Datasheet

200/100MHz Mixed-domain Oscilloscope

Stock number :
180-4804 **RSMDO-2204EX**	180-4802 **RSMDO-2104EX**
180-4803 **RSMDO-2202EX**	180-4801 **RSMDO-2102EX**
180-4800 **RSMDO-2204EG**	180-4798 **RSMDO-2104EG**
180-4799 **RSMDO-2202EG**	180-4797 **RSMDO-2102EG**

CE USB high Speed PC Software Labview Driver Ethernet PictBridge Compatible

FEATURES

- 200/100 Bandwidth Selections: 2 or 4 Channels
- Real Time Sample Rate Per Channel: 1GSa/s (2 Channel Models); Maximum Real Time Sample Rate: 1 GSa/s (4 Channel Models)
- RSMDO-2000EG Equips with a Spectrum Analyzer and a Dual Channel 25MHz AWG
- RSMDO-2000EX Equips with a Spectrum Analyzer ; a Dual Channel 25MHz AWG; DMM and Power Supply
- Per Channel 10M Memory Depth and VPO Waveform Display Technology
- Waveform Update Rate up to 120,000 wfm/s
- 8 " WVGA TFT LCD
- Free Frequency Response Analyzer Software
- Maximum 1M FFT Provides Higher Frequency Domain Resolution Measurements
- High Pass, Low Pass and Band Pass Filter Functions
- 29,000 Segmented Memory Sections and Waveform Search Functions
- I^{2}C/SPI/UART/CAN/LIN Serial Bus Trigger and Decoding Functions
- Data Log Function is Able to Track Signal Changes up to 1000 Hours
- Mask Test Function & Network Storage Function

One Oscilloscope ,Two Domains

RSMDO-2000E series is multi-functional mixed domain oscilloscope. The series includes two feature combinations : RSMDO-2000EG and RSMDO-2000EX. MDO-2000EG models have a built-in spectrum analyzer and a dual channel 25MHz arbitrary waveform generator and RSMDO-2000EX models feature a built-in a spectrum analyzer, arbitrary waveform generator, a 5,000 count DMM, and a 5V/1A power supply. The first of its kind, RSMDO-2000EX is the only oscilloscope to equip with a DMM and a power supply in the T&M industry.

While entering the spectrum mode, RSMDO-2000E series will display a full screen of frequency domain. Users can input Center frequency, Span, Start frequency, and Stop frequency based upon test requirements so as to rapidly and intuitively observe required frequency range that allows users to experience the user interface of a real spectrum analyzer. While observing frequency domain display, engineers can observe waveform characteristics, which are not easily to be seen from time domain waveforms, for instance, the harmonic composition of a waveform and the frequency characteristics of a modulation signal. Compared with oscilloscope' FFT, RSMDO-2000E series allows engineers to effectively conduct signal measurements on frequency domain.

Conventional DSO's FFT always calculates the entire signal bandwidth up to half the sampling rate (Fs). However, the insufficient calculation capability can't conduct FFT calculation with more points. Users can't have the signal's detailed frequency information due to the insufficient frequency resolution from the calculation result. Whereas RSMDO-2000E series analyzes signal spectrum of interest. Compared with oscilloscope' FFT, RSMDO-2000E series allows engineers to effectively conduct signal measurements on frequency domain. Right illustration shown the conventional DSO's FFT (above figure) VS. RSMDO-2000E's Spectrum analyzer (below figure).
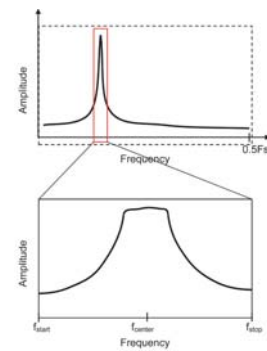
RSMDO-2000E series frequency domain also includes Spectrum Trace Type settings (Normal, Max-hold, Min-hold, and Average)(Figure 1). Users can freely select various Spectrum Traces for simultaneous display. Detection method (Sample, +Peak, -Peak, and Average)(Figure 2) can be individually set for each Trace. Additionally, users, via Cursor, can manually mark the corresponding positions to reflect Frequency and Amplitude. The Search function can also be applied to log spectrum's Peak Table. Amplitude is displayed with dB and Marker can obtain measurement data. Users can use the Search function to search and mark the amplitude and frequency of spectrum signal. Search methods include Max. peak and threshold. Measurement results can be displayed and saved.(Figure 3)
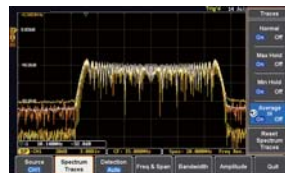
| Figure 1 | Figure 2 | Figure 3 |

