R&S®EX-IQ-Box
Digital Signal Interface Module
Specifications
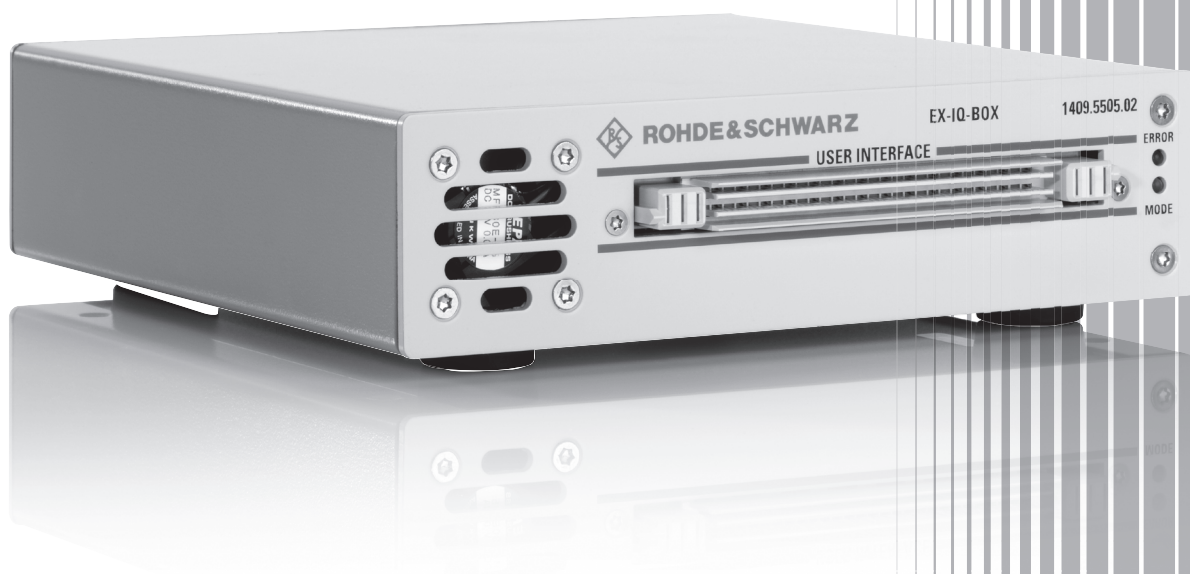
ROHDE & SCHWARZ

Introduction

The R&S®EX-IQ-Box is a digital interface module that provides flexible digital baseband inputs or outputs for signal generators and signal analyzers from Rohde & Schwarz. When equipped with this box, a Rohde & Schwarz vector signal generator delivers realistic digital baseband signals for testing digital transceivers or other components. It can thus cover all common state-of-the-art standards such as LTE, WiMAX and 3GPP including HSPA, as well as user-defined signals and effects such as fading, AWGN or impairments.

The R&S®EX-IQ-Box plus a signal analyzer from Rohde & Schwarz enable the reliable analysis of digital baseband components. The breakout boards supplied with the box and the user-selectable data rates, formats and logic levels make for easy connection of the device under test. The parameters can conveniently be set via the user interface of the signal generator or analyzer.

Key features

- Bidirectional digital I/Q interface for signal generators and analyzers from Rohde & Schwarz
- An R&S®SMU200A, R&S®SMJ100A, R&S®AMU200A or R&S®AFQ100A signal generator produces standard-compliant digital baseband signals when combined with the R&S®EX-IQ-Box
  - Support of all important state-of-the-art standards such as EUTRA/LTE, 3GPP FDD, HSPA, WiMAX, GSM/EDGE, etc.
  - Versatile signal processing functionality (fading, AWGN, I/Q impairments)
- Simple and flexible conversion of digital baseband signals into analog IF or RF signals (together with the R&S®SMU200A or R&S®AMU200A)
- Vector signal analysis of digital baseband signals of all important modern standards such as EUTRA/LTE, 3GPP FDD, HSPA, WiMAX, GSM/EDGE, etc. (together with the R&S®FSQ, R&S®FSG or R&S®FMU)
- Flexible data formats
  - Maximum data rate of 100 MHz, variable resampling in conjunction with the Rohde & Schwarz instrument
  - Variable word width from 4 to 20 bits for I and Q
  - Parallel and serial formats
  - SDR and DDR data rates
  - Non-interleaved and I/Q and Q/I interleaved formats
  - Selectable bit order and word alignment
  - Two's complement and binary offset representation
  - Negate I and Q data
  - Positive and negative logic
- Flexible clock generation
  - Maximum clock rate of up to 100 MHz for parallel formats and up to 400 MHz for serial formats
  - Internal and external clock reference
  - Selectable clock phase (90° steps) and skew (±5 ns)
- Variable signal interface
  - LVTTL, CMOS (1.5 V, 1.8 V, 2.5 V and 3.3 V) and LVDS logic standards
  - Three breakout boards included (single-ended, differential and 68-pin SCSI) for connection of the device under test
- Interoperation with the Rohde & Schwarz instrument

