

Flicker Simulation Mode

Voltage Range	1 mV to 1020V
Current Range	29 µA to 20.5A
Frequency of Fundamental	50 and 60 Hz
Amplitude Modulation Range	± 100%
Frequency of Modulation	0.1 to 30 Hz
Type of Modulation	Square or Sine
Delta V/V Settings for P _{st} = 1	7 settings each for P _{st} = 1, 230V 50 Hz and 120V 60 Hz
Trigger Event	2nd Push of OPER key, or Remote Command

Sags and Swells Simulation Mode

Voltage Range	1 mV to 1020V
Current Range	29 µA to 20.5A
Frequency of Fundamental	45 to 65 Hz
Amplitude Modulation Range	± 100%
Duration of Sag or Swell	0.005 to 60 seconds
Trigger Event	2nd Push of OPER key, or Remote Command

Phase Specifications, Sinewave outputs

The 5520A-PQ option has increased phase uncertainty as shown below. (See the 5520A specifications for all other output combinations.)

Output Combination, 45 Hz to 65 Hz	1-Year Absolute Uncertainty
0.33V to 329.999V and 3.3 mA to 10.9999A	0.07°
0.33V to 329.999V and 10 mV to 3.299999	0.07°

The 5520A-PQ is designed to calibrate instruments based on these applicable standards:

- IEC 61000-3-2 Harmonics Emissions Test
- IEC 61000-3-3 Flicker Emissions Test
- IEC 61000-4-7 General Guide on Harmonic and Interharmonic Measurements
- IEC 61000-4-11 Voltage Dips and Variations Immunity Tests
- IEC 61000-4-14 Voltage Fluctuation Immunity Test
- IEC 61000-4-15 Flickermeter Functionality and Design Specifications
- IEC 868 Flickermeter Standard
- IEEE 1159 Recommended Practice for Monitoring Electric Power Quality
- IEEE 519 Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems

Ordering Information

Model

- 5520A-PQ 5520A Multi-Product Calibrator with Power Quality Option
- 5520A-PQ/3 5520A Multi-Product Calibrator with PQ and 300 MHz Oscilloscope Calibration Option
- 5520A-PQ/6 5520A Multi-Product Calibrator with PQ and 600 MHz Oscilloscope Calibration Option
- 5520A-PQ/1G 5520A Multi-Product Calibrator with PQ and 1 GHz Oscilloscope Calibration Option

Options

- 5520A-PQ/UGK Upgrade Kit - Service Installed + Calibration

Accessories

- 5500A/COIL 50-Turn Current Coil (For calibrating inductive clamps and clamp meters.)
- 5500A/LEADS Comprehensive Test Lead Kit
- 5500A/CASE Transit Case with Wheels
- 5500A/HNDL Side Handle for the 5500A/5520A
- TC100 Test Cart
- Y5537 Rack Mount Kit

Software

- MET/CAL Plus Calibration Software
- 5500/CAL Calibration Software for the 5500A/5520A
- MET/TRACK Asset Management Software

5520A-PQ Power Quality Option for the 5520A Calibrator

Calibrate power quality to the most exacting standards

The 5520A-PQ option enables the Fluke 5520A Multi-Product Calibrator to calibrate power quality instrumentation to the standards of the IEC and other regulatory agencies. Three precision waveform modes provide traceability for power meters, disturbance analyzers, power quality monitors, recorders and other power quality related equipment.

The PQ option increases the 5520A's already impressive workload coverage, flexibility and ease of use. This is a rug-

ged, portable instrument, ideal for use both in the field and on the bench. It is also affordable, allowing you to match your configuration to your workload and add options as that workload changes and grows.

The 5520A-PQ option can be ordered factory installed with a new calibrator or added to your existing 5520A at a local Fluke Service Center.

