HIOKI

CLAMP ON POWER HiTESTER
3169-20, 3169-21

Power Measuring Instruments

- **Measure up to two 3-phase, 3-wire systems (displays voltage and current for three lines)**
  Measure up to four single-phase, 2-wire systems
- **0.5 A to 5000 A range**

- **Compact and light weight**
- **PC card data storage**
- **Power recording for individual waveforms**
- **Simultaneous recording of demand values and harmonics**
- **POWER LOGGER VIEWER SF1001**

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The photo shows the **3169-21** combined with **CLAMP ON SENSORS 9661 and 9669** (optional) for measuring two systems.
The **3169-20/21** can also be used in combination with **CLAMP ON SENSORS** (optional) rated up to 5000 A.

Offering a new approach to energy-related measurement
such as energy conservation, ISO14001 testing, equipment diagnosis, and harmonics measurement.

Measures power lines of up to 254 mm in diameter

FLEXIBLE CLAMP ON SENSOR CT9667

CLAMP ON POWER HiTESTERs 3169-20 and **3169-21** measure of single-phase to three-phase 4-wire circuits with a single unit. In addition to measuring standard parameters such as voltage, current, power, power factor, and integrated values, these clamp-on power meters can simultaneously perform demand measurements required for carrying out power management and energy-saving measures, as well as harmonic measurements. With greater data processing speeds, it is possible to measure the power of just a few cycles, enabling more detailed and effective energy-saving measures for equipment. The **3169-20** and **3169-21** are ideal for users who want to achieve close control over energy-saving management activities and measures.

ISO 9001
JMI-0216

ISO14001
JQA-E-90091

www.hioki.com
HIOKI company overview, new products, environmental considerations and other information are available on our website.

Offering a new measurement method for energy saving activities

All in a compact A5-size unit

Example of use in combination with four **CLAMP ON SENSOR 9661** (optional)

Simultaneous measurement of two 3-phase, 3-wire systems.
Select the clamp-on sensor type most suited to your measurement needs for each individual circuit.

CLAMP ON POWER HiTESTER 3169-21
(Shown with D/A output)

Simultaneous recording of a variety of signal and energy-saving data.

Allows high-speed data transfer to a PC card for each waveform or at intervals of 0.1, 0.2, or 0.5 second.

CLAMP ON SENSOR 9661 (500 A AC)
CLAMP ON SENSOR 9669 (1000 A AC)
(optional)

VOLTAGE CORD L9438-53 (4 provided)

Features

■ Measure power lines of up to four systems (with a common voltage)

One single unit can measure four circuits (single-phase 2-wire), two circuits (3-phase, 3-wire), or a one circuit (3-phase, 4-wire)system.

■ A wide range of measurement functions

The **3169-20/21** can simultaneously measure voltage, current, power (active, reactive, and apparent), integrated power, power factor, and frequency. Further, when using 3-phase, 3-wire (3P3W2M) mode, you can display the voltage and current for all three lines by measuring just two of them. When using the 3-phase, 4-wire (3P4W4I) mode, neutral line current can be displayed using 4 current measurement.

■ Equipped with ranges from 0.5 A to 5000 A

The power meters support seven types of clamp-on current sensors to enable measurement for a variety of items, from CT terminals to large current and thick power lines.

■ Supports high-speed data storage from individual waveforms

When using the standard mode to perform integrated power measurement, you can store data in intervals starting from one second, and when simultaneously measuring integration and harmonics, in intervals starting from one minute. When in the fast mode, you can store RMS data for individual waveforms.

■ PC Card compatible plus internal hard drive for extra memory

Store valuable measurement data in convenient PC cards. The internal memory (1 MB) supports measurement over extended periods and detailed measurement parameters.

■ Multi-language Compatibility

Select from nine languages, including Japanese and English.

■ Detect incorrect connection using vector diagrams

Use the vector display on the connection confirmation screen to check the phase, whether a connection is loose, or whether the clamp-on sensor connection has been reversed during VT/CT terminal measurement.

■ Polarity display and measurement using the reactive power measurement method

The units come equipped with a polarity display for checking LAG/LEAD when measuring power factor or reactive power. Further, you can select the reactive power measurement method, or display the phase factors for RMS values and power comparison.

