R&S®MXO 4 SERIES OSCILLOSCOPE

3 year warranty

Data Sheet
Version 03.01

ROHDE&SCHWARZ
Make ideas real

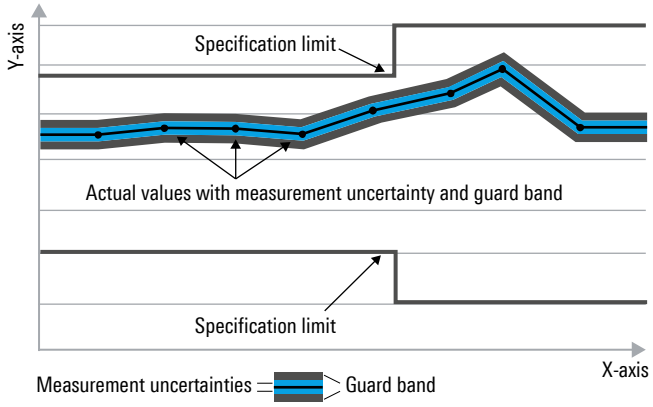
CONTENTS

Definitions

General
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Non-traceable specifications with limits (n. trc.)
Represent product performance that is specified and tested as described under “Specifications with limits” above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Rohde & Schwarz laboratories.

Specifications without limits
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are designated with the format “parameter: value”.

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP/3GPP2 standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bit per second (Gbps), million bit per second (Mbps), thousand bit per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

Base unit

Vertical system: analog channels

Input channels		4 channels
Input impedance		50 Ω ± 1.5 %, 1 MΩ ± 1 % || 12 pF (meas.)
Analog bandwidth (–3 dB)	at 50 Ω input impedance	
	R&S®MXO 4	≥ 200 MHz
	R&S®MXO 4 with -B243 option	≥ 350 MHz
	R&S®MXO 4 with -B245 option	≥ 500 MHz
	R&S®MXO 4 with -B2410 option	≥ 1 GHz
	R&S®MXO 4 with -B2415 option	≥ 1.5 GHz [1]
	at 1 MΩ input impedance	
	R&S®MXO 4	≥ 200 MHz (meas.)
	R&S®MXO 4 with -B243 option	≥ 350 MHz (meas.)
	R&S®MXO 4 with -B245 option	≥ 500 MHz (meas.)
	R&S®MXO 4 with -B2410 option	≥ 700 MHz (meas.) [2]
	R&S®MXO 4 with -B2415 option	≥ 700 MHz (meas.) [2]
Bandwidth limits	max. –1.5 dB, min. –4 dB	1 GHz, 500 MHz, 350 MHz, 200 MHz, 100 MHz, 50 MHz, 20 MHz (meas.)
Rise/fall time (calculated)	10 % to 90 % at 50 Ω	
	R&S®MXO 4	< 1.75 ns
	R&S®MXO 4 with -B243 option	< 1 ns
	R&S®MXO 4 with -B245 option	< 700 ps
	R&S®MXO 4 with -B2410 option	< 350 ps
	R&S®MXO 4 with -B2415 option	< 234 ps
Vertical resolution		12 bit, 18 bit for high definition mode
Input sensitivity	at 50 Ω	0.5 mV/div to 1 V/div, entire analog bandwidth supported for all input sensitivities
	at 1 MΩ	0.5 mV/div to 10 V/div, entire analog bandwidth supported for all input sensitivities
DC gain accuracy	offset and position set to 0 V, after self-alignment	
	input sensitivity > 5 mV/div	±1 % full scale
	input sensitivity ≤ 5 mV/div to ≥ 1 mV/div	±1.5 % full scale
	input sensitivity < 1 mV/div	±2.5 % full scale
Input coupling	at 50 Ω	DC
	at 1 MΩ	DC, AC
Maximum input voltage	at 50 Ω	5 V (RMS), 30 V (V_p)
	at 1 MΩ	300 V (RMS), 400 V (V_p), derates at 20 dB/decade to 5 V (RMS) above 250 kHz
	at 1 MΩ with R&S®RT-ZP11 passive probe	400 V (RMS), 1650 V (V_p), 300 V (RMS) CAT II; for derating and details, see R&S®RT-Zxx Standard Probes data sheet (PD 3607.3851.22)

[1] 1.5 GHz analog bandwidth in interleave mode with 5 Gsample/s real-time sampling rate.

[2] With R&S®RT-ZP11 passive probe.

Position range		±5 div
Offset range at 50 Ω	input sensitivity	
	100 mV/div to 1 V/div	±20 V
	0.5 mV/div to < 100 mV/div	±5 V
Offset range at 1 MΩ	input sensitivity	
	800 mV/div to 10 V/div	±200 V
	80 mV/div to < 800 mV/div	±50 V
	0.5 mV/div to < 80 mV/div	±(5 V – input sensitivity × position)
Offset accuracy		±(0.35 % × |net offset| + 0.5 mV + 0.1 div × input sensitivity) (net offset = offset – position × input sensitivity)
DC measurement accuracy	after adequate suppression of measurement noise using high-resolution sampling mode or waveform averaging or a combination of both	±(DC gain accuracy × |reading – net offset| + offset accuracy)
Channel-to-channel isolation (each channel at same input sensitivity)	input frequency inside instrument bandwidth	> 60 dB (1:1000)

