
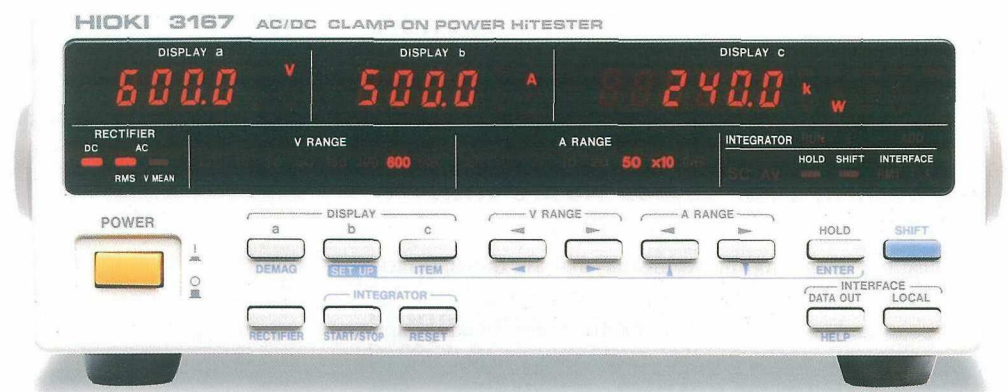


3167 AC/DC CLAMP ON POWER HiTESTER

Power Measuring
Instruments 



Even measures DC power through the clamp

In addition to being able to measure AC power, the **3167 AC/DC CLAMP ON POWER HiTESTER** is a single-phase clamp power meter that can not only measure AC power but also DC power as well. The 3167 is especially useful for testing and evaluating DC systems such as battery-powered vehicles such as robot carriers and motorized carts, solar-power systems, electric cars, and fuel cells.

Can Integrate Total DC Power Without

When measuring power with a direct input waveform power meter, a CT or shunt resistor must be inserted in series in the circuit to be measured, making measurement complicated. In addition to permitting connection via a clamp to a live circuit, the 3167 gives the user a choice of six clamp sensors, allowing the user to select the clamp sensor that is best suited to the task. This tester can be used

with a wide variety of devices, including household appliances, office equipment, and DC-powered devices. Because polarity discrimination is possible in DC measurement, it is also possible to determine whether the object being measured is charging or discharging, and to integrate the power for the two polarities separately.

Main Features

- Simple measurement using clamp input
- Broad range of measurements possible using a wide variety of clamp sensors
- Long-term stable measurement with minimal zero drift
- Broad band of measurement: DC, 10 Hz to 50 kHz
- Wide 15 to 600 V and 2 to 500 A ranges
- Simultaneous integration for positive and negative current and power, and long-term integration over 10,000 hours
- Simultaneity of all data
- Data output to a general-purpose printer
- Measurement including phase advance/delay
- Simultaneous analog output and monitor output for voltage, current, and power (V, A, and W)

■ Totaling over 10,000 hours with high resolution possible

Because the integration power display has six digits, up to a maximum of ± 999999 M (Wh/Ah) can be integrated. The decimal point and unit are switched automatically, making high-resolution measurement possible. In addition, integration is possible over a maximum of 10,000 hours (416 days).

