

Power Quality Analyzers

Analyze your power network quickly

Features

	435	434	43B
Application	Three-phase		Single-phase
Inputs	4 voltage and 4 current (for 3 phases and neutral)		1 voltage and 1 current
Measurements			
Vrms, Arms, Hz, W, VAR, VA, PF, Cos φ (DPPF), Crest Factors	●	●	●
Harmonics and THD (V,A,W), k-factor	●	●	●
Inter-harmonics	●	●	-
kWh and kVARh, kVAh, demand interval	●	●	-
Flicker (Pit, Pst, PF5)	●	●	-
Unbalance	●	●	-
Mains signaling	●	Optional*	-
Recorder/AutoTrend	●/●	●/●	●/-
Logger	●	Optional*	-
System-Monitor (EN50160 compliance)	●	●	-
Real time scope/Phasor diagrams	●/●	●/●	●/-
Dips and swells/Half cycle based	●/●	●/●	●/-
Transient display	●	●	●
Inrush current	●	●	●
IEC61000-4-30, -4-7, -4-15 compliance	Class A	Class B	-
Built-in general purpose Scope and DMM	-	-	●
Memory (screens/data)	50/10	50/10	20 for screens and data
Memory size	16MB**	8 MB**	-
FlukeView software and interface cable	●	●	Depending on configuration
Power Log Software	●	Optional*	-
EN61010 safety rating	600 V CAT IV/1000 V CAT III		600 V CAT III
Current clamps included	4 x i430 Flex	4 x i400S	i400S

* Optional functionality can be added with Logger upgrade kit. For details see ordering information.
** Logger uses user-configurable shared memory.

Fluke 43B

A choice of three configurations

	43Basic	43B	43Kit
i400s Current Clamp	●	●	●
SW43W FlukeView Software		●	●
OC4USB Serial Interface Adapter Cable (USB)		●	●
C120 Hard Case		●	●
VPS40 Voltage Probe		●	
Fluke 61 IR Thermometer		●	
VR101S Voltage Event Recorder			●

All configurations are delivered with test leads, probes, clips, battery pack, banana-to-BNC adapter and line voltage adapter/battery charger.

Check the Fluke web site for Technical Specifications and Application Notes with the Fluke power quality analyzers.

Fluke. Keeping your world up and running.™

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In industry, healthcare, and business – in fact wherever electrical and electronic equipment is indispensable – power quality plays a critical role in maintaining continuity. Non-linear loads, switching, load changes and equipment problems can result in poor power quality. Poor power quality is not only costly in terms of wasted energy and unnecessary downtime, it's also dangerous and increases risk of equipment failure.

Fluke has an unrivalled range of power quality analyzers to help you maintain high-quality power systems. The tools give you the power to analyze every parameter, power-related event or anomaly faster, safer and in more detail than ever before.



430 Series Three-phase Power Quality Analyzers

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Fluke 435



Fluke 434

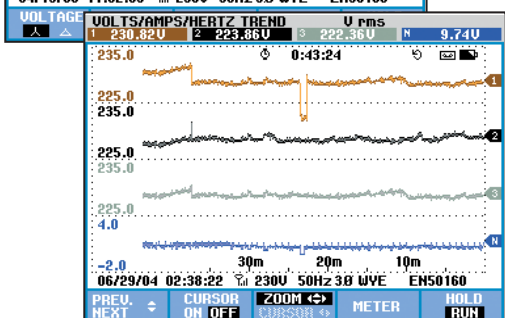


On all inputs



True RMS

Volts/Amps/Hertz				
	L1	L2	L3	N
V _{rms}	230.80	223.86	222.38	9.74
V _{pk}	324.8	326.0	316.0	17.3
CF	1.41	1.46	1.42	1.78
Hz	49.994			
A _{rms}	286	275	282	2.2
A _{pk}	427	421	424	4.0
CF	1.49	1.53	1.50	1.79



Pinpoint power quality problems faster, safer and in greater detail

The Fluke 435 and 434 three-phase power quality analyzers help you locate, predict, prevent and troubleshoot problems in power distribution systems. These easy-to-use handheld tools have many innovative features to give you the details to pinpoint problems faster and safer.

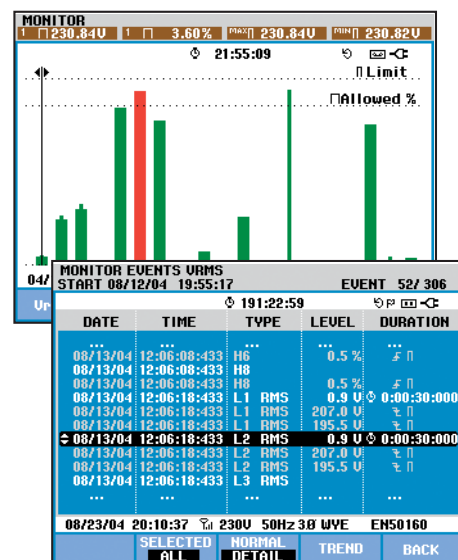
- Complete three-phase troubleshooting tool: measures virtually every power system parameter: voltage, current, frequency, power, power consumption (energy), unbalance and flicker, harmonics and inter-harmonics. Captures events like dips and swells, transients, interruptions and rapid voltage changes.
- The Fluke 435 features 0.1 percent voltage accuracy making it fully compliant with the IEC 61000-4-30 Class A standard
- Logger: record the detail you need Detailed, user-configurable long-time recording gives you the MIN, MAX and AVG readings of up to 100 parameters on all 4 phases with selectable averaging time down to 0.5 seconds. Enough memory is available to record 400 parameters with 1 minute resolution for up to a month.
- Four channels: simultaneously measures voltage and current on all three phases and neutral.
- AutoScaling: easier trend analysis with automatic scaling of the vertical axis you will always use the full display to view the waveforms.
- Automatic transient display: captures up to 40 dips, swells, interruptions or transients automatically.
- Meets the stringent 600 V CAT IV, 1000 V CAT III safety standard required for measurements at the service entrance.
- Rugged, handheld instrument operates for more than 7 hours on included rechargeable NiMH battery pack. Menu-driven interface simplifies operation.
- Extensive data analysis possibilities. Cursors and zoom can be used 'live' while taking the measurements, or 'offline' on stored measurement data. The stored measurements can also be transferred to a PC with FlukeView software (included with Fluke 435 and 434).
- The Fluke 435 comes with Power log software to analyse recorded data and to create reports.
- Complete package includes everything to get started: 4 current clamps, 4 flex clamps with Fluke 435, 5 voltage test leads and clips, line adapter/battery charger and hard case.
- Complies with IEC 61000-4-30 measurement standards.

