Keysight 33210A
10 MHz Function/Arbitrary Waveform Generator

- 10 MHz Sine and Square waveforms
- Pulse, Ramp, Triangle, Noise, and DC waveforms
- Optional 14-bit, 50 MSa/s, 8K point Arbitrary Waveform Generator
- AM, FM, and PWM modulation types
- Linear & logarithmic sweeps and burst operation
- 10 mVpp to 10 Vpp amplitude range
- Graph mode for visual verification of signal settings
- Connect via USB, GPIB and LAN
- Fully compliant to LXI Class C specification
Uncompromising performance at an affordable price

The Keysight Technologies, Inc. 33210A function/arbitrary waveform generator is the latest addition to the 332XX family. Waveforms are generated using direct digital synthesis (DDS) technology which creates stable, accurate low distortion sine waves as well as square waves with fast rise and fall times up to 10 MHz and linear ramp waves up to 100 kHz. For user defined waveforms, Option 002 provides 14-bit, 50 Msa/s 8K point arbitrary waveform generation.

Pulse generation

The 33210A can generate variable-edge-time pulses up to 5 MHz. With variable period, pulse width, and amplitude the 33210A is ideally suited to a wide variety of applications requiring a flexible pulse signal.

Custom waveform generation (Option 002)

The optional 8K point arbitrary waveform generator (Option 002) can be used in the 33210A to generate complex custom waveforms. With 14-bit resolution, and a sampling rate of 50 Msa/s, the 33210A gives you the flexibility to create the waveforms you need. It also lets you store up to four waveforms in nonvolatile memory.

The Keysight IntuiLink arbitrary waveform software allows you to easily create, edit, and download complex waveforms using the waveform editor. Or you can capture a waveform using IntuiLink for Oscilloscopes and send it to the 33210A for output. To find out more about IntuiLink, visit www.keysight.com/find/intuilinx

Easy-to-use functionality

Front-panel operation of the 33210A is straightforward and user friendly. You can access all major functions with a single key or two. The knob or numeric keypad can be used to adjust frequency, amplitude, offset, and other parameters. You can even enter voltage values directly in Vpp, Vrms, dBm, or as high and low levels. Timing parameters can be entered in Hertz (Hz) or seconds.

Internal AM, FM, and PWM modulation make it easy to modulate waveforms without the need for a separate modulation source. Linear and logarithmic sweeps are also built in, with sweep rates selectable from 1 ms to 500 s. Burst mode operation allows for a user-selected number of cycles per trigger. GPIB, LAN, and USB interfaces are all standard, plus you get full programmability using SCPI commands.

External frequency reference (Option 001)

The 33210A external frequency reference lets you synchronize to an external 10 MHz clock, to another 33210A, or to a Keysight 33220A or Keysight 33250A. Phase adjustments can be made from the front panel or via a computer interface, allowing precise phase calibration and adjustment.

Measurement Characteristics

**Waveforms**

<table>
<thead>
<tr>
<th>Waveforms</th>
<th>Sine, Square, Ramp, Triangle, Pulse, Noise, DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Built-in arbitrary waveforms (available only with Option 002 ARB)</td>
<td>Exponential rise, Exponential fall, Negative ramp, Sin(x)/x, Cardiac</td>
</tr>
</tbody>
</table>

**Waveform characteristics**

- **Sine**
  - Frequency range: 1 mHz to 10 MHz
  - Amplitude: 1 Vpp
  - Flatness: 0.1 dB (relative to 1 kHz)

- **Square**
  - Frequency range: 1 mHz to 10 MHz
  - Rise/fall time: 20 ns
  - Overshoot: < 2%

- **Ramp, triangle**
  - Frequency range: 1 mHz to 100 kHz
  - Linearity: < 0.1% of peak output

- **Pulse**
  - Frequency range: 1 mHz to 5 MHz
  - Pulse width: 40 ns minimum

- **Noise**
  - Bandwidth: 7 MHz typical

**8K-point arbitrary waveform generator (Option 002)**

<table>
<thead>
<tr>
<th>Waveforms</th>
<th>1 MHz to 3 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waveform length</td>
<td>2 to 8 k points</td>
</tr>
<tr>
<td>Amplitude resolution</td>
<td>14 bits (including sign)</td>
</tr>
<tr>
<td>Sample rate</td>
<td>50 Msa/s</td>
</tr>
<tr>
<td>Min. rise/fall time</td>
<td>70 ns typical</td>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; 0.1% of peak output</td>
</tr>
</tbody>
</table>
Measurement Characteristics (continued)

<table>
<thead>
<tr>
<th>Settling time</th>
<th>&lt; 500 ns to 0.5% of final value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jitter (RMS)</td>
<td>6 ns + 30 ppm</td>
</tr>
<tr>
<td>Non-volatile memory</td>
<td>4 waveforms</td>
</tr>
</tbody>
</table>

**Common characteristics**

**Frequency**
- **Accuracy**
  - ± (10 ppm + 3 pHz) in 90 days
  - ± (20 ppm + 3 pHz) in 1 year
- **Resolution**
  - 1 µHz (internal)
  - 1 mHz (user)

