

Data Sheet

Power Meter 5335B



The 5335B is a compact, single-phase AC / DC power meter for measuring and analyzing power consumption and power quality parameters quickly and accurately. It supports power measurements up to 600 Vrms, and 20 Arms, with a bandwidth up to of 100 kHz.

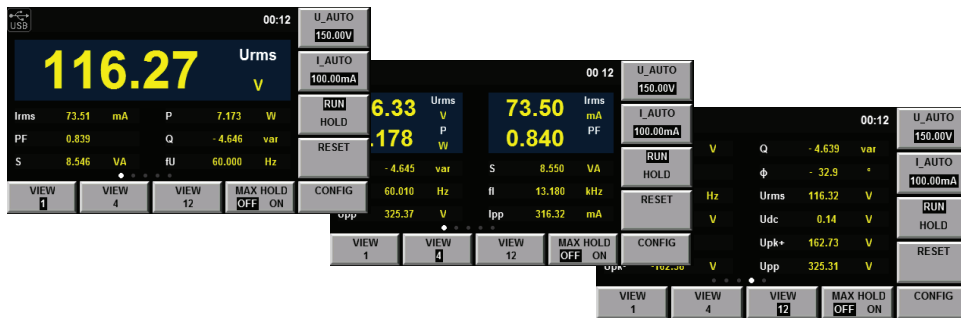
Applications

Measure power, electrical energy bought or sold back to the power grid, inverters, harmonics of motors, un-interruptible power supplies, appliances, and consumer electronics.

Rich Measurement Functions

Measure all AC and DC parameters, including power, current, voltage, power factor, frequency, and phase. Additionally, the meter features a powerful integration function, the ability to perform harmonic measurements to the 50th order and an oscilloscope mode for viewing voltage and current readings in the time domain.

12 real-time parameters can be measured and displayed simultaneously in user customizable views.

