



**RIGOL**

# DG70000 Series

Arbitrary Waveform Generator

**DataSheet**

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# DG70000 Series

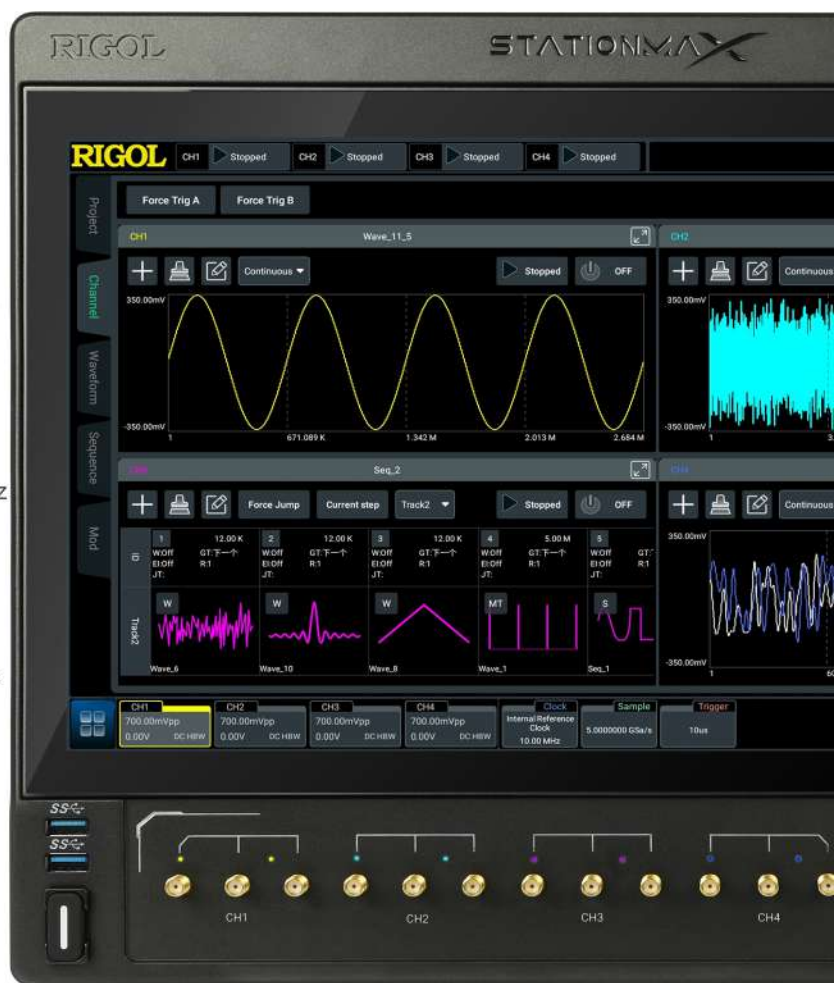
## Arbitrary Waveform Generator

### Key Specifications

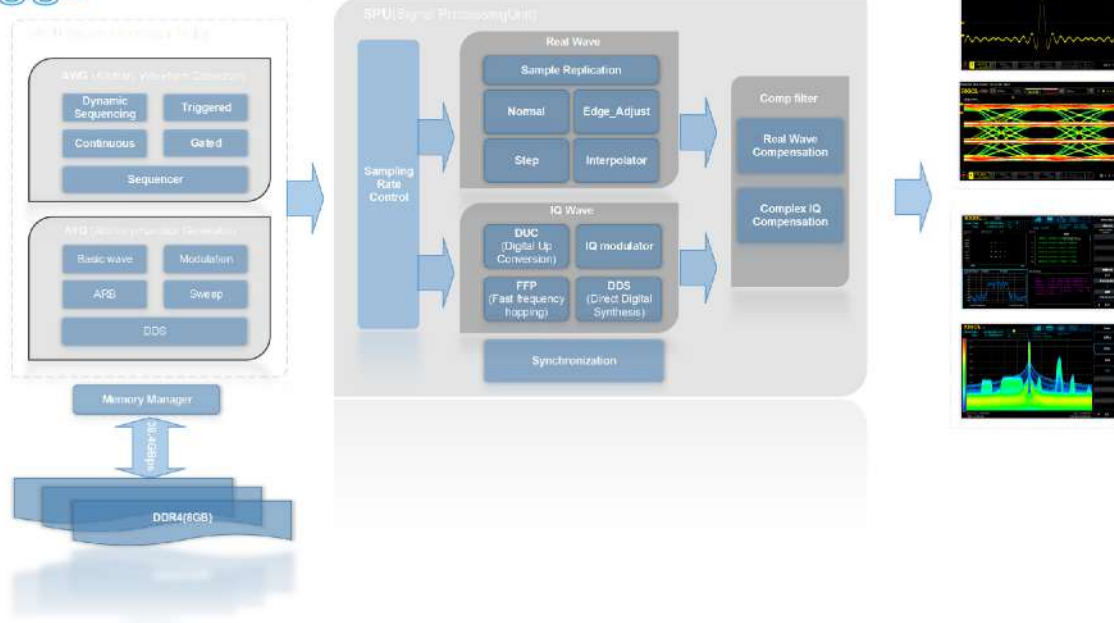
- Sample rates up to 5 GSa/s (12 GSa/s interpolated)
- 4-channel synchronization for a single instrument
- -70 dBc SFDR
- 16-bit vertical resolution
- 1.5 GSample waveform memory depth per channel
- Direct generation of signals with carriers up to 5 GHz
- Total jitter low as 10 ps<sub>p-p</sub>, random jitter low as 350 fs<sub>rms</sub>
- Sample rates adjustable from 100 Sa/s to 12 GSa/s
- High-precision synchronization with channel-to-channel skew repeatability low as  $\pm 10$  ps

### Brand New SiFi III Technical Platform

Built on RIGOL's brand new **SiFi III** platform, the DG70000 series supports multiple signal output modes such as sequence output, precise trigger output, continuous output, and pattern jump output. With industry-leading waveform memory depth, it achieves a maximum data throughput of **38.4 Gbps**. The advanced sequence function allows for configuration of its waveform memory, which maximizes flexibility. In terms of signal processing, this series has various functions including adjustable sample rates, IQ modulation, DUP, and direct digital synthesis (DDS).



