RIGOL

DG5000 Pro Series

Function/Arbitrary Waveform Generator

Data Sheet

DSB18100-1110

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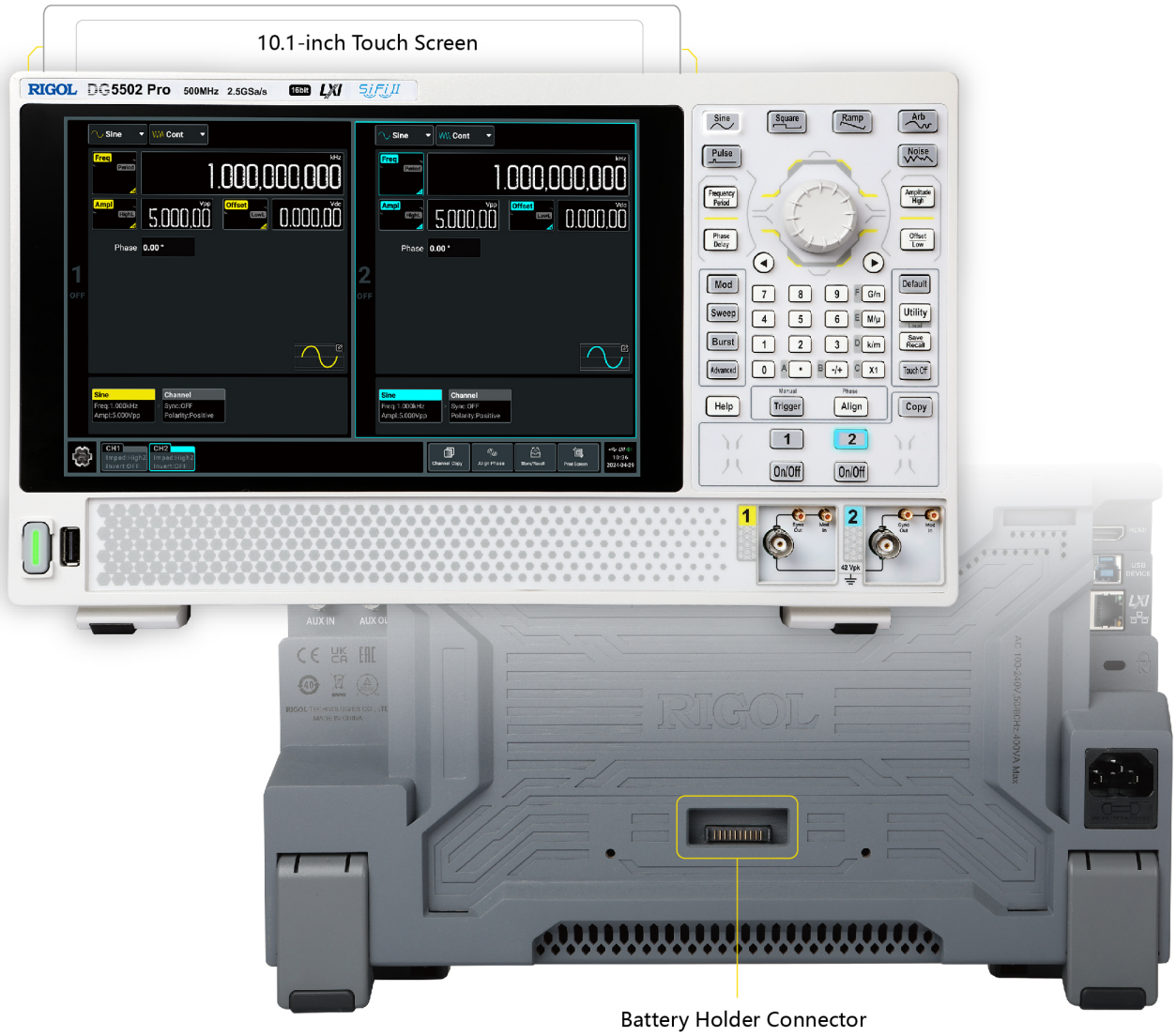
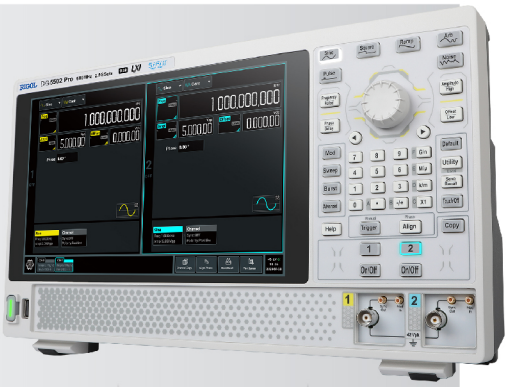
DG5000Pro Series
Function/Arbitrary Waveform Generator