RMS noise floor [3]						
At 50 Ω (meas.)	Input sensitivity	Analog bandwidth (–3 dB)				
		20 MHz	200 MHz	350 MHz	500 MHz	1 GHz
	0.5 mV/div	20 µV	43 µV	47 µV	50 µV	98 µV
	1 mV/div	22 µV	45 µV	50 µV	54 µV	104 µV
	2 mV/div	25 µV	52 µV	56 µV	61 µV	116 µV
	5 mV/div	43 µV	72 µV	77 µV	84 µV	152 µV
	10 mV/div	76 µV	118 µV	120 µV	131 µV	238 µV
	20 mV/div	148 µV	219 µV	219 µV	241 µV	436 µV
	50 mV/div	360 µV	508 µV	492 µV	543 µV	1.01 mV
	100 mV/div	747 µV	1.17 mV	1.19 mV	1.30 mV	2.47 mV
	200 mV/div	1.40 mV	2.13 mV	2.14 mV	2.34 mV	4.43 mV
	500 mV/div	3.47 mV	4.91 mV	4.80 mV	5.27 mV	10.13 mV
	1 V/div	6.88 mV	9.71 mV	9.47 mV	10.41 mV	19.96 mV
1 MΩ (meas.)	Input sensitivity	Analog bandwidth (–3 dB)				
		20 MHz	100 MHz	200 MHz	350 MHz	500 MHz
	0.5 mV/div	28 µV	40 µV	42 µV	47 µV	51 µV
	1 mV/div	28 µV	40 µV	46 µV	50 µV	53 µV
	2 mV/div	30 µV	43 µV	49 µV	54 µV	58 µV
	5 mV/div	44 µV	58 µV	67 µV	71 µV	78 µV
	10 mV/div	73 µV	92 µV	109 µV	109 µV	120 µV
	20 mV/div	138 µV	169 µV	199 µV	198 µV	218 µV
	50 mV/div	344 µV	442 µV	525 µV	529 µV	586 µV
	100 mV/div	739 µV	959 µV	1.13 mV	1.14 mV	1.24 mV
	200 mV/div	1.40 mV	1.74 mV	2.06 mV	2.07 mV	2.27 mV
	500 mV/div	3.47 mV	4.43 mV	5.22 mV	5.28 mV	5.75 mV
	1 V/div	7.11 mV	8.92 mV	10.44 mV	10.53 mV	11.49 mV
	2 V/div	13.83 mV	16.9 mV	19.87 mV	19.56 mV	21.38 mV
	5 V/div	34.84 mV	44.32 mV	52.43 mV	53.39 mV	57.97 mV
	10 V/div	57.16 mV	68.58 mV	80.66 mV	78.53 mV	85.46 mV

[3] HD mode active for bandwidth ≤ 500 MHz.

Vertical system: digital channels

Input channels		16 logic channels (D0 to D15)
Arrangement of input channels		arranged in two logic probes with 8 channels each, assignment of the logic probes to the channels (D0 to D7 or D8 to D15) is displayed on the probe
Input impedance		100 kΩ ± 2 % || ~4 pF (meas.) at probe tips
Maximum input frequency	signal with minimum input voltage swing and hysteresis setting: normal	400 MHz (meas.)
Maximum input voltage		±40 V (V_p)
Minimum input voltage swing		500 mV (V_{pp}) (meas.)
Threshold groups		D0 to D3, D4 to D7, D8 to D11 and D12 to D15
Threshold level	range	±8 V in 25 mV steps
	predefined	CMOS 5.0 V, CMOS 3.3 V, CMOS 2.5 V, TTL, ECL, PECL, LVPECL
Threshold accuracy	threshold between ±4 V	±(100 mV + 3 % of threshold setting)
Comparator hysteresis		normal, robust, maximum

Horizontal system

Timebase range		selectable between 200 ps/div and 10 000 s/div, time per div settable to any value within range
Deskew range (channel deskew)	between analog channels	±100 ns
	between digital channels	±100 ns
Reference position		0 % to 100 % of measurement display area
Horizontal position range (trigger offset range)	max.	+(memory depth/current sampling rate)
	min.	–5000 s
Modes		normal
Channel-to-channel skew	between analog channels	< 100 ps (meas.)
	between digital channels	< 500 ps (meas.)
Timebase accuracy	after delivery/calibration, at +23 °C	±0.2 ppm
	during calibration interval	±1 ppm
Delta time accuracy	corresponds to time error between two edges on same acquisition and channel; signal amplitude greater than 5 divisions, measurement threshold set to 50 %, vertical gain 10 mV/div or greater; rise time lower than four sample periods; waveform acquired in real-time mode	±(0.20/real-time sampling rate + timebase accuracy × |reading|) (peak) (meas.)

Acquisition system

Sampling rate	analog channels (real time)	max. 5 Gsample/s on 2 channels, max. 2.5 Gsample/s on 4 channels
	analog channels (interpolated)	max. 5 Tsample/s
	digital channels	max. 5 Gsample/s on each channel
Waveform acquisition rate	max.	> 4 500 000 waveforms/s
Trigger rearm time	min.	< 21 ns
Memory depth [4]	standard	400 Mpoints with 4 active channel (single), 400 Mpoints with 2 active channel (run)
	R&S®MXO4-B108 option	800 Mpoints with 2 active channel (single), 800 Mpoints with 1 active channel (run)
Acquisition modes	sample	middle sample in decimation interval
	peak detect	largest and smallest sample in decimation interval
	average	average value of samples in decimation interval
	number of averaged waveforms	2 to 16 777 215
	envelope	envelope of acquired waveforms
Sampling modes	real-time mode	max. sampling rate set by digitizer
	interpolated time	enhancement of sampling resolution by interpolation; max. sampling rate is 5 Tsample/s
Interpolation modes		linear, sin(x)/x, sample & hold
Fast segmentation mode	continuous recording of waveforms in acquisition memory without interruption due to visualization	
	max. real-time waveform acquisition rate	> 4 600 000 waveforms/s
	min. blind time between consecutive acquisitions	< 21 ns

High definition mode

General description	The high definition mode increases the numeric resolution of the waveform signal by using digital filtering, leading to reduced noise. Because of the digital trigger concept of the R&S®MXO 4, signals with increased numeric resolution are used as the input for triggering.	
Numeric resolution	bandwidth, at 5 Gsample/s	bit resolution
	1 kHz to 10 MHz	18 bit
	100 MHz	16 bit
	200 MHz	15 bit
	500 MHz	14 bit
Real-time sampling rate	all models	max. 5 Gsample/s on 2 channels, max. 2.5 Gsample/s on 4 channels

[4] The maximum available memory depth depends on the bit depth of the acquired data and, therefore, on the settings of the acquisition system, such as decimation mode, waveform arithmetic or high definition mode.

