

# DGE3000 Series Single-Channel Arbitrary Waveform Generator

## Technical Specifications

All technical specifications are guaranteed when the following conditions are met, unless otherwise stated.

- The signal generator must be operated continuously for more than 30 minutes at the specified operating temperature (20°C to 30°C) to meet these specifications;
- The signal generator is in the calibration interval and has performed a self-calibration.

In addition to the specifications marked with the word "Typical", the specifications used are guaranteed.

## Waveforms

| Waveforms           |                                                                                                                                                       |           |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Bandwidth           | DGE3031                                                                                                                                               | 30 MHz    |
|                     | DGE3061                                                                                                                                               | 60 MHz    |
| Sample Rate         | DGE3031                                                                                                                                               | 125 MSa/s |
|                     | DGE3061                                                                                                                                               | 300 MSa/s |
| Vertical Resolution | 14 bits                                                                                                                                               |           |
| Channel             | 1                                                                                                                                                     |           |
| Standard Waveforms  | Sine wave, square wave, ramp wave, pulse wave, noise                                                                                                  |           |
| Arbitrary Waveforms | Sinc, exponential rise, exponential decline, electrocardiogram, Gaussian, semi-positive, Lorentz, dual audio, DC voltage totaling more than 160 kinds |           |

## Frequency Characteristics

| Frequency Characteristics (Frequency resolution to 1 $\mu$ Hz) |                                     |                    |
|----------------------------------------------------------------|-------------------------------------|--------------------|
| Sine wave                                                      | DGE3031                             | 1 $\mu$ Hz ~ 30MHz |
|                                                                | DGE3061                             | 1 $\mu$ Hz ~ 60MHz |
| Square wave                                                    | DGE3031                             | 1 $\mu$ Hz ~ 15MHz |
|                                                                | DGE3061                             | 1 $\mu$ Hz ~ 20MHz |
| Pulse wave                                                     | DGE3031                             | 1 $\mu$ Hz ~ 15MHz |
|                                                                | DGE3061                             | 1 $\mu$ Hz ~ 20MHz |
| Ramp wave                                                      | DGE3031                             | 1 $\mu$ Hz ~ 1 MHz |
|                                                                | DGE3061                             | 1 $\mu$ Hz ~ 2 MHz |
| Noise wave (-3 dB)                                             | 20 MHz BW(AWGN)                     |                    |
| Arbitrary wave                                                 | 1 $\mu$ Hz - 10 MHz                 |                    |
| Frequency resolution                                           | 1 $\mu$ Hz or 7 significant figures |                    |
| Frequency stability                                            | $\pm$ 30 ppm at 0 $\pm$ 40°C        |                    |

|                      |                  |
|----------------------|------------------|
| Frequency aging rate | ±30 ppm per year |
|----------------------|------------------|

## Amplitude Characteristics

| Amplitude Characteristics (not specifically labeled, the load defaults to 50Ω) |                                                           |                                                                                                                                                                                |
|--------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output amplitude                                                               | DGE3031                                                   | 2mVpp ~ 20Vpp(≤ 10MHz)High Z<br>2mVpp ~ 10Vpp(≤ 30MHz)High Z<br>1mVpp ~ 10Vpp(≤ 10MHz)50 Ω<br>1mVpp ~ 5Vpp(≤ 30MHz)50 Ω                                                        |
|                                                                                | DGE3061                                                   | 2mVpp ~ 20Vpp(≤ 10MHz)High Z<br>2mVpp ~ 10Vpp(≤ 60MHz)High Z<br>1mVpp ~ 10Vpp(≤ 10MHz)50 Ω<br>1mVpp ~ 5Vpp(≤ 60MHz)50 Ω                                                        |
| Amplitude accuracy                                                             | ± (1% of setting + 1 mVpp) (Typical 1kHz sine, 0V offset) |                                                                                                                                                                                |
| Amplitude resolution                                                           | 1mVpp or 4 digits                                         |                                                                                                                                                                                |
| DC offset range (AC +DC)                                                       | DGE3031                                                   | ±(10 Vpk–Amplitude Vpp/2) High Z(≤ 10MHz)<br>±(5Vpk - Amplitude Vpp/2) High Z(≤ 30MHz)<br>±(5 Vpk – Amplitude Vpp/2) 50Ω(≤ 10MHz)<br>±(2.5 Vpk – Amplitude Vpp/2) 50Ω(≤ 30MHz) |
|                                                                                | DGE3061                                                   | ±(10Vpk – Amplitude Vpp/2)High Z(≤ 10MHz)<br>±(5Vpk–Amplitude Vpp/2) High Z(≤ 60MHz)<br>±(5 Vpk - Amplitude Vpp/2) 50Ω(≤ 10MHz)<br>±(2.5 Vpk– Amplitude Vpp/2) 50Ω(≤ 60MHz)    |
| DC offset accuracy                                                             | ± (1 % of  setting  + 1 mV + amplitude Vpp * 0.5%)        |                                                                                                                                                                                |
| Offset resolution                                                              | 1 mVpp or 4 digits                                        |                                                                                                                                                                                |
| Output Impedance                                                               | 50Ω (Typical)                                             |                                                                                                                                                                                |

