

# 39A Universal Waveform Generator

## Seven generators in one versatile box

- Universal waveforms up to 65,536 points with 12-bit resolution
- Waveform sequencing
- Synthesized function generator including square and sine waves to 16 MHz
- Pulse/pulse-train generator
- Trigger generator
- Sweep, AM and tone modes
- Multi-unit phase locking
- GPIB and RS-232 interfaces

Fluke's 39A universal waveform generator combines seven generators in one to provide extensive capabilities. For one low price, it is a universal waveform generator (arb), function generator, pulse/pulse-train generator, sweep generator, trigger generator, tone generator and AM modulation source.

**Universal waveform generator**  
Model 39A is a powerful 12-bit universal waveform generator with 65,536 points of waveform memory and clock speeds up to 40 MS/s. Up to 100 waveforms can be stored in non-volatile memory. Waveforms can be created and modified from the front panel or can be downloaded over the included RS-232 and GPIB interfaces with Fluke's WaveForm DSP2 software. For complex applications, multiple waveforms can be linked together in a sequence.



### Function generator

With 12 standard functions built-in, the 39A is an excellent function generator capable of generating square and sine waves to 16 MHz.

### Pulse and pulse-train generator

Single pulses and complex pulse trains are generated with programmable period, width, delay and amplitude. Pulse trains containing up to 10 independently programmed pulses provide a powerful capability not found in standard pulse generators.

### Versatile operating modes

Model 39A provides a wide range of operating modes including continuous, triggered burst, gated, frequency sweep, tone generation, external amplitude modulation and external signal summing modes.

### Remote operation

Model 39A comes standard with GPIB and RS-232 interfaces plus an RS-232 cable. All functions are programmable from the front panel or remotely.

### Phase locking

Multiple units may be phase locked for multi-channel applications. Phase angle is programmable between units.

### Stored settings

Up to 9 complete instrument setups can be stored in non-volatile memory and power-on settings are programmable.

### Value

Model 39A provides tremendous functionality at a very affordable price. At one low price, the 39A combines the capabilities of seven generators in one.

## 39A Universal Waveform Generator

### Specifications

Specifications apply at 18°C-28°C after 30 minutes warm-up, at maximum output into 50Ω.

#### Waveforms

##### Standard waveforms

Sine, square, triangle, DC, ramp, negative ramp, sin(x)/x, pulse, pulse train, cosine, haversine, havercosine.

##### Sine, cosine, haversine, havercosine

**Range:** 0.1 mHz to 16 MHz.

**Resolution:** 0.1 mHz (7 digits).

**Accuracy:** 10 ppm for 1 year.

**Stability:** < 1 ppm/°C.

##### Harmonic distortion:

< -60 dBc (0.1%) to 20 kHz.

< -50 dBc to 1 MHz.

< -35 dBc to 10 MHz.

##### Non-harmonic spurious:

< -65 dBc to 1 MHz.

##### Square

**Range:** 1 mHz to 16 MHz.

**Resolution:** 1 mHz (4 digits).

**Accuracy:** ± 1 digit of setting.

**Rise and fall times:** < 25 ns.

##### Triangle, ramps, sin(x)/x

**Range:** 0.1 mHz to 100 kHz.

**Resolution:** 0.1 mHz (7 digits).

**Accuracy:** 10 ppm for 1 year.

##### Linearity error:

< 0.1% to 30 kHz.

##### Pulse and pulse train

Trains of up to 10 pulses may be specified, each having independently defined width, delay and amplitude level. Baseline voltage is separately defined and the pulse/pulse-train repetition rate is set by the pulse/pulse-train period.

**Rise and fall times:** < 25 ns.

##### Period:

**Range:** 133.3 ns to 100s.

**Resolution:** 4 digits.

**Accuracy:** ± 1 digit of setting.

##### Delay:

**Range:** -99.9s to +99.9s.

##### Resolution:

0.002% of period or 33.33 ns.

##### Width:

**Range:** -33.33 ns to 99.99s.

##### Resolution:

0.002% of period or 33.33 ns.