Overview of the Rohde & Schwarz instruments that work with the R&S®EX-IQ-Box and list of the required options

Rohde & Schwarz instruments	Digital I/Q input option	Digital I/Q output option
Signal generation		
R&S®AMU200A Baseband Signal Generator and Fading Simulator	R&S®AMU-B17 [1] Analog/Digital Baseband Inputs	R&S®AMU-B18 [2] Digital Baseband Output
R&S®SMU200A Vector Signal Generator	R&S®SMU-B17 Analog/Digital Baseband Inputs	R&S®SMU-B18 Digital Baseband Output
R&S®SMJ100A Vector Signal Generator	–	R&S®SMJ-B18 Digital Baseband Output
R&S®AFQ100A [3] I/Q Modulation Generator	–	R&S®AFQ-B18 Digital Baseband Output
Signal analysis		
R&S®FSQ [3] Signal Analyzer	R&S®FSQ-B17 Digital Baseband Interface	R&S®FSQ-B17 Digital Baseband Interface
R&S®FSG [3] Signal Analyzer	R&S®FSQ-B17 Digital Baseband Interface	R&S®FSQ-B17 Digital Baseband Interface
R&S®FMU36 [3] Baseband Signal Analyzer	R&S®FSQ-B17 Digital Baseband Interface	R&S®FSQ-B17 Digital Baseband Interface

---

[1] With two path-instruments that are equipped with a second digital baseband input option, a second R&S®EX-IQ-Box can be connected.

[2] With two path-instruments that are equipped with a second digital I/Q output option, a second R&S®EX-IQ-Box can be connected.

[3] Interoperation with the R&S®EX-IQ-Box is intended for the future. Implementation is scheduled for March 2008.

Specifications

Specifications apply under the following conditions: 30 minutes warm-up time at ambient temperature, specified environmental conditions met, calibration cycle adhered to, and all internal adjustments performed. Data designated "overrange" or "underrange" and data without tolerance limits is not binding.

EMC specifications are tested with sufficiently shielded cables and accessories (e.g. mouse and keypad). To prevent degradation of these specifications, it is the user's responsibility to use appropriate equipment.

Signal interfaces

User signal interface	direction	input, output
	signals	bidirectional, dual 20-bit data buses for I and Q signals; two marker, trigger and auxiliary signals each
	connector	168-pin Tyco Z-Dok connects to breakout boards (included) with the following connector types:
		68-pin Mini-SCSI (compatible with R&S®AMIQ)
		2 × 40-pin dual 0.1 inch header (single-ended)
		2 × 100-pin dual Samtec (LVDS)
	logic level	
	single-ended	LVTTL, 1.5 V CMOS, 1.8 V CMOS, 2.5 V CMOS, 3.3 V CMOS
	differential	LVDS
	absolute maximum input level	−0.3 V, +3.6 V
Interface I/Q in, I/Q out	interface for connecting the Rohde & Schwarz instrument	in line with R&S®TVR290 [4], I/Q data and control signals, data and interface clock
	logic level	LVDS
	connector	26-pin MDR
	data rate	66 MHz to 100 MHz

I/Q data

Format	parallel, serial	
	strobe position	0 to word size − 1
	strobe polarity	positive, negative
Sample rate	limited by format, word size, protocol, interleaving and ratio of sample rate to clock rate	1 kHz to 100 MHz
Resampling		automatically performed by the Rohde & Schwarz instrument if required
I/Q impairments, I/Q swap		by the Rohde & Schwarz instrument
Signal type		I/Q, IF (complex)
IF frequency		(clock rate)/4
Numeric format		two's complement, binary offset
Word size		4 to 20 bit (depending on the Rohde & Schwarz instrument)
Data protocol		SDR, DDR
Ratio of sample rate to clock rate		1, 4/5, 2/5, 1/5, 1/10, 1/20
Interleaving		none, I/Q, Q/I
Word alignment		MSB, LSB
Bit order		MSB, LSB
Negate data		I, Q, I+Q
Logic type		positive, negative

---

[4] R&S®TVR290 is a Rohde & Schwarz company standard for the transmission of digital I/Q data. It is supported by a wide range of signal generators and signal analyzers.