AutoTrend - Quickly see the trend

Unique AutoTrend gives you fast insight into changes over time. Every displayed reading is automatically and continuously recorded without having to set up threshold levels or interval times, or having to manually start the process. You can quickly view trends in voltage, current, frequency, power, harmonics or flicker on all three phases plus neutral. And you can analyze the trends using the cursors and zoom function – even while background recording continues.

SystemMonitor - Check performance against EN50160 with ease

With a single push of a button, the unique System-Monitor gives you an overview of power system performance, and checks the compliance of incoming power to EN50160 limits or to your own custom specifications. The overview is shown on a single screen, with color-coded bars clearly indicating which parameters fall outside the limits.



The System-Monitor overview screen gives instant insight into whether the voltage, harmonics, flicker, frequency and the number of dips and swells fall outside the set limits. A detailed list is given of all events falling outside the set limits.

AutoTrend automatically records all displayed parameters in the background.

430 Series Three-phase Power Quality Analyzers

FLUKE®

Logger				
	L1	L2	L3	N
U _{rms}	230.83	223.86	222.38	9.76
A _{rms}	286	275	282	2.2
Hz	50.004			
kW	64.7	58.9	62.1	185.6

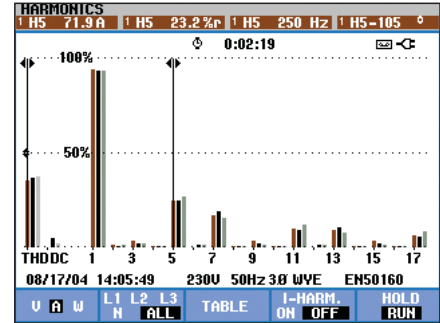
04/13/06 14:38:05 230V 50Hz 3Ø WVE ENS0160

Logging function allows you to customize measurement selections and provides instantaneous analysis of user-selectable parameters.

POWER & ENERGY				
	L1	L2	L3	Total
kW	8.65	21.29	22.53	52.47
kVA	8.79	22.11	22.60	53.28
kVARh	1.60	5.96	1.75	9.30
PF	0.98	0.96	1.00	0.98
cos ϕ	0.99	0.97	1.00	
kWh	0.288	0.709	0.751	1.749
kVAh	0.293	0.737	0.753	1.776
kVARh	0.053	0.198	0.058	0.310

START 08/19/04 15:44:24 0:01:59

Measure and record power (W), VA and VARs. The 434 adds the ability to record energy consumption.



Track harmonics up to the 50th, and measure and record THD in accordance with IEC61000-4-7 requirements



Fluke 435 with flex clamps

Specifications

(Check the Fluke web for detailed specifications)

Inputs	Number of inputs	4 voltage and current (3 phases + neutral)	
	Maximum input voltage	1000 Vrms (6kV Peak)	
	Maximum sampling speed	200 kS/s on each channel simultaneously	
Volt/Amps/Hertz	Vrms (AC+DC)	Measurement range	Accuracy
		Vpk	1...1000 V
	Crest factor, voltage	1.0 ... > 2.8	± 5%
	Arms (AC+DC)	0...20,000 A	± 0.5% ± 5 counts
	Apeak	0 - 5500 A	± 5%
	Crest factor, A	1 ... 10	± 5%
	Hz	50Hz nominal	± 0.01Hz
Dips and swells	Vrms (AC+DC) ¹	0.0% ... 100% of Vnom	± 0.2% of nominal voltage
	Arms (AC+DC) ²	0 ... 20,000 A ¹	± 1% ± 5 counts
Harmonics	Harmonic (interharmonic) (n)	DC, 1..50; (Off, 1..49) measured according to IEC 61000-4-7	
	Vrms	0.0 ... 1000 V	± 0.05% of nominal voltage
	Arms	0.0 ... 4000 mV x clamp scaling	± 5% ± 5 counts
	Watts	depends clamp scaling and voltage	
	DC voltage	0.0 ... 1000 V	± 0.2% of nominal voltage
	THD	0.0 ... 100.0 %	± 2.5% V and A (± 5% Watt)
	Hz	0 ... 3500 Hz	± 1 Hz
	Phase angle	-360° ... +360°	± n x 1.5°
Power and Energy	Watt, VA, VAR	1.0 ... 20.00 MVA ¹	± 1% ± counts
	kWh, kVAh, kVARh	00.00 ... 200.0 GVAh ¹	± 1.5% ± 10 counts
	Power Factor/ Cos ϕ / DPF	0...1	± 0.03
Flicker	Pst (1min), Pst, Pst, PFS	0.00 ... 20.00	± 5%
Unbalance	Volts	0.0 ... 5.0%	± 0.5%
	Current	0.0 ... 20%	± 1%
Transient capture	Volts	± 6000 V	± 2.5% of Vrms
	Minimum detect duration	5 μ s (200 kS/s sampling)	
Inrush mode	Arms (AC+DC)	0.000 ... 20.00 kA ¹	± 1% of meas ± 5 counts
	Inrush duration (selectable)	7.5 s ... 30 min	± 20 ms (Pnom = 50 Hz)
AutoTrend recording	Sampling	5 readings/sec continuous sampling per channel	
	Memory	1800 min, max and avg points for each reading	
	Recording time	Up to 450 days	
	Zoom	Up to 12x horizontal zoom	
Memory	Screens & data	50, shared memory divided between logging, screens and data sets	
Standards	Measurement methods used	IEC61000-4-30 class A; EN50160; IEC 61000-4-15; IEC 61000-4-7	

The advanced functions Interharmonics, Energy, Transients and Inrush are optional for the Fluke 433 and standard available on the Fluke 434.

¹ depending clamp scaling

² Value is measured over 1 cycle, commencing at a fundamental zero crossing, and refreshed each half-cycle

Battery life: > 7 hours with rechargeable NiMH (installed); **Battery charging time:** 4 hours typical

Safety: EN61010-1 (2nd edition) pollution degree 2; 1000 V CAT III / 600 V CAT IV

Case: Rugged, shock proof with integrated protective holster, IP51 (drip and dust proof)

Shock: 30 g; Vibration: 3g according to MIL-PRF-28800F Class 2

Operating temperature: 0°C to +50°C

Size (HxWxD): 256 mm x 169 mm x 64 mm; **Weight:** 1.1 kg

Three Years Warranty



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Included Accessories

Hard carrying case C430 (434)/ Water-tight hard case with rollers C435 (435)

4 current clamps, i400s, CAT IV 600 V

4 current clamps, i430-Flex-4pk, CAT IV

600 V (435)

5 Test leads, 4black, 1 green

Battery Charger Eliminator, BC430

FlukeView Software, SW43W

Power Log Software (435)

Optical Cable for USB , OC4USB

Color localization set, WC100

Getting Started printed

User Manual (CD-ROM)

Ordering information

Fluke 435 Power Quality Analyzer (three-phase) with Logger Function

Fluke 434 Power Quality Analyzer (three-phase)

Fluke 434Kit Logger Upgrade Kit: Adds the Logger Function of the 435 to the 434

OC4USB Serial Interface Adapter/Cable (USB)

I5SPQ3 Set of 3, 5A AC current clamp

I430-flex-4pk set of 4, 3000 A flexclamps

PM9080 Serial Interface Adapter/Cable (RS232)

SW43W FlukeView Software

GPS430 GPS sync module for 430 Series

Fluke 430 Series three-phase and Fluke 43B single-phase Power Quality Analyzers

Technical Data

Analyze your power network quickly

In industry, healthcare, and business – in fact wherever electrical and electronic equipment is depended on – power quality plays a critical role in maintaining productivity and consistency. Non-linear loads, switching, load changes and equipment problems can result in poor power quality. Poor power quality is not only costly in terms of wasted energy and unnecessary downtime, it is also dangerous and increases the risk of equipment failure.

