

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 | |
| Current Input Range via shunt | Table Shunts on page 10 | |
| Display | Color, 5.7" / 144 mm - 320 x 240 pixel | |
| Measured data memory | 4 MB | |
| Memory for Settings | Standard | |
| Fast Fourier Transformation (FFT) | To the 40 th 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) | Standard | |

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.



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

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.



Basic Functions

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.

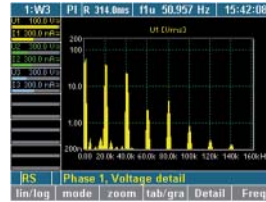
Switching power supplies and UPS – Very wide bandwidth enables detailed and accurate power measurements in the switching link of switching power supplies. Unique coaxial shunt technology delivers precision results in high frequencies of several 100 kHz.

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.

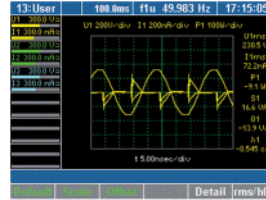
Current transducers – Detect very small phase shift errors between the various current and voltage channels for support the calibration of current transducers.

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.



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.



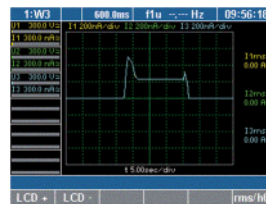
Digital Oscilloscope (DSO)
 Simultaneous display of up to 3 measured values at sample level. Quick view of waveform and distortion.



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.



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 | |
|-----------------------------|---|
| Operating 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.) |
| Dimensions (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 | B2 (according to IEC 60654-1) max. 85 % relative humidity, non-condensing. |
| Mains Connection | 85 to 264 V ac, 47 to 440 Hz, dc 120 to 370 V, approximately 40 VA (65 VA Fluke Norma 5000), European plug with switch. |
| Measuring Terminals | Safety sockets 4 mm, 2 for each input. External shunt connection over BNC socket. |
| Operation | Membrane keyboard with cursor – function keys and direct functions. |

| 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 HO1 will be calculated in synchronous mode also for these values. |
| | U_{RMS} effective value, U_m rectified mean, U_m mean value |
| | U_{p-} , U_{p+} , U_{pp} peak values |
| | U_{cf} crest factor U_{cf} , I_H form factor |
| | U_{fc} fundamental content |
| | U_{thd} distortion factor DIN, IEC |
| | I_{RMS} effective value, I_m rectified mean, I_m mean value |
| | I_{p-} , I_{p+} , I_{pp} peak values |
| | I_{cf} crest factor I_{cf} , I_H form factor |
| | I_{fc} fundamental content |
| | I_{thd} distortion factor DIN, IEC |
| | P active power [W] |
| | Q reactive power [Var] |
| | S apparent power [VA] |
| | λ , $\cos \varphi$ 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 | 0.2 Hz to sampling rate (102 kHz / 341 KHz / 1 MHz) |
| Accuracy | ± 0.01 % |
| | <ul style="list-style-type: none"> 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. |

| Standards and Safety | |
|-------------------------------|---|
| Electrical Safety | EN 61010-1 / 2 nd 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 | Mains input housing (earth ground connector): 1.5 KV ac Mains connection measuring inputs: 5.4 kV ac Measuring inputs housing: 3.3 kV ac Measuring input terminals: 5.4 kV |
| Electromagnetic compatibility | 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 |
| PP52 | | 20 A | 341 kHz | 3 MHz |
| PP54 | | 10 A | 341 kHz | 3 MHz |
| PP64 | 0.03% (0.02% rg + 0.01% rg, at 45 - 65 Hz) | 10 A | 341 kHz | 3 MHz |