SiFi III



# DG70000 Series

## Arbitrary Waveform Generator



16-bit Vertical Resolution



Multi-channel Synchronization

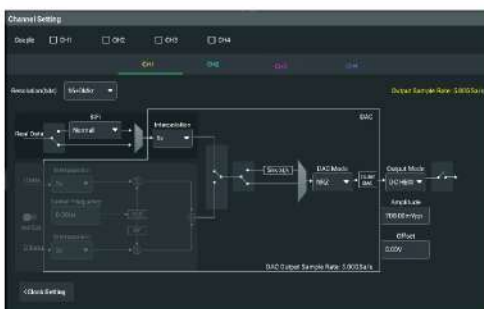
-70 dBc SFDR



1.5 GHz Modulation Bandwidth

## Meeting Requirements for Various Applications

This series is customer-oriented with a variety of functions suitable for practical applications. For example, the creation of advanced sequences enables you to self-define long complex waveforms. It can realize high-precision multi-channel synchronization and the output of high-bandwidth and low-jitter waveforms, making it ready for applications in areas like communications, scientific research, and industry. Multiple standard interfaces provides you with more solutions in connectivity, realizing remote instrument control and synchronization.



Channel Setting Interface



Advanced Sequence Editing Interface

## Brand New Appearance and UI Design Bring Extraordinary User Experience

This series features a 7U full-rack structure and delicate industrial design. Equipped with two touch screens, it brings brand new UI design and extraordinary user experience. The main display is a 15.6-inch touch screen with one button electronic tilt. It supports simultaneous waveform display in multi-pane windowing, making it easier to view signals, measurements, and results.



# DG70000 Series

## Arbitrary Waveform Generator

### High Sample Rate and High Resolution, Restore Signals with High Quality

The DG70000 series provides sample rate up to **12 GSa/s** and an adjustable range from **100 Sa/s** to **12 GSa/s**. The 16-bit high resolution ensures its high fidelity.

To restore the signal with high quality is the basis for reliable and repeatable testing. The DG70000 series features excellent sample rate and resolution, capable of restoring the signal without distortion, presenting you with more real test results.

- **12 GSa/s Sample Rate**  
(5 GSa/s data rate, interpolated: 10 GSa/s for real waveform output and 12 GSa/s for IQ waveform output)
- **16-bit Vertical Resolution**



### Wider Output Frequency Range and Modulation Bandwidth Ensures Wireless Signal Simulation Test

With the renewal and iteration of wireless standards, the carrier frequency and modulation bandwidth of wireless signals are constantly improving, bringing more severe test challenges.

The DG70000 series provides up to **5 GHz** output frequency and up to **1.5 GHz** modulation bandwidth. It can directly output IQ baseband signal or use the Digital Up Converter (DUC) option to generate RF modulated signal, meeting your demands for testing various types of wireless signals.

- **Max. 5 GHz Output Frequency**
- **Max. 1.5 GHz Modulation Bandwidth**



# DG70000 Series

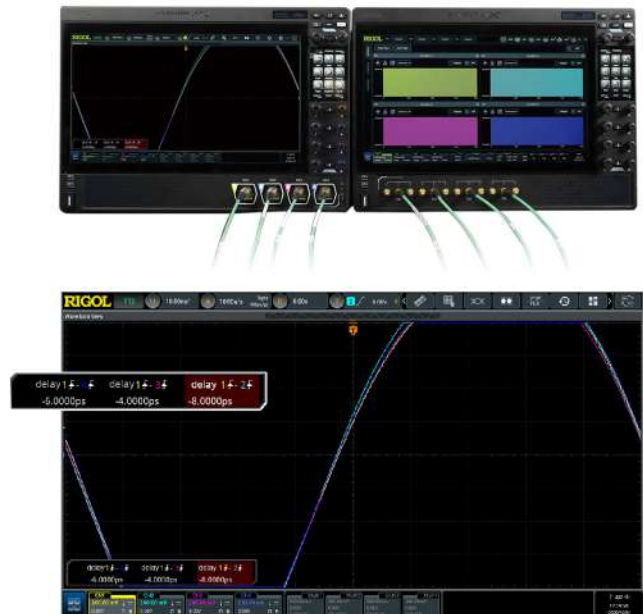
## Arbitrary Waveform Generator

### Lower Channel-to-Channel Delay and Channel Extension Ability, Reproduce Complex Test Scenarios

In cutting-edge fields such as quantum technology, it is necessary to build a multi-channel high-speed signal system. Such complex test scenarios require that the arbitrary waveform generator should support multi-channel signal output and low channel-to-channel delay.

The DG70000 series can realize multi-channel synchronization, and **10 ps** channel-to-channel delay of a single device, enabling you to rebuild multi-channel and low-latency complex test scenarios.

- Min. 10 ps Channel-to-Channel Delay
- Multi-channel Synchronization across Multiple Devices

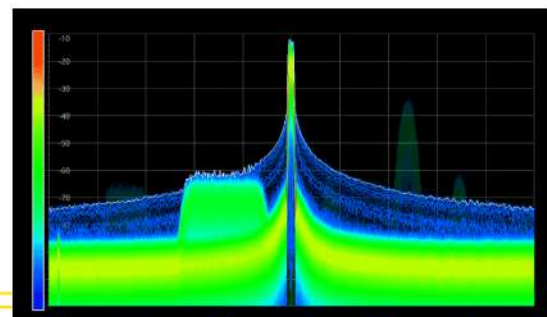


### More Sample Points Help Generate Purer Signals

Simulation testing through building real-world environment can effectively reduce the cost of system testing. Improved signal purity and the creation of long complex signals are key requirements for such simulation.

