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Fluke Norma 4000/5000

High Precision Power Analyzers

Technical Data

Reliable, highly accurate measurements for the test & development of power electronics

Compact Fluke Norma Series power analyzers include the latest power measurement technology to assist engineers working with motors, inverters, lighting, power supplies, transformers and automotive components in making their products more efficient.

Based on a patented high-bandwidth architecture, Fluke Norma Series power analyzers deliver precise measurements of single or three-phase current and voltage, harmonics analysis, Fast Fourier Transformation (FFT) analysis, as well as calculations of power and other derived values. They provide class-leading accuracy and common mode rejection for any waveform, frequency, or phase shift.

- **Fluke Norma 4000:**
  Ideal for field testing, the Fluke Norma 4000 power analyzer offers easy and straight-forward operation. Features include: 1 to 3 power phases, 5.7" / 144 mm color display, harmonic analysis, FFT analysis, scope mode, vector diagram display, recorder function, Fluke NormaView PC software, and 4 MB RAM data memory.

- **Fluke Norma 5000:**
  Providing the highest bandwidth on the market, the Fluke Norma 5000 power analyzer is the ideal test and analysis tool for the development of frequency converters and lighting equipment. Features include: 1 to 6 power phases, optional internal printer, and all of the features and functionality of the Fluke Norma 4000 power analyzer described above.

Fluke Norma Series power analyzers at a glance

	Fluke Norma 4000	Fluke Norma 5000
Number of Phases	1 or 3	3, 4 or 6
Bandwidth	dc to 3 MHz or dc to 10 MHz depending on input module	
Basic Accuracy	0.2%, 0.1% or 0.03% depending on input modules	
Sampling Rate	0.33 MHz or 1 MHz depending on input modules	
Voltage Input Range	0.3 to 1000 V	
Current Input Range (direct, not via shunt)	0.03 mA – 20 A depending on input module	
Display	Color, 5.7" / 144 mm - 320 x 240 pixel	
Memory for Configurations	4 MB	
Memory for Settings	Standard	
Fast Fourier Transformation (FFT)	To the 40th harmonic	
RS232 Interface	Standard	
PI1 Process Interface (8 analog / impulse inputs and 4 analog outputs)	Optional	
IEEE 488/GPIB Interface	Optional	
Fluke NormaView PC Software (for data download, analysis & report writing)	Standard	

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Fluke Norma Series power analyzers – optimum efficiency requires precise measurements

Key Features

- Compact, high precision power analyzers – easy to carry and save working space.
- Simple user interface ensures easy, intuitive operation.
- Standard configurations allow users to specify the exact functionality required for their own unique application.
- Accurately display dynamic events on all phases at exactly the same point in time with simultaneous parallel acquisition of all phases.
- All inputs are galvanically isolated to avoid short circuits in all applications.
- Voltage, current and power harmonics up to the 40th.
- FFT analysis, vector diagram display, recorder function and Digital Oscilloscope (DSO) mode included.
- User-selectable average time – from 15 ms up to 3600 s – for dynamic measurements.
- 4 MB on-board memory for storage of measured values.
- RS232 and USB available as standard; optional IEEE 488/Ethernet available.
- Optional process interface available to measure torque and speed with external sensors; includes four analog outputs for easy use on motor and drive applications.
- 341 kHz or 1 MHz sample rates for detailed signal analysis.
- Bandwidth from dc to 3 MHz / 10 MHz for reliable measurement precision.
- Includes Fluke NormaView PC software for setup, data download, analysis & report writing.

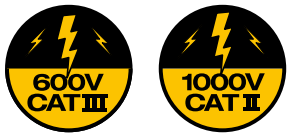
Applications

Electric motors – Complete measurements of both electrical and mechanical power values with an uncertainty of only 0.1%. Through detailed spectrum analysis and dynamic torque calculation capabilities, switching losses caused by the inverter are accurately measured, and a thorough evaluation is made of torque transients and harmonics at higher frequencies.

Inverter drive systems – Simultaneous measurement of all electrical and mechanical power parameters in the same time window enables users to observe the influence one component has on another, or on the whole system.

Lighting systems – Unique bandwidth of up to 10 MHz and a high sampling rate up to 1 MHz provide detailed signal analysis at ballast outputs. A unique shunt technology enables power measurements at very high frequencies. Simultaneous measurement of input and output power provides instant calculation of ballast losses.

Transformers – Synchronous six-phase power measurements enable highly accurate efficiency and loss calculations of large power transformers even at very low power factors. Synchronous multiphase resistance measurements are also possible of transformer coils. The internal formula editor enables voltage ratio calculations, and the combination of high-precision fundamental values and wide bandwidth provides detailed harmonics analysis.