#### Universal waveforms

Up to 50 universal (100 user defined) waveforms may be stored in RAM. Universal waveforms can be defined from front panel editing controls or by downloading waveforms via RS-232 or GPIB. Front panel editing tools include insertion of stored waveforms, point editing and line draw. Waveform DSP2 is an optional software tool for creating and downloading waveforms over RS-232 or GPIB.

**Memory size:** 65,536 points.

Maximum waveform size is 65,536 points, minimum waveform size is 4 points.

**Vertical resolution:** 12 bits.

##### Sample clock range:

100 mHz to 40 MHz.

**Resolution:** 4 digits.

**Accuracy:** ± 1 digit of setting.

##### Waveform sequencing:

Up to 16 waveforms may be linked. Each waveform can have a loop count of up to 32,768. A sequence of waveforms can be looped up to 1,048,575 times or run continuously.

#### Amplitude

**Output impedance:** 50Ω

**Range:** 2.5 mVpp to 10 Vpp (5 mVpp to 20 Vpp into open circuit). Amplitude can be specified open circuit (Hi Z) or into an assumed load of 50Ω or 600Ω in Vpp, Vrms or dBm.

##### Accuracy:

< 2% ± 1 mV at 1 kHz into 50Ω.

##### Amplitude flatness:

± 0.2 dB to 200 kHz; ± 1 dB to 5 MHz; ± 2 dB to 10 MHz.

**Resolution:** 3 digits or 1 mV.

#### Offset

##### Range:

± 5 Vp. DC offset plus signal peak limited to ± 10V into 50Ω

##### Accuracy:

Typically ± 3% plus 10 mV, unattenuated.

##### Resolution:

3 digits or 1 mV.

#### Output filter

Selectable between 10 MHz Elliptic, 10 MHz Bessel or none.

#### Operating modes

##### Continuous

The selected waveform is output continuously at the programmed frequency.

##### Triggered burst

Each active edge of the trigger signal will produce one burst of the waveform, starting and stopping at the waveform position specified by the sync marker setting.

##### Waveforms:

All standard and universal.

**Burst count:** 1 to 1,048,575.

# 39A Universal waveform generator

**Trigger source:**

Manual trigger key, internal trigger generator, external trigger input or remote trigger command.

**Trigger rate:** Internal trigger generator: DC to 100 kHz. External signal: DC to 1 MHz.

**Gated**

The selected waveform is output continuously at the programmed frequency while the selected trigger signal is true.

**Waveforms:** All standard and universal waveforms.

**Gate trigger source:**

Manual trigger key, internal trigger generator, external trigger input or remote trigger command.

**Trigger rate:** Internal trigger generator: DC to 50 kHz.

**External signal:** DC to 1 MHz.

**Frequency sweep**

Both standard and universal waveforms may be swept. Universal waveforms are expanded or condensed to exactly 4,096 points and DDS techniques are used to perform the sweep.

**Waveforms:**

All waveforms except pulse, pulse-train and sequence.

**Sweep modes:**

Manual, continuous, triggered; linear or logarithmic; up or down.

**Sweep range:** 1 MHz to 10 MHz in one range. Phase continuous.

Independent setting of start and stop frequencies.

**Sweep time:** 30 ms to 999s (3 digit resolution).

**Marker:**

Programmable at any single frequency in the sweep range.

**Sweep trigger source:** Manually from keyboard, internal trigger generator, external trigger input or remote trigger command.

**Sweep hold:** Sweep can be held and restarted by the hold key. Must be used in continuous sweep mode.

**Tone**

Allows standard or universal waveform frequency switching up to 16 frequencies. Generating DTMF signals is possible by summing the outputs of two the 39As.

**Waveforms:**

All waveforms except pulse, pulse-train and sequence.

**Frequency list:**

Up to 16 frequencies from 1 MHz to 10 MHz.

**Switching sources:**

External trigger input.

**External amplitude modulation**

**Carrier frequency:** Entire range for selected waveform.

**Carrier waveforms:**

All standard and universal waveforms.

**Modulation source:**

VCA/SUM IN input.

**Modulation frequency range:**

DC-100 kHz.

**Modulation signal range:**

Approximately 2.5 Vpp for 100% level change at maximum output.