The DG70000 series can provide **-70 dBc** spurious-free dynamic range (SFDR) and up to **1.5G** sample points per channel, creating long complex waveforms without compromising bandwidth. At the same time, it provides the advanced sequence function, which can divide the waveform memory to store several waveform segments, making good use of the waveform memory depth. It also makes it flexible to construct your desired waveforms through internal and external trigger events.

- 1.5 GSample Waveform Memory Depth
- -70 dBc SFDR



# Product Features

## Product Features

- Up to 5 GSa/s sample rates (12 GSa/s interpolated)
- 4-channel synchronization for a single instrument (4-channel models only)
- -70 dBc SFDR
- 16-bit vertical resolution
- 1.5 GSample waveform memory depth per channel
- Direct generation of signals with carriers up to 5 GHz
- Generate arbitrary waveforms point by point; recover the signal without distortion
- Total jitter low as 10 ps<sub>p-p</sub>, random jitter low as 350 fs<sub>rms</sub>
- Sample rates adjustable from 100 Sa/s to 12 GSa/s
- High-precision synchronization with channel-to-channel skew repeatability low as ±10 ps
- Support advanced sequence to define outputs of various complex waveforms
- Multiple interfaces available: LAN, USB3.0, HDMI
- Support the import of external waveform files
- 15.6-inch angle-adjustable display

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Built on its unique SiFi III technical platform and Android operating system, the DG70000 series Arbitrary Waveform Generator (AWG) has the following advantages: accurate and adjustable sample rates; generate arbitrary waveforms point by point; recover the signal without distortion; etc. This series is customer-oriented with a variety of functions suitable for practical applications. For example, the creation of advanced sequences enables you to self-define long complex waveforms. The multi-channel high-precision synchronization, high-bandwidth and low-jitter waveform output make it ready for applications in a variety of industrial and communications fields. Equipped with a 15.6-inch angle-adjustable touch screen supporting multi-pane windowing, it brings a brand new UI design and extraordinary user experience. Multiple standard interfaces provide you with more solutions in connectivity, making it simple to control the instrument remotely.

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# Specifications

Specifications are valid under the following conditions:

the instrument is within the calibration period; stored for at least two hours at 0°C to 50°C temperature; 40-minute warm-up.

Unless otherwise noted, the specifications in the manual include the measurement uncertainty.

- **Typical (typ.):** typical performance, which 80 percent of the measurement results will meet at room temperature (approximately 25°C). The data are not warranted and do not include the measurement uncertainty.
- **Nominal (nom.):** the expected mean or average performance or a designed attribute (such as the 50Ω connector). The data are not warranted and are measured at room temperature (approximately 25°C).
- **Measured (meas.):** an attribute measured during the design phase which can be compared to the expected performance, e.g. the amplitude drift varies with time. The data are not warranted and are measured at room temperature (approximately 25°C).

## NOTE:

All charts in this manual are the measurement results of multiple instruments at room temperature unless otherwise noted.

## Overview of the DG70000 Series Technical Specifications

| Overview of the DG70000 Series Technical Specifications |                                                           |         |
|---------------------------------------------------------|-----------------------------------------------------------|---------|
|                                                         | DG70002                                                   | DG70004 |
| Number of Channels                                      | 2                                                         | 4       |
| Sample Rate                                             | 100 Sa/s to 12 GSa/s <sup>[1]</sup>                       |         |
| Vertical Resolution                                     | 16-bit (0 Marker/channel)                                 |         |
|                                                         | 15-bit (1 Markers/channel)                                |         |
|                                                         | 14-bit (2 Markers/channel)                                |         |
| Waveform Memory Depth                                   | 1.5 Gpts/channel                                          |         |
| Multi-channel Synchronization                           | Skew Repeatability                                        | ±10 ps  |
|                                                         | Delay Adjustment Resolution                               | 3 ps    |
| Effective Frequency Output                              | The maximum frequency is determined as "sample rate/2.5". |         |
|                                                         | 2 GHz (Real Data mode)                                    |         |
|                                                         | 4 GHz (IQ Data mode, 10 GSa/s interpolated)               |         |



## Analog Output

| Analog Output                     |                                              |                                                                                                                                             |
|-----------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| DC High Bandwidth Output (DC HBW) | Amplitude Range                              | 350 mVpp to 700 mVpp (single-ended, 50 $\Omega$ terminated) <sup>[2]</sup><br>700 mVpp to 1400 mVpp (differential, 100 $\Omega$ terminated) |
|                                   | Amplitude Accuracy <sup>[3]</sup>            | $\pm 2\%$ of the setting value                                                                                                              |
|                                   | Offset                                       | $\pm 20$ mV (50 $\Omega$ into GND), $\pm 40$ mV into DC voltage terminated                                                                  |
|                                   | Offset Resolution                            | 50 $\mu$ V (nom.)                                                                                                                           |
|                                   | Offset Accuracy <sup>[4]</sup>               | $\pm 2$ mV                                                                                                                                  |
|                                   | Analog Bandwidth                             | 2 GHz (-3 dB), 4 GHz (-6 dB)                                                                                                                |
|                                   | Rise/Fall Time Measured at 20% to 80% Levels | <120 ps at 700 mVpp single-ended termination                                                                                                |
| DC Amplifier Output (DC AMP)      | Amplitude Range                              | 25 mVpp to 1000 mVpp (single-ended, 50 $\Omega$ terminated)<br>50 mVpp to 2000 mVpp (differential, 100 $\Omega$ terminated)                 |
|                                   | Amplitude Accuracy <sup>[3]</sup>            | $\pm 2\%$ of the setting value $\geq 100$ mVpp<br>$\pm 5\%$ of the setting value < 100 mVpp                                                 |
|                                   | Offset                                       | $\pm 1$ V (50 $\Omega$ into GND), $\pm 2$ V into DC voltage terminated                                                                      |
|                                   | Offset Accuracy <sup>[4]</sup>               | Common mode: $\pm(2\%$ of the offset + 10 mV); ((OutP + OutN)/2)<br>Differential mode: $\pm 20$ mV; (OutP - OutN)                           |
|                                   | Analog Bandwidth                             | 1.3 GHz (-3 dB), 2.6 GHz (-6 dB)                                                                                                            |
|                                   | Rise/Fall Time Measured at 20% to 80% Levels | <160 ps at 1.0 Vpp single-ended                                                                                                             |
|                                   |                                              |                                                                                                                                             |
| AC Output (AC)                    | Amplitude Range                              | -20 dBm~+10 dBm                                                                                                                             |
|                                   | Amplitude Accuracy                           | $\pm 0.5$ dB (typ.)                                                                                                                         |
|                                   | Offset                                       | $\pm 2$ V/70 mA                                                                                                                             |
|                                   | Offset Accuracy <sup>[4]</sup>               | $\pm(2\%$ of the offset + 20 mV); into an open circuit (zero-load current)                                                                  |
|                                   | Analog Bandwidth                             | 10 MHz~2 GHz (-3 dB), 10 MHz~3.8 GHz (-6 dB), 10 MHz~4.8 GHz (-18 dB)                                                                       |
| Number of Channels                |                                              | 2/4 channels, 3 SMA connectors per channel at front panel                                                                                   |