Fluke has an unrivalled range of three-phase and single-phase power quality analyzers to help you maintain power systems. The tools give you the power to analyze every parameter, power-related event or anomaly faster, safer and in more detail than ever before.

The range includes the Fluke 435 and 434 three-phase power quality analyzers and the 43B single-phase power quality analyzer.



Power Quality Analyzer Selection Table

	435	434	43B
Application	Three-phase		Single-phase
Inputs	4 voltage and 4 current (for 3 phases and neutral)		1 voltage and 1 current
Measurements			
Vrms, Arms, Hz, W, VAR, VA, PF, Cos φ (DPPF), Crest Factors	●	●	●
Harmonics and THD (V,A,W), k-factor	●	●	●
Inter-harmonics	●	●	-
kWh and kVARh, kVAh, demand interval	●	●	-
Flicker (Plt, Pst, PF5)	●	●	-
Unbalance	●	●	-
Mains signaling	●	Optional*	-
Recorder/Auto trend	●/●	●/●	●/-
Logger	●	Optional*	-
System monitor	●	●	-
Real time scope/Phasor diagrams	●	●/●	●/-
Dips and swells/Half cycle based	●	●/●	●/-
Transient display	●	●	●
Inrush current	●	●	●
IEC61000-4-30, -4-7, -4-15 compliance	Class A	Class B	-
Built-in general purpose Scope and DMM	-	-	●
Memory (screens/data)	50/10**	50/10	20 for screens and data
Memory size	16 MB	8 MB**	
FlukeView Software and interface cable	●	●	Depending on configuration
Power Log Software	●	Optional*	-
EN61010 safety rating	600 V CAT IV/1000 V CAT III		600 V CAT III
Current clamps included	4 X i430 Flex	4 X i400S	i400S

* Optional functionality can be added with upgrade kit. For details see ordering information.

** Logger uses user-configurable shared memory.

Technical Specification Fluke 430 Series Power Quality Analyzers

The specifications of the instrument are verified using the "implementation verification" table 3 as specified in IEC 61000-4-30 a Chapter 6.2 Accuracy is specified in % of reading unless otherwise specified Specifications are valid for models Fluke 435 and Fluke 434 unless otherwise specified

Input characteristics				
Voltage inputs				
Number of inputs	4 (3 phases + neutral) DC coupled			
Maximum input voltage	1000 Vrms			
Nominal Voltage range	50...500 V internally divided in three ranges 500 V, 250 V and 125 V			
Maximum peak voltage	6 kV			
Input impedance	4 MΩ // 5 pF			
Bandwidth	> 10 kHz, up to 100kHz for transient display			
Scaling	1:1, 10:1, 100:1, 1000:1 and variable			
Current inputs				
Number of inputs	4 (3 phases + neutral) DC coupled			
Type	Clamp on current transformer with mV output			
Range	1.400 Arms with included clamps (I400S) 0.1..3000 Arms with optional clamps			
Input impedance	50 kΩ			
Bandwidth	>10 kHz			
Scaling	0.1, 1, 10, 100, 1000 mV/A, variable, i5s and i430-Flex			
Nominal frequency	40..70 Hz			
Sampling system				
Resolution	16 bit analog to digital converter on 8 channels			
Maximum sampling speed	200kS/s on each channel simultaneously			
RMS sampling	5000 samples on 10/122 cycles according IEC 61000-4-30			
PLL synchronization	4096 samples on 10/122 cycles according IEC 61000-4-7			
Display modes				
Waveform display	Available in Scope and Transient mode Captures 8 waveforms simultaneously Display update rate 5x per second Up to 10/12 times horizontal zoom Cursors: Single vertical line showing min, max, avg reading at cursor position			
Phasor	Shows real time phasor diagram Available in Scope and Unbalance mode Display update rate 5x per second			
Meter readings	Available in Volts/Amps/Hertz, Harmonics, Power & Energy, Flicker, Unbalance and Logger ⁴ mode.			
AutoTrend graph	Available in Volts/Amps/Hertz, Dips & Swells, Harmonics, Power & Energy, Flicker, Unbalance, Inrush, Mains Signaling ⁴ Logger ⁴ and Monitor mode Cursors: single vertical line showing with min, max, avg reading at cursor position.			
Bargraph	Available in Harmonics and Monitor mode			
Eventlist	Available in Dips & Swells Mains Signaling ⁴ , Logger ⁴ and Monitor mode			
Measurement modes				
Scope	Vrms, Arms, Vcursor, Acursor, Vfund, Afund, Hz, V phase angles, A phase angles			
Volts/Amps/Hertz	Vrms, Vpk, V Crest Factor, Arms, Apk, A Crest Factor, Hz			
Dips and Swells	Vrms ^{1/2} , Arms ^{1/2} Captures up to 1000 events with date, time, duration, magnitude and phase identification with programmable thresholds			
Harmonics DC, 1 ... 50	Harmonic Volts, THD Volt, Harmonic Arms, THD Arms, K Arms, Harmonic Watts, THD Watts, K Watts, Interharmonic Volts ⁴ , Interharmonic Arms ⁴ (relative to fundamental or to total rms)			
Power and Energy	Watts, VA, VAR, Power factor, Cos φ / DPF, Arms, Vrms, kWh, kVAh, KVARh, peak demand interval using trend, KYZ revenue meter verification via optical input.			
Flicker	Pst[1min], Pst, Plt, PF5, Vrms ^{1/2} , Arms ^{1/2} , Dc, Dmax, TDEX			
Unbalance	Vneg, Vzero, Aneg, Azero, Vfund, Afund, Hz, V phase angles, A phase angles			
Transients	Vrms, Arms, Vcursor, Acursor			
Inrush Currents	Inrush Current, Inrush duration, Arms ^{1/2} , Vrms ^{1/2}			
Mains Signaling ⁴	Relative signaling voltage and absolute signaling voltage averaged over three seconds for two selectable frequencies			
Logger ⁴	Measures and records up to 100 parameters on all 4 phases simultaneously with selectable averaging time. Captures up to 10000 events with date, time, duration, magnitude and phase identification with programmable thresholds			
System Monitor	Vrms, Arms, Harmonic Volts, THD Volts, Plt, Vrms ^{1/2} , Arms ^{1/2} , Vneg, Hz, dips and swells, unbalance. All parameters are measured simultaneously in accordance with EN50160. Using Flaggng to indicate unreliable readings according IEC61000-4-30.			
Accuracy, resolution and range				
Volt/Amps/Hertz		Measurement range	Resolution	Accuracy
Vrms (AC+DC)	Fluke 435	1...600 Vrms	0.01 Vrms	± 0.1% of nominal voltage
	Fluke 434	600...1000 Vrms 1...1000 Vrms	0.01 Vrms 0.1 Vrms	± 0.1% ± 0.5% of nominal voltage
Vpk		1...1400 Vpk	1 V	5% of nominal voltage
Voltage Crest Factor (CF)		1.0 ... > 2.8	0.01	± 5%
Arms (AC+DC)	Fluke 435	0...20.00 kArms ¹	0,001...10 Arms ¹	± 0.5% ± 5 counts ³
	Fluke 434	0...20.00 kArms ¹	0,001...10 Arms ¹	± 1% ± 5 counts ³
	Fluke 434 with i400s	0...40 / 400 Arms	0.1 and 1 Arms	± 1% ± 5 counts ³
	Fluke 435 with i430Flex	30...3000 Arms	1 Arms	± 0.5% ± 20 counts ³
Apk	using 1mV/A scaling	0 - 5500 Apk	1A	± 5%
A Crest Factor (CF)		1 ... 10	0.01	± 5%
Hz ⁵	Fluke 435 @ 50Hz nominal	42.500 ... 57.500 Hz	0.001 Hz	± 0.01Hz
	Fluke 435 @ 60Hz nominal	51.000 ... 69.000 Hz	0.001 Hz	± 0.01Hz
	Fluke 434 @ 50Hz nominal	42.50 ... 57.50 Hz	0.01 Hz	± 0.01Hz
	Fluke 434 @ 60Hz nominal	51.00 ... 69.00 Hz	0.01 Hz	± 0.01Hz
Dips and swells				
Vrms ^{1/2} (AC+DC)	Fluke 435	0.0% ...200% of nominal voltage	0.1Vrms	± 0.2% of nominal voltage
	Fluke 434	0.0% ...200% of nominal voltage	0.1Vrms	± 1% of nominal voltage
Arms ^{1/2} (AC+DC)	Fluke 435	0 ... 20,000 Arms ¹	0,001 Arms...10 Arms	± 1% ± 10 counts ³
	Fluke 434	0 ... 20,000 Arms ¹	0,001 Arms...10 Arms	± 2% ± 10 counts ³
	Fluke 434 with i400s	0 ... 400 Arms	0.1 Arms and 1 Arms	± 2% ± 10 counts ³
	Fluke 435 with i430Flex	30 ... 3000 Arms	1 Arms	± 1% ± 20 counts ³