Trigger system

Trigger sources		analog channels (C1 to C4), digital channels (D0 to D15), trigger in, serial bus
Trigger level range	range	±5 div from center of screen
Trigger modes		auto, normal, single, n single
Trigger sensitivity		10^{-4} div, from DC to instrument bandwidth for all vertical scales
Trigger jitter	full-scale sine wave of frequency set to –3 dB bandwidth	< 1 ps (RMS) (meas.)
Coupling mode	standard	same as selected channel
	HF reject	cutoff frequency selectable from 1 kHz to 500 MHz
	LF reject	attenuates < 50 kHz
Trigger hysteresis	modes	auto (standard) or manual
	sensitivity	10^{-4} div, from DC to instrument bandwidth for all vertical scales
Holdoff range	time	100 ns to 10 s, fixed and random

Main trigger modes		
Edge	triggers on specified slope (positive, negative or either) and level	
Glitch	triggers on glitches of positive, negative or either polarity that are shorter or longer than specified width	
	glitch width	200 ps to 1000 s
Width	triggers on positive or negative pulse of specified width; width can be shorter, longer, inside or outside the interval	
	pulse width	200 ps to 1000 s
Runt	triggers on pulse of positive, negative or either polarity that crosses one threshold but fails to cross a second threshold before crossing the first one again; runt pulse width can be arbitrary, shorter, longer, inside or outside the interval	
	runt pulse width	200 ps to 1000 s
Window	triggers when signal enters or exits a specified voltage range; triggers also when signal stays inside or outside the voltage range for a specified period of time	
Timeout	triggers when signal stays high, low or unchanged for a specified period of time	
	timeout	0 ps to 1000 s
Interval	triggers when time between two consecutive edges of same slope (positive or negative) is shorter, longer, inside or outside a specified range	
	interval time	200 ps to 1000 s
Slew rate	triggers when the time required by a signal edge to toggle between user-defined upper and lower voltage levels is shorter, longer, inside or outside the interval; edge slope may be positive, negative or either	
	toggle time	0 ps to 1000 s
Setup & hold	triggers on setup time and hold time violations between clock and data present on any two input channels; monitored time interval may be specified by the user in the range from –100 s to 100 s around a clock edge and must be at least 200 ps wide	
Pattern	triggers when a logical combination (and, nand, or, nor) of the input channels stays true for a period of time shorter, longer, inside or outside a specified range	
State	triggers when a logical combination (and, nand, or, nor) of the input channels stays true at a slope (positive, negative or either) in one selected channel	

Advanced trigger modes		
Sequence trigger (A/B/R trigger)	triggers on B event after occurrence of A event; delay condition after A event specified as time interval; an optional R event resets the trigger sequence to A	
	A event	edge, glitch, width, runt, window, timeout, interval, slew rate
	B event	edge, glitch, width, runt, window, timeout, interval, slew rate
	R event	edge, glitch, width, runt, window, timeout, interval, slew rate
Serial bus trigger	optional	see dedicated triggering and decoding options
Trigger input	input impedance	50 Ω (meas.) or 1 MΩ (meas.) || 11 pF (meas.)
	max. input voltage at 50 Ω	30 V (V_p)
	max. input voltage at 1 MΩ	300 V (RMS), 400 V (V_p), derates at 20 dB/decade to 5 V (RMS) above 250 kHz
	trigger level	±5 V
	sensitivity	
	input frequency ≤ 500 MHz	300 mV (peak-to-peak) (meas.)
	input coupling	AC, DC (50 Ω and 1 MΩ)
	trigger filter	HF reject (attenuates > 50 kHz), LF reject (attenuates < 50 kHz), noise reject
	trigger modes	edge (positive, negative or either)
Trigger out	functionality	A pulse is generated for every acquisition trigger event.
	output voltage	0 V to 5 V (nom.) at high impedance; 0 V to 2.5 V (nom.) at 50 Ω
	pulse width	selectable between 16 ns and 50 ms
	pulse polarity	low active or high active
	output delay	depends on trigger settings

Spectrum analysis

General description	Spectrum analysis allows signal analysis in the frequency domain.	
Spectrum	sources	channel 1, channel 2, channel 3, channel 4
	setup parameters	center frequency, frequency span, automatic RBW, resolution bandwidth, gate position, gate width, vertical scale, vertical position
	scaling	dBm, dBV, dBµV, V (RMS)
	span	1 Hz to 1.8 GHz [5]
	resolution bandwidth	span/4 ≥ RBW ≥ span/6000
	windows	flat top, Hanning, Hamming, Blackman, rectangular, Kaiser Bessel, Gaussian
	trace types	normal, max. hold, min. hold, average
	max. real-time waveform acquisition rate	> 40 000 waveforms/s
Gate	delimits the display region used for spectrum analysis	
Peak list	peak list; diagram labels for easy identification of the peak list entries in the diagram	

[5] The stop frequency depends on the analog bandwidth of the instrument.

RF characteristics

Sensitivity/noise density	at 1 GHz (measurement of the power spectral density at 1 GHz at input sensitivity 2 mV/div, corresponding to –30 dBm input range of the oscilloscope, using spectrum analysis with center frequency 1 GHz, span 500 kHz, RBW 3 kHz)	–160 dBm (1 Hz) (meas.)
Noise figure	at 1 GHz (calculated based on the noise density above)	14 dB (meas.)
Dynamic range	measured for an input carrier with a frequency of 1 GHz and a level of –3 dBm at the input of the oscilloscope, using spectrum analysis with center frequency 1 GHz, span 2 MHz, RBW 400 Hz at +20 MHz from the center frequency	106 dB (meas.)
Absolute amplitude accuracy	0 Hz to 1.2 GHz	±1 dB (meas.)
Spurious-free dynamic range (excluding harmonics)	measured for an input carrier with frequency 250 MHz and level –3 dBm at input sensitivity 50 mV/div, using spectrum analysis with center frequency 900 MHz, span 1.8 GHz, RBW 300 kHz	65 dBc (meas.)
Second harmonic distortion	measured for an input carrier with frequency 250 MHz and level –3 dBm at input sensitivity 50 mV/div, using spectrum analysis with center frequency 900 MHz, span 1.8 GHz, RBW 300 kHz	–60 dBc (meas.)
Third harmonic distortion	measured for an input carrier with frequency 250 MHz and level –3 dBm at input sensitivity 50 mV/div, using spectrum analysis with center frequency 900 MHz, span 1.8 GHz, RBW 300 kHz	–59 dBc (meas.)