Three power quality modes are packed with features

The three power quality waveform modes in the 5520A-PQ include **Composite Harmonic**, **Flicker Simulation**, and **Sags and Swells Simulation**. These

Technical Data

waveforms are available in either the single output mode (voltage or current) or dual output modes (voltage + current and voltage + voltage). The modes provide traceability for harmonic analysis, flicker, and sags and swells functions of power quality measurement instruments.

The PQ option adds powerful new functionality to the 5520A:

- Fundamental generation combined with up to 15 harmonics, producing a "multi-tone" output to verify the performance of harmonic analyzers.
- Flicker simulation to verify the performance of Flickermeters described in EN 61000-4-15.
- Sags and swells simulation to test power quality analyzers for one of the most critical parameters in an electrical distribution system.
- Improved phase uncertainty over the standard 5520A sinewave modes, for calibrating higher precision wattmeters.

As in all 5520As, these functions also address your power calibration requirements:

- Programmable phase angle between the two output channels (dual output modes) with .01° resolution.
- Phase locking of multiple 5520As for polyphase power testing.
- Performance verification of both three- and four-wire wattmeters.
- Compensation for inductive loads available in all current output modes.

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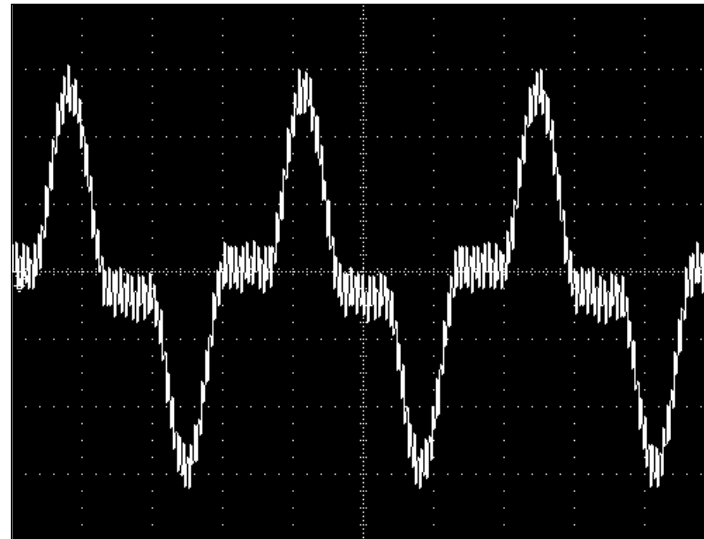
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Composite Harmonic Mode

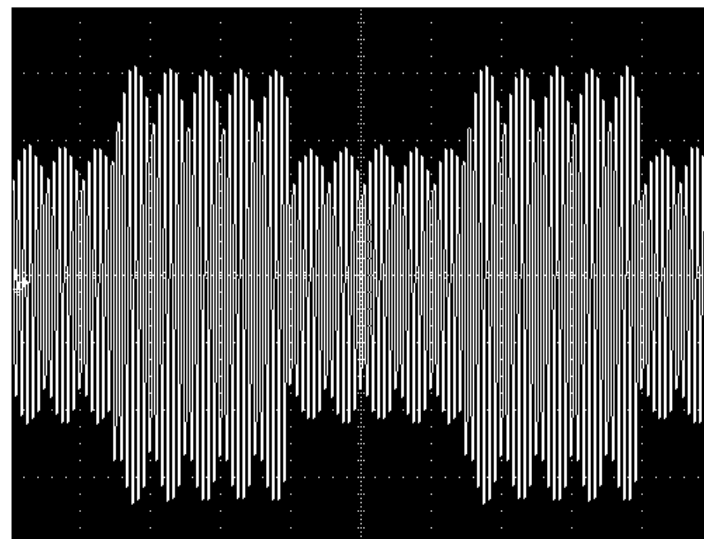
This mode outputs a user defined waveform with up to 15 harmonics, from the 2nd up to the 63rd, that are combined with the fundamental. Both amplitude and phase of each harmonic, relative to the fundamental, can be specified. In the dual output modes (voltage + current and voltage + voltage), the wave shapes are independent of each other, but synchronized in time with 0.01° phase resolution. Up to two user defined waveforms can be stored in non-volatile memory for easy recall. Two IEC 10003-2 waveforms (Class A and Class D current harmonic limits) are pre-defined for CE compliance testing.