Threshold levels	Programmable thresholds in percent of nominal voltage Event detection based upon _cycle rms voltages Captures Dips, Swells Interruptions and Rapid Voltage Changes											
Duration	hhh,mm,ss,mmm					Half cycle					One cycle	
Harmonics												
Harmonic order (n)	DC, 1..50 Grouping: Harmonic groups according to IEC 61000-4-7											
Inter-Harmonic order	Off, 1..49 Grouping: Harmonic and Interharmonic subgroups according to IEC 61000-4-7											
Vrms	Relative (%f):	0.0 ... 100.0%				0.1%				± 0.1% ± n x 0.1% (± 0.4% for %r)		
	Fluke 435 Absolute:	0.0 ... 1000 Vrms				0.1 Vrms				± 0.05% of nominal voltage if < 1% of nominal voltage ± 5% if ≥ 1% of nominal voltage ± 5% ± 2 counts		
	Fluke 434 Absolute:	0.0 ... 1000 Vrms				0.1 Vrms						
Arms	Relative (%f):	0.0 ... 100.0%				0.1%				± 0.1% ± n x 0.1% (± 0.4% for %r)		
	Absolute:	0.0 ... 4000 mV x clamp scaling				1 mVrms x clamp scaling				± 5% ± 5 counts		
Watts (Harmonics only)	Relative:	0.0 ... 100.0%				0.1%				± n x 2%		
	Absolute:	depends on clamp and voltage scaling								± 5% ± n x 2% ± 10 counts		
DC	Relative:	0.0 ... 100.0%				0.1%				± 0.1% V and A (± 2% Watt)		
	Fluke 435 Absolute V:	0.0 ... 1000V				0.1V				± 0.2% of nominal voltage		
	Fluke 434 Absolute V:	0.0 ... 1000V				0.1V				± 5% ± 10 counts		
	Absolute A:	0.0 ... 4000 mV x clamp scaling				1 mVrms x clamp scaling 0.1V				± 5% ± 10 counts		
	Absolute W:	depends on clamp and voltage scaling				depends on scaling				± 5% ± 10 counts		
THD _(n=40)	(relative %f or %r)	0.0 ... 100.0 %				0.1%				± 2.5% V and A (± 5% Watt)		
Hz		0 ... 3500 Hz				1 Hz				± 1Hz		
Phase angle	Fluke 435	-360° ... +0°				1°				± n 1.5° ⁸		
	Fluke 434	-360° ... +0°				1°				± n 1° ⁸		
Power and Energy												
Watt (VA, VAR)	Fluke 435	1.0 ... 20.00MW ¹				0.1 ... 1 kW ¹				± 1% ± 10 counts ³		
	Fluke 434	1.0 ... 20.00MW ¹				0.1 ... 1 kW ¹				± 1.5% ± 10 counts ³		
kWh ⁶ (kVA ⁶ , kVAR ⁶)		00.00 kWhr...200.0 GWhr ¹				00.00 kWhr...200.0 GWhr ¹				0.01 Xhr...100 Whr ¹		
		0.01 Whr...100 Whr ¹				± 1% ± 10 counts ³				± 1.5% ± 10 counts ³		
Power Factor		0...1				0.01				± 0.033		
Cos φ / DPF		0...1				0.01				± 0.033		
Flicker												
Pst (1min), Pst, Plt, PF5 instantaneous Flicker		0.00 ... 20.00				0.01				Within ±5% of tabulated values according IEC61000-4-15		
Dc%, Dmax% and Time d(t) exceeds limits. As described per IEC 61000-3-3		0.0 ... ± 100.0% for Dc% and Dmax% and 0.000 ... 9.999s for Time				0.1% for Dc% and Dmax% and 10 ms for Time				± 1% for Dc% and Dmax% and 20 ms for Time		
Unbalance												
Volts	Fluke 435(neg. and zero seq.)	0.0 ... 5.0%				0.1%				± 0.15%		
	Fluke 434(neg. and zero seq.)	0.0 ... 5.0%				0.1%				± 0.5%		
Current	(neg. and zero seq.)	0.0 ... 20%				0.1%				± 1%		
Transient capture												
Volts	cursor reading	± 6000 Vpk				1 V				± 15% of cursor reading		
	rms reading	10 ... 1000 Vrms				1 V				± 2.5% of Vnominal		
Minimum detect duration		5 µs										
Sampling rate		200kS/s										
Inrush mode												
Arms (AC+DC)		0.000 ... 20.00 kArms ¹				0.001.. 10 Arms ¹				± 1% of meas ± 5 counts		
Inrush Duration		mm:ss:mmm between 7.5s ... 30minutes selectable				10ms				± 20 ms (Fnominal = 50 Hz)		
Mains Signaling⁴												
Threshold levels	Thresholds, limits and signaling duration is programmable for two independent signalling frequencies.											
Signaling frequency		60 ... 3000 Hz				0.1 Hz						
Relative V%		0% ... 100% of				0.1%				± 0.4%		
Absolute V3s (3 second average)		0.0 ... 1000 V				0.1 V				± 5% of nominal voltage		
Trend recording												
Method	AutoTrend automatically records min, max and average values over time for all readings being displayed for the 3 phases and neutral simultaneously.											
Volts/Amps/Hertz, Harmonics, Power & Energy, Flicker, Unbalance and Mains Signaling⁴ mode												
Sampling	5 readings/sec continuous sampling per channel											
Recording time	From 30 min with 1 second display resolution up to 450 days with 6 hour display resolution.											
Zoom	Up to 6x horizontal zoom											
Memory	1800 min, max and avg points for each reading											
	Duration	30 min.	2.5 h	7.5 h	15 h	30 h	150 hr	450 hr	900 hr	75 days		
	Resolution	1 s	5 s	15 s	30 s	60 s	5 min.	15 min.	30 min.	1 hr		
Dips & Swells mode												
Sampling	100/120 ² readings/sec continuous sampling per channel											
Recording time	From 90 sec with 25msec display resolution up to 450 days with 3 hr display resolution.											
Zoom	Up to 12x horizontal zoom											
Memory	3600 min, max and avg points for each reading											
	Duration	90 s	180 s	6 min.	12 min.	30 min.	1 hr	2.5 hr	7.5 hr	15 hr	30 hr	
	Resolution	25 ms	50 ms	100 ms	200 ms	500 ms	1s	2.5 s	7.5 s	15 s	30 s	
Inrush Currents and Flicker PF5 mode												
Sampling	100/120 ² readings/sec continuous sampling per channel											
Recording time	From 7.5 sec with 25msec display resolution up to 30 min with 500msec display resolution for Inrush measurements and up to 2hr with 2.5 sec display resolution for PF5 recordings. Recording time											
Zoom	Up to 12x horizontal zoom											
Memory	3600 min, max and avg points for each reading											
	Duration	7.5 s	15 s	30 s	90 s	180 s	6 min.	12 min.	30 min.	1 hr	2hr	
	Resolution	25 ms	25 ms	25 ms	25 ms	50 ms	100 ms	200 ms	500 ms	1 s	2s	

