

## Specifications DG1022 & DG1022A

All the specifications apply to the DG1022/A Series Function/ Arbitrary Waveform Generator unless specified statement. To meet these specifications, two conditions must be satisfied first:

- The instrument must have operated continuously for more than 30 minutes within the specified operating temperature.
- You must perform the "Test/Cal" operation through the Utility menu if the operating temperature changes by more than 5 °C.
- All specifications are guaranteed unless marked "typical"



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## Characteristics

| Frequency         |  |                     |
|-------------------|--|---------------------|
| Waveforms         | Sine, Square, Ramp, Triangle, Pulse, Noise, Arb                  |                     |
|                   | <b>DG1022</b>  | <b>DG1022A</b>      |
| Sine              | 1 $\mu$ Hz ~ 20MHz   | 1 $\mu$ Hz ~ 25MHz  |
| Square            | 1 $\mu$ Hz ~ 5MHz  | 1 $\mu$ Hz ~ 5MHz   |
| Ramp, Triangle    | 1 $\mu$ Hz ~ 150kHz  | 1 $\mu$ Hz ~ 500kHz |
| Pulse             | 500 $\mu$ Hz ~ 3MHz  | 500 $\mu$ Hz ~ 5MHz |
| Noise             | 5MHz (-3dB)  | 5MHz (-3dB)         |
| Arb               | 1 $\mu$ Hz ~ 5MHz  | 1 $\mu$ Hz ~ 5MHz   |
| Resolution        | 1 $\mu$ Hz   |                     |
| Accuracy          | $\pm$ 50 ppm in 90 days<br>$\pm$ 100 ppm in 1year<br>18°C ~ 28°C |                     |
| Temperature index | < 5 ppm/°C   |                     |

| Sine Wave Spectral Purity |  |             |                |             |
|---------------------------|--|-------------|----------------|-------------|
| Harmonic Distortion       | CH1  |             | CH2            |             |
|                           | $\leq 1V_{PP}$   | $> 1V_{PP}$ | $\leq 1V_{PP}$ | $> 1V_{PP}$ |
| DC-1MHz                   | -45dBc   | -45dBc      | -45dBc         | -45dBc      |
| 1MHz-5MHz                 | -45dBc   | -40dBc      | -45dBc         | -40dBc      |
| 5MHz-20MHz                | -45dBc   | -35dBc      | -45dBc         | -35dBc      |
| Total Harmonic Distortion | DC to 20 kHz, 1Vpp < 0.2%  |             |                |             |
| Spurious (non-harmonic)   | DC to 1 MHz < -70 dBc<br>1 MHz to 10 MHz < -70 dBc + 6 dB/octave |             |                |             |
| Phase Noise               | 10kHz Offset, -108 dBc / Hz (Typical)                            |             |                |             |

| Square Wave    |  |            |
|----------------|--|------------|
| Rise/Fall Time | < 20 ns (10% to 90%), (Typical, 1kHz, 1 Vpp) |            |
| Overshoot      | < 5% (Typical, 1kHz 1Vpp)                    |            |
| Duty Cycle     | 1 $\mu$ Hz to 3MHz                           | 20% to 80% |

|                                     |  |            |
|-------------------------------------|--|------------|
|                                     | 3MHz(not contain) to 4MHz                                | 40% to 60% |
|                                     | 4MHz (not contain) to 5MHz                               | 50%        |
| Asymmetry<br>(below 50% Duty Cycle) | 1% of period+ 20ns (Typical, 1kHz, 1 V <sub>PP</sub> )   |            |
| Jitter                              | 6ns + 0.1% of period (Typical, 1kHz, 1 V <sub>PP</sub> ) |            |

|                  |  |  |
|------------------|--|--|
| <b>Ramp Wave</b> |  |  |
| Linearity        | < 0.1% of peak output (Typical, 1kHz, 1 V <sub>PP</sub> , 100% Symmetry) |  |
| Symmetry         | 0% to 100%   |  |

|                   |   |  |
|-------------------|---|--|
| <b>Pulse Wave</b> |   |  |
| Pulse Width       | 2000s max period; 20ns min period; 1ns resolution |  |
| Overshoot         | < 5%  |  |
| Jitter            | 6ns + 100ppm of period                            |  |

| <b>Arb Wave</b>                           | <b>CH1</b>               | <b>CH2</b>               |
|---|--------------------------|--------------------------|
| Waveform Length                           | 4k points                | 1k points                |
| Amplitude Accuracy                        | 14 bits (including sign) | 10 bits (including sign) |
| Sample Rate                               | 100MSa/s                 | 100MSa/s                 |
| Minimum Rising /Falling Time (Typical)    | 35ns                     | 35ns                     |
| Jitter (RMS) (Typical)                    | 6 ns + 30ppm             | 6 ns + 30ppm             |
| Non-Volatile Storage (Total:10 Waveforms) | 10 waveforms             | 10 waveforms             |

| <b>Output</b>    | <b>DG1022</b>                           |  | <b>DG1022A</b>  |  |
|------------------|---|--|---|--|
|                  | CH1                                     | CH2                                    | CH1   | CH2                                    |
| Amplitude (50 Ω) | 2 mV <sub>PP</sub> ~ 10 V <sub>PP</sub> | 2 mV <sub>PP</sub> ~ 3 V <sub>PP</sub> | ≤20MHz: 2 mV <sub>PP</sub> ~10 V <sub>PP</sub> ;<br>>20MHz: 2 mV <sub>PP</sub> ~5 V <sub>PP</sub> ; | 2 mV <sub>PP</sub> ~ 3 V <sub>PP</sub> |