## Signal Characteristics

| Signal Characteristics                                  |                                 |                                                                                            |
|---------------------------------------------------------|---------------------------------|--------------------------------------------------------------------------------------------|
| Sine                                                    |                                 |                                                                                            |
| Bandwidth flatness (relative to 1 kHz Sine wave, 1 Vpp) | DGE3031                         | ≤10MHz: ±0.3dB<br>≤30MHz: ±0.5dB                                                           |
|                                                         | DGE3061                         | ≤10MHz: ±0.3dB<br>≤35MHz: ±0.5dB<br>≤60MHz: ±1dB                                           |
| Harmonic distortion                                     | DGE3031                         | Typical (0dBm)<br>DC to 1MHz: <-65dBc<br>1MHz to 30MHz: <-60dBc                            |
|                                                         | DGE3061                         | Typical (0dBm)<br>DC to 1MHz: <-65dBc<br>1MHz to 35MHz: <-60dBc<br>35MHz to 60MHz: <-50dBc |
| Total harmonic distortion                               | < 0.2 %, 10 Hz to 20 kHz, 1 Vpp |                                                                                            |

|                                   |                                                                            |               |
|-----------------------------------|----------------------------------------------------------------------------|---------------|
| Non-harmonic distortion           | Typical (0dBm)<br>≤10MHz: <-70dBc<br>>10MHz: <-70dBc + 6dB/ sound interval |               |
| Phase noise                       | Typical (0dBm, 10kHz offset)<br>10MHz: ≤ -110dBc/Hz                        |               |
| Square                            |                                                                            |               |
| Rise/fall time                    | < 20ns                                                                     |               |
| Jitter (rms), typical (1Vpp, 50Ω) | 200ps + 30ppm                                                              |               |
| Overshoot                         | < 5%                                                                       |               |
| Ramp                              |                                                                            |               |
| Linearity                         | < 1% of peak output (typical 1 kHz,1 Vpp, symmetry 50%)                    |               |
| Symmetry                          | 0% to 100%                                                                 |               |
| Pulse                             |                                                                            |               |
| Period                            | DGE3031                                                                    | 67 ns to 1 Ms |
|                                   | DGE3061                                                                    | 50 ns to 1 Ms |
| Pulse Width                       | ≥ 24ns                                                                     |               |
| Rise and fall time                | ≥ 15ns                                                                     |               |
| Overshoot                         | < 5%                                                                       |               |
| Jitter(rms),typical (1Vpp, 50Ω)   | 200ps + 30ppm                                                              |               |
| Noise                             |                                                                            |               |
| Types                             | Gaussian white noise                                                       |               |
| Bandwidth (-3dB)                  | 20 M                                                                       |               |
| Arbitrary wave                    |                                                                            |               |
| Bandwidth                         | 10M                                                                        |               |
| Waveform length                   | 2 to 100K points                                                           |               |
| Sampling rate                     | DGE3031                                                                    | 125 MSa/s     |
|                                   | DGE3061                                                                    | 300 MSa/s     |
| Amplitude accuracy                | 14 bits                                                                    |               |

## Modulation Characteristics

| Modulation Characteristics   |                                                                                    |
|------------------------------|------------------------------------------------------------------------------------|
| Modulation Type              | AM, DSB-AM, FM, PM, ASK, FSK, PSK, BPSK, QPSK, 3FSK, 4FSK, OSK, PWM, SUM           |
| AM                           |                                                                                    |
| Carrier                      | Sine wave, square wave, ramp wave, arbitrary wave (except DC) (ARB length is 8192) |
| Modulated signal source      | Internal or external                                                               |
| Internal modulation waveform | Sine wave, square wave, ramp wave, noise                                           |
| Internal amplitude           | 2 mHz to 100 kHz                                                                   |