■ High-speed D/A output

The **3169-21** comes equipped with 4-channel high-speed D/A output to enable analog output of RMS values for individual waveforms.

■ Ideal for power and harmonics management

The power meters come equipped with a harmonics measurement function that supports measurement of 3-phase power lines. They can also perform simultaneous measurement of harmonics and demand values, enabling both power and harmonics management.

The ultimate in clamp-on power meters!

Sleek Design and Engineering

The photo shows the **3169-21** with D/A output.

Voltage (**VOLTAGE CORD L9438-53**) input terminal

Current (**CLAMP ON SENSOR**) input terminal

D/A output terminal pin placement

Use the **CONNECTION CABLE 9441** to connect to external devices. (Output resistance: 100 Ω)

Pin	Signal name
1	D/A output ch1
2	D/A output ch2
3	D/A output ch3
4	D/A output ch4
5 to 8	GND

- Contrast adjust volume
- Key lock switch
- Power inlet
- Power switch

- D/A output terminal
- External I/O terminal
- RS-232C port
- PC card slot

External I/O terminal pin placement

Pin	Signal name	Pin	Signal name
1	Start/stop input	4	Data storage input
2	Free	5	GND
3	Status output		

Use the **CONNECTION CABLE 9440** to connect to external devices.

Range Configuration Table

Voltage	Connection	CLAMP ON SENSOR 9695-02 (CAT III 300V) (500mA, 1A, 5A, 10A, 50A)			CLAMP ON SENSOR 9661 (5A, 10A, 50A, 100A, 500A)			
		CLAMP ON SENSOR 9694 (CAT III 300V) (500mA, 1A, 5A)			CLAMP ON SENSOR 9660, 9695-03 (CAT III 300V) (5A, 10A, 50A, 100A)			
		500.00mA	1.0000A	5.0000A	10.000A	50.000A	100.00A	500.00A
150.00V	Single-phase 2-wire	75.000 W	150.00 W	750.00 W	1.5000kW	7.5000kW	15.000kW	75.000kW
	Single-phase 3-wire / Three-phase 3-wire	150.00 W	300.00 W	1.5000kW	3.0000kW	15.000kW	30.000kW	150.00kW
	Three-phase 4-wire	225.00 W	450.00 W	2.2500kW	4.5000kW	22.500kW	45.000kW	225.00kW
300.00V	Single-phase 2-wire	150.00 W	300.00 W	1.5000kW	3.0000kW	15.000kW	30.000kW	150.00kW
	Single-phase 3-wire / Three-phase 3-wire	300.00 W	600.00 W	3.0000kW	6.0000kW	30.000kW	60.000kW	300.00kW
	Three-phase 4-wire	450.00 W	900.00 W	4.5000kW	9.0000kW	45.000kW	90.000kW	450.00kW
600.00V	Single-phase 2-wire	300.00 W	600.00 W	3.0000kW	6.0000kW	30.000kW	60.000kW	300.00kW
	Single-phase 3-wire / Three-phase 3-wire	600.00 W	1.2000kW	6.0000kW	12.000kW	60.000kW	120.00kW	600.00kW
	Three-phase 4-wire	900.00 W	1.8000kW	9.0000kW	18.000kW	90.000kW	180.00kW	900.00kW

Voltage	Connection	CLAMP ON SENSOR 9669		
		100.00 A	200.00 A	1.0000kA
150.00V	Single-phase 2-wire	15.000kW	30.000kW	150.00kW
	Single-phase 3-wire / Three-phase 3-wire	30.000kW	60.000kW	300.00kW
	Three-phase 4-wire	45.000kW	90.000kW	450.00kW
300.00V	Single-phase 2-wire	30.000kW	60.000kW	300.00kW
	Single-phase 3-wire / Three-phase 3-wire	60.000kW	120.00kW	600.00kW
	Three-phase 4-wire	90.000kW	180.00kW	900.00kW
600.00V	Single-phase 2-wire	60.000kW	120.00kW	600.00kW
	Single-phase 3-wire / Three-phase 3-wire	120.00kW	240.00kW	1.2000MW
	Three-phase 4-wire	180.00kW	360.00kW	1.8000MW