Key Performance Specifications

- **Two Channels**, Both Isolated from the Ground
- **16-bit** Vertical Resolution
- **2.5 GSa/s** Max. Sample Rate
- **64 Mpts/CH** Arbitrary Waveform Length (128 Mpts/CH Optional)
- **0.8 ns** Min. Rise Time
- **250 MHz/350 MHz/500 MHz** Analog Bandwidth



Product Features

Ground Isolation

The two channels are isolated from the earth ground to eliminate ground loops and improve output stability.

Multi-pulse Output Function

It can generate pulse signals with adjustable edge and pulse width to help engineers perform the Double Pulse Test quickly.

IQ Digital Modulation

The rapid generation of IQ modulation signals is useful for applications like verifying the communication system performance and digital signal processing.

Multiple External Interfaces

DG5000 Pro offers various external interfaces including USB Host & Device, LAN, and HDMI for different test scenarios.

Built-in Harmonic Generator (Max. 20th Order)

The harmonic generator (max. 20th order) provides a more precise measurement method for the performance test of devices like high-order filters and amplifiers.

Various Modulation Types

It supports analog and digital modulation types including AM, FM, PM, ASK, FSK, PSK, and PWM. Internal and external modulation sources are available for applications in college teaching, industrial motor control, and switching power supply.

Sequence Function

The sequence mode supports a list of up to 512 waveforms, with total waveform length of up to 64 Mpts/CH (128 Mpts/CH optional). Repeat, wait, event, and jump are supported. It allows you to load many test cases that need to be performed sequentially at one time, switching from one to another seamlessly.

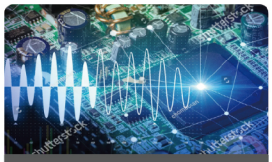
Excellent Interaction Experience

The 10.1-inch HD touch screen (1280x800) supports touch and drag gestures, making smoother and easier measurement operations. Meanwhile, the front-panel keys and knob are optimized to bring better interaction experience and smoother measurements.

Powered by Battery Holder

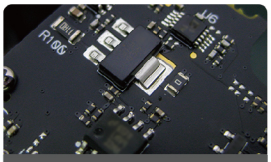
The battery holder option enables the instrument to generate test signals quickly for outdoor or mobile use, allowing hours of operation where no AC power source is available. The battery holder makes it more flexible to use the instrument, making your test no longer limited by the test site.

Applications



Circuit Design and Testing for Embedded Systems

-Clock
-Phase Locked Loop (PLL)
-Audio DAC



Performance Verification of Power Devices

-Double Pulse Test

Automotive Electronics

-Control Unit Signal Simulation
-Collision Warning Signal Simulation

Consumer Electronics

-Sensor Signal

Medical Electronics & Industrial Electronics

-Ultrasonic Testing
-Doppler

Product Features

Product Features

- Dual-channel output, isolated from the ground
- Max. sample rate: 2.5 GSa/s
- Max. output frequency: 500 MHz
- 16-bit vertical resolution
- Square: 170 MHz max. frequency, 0.8 ns min. rise time
- Pulse: 120 MHz max. frequency, 4.2 ns min. pulse width
- Built-in high-order harmonic generator (max. 20th order)
- A maximum Arb waveform length of 64 Mpts/CH (128 Mpts/CH optional)
- Optional functions: Sequence, IQ, Multi-pulse, Pattern, Multi-tone
- Battery holder available to power the instrument, satisfying testing requirements in the field
- 10.1'' HD touch screen, allowing you to configure dual-channel waveforms together from a single screen
- Standard Web Control function for easier remote cooperation