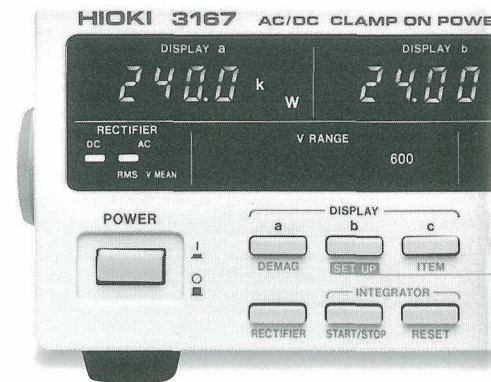
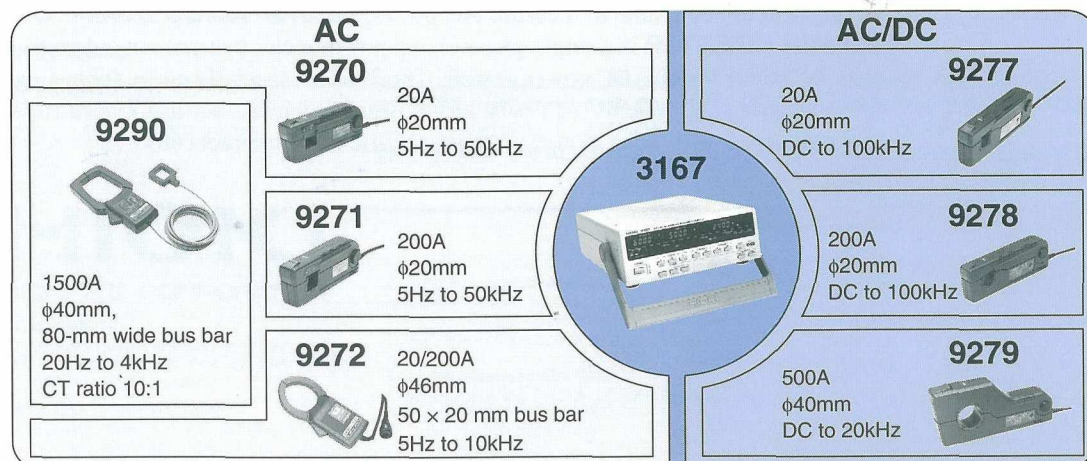
■ Simultaneous integration of Positive and Negative Current

Integration can be done simultaneously for positive (+), negative (-), and total integrated power and current, respectively. This makes the 3167 useful for the testing of devices that charge/discharge batteries and that produce regenerative power.

■ Stable measurement over long periods

Previously, zero drift was a problem in DC measurement so that during measurement over long periods, it was necessary to adjust the zero level regularly. Zero drift is minimized in the 3167, making stable measurement over long periods possible.

Product Configuration



■ Simultaneity of all data

The measured values for all data can be obtained simultaneously. If the hold function is used, simultaneous data for all measured items can be displayed by moving a switch; simultaneous output of all data is also possible.



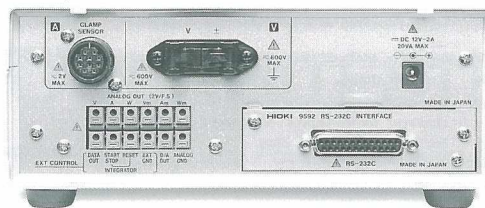
Interrupting the Electrical Circuit

DC drive

Using the DC power supply plug, it is possible to drive the tester off of a 12 V power supply. This feature is useful for field testing, such as if the tester were installed in an electric car. (Use any commercially available DC power supply plug. If a commercial power supply is available, use the AC adapter provided.)

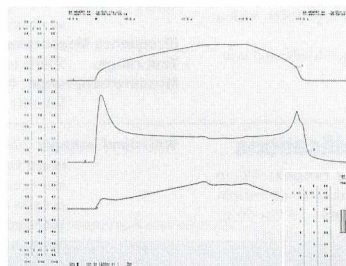


Rear panel

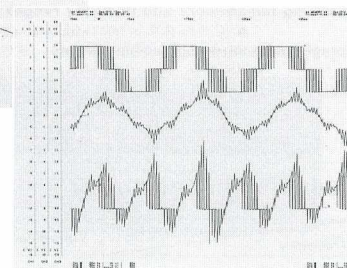


Monitor output/Analog output/ D/A output

The 3167 can simultaneously output voltage, current, and active power waveforms and levels. When connected to a recorder, etc., it is possible to create a record of the waveforms and their interrelationships over time. Any one of the other measurement items can be selected for level output through the D/A output.