Fluke Norma Series power analyzers provide easy & reliable use in the field or as a bench unit in test laboratories.

Automotive – Detailed analysis of all electrical and mechanical components installed in modern cars for developing strategies that help reduce fuel consumption or the increase the range of electric vehicles. Synchronous electrical input and mechanical output measurements provide complete data on the efficiency and losses of individual components as well as the whole drive system.

Switching power supplies and UPS – Very wide bandwidth enables detailed and accurate power measurements in the switching link of switching power supplies. Unique coaxial shunt technology delivers precision results in high frequencies of several 100 kHz.

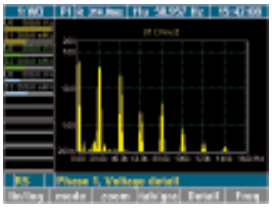
Charge pumps/boost converters – Wide measurement bandwidth combined with wide dynamic range enable precise measurements of charge pumps with very high switching frequency in the link circuit.

Current transducers – Detect very small phase shift errors between the various current and voltage channels for support the calibration of current transducers.

tan δ (dissipation factor) measurement – Measure power at very small power factors and calculate tan δ from voltage and current at very low loss angles.

Calibration and test laboratories – High measurement accuracy enables use as a standard for power calibration and for the certification of voltage, current, power and distortion.

Basic Functions

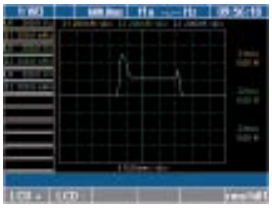


Fast Fourier Transformation (FFT)
Calculation of harmonics with graphical representation. Up to 3 harmonic spectrums are displayed simultaneously. Measured values: U, I, & P per phase. Order: 1st to 40th harmonics, maximum half sample frequency.

Digital Oscilloscope (DSO)
Simultaneous display of up to 3 measured values at sample level. Quick view of waveform and distortion.

Integration function (Energy)
Simultaneous display of up to 6 configurable numeric values. Start/Stop conditions and positive negative direction available.

Vector display
Vector display of the fundamental for up to 6 signals. For easy testing of the right connection of the instrument and quick overview of the phase angle of each signal.



Recorder function
Display of average values over time for trend determination.

RAM data memory
Storing of sample and average values; setting of start and stop conditions. From the RAM approximately 4 MB are available for the storage of measured values. The memory can be expanded up to 128 MB.

Configuration
Set up the analyzer to measure and display data in the format required.

Measure, test & analyze with high precision and ease

Measuring system

Fluke Norma 4000 and Fluke Norma 5000 power analyzers accurately measure current and voltage and calculate active, reactive and apparent power and calculate other derived values from these high-precision measurements.

Accuracy is not affected by either the waveform shape or frequency over a wide range. Phase shift accuracy is maintained due to the input channel design. Harmonics are calculated up to half of the sampling rate.

The DSO function represents measured input parameters as waveforms. Voltage and current can be measured directly via the instrument's integrated voltage dividers and shunts. It is also possible to connect external voltage dividers as well as shunts or current probes for specific applications. Options such as additional interfaces, analogue inputs and outputs are also available. The analyzer firmware can be updated via the standard RS232 interface.

High precision measurements

Fluke Norma Series power analyzers are designed to measure signals in a wide frequency range from dc to MHz. The input stages are dc coupled and designed to handle high rise time signals. A zero and offset calibration against a stable voltage reference runs automatically over short time periods to stabilize the accuracy.

All voltage and current channels are separated by a unique technology of barriers for high channel isolation and common mode rejection. This makes Fluke Norma Series power analyzers suitable for special applications, such as the switching waveforms present on variable frequency drives or high efficiency lighting loads.

Non gapping

The exceptionally high processing power enables precise measurements without gapping, ensuring good results even with rapidly changing signals.

Longtime accuracy

Fluke Norma Series power analyzers maintain high performance and reliable accuracy within the industry's longest recommended recalibration interval of two years. This long interval reduces downtime and saves service costs.

Standard configurations

There are four different measuring channels available for each Fluke Norma Series power analyzer. For the highest level of flexibility and simplicity, you can choose from a variety of standard configurations. This enables users to select the power analyzer best suited to their application's power measurement requirements.

Each power phase module differs in basic accuracy, current measuring range, sampling frequency, and bandwidth. For detailed information about the available optional modular power phases, please refer to Page 6 of the specifications section.

Intuitive keypad operation

Fluke Norma Series power analyzers are very easy to use. With their simple keypad layout and large display, it is possible to select the desired screen and quickly see the important data.