5520A-PQ harmonic output.

Flicker Simulation Mode

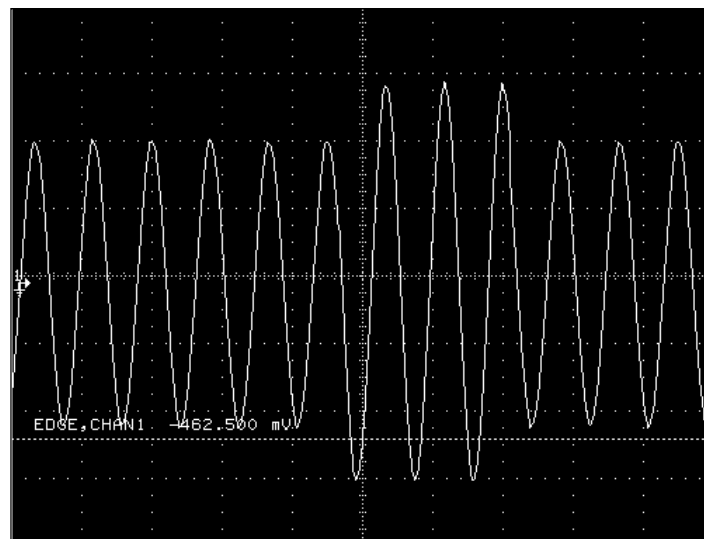
Flicker simulation performs either a rectangular or sine-wave amplitude modulation of the voltage or current output. The repeat frequency or repetition rate of the flicker event is programmable from 0.1 Hz to 30.0 Hz. The duty cycle of the flicker event relative to the nominal amplitude is programmable, giving true modulation of the output signal. The amplitude of the flicker event is programmable from ±100.0% of the base waveform in 0.01% increments. To check the EN 61000-415 flicker function of power quality analyzers, six combinations of delta voltages and change frequencies are provided to quickly check for P_{st} (Perceptibility short term) of 1.



5520A-PQ flicker output.

Sags and Swells Simulation Mode

Sags and Swells simulation performs a one-time amplitude modulation of the voltage or current output. The amplitude is programmable from ±100% of the base waveform. The duration of the sag (also referred to as dip) or swell is adjustable from 0.005 to 60.000 seconds. The ramp period of the sag or swell may also be specified. The Sag and Swell event can be adjusted to occur from 0.0 to 99.999 seconds after the trigger event.



5520A-PQ Sags and Swells output.

5520A-PQ Specifications

Composite Harmonic Mode, General Specifications

Maximum Number of Harmonics in a User Defined Waveform	15
Pre-loaded Industry Waveforms	IEC A, IEC D, NRC7030, NRC 2 to 5
Specified Fundamental Frequencies	10-20 Hz, 45-65 Hz, 400 Hz ¹
Highest Harmonic Frequency	5 kHz ²
Harmonic Amplitude Resolution	0.1% of Fundamental
Harmonic Phase Range (relative to Fundamental)	0 to 360°
Harmonic Phase Resolution	0.1° relative to Fundamental

¹ AC Voltage outputs ≥ 33 V, and Current outputs ≥ 3 A have low frequency limits of 45 Hz.

Other fundamental frequencies within the output limits of the 5520A can be used, but are not specified.

² Current outputs with LCOMP ON have lower limits, as shown in the AC Current table below.

Current outputs > 3A LCOMP OFF have a 4 kHz limit. Voltage outputs > 33V have a 2 kHz limit.

