

MXO 3 SERIES OSCILLOSCOPE

Specifications



Specifications
Version 05.00

ROHDE & SCHWARZ

Make ideas real



CONTENTS

Definitions	3
Base unit.....	4
Vertical system: analog channels.....	4
Vertical system: digital channels	6
Horizontal system	6
Acquisition system.....	6
High definition mode.....	7
Trigger system.....	7
Spectrum analysis	9
RF characteristics.....	9
Waveform measurements.....	10
Waveform math	11
Digital voltmeter.....	11
Display characteristics	11
History and segmented memory	12
Mask testing	12
Miscellaneous.....	13
Input and output.....	13
General data.....	14
Options	16
R&S®MXO3-B1 mixed signal option.....	16
R&S®MXO3-B6 arbitrary waveform generator.....	16
R&S®MXO3-B105 memory upgrade option.....	18
R&S®MXO3-K12 basic jitter analysis	18
R&S®MXO3-K31 power analysis.....	18
R&S®MXO3-K36 frequency response analysis	19
R&S®MXO3-K500 bus analysis	19
R&S®MXO3-K510 low speed serial buses	20
R&S®MXO3-K520 automotive protocols	26
R&S®MXO3-K530 aerospace protocols	28
R&S®MXO3-K550 MIPI low speed protocols.....	29
R&S®MXO3-K560 automotive Ethernet protocols	33
R&S®MXO3-K570 USB protocols	33
Ordering information	35
Warranty and service.....	37

Definitions

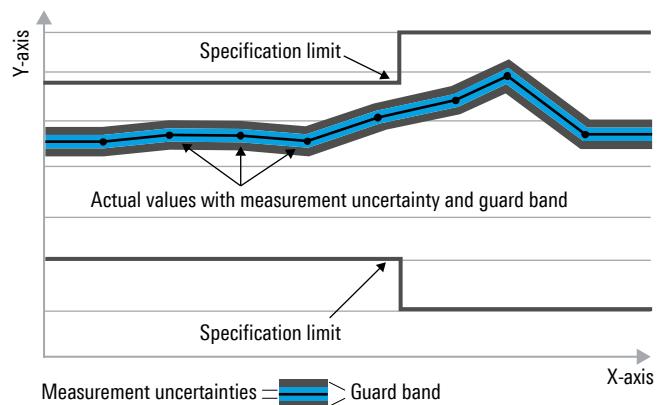
General

Product data applies under the following conditions:

- Three hours of storage at ambient temperature followed by 30 minutes of 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 $<$, \leq , $>$, \geq , \pm 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 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 or 8 channels	
Input impedance	$50 \Omega \pm 1.5 \%$, $1 M\Omega \pm 1 \% \parallel 12 pF$ (meas.)	
Analog bandwidth (−3 dB)	MXO 34, 4-channel instrument at 50Ω input impedance MXO 3 ≥ 100 MHz MXO 3 with -B242 option ≥ 200 MHz MXO 3 with -B243 option ≥ 350 MHz MXO 3 with -B245 option ≥ 500 MHz MXO 3 with -B2410 option ≥ 1 GHz at $1 M\Omega$ input impedance MXO 3 ≥ 100 MHz (meas.) MXO 3 with -B242 option ≥ 200 MHz (meas.) MXO 3 with -B243 option ≥ 350 MHz (meas.) MXO 3 with -B245 option ≥ 500 MHz (meas.) ¹ MXO 3 with -B2410 option ≥ 500 MHz (meas.) ¹ MXO 38, 8-channel instrument at 50Ω input impedance MXO 3 ≥ 100 MHz MXO 3 with -B282 option ≥ 200 MHz MXO 3 with -B283 option ≥ 350 MHz MXO 3 with -B285 option ≥ 500 MHz MXO 3 with -B2810 option ≥ 1 GHz at $1 M\Omega$ input impedance MXO 3 ≥ 100 MHz (meas.) MXO 3 with -B282 option ≥ 200 MHz (meas.) MXO 3 with -B283 option ≥ 350 MHz (meas.) MXO 3 with -B285 option ≥ 500 MHz (meas.) ¹ MXO 3 with -B2810 option ≥ 500 MHz (meas.) ¹	
Additional bandwidth filters available up to instrument bandwidth	500/350/200/100/50/20 MHz (meas.)	
Rise/fall time (calculated)	10 % to 90 % at 50Ω MXO 34, 4-channel instrument MXO 3 < 3.5 ns MXO 3 with -B242 option < 1.75 ns MXO 3 with -B243 option < 1 ns MXO 3 with -B245 option < 700 ps MXO 3 with -B2410 option < 350 ps MXO 38, 8-channel instrument MXO 3 < 3.5 ns MXO 3 with -B282 option < 1.75 ns MXO 3 with -B283 option < 1 ns MXO 3 with -B285 option < 700 ps MXO 3 with -B2810 option < 350 ps	
Vertical resolution	12 bit, up to 18 bit for high definition mode	
Input sensitivity	at 50Ω	1 mV/div to 1 V/div, entire analog bandwidth supported for all input sensitivities
		1 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 coupling	at 50Ω	DC
	at $1 M\Omega$	DC, AC (> 7 Hz)

¹ With R&S®RT-ZP05M passive probe.

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-ZP05M 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 specifications (PD 3607.3851.22)
Position range		±5 div
Offset range at 50 Ω	input sensitivity	
	70 mV/div to 1 V/div	±20 V
	1 mV/div to < 70 mV/div	±3 V
Offset range at 1 MΩ	input sensitivity	
	1 V/div to 10 V/div	±250 V
	60 mV/div to < 1 V/div	±30 V
	1 mV/div to < 60 mV/div	±3 V
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 definition (HD) mode or waveform averaging or a combination of both	±(DC gain accuracy × reading – net offset + offset accuracy)
Channel-to-channel isolation (each channel with same input sensitivity)	input frequency within instrument bandwidth	> 60 dB (1:1000)

RMS noise floor ²						
At 50 Ω (meas.)	Input sensitivity	Analog bandwidth (-3 dB)				
		100 MHz	200 MHz	350 MHz	500 MHz	1 GHz
	1 mV/div	50 μV	64 μV	76 μV	83 μV	136 μV
	2 mV/div	53 μV	68 μV	81 μV	88 μV	143 μV
	5 mV/div	64 μV	78 μV	92 μV	101 μV	166 μV
	10 mV/div	91 μV	107 μV	121 μV	133 μV	224 μV
	20 mV/div	156 μV	174 μV	195 μV	213 μV	371 μV
	50 mV/div	380 μV	418 μV	468 μV	516 μV	901 μV
	100 mV/div	923 μV	1.06 mV	1.20 mV	1.31 mV	2.01 mV
	200 mV/div	1.60 mV	1.76 mV	1.96 mV	2.12 mV	3.46 mV
	500 mV/div	3.69 mV	3.96 mV	4.32 mV	4.75 mV	8.00 mV
	1 V/div	7.28 mV	7.82 mV	8.50 mV	9.30 mV	15.77 mV
At 1 MΩ (meas.)	Input sensitivity	Analog bandwidth (-3 dB)				
		20 MHz	100 MHz	200 MHz	350 MHz	500 MHz
	1 mV/div	35 μV	46 μV	53 μV	62 μV	65 μV
	2 mV/div	34 μV	48 μV	55 μV	66 μV	70 μV
	5 mV/div	47 μV	60 μV	70 μV	81 μV	88 μV
	10 mV/div	74 μV	88 μV	102 μV	118 μV	129 μV
	20 mV/div	138 μV	157 μV	180 μV	205 μV	226 μV
	50 mV/div	334 μV	372 μV	422 μV	477 μV	524 μV
	100 mV/div	715 μV	849 μV	1.00 mV	1.13 mV	1.23 mV
	200 mV/div	1.37 mV	1.56 mV	1.79 mV	2.02 mV	2.21 mV
	500 mV/div	3.37 mV	3.76 mV	4.23 mV	4.77 mV	5.20 mV
	1 V/div	7.08 mV	8.29 mV	9.70 mV	11.18 mV	12.05 mV
	2 V/div	13.78 mV	15.70 mV	18.04 mV	20.40 mV	22.39 mV
	5 V/div	34.20 mV	37.64 mV	42.92 mV	48.16 mV	52.09 mV
	10 V/div	68.50 mV	75.54 mV	85.48 mV	96.27 mV	104.25 mV