With the arrow keys, users can change phases or move the cursor to highlight individual fields, which can be accessed using the ENTER key. Settings can be changed to suit the application at hand. Configurations most used can be saved for later use.

The input modules can handle up to 10 A or 20 A directly or measure current via wideband precision shunts. The available range of shunts enables measurements up to 1500 A and can be used in conjunction with all of the available input modules.

Powerful NormaView PC software

The Fluke NormaView software improves operation efficiency of the analyzers by enabling instrument setup settings to be saved and stored along with the measurement data. Instrument setups can be used for particular measurement tasks. Settings can be easily uploaded to the instrument with just a few mouse clicks. The software also enables quick and easy data download, analysis and report writing.

Optional process interface

The optional process interface can be used with both Fluke Norma 4000 and Fluke Norma 5000 power analyzers. It provides the simultaneous recording of torque (M), speed (N) and mechanical power (Pm) of up to four motors. Each of the eight inputs is switchable between analog (voltage) or digital (frequency) input. This interface provides synchronous capture at a sample rate of 34 kHz. The interface also provides four analog outputs, which are updated after every average interval. By inputting the additional analog and digital values it is possible to fully evaluate electrical and mechanical efficiency in real time.

Specifications

Ambient conditions	
Working Temperature Range	5 °C to 35 °C (41 °F to 95 °F)
Storage Temperature Range	–20 °C to 50 °C (–4 °F to 122 °F)
Housing	Equipped with a solid metal case to meet stringent EMC requirements.
Weight	Fluke Norma 4000: Base unit approx. 5 kg (11 lb.) Fluke Norma 5000: Base unit approx. 7 kg (15 lb.)
Size (HxWxD)	Fluke Norma 4000: 15 cm x 23.7 cm x 31.5 cm (5.9 in. x 9.3 in. x 12.4 in.) Fluke Norma 5000: 15 cm x 44.7 cm x 31.5 cm (5.9 in. x 17.6 in x 12.4 in.)
Display	5.7" / 144mm – 320 x 240 pixel User-selectable background lighting and contrast.
Climatic Class	KYG DIN 40040, max. 85 % relative humidity, non-condensing.
Net Connection	85 to 264 V ac, 50 to 60 Hz, dc 100 to 260 V, ca. 40 VA European plug with switch.
Measuring Inputs	Safety sockets 4 mm, 2 for each input. External shunt connection over BNC socket.
Operation	Membrane keyboard with cursor – function keys and direct functions.
Connections	Rear panel of the 3-phase analyzer

Measured Values	Non-gapping calculation of averaged values for each phase. In three phase system additionally calculation of total power and averaging of V and I of the three phases. The fundamental H01 will be calculated in synchronous mode also for these values.
	U_{RMS} effective value, U_{rm} rectified mean, U_m mean value
	U_p–, U_p+, U_{pp} peak values
	U_{cf} crest factor U_{cf}, U_{ff} form factor
	U_{fc} fundamental content
	U_{thd} distortion factor DIN, IEC
	I_{RMS} effective value, I_{rm} rectified mean, I_m mean value
	I_{p-}, I_{p+}, I_{pp} peak values
	I_{cf} crest factor I_{cf}, I_{ff} form factor
	I_{fc} fundamental content
	I_{thd} distortion factor DIN, IEC
	P active power [W]
	Q reactive power [Var]
	S apparent power [VA]
	ë, cos. phase angular
	Integral function for active power P, reactive power Q, apparent power S, voltage (U_m) and current (I_m),
	Number of digits 4 or 5 dependent on measured value.

Frequency and Synchronization	
Range	DC and 0.2 Hz to sampling rate
Accuracy	±0.01 % of measured value (reading)

- Channels which can be selected: all U/I or external input.
- One of three low pass filter with different frequencies can be switched into the signal.
- The frequency is always visible on the top of the screen.
- The BNC synchronization socket on backside of the instrument can be used either as input or output.
- The input signals can be measured up to the sample rate of the power phase. The maximum level must not be higher then 50 V.
- The output signal is a pulsed 5 Volts TTL signal (frequency depends on the measured synch frequency).

Configuration Memory
Up to 15 user configurations can be saved into a permanent memory and reloaded later on. Changes that were not saved are lost after switching off the instrument.