|                                         |                                                                                    |
|-----------------------------------------|------------------------------------------------------------------------------------|
| modulation frequency                    |                                                                                    |
| Depth                                   | 0% to 100%                                                                         |
| <b>DSBAM</b>                            |                                                                                    |
| Carrier                                 | Sine wave, square wave, ramp wave, arbitrary wave (except DC) (ARB length is 8192) |
| Modulated signal source                 | Internal or external                                                               |
| Internal modulation waveform            | Sine wave, square wave, ramp wave                                                  |
| Internal amplitude modulation frequency | 2 mHz to 100 kHz                                                                   |
| Depth                                   | 0% to 100%                                                                         |
| <b>FM</b>                               |                                                                                    |
| Carrier                                 | Sine wave, square wave, ramp wave, arbitrary wave (except DC) (ARB length is 8192) |
| Modulated signal source                 | Internal or external                                                               |
| Internal modulation waveform            | Sine wave, square wave, ramp wave, noise                                           |
| Internal modulation frequency           | 2 mHz to 100 kHz                                                                   |
| Frequency offset                        | $1\ \mu\text{Hz} \leq \text{offset} < \text{carrier frequency}$                    |
| <b>PM</b>                               |                                                                                    |
| Carrier                                 | Sine wave, square wave, ramp wave, arbitrary wave (except DC) (ARB length is 8192) |
| Modulated signal source                 | Internal or external                                                               |
| Internal modulation waveform            | Sine wave, square wave, ramp wave, noise                                           |
| Internal phase modulation frequency     | 2 mHz to 100 kHz                                                                   |
| Phase deviation range                   | 0° to 180°                                                                         |
| <b>PWM</b>                              |                                                                                    |
| Carrier                                 | Pulse wave                                                                         |
| Modulated signal source                 | Internal or external                                                               |
| Internal modulation waveform            | Sine wave, square wave, ramp wave, noise                                           |
| Internal phase modulation               | 2 mHz to 1 MHz                                                                     |

|                               |                                                                                      |
|-------------------------------|--------------------------------------------------------------------------------------|
| frequency                     |                                                                                      |
| Offset                        | 0% to Carrier pulse duty cycle                                                       |
| <b>ASK</b>                    |                                                                                      |
| Carrier                       | Sine wave, square wave, ramp wave, arbitrary wave(except DC) (ARB length is 8192)    |
| Modulated signal source       | Internal or external                                                                 |
| Internal modulation waveform  | 50% square wave                                                                      |
| Internal modulation amplitude | $0 \text{ mVpp} \leq \text{amplitude} < \text{carrier amplitude}$                    |
| ASK frequency                 | 2 mHz to 1MHz                                                                        |
| <b>PSK</b>                    |                                                                                      |
| Carrier                       | Sine wave, square wave, ramp wave, arbitrary wave(except DC) (ARB length is 8192)    |
| Modulated signal source       | Internal or external                                                                 |
| Internal modulation waveform  | 50% square wave                                                                      |
| PSK frequency                 | 2 mHz to 1MHz                                                                        |
| Phase deviation range         | 0°to 360°                                                                            |
| <b>FSK</b>                    |                                                                                      |
| Carrier                       | Sine wave, square wave, ramp wave, arbitrary wave(except DC) (ARB length is 8192)    |
| Modulated signal source       | Internal or external                                                                 |
| Internal modulation waveform  | 50% square wave                                                                      |
| FSK rate                      | 2 mHz to 1MHz                                                                        |
| FSK hop frequency             | $2\text{mHz} \leq \text{offset} < \text{maximum frequency of corresponding carrier}$ |
| <b>3FSK</b>                   |                                                                                      |
| Carrier                       | Sine wave, square wave, ramp wave, arbitrary wave(except DC) (ARB length is 8192)    |
| Modulated signal source       | Internal                                                                             |
| Internal modulation waveform  | 50% square wave                                                                      |
| FSK rate                      | 2 mHz to 1MHz                                                                        |
| <b>4FSK</b>                   |                                                                                      |
| Carrier                       | Sine wave, square wave, ramp wave, arbitrary wave(except DC) (ARB length is 8192)    |
| Modulated signal              | Internal                                                                             |

|                                         |                                                                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------|
| source                                  |                                                                                   |
| Internal modulation waveform            | 50% square wave                                                                   |
| FSK rate                                | 2 mHz to 1MHz                                                                     |
| <b>BPSK</b>                             |                                                                                   |
| Carrier                                 | Sine wave, square wave, ramp wave, arbitrary wave(except DC) (ARB length is 8192) |
| Modulated signal source                 | Internal                                                                          |
| Internal modulation waveform            | 50% square wave                                                                   |
| BPSK rate                               | 2 mHz to 1MHz                                                                     |
| Phase deviation range                   | 0°~360°                                                                           |
| Data source                             | 01patt, 10patt, PN15,PN21                                                         |
| <b>QPSK</b>                             |                                                                                   |
| Carrier                                 | Sine wave, square wave, ramp wave,arbitrary wave(except DC) (ARB length is 8192)  |
| Modulated signal source                 | Internal                                                                          |
| QPSK frequency                          | 2 mHz to 1MHz                                                                     |
| <b>OSK</b>                              |                                                                                   |
| Carrier                                 | Sine wave                                                                         |
| Modulated signal source                 | Internal                                                                          |
| Internal modulation waveform            | 50% square wave                                                                   |
| OSK frequency                           | 2 mHz to 100 kHz                                                                  |
| Oscillation time                        | 8ns to 250s                                                                       |
| <b>SUM</b>                              |                                                                                   |
| Carrier                                 | Sine wave, square wave, ramp wave,arbitrary wave(except DC) (ARB length is 8192)  |
| Modulated signal source                 | Internal or external                                                              |
| Internal amplitude modulation frequency | 2 mHz to 100 kHz                                                                  |
| Depth                                   | 0% to 100%                                                                        |