**External signal summing**

**Carrier frequency:** Entire range for selected waveform.

**Carrier waveforms:** All standard and universal waveforms.

**Sum source:** VCA/SUM IN input.

**Frequency range:** DC-10 MHz.

**Signal range:** Approximately 2.5 Vpp for 10 Vpp output (50 $\Omega$ ).

**Remote interfaces****RS-232**

Variable baud rate, 9600 baud maximum. 9-pin D-connector.

**GPIB**

Conforms with IEEE-488.1 and IEEE-488.2.

**Drivers**

LabVIEW™ driver available upon request.

**Inputs****Trigger input**

**Frequency range:** DC to 1 MHz.

**Level range:**  $\pm 10V$ .

Minimum pulse width: 50 ns for trigger and gated modes; 50  $\mu s$  for sweep mode; 20 ms for tone mode.

**Input impedance:** 10 k $\Omega$ .

**VCA input (for AM mode)**

**Frequency range:**

DC to 100 kHz

**Signal range:** 2.5V for 100% level change at maximum output.

**Input impedance:**

Typically 6 k $\Omega$ .

**Summing input**

**Frequency range:**

DC to >8 MHz.

**Signal range:** Approximately 2 Vpp input for 20 Vpp output.

**Input impedance:**

Typically 1 k $\Omega$ .

## 39A Universal Waveform Generator

### Hold input

A TTL low switch closure causes a universal waveform to hold at its current position (address). The hold function can be invoked by an input signal to the Hold input, remotely or via the front panel hold key.

**Input impedance:** 10 k $\Omega$ .

### Reference clock input/output

**Set to input:** Input for an external 10 MHz reference clock, TTL/CMOS threshold level.

**Set to output:** Buffered version of the internal 10 MHz reference clock. Outputs levels nominally 1V and 4V from 50 $\Omega$ .

### Set to phase lock:

Used together with SYNC OUT on a master and TRIG IN on a slave to phase lock multiple 39As.

### Outputs

#### Main output

Outputs selected waveform at programmed frequency, amplitude and offset.

**Output impedance:** 50 $\Omega$

#### Sync output

Multifunction output that can be user definable or automatically selectable for any of the following:

#### Waveform sync:

Produces a square wave with 50% duty cycle at the waveform frequency for standard waveforms or a pulse coincident with the first few points of a universal waveform.

#### Position markers:

May be used when generating universal waveforms, any point(s) on the waveform may have associated marker bits set high or low.

#### Burst done:

Produces a pulse coincident with the last cycle of a burst.

#### Sequence sync:

Produces a pulse coincident with the end of a waveform sequence.

#### Trigger:

Selects the current trigger signal. Useful for synchronizing gated or burst signals.

#### Phase lock out:

Used to phase lock two or more 39As. Produces a positive edge at the 0° phase point.

#### Cursor/marker output

Adjustable output pulse for use as a marker in sweep mode or to modulate the Z-axis input of an oscilloscope to provide a cursor for waveform editing.

**Output signal level:** Adjustable from 2V to 14V, normal or inverted; adjustable width as a cursor.

#### Output impedance:

Typically 600 $\Omega$ .

### General

Display: 20 character by 4 row alphanumeric LCD.

**Stored settings:** Up to 9 complete instrument setups and up to 100 universal waveforms can be stored in battery backed memory.

**Dimensions:** 130 mm (height), 212 mm (width), 330 mm (depth).

**Weight:** 4.1 kg (9 lb).

**Power:** 230V, 115V or 100V nominal 50/60 Hz, adjustable internally; operating range  $\pm$  14% of nominal; 100VA maximum.

**Operating range:** 5°C to 40°C, 20% to 80% RH.

**Storage range:** -20°C to 60°C.

#### Environmental:

Indoor use at altitudes to 2 km, Pollution degree 2.

#### Safety:

Complies with EN61010-1.

#### EMC:

Complies with EN50081-1 and EN50082-1.

## Ordering information

**Model 39A:** 40 MS/s Universal Waveform Generator.

**39A-001:** Rack Mount Kit.

**WaveForm DSP2:** Universal waveform creation software.