Interface	
RS232/USB interface for upload of firmware and data exchange with the PC. A printer can be connected over an external converter.	
Options	IEEE 488.2 / 1 MBit/s Ethernet / 10 MBit/s or 100 Mbit/s

Standards and Safety	
Electrical Safety	EN 61010-1 / 2nd Edition 1000 V CAT II (600 V CAT III) Degree of pollution 2, safety Class I EN 61558 for transformer EN 61010-2-031/032 for accessories
Maximum Inputs	For voltage inputs Measurement range 1000 V_{eff}, 2 kV_{peak} For current inputs Measurement range 10 A_{eff}, 20 A_{peak}
Test Voltages	Net input - case (protective conductor): 1.5 KV ac Net connection – Measurement input: 5.4 kV ac Measurement inputs – Case: 3.3 kV ac Measurement input – Measurement input: 5.4 kV
Electromagnetic Susceptibility	Emission: IEC 61326-1, EN 50081-1, EN 55011 Class B Immunity: IEC 61326-1 / Annex A (industrial sector), EN 50082-1

Modular Power Phases

The Fluke Norma 4000 power analyzer can be equipped with up to three power phases, and the Fluke Norma 5000 power analyzer can be equipped with up to six power phases. Users can select the type of power phase best suited for their application from a variety of optional power phases. Specifications vary depending on the model of the power phase.

Each modular plug-in power phase consists of a voltage and a current measurement channel. Each measuring channel is available for each basic unit. However, only one kind of channel can be used per unit (see standard configurations).

Fluke Norma 4000 (rear panel)

Fluke Norma 5000 (rear panel)

Power Phase Overview

Channel	Accuracy	Current range	Sampling rate	Bandwidth
PP42	0.2% (0.1% rg + 0.1% rg)	20 A	341 kHz	3 MHz
PP50	0.1% (0.05% rg + 0.05% rg)	10 A	1 MHz	10 MHz
PP54		10 A	341 kHz	3 MHz
PP64	0.03% (0.02% rg + 0.01% rg)	10 A	341 kHz	3 MHz

PP42 Power Phase

Ranges

Voltage	
8 ranges:	0.3 – 1 – 3 – 10 – 30 – 100 – 300 – 1000 V U_{peak} = 2 x range
Input impedance:	2 MOhm / 20 pF
CMR common mode rejection:	120 dB at 100 kHz

Current	
6 ranges:	60 – 200 mA – 0.6 – 2 – 6 – 20 A I_{peak} = 2 x range; max level 150% at sine wave (limit of error as at 100%).
Input impedance with integrated shunts:	
Ranges 60, 200 mA:	0.5 Ohm
Ranges 0.6, 2 A:	0.05 Ohm
Ranges 6, 20 A:	0.005 Ohm
Current overload:	max. 25 A continuous 30 A < 5 sec / 15 sec no load 100 A < 0.1 s / 30 sec no load
Input for external shunt or probe:	
BNC terminal:	100 kOhm / 30 pF 30 – 100 mV – 0.3 – 1 – 3- 10 V
Overload:	max. 20 V_{rms}
CMR common mode rejection:	120 dB at 100 kHz

Error of Amplitude

Basic accuracy PP42		
Sum limit of error	**U**	**I**
Range	0.1%	0.1%
Reading	0.1%	0.1%

Voltage and current depending on the input level at 45 – 65 Hz frequency range

Input level	Sum limit of error U	Sum limit of error I
in %	in %	in %
100	0.20	0.20
50	0.30	0.30
30	0.43	0.43
10	1.10	1.10
5	2.10	2.10
3	3.43	3.43
1	10.10	10.10

PP42 Bandwidth

	U and I via BNC	I direct measured
Bandwidth –3 dB	3 MHz	0.5 MHz

Current measurement accuracy depending on the frequency (reading + range)

Frequency	Limits of error current in %			
[Hz]	Internal shunt		BNC input	
0	0.20	-0.20	0.20	-0.20
10	0.20	-0.20	0.20	-0.20
45	0.20	-0.20	0.20	-0.20
65	0.20	-0.20	0.20	-0.20
500	0.20	-0.20	0.20	-0.20
1000	0.20	-0.20	0.20	-0.20
2000	0.25	-0.41	0.23	-0.32
5000	0.30	-0.69	0.27	-0.48
10000	0.35	-0.91	0.30	-0.60
20000	0.40	-1.12	0.33	-0.72
50000	0.45	-1.40	0.37	-0.88
100000	0.50	-1.61	0.40	-1.00

Voltage measurement accuracy depending on the frequency (reading + range)

Frequency in Hz	Limits of error voltage in %	
0	0.20	-0.20
10	0.20	-0.20
45	0.20	-0.20
65	0.20	-0.20
500	0.20	-0.20
1000	0.20	-0.20
2000	0.23	-0.32
5000	0.27	-0.48
10000	0.30	-0.60
20000	0.33	-0.72
50000	0.37	-0.88
100000	0.40	-1.00

Valid for averaged values at 23 ± 0,5 °C ambient temperature, sine waveform and after 1 hour turn on time with measuring signal.

