FED-STD-1045/1046	R&S GS2200S	6091.5709.02
FED-STD-1049	R&S GS2201S	6091.5809.02
ALIS (Rohde & Schwarz standard)	R&S GS2210S	6091.5909.02
ALIS Hopping Rohde & Schwarz standard	R&S GS2211S	6091.6005.02
Automatic Phone Patch with Telephone Adapter	R&S GN2100	6033.9505.02
Standard Software for APP	R&S GN2100S	6090.5805.02
Digital Voice Processing Unit	R&S GN2120	6117.4503.03
Digital Voice Processing Unit (NRU)	R&S GN2110	6033.7502.02

Digital Voice Processing Unit (NRU + SCR)	R&S GN2110	6033.7502.03
Digital Voice Option	R&S GN2120	6117.4503.03
Digitally Tuned RF Selection	R&S FK2020	6096.9502.02
Upgrade Kit R&S FK2020 to R&S FK2040		6096.9502.03
Digitally Tuned RF Selection	R&S FK2040	6096.9902.02
External Control Interface	R&S GV2110	6033.6006.02
Standard Software for R&S GV2110	R&S GV2110S	6090.8504.02
Option Interface for R&S GV2110	R&S GV2000	6090.7008.02
Rx/Tx Interface	R&S GS2110	6033.5500.02
Standard Software for R&S GS2110	R&S GS2110S	6090.5605.02
EMC Filter ALE/APP	R&S FK2110	6054.9491.02
Modem Interface	R&S GV2100	6033.8509.02
Modem Data Interface	R&S GV2130	6090.3254.02
Data Link Interface		
LINK Y + LINK 11 (CLEW SLEW)	R&S GV2120	6079.1013.02
LINK Y (CLEW SLEW)	R&S GV2120	6079.1013.03
Blower (external)	R&S KL2100	6050.2992.02
HF Modem, multistandard	R&S GM2200	6117.5500.02
Modem Software		
Rohde & Schwarz 2.7 + 5.4 kbit/s	R&S GM2200S	6117.6006.02
MIL-STD-188-110A Section 5.3 (Single Tone)	R&S GM2201S	6117.6258.02
STANAG 4285	R&S GM2202S	6117.6506.02
STANAG 4529	R&S GM2203S	6117.6758.02
MIL-STD-188-110B Appendix C or STANAG 4539 Annex B, Section 4	R&S GM2204S	6117.7002.02
External HF Modem	R&S GM857C4	6053.1500.02
Remote Control Unit	R&S GB2000	6064.2002.02
RCU (R&S GB2000) Standard Software	R&S GB2001S	6090.3002.02
RCU (R&S GB2000) Naval Software	R&S GB2001S	6090.3002.07
Receiver Input Protection	R&S ZW2900	6072.2514.02
440 V Transformer	R&S BV2900	6072.7016.02
Power Supply	R&S IN2100	6050.1996.02
Antenna Tuning Unit (150 W)	R&S FK2100	6046.8948.02

Standard Software for R&S FK2100	R&S FK2100S	6090.5505.02
Naval Antenna Tuning Unit	R&S FK2100M	6064.9550.02
Naval Software for R&S FK2100M	R&S FK2100S	6090.5505.07
Antenna Tuning Unit	R&S FK2900M	6097.1005.02
System Receiver	R&S EK2000	6093.6002.02
<b>Recommended extras</b>		
Shock Absorber for R&S XK2100	R&S KS2100	6050.3999.02
R&S XK2500/2900	R&S KS2900	6072.6510.02
Service Kit	R&S KA2110	6050.4995.02
Service Manual (English) R&S XK2100		6045.5868.62
R&S FK2100		6045.5874.62
R&S GX2900		6045.6793.62
R&S VK2500/2900		6045.6758.62

<b>Standard Cable Sets (R&amp;S XK2000C)</b>		
1 cable, 25 m	R&S XK2001C	6063.5508.25
2 cables, 2 m each	R&S XK2002C	6063.6504.02
4 cables, 2 m each	R&S XK2003C	6063.7000.02
3 cables, 2 m each	R&S XK2004C	6063.7252.02
2 cables, 2 m each	R&S XK2005C	6063.7500.02
4 cables, 2 m each	R&S XK2006C	6063.7752.02
3 cables, 2 m each	R&S XK2007C	6063.8007.02
1 cable, 10 m	R&S XK2008C	6063.8507.10
1 cable, 20 m	R&S XK2009C	6077.2012.20
2 cables, 2 m each	R&S XK2010C	6078.3364.02
2 cables, 2 m each	R&S XK2011C	6090.9000.02
2 cables, 2 m each	R&S XK2012C	6090.9252.02
<b>Software</b>		
Configuration and Data Transfer Software COM 2000	R&S DS120	6083.8519.04 6083.8519.05
Message Handling Software PostMan II	R&S DS102	6083.8360.02
<b>Further options and accessories</b>		on request



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