With up to 2.5 GSa/s sample rate and 64 Mpts/CH memory depth (128 Mpts/CH optional), the DG5000 Pro Series Function/Arbitrary Waveform Generator is an all-in-one generator that integrates Function Generator, Arbitrary Waveform Generator, Noise Generator, Pulse Generator, Harmonics Generator, and Analog/Digital Modulator. It can be power by a battery holder. It is a multi-functional and cost-effective dual-channel function/arbitrary waveform generator.

Specifications

Specifications are valid under the following conditions:

The instrument is within the calibration period and has been running ceaselessly for over 30 minutes under the specified operating temperature (23℃ ± 5℃).

All the specifications are guaranteed except the parameters marked with "Typical".

Technical Specifications

Technical Specifications			
Model	DG5252 Pro	DG5352 Pro	DG5502 Pro
Max. Frequency	250 MHz	350 MHz	500 MHz
No. of Channels	2		
Max. Sample Rate	2.5 GSa/s		
Vertical Resolution	16 bits		
Channel Skew	-200 ns to +200 ns		
Waveform Memory Depth	64 Mpts/CH (standard), 128 Mpts/CH (optional)		

Waveform Output

Waveform Output	
Output Mode	Continuous, Modulation, Sweep, Burst, Advanced
Continuous	Sine, Square, Ramp, Pulse, Noise, Arb, Harmonic
Modulation	AM, FM, PM, SUM, ASK, FSK, PSK, PWM
Sweep	Linear, Log, Step
Burst	N-cycle, Gated
Advanced	Standard: Arb, PRBS Optional: Sequence, Multi-pulse, Multi-tone, Pattern, IQ

Output Characteristics

Output Characteristics		
Amplitude (into 50 Ω)	Range	≤100 MHz: 1 mVpp to 10 Vpp ≤250 MHz: 1 mVpp to 5 Vpp ≤350 MHz: 1 mVpp to 2 Vpp ≤500 MHz: 1 mVpp to 1 Vpp
	Accuracy[1]	±(1% of the setting + 1 mVpp)
	Resolution	0.1 mVpp, 0.1 mVrms, 1 mV, 0.1 dBm or 4 digits (whichever is lower)
	Unit[2]	Vpp, Vrms, dBm, V (high level and low level)
Offset (into 50 Ω)	Range	±5 Vpk (ac + dc)
	Accuracy	±(1% of |setting| +1 mV + 0.5% of the amplitude (Vpp))
	Resolution	1 mV or 4 digits
Output Impedance	Typical (0 dBm, 0 Vdc), 50 Ω ± 1%	
Load Impedance Setting	Load (adjustable from 1 Ω to 10 kΩ), High Z	
Isolation	The two channels are isolated to the chassis, the maximum isolated DC voltage is ±42 Vpk, and the two channels are not isolated	
Protection	Waveform outputs are automatically disabled when overloaded	

Frequency Characteristics

Frequency Characteristics			
Model	DG5252 Pro	DG5352 Pro	DG5502 Pro
Sine	1 μHz to 250 MHz	1 μHz to 350 MHz	Continuous: 1 μHz to 500 MHz Modulation/Burst: 1 μHz to 350 MHz
Square	Continuous: 1 μHz to 170 MHz Modulation/Burst: 1 μHz to 120 MHz		
Ramp	Continuous: 1 μHz to 5 MHz Modulation/Burst: 1 μHz to 2.5 MHz		

Frequency Characteristics			
Pulse	1 µHz to 120 MHz		
Arb (Continuous Mode)	1 µHz to 100 MHz		
Harmonic	1 mHz to 125 MHz	1 mHz to 175 MHz	1 mHz to 250 MHz
Noise (-3 dB)	Typical (0 dBm), 500 MHz bandwidth		
Output Frequency Resolution	1 µHz or 12 digits		
Frequency Accuracy	$\pm 10^{-6}$ of the setting (except Arb), 0℃ to 50℃ $\pm 10^{-6}$ of the setting ± 1 µHz (Arb), 0℃ to 50℃		