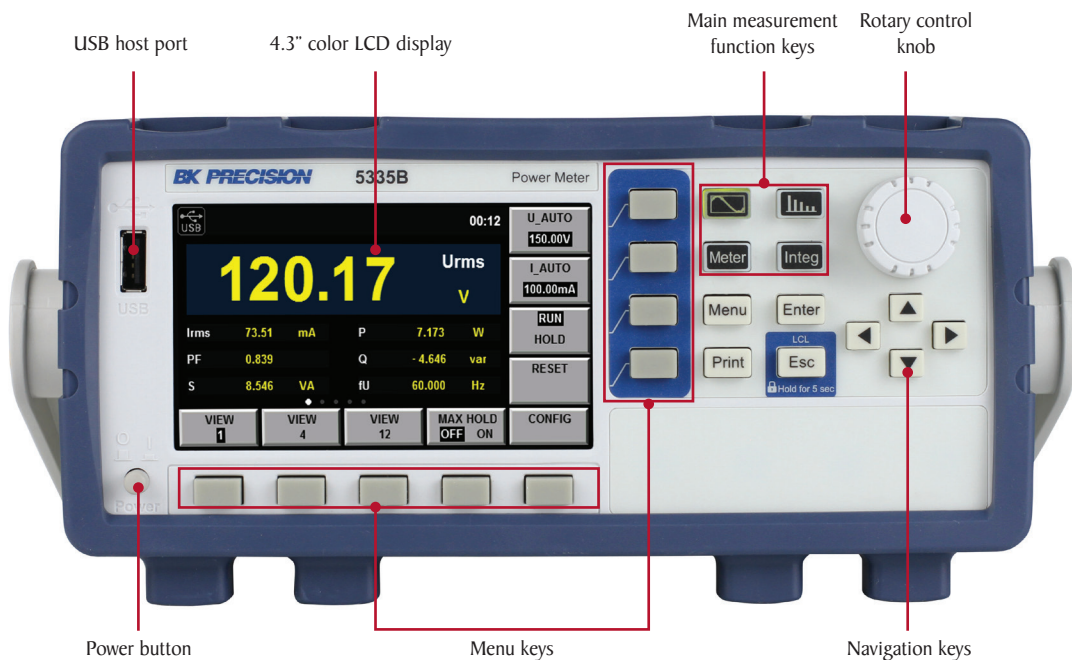


Features & Benefits

- 600 Vrms (Cat II) and 20 Arms direct input ranges
- Frequency ranges DC, 0.5 Hz to 100 kHz
- 0.1% basic accuracy for voltage and current measurements
- 4.3-inch color LCD (TFT)
- Simultaneously measure and display up to 12 measurement parameters
- Capture inrush current, and voltage surge with the peak function
- Harmonic measurements to the 50th order
- Integration function with automatic range switching
- Ability to measure electrical energy which is produced or consumed
- Pre-compliance testing according to IEC/EN 62000-3-2 / 4-7
- Standard USB, GPIB, RS232 and LAN interfaces
- Line and frequency filter capability for reducing unwanted signal noise
- Optional universal breakout box to simplify connection between power meter and DUT

| Model | Basic voltage and current accuracy | Measurement range | | Input bandwidth | Measurements |
|-------|------------------------------------|-------------------|-------------|----------------------|---|
| | | Voltage | Current | | |
| 5335B | ±(0.1% + 0.2% F.S.) | 0 - 600 Vrms | 0 - 20 Arms | DC, 0.5 Hz – 100 kHz | Voltage, Current, Active power, Reactive power, Apparent power, Power factor, Phase difference, Frequency, V Max/V Min, A Max/A Min, Crest factor, Integration, Harmonic distortion factor, Total harmonic distortion (THD) |

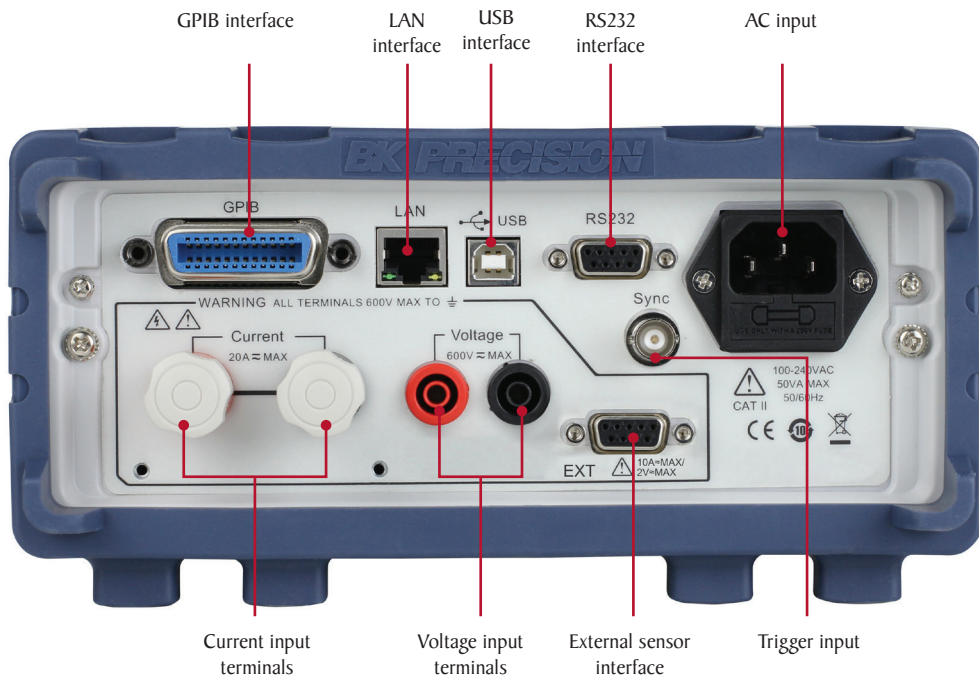
Front panel



Intuitive user interface

The large 4.3 inch color LCD screen enables easy viewing of configuration and measurements. Use the dedicated function keys to select one of the 4 main measurement modes: meter, harmonic, integral or oscilloscope. The results are displayed in numeric and graphical format. Screenshots can be saved directly to a USB flash drive.