## Sweep Characteristics

| Sweep Characteristics |                                                                               |
|-----------------------|-------------------------------------------------------------------------------|
| Carrier               | Sine, square wave, ramp wave, arbitrary wave (Except DC) (ARB length is 8192) |
| Minimum/maximum       | 1 μHz(minimum)/                                                               |

|                                       |                                                                    |
|---------------------------------------|--------------------------------------------------------------------|
| starting frequency                    | maximum frequency of corresponding carrier                         |
| Minimum/maximum termination frequency | 1 $\mu$ Hz(minimum)/<br>maximum frequency of corresponding carrier |
| Types                                 | Linear, logarithmic                                                |
| Sweep time                            | 1 ms to 500 s $\pm$ 0.1%                                           |
| Trigger source                        | Internal, external, manual                                         |

## Burst Characteristics

| Burst Characteristics  |                                                                                                   |                                          |
|------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------|
| Waveform               | Sine wave, square wave, ramp wave, pulse wave and arbitrary wave (Except DC) (ARB length is 8192) |                                          |
| Types                  | N-cycle,Gated                                                                                     |                                          |
| N-cycle trigger source | Internal, external, manual                                                                        |                                          |
| Carrier frequency      | 1 $\mu$ Hz $\leq$ Offset $\leq$<br>Maximum frequency of corresponding carrier/2                   |                                          |
| N-cycle trigger cycle  | DGE3031                                                                                           | 67 ns $\sim$ 1 Ms(Min = Cycles * Period) |
|                        | DGE3061                                                                                           | 34 ns $\sim$ 1 Ms(Min = Cycles * Period) |
| periodicity            | 1 $\sim$ 60000(Max =Burst Period / Period)/infinite                                               |                                          |
| Gated source           | External trigger                                                                                  |                                          |

## Counter Specifications

| Counter Specifications |                                   |
|------------------------|-----------------------------------|
| Measurement function   | Frequency, period                 |
| Frequency Range        | Single channel :100 mHz - 200 MHz |
| Frequency resolution   | 6 digits                          |
| Input resistance       | 1 M $\Omega$                      |

## Input/Output Characteristics

| Input/Output Characteristics     |                                |
|----------------------------------|--------------------------------|
| Communication Interface          | USB Host, USB Device           |
| <b>External modulation input</b> |                                |
| Input frequency range            | DC - 20 kHz                    |
| Input level range                | $\pm$ 1V full scale            |
| Input impedance                  | 10 k $\Omega$ (typical)        |
| <b>External trigger input</b>    |                                |
| Level                            | TTL-compatible                 |
| Slope                            | Rising or falling (selectable) |
| Pulse Width                      | >100ns                         |
| <b>Sync Output</b>               |                                |
| Level                            | TTL-compatible                 |
| Maximum frequency                | 1MHz                           |

## General Specifications

|                                 |                                                                                  |
|---------------------------------|----------------------------------------------------------------------------------|
| <b>Display</b>                  |                                                                                  |
| Display type                    | 3.6-inch color LCD display                                                       |
| Display resolution              | 480 Horizontal ×272 Vertical pixels                                              |
| Display color                   | 65536 colors, 16 bits, TFT                                                       |
| <b>Power</b>                    |                                                                                  |
| Voltage                         | 100- 240 VAC, 50/60 Hz, CAT II                                                   |
| Power consumption               | Less than 15W                                                                    |
| Fuse                            | 250V, F1AL                                                                       |
| <b>Environment</b>              |                                                                                  |
| Temperature                     | Working temperature: 0 °C to 40 °C                                               |
|                                 | Storage temperature: -20 °C to 60 °C                                             |
| Relative humidity               | Less than 35°C: ≤ 90% relative humidity<br>35°C to 40°C: ≤ 60% relative humidity |
| Height                          | Operating 3,000 meters<br>Non-operation 12,000 meters                            |
| <b>Mechanical Specification</b> |                                                                                  |
| Dimension                       | 200mm (Length) × 92 mm (Height) × 145mm (Width)                                  |
| Weight                          | Approx. 0.8 kg                                                                   |
| <b>Others</b>                   |                                                                                  |
| Adjustment interval             | The recommended calibration interval is one year                                 |



V1.0.1