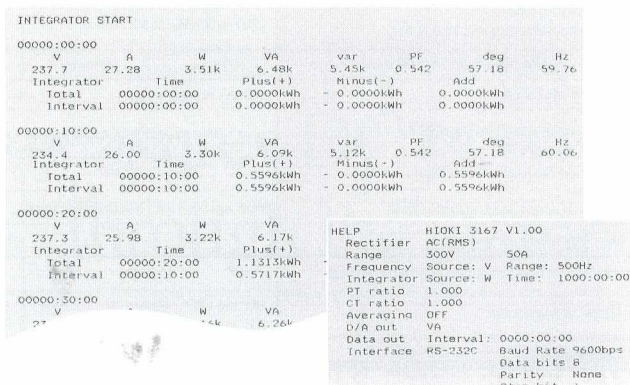
Analog output



Monitor output

Interfaces (optional)

9588GP-IB and 9592RS-232C interfaces are also available. These interfaces can be used for system measurement with a computer. In addition, a printer with the RS-232C interface or with the GP-IB interface that supports the "listen only" function can be connected directly to the 3167, making it possible to print out all data and also to print at intervals synchronized with the start of integration.



Range Configurations

Clamp sensor rated current	200A								
	20A			500A					
V \ A	2.000A	5.000A	10.00A	20.00A	50.00A	100.0A	200.0A	500.0A	
15.00V	30.00W	75.00W	150.0W	300.0W	750.0W	1.500kW	3.000kW	7.500kW	
30.00V	60.00W	150.0W	300.0W	600.0W	1.500kW	3.000kW	6.000kW	15.00kW	
60.00V	120.0W	300.0W	600.0W	1.200kW	3.000kW	6.000kW	12.00kW	30.00kW	
150.0V	300.0W	750.0W	1.500kW	3.000kW	7.500kW	15.00kW	30.00kW	75.00kW	
300.0V	600.0W	1.500kW	3.000kW	6.000kW	15.00kW	30.00kW	60.00kW	150.0kW	
600.0V	1.200kW	3.000kW	6.000kW	12.00kW	30.00kW	60.00kW	120.0kW	300.0kW	

* In the case of reactive power and apparent power, the unit "W" is replaced with "VA" or with "var".

Basic Specifications

Measurement lines: Two single-phase lines (1 ϕ 2 W)

Measurement items: Voltage, current, active power, apparent power, reactive power, power factor, phase angle, frequency, current integral and power integral.

Displays: LED displays

Sample rate: 5 times/sec.

Measurement range: As indicated in Range Configurations table. Equipped with both auto and manual ranging.

Maximum allowable input: Voltage: 600 V effective value; 848 V peak value
Current: Depends on clamp sensor being used. However, for the sensor connector: 5.6 V effective value; 8 V peak value

Crest factor: 3 or less

Input resistance (DC): Voltage: 1M Ω \pm 5%
Current: 200 k Ω \pm 10%

Effect of power factor: \pm 0.3% rdg. or less (specifications for the main unit only, at 45Hz to 66Hz, with a power factor of 0.5)

Input methods: Voltage: Resistance voltage divider and insulated amplifier
Current: Clamp sensor

Effective input range: 10% to 100% of the test range (600 V range only)
10% to 110% of the test range (V, A ranges other than that indicated above)

Display range: 0.4% to 130% of the test range (resolution: 4 digits)

Temperature coefficient: \pm 0.05% f.s./ $^{\circ}$ C or less

Effect on common voltage: \pm 0.2% f.s. or less (with voltage input pin shorted and 600 Vrms AC at 50/60 Hz applied between the voltage input pin and ground)

Maximum common voltage: Voltage input pin: 600 Vrms (DC, 50/60 Hz)

Analog output: 2V DC f.s. voltage, current, and active power simultaneously output
Output accuracy: Measurement accuracy \pm 0.1% f.s.
Response time: 1.1 seconds or less

Monitor output: 2V f.s. voltage, current, and active power simultaneously output

Rectification methods: DC, AC + DC RMS, AC RMS, AC MEAN

Other functions: Scaling, averaging, over-input warning, battery backup, hold

[Frequency Measurement Section]
Test range: 500Hz to 50kHz
Measurement range: 0.8% to 100% of test range (4.000 to 500.0Hz, 400.0Hz to 50.00kHz)

Accuracy: \pm 0.1% rdg. \pm 1 dgt (at 0 $^{\circ}$ C to 40 $^{\circ}$ C, with sine wave input)

[Integration Section]
Measurement range: 0 to \pm 999999MAh/MWh (however, the cumulative time must be less than 10,000 hours)

Accuracy: Accuracy of current and active power measurement: \pm 1 dgt.

