

# 7220 3 PHASE ASYNCHRONOUS POWER ANALYZER

≤ 50 PPM ACCURACY / UNCERTAINTY

Setting New Standards for AC Power Measurements!



**Guildline Instruments 7220 Asynchronous Power Analyzer** is the latest in a 3 phase AC Power Measurement Laboratory Standard designed for the most demanding power measurement applications today.

Innovative, patented sensing technology provides unprecedented current, voltage, power, and phase angle measurement accuracy and uncertainty.

**THE 7220 POWER ANALYZER INCORPORATES THE MOST TECHNOLOGICALLY ADVANCED DESIGN FOR TESTING STATIONARY & QUASI-STATIONARY WAVEFORMS AVAILABLE ON THE MARKET TODAY!**

This Series provides two models with 120V or 240V inputs. Patented measurement circuits and patent pending analysis techniques provide very accurate measurements starting from a single period of a waveform in addition to aggregated or averaged measurements. Asynchronous 24 bit A/D high speed conversion technology increases the dynamic range and accuracy of this instrument.

The 7220 uses asynchronous sampling with multiple high speed, wide band, analogue to digital (A/D) conversion. Coupling this with highly innovative signal processing algorithms, the 7220 provides asynchronous sampling with very low uncertainties previously only available with very expensive synchronous power analyzers.

The unique design allows a single period of a non-synchronous, quasi-stationary signal to be measured with power uncertainties ≤100 ppm. This is a breakthrough in power measurements as no other commercially available power analyzer can provide a low uncertainty measurement for a single period of a noisy signal. For a sinusoidal signal with 3/10 Second Aggregation the Power uncertainty is ≤ 50 ppm.

## FEATURES

- 3-Phase Plus Neutral Measurements!
- Input Current Ranges 5 Arms and 125 Arms!
- Input Voltages up to 1250 Vpk
- Able to Measure Any Signal Including Non-Sinusoidal and Quasi-Stationary!
- Ideal for Noisy/Green Energy Sources!
- Class 0.005 (≤ 50 ppm) Power for 3/10 Second Aggregation!
- Measures Single Wave Power @ ≤100 ppm!
- Phase Angle Accuracy < 10 micro-radians for 3/10 Second Aggregation!
- Data Simultaneously Converted Into Eight Digital Channels!
- Measurements Calculated from Incoming Data Streams and Presented in Real Time on Period-By-Period basis!
- Built-In Data Logging and Oscilloscope Functions!
- High Resolution Display with Touch Front Panel!

# 7220 Asynchronous 3-Phase Power Analyzers

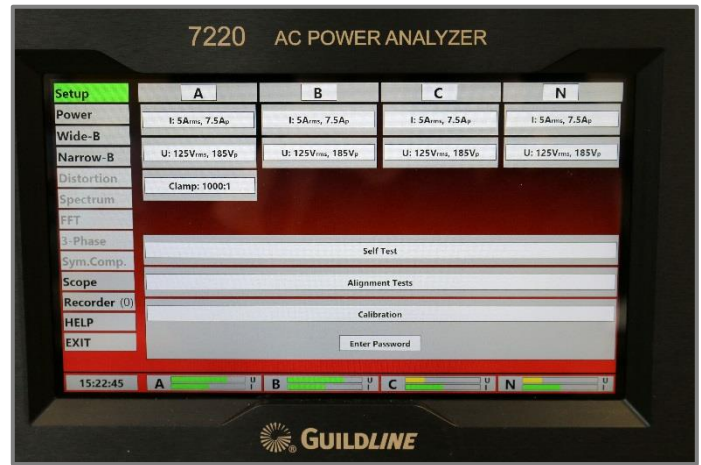
This analytical capability does not exist with synchronous power analyzers which have much higher uncertainties for quasi-stationary signals, or can't measure them at all. As power grids get noisier due to alternative energy sources and power saving devices, the ability to measure noisy signals with low uncertainty is becoming critical!