² 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 and D8 to D15) is displayed on the probe
Input impedance		$100 \text{ k}\Omega \pm 2\% \parallel \sim 4 \text{ pF}$ (meas.) at probe tips
Maximum input frequency	signal with minimum input voltage swing and hysteresis setting: "normal"	300 MHz (meas.)
Maximum input voltage		$\pm 40 \text{ V}$ (V_p); 32 V (RMS), derates to 7 V (RMS) with 20 dB/decade at frequencies above 25 MHz
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	$\pm 8 \text{ V}$ in 25 mV steps
	predefined	CMOS 5.0 V, CMOS 3.3 V, CMOS 2.5 V, TTL, ECL, PECL, LVPECL
Threshold accuracy	threshold level between $\pm 4 \text{ V}$	$\pm (100 \text{ mV} + 3\% \text{ of threshold setting})$
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	$\pm 20 \text{ ms}$
	between digital channels	$\pm 100 \text{ ns}$
Reference position		0 % to 100 % of measurement display area
Horizontal position range (trigger offset range)	max.	$+(\text{memory depth} / \text{current sampling rate})$
	min.	-5000 s
Modes		normal, roll
Channel-to-channel skew	between analog channels	$< 100 \text{ ps}$ (meas.)
	between digital channels	$< 500 \text{ ps}$ (meas.)
Timebase accuracy	after delivery/calibration, at $+23^\circ \text{C}$	$\pm 2.5 \text{ ppm}$
	during calibration interval	$\pm 3.5 \text{ ppm}$
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	$\pm (0.20 / \text{real-time sampling rate} + \text{timebase accuracy} \times \text{reading})$ (peak) (meas.)

Acquisition system

Sampling rate	analog channels (real time)	
	MXO 34	max. 5 Gsample/s on 2 channels, max. 2.5 Gsample/s on 4 channels
	MXO 38	max. 5 Gsample/s on 4 channels, max. 2.5 Gsample/s on 8 channels
	analog channels (interpolated)	max. 5 Tsample/s
Waveform acquisition rate	digital channels	max. 5 Gsample/s on each channel
Trigger rearm time	max.	$> 4\,500\,000$ waveforms/s
	min.	$< 21 \text{ ns}$

Memory depth ³	standard	125 Mpoints
	R&S®MXO34-B105 option	500 Mpoints with 4 active channels (single capture), 500 Mpoints with 2 active channels (run continuous)
	R&S®MXO38-B105 option	500 Mpoints with 8 active channels (single capture), 500 Mpoints with 4 active channels (run continuous)
Acquisition modes	sample	middle sample in decimation interval
	peak detect	largest and smallest sample in decimation interval
	average	average of acquired waveforms
	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 bit resolution of the waveform signal by using digital filtering, leading to reduced noise. Because of the digital trigger concept of the MXO 3, 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	MXO 34	max. 5 Gsample/s on 2 channels, max. 2.5 Gsample/s on 4 channels
	MXO 38	max. 5 Gsample/s on 4 channels, max. 2.5 Gsample/s on 8 channels

Trigger system

Trigger sources	analog channels (C1 to C4), digital channels (D0 to D15), external trigger input, line trigger, serial bus	
Trigger level range	±5 div from center of screen	
Trigger modes	auto, normal, single, n single	
Trigger sensitivity	0.0001 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 frequencies < 50 kHz
Trigger hysteresis	modes	auto (default setting) or manual
	adjustment resolution	0.0001 div, from DC to instrument bandwidth for all vertical scales
Holdoff range	time	100 ns to 10 s, fixed and random

³ 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.

Main trigger modes	
Edge	triggers on specified edge (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 a specified range 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 a specified range 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 a specified range; 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	
Zone trigger	triggers on user-defined zones drawn on the display source acquired waveforms (input channels), math waveforms (including power analysis waveforms), spectrum waveforms, XY plots number of zones/areas up to 4 zones with up to 8 areas each area shapes polygons with up to 16 points area types must intersect, must not intersect combination of zones logical combination of zones of multiple sources using Boolean expressions trigger compatibility requires sequence trigger A \triangleright zone trigger where primary A condition can be: edge, glitch, width, runt, window, timeout, interval, slew rate, setup & hold, state, pattern
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 ≤ 100 MHz	300 mV (V _{pp}) (meas.)
	input frequency > 100 MHz and ≤ 500 MHz	500 mV (V _{pp}) (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 output	functionality	A pulse is generated for each event triggering signal acquisition.
	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 to channel 4, math waveforms, reference waveforms
	setup parameters	center frequency, frequency span, resolution bandwidth (automatic or manual), gate position, gate width, vertical scaling, vertical position
	scaling	dBm, dBV, dB μ V, V (RMS)
	span	1 Hz to 1.2 GHz ⁴
	resolution bandwidth (RBW)	span/4 ≥ RBW ≥ span/6000
	windows	flat top, Hanning, Hamming, Blackman, rectangular, Kaiser Bessel, Gaussian
	trace types	normal, max. hold, min. hold, average
Gate	max. real-time waveform acquisition rate	
	delimits the display region used for spectrum analysis	
Peak list	The values in the peak list are also shown in the diagram to allow easy correlation.	

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)	-157 dBm (1 Hz) (meas.)
Noise figure	at 1 GHz (calculated based on the noise power density above)	16 dB (meas.)
Dynamic range	measured for a 1 GHz input carrier with level -3 dBm at input of oscilloscope, using spectrum analysis with center frequency 1 GHz, span 2 MHz, RBW 400 Hz at +20 MHz from center frequency	106 dB (meas.)
Absolute amplitude accuracy	0 Hz to 800 MHz	±1 dB (meas.)

⁴ The stop frequency depends on the analog bandwidth of the instrument.

Spurious-free dynamic range (excluding harmonics)	measured for a 250 MHz input carrier and level -3 dBm at input sensitivity 50 mV/div, using spectrum analysis with center frequency 600 MHz, span 1.2 GHz, RBW 300 kHz	65 dBc (meas.)
Second harmonic distortion	measured for a 250 MHz input carrier and level -3 dBm at input sensitivity 50 mV/div, using spectrum analysis with center frequency 600 MHz, span 1.2 GHz, RBW 300 kHz	-59 dBc (meas.)
Third harmonic distortion	measured for a 250 MHz input carrier and level -3 dBm at input sensitivity 50 mV/div, using spectrum analysis with center frequency 600 MHz, span 1.2 GHz, RBW 300 kHz	-60 dBc (meas.)