Continuous Characteristics

Continuous Characteristics		
Sine (into 50 Ω)	Amplitude Flatness	Typ.[3] <5 MHz: ±0.1 dB ≥5 MHz to <50 MHz: ±0.2 dB ≥50 MHz to <100 MHz: ±0.5 dB ≥100 MHz to 200 MHz: ±1.0 dB ≥200 MHz: ±2.0 dB
	Harmonic Distortion	Typical (0 dBm amplitude) 10 Hz to <10 MHz: <-60 dBc ≥10 MHz to <50 MHz: <-50 dBc ≥50 MHz to <200 MHz: <-45 dBc ≥200 MHz: <-35 dBc
	Total Harmonic Distortion (THD)	Typical (0 dBm amplitude) 10 Hz to 20 kHz: <0.1%
	Spurious (non-harmonic)	Typical (0 dBm amplitude) 10 Hz to <10 MHz: <-60 dBc ≥10 MHz to <50 MHz: <-55 dBc ≥50 MHz: <-45 dBc + 6 dBc/octave
	Phase Noise	Typical (0 dBm amplitude, 10 kHz offset) 20 MHz: <-105 dBc/Hz
	Residual Clock Noise	Typical (0 dBm amplitude), -60 dBm
	Phase	-360° to +360°, 0.01° resolution
Square	Rise/Fall Time	Typical (0 dBm amplitude, 50 Ω load, 150 MHz frequency), 0.8 ns
	Overshoot	Typical (0 dBm amplitude, >1 kHz frequency), <5%
	Jitter (rms)	Typical (0 dBm amplitude, >1 kHz frequency), 200 ps
	Phase	-360° to +360°, 0.01° resolution

Continuous Characteristics		
Ramp	Linearity	Typical (1 kHz frequency, 0 dBm amplitude, 99.9% symmetry) ≤0.1% of peak output (10% to 90% amplitude)
	Symmetry	0.1% to 99.9% (limited by the ramp period)
	Phase	-360° to +360°, 0.01° resolution
Pulse	Pulse Width	4.2 ns to 999.9 ks (limited by the pulse period)
	Pulse Width Resolution	100 ps or 5 digits
	Duty Cycle	0.01% to 99.99% (limited by the pulse period)
	Rise/Fall Time	1.4 ns to 1 s (limited by the pulse width)
	Overshoot	Typical (0 dBm amplitude, >1 kHz frequency), <5%
	Jitter (rms)	Typical (0 dBm amplitude, >1 kHz frequency), 200 ps
	Phase	-360° to +360°, 0.01° resolution
Noise	Type	White noise
Arb	Type	Built-in waveforms, stored waveforms
	Rise/Fall Time	Typical (0 dBm amplitude), ≤ 3.5 ns
	Jitter (rms)	Typical (0 dBm amplitude, >1 kHz frequency), 200 ps
	Phase	-360° to +360°, 0.01° resolution
Harmonic Output	Harmonic Order	≤20
	Harmonic Type	Order, Combine
	Harmonic Amplitude	The amplitude of each order of the harmonic can be set
	Harmonic Phase	The phase of each order of the harmonic can be set

Modulation Characteristics

Modulation Characteristics	
Modulation Type	AM, FM, PM, ASK, FSK, PSK, PWM, SUM

Modulation Characteristics		
AM	Carrier Waveform	Sine, Square, Ramp, Arb (except DC)
	Modulation Source	Internal/External
	External Modulation Port	Front port
	Internal Modulating Waveform	Sine, Square, Triangle, UpRamp, DnRamp, Noise, Arb
	Modulation Depth	0% to 120%
	Internal Modulation Frequency	2 mHz to 1 MHz
FM	Carrier Waveform	Sine, Square, Ramp, Arb (except DC)
	Modulation Source	Internal/External
	External Modulation Port	Front port
	Internal Modulating Waveform	Sine, Square, Triangle, UpRamp, DnRamp, Noise, Arb
	Internal Modulation Frequency	2 mHz to 1 MHz
PM	Carrier Waveform	Sine, Square, Ramp, Arb (except DC)
	Internal Modulation Source	Internal/External
	External Modulation Port	Front port
	Internal Modulating Waveform	Sine, Square, Triangle, UpRamp, DnRamp, Noise, Arb
	Internal Modulation Frequency	2 mHz to 1 MHz
	Phase Deviation	0° to 360°, 0.01° resolution