The 7220 Power Analyzer contains eight independent measurement channels used to monitor three phases and the neutral line for both voltage and current. Models include either 120V or 240V inputs. Data is simultaneously converted into eight digital channels. For a 3/10 second aggregation on a sinusoidal signal, power measurement uncertainty is  $\leq 50$  ppm. For a power measurement of a single period of any wave form, including one with harmonics and frequency jitter, the power uncertainty is  $<100$  ppm.

The front panel contains an embedded windows-10 computer with a high resolution color touch display while all measurements and data collection is completed on a second high speed real-time processor. All measurement results are calculated from the incoming data streams and presented in real time on the screen. Results may be further aggregated, synchronized to the CUT (Coordinated Universal Time), and stored for documentation and further analysis. Test results can also be presented in a graphical form on the screen.

The rear panel is divided into four groupings, each consisting of a voltage input, two current inputs, and a safety fuse.

There are two current ranges optimized for 0-5 Ampere operation, and optimized for 0 – 125 Ampere operation. Separate high quality terminal connectors are provided to handle currents above 5 A. These terminal connections are the same as found on all Guildline High Current standards and provide the best possible connections with minimal affects due to noise. An optional adaptor/connector set is available to facilitate connections to a wide variety of equipment.



The functionality of the 7220 Power Analyzer can be expanded by a customer to provide customized measurements, or to conform to any National, or future International Standards. All calculations are performed by the imbedded Windows computer which can accept customer programs or special algorithms.

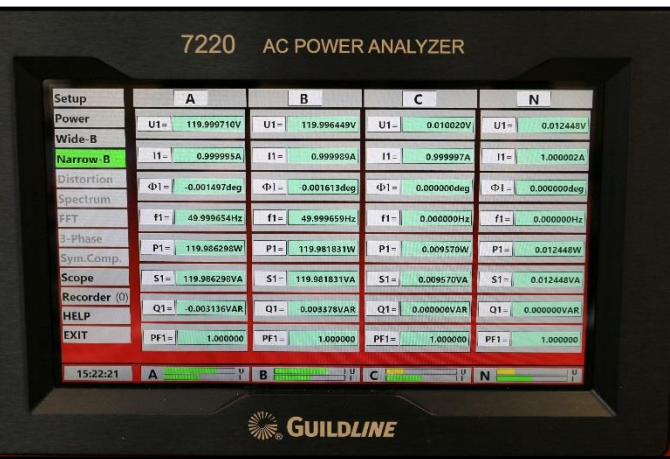
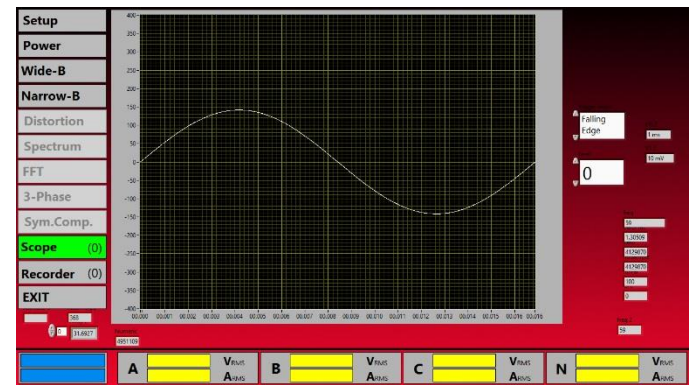
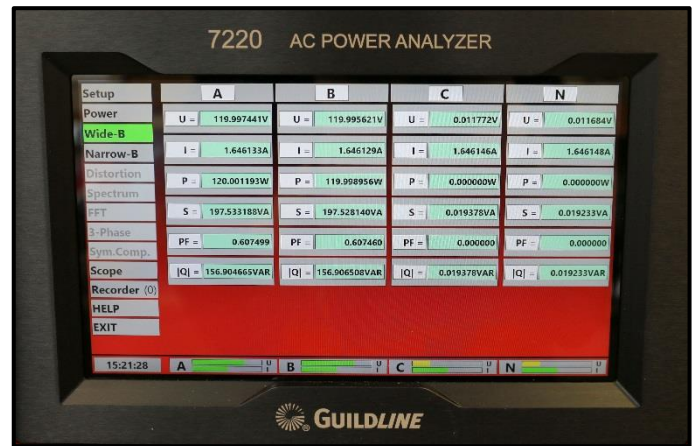
The 7220 Power Analyzer is built as a 5U bench top unit and does not require forced air cooling which reduces the measurement noise. Optionally the 7220 Power Analyzer can be installed in a 19" rack.