Compared with the general spectrum analyzer, the spectrum function of RSMDO-2000E series can test below~9kHz signals, which is applicable to the frequency domain analysis of audio frequency and vibration. RSMDO-2000E series can also test the frequency domain signal with DC component without damaging the instrument. With respect to frequency domain waveform display, RSMDO-2000E series, featuring the same capability of a real-time spectrum analyzer, is faster than the general spectrum analyzer. Why? It is because RSMDO-2000E series utilizes digital circuit and software to calculate FFT. The general spectrum analyzer can only process the signal of a narrow frequency bandwidth at a time by frequency sweeping. Each sweeping will take several ms to dozens of ms. Hundreds and thousands of frequency sweepings are gathered to form a spectrum. Therefore, the displayed spectrum is not obtained at the same time. RSMDO-2000E series obtains spectrum display at the same time by utilizing digital circuit and software to calculate FFT that is faster than the frequency sweeping method. The FFT settings of oscilloscopes are based upon horizontal scale (sample rate) setting, which is totally different from the frequency range setting of RSMDO-2000E series. Most instruments will have insufficient frequency resolution due to insufficient FFT points while conducting spectrum measurement by FFT. Compared with the FFT of oscilloscopes, RSMDO-2000E series satisfies users with signal measurement requirements under 9kHz; a better setting interface, measurement resolution and measurements speed.

Three screen displays on the right show the spectrum results of RSMDO-2000E's spectrum analyzer and the FFT of two different branded oscilloscopes after testing the same FSK signal. The parameters of FSK signal: 500mVpp sine wave, fmax: 10.2MHz, fmin: 10.0MHz, bit rate: 10.0kHz.The upper right screen display is the spectrum of RSMDO-2000E's spectrum analyzer. Users can directly input Center and Span Frequency by an intuitive and swift setting. Fmax and fmin can be clearly identified from the screen display.
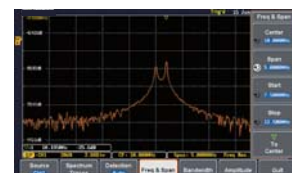
The right screen display is an often seen spectrum from a general oscilloscope's FFT. The left boundary started from DC (low frequency signal) and the maximum frequency on the right is half of the sample rate (can be extended to the right or even out of the boundary). The Span setting for spectrum can only be switched by fixed 1-2-5 multiplying factors. Therefore, users can't set Span according to their requirements that is extremely inconvenient for the operation. In fact, switching multiplying factor is to conduct Zoom In/Out calculation on the original FFT spectrum and the sample rate remains the same during the calculation process. Users can easily encounter the upper and lower boundary limits that is totally different from the general spectrum analyzer in terms of operational experience. Most importantly, no matter how setting is changed the important fmax and fmin of spectrum can't be identified.

The right screen display is the FFT spectrum from a well-known oscilloscope manufacturer. It also provides Span setting (adjustable 1-2-5 multiplying factor) but the result is the same as the previous case, which only conducts Zoom In/Out calculation on FFT spectrum and FFT calculation points have not increased. This method is absolutely unhelpful on increasing frequency resolution. Therefore, its fmax and fmin can't be identified as well.