Modulation Characteristics		
ASK/FSK/PSK	Carrier Waveform	Sine, Square, Ramp, Arb (except DC)
	Modulation Source	Internal/External
	External Modulation Port	Front port, rear port
	Internal Modulating Waveform	Square with 50% duty cycle
	Internal Keying Frequency	2 mHz to 1 MHz
	No. of Levels	2
PWM	Carrier Waveform	Pulse
	Modulation Source	Internal/External
	External Modulation Port	Front port
	Internal Modulating Waveform	Sine, Square, Triangle, UpRamp, DnRamp, Noise, Arb
	Internal Modulation Frequency	2 mHz to 1 MHz
	Width Deviation	0% to 49.99% of the pulse period (limited by the pulse width)
SUM	Carrier Waveform	Sine, Square, Ramp, Arb (except DC)
	Sum Source	Sine, Square, Triangle, UpRamp, DnRamp, Noise, Arb
	Sum Frequency	2 mHz to 1 MHz
	Sum Ratio	0% to 100% of the amplitude setting (Vpp)

Burst Characteristics

Burst Characteristics	
Carrier Waveform	Sine, Square, Ramp, Pulse, Noise, Arb (except DC)
Burst Count	1 to 1,000,000/Infinite

Burst Characteristics	
Internal Burst Period	4 µs to 8000 s
Burst Phase	-360° to +360°, 0.01° resolution
Trigger Delay	0 ns to 85 s (limited by the burst period)
Gate Source	External trigger
Trigger Source	Internal, External leading edge, External trailing edge, Manual, Timer (remote mode only)

Sweep Characteristics

Sweep Characteristics	
Type	Linear, Log, Step
Carrier Waveform	Sine, Square, Ramp, Arb (except DC)
Sweep Time	1 ms to 250,000 s
Hold/Return Time	0 s to 3600 s
Orientation	Up/Down
Trigger Source	Internal, external leading edge, external trailing edge, manual
Mark	Falling edge of the sync signal (programmable)

Sweep Start/Stop Frequency Range			
Model	DG5252 Pro	DG5352 Pro	DG5502 Pro
Sine	1 µHz to 250 MHz	1 µHz to 350 MHz	1 µHz to 350 MHz
Square	1 µHz to 120 MHz		
Ramp	1 µHz to 2.5 MHz		
Arb	1 µHz to 100 MHz		

Advanced Mode Characteristics

Advanced Mode Characteristics	
Type	Arb, Sequence, PRBS, Multi-pulse, Multi-tone, Pattern, IQ

Advanced Mode Characteristics		
Arb	Sample Rate	1 μSa/s to 1.25 GSa/s
	Jitter (rms) period-period	Typical (0 dBm amplitude), 100 ps
	Waveform Length	32 pts/CH to 64 Mpts/CH (128 Mpts/CH optional)
	Filter Mode	Normal, Step, Edge, Interpolation
Sequence (optional)	Sample Rate	1 μSa/s to 1.25 GSa/s
	Length	32 pts/CH to 64 Mpts/CH (128 Mpts/CH optional)
	No. of Steps	1 to 512
	Loop	1 to 256
	Wait/Event	Off, external trigger (rising/falling edge), manual trigger, timer
	Event Jump Destination	Next, First, Last, Specify SN
	Go To Destination	Next, First, Last, End, Specify SN
	Timer	4 μs to 8000 s
	Filter Mode	Normal, Step, Edge, Interpolation
PRBS	Bit Rate	1 μbps to 300 Mbps
	Sequence Length	2^n-1, n=3,4,...,32
	Edge Time	2 ns to 1 μs (limited by the bit rate)
	Jitter (rms)	200 ps