Waveform measurements

Automatic measurements	measurements on channels, math waveforms, reference waveforms	amplitude, high, low, maximum, minimum, peak-to-peak, mean, RMS, sigma, positive overshoot, negative overshoot, area, rise time, fall time, positive pulse width, negative pulse width, period, frequency, positive duty cycle, negative duty cycle, delay, phase, burst width, pulse count, edge count, pulse train, positive switching, negative switching, cycle area, cycle mean, cycle RMS, cycle sigma, setup, hold, setup/hold time, setup/hold ratio, slew rate rising, slew rate falling, delay to trigger
	gate	delimits the display region evaluated for automatic measurements
	reference levels	user-configurable vertical levels define support structures for automatic measurements
	statistics	displays maximum, minimum, mean, standard deviation and measurement count for each automatic measurement
	number of active measurements	16
Cursor measurements	setup	up to 2 cursor sets on screen, each set consisting of two horizontal and two vertical cursors.
	target	acquired waveforms (input channels), math waveforms, reference waveforms, XY diagrams
	operating mode	vertical measurements, horizontal measurements or both; vertical cursors either set manually or locked to waveform

Waveform math

General features	number of math equations	up to 5
	number of reference waveforms	up to 4
	sources	channel 1, channel 2, channel 3, channel 4, math waveforms 1 to 4, reference waveforms 1 to 4
Functions	operators	add, subtract, multiply, divide, absolute value, square, square root, integrate, differentiate, $\log_{10}$, $\log_e$, $\log_2$, reciprocal, invert, low pass, high pass, rescale (a*x+b)
	filter	low pass, high pass
	filter types	gaussian, rectangular
	gate	delimits the display region used for waveform math

Display characteristics

Diagram types	Yt, zoom, spectrum
Display interface configuration	display area can be split up into separate diagram areas by dragging and dropping signal icons; each diagram area can hold any number of signals; diagram areas may be stacked on top of each other and later accessed via the dynamic tab menu
Signal icon	each active waveform is represented by a separate signal icon on the signal bar; the signal icon displays the individual vertical and acquisition settings
Toolbar	enables quick access to important tools; allows to directly set their most common parameters in a simple menu and gives access to more detailed parameters in the main menu; user-defined selection of tools in the toolbar
Upper menu	displays the trigger, horizontal, and acquisition settings; allows quick access to these settings
Main menu	provides access to all instrument settings in a compact menu structure
Axis label	X-axis ticks and Y-axis ticks labeled with tick value and physical unit
Diagram label	diagrams may be individually labeled with a descriptive user-defined name
Diagram layout	grid, crosshair, axis labels and diagram label may be switched on and off separately
Persistence	50 ms to 50 s, or infinite
Zoom	user-defined zoom window provides vertical and horizontal zoom; touchscreen interface simplifies resize and drag operations on zoom window
Signal colors	predefined or user-defined color tables for persistence display

History and segmented memory

Acquisition memory	automatic	automatic segment size and sample rate		
	manual	user-defined size and sample rate		
Memory segmentation	function	memory segments for the acquisition		
	number of segments	record length	segments [6] (up to)	total memory
		1 kpoints	1 048 575	1.048 Gpoints
		2 kpoints	524 287	1.048 Gpoints
		5 kpoints	262 143	1.310 Gpoints
		10 kpoints	131 071	1.310 Gpoints
		20 kpoints	65 535	1.310 Gpoints
		50 kpoints	32 767	1.638 Gpoints
		100 kpoints	16 383	1.638 Gpoints
		200 kpoints	9 361	1.872 Gpoints
		500 kpoints	4 095	2.047 Gpoints
		1 Mpoints	2 113	2.113 Gpoints
		2 Mpoints	1 056	2.112 Gpoints
		5 Mpoints	427	2.135 Gpoints
		10 Mpoints	213	2.130 Gpoints
		20 Mpoints	106	2.120 Gpoints
		50 Mpoints	41	2.050 Gpoints
		100 Mpoints	20	2.000 Gpoints
		200 Mpoints	9	1.800 Gpoints
		400 Mpoints	4	1.600 Gpoints
		800 Mpoints	2	1.600 Gpoints
	Segmentation is active on all analog and logic channels, protocol decoding and spectrum analysis.			
Fast-segmented mode	continuous recording of waveforms in acquisition memory without interruption due to visualization; blind time between consecutive acquisitions, see Acquisition system			
History mode	function	The history mode always provides access to past acquisitions in the segmented memory.		
	timestamp resolution	1 ns		
	history player	replays the recorded waveforms; repetition possible; adjustable speed; manual next/previous segment; numerical segment number input		
	analyze options	overlay all segments, average all segments, envelope all segments		

[6] With R&S®MXO4-B108 memory option. The maximum number of segments without R&S®MXO4-B108 memory option is limited to 10 000. The maximum number of segments depends on the number of active channels and the bit depth of the acquired data and, therefore, on the settings of the acquisition system, such as decimation mode, waveform arithmetic or high definition mode.

Miscellaneous

Remote control	web interface	full operation of the instrument's touch interface, keys and multifunction wheel via web browser
	VNC	control of the instrument through virtual network computing
	SCPI	standard instrument programming interface through VISA
Languages	available languages for the user interface	English, German, French, Simplified Chinese, Traditional Chinese, Japanese, Russian, Spanish, Italian, Portuguese, Korean, Czech, Polish
	online help on the instrument	English

Input and output

Front		
Channel inputs		BNC; for details, see Vertical system
	probe interface	auto-detection of passive probes, Rohde & Schwarz active probe interface
Trigger input		BNC; for details, see Trigger system
	probe interface	auto detection of passive probes
Waveform generator outputs (requires R&S®MXO4-B6 option)		BNC; for details, see R&S®MXO4-B6, waveform generator, demo lugs and GND lug
Digital channel inputs	D15 to D8, D7 to D0	interface for R&S®RT-ZL04 logic probe
Probe compensation output	signal shape	rectangle, V_{low} = 0 V, V_{high} = 3.3 V amplitude 3.3 V (V_{pp}) ± 5 % (meas.)
	frequency	1 kHz ± 1 % (meas.)
USB interface		1 × USB 3.1 gen1 port, type A plug, 2 × USB 2.0 high speed ports, type A plug