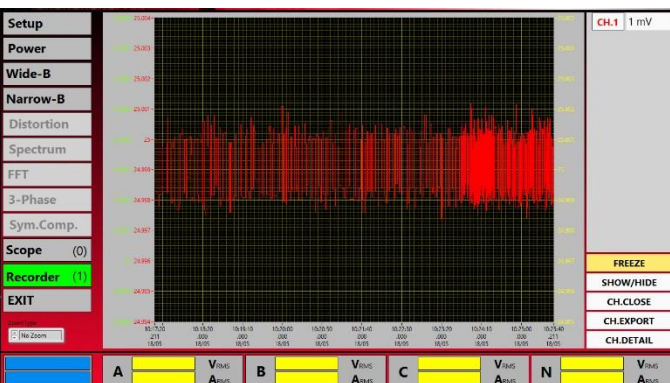
# 7220 Asynchronous 3-Phase Power Analyzers

**OPERATION:** The 7220 Power Analyzer can be used to analyze power in 1-, 2-, 3-phase,  $\Delta$ , and Y configurations; and with 50 Hz, 60 Hz, and 400 Hz systems. Phase angle measurements can be made between any two channels. This includes voltage and current for each phase plus neutral; two currents from any phase plus neutral; and two voltages from any phase plus neutral. The 7220 can measure key power parameters as defined by IEC 61000 International Standards.

Wideband functionality provides an analysis of the entire incoming signal including harmonics. The Narrowband focuses on just the fundamental signal and eliminates all other frequencies. This separate analysis is very useful. For example by comparing the wideband and narrowband results a true power factor can be calculated even in the presence of a noisy signal.



To facilitate the analysis on non-synchronous waveforms, the 7220 contains a complete built-in oscilloscope function. This capability provides very useful information during the measurement process.

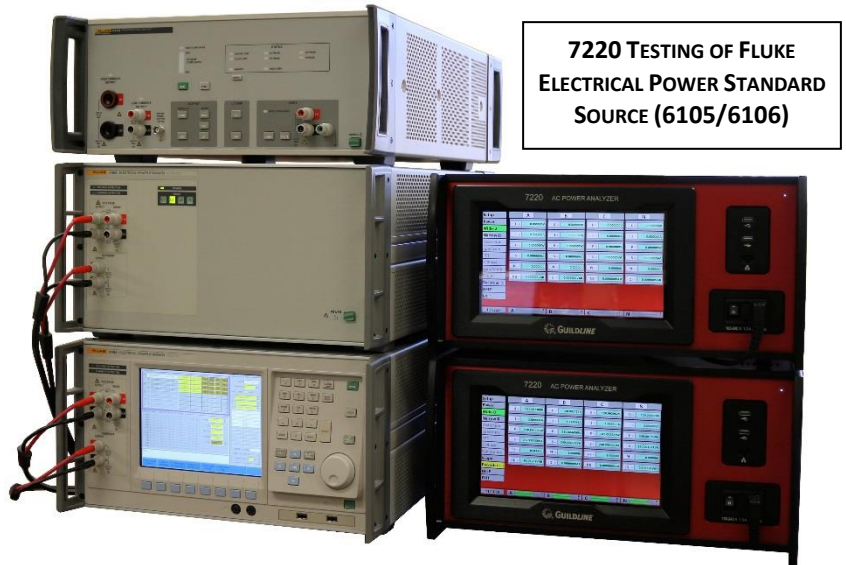


In addition to the Oscilloscope Function, there is a Recorder Function (i.e. for data logging) that captures and stores requested data. The stored data can then be further analyzed or copied onto a USB storage device.