Power / Angular Error

PP42	Between U and I_{BNC}	Between U and I_{Shunt}
Angular Error	0.005° +0.005° / kHz	0.025° +0.015° / kHz Aliasing filter OFF

Error Power $E_P = \frac{2}{\sqrt{3}} \times \sqrt{E_U^2 + E_I^2 + E_W^2}$

Frequency in Hz	Limit of error power in % at Lamda = 1	
45	0.33	-0.33
65	0.33	-0.33

PP50 Power Phase

Ranges

Voltage	
8 ranges:	0.3 – 1 – 3 – 10 – 30 – 100 – 300 – 1000 V U_{peak} = 2 x range
Input impedance:	2 MOhm / 20 pF
CMR common mode rejection:	120 dB at 100 kHz

Current	
6 ranges:	30 – 100 mA – 0.3 – 1 – 3 – 10 A I_{peak} = 2 x range; max level 150% at sine wave (limit of error as at 100%).
Input impedance with integrated shunts:	
Ranges 30, 100 mA:	1 Ohm
Ranges 0.3, 1 A:	0.1 Ohm
Ranges 3, 10 A:	0.01 Ohm
Current overload:	max. 15 A continuous
	30 A < 5 sec / 15 sec no load
	100 A < 0.1 s / 30 sec no load
Input for external shunt or probe:	
BNC terminal:	100 kOhm / 30 pF 30 – 100 mV – 0.3 – 1 – 3- 10 V
Overload:	max. 20 Vrms
CMR common mode rejection:	120 dB at 100 kHz

Error of Amplitude

Basic accuracy PP50		
Sum limit of error	**U**	**I**
range	0.05%	0.05%
reading	0.05%	0.05%

Voltage and current depending on the input level at 45 – 65 Hz frequency range

Input level	Sum limit of error U	Sum limit of error I
in %	in %	in %
100	0.10	0.10
50	0.15	0.15
30	0.22	0.22
10	0.55	0.55
5	1.05	1.05
3	1.72	1.72
1	5.05	5.05

PP50 Bandwidth

	U and I via BNC	I direct measured
Bandwidth –3 dB	10 MHz	1 MHz

Current measurement accuracy depending on the frequency (reading + range)

Frequency	Limits of error current [%]			
[Hz]	Internal shunt		BNC input	
0	0.10	-0.10	0.10	-0.10
10	0.10	-0.10	0.10	-0.10
45	0.10	-0.10	0.10	-0.10
65	0.10	-0.10	0.10	-0.10
500	0.10	-0.10	0.10	-0.10
1000	0.10	-0.10	0.10	-0.10
2000	0.12	-0.19	0.12	-0.16
5000	0.15	-0.31	0.13	-0.24
10000	0.18	-0.40	0.15	-0.30
20000	0.20	-0.49	0.17	-0.36
50000	0.23	-0.61	0.18	-0.44
100000	0.25	-0.70	0.20	-0.50

Voltage measurement accuracy depending on the frequency (reading + range)

Frequency in Hz	Limits of error voltage in %	
0	0.10	-0.10
10	0.10	-0.10
45	0.10	-0.10
65	0.10	-0.10
500	0.10	-0.10
1000	0.10	-0.10
2000	0.12	-0.16
5000	0.13	-0.24
10000	0.15	-0.30
20000	0.17	-0.36
50000	0.18	-0.44
100000	0.20	-0.50

Valid for averaged values at 23 ± 0.5 °C ambient temperature, sine waveform and after 1 hour turn on time with measuring signal.

Power / Angular Error

PP50	Between U and I_{BNC}	Between U and I_{Shunt}
Angular Error	0.005° +0.005° / kHz	0.025° +0.015° / kHz Aliasing filter OFF

Error Power $E_P = \frac{2}{\sqrt{3}} \times \sqrt{E_U^2 + E_I^2 + E_W^2}$

Frequency in Hz	Limit of error power in % at Lamda = 1	
45	0.16	-0.16
65	0.16	-0.16

PP54 Power Phase

Ranges

Voltage	
8 ranges:	0.3 – 1 – 3 – 10 – 30 – 100 – 300 – 1000 V U_{peak} = 2 x range
Input impedance:	2 MOhm / 20 pF
CMR common mode rejection:	120 dB at 100 kHz