PP42 Power Phase

Ranges

| Voltage | |
|----------------------------|--|
| 8 ranges: | 0.3 - 1 - 3 - 10 - 30 - 100 - 300 - 1000 V $V_{peak} = 2 \times \text{range}$ |
| Input impedance: | 2 M Ω / 20 pF |
| CMR common mode rejection: | 120 dB at 100 kHz |

| Current (20A) | |
|---|---|
| 6 ranges: | 60 - 200 mA - 0.6 - 2 - 6 - 20 A $I_{peak} = 2 \times \text{range}$ |
| Input impedance with integrated shunts: | |
| Ranges 60, 200 mA: | 1 Ω typ. |
| Ranges 0.6, 2 A: | 0.2 Ω typ. |
| Ranges 6, 20 A: | 0.02 Ω typ. |
| 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 k Ω / 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 | V | I |
| Error of Range | 0.1% | 0.1% |
| Error of 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 V | 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

| | V and I via BNC | I direct measured |
|-----------------|-----------------|-------------------|
| Bandwidth -3 dB | 3 MHz | 0.5 MHz |

Voltage and current measurement accuracy depending on the input level and the frequency (reading + range)

| Frequency [Hz] | Limits of error in % | | | |
|----------------|----------------------|----------|----------|----------|
| | Input level in % | | | |
| | 100 | 75 | 50 | 25 |
| 0 - 1,000 | +/- 0.20 | +/- 0.23 | +/- 0.30 | +/- 0.50 |
| 2,000 | +/- 0.29 | +/- 0.34 | +/- 0.44 | +/- 0.73 |
| 5,000 | +/- 0.41 | +/- 0.48 | +/- 0.61 | +/- 1.02 |
| 10,000 | +/- 0.50 | +/- 0.58 | +/- 0.75 | +/- 1.25 |
| 20,000 | +/- 0.65 | +/- 0.76 | +/- 0.98 | +/- 1.63 |
| 50,000 | +/- 0.84 | +/- 0.99 | +/- 1.27 | +/- 2.12 |
| 100,000 | +/- 1.00 | +/- 1.17 | +/- 1.50 | +/- 2.50 |

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

Power / Angular Error

| PP42 | Between VV and I_{BNC} | Between V and I_{shunt} |
|---------------|--------------------------|---|
| Angular Error | 0.005° +0.005° / kHz | 0.005° +0.015° / kHz Aliasing filter OFF |

Error Power E_p in % of rdg = $\pm \left(E_v + E_i + \frac{E_a \cdot S}{P} \right)$

| Frequency [Hz] | Input level [%] | Limit of error in % | | |
|----------------|-----------------|---------------------|-----------|------------|
| | | Lamda=1 | Lamda=0.1 | Lamda=0.01 |
| 45 - 65 | 100 | 0.33 | 0.34 | 1.06 |

PP50 Power Phase

Ranges

| Voltage | |
|----------------------------|--|
| 8 ranges: | 0.3 - 1 - 3 - 10 - 30 - 100 - 300 - 1000 V $V_{peak} = 2 \times \text{range}$ |
| Input impedance: | 2 MOhm / 20 pF |
| CMR common mode rejection: | 120 dB at 100 kHz |

| Current (10A) | |
|---|---|
| 6 ranges: | 30 - 100 mA - 0.3 - 1 - 3 - 10 A $I_{peak} = 2 \times \text{range}$ |
| Input impedance with integrated shunts: | |
| Ranges 30, 100 mA: | 1.4 Ohm typ. |
| Ranges 0.3, 1 A: | 0.25 Ohm typ. |
| Ranges 3, 10 A: | 0.025 Ohm typ. |
| 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 | V | I |
| Error of range | 0.05% | 0.05% |
| Error of 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 V | 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

| | V and I via BNC | I direct measured |
|-----------------|-----------------|-------------------|
| Bandwidth -3 dB | 10 MHz | 1 MHz |

Voltage and current measurement accuracy depending the input level and frequency (reading + range)

| Frequency [Hz] | Limits of error in % | | | |
|----------------|----------------------|----------|----------|----------|
| | Input level in % | | | |
| | 100 | 75 | 50 | 25 |
| 0 - 1,000 | +/- 0.10 | +/- 0.12 | +/- 0.15 | +/- 0.25 |
| 2,000 | +/- 0.15 | +/- 0.17 | +/- 0.22 | +/- 0.36 |
| 5,000 | +/- 0.20 | +/- 0.24 | +/- 0.31 | +/- 0.51 |
| 10,000 | +/- 0.25 | +/- 0.29 | +/- 0.38 | +/- 0.63 |
| 20,000 | +/- 0.33 | +/- 0.38 | +/- 0.49 | +/- 0.81 |
| 50,000 | +/- 0.42 | +/- 0.50 | +/- 0.64 | +/- 1.06 |
| 100,000 | +/- 0.50 | +/- 0.58 | +/- 0.75 | +/- 1.25 |