Clock

Clock rate	reference source, internal	
	LVTTL/CMOS logic level	1 kHz to 100 MHz
	LVDS logic level	1 kHz to 400 MHz
	reference source, external	
	LVTTL/CMOS logic level	25 kHz to 100 MHz
	LVDS logic level	25 kHz to 400 MHz
Reference	source	internal (from Rohde & Schwarz instrument), external from user interface
	internal input	
	impedance	50 Ω
	frequency	5 MHz, 10 MHz, 13 MHz (automatically selected)
	level	–3 dBm to 10 dBm
	external user interface input frequency	
	LVTTL/CMOS logic level	25 kHz to 100 MHz
	LVDS logic level	25 kHz to 400 MHz
Clock polarity	user interface	positive, negative
Clock phase (relative to data)		0, 90, 180, 270°
Clock skew (relative to data)	range	–5 ns to 5 ns
	resolution	50 ps

Operating data

Power supply (included)	input voltage range, AC, nominal	100 V to 240 V (AC), 50 Hz to 60 Hz
EMC		in line with EMC directive of EU (2004/108/EC), applied standard: EN 61326 (immunity for industrial environment, class A emissions) [5]
Immunity to interfering field strength		up to 10 V/m
Environmental conditions	operating temperature range	+5 °C to +40 °C in line with EN 60068-2-1, EN 60068-2-2
	storage temperature range	–20 °C to +60 °C
	climatic resistance	+40 °C/90 % rel. humidity in line with EN 60068-2-3
Mechanical resistance	vibration, sinusoidal	5 Hz to 150 Hz, max. 2 g at 55 Hz, 55 Hz to 150 Hz, 0.5 g const., in line with EN 60068-2-6
	vibration, random	10 Hz to 300 Hz, acceleration 1.2 g (rms), in line with EN 60068-2-64
	shock	40 g shock spectrum, in line with EN 60068-2-27, MIL-STD-810E
Electrical safety		IEC 61010-1, EN 61010-1, UL 61010-1, CSA C22.2 No. 61010-1
Approvals		VDE-GS, $_c$CSA$_{US}$
Dimensions (W × H × D)		168 mm × 47 mm × 190 mm (6.61 in × 1.85 in × 7.48 in)
Weight		1 kg (2.2 lb)

Ordering information

Designation	Type	Order No.
Digital Signal Interface Module including power supply, USB and LVDS cable, 3 breakout boards, 1 Tyco Z-Dok 168-pin connector, operating and service manual	R&S®EX-IQ-Box	1409.5505.02

---

[5] The instrument complies with the emission requirements stipulated by EN 55011 class A. This means that the instrument is suitable for use in industrial environments. In line with EN 61000-6-4, operation in residential, commercial and business areas or small-size companies is not covered. Thus, the instrument may not be operated in residential, commercial and business areas or in small-size companies, unless additional measures are taken to ensure that EN 6100-6-3 is complied with.

About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established more than 70 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Service & support

With 24-hour support worldwide and personal service contacts in over 70 countries, Rohde & Schwarz is present around the globe. The company stands for high quality, preventive service, and compliance with delivery schedules – no matter whether the task at hand is calibration or application support.

Regional contacts

Europe +49 1805 12 42 42*
customersupport@rohde-schwarz.com
Americas +1 888 837 8772
customer.support@rsa.rohde-schwarz.com
Asia | Pacific +65 65 130 488
customersupport.asia@rohde-schwarz.com

Certified Quality System
ISO 9001
DQS REG. NO 1954 QM

Certified Environmental System
ISO 14001
DQS REG. NO 1954 UM

For product brochure,
see PD 5213.9511.12
and www.rohde-schwarz.com
(search term: EX-IQ-Box)

*0.14 €/min within the German fixed-line phone network;
prices in different mobile phone networks and in different countries vary