## Time Domain

| Time Domain                               |                |
|-------------------------------------------|----------------|
| Bit Rate (sample rate/4 points per cycle) | Max. 1.25 Gb/s |



| Time Domain |               |                       |
|-------------|---------------|-----------------------|
| Jitter      | Random Jitter | 350 fs <sub>rms</sub> |
|             | Total Jitter  | 10 ps <sub>p-p</sub>  |

## Frequency Domain

| Frequency Domain           |                 |                    |
|----------------------------|-----------------|--------------------|
| Output Match VSWR          | DC HBW          | DC~4 GHz < 1.8:1   |
|                            | DC AMP          | DC~2.6 GHz < 1.8:1 |
|                            | AC              | DC~5 GHz < 2.0:1   |
| Intermodulation Distortion | 100 MHz ± 1 MHz | -70 dBc            |
|                            | 1 GHz ± 1 MHz   | -60 dBc            |

## Spurious Free Dynamic Range (SFDR)

SFDR Characteristics: SFDR is determined as a function of the directly generated carrier frequency. Harmonics not included. Measured with a balun and with output amplitude set to 500 mVpp.

| SFDR DC HBW Output (Typ.) |               |                     |                |                           |                |
|---------------------------|---------------|---------------------|----------------|---------------------------|----------------|
|                           | DC HBW Output | In Band Performance |                | Adjacent Band Performance |                |
|                           |               | Measured Across     | Specifications | Measured Across           | Specifications |
| 2.5 GSa/s                 | 100 MHz       | DC~500 MHz          | -80 dBc        | DC~1.25 GHz               | -72 dBc        |
|                           | DC~625 MHz    | DC~625 MHz          | -70 dBc        | DC~1.25 GHz               | -62 dBc        |
|                           | DC~1 GHz      | DC~1 GHz            | -60 dBc        | DC~1.25 GHz               | -58 dBc        |
| 5 GSa/s                   | 100 MHz       | DC~1 GHz            | -80 dBc        | DC~2.5 GHz                | -72 dBc        |
|                           | DC~1.25 GHz   | DC~1.25 GHz         | -70 dBc        | DC~2.5 GHz                | -62 dBc        |
|                           | DC~2 GHz      | DC~2 GHz            | -60 dBc        | DC~2.5 GHz                | -58 dBc        |
| 10 GSa/s                  | 100 MHz       | DC~1 GHz            | -80 dBc        | DC~5 GHz                  | -60 dBc        |
|                           | DC~1.25 GHz   | DC~1.25 GHz         | -68 dBc        | DC~5 GHz                  | -50 dBc        |
|                           | DC~2 GHz      | DC~2 GHz            | -60 dBc        | DC~5 GHz                  | -48 dBc        |
|                           | 2 GHz~3.5 GHz | 2 GHz~3.5 GHz       | -42 dBc        | DC~5 GHz                  | -42 dBc        |
|                           | 3.5 GHz~4 GHz | 3.5 GHz~4 GHz       | -55 dBc        | DC~5 GHz                  | -40 dBc        |
| 12 GSa/s                  | 100 MHz       | DC~1 GHz            | -80 dBc        | DC~5 GHz                  | -60 dBc        |
|                           | DC~1.25 GHz   | DC~1.25 GHz         | -68 dBc        | DC~5 GHz                  | -50 dBc        |
|                           | DC~2 GHz      | DC~2 GHz            | -60 dBc        | DC~5 GHz                  | -48 dBc        |
|                           | 2 GHz~3.5 GHz | 2 GHz~3.5 GHz       | -42 dBc        | DC~5 GHz                  | -42 dBc        |
|                           | 3.5 GHz~4 GHz | 3.5 GHz~4 GHz       | -55 dBc        | DC~5 GHz                  | -40 dBc        |
| SFDR DC AMP Output (Typ.) |               |                     |                |                           |                |
|                           | DC AMP Output | In Band Performance |                | Adjacent Band Performance |                |
|                           |               | Measured Across     | Specifications | Measured Across           | Specifications |
| 2.5 GSa/s                 | 100 MHz       | DC~500 MHz          | -80 dBc        | DC~1.25 GHz               | -72 dBc        |
|                           | DC~625 MHz    | DC~625 MHz          | -70 dBc        | DC~1.25 GHz               | -62 dBc        |
|                           | DC~1 GHz      | DC~1 GHz            | -60 dBc        | DC~1.25 GHz               | -58 dBc        |