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|---|---|--|
| Amplitude Accuracy<br>(1kHz Sine) <sup>[1]</sup>  | $\pm(2\% \text{ of setting} + 2\text{mV}_{PP})$ | $\pm (2\% \text{ of setting} + 2 \text{ mV}_{PP})$ |
| Amplitude Flatness<br>(Sine wave relative to<br>1kHz, 5V <sub>PP</sub> ) <sup>[1]</sup> | <100kHz      0.1 dB                             | <100kHz      0.1 dB                                |
|   | 100kHz ~ 5MHz   0.15 dB                         | 100kHz ~ 5MHz   0.15 dB                            |
|   | 5MHz ~ 20MHz   0.3 dB                           | 5MHz ~ 25MHz   0.3 dB                              |

| <b>DC Offset</b> | <b>CH1</b>   | <b>CH2</b>   |
|------------------|--|--|
| Range (DC)       | 5V (50Ω)<br>10 V (High Z)  | 1.5V (50Ω)<br>3 V (High Z)                                       |
| Accuracy         | $\pm (2\% \text{ of the }  \text{Offset Setting}  + 2\text{mV})$ | $\pm (2\% \text{ of the }  \text{Offset Setting}  + 2\text{mV})$ |

| <b>Waveform Output</b>    | <b>CH1</b>  | <b>CH2</b>              |
|---------------------------|---|-------------------------|
| Impedance                 | 50 Ω (Typical)  | 50 Ω (Typical)          |
| Protection <sup>[2]</sup> | Short-circuit protected,<br>overload relay<br>automatically disables<br>main output | Short-circuit protected |

| <b>AM (CH1)</b>      |   |
|----------------------|---|
| Carrier Waveforms    | Sine, Square, Ramp, Arb (Except DC)                                   |
| Source               | Internal/ External  |
| Modulating Waveforms | Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb<br>(2mHz to 20kHz) |
| Depth                | 0% ~ 120%   |
| <b>FM (CH1)</b>      |   |
| Carrier Waveforms    | Sine, Square, Ramp, Arb (Except DC)                                   |
| Source               | Internal/ External  |
| Modulating Waveforms | Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb<br>(2mHz to 20kHz) |
| Frequency Deviation  | DC ~ 10 MHz   |
| <b>PM (CH1)</b>      |   |
| Carrier Waveforms    | Sine, Square, Ramp, Arb (Except DC)                                   |
| Source               | Internal/ External  |
| Modulating Waveforms | Sine, Square, UpRamp, DnRamp, Triangle, Noise, Arb                    |

|                      |                                       |
|----------------------|---------------------------------------|
|                      | (2mHz to 20kHz)                       |
| Phase Deviation      | 0 to 360°                             |
| <b>FSK (CH1)</b>     |                                       |
| Carrier Waveforms    | Sine, Square, Ramp, Arb (Except DC)   |
| Source               | Internal/ External                    |
| Modulating Waveforms | 50% duty cycle square (2mHz to 50kHz) |

|                    |                                     |
|--------------------|-------------------------------------|
| <b>Sweep (CH1)</b> |                                     |
| Carrier Waveforms  | Sine, Square, Ramp, Arb (Except DC) |
| Type               | Linear or Logarithmic               |
| Direction          | Up or Down                          |
| Sweep Time         | 1 ms to 500 s $\pm$ 0.1%            |
| Source             | Internal/External/Manual            |

|                    |   |
|--------------------|---|
| <b>Burst (CH1)</b> |   |
| Waveforms          | Sine, Square, Ramp, Pulse, Noise, Arb (Except DC) |
| Types              | Count (1 to 50,000 periods), infinite, gated      |
| Start Phase        | -180° to +180°                                    |
| Internal Period    | 1 $\mu$ s – 500s $\pm$ 1%                         |
| Gate Source        | External Trigger                                  |
| Trigger Source     | Internal/External/Manual                          |

|   |  |
|---|--|
| <b>Rear Panel Connector<sup>[3]</sup></b> |  |
| External Modulation                       | $\pm$ 5 V <sub>PK</sub> = 100% modulation<br>5k $\Omega$ input impedance |
| External Trigger                          | TTL-compatible   |

|                      |                                |
|----------------------|--------------------------------|
| <b>Trigger Input</b> |                                |
| Input Level          | TTL-compatible                 |
| Slope                | Rising or falling (selectable) |
| Pulse Width          | > 100 ns                       |
| Input Impedance      | > 10 k $\Omega$ , DC coupled   |
| Latency              | Sweep: < 500 $\mu$ s (Typical) |