Rear		
Trigger out		BNC; for details, see Trigger system
USB interface		2 × USB 3.1 gen1 ports, type A plug, 1 × USB 3.1 gen1, type B plug
LAN interface		RJ-45 connector, supports 10/100/1000BASE-T
External monitor interface		HDMI™, 1920 × 1080 pixel at 60 Hz, output of oscilloscope display
Reference input	connector	BNC
	impedance	50 Ω (nom.)
	input frequency range	10 MHz (±20 ppm)
	sensitivity	≥ –10 dBm into 50 Ω, ≤ 10 dBm at 10 MHz
Reference output	connector	BNC
	impedance	50 Ω (nom.)
	output signal	10 MHz (specified in timebase accuracy), 8 dBm (nom.)
Security slot		for standard Kensington style lock
VESA mount		VESA compatibility mounting interface, 100 mm × 100 mm pattern size

Right side		
Ground jack		connected to ground

General data

Display	type	13.3" LC TFT color display with capacitive touchscreen
	resolution	1920 × 1080 pixel (Full HD)

Temperature		
Temperature loading	operating temperature range	0 °C to +50 °C
	storage temperature range	–40 °C to +70 °C
		in line with MIL-PRF-28800F section 4.5.5.1.1.1 class 3 tailored to +45 °C for operation
Climatic loading		+25 °C/+50 °C at 85 % relative humidity cyclic, in line with IEC 60068-2-30

Altitude		
Operating		up to 3000 m above sea level
Nonoperating		up to 4600 m above sea level

Mechanical resistance		
Vibration	sinusoidal	5 Hz to 150 Hz, max. 1.8 g at 55 Hz; 0.5 g from 55 Hz to 150 Hz, in line with EN 60068-2-6
		10 Hz to 55 Hz, in line with MIL-PRF-28800F, section 4.5.5.3.2 class 3
	random	10 Hz to 300 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64
		5 Hz to 500 Hz, acceleration 2.058 g (RMS), in line with MIL-PRF-28800F, section 4.5.5.3.1 class 3
Shock		40 g shock spectrum, in line with MIL-STD-810G, method no. 516.6, procedure I
		30 g functional shock, halfsine, duration 11 ms, in line with MIL-PRF-28800F, section 4.5.5.4.1

Electromagnetic compatibility (EMC)		
RF emission		in line with CISPR 11/EN 55011 group 1 class A (for a shielded test setup); the instrument complies with the emission requirements stipulated by EN 55011, EN 61326-1 and EN 61326-2-1 class A, making the instrument suitable for use in industrial environments
Immunity		in line with IEC/EN 61326-1 table 2, immunity test requirements for industrial environment [7]

Certifications		VDE, $_{C}$CSA$_{US}$, KC

Calibration interval		1 year

[7] Test criterion is displayed noise level within ±1 div for input sensitivity of 5 mV/div.

Power supply		
AC supply		100 V to 240 V ±10 % at 50 Hz to 60 Hz and 400 Hz ±5 %, max. 2.3 A to 1.3 A, in line with MIL-PRF 28800F, section 3.5
Power consumption		max. 210 W
Safety		in line with IEC 61010-1, EN 61010-1, CAN/CSA-C22.2 No. 61010-1, UL 61010-1

Mechanical data		
Dimensions	W × H × D	414 mm × 279 mm × 162 mm (16.3 in × 10.99 in × 6.38 in)
Weight	without options, nominal	6.0 kg (13.23 lb)
Rackmount height	with R&S®ZZA-MXO4 rackmount kit	6 HU

Options

R&S®MXO4-B1 mixed signal option

Mixed signal capability is a standard functionality of the R&S®MXO 4 series oscilloscopes. The R&S®MXO4-B1 mixed signal option provides 16 digital channels with two R&S®RT-ZL04 probes.

R&S®MXO4-B6 arbitrary waveform generator

Arbitrary function/waveform generator, 2 analog channels

General		
Output channel		2 channels
Vertical resolution		16 bit
Operating modes		function generator, arbitrary waveform generator, modulation, frequency sweep

Function generator	output of predefined waveforms	
Sample rate		625 Msample/s
Waveforms	sine, square/pulse, ramp, DC, noise, sine cardinal (sinc), Gaussian pulse, Lorentz, exponential fall, exponential rise, cardiac	
Sine	frequency range	1 mHz to 100 MHz
	amplitude flatness (relative to 1 kHz)	≤ ±0.5 dB (meas.)
	total harmonic distortion (into 50 Ω)	
	f ≤ 10 MHz	≤ –60 dBc (meas.)
	f > 10 MHz	≤ –40 dBc (meas.)
	nonharmonic spurious	–75 dBc (meas.)
Square/pulse	frequency range	1 mHz to 30 MHz
	duty cycle (if pulse width limit is not exceeded)	0.01 % to 99.99 %, 0.01 % resolution
	pulse width	≥ 16.5 ns, 0.1 ns resolution
	rise/fall time	9 ns (meas.)
	overshoot	≤ 2 % (meas.)
	jitter (cycle-to-cycle) (≥ 0.2 V (V_{pp}))	≤ 40 ps (RMS) (meas.)
Ramp (triangle, sawtooth)	frequency range	1 mHz to 1 MHz
	variable symmetry	0 % to 100 %, 0.1 % resolution
DC	level range	
	into 50 Ω	± 2.5 V
	into open circuit	± 5 V
	resolution	1 mV
Noise	amplitude	
	DC	0 V to 5 V (V_{pp}) (into 50 Ω), 0 V to 10 V (V_{pp}) (into open circuit), 1 mV resolution
	all other waveforms	0 % to 100 % of AC signal amplitude, 1 % resolution
	bandwidth	≥ 100 MHz
Sine cardinal (sinc)	frequency range	1 mHz to 5 MHz
Gaussian pulse	frequency range	1 mHz to 25 MHz
Lorentz	frequency range	1 mHz to 10 MHz
Exponential rise/fall	frequency range	1 mHz to 10 MHz
Cardiac	frequency range	1 mHz to 1 MHz