| SFDR DC AMP Output (Typ.) |               |               |         |            |         |
|---------------------------|---------------|---------------|---------|------------|---------|
| 5 GSa/s                   | 100 MHz       | DC~1 GHz      | -80 dBc | DC~2.5 GHz | -72 dBc |
|                           | DC~1.25 GHz   | DC~1.25 GHz   | -70 dBc | DC~2.5 GHz | -62 dBc |
|                           | DC~2 GHz      | DC~2 GHz      | -60 dBc | DC~2.5 GHz | -58 dBc |
| 10 GSa/s                  | 100 MHz       | DC~1 GHz      | -80 dBc | DC~5 GHz   | -60 dBc |
|                           | DC~1.25 GHz   | DC~1.25 GHz   | -68 dBc | DC~5 GHz   | -50 dBc |
|                           | DC~2 GHz      | DC~2 GHz      | -60 dBc | DC~5 GHz   | -48 dBc |
|                           | 2 GHz~2.6 GHz | 2 GHz~2.6 GHz | -44 dBc | DC~5 GHz   | -44 dBc |
| 12 GSa/s                  | 100 MHz       | DC~1 GHz      | -80 dBc | DC~5 GHz   | -60 dBc |
|                           | DC~1.25 GHz   | DC~1.25 GHz   | -68 dBc | DC~5 GHz   | -50 dBc |
|                           | DC~2 GHz      | DC~2 GHz      | -60 dBc | DC~5 GHz   | -48 dBc |
|                           | 2 GHz~2.6 GHz | 2 GHz~2.6 GHz | -44 dBc | DC~5 GHz   | -44 dBc |

| SFDR AC Output (Typ.) |               |                     |                |                           |                |
|-----------------------|---------------|---------------------|----------------|---------------------------|----------------|
|                       | AC Output     | In Band Performance |                | Adjacent Band Performance |                |
|                       |               | Measured Across     | Specifications | Measured Across           | Specifications |
| 2.5 GSa/s             | 100 MHz       | DC~500 MHz          | -80 dBc        | DC~1.25 GHz               | -72 dBc        |
|                       | DC~625 MHz    | DC~625 MHz          | -70 dBc        | DC~1.25 GHz               | -62 dBc        |
|                       | DC~1 GHz      | DC~1 GHz            | -60 dBc        | DC~1.25 GHz               | -58 dBc        |
| 5 GSa/s               | 100 MHz       | DC~1 GHz            | -80 dBc        | DC~2.5 GHz                | -72 dBc        |
|                       | DC~1.25 GHz   | DC~1.25 GHz         | -70 dBc        | DC~2.5 GHz                | -62 dBc        |
|                       | DC~2 GHz      | DC~2 GHz            | -58 dBc        | DC~2.5 GHz                | -58 dBc        |
| 10 GSa/s              | 100 MHz       | DC~1 GHz            | -80 dBc        | DC~5 GHz                  | -60 dBc        |
|                       | DC~1.25 GHz   | DC~1.25 GHz         | -68 dBc        | DC~5 GHz                  | -50 dBc        |
|                       | DC~2 GHz      | DC~2 GHz            | -58 dBc        | DC~5 GHz                  | -46 dBc        |
|                       | 2 GHz~3.5 GHz | 2 GHz~3.5 GHz       | -46 dBc        | DC~5 GHz                  | -42 dBc        |
|                       | 3.5 GHz~4 GHz | 3.5 GHz~4 GHz       | -46 dBc        | DC~5 GHz                  | -40 dBc        |
| 12 GSa/s              | 100 MHz       | DC~1 GHz            | -80 dBc        | DC~5 GHz                  | -60 dBc        |
|                       | DC~1.25 GHz   | DC~1.25 GHz         | -68 dBc        | DC~5 GHz                  | -50 dBc        |
|                       | DC~2 GHz      | DC~2 GHz            | -58 dBc        | DC~5 GHz                  | -46 dBc        |
|                       | 2 GHz~3.5 GHz | 2 GHz~3.5 GHz       | -46 dBc        | DC~5 GHz                  | -42 dBc        |
|                       | 3.5 GHz~4 GHz | 3.5 GHz~4 GHz       | -46 dBc        | DC~5 GHz                  | -40 dBc        |

## Harmonics and Phase Noise

| Harmonics                             |                |           |
|---------------------------------------|----------------|-----------|
| Harmonic Distortion (@ 500 mVpp)      |                |           |
| SHG<br>(Differential or with a balun) | 10 MHz~500 MHz | < -62 dBc |
|                                       | 500 MHz~1 GHz  | < -50 dBc |
|                                       | 1 GHz~4 GHz    | < -30 dBc |
| SHG<br>(Single-ended)                 | 10 MHz~500 MHz | < -42 dBc |
|                                       | 500 MHz~1 GHz  | < -40 dBc |
|                                       | 1 GHz~4 GHz    | < -25 dBc |

## Harmonics

|     |                |           |
|-----|----------------|-----------|
| THG | 10 MHz~750 MHz | < -55 dBc |
|     | 750 MHz~1 GHz  | < -50 dBc |
|     | 1 GHz~2 GHz    | < -35 dBc |

## Harmonic Distortion (@ 1000 mVpp)

|                                       |                |           |
|---------------------------------------|----------------|-----------|
| SHG<br>(Differential or with a balun) | 10 MHz~500 MHz | < -55 dBc |
|                                       | 500 MHz~1 GHz  | < -45 dBc |
|                                       | 1 GHz~2.6 GHz  | < -35 dBc |
| SHG<br>(Single-ended)                 | 10 MHz~500 MHz | < -38 dBc |
|                                       | 500 MHz~1 GHz  | < -30 dBc |
|                                       | 1 GHz~2.6 GHz  | < -25 dBc |
| THG                                   | 10 MHz~500 MHz | < -33 dBc |
|                                       | 500 MHz~1 GHz  | < -30 dBc |
|                                       | 1 GHz~2.6 GHz  | < -25 dBc |