Composite Harmonic Mode, AC Voltage

Composite Waveform Range	Harmonic Amplitude Range (% of Fundamental)	Best Harmonic Amplitude Uncertainty (% of harmonic + V)	Best Harmonic Phase Uncertainty (relative to Fundamental)	Best Absolute RMS Uncertainty of Composite Waveform
1 mV to 32.999 mV	0 to 100%	0.20% + 30 μV	0.3°	0.20% + 30 μV
33 mV to 329.999 mV	0 to 100%	0.20% + 40 μV	0.3°	0.20% + 40 μV
0.33V to 3.29999V	0 to 100%	0.20% + 400 μV	0.3°	0.20% + 400 μV
3.3V to 32.9999V	0 to 100%	0.20% + 4 mV	0.3°	0.20% + 4 mV
33V to 329.999V	0 to 100% ¹	0.25% + 40 mV	0.5°	0.25% + 40 mV
330V to 1020V	0 to 100% ¹	0.25% + 160 mV	0.5°	0.25% + 160 mV

¹ 0 to 30% for harmonics > 440 Hz, 0 to 10% for harmonics > 900 Hz, and 0 to 5% for harmonics up to 2 kHz.

Composite Harmonic Mode, AC Voltage Auxiliary Output (dual output mode only)

Composite Waveform Range	Harmonic Amplitude Range	Harmonic Amplitude Uncertainty (% of harmonic + V)	Harmonic Phase Uncertainty (relative to Fundamental)	Absolute Uncertainty of Composite Waveform
10 mV to 329.999 mV	0 to 100%	0.20% + 500 μV	0.5°	0.25% + 1 mV
.33V to 5V	0 to 100%	0.20% + 2 mV	0.5°	0.25% + 10 mV

Composite Harmonic Mode, AC Current LCOMP OFF

Composite Waveform Range	Harmonic Amplitude Range (% of RMS waveform)	Best Harmonic Amplitude Uncertainty (% of harmonic + A)	Best Harmonic Phase Uncertainty (relative to Fundamental)	Best Absolute Uncertainty of Composite Waveform
29 μA to 329.99 μA	0 to 100%	0.20% + 1 μA	0.3°	0.20% + 1 μA
0.33 mA to 3.2999 mA	0 to 100%	0.20% + 1 μA	0.3°	0.20% + 10 μA
3.3 mA to 32.999 mA	0 to 100%	0.20% + 10 μA	0.3°	0.20% + 100 μA
33 mA to 329.99 mA	0 to 100%	0.20% + 100 μA	0.3°	0.20% + 1 mA
0.33A to 2.99999A	0 to 100% ¹	0.20% + 1 mA	0.5°	0.5% + 20 mA
3A to 20.5A	0 to 100% ¹	0.3% + 10 mA	0.5°	0.5% + 100 mA

¹ 0 to 20% for harmonics > 900 Hz, 0 to 10% for harmonics > 2 kHz

Composite Harmonic Mode, AC Current LCOMP ON*

Composite Waveform Range	Highest Harmonic Frequency	Harmonic Amplitude Range	Best Harmonic Amplitude Uncertainty (% of harmonic + A)	Best Harmonic Phase Uncertainty (relative to Fundamental)	Best Total Uncertainty of Composite Waveform
29 μA to 329.99 μA	1 kHz	0 to 100%	0.6% + 1 μA	1°	0.5% + 1 μA
0.33 mA to 3.2999 mA	1 kHz	0 to 100%	0.6% + 1 μA	1°	0.5% + 1 μA
3.3 mA to 32.999 mA	1 kHz	0 to 100%	0.4% + 10 μA	1°	0.5% + 10 μA
33 mA to 329.99 mA	1 kHz	0 to 100%	0.4% + 100 μA	1°	0.5% + 100 μA
0.33A to 2.99999A	440 Hz	0 to 100%	0.6% + 1 mA	1°	0.5% + 1 mA
3A to 20.5A	440 Hz	0 to 100%	1% + 10 mA	1°	0.75% + 10 mA

* LCOMP ON is used to drive inductive loads like the 5500A/COIL and current clamps.