Arbitrary waveform generator	output of user-defined waveforms	
Waveform length		1 sample to 40 Msample on each channel
Sample rate		1 sample/s to 312.5 Msample/s
Filter bandwidth		100 MHz
Modulation		
Modulation types		amplitude modulation (AM), frequency modulation (FM), frequency-shift key modulation (FSK), pulse width modulation (PWM)
Carrier waveform	AM, FM, FSK	sine
	PWM	square/pulse
AM	modulation signals	sine, square, ramp (triangle, sawtooth)
	modulation frequency	1 mHz to 1 MHz
	depth	0 % to 100 %, 0.1 % resolution
FM	modulation signals	sine, square, triangle, ramp, inverse ramp
	modulation frequency	1 mHz to 1 MHz
	frequency deviation	1 mHz to 10 MHz
FSK	modulation signal	50 % duty cycle square wave
	range of frequency 1, frequency 2	1 mHz to 100 MHz
	hop rate	1 mHz to 1 MHz
PWM	modulation signals	sine, square, ramp
	depth	0 % to 99.99 % of the duty cycle, 0.01 % resolution

Frequency sweep	output of a sinusoidal waveform with the frequency changing linearly between the start frequency and the stop frequency within the sweep time	
	waveform	sine
	frequency range	1 mHz to 100 MHz
	direction	up (start frequency < stop frequency)
		down (start frequency > stop frequency)
	sweep time	1 ms to 500 s

Two-channel operation	operating modes	independent channels, coupled parameters, differential
	parameter coupling	none, frequency and/or amplitude
	relative phase	–180° to 180°, 0.1° resolution
	channel-to-channel skew (each channel with same output amplitude)	≤ 200 ps (meas.)
	channel-to-channel isolation (each channel with same output amplitude)	≥ 70 dB (meas.)

Outputs		
Connectors		BNC; on the front of the instrument
Function		on, off, inverted
Output impedance		nom. 50 Ω
Overload protection	V_{pp} > 200 mV into open circuit	a short-circuit to ground is tolerated indefinitely, automatic shutoff in case of voltages ≥ +12 V or ≤ –12 V (meas.)
	V_{pp} ≤ 200 mV into open circuit	a short-circuit to ground is tolerated indefinitely, automatic shutoff in case of voltages ≥ +4 V or ≤ –4 V (meas.)
Amplitude range [8]	sine, square/pulse, ramp, exponential rise/fall, arbitrary waveforms, sine cardinal (sinc), Gauss, Lorentz, cardiac	
	into 50 Ω	5 mV to 5 V (V_{pp})
	into open circuit	10 mV to 10 V (V_{pp})
	resolution	1 mV
	accuracy	±1 % at 1 kHz
DC offset range	sine, square/pulse, ramp, exponential rise/fall, arbitrary waveforms	
	into 50 Ω	±2.5 V (V_{pp} > 100 mV), ±1.25 V (V_{pp} ≤ 100 mV)
	into open circuit	±5.0 V (V_{pp} > 200 mV), ±2.5 V (V_{pp} ≤ 200 mV)
	sine cardinal (sinc): DC offset range is signal amplitude dependent	
	into 50 Ω	–2.823 V to +2.177 V (V_{pp} = 1 V)
	into open circuit	–5.323 V to +4.677 V (V_{pp} = 1 V)
	Gauss, Lorentz: DC offset range is signal amplitude dependent	
	into 50 Ω	–3.000 V to +2.000 V (V_{pp} = 1 V)
	into open circuit	–5.500 V to +4.500 V (V_{pp} = 1 V)
	Cardiac: DC offset range is signal amplitude dependent	
	into 50 Ω	–2.814 V to +2.186 V (V_{pp} = 1 V)
	into open circuit	–5.314 V to +4.686 V (V_{pp} = 1 V)
	resolution	1 mV
	accuracy	±(1 % of control + (0.5 % of amplitude) + 2 mV)
Frequency accuracy		| ∆f | ≤ [(timebase accuracy) × (nominal frequency) + 1.1 µHz] (calc.) (timebase accuracy, see Horizontal system)

R&S®MXO4-B108 memory upgrade to option, 800 Mpoints on 2 channels

Extension of memory depth and memory segments		
Memory depths		800 Mpoints with 2 active channels (single), 800 Mpoints with 1 active channel (run)
Memory segmentation	maximum number of segments	1 048 575 segments

[8] Amplitude is the sum of the AC amplitude and the noise amplitude.

R&S®MXO4-K36 frequency response analysis

Frequency response analysis (requires R&S®MXO4-B6 option)		
Stimulus	frequency mode	single sweep or repeated sweep
	frequency range	10 Hz to 100 MHz
	amplitude mode	fixed or amplitude profile
	amplitude level	10 mV to 10 V into high Z
		5 mV to 5 V into 50 Ω
Input and output sources		channel 1, channel 2, channel 3, channel 4
Number of test points		10 points to 500 points per decade
Measurement		dual pair of tracking gain and phase cursors
Diagram types	manually changeable vertical window size	parallel display of result window and input and output signal view
Result table		navigation and export functions
Scaling	during and after test	auto-scale and manual scaling and positioning

R&S®MXO4-K510 low speed serial buses

I²C decoding		
Protocol configuration	bit rate	auto-detected
Trigger	source (clock and data)	any input channel or logical channel
	trigger event setup	start, stop, restart, missing ACK, address, data, address + data
	address setup	7 bit or 10 bit address (value in hex or binary); read, write or either; condition =, ≠, ≥, ≤, in range, out of range
	data setup	data pattern up to 8 byte (hex or binary); condition =, ≠; offset within frame in range from 0 byte to 4095 byte
Decode	source (clock and data)	any input channel, logical channel
	display type	decoded bus, tabulated list
	color coding	frame, start/restart, address (r/w), data, ACK/NACK, stop, error
	address and data format	hex, decimal, octal, binary, ASCII