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 V and I_{BNC} | Between V and I_{shunt} |
|---------------|-------------------------|---|
| Angular Error | 0.005° +0.005° / kHz | 0.005° +0.010° / kHz Aliasing filter OFF |

Error Power E_p in % of rdg = $\pm \left(E_v + E_i + \frac{E_a \cdot S}{P} \right)$

| Frequency [Hz] | Input level [%] | Limit of error in % | | |
|----------------|-----------------|---------------------|-----------|------------|
| | | Lamda=1 | Lamda=0.1 | Lamda=0.01 |
| 45 - 65 | 100 | 0.16 | 0.19 | 1.02 |

PP52 Power Phase

Ranges

| Voltage | |
|----------------------------|--|
| 8 ranges: | 0.3 - 1 - 3 - 10 - 30 - 100 - 300 - 1000 V $V_{peak} = 2 \times \text{range}$ |
| Input impedance: | 2 MOhm / 20 pF |
| CMR common mode rejection: | 120 dB at 100 kHz |

| Current (20A) | |
|---|---|
| 6 ranges: | 60 - 200 mA - 0.6 - 2 - 6 - 20 A $I_{peak} = 2 \times \text{range}$ |
| Input impedance with integrated shunts: | |
| Ranges 60, 200 mA: | 1 Ohm typ. |
| Ranges 0.6, 2 A: | 0.2 Ohm typ. |
| Ranges 6, 20 A: | 0.02 Ohm typ. |
| 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 PP52 | | |
|---------------------|-------|-------|
| Sum limit of error | V | I |
| Error of range | 0.05% | 0.05% |
| Error of 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 V | 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 |

PP52 Bandwidth

| | V and I via BNC | I direct measured |
|-----------------|-----------------|-------------------|
| Bandwidth -3 dB | 3 MHz | 1 MHz |

Voltage and current measurement accuracy depending the input level and frequency (reading + range)

| Frequency [Hz] | Limits of error in % | | | |
|----------------|----------------------|----------|----------|----------|
| | Input level in % | | | |
| | 100 | 75 | 50 | 25 |
| 0 - 1,000 | +/- 0.10 | +/- 0.12 | +/- 0.15 | +/- 0.25 |
| 2,000 | +/- 0.15 | +/- 0.17 | +/- 0.22 | +/- 0.36 |
| 5,000 | +/- 0.20 | +/- 0.24 | +/- 0.31 | +/- 0.51 |
| 10,000 | +/- 0.25 | +/- 0.29 | +/- 0.38 | +/- 0.63 |
| 20,000 | +/- 0.33 | +/- 0.38 | +/- 0.49 | +/- 0.81 |
| 50,000 | +/- 0.42 | +/- 0.50 | +/- 0.64 | +/- 1.06 |
| 100,000 | +/- 0.50 | +/- 0.58 | +/- 0.75 | +/- 1.25 |

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

| PP52 | Between VV and I _{BNC} | Between V and I _{shunt} |
|---------------|---------------------------------|---|
| Angular Error | 0.005° +0.005° / kHz | 0.005° +0.015° / kHz Aliasing filter OFF |

Error Power E_p in % of rdg = $\pm \left(E_v + E_i + \frac{E_a \cdot S}{P} \right)$

| Frequency [Hz] | Input level [%] | Limit of error in % | | |
|----------------|-----------------|---------------------|-----------|------------|
| | | Lamda=1 | Lamda=0.1 | Lamda=0.01 |
| 45 - 65 | 100 | 0.16 | 0.19 | 1.02 |