Timer setting range: 1 minute to 10,000 hours (can be set in one-minute increments)

Accuracy of cumulative integration time: \pm 100ppm \pm 1 second (at 0 $^{\circ}$ C to 40 $^{\circ}$ C)

Functions: Integration for each polarity, external control, elapsed time display, data backup during power outage

[D/A output]
Accuracy: Measurement accuracy \pm 0.2% f.s. (at 23 $^{\circ}$ C \pm 3 $^{\circ}$ C)
Output voltage: 2 V DC f.s.
Output contents: Select any one of: apparent power, reactive power, power factor, phase angle, frequency, cumulative current integration, cumulative power Integration

[GP-IB]
Conforms with IEEE-488.1 1987; with reference to IEEE-488.2 1987
[RS-232C]
Asynchronous communication, full duplex
Baud rate: Select from 1200, 2400, 4800, 9600

General-purpose Specifications

Operating temperature and humidity ranges: 0 $^{\circ}$ C to 40 $^{\circ}$ C, 80% R.H. or less (with no condensation)

Storage temperature and humidity ranges: -10 $^{\circ}$ C to 50 $^{\circ}$ C, 80% R.H. or less (with no condensation)

Insulation resistance: 100M Ω or more at 500V DC (between voltage input pins and case, output pins and external control pins/between voltage input pins and power supply)

Withstand voltage: 2.2kV AC, 50/60Hz, for one minute (between voltage input pins and case, output pins and external control pins/between voltage input pins and power supply)
When using 9418 AC adapter:
1.5kV AC, 50/60Hz, for one minute (between power supply primary side and case, output pins and external control pins)

Power supply: 12V DC \pm 2V

When using 9418 AC adapter:
100V to 240V AC, 50/60Hz

Power consumption: 20VA max. (for rated input, 13 VA max.)

Dimensions/mass: Approximately 215 mm (W) \times 80 mm (H) \times 280 mm (D), and approximately 2.4 kg (including optional 9588 or 9592)

Accessories: 9418-10 AC adapter \times 1, power cord \times 1, 9179 voltage cord \times 1

Measurement accuracy (23 $^{\circ}$ C \pm 3 $^{\circ}$ C, power factor = 1, warm-up time: 30 minutes)

Frequency	Measurement item	Voltage/active power	Current
DC		\pm 0.4%rdg. \pm 0.3%f.s.	\pm 0.5%f.s.
10 to 20Hz		\pm 1.5%f.s.	\pm 1.0%f.s.
20 to 45Hz		\pm 0.4%rdg. \pm 0.4%f.s.	\pm 0.3%f.s.
45 to 66Hz		\pm 0.4%rdg. \pm 0.1%f.s.	\pm 0.3%f.s.
66 to 4kHz		\pm 0.4%rdg. \pm 0.4%f.s.	\pm 0.3%f.s.
4k to 10kHz		\pm 1.4%f.s.	\pm 1.0%f.s.
10k to 50kHz		\pm 3.0%f.s.	\pm 1.0%f.s.

The accuracy of the clamp sensors used with this unit affects the total accuracy additively.

Formulas

Apparent power (VA)	Reactive power (var)	Power factor (PF)	Phase angle (deg.)
$VA = V \times A$	$var = s\sqrt{VA^2 - W^2}$	$PF = s \left \frac{W}{VA} \right $	$deg. = s \cos^{-1} \left \frac{W}{VA} \right $

Note 1: "V" represents voltage, "A" represents current, and "W" represents active power. (The measured values in these cases do not include the rounding error of \pm 1 dgt that results from display.)