Users will see fmax and fmin appearing on the screen alternatively if the conventional swept tuned spectrum analyzer is used to conduct the measurement on the previous signal. The reason is that each frequency component is not obtained at the same time frame and it will take a longer time to process.

FRA of RC high-pass filter

RSMDO-2000E also provide the frequency response analysis function (Bode plot). The FRA software can be directly downloaded from GW Instek website. Via arbitrary waveform generator, oscilloscope, and FRA software, users can obtain DUT's FRA characteristic curve plot. FRA has a very wide application range, including product circuit and component performance verification and analysis such as Feedback of Circuit Design, Filter Design, Amplifier Design, Resonant Circuit Design, Cable Frequency Response, and Signal Transformer Performance. Via FRA, users can preliminarily verify product and analyze component's characteristics without the expensive instrument.
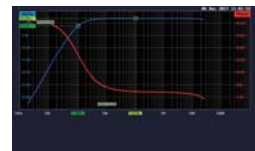
Cursor measurement for the determination at 3dB cut-off frequency of the high-pass filter.

The frequency range of FRA is from 20Hz to 25MHz; the number of test point can be selected from 10 to 90 points per decade. After completing the Bode plot, users can select measurement curve by Cursor so as to retrieve each point's amplitude and phase on the curve.

Other than the new functionalities, the hardware characteristics of RSMDO-2000EG and RSMDO-2000EX are identical to those of RSGDS-2000E Series. RSMDO-2000EG and RSMDO-2000EX are equipped with 8-inch display and feature bandwidth selections of 200MHz, 100MHz, and 70MHz. Models with two analog channels provide 1GSa/s real-time sampling rate per channel; models with four analog channels provide 1GSa/s maximum real-time sampling rate. The waveform update rate of 120,000 wfm/s and the minimum 1mV/div vertical range allow RSMDO-2000EG series RSMDO-2000EX to measure complex feeble signals and clearly display measurement results. With respect to the memory depth, RSMDO-2000E series provide 10M long memory for users to completely retrieve and analyze waveforms. Users, based upon the application requirements, can select 1k, 10k, 100k, 1M or 10M memory depth. The segmented memory can be divided the maximum into 29,000 sections for users to bypass any unimportant waveforms so as to swiftly search all required waveforms. With the function, more meaningful waveforms can be saved and target waveforms can be displayed rapidly. With the waveform search function, users can rapidly search desired waveforms according to the required trigger conditions. RSMDO-2000E series also provides 1M FFT display that allows users to correctly and efficiently acquire measurement results of the frequency domain. RSMDO-2000E series, enhancing by the high waveform update rate of 120,000wfm/sec, Window Zoom and Peak Search, becomes the optimal choice of the economical and multi-function mixed domain oscilloscope.