Technical Specifications Fluke 430 Series three-phase Power Quality Analyzers

Logger mode										
Sampling	Combination of 5 readings/sec and 100/1202 readings/sec continuous sampling per channel depending on the parameter measured									
Recording time	Depends on selected readings and averaging time									
Zoom	Two zoom positions, display all or 1x									
Memory	User configurable shared memory, up to 15 MB on Fluke 435, up to 7 MB on Fluke 434 ⁴									
	Nr of readings on 3 phases + N	1			10			100		
	Averaging time	0.5 s	10 min	2 hr	0.5 s	10 min	2 hr	0.5 s	10 min	2 hr
	Max ⁷ duration using 15MB	66 hr	9 year	100 year	6 hr	333 days	10 year	18 min	31 days	1 year
Monitor mode										
Sampling	Combination of 5 readings/sec and 100/120 ² readings/sec continuous sampling per channel depending on the parameter measured.									
Recording time	Up to 1 week with 10 min resolution									
Memory	1008 min, max and avg points for each reading, 10 minute resolution									
Limits	According EN50160 or customer definable									
Measurement method										
Vrms, Arms	10/12 ² cycle contiguous non overlapping intervals using 500/416 ² samples per cycle in accordance with IEC 61000-4-30									
Vpeak, Apeak	Absolute highest sample value within 10/12 ² cycle interval with 40µs sample resolution									
V Crest Factor	Measures ratio between the Vpeak and Vrms									
A Crest Factor	Measures ratio between the Apeak and Arms									
Hz	Measured every 10 sec in accordance with IEC61000-4-30									
Vrms ^{1/2} , Arms ^{1/2}	Value is measured over 1 cycle, commencing at a fundamental zero crossing, and refreshed each half-cycle. This technique is independent for each channel in accordance with IEC 61000-4-30.									
Harmonics	Calculated from 10/12-cycle gapless harmonic group measurements on Voltage and Amps according to IEC 61000-4-7									
Watt	Selectable Total or Fundamental real power display Calculates average value of instantaneous power over 10/12 cycle period for each phase Total Active Power $P_T = P_1 + P_2 + P_3$									
VA	Selectable Total or Fundamental apparent power display Calculates apparent power using Vrms x Arms value over 10/12 cycle period Total Apparent Power is root mean square of real and apparent power									
VAR	Selectable Total of Fundamental reactive power display Calculates reactive power as root of VA squared minus Watt squared over 10/12 cycle period. Capacitive and inductive load is indicated with capacitor and inductor icons									
Power Factor	Calculated Watt / VA									
Cos φ / DPF	Cos of angle between fundamental voltage and current									
Unbalance	The supply voltage unbalance is evaluated using the method of symmetrical components according to IEC61000-4-30									
Flicker	According to IEC 61000-4-15 Flickermeter - Functional and design specification. Includes 230V 50Hz lamp and 120V 60Hz lamp models									
Transient capture	Captures waveform triggered on signal envelope. Additionally triggers on dips, swells, interruptions and Amps level as specified by IEC61000-4-30									
Inrush current	The inrush current begins when the Arms half cycle rises above the inrush threshold, and ends when the Arms half cycle rms is equal to or below the inrush threshold minus a user-selected hysteresis value. The measurement is the square root of the mean of the squared Arms half cycle values measured during the inrush duration. Each half-cycle interval is contiguous and non-overlapping as recommended by IEC 61000-4-30. Markers indicate inrush duration. Cursors allow measurement of peak Arms half cycle.									
Mains Signaling	Measurement are based on: either the corresponding 10/12-cycle r.m.s. value interharmonic bin or the rms of the four nearest 10/12-cycle rms value interharmonic bins per IEC 61000-4-30 Limit setup for Monitor mode follows EN50160 "Meistercurve"									
Time Synchronisation	Optional GPS430 timesync module provides time uncertainty ≤ 20 ms or ≤ 16.7 ms2 for time tagging of events and time aggregated measurements. When synchronisation becomes unavailable, time tolerance is ≤ 1-s/24 h									
Wiring Combinations										
3Ø WYE	Three phase four wire system WYE									
3Ø DELTA	Three phase three wire system Delta									
1Ø + NEUTRAL	Single phase with neutral									
1Ø SPLIT PHASE	Split phase									
1Ø IT NO NEUTRAL	Single phase system with two phase voltages without neutral									
3Ø IT	Three phase system without neutral WYE									
3Ø HIGH LEG	Four wire three phase Delta system with center tapped high leg									
3Ø OPEN LEG	Open delta three wire system with 2 transformer windings									
2-ELEMENT	Three phase three wire system without current sensor on phase L2 / B (2 Watt meter method)									
2_-ELEMENT	Three phase four wire system without voltage sensor on phase L2 / B									
General										
Case										
Design	Rugged, shock proof with integrated protective holster									
Drip and dust proof	IP51 according to IEC60529 when used in tilt stand position									
Shock and Vibration	Shock 30g, Vibration: 3g Sinusoid, Random 0.03g2/Hz according to MIL-PRF-28800F Class 2									
Display										
Size	115.2 x 86.4 mm									
Resolution	320 x 240 pixels									
Contrast and brightness	User adjustable, temperature compensated									
Memory										
Screens	50 screen memories									
Data	10 data memories for storing data including recordings									
Logger	User configurable shared memory, up to 15 MB on Fluke 435, up to 7 MB on Fluke 434									
Limit templates	2 preprogrammed, 2 administrator (programmable via FlukeView), 2 user locations									
Real-time clock	Time and date stamp for AutoTrend, Transient display and SystemMonitor									
Mechanical										
Size	256 x 169 x 64 mm									
Weight	2kg									