Advanced Mode Characteristics		
Multi-pulse (optional)	No. of Pulses	2 to 30
	Trigger Source	Off, external trigger (rising/falling edge), manual trigger, timer
	Trigger Delay	5 μs to 1 s
	Timer	5 μs to 8000 s (limited by the trigger delay time and the high/low level width)
	High/Low Level Width	20 ns to 150 μs
	Edge Time	2 ns to 1 μs (limited by the min. high/low level width)
Multi-tone (optional)	No. of Tones	2 to 16
Pattern (optional)	Baud Rate	1 μBaud to 300 MBaud
	Input Data Type	Pattern, File
	Encoding Type	NRZ, RZ, Manchester
	Data Type	Binary, Hexadecimal (supporting 4B5B encoding), KD Symbol (supporting 8B10B encoding)
	Max. Data Length	Pattern: 4000 characters (binary), 1000 characters (hexadecimal/KD symbol) File: 64M characters (binary), 12M characters (hexadecimal/KD symbol)
	Preset Amplitude	TTL, CMOS5.0, CMOS3.3, CMOS2.5, CMOS1.8, ECL, PECL
IQ (optional)	Symbol Rate	100 Sa/s to 100 MSa/s
	Symbol Length	10 to 20 M
	Modulation Type	BPSK, QPSK, 8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM
	Code Type	OFF, Differential, Gray, Differential+Gray
	Center Frequency	0 Hz to 500 MHz

AUX IN/OUT Characteristics

AUX IN/OUT Characteristics		
External Modulation Input	Input Range	ASK, FSK, PSK: 3.3 V logic level AM, FM, PM, PWM: ±5 V full range
	Frequency Range	Front-panel SMB: DC to 100 kHz (1 MSa/s) Rear-panel BNC: DC to 10 Mbps
	Input Impedance	10 kΩ
	Connector	ASK, FSK, PSK: BNC (rear panel) or SMB (rear panel), selectable AM, FM, PM, PWM: SMB (front panel)
External Trigger/ Gated Burst Input	Level	TTL-compatible
	Impedance	10 kΩ
	Edge	Positive/negative(selectable)
	Min. Pulse Width	100 ns
	Trigger Delay Range	0 ns to 85 s
	Trigger Delay Resolution	100 ps or 5 digits
	Jitter (rms)	Typical (trigger input to signal output, Burst mode), 800 ps
	Connector	BNC (rear panel)
Trigger Output	Level	3.3 V CMOS
	Output Impedance	50 Ω
	Jitter (rms)	Typical (Continuous mode), 400 ps
	Connector	SMB (front panel)
Sync Output	Level	TTL-compatible
	Impedance	50 Ω
	Connector	SMB (front panel)

AUX IN/OUT Characteristics		
10 MHz Reference Input	Impedance	1 kΩ
	Input Coupling	AC coupling
	Lock Range	10 MHz ± 100 Hz
	Required Input Voltage	100 mVpp to 5 Vpp
	Connector	BNC (rear panel)
10 MHz Reference Output	Impedance	50 Ω
	Level	Typical (50 Ω), 1.2 Vpp
	Output Coupling	AC coupling
	Connector	BNC (rear panel)

Protection

Protection	
Overvoltage Protection	Occurred when: The instrument amplitude setting is greater than 4 Vpp or the output AC + DC is greater than |2 Vdc| and the input voltage is greater than ±12 x (1 ± 5%)V (<10 kHz). Disruptive voltage: ±18(Vac + dc) The instrument amplitude setting is less than or equal to 4 Vpp or the output AC + DC is less than |2 Vdc| and the input voltage is greater than ±2.5 x (1 ± 5%)V (<10 kHz). Disruptive voltage: ±3.5(Vac + dc)

Characteristics

Characteristics	
Display	10.1-inch touch screen, 1280x800 (screen area) 16:9
Stabilization Time	At least 30-minute warm-up
Internal Non-volatile Memory	128 GB