# 7220 Asynchronous 3-Phase Power Analyzers

The 7220 Asynchronous 3-Phase Analyzer can provide precise measurements for quasi-stationary signals and synchronous signals, with capability to track fast voltage, current, power, phase and frequency changes down to a period by period base. It is not dependent on hardware or software frequency synchronization so will always provide measurement data even in the presence of frequency jitter.

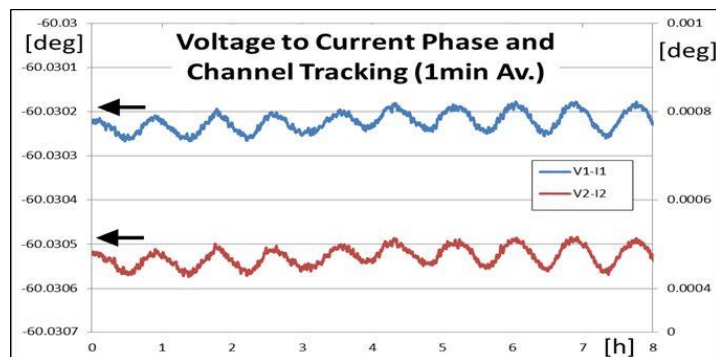
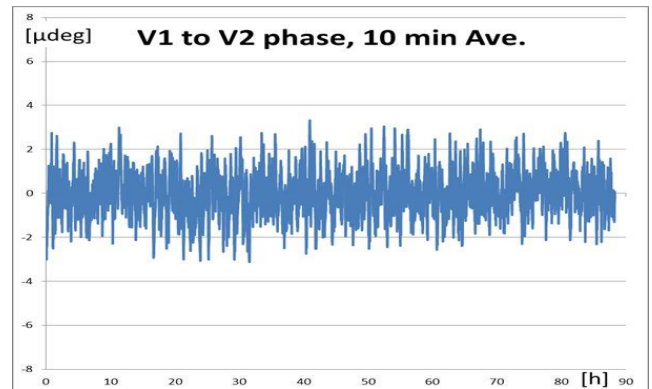
Historically Asynchronous Measurements were limited by analogue to digital (A/D) speed, bandwidth and available processing power. However, today's best A/D converters are faster and provide wide bandwidth with excellent linearity. The 7220 Power Analyzer uses Guildline developed innovative PCB layout designs to support High Speed, Low Noise Processing for each separate measurement channel and adds unique multiple (stacked) Digital Signal Processing algorithms for each single period of a waveform.



The basis of the 7220 design is to transform each input signal very accurately into the digital realm. Specialized DSP algorithms are then applied to each period of the wave form to: digitally remove noise before analysis; optimize current, voltage and power calculations; determine phase angle; analyze harmonics and much more. In fact, over 12 distinct algorithms based on over 5 years of testing produce measurement uncertainties and analysis never before achieved – and not just on “clean signals” but real world noisy signals found in today's environments.

## Just how good is the 7220?

As an example, during Guildline's testing of the 7220 Power Analyzer - phase angle measurements were taken continuously over a 90-hour period. When averaged over 10 minutes the standard deviation of the phase angle was within  $\pm 3 \mu\text{deg}$  or  $\pm 0.05 \mu\text{rad}$ . The 7220 specification for phase angle measurements is  $10 \mu\text{rad}$  which cannot be provided by any other commercially available power analyzer.