SPI decoding		
Protocol configuration	type	2-wire, 3-wire and 4-wire SPI
	bit rate	auto-detected
	bit order	LSB first, MSB first
	word size	4/8/12/16/20/24/28/32 bit
	frame condition	CS, timeout
	polarity (MOSI, MISO, CS, CLK)	active high, active low
	phase (CLK)	first edge, second edge
Trigger	source (MOSI, MISO, CS, CLK)	any input channel or logical channel
	bit rate	up to 50 Mbps
	trigger event setup	start of frame, end of frame, MOSI, MISO
	data setup	data pattern up to 32 bit (hex or binary); condition =, ≠; offset within frame in range from 0 to 4095 bit
Decode	source (MOSI, MISO, CS, CLK)	any input channel, logical channel
	display type	decoded bus, tabulated list
	color coding	frame, word, error
	data format	hex, decimal, octal, binary, ASCII

UART/RS-232/RS-422/RS-485 decoding		
Protocol configuration	bit rate	300 bps to 20 Mbps
	signal polarity	idle low, idle high
	number of bits	5 bit to 9 bit
	bit order	LSB first, MSB first
	parity	odd, even, mark, space, none
	stop bit	1, 1.5 or 2
	end of packet	timeout, none
Trigger	source (TX and RX)	any input channel or logical channel
	trigger event setup	start bit, packet start, data, parity error, stop error, break condition
	data setup	data pattern (hex, decimal, octal, binary or ASCII); condition =, ≠; offset within packet in range 0 to 4095 words
Decode	source (TX and RX)	any input channel, logical channel
	display type	decoded bus, tabulated list
	color coding	packet, data payload, start error, parity error, stop error
	data format	hex, decimal, octal, binary, ASCII

R&S®MXO4-K520 automotive protocols

CAN FD/XL decoding [9]		
Protocol configuration	signal type	CAN_H, CAN_L
	bit rate	
	nominal bit rate	100 kbps to 1 Mbps
	FD data rate	100 kbps to 15 Mbps
	XL data rate	100 kbps to 15 Mbps
	sampling point	10 % to 95 % within bit period; independent settings for nominal bit rate, FD data rate and XL data rate
	device list	associate frame identifier with symbolic ID, load DBC file content
Trigger	source	any input channel or logical channel
	trigger event setup	start of frame, frame type, identifier, identifier + data, symbolic, error condition (any combination of CRC error, bit stuffing error, form error and ACK error)
	identifier setup	frame type (data, remote or both), identifier type (standard or extended); condition =, ≠, ≥, ≤, in range, out of range
	FD bits	FDF, BRS and ESI (0, 1, X)
	data setup	data pattern up to 8 byte (hex or binary); condition =, ≠
	symbolic setup	message name, signal name; numeric signal condition =, ≠, ≥, ≤, in range, out of range; enumerated signal condition =, ≠, ≥, ≤
Decode	source	any input channel, logical channel
	display type	decoded bus, tabulated list
	color coding	start of frame, identifier, DLC, ADS, SDT, VCID, AF, data payload, CRC, end of frame, error frame, overload frame, CRC error, bit stuffing error
	data format	hex, decimal, octal, binary, ASCII, symbolic

[9] Available with future firmware release.