PP54 Power Phase

Ranges

| Voltage | |
|----------------------------|--|
| 8 ranges: | 0.3 - 1 - 3 - 10 - 30 - 100 - 300 - 1000 V $V_{peak} = 2 \times \text{range}$ |
| Input impedance: | 2 MOhm / 20 pF |
| CMR common mode rejection: | 120 dB at 100 kHz |

| Current (10A) | |
|---|---|
| 6 ranges: | 30 - 100 mA - 0.3 - 1 - 3 - 10 A $I_{peak} = 2 \times \text{range}$; max level 150% at sine wave (limit of error as at 100%). |
| Input impedance with integrated shunts: | |
| Ranges 30, 100 mA: | 1.4 Ohm typ. |
| Ranges 0.3, 1 A: | 0.25 Ohm typ. |
| Ranges 3, 10 A: | 0.025 Ohm typ. |
| 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 | V | I |
| Error of range | 0.05% | 0.05% |
| Error of 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 V | 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

| | V and I via BNC | I direct measured |
|-----------------|-----------------|-------------------|
| Bandwidth -3 dB | 3 MHz | 1 MHz |

Voltage and current measurement accuracy depending on the input level and the frequency (reading + range)

| Frequency [Hz] | Limits of error in % | | | |
|----------------|----------------------|----------|----------|----------|
| | Input level in % | | | |
| | 100 | 75 | 50 | 25 |
| 0 - 1,000 | +/- 0.10 | +/- 0.12 | +/- 0.15 | +/- 0.25 |
| 2,000 | +/- 0.15 | +/- 0.17 | +/- 0.22 | +/- 0.36 |
| 5,000 | +/- 0.20 | +/- 0.24 | +/- 0.31 | +/- 0.51 |
| 10,000 | +/- 0.25 | +/- 0.29 | +/- 0.38 | +/- 0.63 |
| 20,000 | +/- 0.33 | +/- 0.38 | +/- 0.49 | +/- 0.81 |
| 50,000 | +/- 0.42 | +/- 0.50 | +/- 0.64 | +/- 1.06 |
| 100,000 | +/- 0.50 | +/- 0.58 | +/- 0.75 | +/- 1.25 |

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 V and I _{BNC} | Between V and I _{shunt} |
|---------------|--------------------------------|--|
| Angular Error | 0.005° + 0.005° / kHz | 0.020° + 0.010° / kHz Aliasing filter OFF |

Error Power E_p in % of rdg = $\pm \left(E_v + E_i + \frac{E_a \cdot S}{P} \right)$

| Frequency [Hz] | Input level [%] | Limit of error in % | | |
|----------------|-----------------|---------------------|-----------|------------|
| | | Lamda=1 | Lamda=0.1 | Lamda=0.01 |
| 45 - 65 | 100 | 0.16 | 0.19 | 1.02 |

PP64 Power Phase

Ranges

| Voltage | |
|----------------------------|--|
| 8 ranges: | 0.3 - 1 - 3 - 10 - 30 - 100 - 300 - 1000 V $V_{peak} = 2 \times \text{range}$ |
| Input impedance: | 2 MOhm / 20 pF |
| CMR common mode rejection: | 120 dB at 100 kHz |

| Current (10A) | |
|---|---|
| 6 ranges: | 30 - 100 mA - 0.3 - 1 - 3 - 10 A $I_{peak} = 2 \times \text{range}$; max level 150% at sine wave (limit of error as at 100%). |
| Input impedance with integrated shunts: | |
| Ranges 30, 100 mA: | 1.4 Ohm typ. |
| Ranges 0.3, 1 A: | 0.25 Ohm typ. |
| Ranges 3, 10 A: | 0.025 Ohm typ. |
| 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 | V | I |
| Error of range | 0.02% | 0.02% |
| Error of 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 V | 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

| | V and I via BNC | I direct measured |
|----------------|-----------------|-------------------|
| Bandwidth -3dB | 3 MHz | 1 MHz |