Power	
Line power	Switchable 115V, 230V adapter with country specific plug
Power Adapter input voltage	15...23 Vdc; use only Power Adapter BC430
Battery power	Rechargeable NiMH BP190 (installed)
Battery operating time	> 7 hours
Battery charging time	4 hours, 8 hours for /006 version (Instrument off)
Power saving	Adjustable time for dimmed backlight with on screen power indicator
Standards	
Measurement methods used	IEC61000-4-30 class A
Measurement performance	Fluke 435 IEC61000-4-30 Class A, Fluke 434 IEC61000-4-30 Class B
Power Quality	EN50160
Flicker	IEC 61000-4-15
Harmonics	IEC 61000-4-7
Cross talk	
Between V inputs	-60 dB @ Fnominal
Voltage to current input	-95 dB @ Fnominal
Safety	
Compliance	IEC/EN61010-1 (2nd edition) pollution degree 2; CAN/CSA C22.2 No 101.1 ANSI/ISA S82.01
Max voltage on banana input	1000 V CAT III / 600 V CAT IV
Max voltage on current BNC input	42 Vpeak
Environmental	
Operating temperature	0°C to +50°C battery only, 0°C to +40°C with adapter, within spec +15°C to +35°C
Storage temperature	-20 °C to +60 °C
Humidity	10 .. 30 °C: 95% RH non condensing 30 .. 40 °C: 75% RH non condensing 40 .. 50 °C: 45% RH non condensing battery only
Maximum operating altitude	3000m. Derate to 1000 V CAT II / 600 V CAT III / 300 V CAT IV above 2000m
Maximum storage altitude	12km
Warranty	3 years on mainframe, 1 year on included accessories
Printers and Interface	
Type	Serial, optically isolated. Compatible with PM9080 (RS-232) or OC4USB (USB)
Baud rate	1200, 2400, 9600 ... 57k6
Print out facility (B&W only)	Via optional adapter PM9080 or PAC 91
Print protocol	Epson FX LQ, Deskjet, LaserJet , DPU-414 or PostScript

Accessories Fluke 430 Series

Accessories		
Included	435	434
	Water-tight hard case with rollers C435	Hard carrying case with clamp holders C430
	4 current clamps, i430-Flexipack	4 current clamps, i400s
	5 Test leads, 4black, 1 green	5 Test leads, 4black, 1 green
	5 Alligator clips, 4black, 1 green	5 Alligator clips, 4black, 1 green
	Battery Charger Eliminator, BC430	Battery Charger Eliminator, BC430
	FlukeView Software, SW43W	FlukeView Software, SW43W
	Power Log Software	
	Optical Cable for USB , OC4USB	Optical Cable for USB, OC4USB
	Color localization set, WC100	Color localization set, WC100
	Getting Started printed	Getting Started printed
	User Manual (CD-ROM)	User Manual (CD-ROM)

Ordering Information

Fluke 435	Power Quality Analyzer (three-phase) with Logger Function
Fluke 434	Power Quality Analyzer (three-phase)
Fluke 434Kit	Logger Upgrade Kit: Adds the Logger Function of the 435 to the 434
OC4USB	Serial Interface Adapter/Cable (USB)
PM9080	Serial Interface Adapter/Cable (RS232)
SW43W	FlukeView Software

- ¹ depending clamp scaling, volt scaling 1:1
- ² 50Hz/60Hz nominal frequency according to IEC 61000-4-30
- ³ Add clamp accuracy
- ⁴ The logger and Mains Signaling function are optional for the Fluke 434 and standard available on the Fluke 435
- ⁵ Measured on reference voltage input A/L1
- ⁶ Maximum time 9999 hours
- ⁷ Estimated duration
- ⁸ Add +/- (n-1) x 2.5° for Amp. when using i430-flex-4pk

Technical Specifications Fluke 43B single-phase Power Quality Analyzer

The Fluke 43B Power Quality Analyzer is optimized for industrial measurements on the 50 Hz fundamental frequency. Since its usable fundamental frequency range extends from 10 Hz to 400 Hz, the 43B is ideal for industrial, aviation, marine and railway applications.

Mode	Usable bandwidth	Harmonics on 400 Hz fundamental	Typical accuracy for 400 Hz fundamental
Volt Amp Hz	10 Hz ... 3.5 kHz	9th harmonic	5%
Power	20Hz ... 2 kHz	5th harmonic	10%
Harmonics	10 Hz ... 3.5 kHz	9th harmonic	10% Channel 1 50% Channel 2

Note: Current harmonics measurements can be done via channel 1 with improved accuracy

Technical Specifications Fluke 43B single-phase Power Quality Analyzer

Accuracies are stated as \pm (percentage of reading + counts) without probes unless otherwise noted.
Specifications are valid for signals with a fundamental between 40 and 70 Hz.