Waveform measurements

Automatic measurements	measurements on acquired waveforms (input 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
	track	measurement results displayed as continuous trace that is time-correlated to the measurement source
	number of active measurements	16
	result line annotation	
Cursor measurements	available cursors	up to two cursor sets on screen, each set with two horizontal and two vertical cursors
	target waveforms	acquired waveforms (input channels), math waveforms, reference waveforms, XY diagrams
	operating modes	vertical measurements, horizontal measurements, or both; vertical cursors either set manually or locked to waveform
	source mode	single source, use second source, multiple sources (multichannel cursor)
	multiple sources mode selection	acquired waveforms (input channels), math waveforms, reference waveforms
Waveform histogram	number of diagrams	up to 8
	sources	acquired waveforms (input channels), math waveforms, reference waveforms
	mode	vertical, horizontal
	windowing	user-defined

Waveform math

General features	number of math equations	up to 8
	number of reference waveforms	up to 8
	sources	channel 1, channel 2, channel 3, channel 4, channel 5, channel 6, channel 7, channel 8, math waveforms 1 to 8, reference waveforms 1 to 8
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

Digital voltmeter

Accuracy	related to channel settings of voltmeter source
Measurements	DC, DC RMS, AC RMS
Sources	C1, C2, C3, C4, C5, C6, C7, C8
Number of measurements	up to 4
Resolution	up to 6 digits
Bandwidth	up to 20 MHz

Display characteristics

Diagram types	Yt, XY, zoom, spectrum
Display configuration (waveform layout)	The display area can be split into separate diagram areas by dragging and dropping signal icons. Each diagram area can hold any number of signals. Diagrams can be stacked on top of each other and later accessed via dynamic tabs (Tab 1, etc.).
Signal icons	Each active waveform is represented by a 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 set the most common parameters directly 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 bar	display trigger, horizontal and acquisition system settings; allows quick access to these settings
Main menu	provides access to all instrument settings in a compact menu structure
Axis label	The x-axis and y-axis are labeled with values and physical unit.
Diagram label	Diagrams can be individually labeled with a descriptive, user-defined name.
Diagram layout	The grid, crosshair, axis labeling and diagram labeling can be switched on and off separately.
Persistence	50 ms to 50 s, or infinite
Zoom	vertical and horizontal; touch interface simplifies resize and drag operations on zoom window
Signal colors (waveform coding)	predefined or user-defined color tables for persistence display

History and segmented memory

Acquisition memory	automatic	automatic setting of segment size and sample rate	
	manual	user-defined setting of segment size and sample rate	
Memory segmentation	function	memory segments for the acquisition	
	number of segments	record length	segments ⁵ (up to)
		1 kpoint	1 048 575
		2 kpoints	524 287
		5 kpoints	262 143
		10 kpoints	131 071
		20 kpoints	65 535
		50 kpoints	32 767
		100 kpoints	16 383
		200 kpoints	9 361
		500 kpoints	4 095
		1 Mpoint	2 113
		2 Mpoints	1 056
		5 Mpoints	427
		10 Mpoints	213
		20 Mpoints	106
		50 Mpoints	41
		100 Mpoints	20
		200 Mpoints	9
		400 Mpoints	4
		500 Mpoints	3
	Segmentation is available 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	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	

Mask testing

Test definition	number of masks	up to 8 simultaneously
	source	acquired waveforms (input channels), math waveforms, reference waveforms, spectrum waveforms, XY plots
	fail condition	waveform hit
	test rate	up to 4 million waveforms/s
	action on error	acquisition stop, beep, save waveform, pulse on trigger out
Mask definition with segments	number of segments per mask test	up to 8
	segment definition	array of at least 3 points defines an inner region
Result statistics	category	total completed acquisition, failed acquisition, passed acquisition, fail rate, overall test result (pass/fail)
Visualization options	waveform style	vectors, dots
	mask colors	predefined colors for mask without violation (translucent gray), mask with violation (translucent red)

⁵ With R&S®MXO3-B105 memory option. The maximum number of segments depends on the number of active channels and the bit resolution of the acquired data and, therefore, on the acquisition system settings such as decimation mode, use of waveform arithmetics or high definition (HD) mode. The maximum number of segments without R&S®MXO3-B105 memory option is limited to 10 000.

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
Digital channel inputs	D15 to D8, D7 to D0	interface for R&S®RT-ZL03X logic probe
	signal shape	rectangle, $V_{\text{low}} = 0 \text{ V}$, $V_{\text{high}} = 3.3 \text{ V}$
	frequency	amplitude 3.3 V (V_{pp}) $\pm 5 \%$ (meas.) $1 \text{ kHz} \pm 1 \%$ (meas.)
Demo P1	analog signal output for demo apps	$V_p \leq \pm 5 \text{ V}$ (meas.)
Demo P2	digital signal output demo apps	$V_p \leq 3.3 \text{ V}$ (meas.)
USB interface		2 x USB 3.1 Gen 1 ports, type A plug

Rear		
Trigger input		BNC; for details, see Trigger system
Trigger out		BNC; for details, see Trigger system
Waveform generator output (requires R&S®MXO3-B6 option)		BNC; for details, see R&S®MXO3-B6 option
USB interface		1 x USB 3.1 Gen 1 port, type B plug
LAN interface		RJ-45 connector, supports 10/100/1000BASE-T, LXI compliant
External monitor interface		HDMI, 1920 x 1080 pixel at 60 Hz, output of oscilloscope display
Security slot		for standard Kensington style lock
VESA mount		VESA compatibility mounting interface, 100 mm x 100 mm pattern size

Right side		
Ground jack		connected to ground

General data

Display	type	11.6" LC TFT color display with capacitive touchscreen
	resolution	1920 × 1080 pixel (Full HD)

Temperature		
Temperature range	operating temperature range	0 °C to +45 °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 resistance	damp heat	+25 °C/+45 °C at 95 % 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	8 Hz to 500 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 emissions		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 ⁶

Certifications		
EU legislation	EU: in line with Data Act – Regulation (EU) 2023/2854	VDE, cCSA _{US} , KC for details, see user documentation

Calibration interval	1 year
----------------------	--------

⁶ 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 \pm 10 % at 50 Hz to 60 Hz and 400 Hz \pm 5 %, max. 2.8 A to 1.8 A, in line with MIL-PRF 28800F, section 3.5
Power consumption	maximum	280 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 \times H \times D	375 mm \times 233 mm \times 163 mm (14.76 in \times 9.17 in \times 6.42 in)
Weight	without options, nominal	4.0 kg (8.82 lb)
Rackmount height	with R&S®ZZA-MXO3 rackmount kit	5 HU

Options

R&S®MXO3-B1 mixed signal option

Mixed signal capability is a standard functionality of the MXO 3 series oscilloscopes. The R&S®MXO3-B1 mixed signal option provides 16 digital channels with two R&S®RT-ZL03X probes.

R&S®MXO3-B6 arbitrary waveform generator

Arbitrary function/waveform generator, 1 analog channel

General		
Output channel		1 channel
Vertical resolution		14 bit
Operating modes		function generator, arbitrary waveform generator, modulation, frequency sweep