Voltage and current measurement accuracy depending on the input level and the frequency (reading + range)

| Frequency [Hz] | Limits of error in % | | | |
|----------------|----------------------|----------|------------|----------|
| | Input level in % | | | |
| | 100 | 75 | 50 | 25 |
| 0 - 45 | +/- 0.05 | +/- 0.06 | +/- 0.07 | +/- 0.11 |
| 45-65 | +/- 0.03 | +/- 0.04 | +/- 0.05 | +/- 0.09 |
| 65 - 1,000 | +/- 0.05 | +/- 0.06 | +/- 0.07 | +/- 0.11 |
| 2,000 | +/- 0.16 | +/- 0.18 | +/- 0.23 | +/- 0.37 |
| 5,000 | +/- 0.29 | +/- 0.34 | +/- 0.44 | +/- 0.72 |
| 10,000 | +/- 0.40 | +/- 0.47 | +/- 0.60 | +/- 0.99 |
| 20,000 | +/- 0.52 | +/- 0.61 | +/- 0.78 | +/- 1.29 |
| 50,000 | +/- 0.68 | +/- 0.79 | +/- 0.1.01 | +/- 1.68 |
| 100,000 | +/- 0.80 | +/- 0.93 | +/- 1.20 | +/- 1.99 |

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 / Between V and I

| PP64 | 45-65Hz, antialiasing filter on | 10Hz- 100kHz antialiasing filter off |
|---------------|---------------------------------|--------------------------------------|
| Angular Error | 0.0025° | 0.005° + 0.005° / kHz |

Error Power E_p in % of rdg = $\pm \left(E_v + E_i + \frac{E_a \cdot S}{P} \right)$

| Frequency [Hz] | Input level [%] | Limit of error in % | | |
|----------------|-----------------|---------------------|-----------|------------|
| | | Lamda=1 | Lamda=0.1 | Lamda=0.01 |
| 45 - 65 | 100 | 0.05 | 0.07 | 0.51 |

Ordering Information



Fluke Norma 4000
Basic Configuration



Fluke Norma 5000
Basic Configuration

| | | | |
|---|--|---|---|
| <p>Fluke Norma 4000 High Precision Power Analyzer</p> | <p>Basic configuration includes:</p> <ul style="list-style-type: none"> • 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 with measurement values full point is : Test certificate with measurement values | <p>Fluke Norma 5000 High Precision Power Analyzer</p> | <p>Basic configuration includes:</p> <ul style="list-style-type: none"> • 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 with measurement values full point is : Test certificate with measurement 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, I _{max} 32A |
| 3024689 | Cables for 32 A Planar Shunt |
| 3024886 | 10 A Triaxial Shunt with Cables, I _{max} 30A (10 mΩ, 0 to 2 MHz) |
| 3024899 | 30 A Triaxial Shunt with Cables, I _{max} 100A (1mΩ, 0 to 2 MHz) |
| 3024847 | 100 A Shunt with Cables, I _{max} 300A (0,2 mΩ, 0 to 1 MHz) |
| 3024858 | 150 A Shunt with Cables, I _{max} 450A (0.5 mΩ, 0 to 0.5 MHz) |
| 3024864 | 300 A Shunt with Cables, I _{max} 1000A (0,06 mΩ, 0 to 0,5 MHz) |
| 3024873 | 500 A Shunt with Cables, I _{max} 1500A (0,06 mΩ, 0 to 0.2 MHz) |
| 3024692 | LG Shunt Cables for High Current Shunts |
| 3313059 | Fluke Norma 4000,19 inch rack mount kit with handles |
| 3313067 | Fluke Norma 5000,19 inch rack mount kit with handles |

Cables & Adaptors

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

Printer Accessories

| Order Number | Description |
|--------------|--|
| 3024650 | Printer Cable for Fluke Norma 5000 and Fluke Norma 4000 (RS232-Centronics) |
| 3024781 | Norma Printer Paper |

All accessories have a two-year warranty.