## Phase Noise

|                                           |                                         |
|-------------------------------------------|-----------------------------------------|
| Output Phase Noise<br>Typ. <sup>[5]</sup> | fc=100 MHz: -126 dBc/Hz @ offset 10 kHz |
|                                           | fc=1 GHz: -112 dBc/Hz @ offset 10 kHz   |
|                                           | fc=2 GHz: -106 dBc/Hz @ offset 10 kHz   |
|                                           | fc=4 GHz: -100 dBc/Hz @ offset 10 kHz   |

## Input

|                         |                                    |                                              |
|-------------------------|------------------------------------|----------------------------------------------|
| Input                   |                                    |                                              |
| Trigger In              | Inputs                             | 2                                            |
|                         | Polarity                           | Positive or Negative                         |
|                         | Impedance                          | 1 MΩ (nom.)                                  |
|                         | Range                              | 1 MΩ: ±8 V <sub>rms</sub>                    |
|                         | Threshold Level                    | Range: -5.0 V to 5.0 V                       |
|                         |                                    | Resolution: 0.1 V (nom.)                     |
|                         | Trigger Pulse Width <sup>[6]</sup> | 20 ns                                        |
|                         | Minimum Trigger Interval           | 10 μs                                        |
|                         | Trigger Sensitivity                | 500 mVpp                                     |
|                         | Connector                          | SMA (rear panel)                             |
| Modulating Signal Input | Inputs                             | 4                                            |
|                         | Multiplexing                       | Analog modulation input or baseband IQ input |
|                         | Frequency Range                    | DC~100 MHz                                   |
|                         | Input Level                        | 1 Vpp (full-range)                           |
|                         | Impedance                          | 50 kΩ (nom.)                                 |
|                         | Connector                          | SMA (rear panel)                             |

| Input              |                             |                                        |
|--------------------|-----------------------------|----------------------------------------|
| Pattern Jump Input | Input Impedance             | 1 k $\Omega$ to GND                    |
|                    | Input Level                 | 3.3 V LVCMOS                           |
|                    | Number of Destinations      | 256                                    |
|                    | Strobe Polarity             | Negative or positive edge (selectable) |
|                    | Strobe Setup Time           | 5 ns                                   |
|                    | Strobe Hold Time            | 5 ns                                   |
|                    | Strobe Minimum Pulse Width  | 64 ns                                  |
|                    | Analog Output Channel Delay | <12,500/sample rate                    |
|                    | Connector                   | DB15 female (rear panel)               |

| Pattern Jump Pin Assignments |                   |     |                   |     |                   |
|------------------------------|-------------------|-----|-------------------|-----|-------------------|
| Pin                          | Description       | Pin | Description       | Pin | Description       |
| 1                            | GND               | 6   | GND               | 11  | Data bit 5, input |
| 2                            | Data bit 0, input | 7   | Strobe, input     | 12  | Data bit 6, input |
| 3                            | Data bit 1, input | 8   | GND               | 13  | Data bit 7, input |
| 4                            | Data bit 2, input | 9   | GND               | 14  | GND               |
| 5                            | Data bit 3, input | 10  | Data bit 4, input | 15  | GND               |

## Waveform Capability

| Waveform Capability             |                                                                 |
|---------------------------------|-----------------------------------------------------------------|
| Waveform File Import Capability | *.txt file format, supporting voltage code and normalized value |
|                                 | *.wfm file format created by RIGOL AWG                          |
|                                 | *.seq file format created by RIGOL AWG                          |
| Waveform File Export Capability | *.txt file format, supporting voltage code and normalized value |
|                                 | *.wfm file format created by RIGOL AWG                          |
|                                 | *.seq file format created by RIGOL AWG                          |

## Marker Output

| Marker Output    |                      |
|------------------|----------------------|
| Number           | 0 (default), 1, or 2 |
| Min. Pulse Width | 3.2 ns               |
| Max. Data Rate   | 2.5 GSa/s            |
| Type             | Single-ended         |
| Impedance        | 50 $\Omega$ (nom.)   |



## Marker Output

|                         |                                    |
|-------------------------|------------------------------------|
|                         | Window: -0.5 V to 1.75 V           |
| Output into 50 $\Omega$ | Amplitude: 400 mV to 1.75 V (typ.) |
|                         | Resolution: 100 $\mu$ V (nom.)     |

|               |                   |
|---------------|-------------------|
| Rise Time     | (20%~80%): 750 ps |
| Delay Control | $\pm 2$ ns        |
| Connector     | SMA (rear panel)  |

## Sequencer

### Sequencer

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sequence         | Number of steps for each sequence: 1 to 16,384                                                                                                                                                                                                                                                                                                                                                                                     |
| Subsequence      | Number of steps for each subsequence: 1 to 16,383                                                                                                                                                                                                                                                                                                                                                                                  |
| Waveform Segment | Waveform length: 2.4k to 500M sample points (1.5G optional)<br>Minimum waveform granularity: 1 sample point                                                                                                                                                                                                                                                                                                                        |
| Output Sequence  | Execute the steps of the sequence/subsequence in specific order.                                                                                                                                                                                                                                                                                                                                                                   |
| Loop             | Execute 1 to $2^{32}-1$ times or infinite times in loop.                                                                                                                                                                                                                                                                                                                                                                           |
| Jump             | Wait: wait for a trigger event to play the step in the sequence<br><br>Synchronous Jump: support synchronous event jump to a specified step in the sequence<br><br>Asynchronous Jump: support asynchronous event jump to a specified step in the sequence<br><br>Go To: define the next step in the sequence or subsequence to go to and play<br><br>Pattern Jump: support pattern jump for sequence steps (256 jump destinations) |