Function generator	output of predefined waveforms	
Sample rate		312.5 Msample/s
Waveforms	sine, square/pulse, ramp, DC, noise, sine cardinal (sinc), Gaussian pulse, Lorentz, exponential fall, exponential rise, cardiac	
Sine	<p>frequency range</p> <p>amplitude flatness (relative to 1 kHz)</p> <p>total harmonic distortion (into 50 Ω)</p> <p>$f \leq 10 \text{ MHz}$</p> <p>$f > 10 \text{ MHz}$</p> <p>nonharmonic spurious</p>	<p>1 mHz to 50 MHz</p> <p>$\leq \pm 1.5 \text{ dB}$ (meas.)</p> <p>$\leq -60 \text{ dBc}$ (meas.)</p> <p>$\leq -40 \text{ dBc}$ (meas.)</p> <p>-65 dBc (meas.)</p>
Square/pulse	<p>frequency range</p> <p>duty cycle (if pulse width limit is not exceeded)</p> <p>pulse width</p> <p>rise/fall time</p> <p>overshoot</p> <p>jitter (cycle-to-cycle) ($\geq 0.2 \text{ V (V}_{\text{pp}}\text{)}$)</p>	<p>1 mHz to 20 MHz</p> <p>0.01 % to 99.99 %, 0.01 % resolution</p> <p>$\geq 16.5 \text{ ns}$, 0.1 ns resolution</p> <p>10 ns (meas.)</p> <p>$\leq 2 \%$ (meas.)</p> <p>$\leq 40 \text{ ps (RMS)}$ (meas.)</p>
Ramp (triangle, sawtooth)	<p>frequency range</p> <p>variable symmetry</p>	<p>1 mHz to 1 MHz</p> <p>0 % to 100 %, 0.1 % resolution</p>
DC	<p>level range</p> <p>into 50 Ω</p> <p>into open circuit</p> <p>resolution</p>	<p>$\pm 2.5 \text{ V}$</p> <p>$\pm 5 \text{ V}$</p> <p>1 mV</p>
Noise	<p>amplitude</p> <p>DC</p> <p>all other waveforms</p> <p>bandwidth</p>	<p>0 V to 5 V (V_{pp}) (into 50 Ω), 0 V to 10 V (V_{pp}) (into open circuit), 1 mV resolution</p> <p>0 % to 100 % of AC signal amplitude, 1 % resolution</p> <p>$\geq 50 \text{ MHz}$</p>
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 32 ksample
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 50 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 50 MHz
	direction	up (start frequency < stop frequency) down (start frequency > stop frequency)
	sweep time	1 ms to 500 s

Outputs	Connectors	BNC; on the front of the instrument															
	Function	on/off, inverted															
	Output impedance	nom. 50 Ω															
	Overload protection	<p>$V_{pp} > 200$ mV into open circuit</p> <p>a short-circuit to ground is tolerated indefinitely, automatic shutoff in case of voltages $\geq +12$ V or ≤ -12 V (meas.)</p>															
		<p>$V_{pp} \leq 200$ mV into open circuit</p> <p>a short-circuit to ground is tolerated indefinitely, automatic shutoff in case of voltages $\geq +4$ V or ≤ -4 V (meas.)</p>															
	Amplitude range ⁷	<p>sine, square/pulse, ramp, exponential rise/fall, arbitrary waveforms, sine cardinal (sinc), Gaussian, Lorentz, cardiac</p> <table> <tr> <td>into 50 Ω</td> <td>5 mV to 5 V (V_{pp})</td> </tr> <tr> <td>into open circuit</td> <td>10 mV to 10 V (V_{pp})</td> </tr> <tr> <td>resolution</td> <td>1 mV</td> </tr> <tr> <td>accuracy</td> <td>±1 % at 1 kHz</td> </tr> </table>	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							
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	<p>sine, square/pulse, ramp, exponential rise/fall, arbitrary waveforms</p> <table> <tr> <td>into 50 Ω</td> <td>±2.5 V ($V_{pp} > 100$ mV), ±0.25 V ($V_{pp} \leq 100$ mV)</td> </tr> <tr> <td>into open circuit</td> <td>±5.0 V ($V_{pp} > 200$ mV), ±0.5 V ($V_{pp} \leq 200$ mV)</td> </tr> </table> <p>sine cardinal (sinc): DC offset range is signal amplitude dependent</p> <table> <tr> <td>into 50 Ω</td> <td>-2.823 V to +2.177 V ($V_{pp} = 1$ V)</td> </tr> <tr> <td>into open circuit</td> <td>-5.323 V to +4.677 V ($V_{pp} = 1$ V)</td> </tr> </table> <p>Gaussian, Lorentz: DC offset range is signal amplitude dependent</p> <table> <tr> <td>into 50 Ω</td> <td>-3.000 V to +2.000 V ($V_{pp} = 1$ V)</td> </tr> <tr> <td>into open circuit</td> <td>-5.500 V to +4.500 V ($V_{pp} = 1$ V)</td> </tr> </table> <p>cardiac: DC offset range is signal amplitude dependent</p> <table> <tr> <td>into 50 Ω</td> <td>-2.814 V to +2.186 V ($V_{pp} = 1$ V)</td> </tr> <tr> <td>into open circuit</td> <td>-5.314 V to +4.686 V ($V_{pp} = 1$ V)</td> </tr> </table>	into 50 Ω	±2.5 V ($V_{pp} > 100$ mV), ±0.25 V ($V_{pp} \leq 100$ mV)	into open circuit	±5.0 V ($V_{pp} > 200$ mV), ±0.5 V ($V_{pp} \leq 200$ mV)	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)	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)	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)
into 50 Ω	±2.5 V ($V_{pp} > 100$ mV), ±0.25 V ($V_{pp} \leq 100$ mV)																
into open circuit	±5.0 V ($V_{pp} > 200$ mV), ±0.5 V ($V_{pp} \leq 200$ mV)																
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)																
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)																
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		$ \Delta f \leq [(\text{timebase accuracy}) \times (\text{nominal frequency}) + 1.1 \mu\text{Hz}] (\text{calc.})$ (timebase accuracy, see Horizontal system)															

⁷ Amplitude is the sum of the AC amplitude and the noise amplitude.

R&S®MXO3-B105 memory upgrade option

Extension of memory depth and memory segments		
Memory depths	MXO 34	500 Mpoints with 4 active channels (single capture), 500 Mpoints with 2 active channels (run continuous)
	MXO 38	500 Mpoints with 8 active channels (single capture), 500 Mpoints with 4 active channels (run continuous)
Memory segmentation	maximum number of segments	1 048 575 segments

R&S®MXO3-K12 basic jitter analysis

General description	The R&S®MXO3-K12 basic jitter analysis option extends the functionality of the standard MXO 3 firmware with a suite of measurement, analysis and visualization tools for signal integrity analysis and jitter characterization.	
Waveform measurements	category	jitter
	measurements on acquired waveforms (input channels), math waveforms, reference waveforms	cycle-to-cycle jitter, N-cycle jitter, cycle-to-cycle width, cycle-to-cycle duty cycle, time-interval error, data rate, unit interval, skew delay, skew phase
	gate	delimits the display region evaluated for measurements
	reference levels	user-configurable vertical levels define support structures for measurements
	statistics	displays maximum, minimum, mean, standard deviation and measurement count for each measurement
	track	measurement results displayed as continuous trace that is time-correlated to the measurement source

R&S®MXO3-K31 power analysis

Power analysis		
General description	The R&S®MXO3-K31 power analysis option extends the MXO 3 firmware with measurement functionality focused on switched mode power supplies (SMPS) and DC/DC converters. Up to three sets of power analysis measurements are possible.	
Input	quality	evaluation of power quality at an AC input; measures real power, apparent power, reactive power, power factor and phase angle of power, frequency, crest factor, RMS of voltage and current
	harmonics	measures up to the 334th harmonic of the incoming line frequency; precompliance checking for IEC 61000-3-2 (A, B, C, D), RTCA DO-160, MIL-STD-1399, max. limit checks
Power path	switching loss	measures switching loss and conduction loss of a power device
	turn on/off time	measures relationship between input AC/DC and output DC voltage, when turning SMPS off and on
	efficiency	measures input power and output power to calculate the efficiency of a power device
	safe operating area (SOA)	checks violation of voltage and current limits in which a power device can operate without damage; current versus voltage view; violation mask is user-defined; up to 4 masks; save/load of masks; export of mask violation data
Deskew	automated	automated compensation of the propagation delay
Zero offset	automated	automatic compensation of input offset

R&S®MXO3-K36 frequency response analysis

Frequency response analysis (requires R&S®MXO3-B6 option)		
Stimulus	frequency mode	single sweep, repeated sweep and single frequency
	frequency range	10 mHz to 50 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, channel 5, channel 6, channel 7, channel 8
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
References	number of reference waveforms	up to 4