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|--|---------------------------|
|  | Burst: < 500 ns (Typical) |
|--|---------------------------|

| <b>Trigger Output</b> |                                  |
|-----------------------|----------------------------------|
| Level                 | TTL-compatible into >1k $\Omega$ |
| Pulse Width           | > 400ns (Typical)                |
| Output Impedance      | 50 $\Omega$ (Typical)            |
| Maximum Rate          | 1 MHz                            |

| <b>Sync Output (CH1)</b> |                                  |
|--------------------------|----------------------------------|
| Level                    | TTL-compatible into >1k $\Omega$ |
| Pulse Width              | > 50ns (Typical)                 |
| Output Impedance         | 50 $\Omega$ (Typical)            |
| Maximum Frequency        | 2 MHz                            |

| <b>Counter Specification</b>                         |  |   |  |
|--|--|---|--|
| Function   | Frequency, period, positive/negative Pulse width, Duty cycle |   |  |
| Frequency range                                      | Single channel: 100MHz ~ 200MHz                              |   |  |
| Frequency resolution                                 | 6 digits/second  |   |  |
| Voltage range and sensitivity (not modulated signal) |  |   |  |
| Auto mode  | 1Hz to 200MHz  | 200 mV <sub>PP</sub> to 5 V <sub>PP</sub>       |  |
| Manual mode  | DC   | DC offset range                                 | $\pm 1.5$ VDC                                  |
|  |  | 100MHz~100MHz                                   | 20m VRMS to $\pm 5$ Vac+dc                     |
|  | AC   | 100MHz~200MHz                                   | 40m VRMS to $\pm 5$ Vac+dc                     |
|  |  | 1Hz~100MHz                                      | 50m V <sub>PP</sub> to $\pm 5$ V <sub>PP</sub> |
|  | 100MHz~200MHz  | 100m V <sub>PP</sub> to $\pm 5$ V <sub>PP</sub> |  |
| Pulse width and Duty cycle measure                   | 1Hz to 10MHz (100mV <sub>PP</sub> ~ 10V <sub>PP</sub> )      |   |  |
| Input adjust   | Input impedance  |   | 1M $\Omega$                                    |
|  | Coupling mode  |   | AC, DC   |
|  | High frequency restrain                                      |   | High frequency noise restrain (HFR) on or off  |
|  | sensitivity  |   | Low, Medium, High                              |

|              |  |
|--------------|--|
| Trigger mode | The trigger level can adjust manually/ automatically |
|              | Trigger level range: $\pm 3$ V (0.1% to 100%)        |
|              | Resolution: 6 mV                                     |

**NOTE:**

[1] In atypical condition, the specification may have minor differences.

[2] In normal temperature, short circuit in less than half hour will be tolerable.

- CH1 is provided with **Overvoltage** function. When the output terminal is connected to an external circuit, the relationships between the output voltage "Vout" of generator and the voltage "Vin" possibly generated by external circuit are:

If  $V_{out} \leq 1V_{DC}$ , the protective range of Vin is  $\pm 6.5V$

If  $V_{out} > 1V_{DC}$ , the protective range of Vin is  $\pm 12.5V$

Thereinto,  $V_{out} = \text{Amplitude}/2 + |\text{Offset}|$ , the Amplitude and Offset are the parameters of the signal outputted from generator.

The generator will cut off the output automatically when Vin exceeds the specified range.

- The voltage inputted to the output connector of CH2 should be within  $\pm 3V$ .

[3] External input voltage should be within  $\pm 5V$ , or else the generator may be damaged.

## General Specifications

| <b>Display</b>     |                              |
|--------------------|------------------------------|
| Type               | Black and White LCD Screen   |
| Resolution         | 256 Horizontal x 64 Vertical |
| Grey Degree        | 4 Grey Level                 |
| Contrast (typical) | 150 : 1                      |
| Light (typical)    | 300 nit                      |

| <b>Power</b> |   |
|--------------|---|
| Supply       | 100-240 VAC <sub>RMS</sub> , 45~440Hz, CAT II |
| Consumption  | Less than 40W                                 |
| Fuse         | 2A, T Level , 250V                            |

| <b>Environment</b> |                                     |
|--------------------|-------------------------------------|
| Temperature Range  | Operation: 10°C~+40°C               |
|                    | Non-operation: -20°C~+60°C          |
| Cooling            | Natural cooling                     |
| Humidity Range     | Below +35°C: ≤90% relative humidity |
|                    | +35°C~+40°C: ≤60% relative humidity |
| Height Range       | Operation: below 3,000m             |
|                    | Non-operation: below 15,000m        |

| <b>Instrument Specifications</b> |                  |        |
|----------------------------------|------------------|--------|
| Dimension                        | Width            | 232mm  |
|                                  | Height           | 108mm  |
|                                  | Depth            | 288mm  |
| Weight                           | Package excluded | 2.65kg |
|                                  | Package Included | 4kg    |

| <b>IP Protection</b> |
|----------------------|
| IP2X                 |

| <b>Calibration Interval</b> |
|-----------------------------|
| One year suggested          |