Power Supply

Power Supply	
Input Voltage	AC 100 to 240 V, 47 to 63 Hz or 115 V, 360 to 440 Hz

Power Supply	
Consumption	210 W (max.)
Fuse	3.15 A, Class T, 250 V

Interface

Interface	
LAN	1 at rear panel, 10/100/1000 BASE-T port, supporting LXI-C
Web Control	Support Web Control (input the IP address of the instrument into the Web browser to display the operation interface)
HDMI	1 at rear panel, HDMI (type A) used to connect to an external monitor or projector
USB 3.0 Host	1 at front panel
USB 3.0 Device	1 at rear panel, supporting TMC

Mechanical Characteristics

Mechanical Characteristics	
Dimension	358 mm (W) x 215 mm (H) x 122 mm (D)
Rack Mount Kit	5 U
Weight	4.2 kg (package excluded)

Environment

Environment		
Temperature Range	Operating	0℃ to +40℃
	Non-operating	-20℃ to +60℃
Humidity Range	Operating	0℃ to +40℃, ≤80% RH (without condensation)
	Non-operating	-20℃ to 40℃, ≤90% RH (without condensation)
		below 60℃, ≤80% RH (without condensation)
Altitude	Operating	Below 3,000 m
	Non-operating	Below 12,000 m

Regulation Standards

Regulation Standards	
Electromagnetic Compatibility	Compliant with EMC Directive (2014/30/EU) EN IEC 61326-1:2021 EN IEC 61000-3-2:2019+A1 EN 61000-3-3:2013+A1+A2 BS EN IEC 61326-1:2021 BS EN IEC 61000-3-2:2019+A1 BS EN 61000-3-3:2013+A1+A2 FCC Part 15, Subpart B:2021 ICES-001:2020
Safety	EN 61010-1:2010+A1 IEC 61010-1:2010+A1 BS EN 61010-1:2010+A1 UL 61010-1: 2012 R6.23 CAN/CSA-C22.2 NO. 61010-1-12+GI1+GI2 (R2017) +A1

Warranty and Calibration Interval

Warranty and Calibration Interval	
Warranty	3 years (excluding the accessories)
Recommended Calibration Interval	12 months

NOTE:

[1]: 1 kHz Sine, amplitude >1 mVpp, 0 V offset, unit: Vpp.

[2]: dBm is available only when the load impedance is not set to HighZ; Vrms is not available for Arb; Vpp and V (high level and low level) are available for all waveform types.

[3]: 1 μHz to 200 kHz relative to 1 kHz Sine, >200 kHz relative to 1 MHz Sine; 0 dBm amplitude.

Order Information and Warranty Period

Order Information

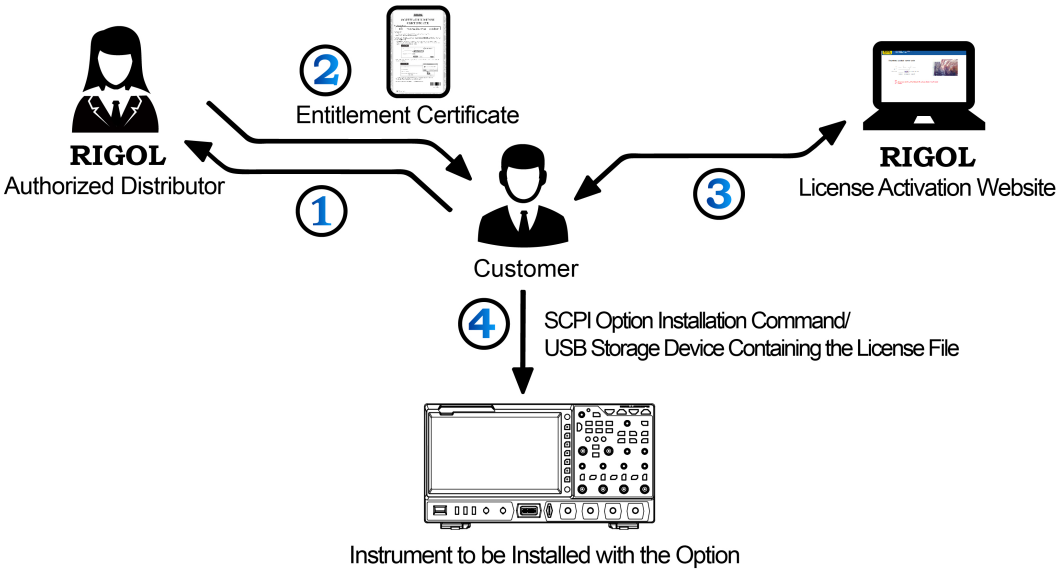
Order Information	Order No.
Model	
250 MHz Bandwidth, 2.5 GSa/s Sample Rate, Dual-channel	DG5252 Pro
350 MHz Bandwidth, 2.5 GSa/s Sample Rate, Dual-channel	DG5352 Pro
500 MHz Bandwidth, 2.5 GSa/s Sample Rate, Dual-channel	DG5502 Pro
Standard Accessories	
Power Cord Conforming to the Standard of the Destination Country	— —
USB Cable	CB-USBA-USBB-FF-150
Two BNC Cables	CB-BNC-BNC-MM-100
Options	
IQ Modulation Option	DG5000 Pro-IQ
Multi-pulse Output Option	DG5000 Pro-MPUL
Advanced Sequence Function	DG5000 Pro-SEQ
Multi-tone Option	DG5000 Pro-MTONE
Pattern Option	DG5000 Pro-PJ
128 Mpts/CH (Max.) Arb Length Upgrade Option	DG5000 Pro-2RL
Function Bundle Option DG5000 Pro-IQ/MPUL/SEQ/MTONE/PJ/2RL included	DG5000 Pro-BND
Optional Accessories	