R&S®MXO3-K500 bus analysis

Protocol measurements (require corresponding R&S®MXO3-K510 to R&S®MXO3-K560 protocol options)		
Frame to frame	measures the distance between the starts of two selectable frame types in seconds	<ul style="list-style-type: none"> from: frame type, field type, field value to: frame type, field type field value
Trigger to frame	measures the distance between the trigger event and the start of a selectable frame type in seconds	frame identification; frame type, field type, field value
Frame to trigger	measures the distance between the start of a selectable frame type and the trigger event	frame identification; frame type, field type, field value
Field value	allows for the selection of frame types and displays the value of a specified field	frame identification; frame type, field type, field value tracked; field type
Main bit rate	measures the main bit rate of a protocol based on the relevant bits in a frame; if a protocol provides multiple bit rates, the most relevant bit rate is being measured	frame identification; frame type, field type, field value
Second bit rate	for protocols with multiple bit rates, the secondary bit rate is available	only available for protocols with 2 bit rates frame identification; frame type, field type, field value
Bus idle	measures the percentage of idle time on a bus; idle time is defined as the time where the bus is not occupied by frames	no settings
Gap	measures the distance between the end of a frame to the start of another	no settings
Frame count	counts the total number of frames in each acquisition	no settings
Frame errors	counts the total number of erroneous frames in each acquisition	no settings
Frame error rate	measures the percentage of erroneous frames in relation to the total frames	no settings
Consecutive frame error rate	measures the percentage of follow up (consecutive) frame errors, ignoring all single frame errors	no settings

R&S®MXO3-K510 low speed serial buses

I ² C triggering and decoding		
Protocol configuration	bit rate	auto detected
Trigger (hardware based)	source (clock and data)	any analog 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
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	frame type	write, read, 10 bit write, 10 bit read
	write	address; conditions =, ≠, <, ≤, >, ≥, in range, out of range; ACK-A; value 0, 1 data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; data index: selects the specific data word; conditions =, in range; ACK-D word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; ACK-D index: selects the specific data word; conditions =, in range
	read	address; conditions =, ≠, <, ≤, >, ≥, in range, out of range; ACK-A; value 0, 1 data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; data index: selects the specific data word; conditions =, in range; ACK-D word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; ACK-D index: selects the specific data word; conditions =, in range
	10 bit write	address; conditions =, ≠, <, ≤, >, ≥, in range, out of range; ACK-A, ACK-A2; value 0, 1 for each of these options; data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; data index: selects the specific data word; conditions =, in range; ACK-D word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; ACK-D index: selects the specific data word; conditions =, in range

	10 bit read	address; conditions =, ≠, <, ≤, >, ≥, in range, out of range; ACK-A; value 0, 1 data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; data index: selects the specific data word; conditions =, in range; ACK-D word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; ACK-D index: selects the specific data word; conditions =, in range
	error condition	no stop bit, 10 bit read address different, unknown
Decode	source (clock and data)	any analog or logical input channel; math or reference waveform
	display type	decoded bus, tabulated list
	color coding	frame, start/restart, address (read/write), data, ACK/NACK, stop, error
	data format	hex, decimal, octal, binary, ASCII
	result export	export of all result data into CSV, XML, HTML and Py file formats
	filter	filter result table on frame types, field values, status
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

SPI triggering and 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 (hardware based)	source (MOSI, MISO, CS, CLK)	any analog 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 bit to 4095 bit
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	frame type	MISO, MOSI, MISOMOSI
	MISO	data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; data index: selects the specific data word; conditions =, in range
	MOSI	data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; data index: selects the specific data word; conditions =, in range
	MISOMOSI	data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; data index: selects the specific data word; conditions =, in range
	error condition	void, length

Decode	source (MOSI, MISO, CS, CLK)	any analog or logical input channel; math or reference waveform
	display type	decoded bus, tabulated list
	color coding	frame, word, error
	data format	hex, decimal, octal, binary, ASCII
	filter	filter result table on frame types, field values, status
	result export	export of all result data into CSV, XML, HTML and Py file formats
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

QUAD-SPI triggering and decoding		
Protocol configuration	source (CS, SCLK, IO0 to IO3)	any analog or logical input channel; math or reference waveform
	bit rate	auto detected
	polarity (SCLK)	rising, falling
	polarity (CS, IO0 to IO3)	active high, active low
	instruction mode	single, dual, quad
	opcode	configurable list for opcode translation opcode list can be saved and loaded
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	frame type	data
	data	
	error condition	length, opcode
Decode	display type	decoded bus, tabulated list
	color coding	frame, word, error
	data format	hex, decimal, octal, binary, ASCII
	filter	filter result table on frame types, field values, status
	result export	export of all result data into CSV, XML, HTML and Py file formats
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

UART/RS-232/RS-422/RS-485 triggering and 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 (hardware based)	source (TX and RX)	any analog 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 word to 4095 words
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	frame type	TX, RX
	TX	data; conditions =, ≠, <, ≤, >, ≥, in range, out of range
	RX	data; conditions =, ≠, <, ≤, >, ≥, in range, out of range
	error condition	start, stop, parity, break
Decode	source (TX and RX)	any analog or logical input channel; math or reference waveform
	display type	decoded bus, tabulated list
	color coding	packet, data payload, start error, parity error, stop error
	data format	hex, decimal, octal, binary, ASCII
	filter	filter result table on frame types, field values, status
	result export	export of all result data into CSV, XML, HTML and Py file formats
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

Clocked NRZ (NRZC) triggering and decoding		
Protocol configuration	signal type	up to 3 selectable channels: data, clock and optional enable (CS); differential or single-ended
	min. gap time	optional (off by default); range 1 ns to 1 s; indicates min idle time for gap detection and frame separation
	auto threshold setup	assisted threshold configuration
	source	any analog or logical input channel; math or reference waveform
	properties	active data state (high/low), clock edge (rising/falling/both), enable state (high/low)
	frame separation	gap or enable (CS) signal
	frame	multiple frame management, frame identification and sync, variable length frames, variable number of cells
Frame format	cells	name, size (bit count), condition, numeric format, bit order, RGB color, result column
	file storage of frame format	save/load as xml files

Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	variants	all supported bit encodings
	trigger event setup	frame start
		pattern
		advanced trigger
	frame start	gap, start bit
	advanced trigger	frame type (with OR combinations), frame fields (with AND combinations), frame field data; conditions =, ≠, <, ≤, >, ≥, in range, out of range for data count, word count, data value; error types
	display type	decoded bus, logical signal, bus signal, tabulated list, result details, decode layers
	color coding	according to cell configuration table
	data format	according to cell configuration table
Decode	decode layer	edges, binary
	result export	export of all result data into CSV, XML, HTML and Py file formats
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

Unclocked NRZ (NRZU) triggering and decoding		
Protocol configuration	signal type	up to 2 selectable channels: data and optional enable (CS); differential or single-ended
	min gap time	optional (off by default); range 1 ns to 1 s; indicates min idle time for gap detection and frame separation
	bit rate	optional (off by default); if not provided, it will be automatically calculated
	auto threshold setup	assisted threshold configuration
	source	any analog or logical input channel; math or reference waveform
	properties	active data state (high/low), enable state (high/low)
	frame separation	gap or enable (CS) signal
Frame format	frame	multiple frame management, frame identification and sync, variable length frames, variable number of cells
	cells	name, size (bit count), condition, numeric format, bit order, RGB color, result column
	file storage of frame format	save/load as xml files
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	variants	all supported bit encodings
	trigger event setup	frame start
		pattern
		advanced trigger
	frame start	gap, start bit
	advanced trigger	frame type (with OR combinations), frame fields (with AND combinations), frame field data; conditions =, ≠, <, ≤, >, ≥, in range, out of range for data count, word count, data value; error types
Decode	display type	decoded bus, logical signal, bus signal, tabulated list, result details, decode layers
	color coding	according to cell configuration table
	data format	according to cell configuration table
	decode layer	edges, binary
	result export	export of all result data into CSV, XML, HTML and Py file formats

Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

Manchester triggering and decoding		
Protocol configuration	signal type	up to 2 selectable channels: data and optional enable (CS); differential or single-ended
	data phase	first/second edge
	min gap time	optional (off by default); range 1 ns to 1 s; indicates min idle time for gap detection and frame separation
	bit rate	optional (off by default); if not provided, it will be automatically calculated
	source	any analog or logical input channel; math or reference waveform
	properties	active data state (high/low), enable state (high/low)
	frame separation	gap or enable (CS) signal
Frame format	frame	multiple frame management, frame identification and sync, variable length frames, variable number of cells
	cells	name, size (bit count), condition, numeric format, bit order, RGB color, result column
	file storage of frame format	save/load as xml files
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	variants	all supported bit encodings
	trigger event setup	frame start pattern advanced trigger
	frame start	gap, start bit
	advanced trigger	frame type (with OR combinations), frame fields (with AND combinations), frame field data; conditions =, ≠, <, ≤, >, ≥, in range, out of range for data count, word count, data value; error types
Decode	display type	decoded bus, tabulated list, result details, decode layers
	color coding	according to cell configuration table
	data format	according to cell configuration table
	decode layer	edges, binary
	result export	export of all result data into CSV, XML, HTML and Py file formats
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

R&S®MXO3-K520 automotive protocols

CAN FD/CAN XL decoding		
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	30 % to 90 % 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, error condition (any combination of CRC error, bit stuffing error, form error and ACK error)
	identifier setup	identifier type (standard or extended); condition =, ≠, ≥, ≤, in range, out of range
	FD bits	BRS and ESI (0, 1, X)
	XL setup	SDT, VCID, AF; condition =, ≠, ≥, ≤, in range, out of range
	data setup	data pattern up to 8 byte (hex, decimal, octal, binary or ASCII); condition =, ≠
Decode	source	any analog or logical input channel; math or reference waveform
	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
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

LIN decoding		
Protocol configuration	version	1.3, 2.x or SAE J602; mixed traffic is supported
	bit rate	1 kbps to 20 Mbps
Trigger	source	any analog or logical input channel; math or reference waveform
	trigger event setup	start of frame (sync break), identifier, identifier + data, wake-up frame, error condition (any combination of checksum error, parity error and sync field error)
	identifier setup	range from 0d to 63d; condition =, ≠, ≥, ≤, in range, out of range
	data setup	data pattern up to 8 byte (hex, decimal, octal, binary or ASCII); condition =, ≠
Decode	source	any input channel, logical channel
	display type	decoded bus, tabulated list
	color coding	frame, frame identifier, data payload, checksum, error condition
	data format	hex, decimal, octal, binary, ASCII
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

SENT triggering and decoding		
Protocol configuration	signal type	data signal
	clock period (clock tick)	1 μ s to 100 μ s
	clock tolerance	0 % to 25 %
	data nibbles	1 to 6
	serial message type	none, short serial message and enhanced serial message
	CRC version	Legacy (Feb 2008) and v2010 (Latest)
	CRC calculation	SAE J2716 standard and TLE 4998X
	pause pulse	no, yes, for constant frame length
	frame length in clock ticks (applicable only when pause pulse = constant frame length)	104 to 922
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	trigger event setup	calibration or sync, transmission sequence, serial message and error condition
	transmission sequence status nibble setup	from 0 to F, condition =, ≠, ≥, ≤, in range, out of range
	transmission sequence data nibbles setup	each nibble value from 0 to F, condition =, ≠, ≥, ≤, in range, out of range
	serial message identifier setup	from 00 to FF, condition =, ≠, ≥, ≤, in range, out of range
	serial message identifier type setup (applicable only when the serial protocol = enhanced serial message in protocol configuration)	4 bit and 8 bit
	serial message data setup	00 to FF (short serial message) 000 to FFF (enhanced serial message with 8 bit ID) 0000 to FFFF (enhanced serial message with 4 bit ID)
	error condition setup	form error, calibration pulse error, pulse period error, CRC error and irregular frame length error
Decode	source	any analog or logical input channel; math or reference waveform
	display type	decoded bus, tabulated list
	color coding	transmission sequence: sync/calibration, status, data bits, CRC, pause pulse (optional), calibration pulse error, pulse period error, irregular frame length error and CRC error; serial message: identifier, data, CRC, form error, CRC error
	data format	hex, decimal, octal, binary, ASCII
	result export	export of all result data into CSV, XML, HTML and Py file formats
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

R&S®MXO3-K530 aerospace protocols

ARINC 429 decoding		
Protocol configuration	bit rate	high (100 kbps), low (12.0 kbps to 14.5 kbps)
	signal polarity	A leg, B leg
	min. gap	0 to 100 bit, off
	max. gap	0 to 1000 bit, off
Decode	source	any analog channel, math or reference waveform
	display type	decoded bus, tabulated list, decode layers for different cell types
	color coding	hex, decimal, octal, binary, ASCII
	data format	off, ternary symbols, bits, words
	decode layer	filter result table on frame types, field values, status
	filter	export of all result data into CSV, XML, HTML and Py file formats
	result export	
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

MIL-STD-1553 triggering and decoding		
Protocol configuration	signal type	single-ended
	bit rate	standard bit rate (1 Mbit/s)
	polarity	normal, inverted
	device list	associate frame identifier with symbolic ID
	auto threshold setup	assisted threshold configuration
	timing	min. gap (2 µs to 262 µs) or off; max. response (2 µs to 262 µs) or off
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	frame type	command, status, cmd/status, data
	command	RTA, Info; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; P value 0, 1
	status	RTA, Info; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; P value 0, 1
	cmd/Status	RTA, Info; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; P value 0, 1
	data	data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; data index: selects the specific data word; conditions =, in range; P value 0, 1
	error condition	sync, Manchester coding, parity, gap, response timeout
Decode	source	any analog channel, math or reference waveform
	display type	decoded bus, logical signal, bus + logical signal, tabulated list
	color coding	frame (word), sync, RTA, status bit field, parity, data field, error condition
	data format	hex, octal, binary, ASCII, signed, unsigned
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

SpaceWire triggering and decoding		
Protocol configuration	signal type	two channels: strobe and data (differential or single-ended)
	bit rate	auto adjust (strobe + data)
	auto threshold setup	assisted threshold configuration
	timing	min. gap (1 ns to 1 s)
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	frame type	data, time, FCT, null, EOP, EEP, bad esc
	data	conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options
	time	conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options
	bad esc	conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; P value 0, 1
	error condition	parity error, length error
Decode	source	any analog channel, math or reference waveform
	display type	decoded bus, logical signal, bus + logical signal, tabulated list, decode layers
	color coding	control frame, data frame, null frame, time code
	data format	hex, octal, binary, ASCII, signed, unsigned
	result export	export of all result data into CSV, XML, HTML and Py file formats
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