Standard configurations

| Order number | Short Description | Description | Power phases type | | | | | No. of phases | IEEE488/ LAN | Process interface | Printer |
|--------------|--------------------|--|-------------------|------|------|------|------|---------------|-----------------|-------------------|---------|
| | | | PP42 | PP50 | PP52 | PP54 | PP64 | | | | |
| 3108534 | Fluke-N4K 1PP42 | Fluke-Norma 4000, single phase with PP42 power phase input module | ● | | | | | 1 | | | |
| 3108541 | Fluke-N4K 3PP42 | Fluke-Norma 4000, three phase with 3xPP42 power phase input modules | ● | | | | | 3 | | | |
| 3108552 | Fluke-N4K 3PP42I | Fluke-Norma 4000, three phase with 3xPP42 power phase input modules with IEEE488 / Ethernet interface | ● | | | | | 3 | ● | | |
| 3108565 | Fluke-N4K 3PP42IP | Fluke-Norma 4000, three phase with 3xPP42 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels | ● | | | | | 3 | ● | ● | |
| 3110957 | Fluke-N4K 3PP42B | Fluke-Norma 4000, three phase with 3xPP42 power phase input modules with current binding post | ● | | | | | 3 | | | |
| 3110969 | Fluke-N4K 3PP42IB | Fluke-Norma 4000, three phase with 3xPP42 power phase input modules with current binding post with IEEE488 / Ethernet interface | ● | | | | | 3 | ● | | |
| 3110978 | Fluke-N4K 3PP42IPB | Fluke-Norma 4000, three phase with 3xPP42 power phase input modules with current binding post with IEEE488 / Ethernet interface and analog / digital output channels | ● | | | | | 3 | ● | ● | |
| 3108576 | Fluke-N4K 3PP50 | Fluke-Norma 4000, three phase with 3xPP50 power phase input modules | | ● | | | | 3 | | | |
| 3108583 | Fluke-N4K 3PP50I | Fluke-Norma 4000, three phase with 3xPP50 power phase input modules with IEEE488 / Ethernet interface | | ● | | | | 3 | ● | | |
| 3108590 | Fluke-N4K 3PP50IP | Fluke-Norma 4000, three phase with 3xPP50 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels | | ● | | | | 3 | ● | ● | |
| 3312894 | Fluke-N4K 3PP52IB | Fluke-Norma 4000, three phase with 3xPP52 power phase input modules with current binding post with IEEE488 / Ethernet interface | | | ● | | | 3 | ● | | |
| 3108601 | Fluke-N4K 3PP54I | Fluke-Norma 4000, three phase with 3xPP54 power phase input modules with IEEE488 / Ethernet interface | | | | ● | | 3 | ● | | |
| 3108612 | Fluke-N4K 3PP54IP | Fluke-Norma 4000, three phase with 3xPP54 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels | | | | ● | | 3 | ● | ● | |
| 3108620 | Fluke-N5K 3PP50 | Fluke-Norma 5000, three phase with 3xPP50 power phase input modules | | ● | | | | 3 | | | |
| 3108635 | Fluke-N5K 3PP50I | Fluke-Norma 5000, three phase with 3xPP50 power phase input modules with IEEE488 / Ethernet interface | | ● | | | | 3 | ● | | |
| 3108647 | Fluke-N5K 3PP50IP | Fluke-Norma 5000, three phase with 3xPP50 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels | | ● | | | | 3 | ● | ● | |
| 3108658 | Fluke-N5K 3PP54 | Fluke-Norma 5000, three phase with 3xPP54 power phase input modules | | | | ● | | 3 | | | |
| 3108664 | Fluke-N5K 3PP54I | Fluke-Norma 5000, three phase with 3xPP54 power phase input modules with IEEE488 / Ethernet interface | | | | ● | | 3 | ● | | |
| 3312934 | Fluke-N5K 3PP54R | Fluke-Norma 5000, three phase with 3xPP54 power phase input modules and printer | | | | ● | | 3 | | | ● |
| 3108673 | Fluke-N5K 3PP54IP | Fluke-Norma 5000, three phase with 3xPP54 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels | | | | ● | | 3 | ● | ● | |
| 3312941 | Fluke-N5K 3PP54IR | Fluke-Norma 5000, three phase with 3xPP54 power phase input modules with IEEE488 / Ethernet interface and printer | | | | ● | | 3 | ● | | ● |
| 3108686 | Fluke-N5K 3PP64 | Fluke-Norma 5000, three phase with 3xPP64 power phase input modules | | | | | ● | 3 | | | |
| 3108699 | Fluke-N5K 3PP64I | Fluke-Norma 5000, three phase with 3xPP64 power phase input modules with IEEE488 / Ethernet interface | | | | | ● | 3 | ● | | |
| 3108702 | Fluke-N5K 3PP64IP | Fluke-Norma 5000, three phase with 3xPP64 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels | | | | | ● | 3 | ● | ● | |
| 3312952 | Fluke-N5K 3PP64R | Fluke-Norma 5000, three phase with 3xPP64 power phase input modules and printer | | | | | ● | 3 | | | ● |
| 3312965 | Fluke-N5K 3PP64IR | Fluke-Norma 5000, three phase with 3xPP64 power phase input modules with IEEE488 / Ethernet interface and printer | | | | | ● | 3 | ● | | ● |
| 3312976 | Fluke-N5K 3PP64IPR | Fluke-Norma 5000, three phase with 3xPP64 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels and printer | | | | | ● | 3 | ● | ● | ● |
| 3108716 | Fluke-N5K 4PP54 | Fluke-Norma 5000, three phase with 4xPP54 power phase input modules | | | | ● | | 4 | | | |
| 3108725 | Fluke-N5K 4PP54IP | Fluke-Norma 5000, three phase with 4xPP54 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels | | | | ● | | 4 | ● | ● | |
| 3312929 | Fluke-N5K 6PP42IB | Fluke-Norma 5000, three phase with 6xPP42 power phase input modules with current binding post with IEEE488 / Ethernet interface | ● | | | | | 6 | ● | | |