Another example to the left shows a periodic phase angle shift between voltage and current for two separate Fluke 6105/6106 models. Both 6105 models show a phase angle drift of about 0.0001 degrees with a periodicity of about 1 hour. A Guildline 7220 is the only commercially available power analyzer that can measure this type of frequency shift over time.

# 7220 Asynchronous 3-Phase Power Analyzers

BASIC MEASUREMENTS	
Voltage	U(1), U(10/12), U(150/180), Urms(+½), Urms(-½) , Uav+, Uav-, Up-p, Crest Factor
Current	I(1), I(10/12), I(150/180), Irms(+½), Irms(-½), Iav+, Iav-, Ip-p, Crest Factor
Power	Instantaneous, Apparent, Real, Reactive, Power Factor, Distortion
Energy	One and three phase Energy cumulative power (J, Wh, or kWh)
Frequency	f(1), f(10/12), f(150/180), f(10s)
Harmonics	Voltage and Current Harmonics (up to #64), Subharmonics and Interharmonics
Phase angle	Any input to any input phase shift for the fundamental and harmonics
3 Phase	Power, Voltage and Current Balance, Symmetrical Components

INPUT SPECIFICATIONS	VOLTAGE	CURRENT
Number of Inputs (8 Total)	4	4
Maximum Inputs	600 V <sub>rms</sub>	5 A <sub>rms</sub> – High Sensitivity Range (Fused) 10 A <sub>rms</sub> – High Dynamic Range (Fused) 125 A <sub>rms</sub> – High Range (Not Fused)
Maximum peak Input	1250 V <sub>pk</sub>	7.76 A <sub>pk</sub> – High Sensitivity Range 31.65 A <sub>pk</sub> – High Dynamic Range 178 A <sub>pk</sub> – High Range
Input Impedance	2 MΩ    20 pF	<60 mΩ, <32 μΩ
Common Mode Rejection (50/60 Hz)	>110 db (2 mV/600V)	<50 nS (<30 μA/600 V)
Input Bandwidth	10 kHz anti-aliasing filter	10 kHz anti-aliasing filter
Crest Factor	2.1 @ 600V <sub>rms</sub>	≤ 1.4 @ 5 A, ≤1.4 @125 A

SPECIFICATIONS (23 °C ± 2 °C)	
<b>Power Accuracy</b>	<b>Voltage Accuracy</b>
≤ 50 ppm for 10 Second Aggregation	≤ 40 ppm for 10 Second Aggregation
≤ 100 ppm for a Single Period of a Wave Form	≤ 70 ppm for a Single Period of a Wave Form
<b>Current Accuracy</b>	<b>Phase Angle Accuracy</b>
≤ 5 ppm for 10 Second Aggregation	≤ 10 micro-radians for 10 Second Aggregation
≤ 30 ppm for a Single Period of a Wave Form	≤ 100 micro-radians for a Single Period of a Wave Form
Channel Skew ≤ 5 ns	
Resolution	24 bit conversion on all channels
Sampling Speed	94 kSPS continuous for all channels



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GENERAL SPECIFICATIONS			
Communication	2 x USB 2.0, 1 x Ethernet	Safety IEC61010-1, Annex K	Cat. II 1000 V, Cat. III 600 V
Operating Temperature		15 °C – 35 °C	60 °F – 105 °F
Dimensions (Width x Height x Depth)			Weight
441 mm x 238 mm x 470 mm	17 3/8" x 9 3/8" x 18 1/2"		20 kg      44 lbs

ORDERING INFORMATION	
7220-120V	120 V model with 5 Ampere and 125 Ampere inputs
7220-240V	240 V model with 5 Ampere and 125 Ampere inputs
	Operation Manual and Certificate of Conformance included
/SM	Service Manual – Optional Manual
Voltage and Current Lead Sets Available – for more information, please contact Guildline Instruments	

**Guildline** IS DISTRIBUTED BY:

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