SPECIFICATIONS

		RSMDO-2102E(G/X)	RSMDO-2104E(G/X)	RSMDO-2202E(G/X)	RSMDO-2204E(G/X)
VERTICAL SENSITIVITY	Channels	2Ch+EXT	4Ch	2Ch+EXT	4Ch
	Bandwidth Rise Time Bandwidth Limit	DC~100MHz(-3dB) 3.5ns 20MHz		DC~200MHz(-3dB) 1.75ns 20M/100MHz	
	Vertical Resolution Input Coupling Input Impedance DC Gain Accuracy Polarity Maximum Input Voltage Offset Position Range Waveform Signal Process	8 bits : 1mV ~ 10V/div AC, DC, GND 1MΩ// 16pF approx. ±(3% when 2mV/div or greater is selected ; ±(5%) when 1mV/div is selected Normal & Invert 300Vrms , CAT I 1mV/div ~ 20mV/div : ±0.5V ; 50mV/div ~ 200mV/div : ±5V ; 500mV/div ~ 2V/div : ±25V ; 5V/div~10V/div : ±250V + , - , × , ÷ , FFT , Uesr Defined Expression FFT : 1Mpts ; FFT : Spectral magnitude. Set FFT Vertical Scale to Linear RMS or dBV RMS and FFT Window to Rectangular, Hamming , Hanning, or Blackman			
TRIGGER	Source Trigger Mode Trigger Type Trigger Holdoff Range Coupling Sensitivity	Ch1 ,CH2, CH3, CH4, Line, EXT* ; *dual channel models only Auto (Supports Roll Mode for 100 ms/div and slower), Normal, Single Sequence Edge, Pulse Width(Glitch), Video, Pulse Runt, Rise & Fall(Slope), Alternate, Time out, Event-Delay(1~65,535 events),Time-Delay(Duration;4ns~10s), Bus 4ns ~ 10s AC, DC, LF rej. , Hf rej. , Noise rej. 1div			
EXT TRIGGER	Range Sensitivity Input Impedance	±15V DC ~ 100MHz Approx. 100mV; 100MHz ~ 200MHz Approx. 150mV 1MΩ±3%, ~16pF			
HORIZONTAL	Time Base Range Pre-trigger Post-trigger Time Base Accuracy Real Time Sample Rate Record Length Acquisition Mode Peak Detection Average	1ns/div ~ 100s/div (1-2-5 increments); ROLL : 100ms/div ~ 100s/div 10 div maximum 2,000,000 div maximum ±50 ppm over any ≥ 1 ms time interval Max. : 1GSa/s (4ch model); Per channel 1GSa/s (2ch model) 10Mpts/CH Normal, Average, Peak Detect, Single 2ns (typical) Selectable from 2 to 256			