See Recommended Accessories on Page 10.

Standard configurations

| Order number | Short Description | Description | Power phases type | | | | | No. of phases | IEEE488/ LAN | Process interface | Printer |
|--------------|--------------------|--|-------------------|------|------|------|------|---------------|-----------------|-------------------|---------|
| | | | PP42 | PP50 | PP52 | PP54 | PP64 | | | | |
| 3313044 | Fluke-N5K 6PP42IBR | Fluke-Norma 5000, three phase with 6xPP42 power phase input modules with current binding post with IEEE488 / Ethernet interface and printer | ● | | | | | 6 ● | ● | | ● |
| 3312918 | Fluke-N5K 6PP50IP | Fluke-Norma 5000, three phase with 6xPP50 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels | | ● | | | | 6 | ● | ● | |
| 3313003 | Fluke-N5K 6PP50IR | Fluke-Norma 5000, three phase with 6xPP50 power phase input modules with IEEE488 / Ethernet interface and printer | | ● | | | | 6 | ● | | ● |
| 3313015 | Fluke-N5K 6PP50IPR | Fluke-Norma 5000, three phase with 6xPP50 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels and printer | | | | | | 6 | ● | ● | ● |
| 3312907 | Fluke-N5K 6PP50I | Fluke-Norma 5000, three phase with 6xPP50 power phase input modules with IEEE488 / Ethernet interface | | ● | | | | 6 | ● | | |
| 3108733 | Fluke-N5K 6PP54I | Fluke-Norma 5000, three phase with 6xPP54 power phase input modules with IEEE488 / Ethernet interface | | | | ● | | 6 | ● | | |
| 3108740 | Fluke-N5K 6PP54IP | Fluke-Norma 5000, three phase with 6xPP54 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels | | | | ● | | 6 | ● | ● | |
| 3312983 | Fluke-N5K 6PP54IR | Fluke-Norma 5000, three phase with 6xPP54 power phase input modules with IEEE488 / Ethernet interface and printer | | | | ● | | 6 | ● | | ● |
| 3312990 | Fluke-N5K 6PP54IPR | Fluke-Norma 5000, three phase with 6xPP54 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels and printer | | | | ● | | 6 | ● | ● | ● |
| 3108757 | Fluke-N5K 6PP64I | Fluke-Norma 5000, three phase with 6xPP64 power phase input modules with IEEE488 / Ethernet interface | | | | | ● | 6 | ● | | |
| 3108769 | Fluke-N5K 6PP64IP | Fluke-Norma 5000, three phase with 6xPP64 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels | | | | | ● | 6 | ● | ● | |
| 3313026 | Fluke-N5K 6PP64IR | Fluke-Norma 5000, three phase with 6xPP64 power phase input modules with IEEE488 / Ethernet interface and printer | | | | | ● | 6 | ● | | ● |
| 3313032 | Fluke-N5K 6PP64IPR | Fluke-Norma 5000, three phase with 6xPP64 power phase input modules with IEEE488 / Ethernet interface and analog / digital output channels and printer | | | | | ● | 6 | ● | ● | ● |

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