5520A-PQ

Power Quality Option for the 5520A Calibrator

Technical Data

Calibrate power quality to the most exacting standards

The 5520A-PQ option enables the Fluke Calibration 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 rugged, 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 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.
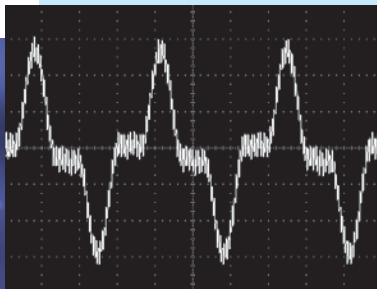
Composite harmonic mode

This mode outputs a user defined waveform with up to 15 har-monics, 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 speci-fied. 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.
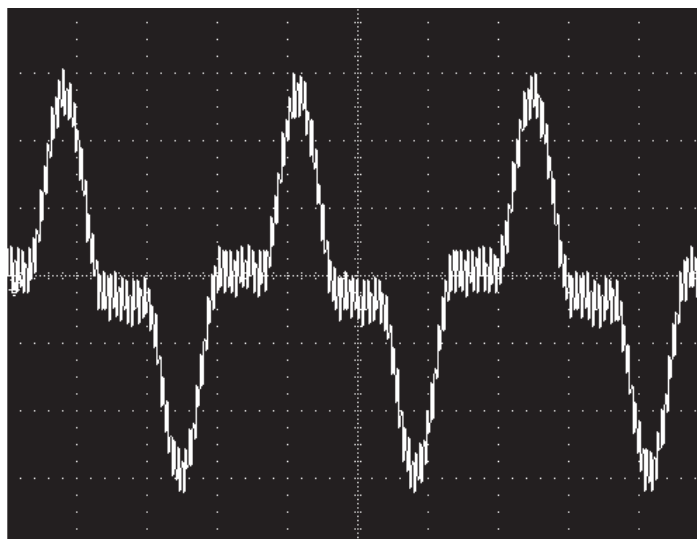
5520A-PQ harmonic output.

Flicker simulation mode

Flicker simulation performs either a rectangular or sine-wave amplitude modulation of the volt-age 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 rela-tive 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 com-binations of delta voltages and change frequencies are provided to quickly check for a P_{st} (Percep-tibility $_{short\ term}$) of 1.
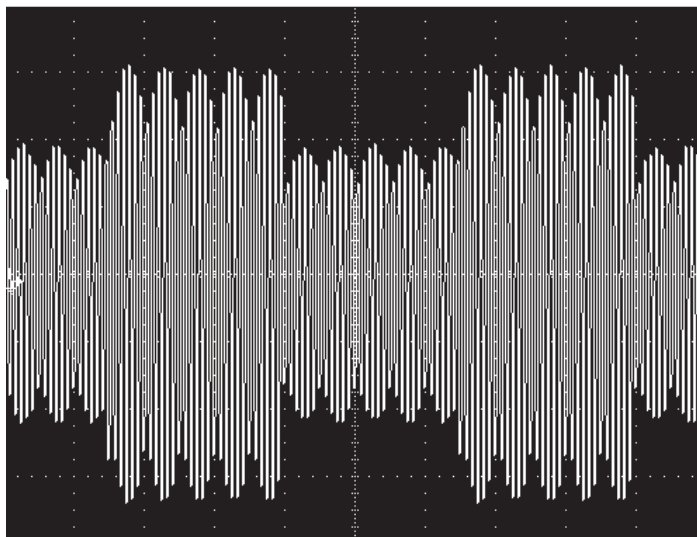
5520A-PQ flicker output.

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.
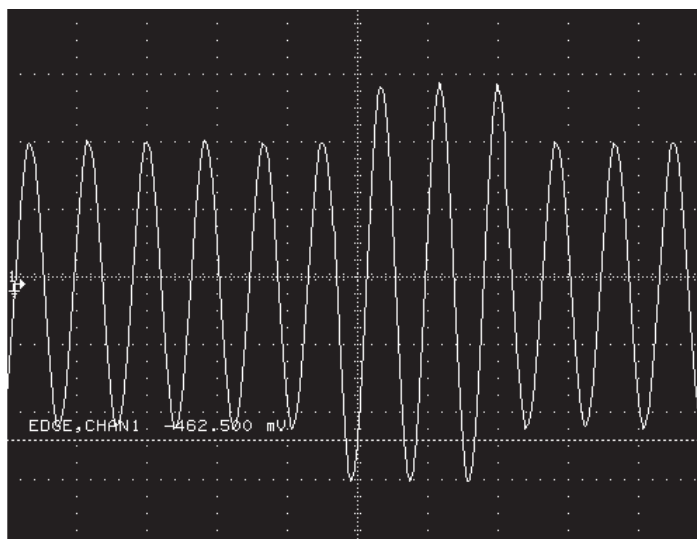
5520A-PQ sags and swells output.