SPECIFICATIONS

X-Y MODE	X-Axis Input	Channel 1 ; Channel 3* (* : four channel models only)
	Y-Axis Input	Channel 2 ; Channel 4* (* : four channel models only)
	Phase Shift	±3° at 100kHz
CURSORS AND MEASUREMENT	Cursors	Amplitude, Time, Gating Available; Unit : Seconds(S), Hz(1/S), Phase (Degrees), Ratio(%)
	Automatic Measurement	38 sets : Pk-Pk, Max, Min, Amplitude, High, Low, Mean, RMS, Cycle RMS, Area, Cycle Area, ROVShoot, FOVShoot, RPREShoot, FPREShoot, Frequency, Period, RiseTime, FallTime, +Width, -Width, Duty Cycle, +Pulses, -Pulses, +Edges, -Edges, %Flicker, Flicker Idx., FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF, Phase
CONTROL PANEL FUNCTION	Auto Counter	6 digits, range from 2Hz minimum to the rated bandwidth
	Autoset	Single-button, automatic setup of all channels for vertical, horizontal and trigger systems, with undo Autoset
	Save Setup	20 sets
	Save Waveform	24 sets
DISPLAY SYSTEM	TFT LCD Type	8" TFT LCD WVGA color display
	Display Resolution	800 horizontal x 480 vertical pixels (WVGA)
	Interpolation	Sin(x)/x
	Waveform Display	Dots, Vectors, Variable persistence(16ms~4s), Infinite persistence
	Waveform Update Rate	120,000 waveforms per second, maximum
	Display mode	YT ; XY
	Display Graticule	8 x 10 divisions
INTERFACE	USB Port	USB 2.0 High-speed host port x 1, USB 2.0 High-speed device port x 1
	Ethernet Port (LAN)	RJ-45 connector, 10/100Mbps with HP Auto-MDIX
	Go/NoGo BNC	5V Max/10mA TTL open collector output
	Kensington Style Lock	Rear-panel security slot connects to standard Kensington-style lock
SPECTRUM ANALYZER SPECIFICATIONS	Frequency Range	DC~500MHz(Max.) (Max. bandwidth ~500MHz uncalibrated)
	Span	1kHz ~ 500MHz(Max.)
	Resolution Bandwidth	1Hz ~ 500kHz(Max.)
	Reference Level	-50 dBm to +40dBm in steps of 5dBm
	Vertical Units	dBV RMS; Linear RMS; dBm
	Vertical Position	-12divs to +12divs
	Vertical Scale	1dB/div to 20dB/div in a 1-2-5 Sequence
	Display Average Noise Level	1V/div < -50dBm, Avg : 16 ; 100mV/div < -70dBm, Avg : 16 ; 10mV/div < -90dBm, Avg : 16
	Spurious Response	2nd harmonic distortion< 40dBc ; 3rd harmonic distortion< 45dBc
	Frequency Domain Trace Types	Normal ; Max Hold ; Min Hold ; Average (2 ~ 256)
	Detection Methods	Sample ; +Peak ; -Peak ; Average
	FFT Windows	FFT Factor : Hanning 1.44 ; Rectangular 0.89 ; Hamming 1.30 ; Blackman 1.68
AWG SPECIFICATIONS	Channels	2
	Sample Rate	200 Msa/s
	Vertical Resolution	14 bits
	Max. Frequency	25 MHz
	Waveforms	Sine, Square, Pulse, Ramp, DC, Noise, Sinc, Gaston, Lorentz, Exponential Rise, Exponential Fall, Haversine, Cardiac
	Output Range	20 mVpp to 5 Vpp, HighZ;10 mVpp to 2.5 Vpp, 50 Ω
	Output Resolution	1mV
	Output Accuracy	2% (1 kHz)
	Offset Range	±2.5 V, HighZ;±1.25 V, 50 Ω
	Offset Resolution	1mV
	Sine	Frequency Range:100mHz~25MHz ; Flatness:±0.5 dB(relative to 1kHz) ; Harmonic Distortion:-40 dBc ; Stray (Non-harmonic):-40 dBc ; Total Harmonic Distortion:1% ; S/N Ratio:40 dB
	Square/Pulse	Frequency Range:100mHz~15MHz ; Rise/Fall time:<15ns ; Overshoot: <3% ; Duty cycle Square:50% & Pulse:0.4%~99.6% ; Min. Pulse Width:30 ns ; Jitter:500 ps
	Ramp	Frequency Range:100mHz~1MHz ; Linearity: 1% ; Symmetry: 0~100%
FREQUENCY RESPONSE ANALYSIS	Dynamic Range	> 80 dB (typical)
	Input and Output Sources	Channel 1 or 2 (3 or 4 for four channel model)
	Frequency Range	20 Hz to 25 MHz
	Number of Test Points	10 to 90 points per decade
	Test Amplitude	20 mVpp to 5 Vpp into High-Z Fixed amplitude across entire sweep
	Test Results	Logarithmic overlaid gain and phase plot
	Manual Measurements	Two pairs of tracking gain and phase markers
	Plot Scaling	Auto-scaled during test
DMM SPECIFICATIONS (RSMDO-2000EX only)	Digit Level	5,000 counts ; CAT II 600Vrms, CAT III 300Vrms
	DC Voltage	50mV, 500mV, 5V, 50V, 500V, 1000V 6 ranges
	Accuracy	50mV, 500mV, 5V, 50V, 500V, 1000V ±(0.1% reading + 5 digits)
	Input Impedance	10MΩ
	DC Current	50mA, 500mA, 10A 3 ranges
	Accuracy	50mA~500mA (0.5% reading+0.05mA), 10A ±(0.5% reading + 50mA)
	AC Voltage	50mV, 500mV, 5V, 50V, 700V 5 ranges
	Accuracy	50mV, 500mV, 5V, 50V, 700V ±(1.5% reading + 15 digits) at 50Hz~1kHz * Amplitude greater than 0.2% of the full scale reading.
	AC Current	50mA, 500mA, 10A 3 ranges
	Accuracy	50mA, 500mA, ±(1.5% reading + 0.05mA)at 50Hz~1kHz ; 10A ±(3% reading + 50mA) at 50Hz~1kHz * Measure range: >10mA
	Resistance	500Ω, 5kΩ, 50kΩ, 500kΩ, 5MΩ, 5 ranges
	Accuracy	500Ω, 5kΩ, 50kΩ, 500kΩ ±(0.3% reading + 3 digits); 5MΩ ±(0.5% reading + 5 digits)
POWER SUPPLY SOECIFICATIONS (RSMDO-2000EX only)	Output Channel	CH1 & CH2
	Output Voltage Range	1.0V~5.0V
	Output Current (Max.)	1A
	Voltage Step	0.1V Continuously Adjustable
	Output Voltage Accuracy	±3%
	Ripple and Noise	50mVrms
POWER SOURCE MISCELLANEOUS	Line Voltage Range	AC 100V ~ 240V, 48Hz ~ 63Hz, auto selection
	Multi-Language Menu	Available
	On-Line Help	Available
	Time Clock	Time and date, provide the date/time for saved data
	Operation Environment	Temperature: 0°C to 50°C. Relative Humidity: ≤80% at 40°C or below; ≤45%, 41°C ~ 50°C
DIMENSIONS & WEIGHT		384(W) X 208(H) X 127.3(D)mm, Approx. 3 kg