Voltage	Connection	FLEXIBLE CLAMP ON SENSOR CT9667	
		500.00 A	5.0000kA
150.00V	Single-phase 2-wire	75.000kW	750.00kW
	Single-phase 3-wire / Three-phase 3-wire	150.00kW	1.5000MW
	Three-phase 4-wire	225.00kW	2.2500MW
300.00V	Single-phase 2-wire	150.00kW	1.5000MW
	Single-phase 3-wire / Three-phase 3-wire	300.00kW	3.0000MW
	Three-phase 4-wire	450.00kW	4.5000MW
600.00V	Single-phase 2-wire	300.00kW	3.0000MW
	Single-phase 3-wire / Three-phase 3-wire	600.00kW	6.0000MW
	Three-phase 4-wire	900.00kW	9.0000MW

Note 1: The range configuration table displays the full-scale display values for each measurement range. **Note 2:** In the table, "unit W" has been replaced with "VA" or "var" for the apparent-power and reactive power measurement ranges. **Note 3:** Voltage and current input values 0.4% or less than the measurement range are displayed as "zero". When either the voltage or current for the power line is zero, the power value is displayed as zero. **Note 4:** You can display measurement values up to 130% of each measurement range.

Measure hidden power waste through secure connections, simple measurement methods, and detailed data capture.

Promises reliable measurement for power demand requirements!

■ Select from a variety of data, including detailed and harmonics data for multiple circuits

★ To measure multiple systems simultaneously

A single unit can measure two three-phase, 3-wire systems. Further, you can make individual clamp-on sensor and current range settings for each system.

Also, in addition to performing simultaneous measurement for up to four systems (single-phase, 2-wire) with a common voltage, you can set the current range individually for each system. Setting the most suitable current range for both large and small loads allows you to acquire more accurate measurements.

Measurement for up to four single-phase, 2-wire systems

Measurement for up to two three-phase, 3-wire systems

Use the 9661 sensor to measure a single system

Use the 9669 sensor to measure two systems

★ Magnetic voltage adapters for hard-to-clip terminals

New magnetic voltage adapters convertible with the Voltage Cords L9438-53 let you accurately detect voltage when the circuit terminals are too shallow for alligator clips to latch on.

Options
Magnetic Adapter 9804-01, 9804-02

ø11mm

generally compatible with M6 pan screws

★ Simultaneous power and harmonics management

Use a single unit to simultaneously measure data for power and harmonics.
All acquired data can be saved onto a PC card.

Power data (including demand data) and harmonics data can be simultaneously saved onto a PC card or in the unit's internal memory. Further, data for all of the systems being measured can be saved when measuring multiple circuits. Each of these two new unit's offers a management system for power and harmonic quality.

★ When measurement accuracy is crucial

The addition of a vector display for viewing the connection status completes the preparation required for measurement.

Have you ever experienced incorrect measurement results?
The most common cause of incorrect data is a faulty connection. With the **3169-20/21** you can use the vector display to check the phase, whether a connection is loose, or whether the clamp-on sensor connection has been reversed.
Also, you are assured of proper connection when measuring the VT (PT)/CT terminals even if you cannot see the line you are measuring.

Checking the connection on the vector display

Accurate and reliable results

The basic settings are constantly displayed, allowing you to measure with confidence.

During measurement, in addition to displaying the voltage and current ranges, and VT (PT) and CT ratios for each system, the unit can also display items such as the measurement interval. Because the basic settings are constantly visible, you can be confident of obtaining the correct measurement results.

★ Capture facility data quickly

By using continuous processing to measure individual waveforms, you can accurately measure data in a relatively short amount of time.

Use the desired measurement method to continuously measure the voltage, current, and power for individual waveforms, enabling you to obtain accurate data in one second or less. Further, you can record the maximum, minimum and average values.

★ Measure another device simultaneously

Using the external I/O function, you can obtain even more detailed measurements for energy conservation.

In addition to measurement start/stop control through external input, you can use this function to output the measurement start/stop signal for the **3169-20/21**. Simultaneous recording of a variety of signals is also possible for equipment when using multiple devices to perform start control and multi-channel recording.

Simultaneous control for signals from equipment

Master control

Simultaneous operation

Synchronous with master

3169-20

3169-20

MEMORY HiCORDER

Large storage capacity to accommodate power and harmonics data for individual waveforms. Supports energy saving measures that can be carried out from your PC.