R&S®MXO3-K550 MIPI low speed protocols

SPMI triggering and decoding		
Protocol configuration	bit rate	auto detected
	supported version	2.0
	GSID	selectable in range 0 to 15
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	frame type	register 0 write, register write, register read, extended register write, extended register read, extended register write long, extended register read long, main write, main read
	register 0 write setup	sub address, data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; ack
	register write/read	sub address, register address, data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; ack (write only)
	extended register write/read	sub address, byte count, register address, data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; data index: selects the specific data word; conditions =, in range; ack (write only)
	extended register write long/read long	sub address, byte count, register address, register address 2, data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; data index: selects the specific data word; conditions =, ≠, <, ≤, >, ≥, in range; ack (write only)

	main write/read	main address, register address, data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; frame byte; conditions =, ≠, <, ≤, >, ≥, in range; ack (write only)
	error condition	no response, ack, bus park, parity, length, arbitration, SSC, command, coding
Decode	source (SCLK and SDATA)	any analog or logical input channel; math or reference waveform
	display type	decoded bus, tabulated list, details, decode layers
	color coding	arbitration sequence, command sequence, sequence start condition, device address, command, byte count, register address, data payload, parity bits, bus park cycle, ack, error
	data format	hex, decimal, octal, binary, ASCII
	decode layer	off, edges, bit
	filter	filter result table on frame types, field values, status
	result export	export of all result data into CSV, XML, HTML and Py file formats
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

RFFE triggering and decoding		
Protocol configuration	signal type	two channel, single-ended
	bit rate	auto detected
	source (SCLK, SDATA)	any analog or logical input channel; math or reference waveform
	supported versions	1.X, 2.0, 2.1 and 3.1
	read mode	standard or read mode
	glitch filter	configurable glitch filter
	gap detection	detect gaps between sequences
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	trigger event setup	sequence start, sequence stop, register 0 write, register write, register read, extended register write, extended register read, extended register write long, extended register read long, error condition types
	sequence start setup	4 bit sub device address; conditions =, ≠, <, ≤, >, ≥, in range, out of range
	sequence stop setup	4 bit sub device address; conditions =, ≠, <, ≤, >, ≥, in range, out of range
	register 0 write setup	4 bit sub device address, 7 bit data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options
	register write/read	4 bit sub device address, 5 bit register address, 8 bit data word; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options
	extended register write/read	4 bit sub device address; 8 bit address, byte count: 0 to 15 (inclusive), data pattern: 1 to 16 byte (hex or binary); conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; index: 1 to 16 selects the specific data frame byte; conditions =, ≠, <, ≤, >, ≥, in range

	extended register write long/read long	4 bit sub device address, 8 bit address, byte count: 0 to 7 (inclusive), data pattern: 0 to 8 byte (hex or binary); conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; index: 1 to 8 selects the specific data frame byte; conditions =, ≠, <, ≤, >, ≥, in range
	interrupt summary and notification	4 bit sub device address, bit count 0 to 32, notification and interrupt bits
	masked write	4 bit sub device address; 8 bit address, 8 bit mask, 8 bit data pattern; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; frame byte; conditions =, ≠, <, ≤, >, ≥, in range
	main device ownership handover	2 bit MID; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; frame byte; conditions =, ≠, <, ≤, >, ≥, in range
	main device write/read	2 bit MID, 8 bit address, 16 bit data pattern; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; frame byte; conditions =, ≠, <, ≤, >, ≥, in range
	main device context transfer write/read	2 bit MID, 8 bit byte count, 8 bit address, data pattern: 1 to 8 byte (hex or binary); conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; index: 1 to 256 selects the specific data frame byte; conditions =, ≠, <, ≤, >, ≥, in range
	error condition	SSC error; length error, bus park error, parity error, no response, unknown sequence, version error, min. gap between frames: 1 ns to 10 us
Decode	display type	decoded bus, logical signal, bus + logical signal, tabulated list, decode layers
	color coding	sequence, frame, error
	data format	hex, octal, binary, ASCII, signed, unsigned
	decode layer	off, edges, bit
	filter	filter result table on frame types, field values, status
	result export	export of all result data into CSV, XML, HTML and Py file formats
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

I ³ C triggering and decoding			
Protocol configuration	signal type	two channel, single-ended	
	bit rate	auto detected	
	source (SCL, SDA)	any analog or logical input channel; math or reference waveform	
	gap detection	detect gaps between sequences	
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate	
	frame type	I ³ C probe, read, write, CCC broadcast, CCC direct, HDR-DDR, HDR-ternary	
	I ³ C probe	reserved; conditions =, ≠, <, ≤, >, ≥, in range, out of range; R/W; value 0, 1 ACK; value 0, 1	
	read	address; conditions =, ≠, <, ≤, >, ≥, in range, out of range; R/W; value 0, 1 ACK-A; value 0, 1 data; conditions =, ≠, <, ≤, >, ≥, in range, out of range; data index: selects the specific data word; conditions =, in range	
	write	address; conditions =, ≠, <, ≤, >, ≥, in range, out of range; R/W; value 0, 1 ACK-A; value 0, 1 data; conditions =, ≠, <, ≤, >, ≥, in range, out of range for each of these options; data index: selects the specific data word; conditions =, in range	
	CCC broadcast	reserved; conditions =, ≠, <, ≤, >, ≥, in range, out of range; R/W; value 0, 1 ACK-A; value 0, 1 ccc; conditions =, ≠, <, ≤, >, ≥, in range, out of range; data; conditions =, ≠, <, ≤, >, ≥, in range, out of range; data index: selects the specific data word; conditions =, in range	
	CCC broadcast	reserved; conditions =, ≠, <, ≤, >, ≥, in range, out of range; R/W; value 0, 1 ACK-A; value 0, 1 ccc; conditions =, ≠, <, ≤, >, ≥, in range, out of range; data; conditions =, ≠, <, ≤, >, ≥, in range, out of range; data index: selects the specific data word; conditions =, in range	
	HDR-DDR	command; conditions =, ≠, <, ≤, >, ≥, in range, out of range; address; conditions =, ≠, <, ≤, >, ≥, in range, out of range; data; conditions =, ≠, <, ≤, >, ≥, in range, out of range; data index: selects the specific data word; conditions =, in range p; conditions =, ≠, <, ≤, >, ≥, in range, out of range; p index: selects the specific data word; conditions =, in range crc; conditions =, ≠, <, ≤, >, ≥, in range, out of range;	

	HDR-ternary	R/W; value 0, 1 command; conditions =, ≠, <, ≤, >, ≥, in range, out of range; address; conditions =, ≠, <, ≤, >, ≥, in range, out of range; data; conditions =, ≠, <, ≤, >, ≥, in range, out of range; data index: selects the specific data word; conditions =, in range p; conditions =, ≠, <, ≤, >, ≥, in range, out of range; p index: selects the specific data word; conditions =, in range
	error condition	ACK, parity, CRC, length, unknown
Decode	source (clock and data)	any input channel, logical channel
	display type	decoded bus, tabulated list
	color coding	frame, field types, status
	data format	hex, decimal, octal, binary, ASCII
	filter	filter result table on frame types, field values, status
	result export	export of all result data into CSV, XML, HTML and Py file formats
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

R&S®MXO3-K560 automotive Ethernet protocols

10BASE-T1S triggering and decoding		
Protocol configuration	source	any analog input channel, math or reference waveform
	threshold	upper/lower
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	frame type	MAC, COMMIT, BEACON or unknown
	MAC frame setup	destination address (condition =, ≠, <, >, ≥, ≤, in range, out of range), source address (condition =, ≠, <, >, ≥, ≤, in range, out of range), length/type (condition =, ≠, <, >, ≥, ≤, in range, out of range), data (condition =, ≠, <, >, ≥, ≤, in range, out of range), data index (condition =, in range)
	error condition setup	preamble, SFD, ESD, CRC
Decode	display type	decoded bus, tabulated list, details, decode layers
	color coding	for different cell types
	data format	hex, decimal, octal, binary, signed, unsigned, ASCII
	decode layer	reversed bits, descrambled bits, scrambled bits, ternary symbols
	filter	filter result table on frame types, field values, status
	result export	export of all result data into CSV, XML, HTML and Py file formats
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed in the table when the filter is turned on.	
	settings	same as trigger settings