Current	
6 ranges:	30 – 100 mA – 0,3 – 1 – 3 – 10 A I_{peak} = 2 x range; max level 150% at sine wave (limit of error as at 100%).
Input impedance with integrated shunts:	
Ranges 30, 100 mA:	1 Ohm
Ranges 0.3, 1 A:	0.1 Ohm
Ranges 3, 10 A:	0.01 Ohm
Current overload:	max. 15 A continuous
	30 A < 5 sec / 15 sec no load
	100 A < 0.1 s / 30 sec no load
Input for external shunt or probe:	
BNC terminal:	100 kOhm / 30 pF 30 – 100 mV – 0.3 – 1 – 3- 10 V
Overload:	max. 20 V_{rms}
CMR common mode rejection:	120 dB at 100 kHz

Error of Amplitude

Basic accuracy PP54		
Sum limit of error	**U**	**I**
range	0.05%	0.05%
reading	0.05%	0.05%

Voltage and current depending on the input level at 45 – 65 Hz frequency range

Input level	Sum limit of error U	Sum limit of error I
in %	in %	in %
100	0.10	0.10
50	0.15	0.15
30	0.22	0.22
10	0.55	0.55
5	1.05	1.05
3	1.72	1.72
1	5.05	5.05

PP54 Bandwidth

	U and I via BNC	I direct measured
Bandwidth –3 dB	3 MHz	1 MHz

Current measurement accuracy depending on the frequency (reading + range)

Frequency	Limits of error current [%]			
[Hz]	Internal shunt		[Hz]	
0	0.10	-0.10	0.10	-0.10
10	0.10	-0.10	0.10	-0.10
45	0.10	-0.10	0.10	-0.10
65	0.10	-0.10	0.10	-0.10
500	0.10	-0.10	0.10	-0.10
1000	0.10	-0.10	0.10	-0.10
2000	0.15	-0.28	0.13	-0.22
5000	0.20	-0.52	0.17	-0.38
10000	0.25	-0.70	0.20	-0.50
20000	0.30	-0.88	0.23	-0.62
50000	0.35	-1.12	0.27	-0.78
100000	0.40	-1.30	0.30	-0.90

Voltage measurement accuracy depending on the frequency (reading + range)

Frequency in Hz	Limits of error voltage in %	
0	0.10	-0.10
10	0.10	-0.10
45	0.10	-0.10
65	0.10	-0.10
500	0.10	-0.10
1000	0.10	-0.10
2000	0.13	-0.22
5000	0.17	-0.38
10000	0.20	-0.50
20000	0.23	-0.62
50000	0.27	-0.78
100000	0.30	-0.90

Valid for averaged values at 23 ± 0.5 °C ambient temperature, sine waveform and after 1 hour turn on time with measuring signal.

Power / Angular Error

PP54	Between U and I_{BNC}	Between U and I_{Shunt}
Angular Error	0.005° +0.005° / kHz	0.025° + 0.015° / kHz Aliasing filter OFF

Error Power

$$E_P = \frac{2}{\sqrt{3}} \times \sqrt{E_U^2 + E_I^2 + E_W^2}$$

Frequency in Hz	Limit of error power in % at Lamda = 1	
45	0.16	-0.16
65	0.16	-0.16

PP64 Power Phase

Ranges

Voltage	
8 ranges:	0.3 – 1 – 3 – 10 – 30 – 100 – 300 – 1000 V U_{peak} = 2 x range
Input impedance:	2 MOhm / 20 pF
CMR common mode rejection:	120 dB at 100 kHz

Current	
6 ranges:	30 – 100 mA – 0,3 – 1 – 3 – 10 A I_{peak} = 2 x range; max level 150% at sine wave (limit of error as at 100%).
Input impedance with integrated shunts:	
Ranges 30, 100 mA:	1 Ohm
Ranges 0.3, 1 A:	0.1 Ohm
Ranges 3, 10 A:	0.01 Ohm
Current overload:	max. 15 A continuous
	30 A < 5 sec / 15 sec no load
	100 A < 0.1 s / 30 sec no load
Input for external shunt or probe:	
BNC terminal:	100 kOhm / 30 pF 30 – 100 mV – 0.3 – 1 – 3- 10 V
Overload:	max. 20 V_{rms}
CMR common mode rejection:	120 dB at 100 kHz

Error of Amplitude

Basic accuracy PP64		
Sum limit of error	**U**	**I**
range	0.02%	0.02%
reading	0.01%	0.01%

Voltage and current depending on the input level at 45 – 65 Hz frequency range

Input level	Sum limit of error U	Sum limit of error I
in %	in %	in %
100	0.03	0.03
50	0.05	0.05
30	0.08	0.08
10	0.21	0.21
5	0.41	0.41
3	0.68	0.68
1	2.01	0.03