Input Characteristics	Ranges	Accuracy
Input impedance	1 M Ω , 20 pF	
Voltage rating	600 Vrms, CAT III	
Volt / Amps / Hertz		
True-rms voltage (AC+DC)	5.000 V, 50.00 V, 500.0 V, 1250 V*	\pm (1 % + 10 counts)
True-rms current (AC+DC)	50.00 A, 500.0 A, 5.000 kA, 50.00 kA, 1250 kA	\pm (1 % + 10 counts)
Frequency	10.0 Hz to 15.0 kHz	\pm (0.5 % + 2 counts)
CF Crest Factor	1.0 to 10.0	\pm (5% + 1 count)
Power		
W, VA, VAR Reactive Power 1-phase and 3-phase, 3 conductor balanced loads	250 W 2.50 kW, 25.0 kW, 250 kW, 2.50 MW, 25 MW, 250 MW, 625 MW, 1.56 GW	\pm (2 % + 6 counts) Total Power \pm (4 % + 4 counts) Fundamental Power
PF Power Factor	0.00 to 1.00	\pm 0.04
DPF Displacement Power Factor	0.00 to 0.25 0.25 to 0.90 0.90 to 1.00	not specified \pm 0.04 \pm 0.03
Hz Frequency Fundamental	40.0 to 70.0 Hz	\pm (0.5 % + 2 counts)
Harmonics		
Volts, Amps, Watts	Fundamental	V,A \pm (3 % + 2 counts), W \pm (5 % + 2 counts)
	2 to 31st Harmonic	V,A \pm (5 % + 3 counts), W \pm (10 % + 10 counts)
	32 to 51st Harmonic	V,A \pm (15 % + 5 counts), W \pm (30 % + 5 counts)
Frequency of fundamental	40 Hz to 70 Hz	\pm 0.25 Hz
Phase	Volt & Amps (between Fund. & Harmonic) Watts (between Volt Fund. & Amps Harmonic)	2nd (\pm 3°) ... 51st (\pm 15°) Fund (\pm 5°) ... 51st (\pm 15°)
K-Factor (Amps & Watts)	1.0 to 30.0	\pm 10 %
THD	0.00 to 99.99	\pm (3% + 8 counts)
Sags & Swells		
Recording times (selectable)	4 min to 16 days	
Vrms Actual, Vrms max, min (AC + DC)	5.000 V, 50.00 V 500.0 V, 1250 V*	Readings \pm (2% + 10 counts) Cursor readings \pm (2% + 12 counts) Cursor Readings Average \pm (2% + 10 counts)
Arms Actual, Arms max, min (AC + DC)	50.00 A, 500.0 A, 5.000 kA, 50.00 kA	

Recording	Ranges	Accuracy
Recording times (selectable)	4 min to 16 days	
Parameters	Choose one or two parameters from one of the groups below	
V/A/Hz	Line Voltage, Current, Frequency	
Power	Watts, VA, VAR, PF, DPF, Frequency	
Harmonics	THD, Volt(Fund. & Harmonic), Amps(F&H) Watts(F&H) Freq.(H), %(H) of total, Phase(H), KF	
Ohms	Ohms, Diode, Continuity, Capacitance	
Temperature	$^{\circ}$ C or $^{\circ}$ F	
Scope	DC Voltage, DC Current, AC Voltage, AC Current, Frequency, Pulse Width + or -,Phase, Duty cycle + or -, Peak max, Peak min, Peak min-max, Crest Factor	
Transients		
Minimum pulse width	40 ns	
Useful bandwidth input 1	DC to 1 MHz (with test leads TL24)	
Number of transients	40	
Voltage threshold settings	20%, 50%, 100%, 200% above or below reference signal	
Reference signal	After START, the Vrms and frequency of the signal are measured. From these data a pure sinewave is calculated as reference for threshold setting.	
Vpeak min, Vpeak max at cursor	10 V, 25 V, 50 V, 125 V, 250 V, 500 V, 1250 V	\pm 5% of full scale

*Rated 600V CAT III

Inrush Current	Ranges	Accuracy
Current ranges (selectable)	1 A, 5 A, 10 A, 50 A, 100 A, 500 A, 1000 A	
Inrush times (selectable)	1 s, 5 s, 10 s, 50 s, 100 s, 5 min	
Cursor readings	A peak max at cursor 1 and cursor 2	\pm 5% of full scale
Time between cursors**	4 to 235 pixels	\pm (0.2% + 2 pixels)
Scope, dual channel scope with measurement reading		
Input Impedance		
Input 1	1 M Ω /12 pF; with BB120: 20 pF	\pm 2 pF; with BB120 \pm 3 pF
Input 2	1 M Ω /10 pF; with BB120: 18 pF	\pm 2 pF; with BB120 \pm 3 pF
Vertical		
Voltage ranges	50 mV/div to 500V/div	\pm (1% + 2 pixels)
Vertical sensitivity, resolution	5 mV/div to 500V/div, 8 bit (256 levels)	
Bandwidth channel [1] (voltage)	DC to 20 MHz at inputs, or with BB120 and VPS40 (standard with Fluke 43B); 1 MHz with TL24 Leads	
Bandwidth channel [2] (current)	DC to 15 kHz at inputs 10 kHz with supplied current clamps	
Coupling	DC, AC (10 Hz -3 dB)	
Horizontal		
TimeBase modes	Normal, roll, single	
TimeBase ranges	60 s/div to 20 ns/div	\pm (0.4% + 1 pixel)
Sampling rate	25 MS/s	
Record length (min / max samples)	512 per channel	