R&S®MXO3-K570 USB protocols

USB 1.1/2.0 triggering and decoding		
Protocol configuration	signal type	single-ended, differential
	protocol type	low, full, high speed
	bit rate	standard bit rates (1.5/12/480 Mbit/s)

	source	any analog input channel; math or reference waveform
Trigger (software based)	primary event trigger (hardware based)	edge, glitch, width, runt, windows, timeout, interval, slew rate
	trigger event setup	start of packet; frame types: token (IN, OUT, SOF, SETUP), data (DATA0, DATA1, DATA2 ⁸ , MDATA ⁸), handshake (ACK, NAK, STALL, NYET ⁸), special (PRE/ERR, SPLIT ⁸ , PING ⁸ , Reserved ⁸); error conditions (PID error, CRC error, length error, bit-stuffing error, incomplete)
	frame detail setup (field conditions)	condition =, ≠, ≥, ≤, in range, out of range
	data setup	byte search (hex, decimal, octal, binary or ASCII), bit separately configurable (1, 0 or don't care); condition =, ≠; position-based or range-based triggering (first occurrence in packet payload)
	error condition	PID error, CRC error, bit-stuffing error, length error
Decode	source	any input channel, math waveform
	display type	decoded bus, logical signal, bus + logical signal, tabulated list
	color coding	packet identifier, payload length, frame, address, endpoint, data payload, CRC5, CRC16, error condition
	data format	hexadecimal, decimal, octal, binary, ASCII, unsigned
Filter	The filter function selects those decode events that shall be shown in the result table. Events that do not match the criteria set will not be displayed on the table when the filter is turned on.	same as trigger settings

⁸ Only available in USB2.0 (high speed).

Ordering information

Designation	Type	Order No.
Choose your base model		
Oscilloscope, 100 MHz, 4 channels		
Oscilloscope, 100 MHz, 8 channels	MXO 34	1335.2050.04
Base unit (including standard accessories: 500 MHz passive probe (10:1) per channel, accessories bag, quick start guide, power cord)	MXO 38	1335.2050.08
Choose your bandwidth upgrade		
Upgrade of MXO 34 to 200 MHz bandwidth	R&S®MXO3-B242	1335.2221.02
Upgrade of MXO 34 to 350 MHz bandwidth	R&S®MXO3-B243	1335.2244.02
Upgrade of MXO 34 to 500 MHz bandwidth	R&S®MXO3-B245	1335.2267.02
Upgrade of MXO 34 to 1 GHz bandwidth	R&S®MXO3-B2410	1335.2280.02
Upgrade of MXO 38 to 200 MHz bandwidth	R&S®MXO3-B282	1335.2815.02
Upgrade of MXO 38 to 350 MHz bandwidth	R&S®MXO3-B283	1335.2821.02
Upgrade of MXO 38 to 500 MHz bandwidth	R&S®MXO3-B285	1335.2838.02
Upgrade of MXO 38 to 1 GHz bandwidth	R&S®MXO3-B2810	1335.2844.02
Choose your options		
Mixed signal option for MXO 3 series with 16 digital channels	R&S®MXO3-B1	1335.2073.02
Arbitrary waveform generator, 50 MHz, 1 analog channel	R&S®MXO3-B6	1335.2850.02
Memory upgrade to 500 Mpoints	R&S®MXO3-B105	1335.3105.02
Basic jitter analysis	R&S®MXO3-K12	1335.3170.02
Power analysis	R&S®MXO3-K31	1335.2880.02
Frequency response analysis	R&S®MXO3-K36	1335.2896.02
Bus analysis	R&S®MXO3-K500	1335.2980.02
Low speed serial buses (I ² C/QuadSPI/SPI/UART/RS-232/RS-422/RS-485/NRZ clocked/ NRZ unclocked/Manchester)	R&S®MXO3-K510	1335.2867.02
Automotive protocols (CAN/CAN FD/LIN/SENT)	R&S®MXO3-K520	1335.2873.02
Aerospace protocols (ARINC 429/MIL-STD-1553/SpaceWire)	R&S®MXO3-K530	1335.2996.02
MIPi low speed protocols (SPMI/RFFE/I ² C)	R&S®MXO3-K550	1335.5214.02
Automotive Ethernet protocols (10BASE-T1S)	R&S®MXO3-K560	1335.5943.02
USB protocols (USB 1.1/2.0)	R&S®MXO3-K570	1335.3186.02
R&S®ScopeStudio Software	R&S®MXO-PC	1801.9005.02
R&S®ScopeStudio Protocol Decode Option	R&S®MXO-PC-K1	1804.8874.02
Application bundle, consists of the following options: R&S®MXO3-B6, R&S®MXO3-B105, R&S®MXO3-K31, R&S®MXO3-K36, R&S®MXO3-K510, R&S®MXO3-K520, R&S®MXO3-K530, R&S®MXO3-K550, R&S®MXO3-K560	R&S®MXO3-PK1	1335.2909.02
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-ZP05M	1335.3505.02
700 MHz, 14.9 MΩ, 25:1, 30 V, 4 pF, MMCX	R&S®RT-ZPMMCX	1803.1599.02
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, 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, 60 V DC, 42.4 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: passive		
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

Designation	Type	Order No.
High voltage probes: differential		
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	1409.7750.02
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	1409.7766.02
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	1409.7772.02
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 probe⁹		
300 MHz logic probe, 8 channels	R&S®RT-ZL03X	1335.3005.02
Probe accessories		
Accessory set for R&S®RT-ZP10/-ZP11 passive probe (2.5 mm probe tip)	R&S®RT-ZA1	1409.7566.02
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 for the logic probes	R&S®RT-ZA19	1335.7875.02
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-ZAP	1326.3641.02
Choose your accessories		
Front cover	R&S®MXO3-Z1	1335.1902.02
Soft case	R&S®MXO3-Z3	1335.1919.02
Transit case	R&S®MXO3-Z4	1335.1925.02
Rackmount kit, for MXO 3 oscilloscopes with 5 HU	R&S®ZZA-MXO3	1335.2715.02
VESA mount (compatible with standard 100 mm × 100 mm pattern)	Choose industry standard mounts	

⁹ The R&S®MXO3-B1 mixed signal option contains two R&S®RT-ZL03X logic probes.

Warranty and service

Warranty		
Base unit		3 years
All other items		1 year
Service options		
	Service plans	On demand
Calibration	up to five years ¹⁰	pay per calibration
Warranty and repair	up to five years ¹⁰	standard price repair
Contact your Rohde & Schwarz sales office for further details.		

The terms HDMI and HDMI High-Definition Multimedia Interface, and the HDMI Logo are trademarks or registered trademarks of HDMI Licensing, LLC in the United States and other countries.

¹⁰ For extended periods, contact your Rohde & Schwarz sales office.

Service at Rohde & Schwarz

You're in great hands

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

Rohde & Schwarz

The Rohde & Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test & measurement, technology systems and networks & cybersecurity. Founded more than 90 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and has an extensive sales and service network with locations in more than 70 countries.

www.rohde-schwarz.com

Sustainable product design

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

Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

More Rohde & Schwarz certificates



Rohde & Schwarz training

www.training.rohde-schwarz.com

Rohde & Schwarz customer support

www.rohde-schwarz.com/support



R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG

Trade names are trademarks of the owners

PD 3673.1382.22 | Version 05.00 | December 2025 (sk)

MXO 3 Series Oscilloscope

Data without tolerance limits is not binding | Subject to change

© 2025 Rohde & Schwarz | 81671 Munich, Germany