## Clock Characteristics

### Clock Characteristics

|                               |                       |                                                  |
|-------------------------------|-----------------------|--------------------------------------------------|
| 10 MHz Reference Clock Output | Output Amplitude      | +4 dBm $\pm 2$ dB                                |
|                               | Output Frequency      | 10 MHz $\pm$ (1 ppm + aging)                     |
|                               | Temperature Stability | < 0.5 ppm (0°C to 50°C, with the reference 25°C) |
|                               | Aging Rate            | < 1 ppm/year                                     |
| Sample Clock Output           | Output Impedance      | 50 $\Omega$ (nom.)                               |
|                               | Output Amplitude      | +2 dBm to +10 dBm                                |
|                               | Output Frequency      | 2.5 GHz~6 GHz                                    |
|                               | Output Impedance      | 50 $\Omega$ (nom.)                               |

| Clock Characteristics       |                          |                                     |
|-----------------------------|--------------------------|-------------------------------------|
| Sync Clock Output           | Output Amplitude         | 1.0 V $\pm$ 150 mVpp to 50 $\Omega$ |
|                             | Output Frequency         | Sample clock frequency/32           |
|                             | Output Impedance         | 50 $\Omega$ (nom.)                  |
| Reference Clock Input       | Input Amplitude          | -5 dBm to +5 dBm                    |
|                             | Fixed Frequency          | 10 MHz, $\pm$ 40 Hz                 |
|                             | Variable Frequency Range | 35 MHz~150 MHz                      |
|                             | Input Impedance          | 50 $\Omega$ (nom.)                  |
| External Sample Clock Input | Input Amplitude          | 0 dBm to +10 dBm                    |
|                             | Input Frequency          | 2.5 GHz~6.0 GHz                     |
|                             | Input Impedance          | 50 $\Omega$ (nom.)                  |
| Connector                   | SMA (rear panel)         |                                     |

## NOTE:

[1] 5 GSa/s data rate, interpolated: 10 GSa/s for real waveform output; 12 GSa/s for IQ waveform output.

[2] It is recommend to connect the output terminal that is not in use to GND with a 50  $\Omega$  load.

[3] 100 MHz sine waveform

[4] It is under the condition that the self-calibration temperature is within 25°C $\pm$ 5°C indoor temperature.

[5] 5 GHz sample clock with 10 GSa/s sample rate

[6] Nominal value with 5 GHz sample clock. Reference formula: 48/Sample Clock + 10 ns.

# General Specifications

## Characteristics

| Characteristics  |                                          |
|------------------|------------------------------------------|
| Operating System | Android                                  |
| Touch Screen     | 15.6" main screen, 3.5" auxiliary screen |

## Interface

| Interface                           |                                                                                                                     |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| LAN Interface                       | 1 at rear panel, RJ-45 Ethernet connector, 10/100/1000BASE-T port, supporting LXI-C                                 |
| Web Control                         | Support Web Control (input the IP address of the generator into the Web browser to display the operation interface) |
| HDMI Interface                      | 1 at rear panel, HDMI 1.4b, A plug; used to connect to an external monitor or projector                             |
| USB 3.0 Host High-Speed Interface   | 4 (2 at front panel and 2 at rear panel)                                                                            |
| USB 3.0 Device High-Speed Interface | 1 at rear panel, supporting TMC                                                                                     |
| Sync Control Interface              | 1 at rear panel, MDR-26 interface, used to control the synchronization of multiple instruments                      |

## Power Supply

| Power Supply |                            |
|--------------|----------------------------|
| AC Input     | 100 V to 240 V (nom.)      |
| AC Frequency | 45 Hz to 440 Hz            |
| Consumption  | 300 W (typ.), 500 W (max.) |

## Environment

| Environment       |               |             |
|-------------------|---------------|-------------|
| Temperature Range | Operating     | 0°C~+50°C   |
|                   | Non-operating | -30°C~+70°C |

## Environment

|                |               |                                                |
|----------------|---------------|------------------------------------------------|
| Humidity Range | Operating     | below +30°C: ≤90% RH (without condensation)    |
|                |               | +30°C to +40°C, ≤75% RH (without condensation) |
|                |               | +40°C to +50°C, ≤45% RH (without condensation) |
| Altitude       | Non-operating | below 65°C: ≤90% RH (without condensation)     |
|                | Operating     | below 3,000 meters                             |
|                | Non-operating | below 15,000 meters                            |

## Regulation Standards

### Regulation Standards

|                               |                                                                                                                                                                                              |                                                                                                                                    |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Electromagnetic Compatibility | Compliant with EMC Directive (2014/30/EU), compliant with or higher than the standards specified in EN 61326-1: 2013, EN 61326-2-1:2013, EN IEC 61000-3-2:2019+A1, EN 61000-3-3:2013+A1:2019 |                                                                                                                                    |
|                               | CISPR 11:2009+A1 Class A                                                                                                                                                                     |                                                                                                                                    |
|                               | EN IEC 61000-3-2:2019+A1                                                                                                                                                                     | Harmonics, Class A                                                                                                                 |
|                               | EN 61000-3-3:2013+A1:2019                                                                                                                                                                    | Voltage flicker                                                                                                                    |
|                               | EN 61000-4-2:2009                                                                                                                                                                            | ±4.0 kV (contact discharge), ±8.0 kV (air discharge)                                                                               |
|                               | EN 61000-4-3:2006+A1+A2                                                                                                                                                                      | 10 V/m (80 MHz to 1 GHz); 3 V/m (1.4 GHz to 6 GHz)                                                                                 |
|                               | EN 61000-4-4:2004+A1                                                                                                                                                                         | 2 kV power cord                                                                                                                    |
|                               | EN 61000-4-5:2006                                                                                                                                                                            | 1 kV (phase-to-neutral voltage); 2 kV (phase-to-earth voltage); 2 kV (neutral-to-earth voltage)                                    |
|                               | EN 61000-4-6:2009                                                                                                                                                                            | 10V, 0.15 MHz to 80 MHz                                                                                                            |
|                               | EN 61000-4-11:2004                                                                                                                                                                           | Voltage dip: 0% UT during half cycle; 0% UT during 1 cycle; 70% UT during 25 cycles<br>Short interruption: 0% UT during 250 cycles |
| Safety                        | EN 61010-1:2010+A1:2019                                                                                                                                                                      |                                                                                                                                    |
|                               | IEC 61010-1:2010+A1:2016                                                                                                                                                                     |                                                                                                                                    |
|                               | UL 61010-1: 2012 R7.19                                                                                                                                                                       |                                                                                                                                    |
|                               | CAN/CSA-C22.2 NO. 61010-1-12 + GI1 + GI2 (R2017) + A1                                                                                                                                        |                                                                                                                                    |
| Vibration                     | Meets GB/T 6587; class 2 random                                                                                                                                                              |                                                                                                                                    |
|                               | Meets MIL-PRF-28800F and IEC60068-2-6; class 3 random                                                                                                                                        |                                                                                                                                    |