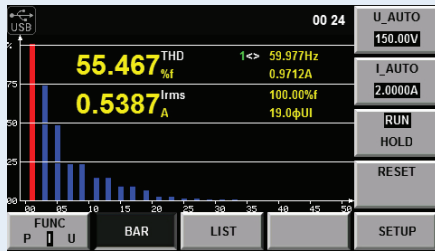
Rear panel



Flexible operation

Harmonic measurement

Voltage, current, active power, reactive power and phase values of each harmonic can be measured and displayed as a list or bar chart, enabling the user to quickly visualize and analyze the results. Total harmonic distortion (THD) can be evaluated up to the 50th order with the ability to display individual harmonic components.



Bar chart

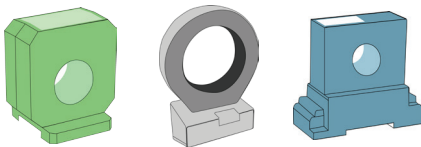
00 25 U_AUTO 150.00V
I_AUTO 2.0000A

| ORDER | U(V) | I(A) | P(W) |
|-------|--------|--------|--------|
| 0 | 0.07 | 0.0012 | -0.00 |
| 1 | 116.38 | 0.9706 | 106.51 |
| 2 | 0.04 | 0.0037 | 0.00 |
| 3 | 0.33 | 0.4767 | -0.06 |
| 4 | 0.02 | 0.0026 | -0.00 |
| 5 | 1.31 | 0.2295 | 0.01 |

List

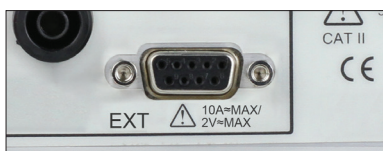
List

Current sensor input



Example current transducers

Current measurements above 20 A are supported by connecting an external current sensor to the external sensor interface.

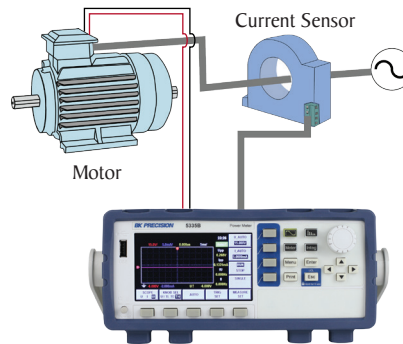


External sensor



To accommodate commonly available current sensor types, users can select from the 50 mV - 2 V or 2.5 V - 10 V ranges.

Motor testing



Power Meter

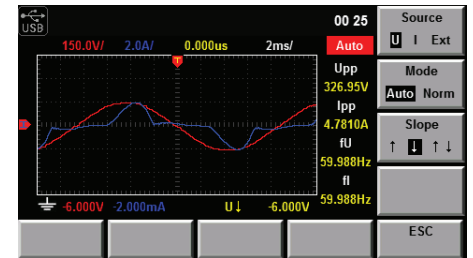
Many industrial products use PWM as a speed control method. The 5335B is able to measure input signals ranging from 0.5 Hz - 100 kHz and input voltages up to 600 V. Current can be monitored directly or by using external industry standard sensors.

Integration measurement



The integration function is useful for analyzing bought and sold electrical energy of a grid tied power systems. The 5335B meter provides current integral and active power integral (Wh) functionality using automatic range switching for accurate measurement results.

Oscilloscope function



Displays waveforms of sampled voltage and current.

Optional universal breakout box



The optional TLBB53 breakout box simplifies AC line connection between the power meter and the DUT, and eliminates the need to cut the power cord and strip wires to connect to the power meter. This breakout box supports easy plug in connection and uses a universal socket to support most plugs used worldwide. A circuit breaker/ switch is also provided for additional protection.

Specifications

Specifications are subject to the following conditions
 Temperature: 23±5° C, humidity: 30 to 75% RH.
 Warm-up time: 30 minutes

