

Model 3390 Arbitrary Waveform Generator

Specifications

Keithley Instruments

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DISPLAY: Graph mode for visual verification of signal settings.

CAPABILITY:

Standard waveforms: Sine, Square, Ramp, Triangle, Pulse, Noise, DC

Built-in arbitrary waveforms: Exponential Rise and Fall, Negative ramp, Sin(x)/x, Cardiac

WAVEFORM CHARACTERISTICS

Sine	Specification
Frequency	1 μ Hz to 50MHz
Amplitude Flatness ^{1,2} (Relative to 1KHz)	0.1dB(<100KHz) 0.15dB(100kHz to 5MHz) 0.3dB(5MHz to 20MHz) 0.5dB(20MHz to 50MHz)
Harmonic distortion ^{2,3} (unit: dBc)	DC to 20kHz: -60(<1Vpp) -60(\geq 1Vpp) 20 kHz to 100 KHz: -65(<1Vpp) -60(\geq 1Vpp) 100 kHz to 1 MHz: -50(<1Vpp) -45(\geq 1Vpp) 1 MHz to 20 MHz: -40(<1Vpp) -35(\geq 1Vpp) 20 MHz to 50 MHz: -30(<1Vpp) -30(\geq 1Vpp)
Total harmonic distortion ^{2,3}	DC to 20kHz, V \geq 0.5Vpp THD \leq 0.06%, typical
Spurious ^{2,4} (non-harmonic)	DC to 1MHz -70dBc 1MHz to 50MHz -70dBc + 6dB/octave
Phase Noise (10K Offset)	-115 dBc/Hz, typical when f \geq 1MHz, V \geq 0.1Vpp

Square	Specification
Frequency	1 μ Hz to 25MHz
Rise/Fall time	< 10ns
Overshoot	< 2%
Variable Duty Cycle	20% to 80% (to 10MHz) 40% to 60% (to 25MHz)
Asymmetry	1% of period + 5ns (@ 50% duty)
Jitter (RMS)	1ns + 100ppm of period

Ramp, Triangle	Specification
Frequency	1 μ Hz to 200kHz
Linearity	< 0.25% of peak output
Symmetry	0.0% ~ 100.0%

¹ Add 10%/°C of spec for offset and amplitude for operation outside the range of 18°C to 28°C

² Autorange enabled

³ DC offset set to 0V

⁴ Spurious output at low amplitude is -75dBm typical

Specifications are subject to change without notice.



Pulse	Specification
Frequency	500µHz to 10MHz
Pulse width	20ns minimum 10ns res. (period ≤ 10s)
Variable Edge Time	<10ns to 100ns
Overshoot	<2%
Jitter (RMS)	300ps + 0.1ppm of period

Noise	Specification
Bandwidth	20MHz typical

Arbitrary	Specification
Frequency	1µHz to 10MHz
Length	2 to 256K
Resolution	14 bits (including sign)
Sample Rate	125Msa/s
Min Rise/Fall Time	30ns typical
Linearity	<0.1% of peak output
Settling Time	<250ns to 0.5% of final value
Jitter(RMS)	6ns + 30ppm
Non-volatile Memory	4 waveforms * 256K Points

Common Characteristic	Specification
Frequency Resolution	1µHz
Amplitude Range	10mVpp to 10Vpp in 50Ω 20mVpp to 20Vpp in Hi-Z
Amplitude Accuracy ^{1,2} (@ 1KHz)	±1% of setting ±1mVpp
Amplitude Units	Vpp, Vrms, dBm
Amplitude Resolution	4 digits
DC Offset Range (Peak AC + DC)	±5V in 50Ω ±10V in Hi-Z
DC Offset Accuracy ^{1,2}	±2% of offset setting ±0.5% of amplitude setting
DC Offset Resolution	4 digits
Main Output Impedance	50Ω typical
Main Output Isolation	42Vpk maximum to earth
Main Output Protection	Short-circuit protected; overload automatically disables main output
Internal Frequency Reference Accuracy ⁵	±10ppm in 90 days ±20ppm in 1 year
External Frequency Reference Standard/Option	Standard
External Frequency Input: Lock Range Level Impedance Lock Time	10MHz ± 500Hz 100mVpp ~ 5Vpp 1KΩ typical, AC coupled <2 s
External Lock Range	10MHz
Frequency Output: Level Impedance	632mVpp (0dBm), typical 50Ω typical, AC coupled