PP64 Bandwidth

	U and I via BNC	I direct measured
Bandwidth –3dB	3 MHz	1 MHz

Current measurement accuracy depending on the frequency (reading + range)

Frequency	Limits of error current [%]			
[Hz]	Internal shunt		[Hz]	
0	0.03	-0.03	0.03	-0.03
10	0.03	-0.03	0.03	-0.03
45	0.03	-0.03	0.03	-0.03
65	0.03	-0.03	0.03	-0.03
500	0.03	-0.03	0.03	-0.03
1000	0.03	-0.03	0.03	-0.03
2000	0.08	-0.21	0.06	-0.15
5000	0.13	-0.45	0.10	-0.31
10000	0.18	-0.63	0.13	-0.43
20000	0.23	-0.81	0.16	-0.55
50000	0.28	-1.05	0.20	-0.71
100000	0.33	-1.23	0.23	-0.83

Voltage measurement accuracy depending on the frequency (reading + range)

Frequency in Hz	Limits of error voltage in %	
0	0.03	-0.03
10	0.03	-0.03
45	0.03	-0.03
65	0.03	-0.03
500	0.03	-0.03
1000	0.06	-0.15
5000	0.10	-0.31
10000	0.13	-0.43
20000	0.16	-0.55
50000	0.20	-0.71
100000	0.23	-0.83

Valid for averaged values at 23 ± 0.5 °C ambient temperature, sine waveform and after 1 hour turn on time with measuring signal.

Power / Angular Error

PP64	Between U and I_{BNC}	Between U and I_{Shunt}
Angular Error	0.0025° +0.0025°/kHz	0.005° +0.005°/kHz

Error Power

$$E_P = \frac{2}{\sqrt{3}} \times \sqrt{E_U^2 + E_I^2 + E_W^2}$$

Frequency in Hz	Limit of error power in % at Lamda = 1	
45	0.05	-0.05
65	0.05	-0.05

FLUKE ®

Ordering Information

Fluke Norma 4000
Basic Configuration

Fluke Norma 5000
Basic Configuration

Fluke Norma 4000 High Precision Power Analyzer	Basic configuration includes: • Power supply cable • 5.7" / 144 mm Color display • RS232/USB interface for data download • Space for three power-phases and options • Fluke NormaView PC software • Color user's manual • Test certificate • Calibration values	Fluke Norma 5000 High Precision Power Analyzer	Basic configuration includes: • Power supply cable • 5.7" / 144 mm Color display • Internal printer (optional) • RS232/USB interface for data download • Space for six power-phases and options • Fluke NormaView PC software • Color user's manual • Test certificate • Calibration values

Recommended Accessories

Shunts

The input modules can take up to 10 A or 20 A directly or measure current via wideband precision shunts. The available range of shunts enable measurements up to 1500 A and can be used in conjunction with all of the available input modules.

Order Number	Description
3024677	32 A Planar Shunt
3024689	Cables for 32 A Planar Shunt
3024886	10 A Triaxial Shunt with Cables (0.333 Ω, 0 to 0.5 MHz)
3024899	30 A Triaxial Shunt with Cables (0.010 Ω, 0 to 0.5 MHz)
3024847	100 A Shunt with Cables (0.001 Ω, 0 to 0.5 MHz)
3024858	150 A Shunt with Cables (0.5 mΩ, 0 to 0.5 MHz)
3024864	300 A Shunt with Cables (0.1 mΩ, 0 to 1 MHz)
3024873	500 A Shunt with Cables (0.1 mΩ, 0 to 0.2 MHz)
3024692	LG Shunt Cables for High Current Shunts

Optional shunts for Fluke Norma Series power analyzers

Cables & Adaptors

Order Number	Description
3024661	Measurement Cable Set (for one power phase)
3024704	Fluke Norma WYE Adaptor (external accessory box)

32 A Planar Shunt

Printer Accessories

Order Number	Description
3024650	Printer Cable for Fluke Norma 5000 (RS232-Centronics)

All accessories have a two-year warranty.