| Model | 5335B | |
|--|---|--|
| General Measurement Specifications | | |
| Basic measurements | Voltage, Current | Peak to peak, Maximum, Minimum, Average_rms, Average_rectified, DC, Crest factor (current), Inrush (current) |
| | Power | Real, Apparent, Reactive, DC, Power factor |
| | Time | Frequency, Phase |
| | Integration | Total power, Total current, Maximum power, Minimum power |
| Harmonic measurements | Type | Current, Voltage, Real power, Apparent power, Reactive power, Power factor, Phase, Percentage of total (Current, Voltage, Power) |
| | Range | DC up to 50 th order |
| | Max. Frequency | 100 kHz |
| Input bandwidth | DC, 0.5 Hz to 100 kHz | |
| Measurement method | Digital sampling | |
| A/D Converter | Simultaneous conversion of voltage and current inputs, Resolution: 18-bit, Maximum conversion rate: 10 μs | |
| Line filter | Select OFF or ON (cutoff frequency at 500 Hz) | |
| Peak (max,min) | Voltage, current, or power | |
| Input voltage continuous max. | 1.5 kV-peak or 1 kV-RMS, whichever is less | |
| Input voltage transient (<1s) max. | 2 kV-peak or 1.5 kV-RMS, whichever is less | |
| Input voltage common-mode max. | 600 Vrms | |
| Voltage input impedance | 2 MΩ + 13 pF in parallel (typical) | |
| Current input impedance (typical) | 5 mA to 200 mA range | 505 mΩ + 0.1 μH |
| | 0.5 A to 20 A range | 5 mΩ + 0.1 μH |
| | Sensor input | 20 kΩ (50 mV to 2 V) 100 kΩ (2.5 V to 10 V) |
| Input current continuous max. | 5 mA to 200 mA range | 30 A-peak or 20 A-RMS, whichever is less |
| | 0.5 A to 20 A range | 100 A-peak or 30 A-RMS, whichever is less |
| | Sensor input | Peak value less than or equal to 5 times the rated range |
| Input current transient (<1s) max. | 5 mA to 200 mA range | 30 A-peak or 20 A-RMS, whichever is less |
| | 0.5 A to 20 A range | 150 A-peak or 40 A-RMS, whichever is less |
| | Sensor input | Peak value less than or equal to 10 times the rated range |
| Voltage Measurement Accuracy and Ranges | | |
| Ranges | CF=3: 15 V, 30 V, 60 V, 150 V, 300 V, 600 V CF=6: 7.5 V, 15 V, 30 V, 75 V, 150 V, 300 V | |
| Accuracy ² (line, frequency, & digital filter set to off) | DC - 1 kHz | ±(0.1% + 0.2% F.S.) |
| | 1 kHz < f ≤ 10 kHz | ±((0.07 f ¹)% + 0.3% F.S.) |
| | 10 kHz < f ≤ 100 kHz | ±(0.5% + 0.5% F.S.) ± [(0.04 × (f ¹ - 10))%] |
| Temperature coefficient | For temperature changes after zero-level compensation or range change | + 0.02% F.S. /°C to the DC voltage accuracy |
| | Influence of self-generated heat caused by voltage input (U is the voltage reading (V)) | + 0.0000001 × U ² % to the AC voltage accuracy + 0.0000001 × U ² % + 0.0000001 × U ² % F.S. to DC current accuracy |

¹ Input signal frequency in kHz

² Input waveform: Sine wave crest factor: 3, common-mode voltage: 0 V, power factor: 1
 Frequency filter: Turn on when measuring ≤ 200 Hz

Specifications (cont.)