Trigger source	Input 1 or Input 2 or Automatic selection
Trigger Mode	Automatic Connect-and-View™, Free Run, Single Shot.
Connect-and-View™	Advanced automatic triggering that recognizes signal patterns and automatically adjusts triggering, timebase and amplitude. Automatically displays stable pictures of complex and dynamic signals like motor drive and control signals.
Pre-trigger	Up to 10 divisions
Measurement readings, per channel selectable	Volts & Amps (DC, AC, AC + DCrms, Peak max, Peak min, Peak min / max), Frequency, Duty cycle + or -, Phase, Pulse Width + or -, Crest factor
Ohms, Diode, Continuity, Capacitance	
Ohms	500.0 Ω 5.000 kΩ, 50.00 kΩ, 500.0 kΩ, 5.000 MΩ, 30.00 MΩ ± (0.6% +5 counts)
Diode voltage	0 to 3.000 V ± (2% +5 counts)
Continuity, shorts > 1 ms	Beeper on at < 30Ω ± 5Ω,
Capacitance	50.00 nF, 500.0 nF, 5.000 μF, 50.00 μF, 500.0 μF ±(2% +10 counts)
Temperature***	-100.0 °C to 400.0 °C, -200.0 °F to 800.0 °F ±(0.5% +5 counts)
Max current, max open circuit volt.	0.5 mA, < 4 V (all functions above)
Memory	
Number of screens	20
General specifications	
Optical Isolated RS-232 Interface	
To printer	Supports HP LaserJet, DeskJet, Epson FX/LQ and Postscript printers with optional PAC91 Printer Adapter Cable
To PC	FlukeView® Power Quality Analyzer software with PM9080 Interface Adapter included with 43B and 43Kit
FlukeView® Power Quality Software	
Hardware requirements	PC or 100% compatible with Windows 95, 98, Me, 2000, NT4.0.
Power	
Line voltage adapter/battery charger included	
Installed battery	Rechargeable NiCd pack (4 to 6 Vdc)
Operating time	4 hours
Charging time	4 hours (unit OFF) 12 hours (unit ON)
Refresh Cycle	8 to 14 hours (to keep NiCd battery capacity optimal)
Environmental	
Operating Temperature	0°C to 50°C (32°F to 122°F)
Shock & Vibration	MIL 28800E, Type 3, Class III, Style B
Case	IP51 (dust, drip water proof)
Mechanical Data	
Size (H x W x D)	232 x 115 x 50 mm
Weight	1.1 kg
Safety	
For measurements on 600 Vrms Category III installations, Pollution Degree 2 in accordance with EN61010-1 (1993) (IEC1010-1) ANSI/ISA S82.01-1994 CAN/CSA-C22.2 No. 1010.1-92 UL3111-1	
Surge protection	6 kV on input 1 and 2
Floating measurements	600 Vrms from any terminal to ground
Warranty	3 years parts and labor on Fluke 43B, 1 year on accessories

** 1 pixel = inrush time/250

*** Requires optional temperature accessory

Ordering Information

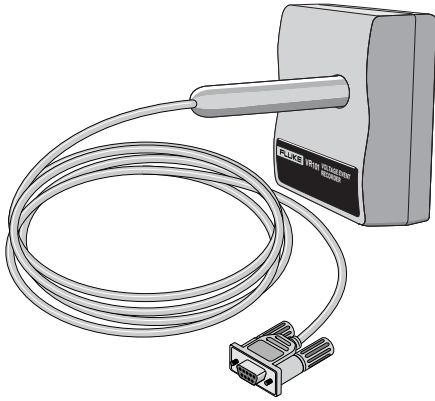
Fluke 43Basic Power Quality Analyzer (Single-phase)

Fluke 43B Power Quality Analyzer (Single-phase)

Fluke 43Kit Power Quality Analyzer (Single-phase)

Standard available in all models	43Basic	43B	43Kit
Fluke 43B Power Quality Analyzer	●	●	●
BP120 NiCd Battery Pack (installed)	●	●	●
PM 8907 Battery Charger/Line Voltage Adapter	●	●	●
TL24 Test Leads	●	●	●
AC20 Industrial Test Clips	●	●	●
TP4 Slim Reach Test Probe Set (4 mm)	●	●	●
BB120 Banana-to-BNC Adapter Plug	●	●	●
Model difference			
i400s AC Current Clamp (200 A)	●		
80i500s AC Current Clamp (500 A)		●	●
SW43W FlukeView® Software for Windows		●	●
PM 9080 Serial Interface/Adapter Cable		●	●
C120 Hard Case		●	●
TP1 Slim Reach Test Probe Set (flat blade)		●	●
AC85 Large Jaw Alligator Clips		●	●
Power Quality Video		●	●
Users Manual / Application Guide		●	●
Manual CD 43B	●		●
Promotional Model Numbers			
VPS40 Voltage Probe		●	
Fluke 61 IR Thermometer		●	
Fluke VR101S Voltage Event Recorder System			●

Technical Specifications Fluke VR101S Voltage Event Recorder System



Ordering Information

(Note: At least one VR101S is required for proper operation)
 VR101S Voltage Event Recorder System
 VR101 Voltage Event Recorder

Computer Hardware Requirements for EventView software

IBM PC or 100% compatible,
 with Windows® 3.1 or Windows 95/98/NT/XP
 or 2000 installed and operating
 At least one free RS-232 serial port
 A pointing device (recommended)
 2 MB hard drive space
 4 MB RAM (8 MB for Windows 95/98 or higher)

Included Accessories VR101S

VR101 Voltage Event Recorder,
 Optical interface cable, 9-to-25 pin adapter,
 EventView Software on two 3 1/2 inch
 floppies, Users Manual

Included Accessories VR101

VR101 Voltage Event Recorder,
 Instruction Sheet

Electrical			
(voltage versions, plug style, and manual languages are determined by country)			
Voltage Version	Operating range	Nominal frequencies	Power consumption
120 V	70 V to 140 V	50 Hz or 60 Hz	2 W
230 V	140 V to 270 V	50 Hz or 60 Hz	3 W

Sags, Swells and Outage Measurements			
Voltage Version	Range	Accuracy	Resolution
120 V Hot-to-neutral	0 to 200 V rms	±2 V rms	1 V rms
Neutral-to-ground	3 to 200 V rms	±2 V rms	1 V rms
230 V Hot-to-neutral	0 to 400 V rms	±4 V rms	2 V rms
Neutral-to-ground	3 to 120 V rms	±2 V rms	1 V rms

Transient Measurements			
	Range	Accuracy	Resolution
Hot-to-neutral	100 to 2500 V peak	±(10% reading + 10 V)	10 V
Neutral-to-ground	50 to 2500 V peak	±(10% reading + 10 V)	10 V
Phase angle	20° to 180°	±1°	1°
	200° to 360°		
Minimum pulse width: 1 µs			

Frequency Measurements			
	Range	Accuracy	Resolution
	45 to 65 Hz	±0.1 Hz (3 cycles min)	0.1 Hz

Time Measurements: Events < 1 second			
	Accuracy	Resolution	
Hot-to-neutral	±0.5 cycles	0.5 cycles	
Neutral-to-ground	±1 cycle	1 cycle	
Events ≥ 1 second (time stamp)			
	Accuracy	Resolution	
	±(2 sec/day + 8 sec)	8 sec	

General Specifications	
Memory size	4000 events
Power	
Battery type	3.5V lithium (non-replaceable)
Battery life	7 years
Mechanical	
Physical size	85 mm x 68 mm x 35 mm
Weight	120g
Environmental	
Operating temperature	-40 to 70°C
Relative Humidity	0 to 95% (non-condensing)
Safety	
	CSA Certification pending, CSA-NRTL (to UL 3111) certification pending, Complies with requirements of EN61010-1:1993
Warranty	1 year



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