Note : Three-year warranty, excluding probes & LCD display panel.

Specifications subject to change without notice.

ORDERING INFORMATION

RSMDO-2204E(G/X) 200MHz,4Channel,Digital Storage Oscilloscope,Spectrum analyzer,dual channel 25MHz AWG
RSMDO-2202E(G/X) 200MHz,2Channel,Digital Storage Oscilloscope,Spectrum analyzer,dual channel 25MHz AWG
RSMDO-2104E(G/X) 100MHz,4Channel,Digital Storage Oscilloscope,Spectrum analyzer,dual channel 25MHz AWG
RSMDO-2102E(G/X) 100MHz,2Channel,Digital Storage Oscilloscope,Spectrum analyzer,dual channel 25MHz AWG

"(X)" built in 5,000 counts DMM and power supply

ACCESSORIES

Quick start guide,User manual CD x 1,Power cord x 1, **GTL-110** BNC-BNC cable x 2, **GTL-105A** Alligator Clip test lead
(only on RSMDO-2000EX), **GTL-207A** Banana plug test lead (only on RSMDO-2000EX)
GTP-100B-4 : 100MHz(10:1/1:1)Switchable passive probe for RSMDO-2102E(X)/2104E(X)(one per channel)
GTP-200B-4 : 200MHz(10:1/1:1)Switchable passive probe for RSMDO-2202E(X)/2204E(X)(one per channel)

OPTIONAL ACCESSORIES

GRA-426	Rack Adapter Panel	**GCP-100**	Current Probe, DC~100KHz, 100A, Current Probe
GAK-003	50Ω Impedance Adapter	**GCP-1030**	Current Probe, DC~100KHz, 30Arms, Current Probe
GSC-008	Soft Carrying Case	**GCP-206P**	Current Probe - Power Supply, 2 Channel Power Supply for GCP-530/1030
GTL-246	USB Cable, USB 2.0, A-B Type, 1200mm		
GDB-03	Oscilloscope Education & Training Kit	**GCP-425P**	Current Probe - Power Supply, 4 Channel Power Supply for GCP-530/1030
GCP-020	Current Probe, 40Hz~40kHz, 240A, Current Probe	**GCP-530**	Current Probe, DC~50MHz, 30Arms, Current Probe
		GDP-025	Differential Probe, 25M High Voltage Differntial Probe
GTP-033A	Oscilloscope Probe, 35MHz 1:1 Passive Probe	**GDP-050**	Differential Probe, 50M High Voltage Differntial Probe

FREE DOWNLOAD

PC Software	OpenWave software	**Driver**	USB driver ; LabView driver