| Current Measurement Accuracy and Ranges | | | | | | | |
|--|--|--|---------------------|--|----------------------|---------------------|---------------------|
| Direct input range | | CF= 3: 5 mA, 10 mA, 20 mA, 50 mA, 100 mA, 200 mA, 0.5 A, 1 A, 2 A, 5 A, 10 A, 20 A | | | | | |
| | | CF= 6: 2.5 mA, 5 mA, 10 mA, 25 mA, 50 mA, 100 mA, 250 mA, 0.5 A, 1 A, 2.5 A, 5 A, 10 A | | | | | |
| Sensor input range | External 1 | CF = 3: 2.5 V, 5 V, 10 V CF = 6: 1.25 V, 2.5 V, 5 V | | | | | |
| | External 2 | CF = 3: 50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V CF = 6: 25 mV, 50 mV, 100 mV, 250 mV, 500 mV, 1 V | | | | | |
| Accuracy ² (line, frequency, & digital filter set to off) | DC to 1 kHz | ±(0.1% + 0.2% F.S.) | | | | | |
| | 1 kHz < f ≤ 10 kHz | ±{(0.07 f ¹)% + 0.3% F.S.} | | | | | |
| | 10 kHz < f ≤ 100 kHz | ±(0.5% + 0.5% F.S.) ± [(0.04×(f ¹ -10))%] | | | | | |
| Temperature coefficient | 2.5 to 200 mA | 5 μA/V °C (after zero-level compensation, or range change) | | | | | |
| | 500 mA to 20 A | 500 μA/V °C (after zero-level compensation, or range change) | | | | | |
| | Influence of internal sensor self-heating | + 0.00013 × I ² % of reading to the AC current accuracies + 0.00013 × I ² % of reading + 0.004 × I ² mA (0.5 to 20 A) or 0.00013 × I ² % of reading + 0.00004 × I ² mA (2.5 to 200 mA), add to the DC current accuracy specifications | | | | | |
| Power Measurement Accuracy | | | | | | | |
| Real power accuracy ^{2,3} (CF= 3) ⁴ | DC | ±(0.1% + 0.2% F.S.) | | | | | |
| | 0.5 Hz ≤ f < 45 Hz | ±(0.3% + 0.2% F.S.) | | | | | |
| | 45 Hz ≤ f ≤ 66 Hz | ±(0.1% + 0.1% F.S.) | | | | | |
| | 66 Hz < f ≤ 1 kHz | ±(0.2% + 0.2% F.S.) | | | | | |
| | 1 kHz < f ≤ 10 kHz | ±(0.1% + 0.3% F.S.) ± [(0.067×(f-1))%] | | | | | |
| | 10 kHz < f ≤ 100 kHz | ±(0.5% + 0.5% F.S.) ± [(0.09×(f-10))%] | | | | | |
| Apparent power (S) | Voltage accuracy + current accuracy | | | | | | |
| Reactive power (Q) | Apparent power accuracy + (√(1.0004-PF ²) - (√(1-PF ²))) × 100% | | | | | | |
| Power factor (PF) | ±[(PF-PF/1.0002) + abs(cos∅ - cos{∅+sin ⁻¹ (influence from the power factor when PF=0%/100)})] ± 1 digit when voltage and current are at the measurement range rated input | | | | | | |
| Phase difference (Φ) | ±[abs(∅ - cos ⁻¹ (PF/1.0002)) + sin ⁻¹ {(influence from the power factor when PF=0%/100)}] deg ± 1 digit when voltage and current are at the measurement range rated input | | | | | | |
| Temperature coefficient | Same as the temperature coefficient for voltage and current | | | | | | |
| Frequency Measurement Accuracy | | | | | | | |
| Frequency measurement range | Data update interval | 0.1 s | 0.25 s | 0.5 s | 1 s | 2 s | 5 s |
| | Measurement range | 25 Hz ≤ f ≤ 100 kHz | 10 Hz ≤ f ≤ 100 kHz | 5 Hz ≤ f ≤ 100 kHz | 2.5 Hz ≤ f ≤ 100 kHz | 1.5 Hz ≤ f ≤ 50 kHz | 0.5 Hz ≤ f ≤ 20 kHz |
| Accuracy | ±0.06% | | | (CF 3 and signal <30% F.S.) or, (CF 6 and signal <60% F.S.), and ≤ 200 Hz with frequency filter on | | | |
| Frequency filter | 500 Hz low-pass | | | | | | |

¹ Input signal frequency in kHz

² Input waveform: Sine wave crest factor: 3, common-mode voltage: 0 V, power factor: 1
Frequency filter: Turn on when measuring ≤ 200 Hz

³ When power factor (PF)=0 (apparent power (S)):
±0.2% of S when 45 Hz ≤ f ≤ 66 Hz
±{(0.2+0.2×f)% of S} when 0.066 ≤ f ≤ 100 kHz

When 0 < PF < 1 (phase angle (Φ)):

(power reading) × [(power reading error %) + (power range %) × (power range/indicated apparent power value) + {tanΦ × (influence when PF=0)}]

When the line filter is turned ON:

45 to 66 Hz: Add 0.3% of reading

<45 Hz: Add 1% of reading

⁴ Accuracy when the crest factor is set to 6, the accuracy is obtained by doubling specified accuracies