⁵ Add 1ppm/°C average for operation outside the range of 18°C to 28°C

Common Characteristic	Specification
Phase Offset: Range Resolution Accuracy	-360° to +360° 0.001° 8ns
Modulation	Specification
Modulation Type	AM, FM, PM, FSK, PWM, Sweep and Burst
AM: Carrier Source Internal Modulation Frequency (Internal) Depth	Sine, Square, Ramp, Arb Internal/External Sine, Square, Ramp, Triangle, Noise, Arb 2mHz to 20KHz 0.0% ~ 120.0%
FM: Carrier Source Internal Modulation Frequency (Internal) Deviation	Sine, Square, Ramp, Arb Internal/External Sine, Square, Ramp, Triangle, Noise, Arb 2mHz to 20KHz DC ~ 25MHz
PM: Carrier Source Internal Modulation Frequency (Internal) Deviation	Sine, Square, Ramp, Arb Internal/External Sine, Square, Ramp, Triangle, Noise, Arb 2mHz to 20KHz 0.0° to 360°
PWM: Carrier Source Internal Modulation Frequency (Internal) Deviation	Pulse Internal/External Sine, Square, Ramp, Triangle, Noise, Arb 2mHz to 20KHz 0% ~ 100% of pulse width
FSK: Carrier Source Internal Modulation Frequency (Internal)	Sine, Square, Ramp, Arb Internal/External 50% duty cycle Square 2mHz to 100KHz
External Modulation Input ⁶ : Voltage Range Input Resistance Bandwidth	±5V full scale 8.7KΩ typical DC to 20KHz
SWEEP: Waveforms Type Direction Sweep Time Trigger Marker	Sine, Square, Ramp, Arb Linear or logarithmic Up or down 1ms ~ 500s Internal, External or Manual Falling edge of sync signal (programmable frequency)

⁶ FSK uses trigger input (1MHz maximum)

Modulation	Specification
BURST⁷ Waveforms Type Start/Stop Phase Internal Period Gated Source Trigger Source	Sine, Square, Ramp, Triangle, Noise, Arb Internal/External -360° to +360° 1µs ~ 500s External trigger Internal, External or Manual
Trigger Input: Level Slope Pulse width Impedance Latency	TTL compatible Rising or Falling (Selectable) >100ns >10KΩ, DC coupled <500ns
Trigger Output: Level Pulse width Output Impedance Maximum rate Fan-out	TTL compatible into ≥1KΩ >400ns 50Ω typical 1MHz ≤4 Keithley 3390s

Pattern Mode CHARACTERISTIC	Specification
Clock Maximum Rate	50MHz
Output: Level Output Impedance	TTL compatible into ≥2KΩ 110Ω typical
Pattern Length	2 to 256K

General	Specification
Power Supply	110-240VAC ±10%
Power Cord Freq.	50Hz to 60Hz
Power Consumption	50VA max
Operating Environment	0°C to 50°C
Storage Temperature	-30°C to 70°C
Interface	USB, LAN, LXI-C, GPIB
Language	SCPI-1993, IEEE-488.2
Dimensions	107(H) x 224(W) x 380(D)mm
Weight	4.08Kg
Safety	Conforms with European Union Directive 2006/95/EC, EN 61010-1
EMC	Conforms with European Union Directive 2004/108/EC, EN 61326-1
Warm-up Time	1 hour
Warranty	1 Year

⁷ Sine and square waveforms above 10MHz are allowed only with an "infinite" burst count