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

Composite harmonic mode, ac voltage

Composite waveform range	Harmonic amplitude range (% of fundamental)	Harmonic amplitude uncertainty (% of fundamental +V)	Harmonic phase uncertainty (relative to fundamental)	Absolute RMS uncertainty of composite waveform (% RMS + V)
1 mV to 32.999 mV	0.1 to 100 %	0.1 % + 10 µV	0.5 °	0.20 % + 6 µV
33 mV to 329.99 mV	0.1 to 100 %	0.1 % + 60 µV	0.5 °	0.20 % + 10 µV
0.33 V to 3.2999 V	0.1 to 100 %	0.1 % + 400 µV	0.5 °	0.20 % + 100 µV
3.3 V to 32.999 V	0.1 to 100 %	0.1 % + 4 mV	0.5 °	0.20 % + 1 mV
33 V to 329.99 V	0.1 to 100 %[1]	0.2 % + 20 mV	0.75 °	0.20 % + 10 mV
330 V to 1020 V	0.1 to 100 %[1]	0.25 % + 100 mV	0.75 °	0.20 % + 100 mV

[1]All frequencies can have harmonics that are up to 100 % of the fundamental, but uncertainties are not specified unless otherwise indicated.

Composite harmonic mode, ac voltage auxiliary output (dual output mode only)

Composite waveform range	Harmonic amplitude range (% of fundamental)	Harmonic amplitude uncertainty (% of fundamental +V)	Harmonic phase uncertainty (relative to fundamental)	Absolute RMS uncertainty of composite waveform (% RMS + V)
10 mV to 329.99 mV	0.1 to 100 %	0.1% + 100 µV	0.5 °	0.2 % + 100 µV
.33 V to 5 V	0.1 to 100 %	0.1 % + 1 mV	0.5 °	0.2 % + 1 mV

Composite harmonic mode, ac current LCOMP OFF

Composite waveform range	Harmonic amplitude range (% of fundamental)	Harmonic amplitude uncertainty (% of fundamental +A)	Harmonic phase uncertainty (relative to fundamental)	Absolute RMS uncertainty of composite waveform (% RMS + A)
29 µA to 329.9 µA	0.1 to 100 %	0.1 % + 0.1 µA	0.5 °	0.2 % + 0.1 µA
0.33 mA to 3.299 mA	0.1 to 100 %	0.1 % + 1 uA	0.5 °	0.2 % + 1 µA
3.3 mA to 32.99 mA	0.1 to 100 %	0.1 % + 10 µA	0.5 °	0.2 % + 10 µA
33 mA to 329.9 mA	0.1 to 100 %	0.1 % + 100 µA	0.5 °	0.2 % + 100 µA
0.33 A to 2.999 A	0.1 to 100 % 1	0.1 % + 1 mA	0.5 °	0.2 % + 1 mA
3 A to 20.5 A	0.1 to 100 % 1	0.1 % + 10 mA	0.5 °	0.2 % + 10 mA

[1]All frequencies can have harmonics that are up to 100 % of the fundamental, but uncertainties are not specified unless otherwise indicated.

Composite harmonic mode, ac current LCOMP ON*

Composite waveform range	Harmonic frequency	Harmonic amplitude range (% of fundamental)	Harmonic amplitude uncertainty (% of fundamental +A)	Harmonic phase uncertainty (relative to fundamental)	Absolute RMS uncertainty of composite waveform (% RMS + A)
29 µA to 329.99 µA	900 Hz	0.1 to 30 %	0.5 % + 0.1 µA	0.5 °	0.5 % + 1 µA
0.33 mA to 3.2999 mA	900 Hz	0.1 to 30 %	0.5 % + 1 uA	0.5 °	0.5 % + 1 µA
3.3 mA to 32.999 mA	900 Hz	0.1 to 30 %	0.4 % + 10 µA	0.5 °	0.5 % + 10 µA
33 mA to 329.9 mA	900 Hz	0.1 to 30 %	0.4 % + 100 µA	0.5 °	0.5 % + 100 µA
0.33 A to 2.999 A	440 Hz	0.1 to 30 %	0.5 % + 1 mA	0.75 °	0.5 % + 1 mA
3 A to 20.5 A	440 Hz	0.1 to 30 %	0.5 % + 10 mA	0.75 °	0.75 % + 10 mA

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

Flicker simulation mode

Voltage range	1 mV to 1020 V
Current range	29 µA to 20.5 A
Frequency of fundamental	50 Hz and 60 Hz
Amplitude modulation range	± 100 %
Frequency of modulation	0.1 Hz to 40 Hz
Type of modulation	Square or sine
Delta V/V settings for P_{st} = 1	7 settings each for P_{st} = 1, 230 V 50 Hz and 120 V 60 Hz
Trigger event	2nd Push of OPER key, or remote command

Sags and swells simulation mode

Voltage range	1 mV to 1020 V
Current range	29 µA to 20.5 A
Frequency of fundamental	45 Hz to 65 Hz
Amplitude modulation range	± 100 %
Duration of sag or swell	0.032 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
0.65 V to 329.99 V	0.07 °
6.5 mA to 10.9999 A	0.07 °

Ordering information

Models

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
MET/TEAM	Asset Management Software

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

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Electrical	RF	Temperature	Pressure	Flow	Software