## Regulation Standards

|       |                                                                                                                        |
|-------|------------------------------------------------------------------------------------------------------------------------|
| Shock | Meets GB/T 6587-2012; class 2 random                                                                                   |
|       | Meets MIL-PRF-28800F and IEC 60068- 2- 27; class 3 random                                                              |
|       | (in non-operating conditions: 30 g, half sine, 11 ms duration, 3 shocks along the main axis, a total of 18 vibrations) |

## Mechanical Characteristics

### Mechanical Characteristics

|           |                                      |
|-----------|--------------------------------------|
| Dimension | 439 mm (W) x 310 mm (H) x 491 mm (D) |
|-----------|--------------------------------------|

|        |                            |
|--------|----------------------------|
| Weight | Package excluded: <22.5 kg |
|--------|----------------------------|

|                            |
|----------------------------|
| Package included: <29.5 kg |
|----------------------------|

## Warranty and Calibration Interval

### Warranty and Calibration Interval

|          |                                                           |
|----------|-----------------------------------------------------------|
| Warranty | Three years for the mainframe, excluding the accessories. |
|----------|-----------------------------------------------------------|

|                                  |           |
|----------------------------------|-----------|
| Recommended Calibration Interval | 12 months |
|----------------------------------|-----------|



# Order Information and Warranty Period

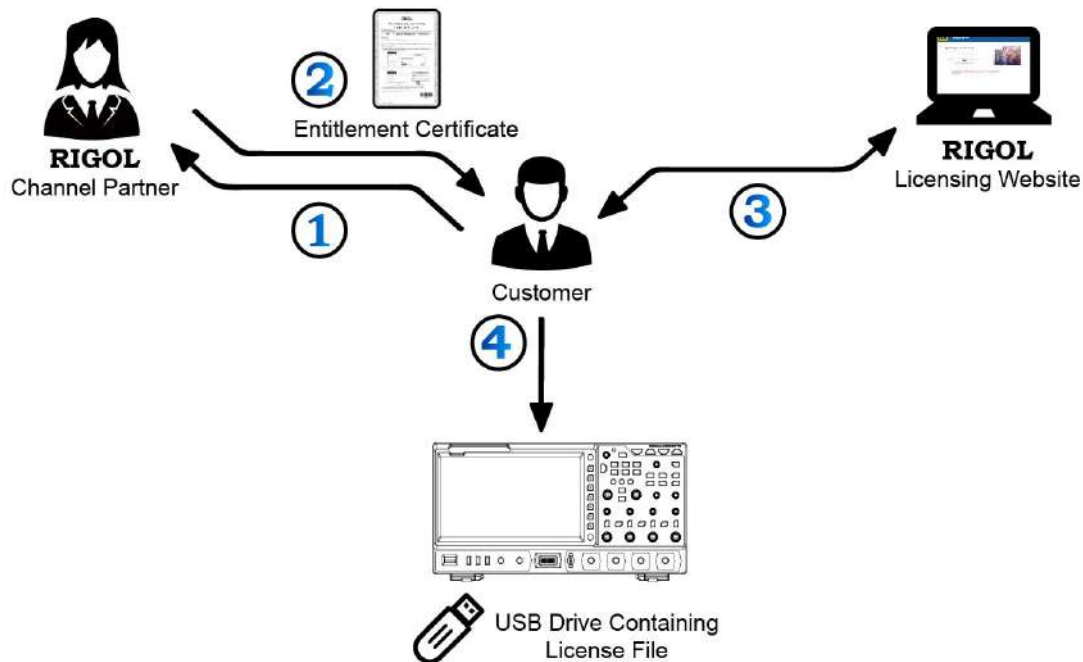
## Order Information

| Order Information                                                 | Order No.       |
|-------------------------------------------------------------------|-----------------|
| <b>Model</b>                                                      |                 |
| 4-channel, 2 GHz bandwidth, 5 GSa/s data rate, 1.5G sample points | DG70004         |
| 2-channel, 2 GHz bandwidth, 5 GSa/s data rate, 1.5G sample points | DG70002         |
| <b>Standard Shipped Accessory</b>                                 |                 |
| Power cord (based on destination country)                         | — —             |
| USB cable                                                         | — —             |
| Three 50 $\Omega$ , 18 GHz SMA terminators per channel            | — —             |
| <b>Performance Upgrade Option</b>                                 |                 |
| Digital Up Converter (DUC) and IQ Modulation                      | DG70000-DIGUP   |
| Complex Sequence Function                                         | DG70000-SEQ     |
| High-speed Serial Function                                        | DG70000-PJ      |
| DC Amplifier Output                                               | DG70000-DC      |
| Multitone & Chirp Mode                                            | DG70000-MTONENL |

## Warranty Period

Three years for the mainframe, excluding the accessories.

# Option Ordering and Installation Process



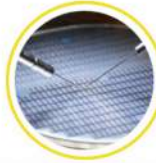
1. According to the usage requirements, please purchase the specified function options from **RIGOL Sales Personnel**, and provide the serial number of the instrument that needs to install the option.
2. After receiving the option order, the **RIGOL** factory will mail the paper software product entitlement 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.

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