Order Information	Order No.
Battery Holder	BatHolder138
40dB Attenuator (50 Ω, 1 W)	RA5040K
SMB(F) to SMB(F) Cable (1 m)	CB-SMB-SMB-FF-100
SMB(F) to BNC(F) Cable (1 m)	CB-SMB-BNC-FF-100
SMB(F) to BNC(M) Cable (1 m)	CB-SMB-BNC-FM-100
BNC to Alligator Clip Cable	CB-BNC-AC-100-L

Warranty Period

Three years for the mainframe, excluding the accessories.

Option Ordering and Installation Process



1. According to the usage requirements, please purchase the specified function options from **RIGOL Sales Personnel**, and provide the serial number of the instrument that needs to install the option.
2. After receiving the option order, the **RIGOL** factory will mail the paper software product entitlement certificate to the address provided in the order.
3. Log in to **RIGOL** official website for registration. Use the software key and instruments serial number provided in the entitlement certificate to obtain the option license code and the option license file.
4. Install the option by running the SCPI command concerning the option installation. You can also save the option license file to the root directory of the USB storage device. Then insert it to the instrument. After being recognized, follow the instructions to install the option.

NOTE:

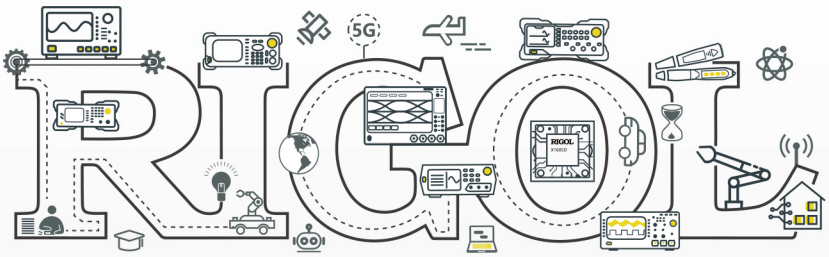
If any problems occur during the option installation process, please contact **RIGOL** technical team.

Boost Smart World and Technology Innovation

Industrial Intelligent Manufacturing

Semiconductors

Education& Research



Communication

System Integration

New Energy

- Cellular-5G/WIFI
- UWB/RFID/ ZIGBEE
- Digital Bus/Ethernet
- Optical Communication

- Digital/Analog/RF Chip
- Memory and MCU Chip
- Third-Generation Semiconductor
- Solar Photovoltaic Cells

- New Energy Automobile
- PV/Inverter
- Power Test
- Automotive Electronics

Provide Testing and Measuring Products and Solutions for Industry Customers

HEADQUARTER

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