**Amplitude**
- **Range**
  - 10 mVpp to 10 Vpp into 50 Ω
  - 20 mVpp to 20 Vpp into open circuit
- **Accuracy**
  - ± 2% of setting
  - ± 1 mVpp
- **Units**
  - Vpp, Vrms, dBm
- **Resolution**
  - 3 digits

**DC offset**
- **Range**
  - ± 5 V into 50 Ω
  - ± 10 V into open circuit
- **Accuracy**
  - ± 2% of offset setting
  - ± 0.5% of amplitude
  - ± 2 mV
- **Resolution**
  - 3 digits

**Main output**
- **Impedance**
  - 50 Ω typical
- **Isolation**
  - ± 42 Vpk maximum to earth
- **Protection**
  - Short-circuit protected, overload automatically disables main output

**External frequency reference (Option 001)**

**Rear panel input**
- **Lock range**
  - 10 MHz ± 500 Hz
- **Level**
  - 100 mVpp to 5 Vpp
- **Impedance**
  - 1 kΩ, typical
- **Lock time**
  - < 2 seconds

**Rear panel output**
- **Frequency**
  - 10 MHz
- **Level**
  - 632 mVpp (0 dBm), typical
- **Impedance**
  - 50 Ω, typical
- **AC coupled**

**Phase offset**
- **Range**
  - +360° to –360°
- **Resolution**
  - 0.001°
- **Accuracy**
  - ± 20 ns

**Modulation**

**AM**
- **Carrier waveforms**
  - Sine, Square
- **Source**
  - Internal/External
- **Internal modulation**
  - Sine, Square, Ramp, Triangle, Noise, Arb²
  - (2 mHz to 20 kHz)
- **Depth**
  - 0.0% to 120.0%

**FM**
- **Carrier waveforms**
  - Sine, Square
- **Source**
  - Internal/External
- **Internal modulation**
  - Sine, Square, Ramp, Triangle, Noise, Arb²
  - (2 mHz to 20 kHz)

**Deviation**
- **DC to 5 MHz**

**PWM**
- **Carrier waveforms**
  - Pulse
- **Source**
  - Internal/External
- **Internal modulation**
  - Sine, Square, Ramp, Triangle, Noise, Arb²
  - (2 mHz to 20 kHz)
- **Deviation**
  - 0% to 100% of pulse width

**External modulation input (for AM, FM, PWM)**
- **Voltage range**
  - ± 5 V full scale
- **Input impedance**
  - 5 kΩ typical
- **Bandwidth**
  - DC to 20 kHz

**Sweep**
- **Waveforms**
  - Sine, Square, Ramp
- **Type**
  - Linear or Logarithmic
- **Direction**
  - Up or Down
- **Sweep time**
  - 1 ms to 500 s
- **Trigger source**
  - Single, External or Internal
- **Marker**
  - Falling edge of sync signal (programmable frequency)

**Burst**
- **Waveforms**
  - Sine, Square, Ramp
- **Type**
  - Counted (1 to 50,000 cycles), Infinite, Gated
- **Start/stop phase**
  - +360° to –360°
- **Internal period**
  - 1 µs to 500 s
- **Gate source**
  - External trigger
- **Trigger source**
  - Single, External or Internal

**Trigger characteristics**

**Trigger input**
- **Input level**
  - TTL compatible
- **Slope**
  - Rising or Falling, selectable
- **Pulse width**
  - > 100 ns
- **Input impedance**
  - > 10 kΩ, DC coupled
- **Latency**
  - < 500 ns
- **Jitter (rms)**
  - 6 ns (3.5 ns for pulse)

**Trigger output**
- **Level**
  - TTL compatible into ± 1 kΩ
- **Pulse width**
  - > 400 ns
- **Output impedance**
  - 50 Ω typical
- **Maximum rate**
  - 1 MHz
- **Fanout**
  - ≤ 4 Keysight 33210As (or equivalent)

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1. Add 1/10th of output amplitude and offset spec per °C for operation outside the range of 18 to 28 °C
2. Autorange enabled
3. DC offset set to 0 V
4. Spurious output at low amplitude is –75 dBm typical
5. Add 1 ppm/°C average for operation outside the range of 18 to 28 °C
6. Sine and square waveforms above 3 MHz are allowed only with an “infinite” burst count
7. Only available if Option 002 is installed
### Ordering Information

**Keysight 33210A**

10 MHz function/arbitrary waveform generator

**Accessories included**

Operating manual, service manual, quick reference guide, IntuiLink waveform editor software, test data, USB cable, and power cord (see language option).

**Options**

- **Opt. 001** External timebase reference
- **Opt. 002** 8K-point arbitrary waveform generator
- **Opt. A6J** ANSI Z540 calibration
- **Opt. AB0** Taiwan: Chinese manual
- **Opt. AB1** Korea: Korean manual
- **Opt. AB2** China: Chinese manual
- **Opt. ABA** English: English manual
- **Opt. ABD** Germany: German manual
- **Opt. ABF** France: French manual
- **Opt. ABJ** Japan: Japanese manual
- **Opt. PLG** Continental European power cord

**Other Accessories**

- **34131A** Carrying case
- **34161A** Accessory pouch
- **34190A** Rackmount kit
- **34191A** Dual flange kit, 2U
- **34194A** Dual lock link kit
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