Specifications (cont.)

| Harmonic Measurement Parameters | | | | | |
|---|--|---|---------------------|---------------------|---------------------|
| Measurement method | PLL synchronization | | | | |
| Frequency range | PLL frequency source range 10 Hz to 1.2 kHz (typical) | | | | |
| FFT data length | 1024 | | | | |
| Window function | Rectangle | | | | |
| Fundamental frequency (Fund. freq.) | 10 Hz to 75 Hz | 75 Hz to 150 Hz | 150 Hz to 300 Hz | 300 Hz to 600 Hz | 600 Hz to 1200 Hz |
| Sample rate | (Fund. freq.) x 1024 | (Fund. freq.) x 512 | (Fund. freq.) x 256 | (Fund. freq.) x 128 | (Fund. freq.) x 64 |
| Window width | 1 | 2 | 4 | 8 | 16 |
| Upper limit of analysis orders | 50 | 32 | 16 | 8 | 4 |
| Harmonic Measurement Accuracy (when line filter is off, the accuracy shown below is the sum of reading and range error) | | | | | |
| Frequency | 10 Hz ≤ f < 45 Hz | 45 Hz ≤ f ≤ 440 Hz | 440 Hz < f ≤ 1 kHz | 1 kHz < f ≤ 2.5 kHz | 2.5 kHz < f ≤ 5 kHz |
| Voltage and current | ±0.15% ± 0.35% F.S. | ±0.15% ± 0.35% F.S. | ±0.20% ± 0.35% F.S. | ±0.80% ± 0.45% F.S. | 3.05% ± 0.45% F.S. |
| Power | ±0.15% ± 0.50% F.S. | ±0.20% ± 0.50% F.S. | ±0.40% ± 0.50% F.S. | 1.56% ± 0.60% F.S. | 5.77% ± 0.60% F.S. |
| Oscilloscope Function | | | | | |
| Channels | 2 | | | | |
| Measurement | Voltage and current | | | | |
| Bandwidth (-3 dB) | 10 kHz | | | | |
| Sample rate | 100 kS/s | | | | |
| Record length | 300 points/channel | | | | |
| Horizontal scale (Accuracy ±4.0%) | 500 us, 1 ms, 2 ms, 5 ms, 10 ms, 20 ms, 50 ms, 100 ms, 200 ms, 500 ms | | | | |
| Vertical scale ranges (Accuracy ±4.0%) | CF 3 | I: 2.5, 5, 10, 25, 50, 100, 250, 500 mA/div, 1 A, 2.5 A, 5 A, 10 A/div, U: 7.5, 15, 30, 75, 150, 300 V/div | | | |
| | CF 6 | I: 5, 10, 20, 50, 100, 200, 500 mA/div, 1 A, 2 A, 5 A, 10 A, 20 A/div, U: 15, 30, 60, 150, 300, 600 V/div | | | |
| Maximum input voltage (DC+AC peak) | 1800 V | | | | |
| Maximum input current (DC+AC peak) | 60 A | | | | |
| Environmental and Safety | | | | | |
| Temperature | Operating: 41 °F to 104 °F (5 °C to 40 °C) Storage: -4 °F to 122 °F (-20 °C to 50 °C) | | | | |
| Humidity | 20% RH to 80% RH (non-condensing) | | | | |
| Electromagnetic compatibility | IEC 61326 | | | | |
| Safety | IEC 61010-1, EN 61010-1, Measurement 600 V CAT II | | | | |
| General | | | | | |
| Display | 4.3" TFT-LCD display, 480 x 272 | | | | |
| Remote Interfaces | USB, GPIB, RS232, LAN | | | | |
| Power | 100 to 240 VAC, 50 / 60 Hz | | | | |
| Power Consumption | 50 VA max. | | | | |
| Dimensions (W x H x D) | 8.4" x 3.5" x 14" (214.5 x 88.2 x 354.6 mm) | | | | |
| Weight | 6.2 lbs (2.8 kg) | | | | |
| Three-Year Warranty | | | | | |
| Standard Accessories | Getting started manual, instruction manual (downloadable), AC power cord, USB type A-to-type B cable, certificate of calibration | | | | |