FLUKE ®

Standard configurations

Order number	Description	Power phase type				No. of phases	IEEE488/ LAN	Process interface
		PP42	PP50	PP54	PP64			
Fluke-N4K 1PP42	Fluke-Norma 4000, single phase with PP42 power phase input module	●				1		
Fluke-N4K 3PP42	Fluke-Norma 4000, three phase with 3 x PP42 power phase input modules	●				3		
Fluke-N4K 3PP42I	Fluke-Norma 4000, three phase with 3 x PP42 power phase input modules with IEEE488/ Ethernet (IFC1) interface	●				3	●	
Fluke-N4K 3PP42IP	Fluke-Norma 4000, three phase with 3 x PP42 power phase input modules with IEEE488 / Ethernet (IFC1) interface and analog / digital input output channels (PI1)	●				3	●	●
Fluke-N4K 3PP42B	Fluke-Norma 4000, three phase with 3 x PP42 power phase input modules with current binding post	●				3		
Fluke-N4K 3PP42IB	Fluke-Norma 4000, three phase with 3 x PP42 power phase input modules with current binding post with IEEE488/ Ethernet (IFC1) interface	●				3	●	
Fluke-N4K 3PP42IPB	Fluke-Norma 4000, three phase with 3 x PP42 power phase input modules with current binding post with IEEE488/ Ethernet interface and analog / digital input output channels (PI1)	●				3	●	●
Fluke-N4K 3PP50	Fluke-Norma 4000, three phase with 3 x PP50 power phase input modules		●			3		
Fluke-N4K 3PP50I	Fluke-Norma 4000, three phase with 3 x PP50 power phase input modules with IEEE488/ Ethernet (IFC1) interface		●			3	●	
Fluke-N4K 3PP50IP	Fluke-Norma 4000, three phase with 3 x PP50 power phase input modules with IEEE488 / Ethernet (IFC1) interface and analog / digital input output channels (PI1)		●			3	●	●
Fluke-N4K 3PP54I	Fluke-Norma 4000, three phase with 3 x PP54 power phase input modules with IEEE488/ Ethernet (IFC1) interface			●		3	●	
Fluke-N4K 3PP54IP	Fluke-Norma 4000, three phase with 3 x PP54 power phase input modules with IEEE488 / Ethernet (IFC1) interface and analog / digital input output channels (PI1)			●		3	●	●
Fluke-N5K 3PP50	Fluke-Norma 5000, three phase with 3 x PP50 power phase input modules		●			3		
Fluke-N5K 3PP50I	Fluke-Norma 5000, three phase with 3 x PP50 power phase input modules with IEEE488/ Ethernet (IFC1) interface		●			3	●	
Fluke-N5K 3PP50IP	Fluke-Norma 5000, three phase with 3 x PP50 power phase input modules with IEEE488 / Ethernet (IFC1) interface and analog / digital input output channels (PI1)		●			3	●	●
Fluke-N5K 3PP54	Fluke-Norma 5000, three phase with 3 x PP54 power phase input modules			●		3		
Fluke-N5K 3PP54I	Fluke-Norma 5000, three phase with 3 x PP54 power phase input modules with IEEE488/ Ethernet (IFC1) interface			●		3	●	
Fluke-N5K 3PP54IP	Fluke-Norma 5000, three phase with 3 x PP54 power phase input modules with IEEE488 / Ethernet (IFC1) interface and analog / digital input output channels (PI1)			●		3	●	●
Fluke-N5K 3PP64	Fluke-Norma 5000, three phase with 3 x PP64 power phase input modules				●	3		
Fluke-N5K 3PP64I	Fluke-Norma 5000, three phase with 3 x PP64 power phase input modules with IEEE488/ Ethernet (IFC1) interface				●	3	●	
Fluke-N5K 3PP64IP	Fluke-Norma 5000, three phase with 3 x PP64 power phase input modules with IEEE488 / Ethernet (IFC1) interface and analog / digital input output channels (PI1)				●	3	●	●
Fluke-N5K 4PP54	Fluke-Norma 5000, four phase with 4 x PP54 power phase input modules			●		4		
Fluke-N5K 4PP54IP	Fluke-Norma 5000, four phase with 4 x PP54 power phase input modules with IEEE488 / Ethernet (IFC1) interface and analog / digital input output channels (PI1)			●		4	●	●
Fluke-N5K 6PP54I	Fluke-Norma 5000, six phase with 6 x PP54 power phase input modules with IEEE488 / Ethernet (IFC1) interface		●			6	●	
Fluke-N5K 6PP54IP	Fluke-Norma 5000, six phase with 6 x PP54 power phase input modules with IEEE488 / Ethernet (IFC1) interface and analog / digital input output channels (PI1)		●			6	●	●
Fluke-N5K 6PP64I	Fluke-Norma 5000, six phase with 6 x PP64 power phase input modules with IEEE488 / Ethernet (IFC1) interface				●	6	●	
Fluke-N5K 6PP64IP	Fluke-Norma 5000, six phase with 6 x PP64 power phase input modules with IEEE488 / Ethernet (IFC1) interface and analog / digital input output channels (PI1)				●	6	●	●