Ordering information

Designation	Type	Order No.
R&S®MXO 4 series, base model		
Oscilloscope, 200 MHz, 4 channels	R&S®MXO 4	1335.5050.04
Base unit (including standard accessories: 700 MHz passive probe (10:1) per channel, accessories bag, quick start guide, power cord)		
Choose your bandwidth upgrade		
Upgrade of R&S®MXO 4 series oscilloscopes to 350 MHz bandwidth	R&S®MXO4-B243	1335.4276.02
Upgrade of R&S®MXO 4 series oscilloscopes to 500 MHz bandwidth	R&S®MXO4-B245	1335.4299.02
Upgrade of R&S®MXO 4 series oscilloscopes to 1 GHz bandwidth	R&S®MXO4-B2410	1335.4318.02
Upgrade of R&S®MXO 4 series oscilloscopes to 1.5 GHz bandwidth	R&S®MXO4-B2415	1335.4330.02
Choose your options		
Mixed signal option for R&S®MXO 4 series with 16 digital channels	R&S®MXO4-B1	1335.4130.02
Arbitrary waveform generator, 100 MHz, 2 analog channels	R&S®MXO4-B6	1335.4147.02
Memory upgrade to 800 Mpoints on 2 channels	R&S®MXO4-B108	1335.5772.02
Low speed serial triggering and decode (I^2C/SPI/UART/RS-232/RS-422/RS-485)	R&S®MXO4-K510	1335.5195.02
Automotive serial triggering and decode (CAN/CAN FD/CAN XL/LIN) [10]	R&S®MXO4-K520	1335.5550.02
Frequency response analysis	R&S®MXO4-K36	1335.5572.02
Application bundle, consists of the following options: R&S®MXO4-K510, R&S®MXO4-K520 [10], R&S®MXO4-K36, R&S®MXO4-B6	R&S®MXO4-PK1	1335.5237.02
Choose your additional probes		
Single-ended passive probes		
700 MHz, 10 MΩ, 10:1, 400 V, 9.5 pF, 2.5 mm	R&S®RT-ZP11	1803.0005.02
500 MHz, 10 MΩ, 10:1, 400 V, 9.5 pF, 2.5 mm	R&S®RT-ZP10	1409.7550.00
500 MHz, 10 MΩ, 10:1, 300 V, 10 pF, 5 mm	R&S®RT-ZP05S	1333.2401.02
38 MHz, 1 MΩ, 1:1, 55 V, 39 pF, 2.5 mm	R&S®RT-ZP1X	1333.1370.02
Active broadband probes: single-ended		
1.0 GHz, 10:1, 1 MΩ, BNC interface	R&S®RT-ZS10L	1333.0815.02
1.0 GHz, active, 1 MΩ, Rohde & Schwarz probe interface	R&S®RT-ZS10E	1418.7007.02
1.0 GHz, active, 1 MΩ, R&S®ProbeMeter, micro button, Rohde & Schwarz probe interface	R&S®RT-ZS10	1410.4080.02
1.5 GHz, active, 1 MΩ, R&S®ProbeMeter, micro button, Rohde & Schwarz probe interface	R&S®RT-ZS20	1410.3502.02
Active broadband probes: differential		
1.0 GHz, active, differential, 1 MΩ, R&S®ProbeMeter, micro button, incl. 10:1 external attenuator, 1 MΩ, 70 V DC, 46 V AC (peak), Rohde & Schwarz probe interface	R&S®RT-ZD10	1410.4715.02
1.5 GHz, active, differential, 1 MΩ, R&S®ProbeMeter, micro button, Rohde & Schwarz probe interface	R&S®RT-ZD20	1410.4409.02
Power rail probe		
2.0 GHz, 1:1, 50 kΩ, ±0.85 V, ±60 V offset, Rohde & Schwarz probe interface	R&S®RT-ZPR20	1800.5006.02
High voltage probes		
250 MHz, 100:1, 100 MΩ, 850 V, 6.5 pF	R&S®RT-ZH03	1333.0873.02
400 MHz, 100:1, 50 MΩ, 1000 V, 7.5 pF	R&S®RT-ZH10	1409.7720.02
400 MHz, 1000:1, 50 MΩ, 1000 V, 7.5 pF	R&S®RT-ZH11	1409.7737.02
High voltage probes: differential		
100 MHz, 8 MΩ, 1 kV (RMS) (CAT III), BNC interface	R&S®RT-ZD01	1422.0703.02
200 MHz, 250:1/25:1, 5 MΩ, 750 V (peak), 300 V CAT III, Rohde & Schwarz probe interface	R&S®RT-ZHD07	1800.2307.02
100 MHz, 500:1/50:1, 10 MΩ, 1500 V (peak), 1000 V CAT III, Rohde & Schwarz probe interface	R&S®RT-ZHD15	1800.2107.02
200 MHz, 500:1/50:1, 10 MΩ, 1500 V (peak), 1000 V CAT III, Rohde & Schwarz probe interface	R&S®RT-ZHD16	1800.2207.02
100 MHz, 1000:1/100:1, 40 MΩ, 6000 V (peak), 1000 V CAT III, Rohde & Schwarz probe interface	R&S®RT-ZHD60	1800.2007.02
Current probes		
20 kHz, AC/DC, 0.01 V/A and 0.001 V/A, ±200 A and ±2000 A, BNC interface	R&S®RT-ZC02	1333.0850.02
100 kHz, AC/DC, 0.1 V/A, 30 A, BNC interface	R&S®RT-ZC03	1333.0844.02
2 MHz, AC/DC, 0.01 V/A, 500 A (RMS), Rohde & Schwarz probe interface	R&S®RT-ZC05B	1409.8204.02
10 MHz, AC/DC, 0.01 V/A, 150 A (RMS), BNC interface	R&S®RT-ZC10	1409.7750K02
10 MHz, AC/DC, 0.01 V/A, 150 A (RMS), Rohde & Schwarz probe interface	R&S®RT-ZC10B	1409.8210.02
50 MHz, AC/DC, 0.1 V/A, 30 A (RMS), Rohde & Schwarz probe interface	R&S®RT-ZC15B	1409.8227.02
100 MHz, AC/DC, 0.1 V/A, 30 A (RMS), BNC interface	R&S®RT-ZC20	1409.7766K02

[10] Available with future firmware release.

Designation	Type	Order No.
100 MHz, AC/DC, 0.1 V/A, 30 A (RMS), Rohde & Schwarz probe interface	R&S®RT-ZC20B	1409.8233.02
120 MHz, AC/DC, 1 V/A, 5 A (RMS), BNC interface	R&S®RT-ZC30	1409.7772K02
EMC near-field probe		
Probe set for E and H near-field measurements, 30 MHz to 3 GHz	R&S®HZ-15	1147.2736.02
Logic probe		
400 MHz logic probe, 8 channels	R&S®RT-ZL04	1333.0721.02
Probe accessories		
Accessory set for R&S®RT-ZP11 passive probe (2.5 mm probe tip)	R&S®RT-ZA1	1409.7566.00
Probe power supply for R&S®RT-ZC10/-ZC20/-ZC30	R&S®RT-ZA13	1409.7789.02
External attenuator 10:1, 2.0 GHz, 1.3 pF, 60 V DC, 42.4 V AC (peak), for R&S®RT-ZD20/-ZD30 probes	R&S®RT-ZA15	1410.4744.02
Probe pouch	R&S®RT-ZA19	
Power deskew and calibration test fixture	R&S®RT-ZF20	1800.0004.02
3D positioner with central tensioning knob for easy clamping and positioning of probes (span width: 200 mm, clamping range: 15 mm)	R&S®RT-ZA1P	1326.3641.02
Choose your accessories		
Front cover	R&S®MXO4-Z1	1335.4360.02
Soft bag	R&S®MXO4-Z3	1335.5589.02
Transit case	R&S®MXO4-Z4	1335.5595.02
Rackmount kit, for R&S®MXO 4 oscilloscopes with 6 HU	R&S®ZZA-MXO4	1335.5108.02
VESA mount (compatible with standard 100 mm × 100 mm pattern)	Choose industry standard mounts	

Warranty		
Base unit		3 years
All other items [11]		1 year
Options		
Extended warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended warranty, two years	R&S®WE2	
Extended warranty with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	
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 a term of one and two years (WE1 and WE2)
Repairs carried out during the contract term are free of charge [12]. Necessary calibration and adjustments carried out during repairs are also covered.

Extended warranty with calibration coverage (CW1 and CW2)
Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs [12] and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

Extended warranty with accredited calibration (AW1 and AW2)
Enhance your extended warranty by adding accredited calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated under accreditation, inspected and maintained during the term of the contract. It includes all repairs [12] and accredited calibration at the recommended intervals as well as any accredited calibration carried out during repairs or option upgrades.

[11] For options installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

[12] Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.

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- ► Local and personalized
- ► Customized and flexible
- ► Uncompromising quality
- ► Long-term dependability

Rohde&Schwarz

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- ► Energy efficiency and low emissions
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PD 3609.8473.22 | Version 03.01 | September 2022 (sk)
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