Note 2: "s" indicates the polarity, and is "-1" when the current phase is ahead of the voltage (LEAD), and "+1" when behind the voltage (LAG).

Note 3: The accuracy of these formulas is \pm 1 dgt versus the value calculated from the measured values.

Clamp Sensor Specifications

	9270	9271	9272	9277	9278	9279
Rated current	AC 20A	AC 200A	AC 20/200A	AC/DC 20A	AC/DC 200A	AC/DC 500A
Accuracy (23$^{\circ}$C \pm 3$^{\circ}$C) 9270 to 9272 (45Hz to 66Hz) 9277 to 9279 (DC, 45Hz to 66Hz)	\pm 0.5% rdg \pm 0.05% f.s. (amplitude) \pm 0.2 $^{\circ}$ or less (phase)			After demagnetization and with at least 30 minutes warm-up time \pm 0.5% rdg \pm 0.05% f.s. (amplitude) \pm 0.2 $^{\circ}$ or less (phase, but not specified for DC)		
Frequency characteristics (amplitude, phase) (deviation from basic accuracy)	10Hz to 20kHz: 1.0%, within \pm 0.5 $^{\circ}$ 5Hz to 50kHz: 2.5%, within \pm 1.0 $^{\circ}$		10Hz to 1kHz: 1.0%, within \pm 0.5 $^{\circ}$ 5Hz to 10kHz: 2.5%, within \pm 2.0 $^{\circ}$	DC to 1kHz: within \pm 1.0% 1k to 50kHz: within \pm 2.5% 50k to 100kHz: within \pm 5.0%		DC to 1kHz: within \pm 1.0% 1k to 10kHz: within \pm 2.5% 10k to 20kHz: within \pm 5.0%
Maximum allowable input (continuous)	100Arms	500Arms	400Arms (for 10 sec.)	50Arms	350Arms	650Arms
Input resistance	0.2m Ω or less	0.02m Ω or less		0.05m Ω or less	0.002m Ω or less	0.001m Ω or less
Temperature coefficient (0$^{\circ}$C to 40$^{\circ}$C)	\pm 0.05% f.s./ $^{\circ}$ C or less			Sensitivity: within \pm 0.05% f.s./ $^{\circ}$ C Offset: within \pm 0.005% f.s./ $^{\circ}$ C		
Effect of conductor position	Within \pm 0.3%		Within \pm 1.5%	Within \pm 0.5%	Within \pm 1.5%	
Effect of external magnetic field	20mA equivalent typ.	200mA equivalent typ.	2.5A equivalent typ.	0.2A or less	1A or less	2A or less
Maximum circuit voltage	600V AC rms (850V peak) insulated conductor					
Diameter of conductor that can be measured	ϕ 20mm		ϕ 46mm or 50 \times 20mm bus bar	ϕ 20mm		ϕ 40mm
Dimensions/mass	145mm (W) \times 60mm (H) \times 33mm (D), approximately 230g		62mm (W) \times 174mm (H) \times 33mm (D), approximately 420g	176mm (W) \times 63mm (H) \times 34mm (D), approximately 430g		220mm (W) \times 103mm (H) \times 43.5mm (D), approximately 860g
Accessories	9355 carrying case			9375 carrying case, mark band		

Options

9270 CLAMP ON SENSOR
9271 CLAMP ON SENSOR
9272 CLAMP ON SENSOR

9277 UNIVERSAL CLAMP ON CT
9278 UNIVERSAL CLAMP ON CT
9279 UNIVERSAL CLAMP ON CT
9290 CLAMP ON ADAPTER

9588 GP-IB INTERFACE
9592 RS-232C INTERFACE
9151-02 GP-IB CONNECTOR CABLE (2 m)
9151-04 GP-IB CONNECTOR CABLE (4 m)

HIOKI

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