Greater flexiblity for energy saving measures through detailed measurement!

■ Reduce energy consumption by "1%"! Why not try analyzing your energy saving measures?

★ Save measurement details to PC card for extended measurements!

Why not try a shorter data management interval?

With the **3169-20/21**, you can set the data recording interval to 1 minute. If you are unsure how to proceed with energy conservation, you can use a large capacity PC card to save measurement details, then use the data to create a load fluctuation graph and analyze this to help reduce wasted power consumption.

Further, because you can save a variety of data, including simultaneous recording of power and harmonics data, waveform data storage, and print-outs of the screen, these two new units help by storing measurement details.

Measurement conditions: 1-minute recording interval, when using a PC card (512 MB)

Data storage	1P2W × 4	1P3W × 2	3P3W2M × 2	3P3W3M,3P4W
Normal measurement (only saves average, integrated, and demand values)	340 days	365 days	365 days	365 days
Normal measurement (saves all items)	180 days	160 days	145 days	240 days
Normal measurement + harmonics measurement (saves all items)	6 days	6 days	5 days	7 days

When using a 512 MB PC card

| Interval	1P2W × 4	1P3W × 2	3P3W2M × 2	3P3W3M,3P4W
1 minute	180 days (6 days)	160 days (6 days)	145 days (5 days)	240 days (7 days)
2 minutes	365 days (12 days)	320 days (13 days)	300 days (9 days)	365 days (15 days)
5 minutes	365 days (30 days)	365 days (32 days)	365 days (24 days)	365 days (38 days)
10 minutes	365 days (60 days)	365 days (64 days)	365 days (48 days)	365 days (76 days)
15 minutes	365 days (90 days)	365 days (100 days)	365 days (74 days)	365 days (114 days)
30 minutes	365 days (184 days)	365 days (200 days)	365 days (150 days)	365 days (230 days)

Measurement conditions: When saving all items using normal measurement, the number of days in parentheses indicate normal measurement + harmonics measurement, maximum measurement period of one year

★ Identify even small amounts of power waste using individual waveform measurements

The **3169-20/21** can help turn you into a keen energy saving specialist.

These two new units allow you to measure power data by recording the RMS values for individual waveforms.

By measuring just a few seconds of machine cycles or changes in operating patterns of facilities such as manufacturing equipment, you can grasp power fluctuations over a relatively short amount of time and view improvements in the form of numerical data. Gain unsurpassed energy savings by achieving simple improvements around the work environment.
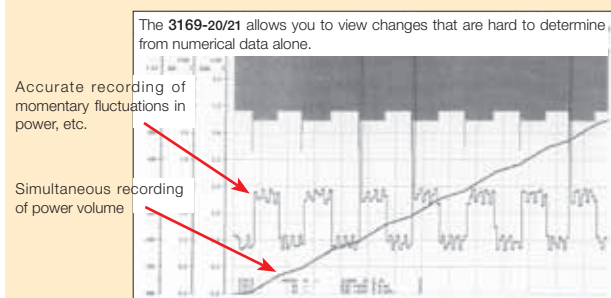

Results can be easily processed using software such as Excel.
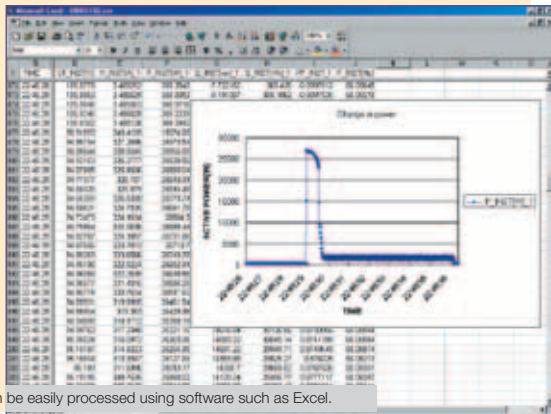
★ Improve energy-saving operations and create an energy-efficient facility

Why not try to improve your energy-saving measures using the **3169-21**?

Using the D/A output (4 ch) function on the **3169-21**, you can simultaneously record a variety of measurement and control signals for equipment, such as the power fluctuation and temperature/flow for individual waveforms, onto a **HIOKI MEMORY HiCORDER** or logger.
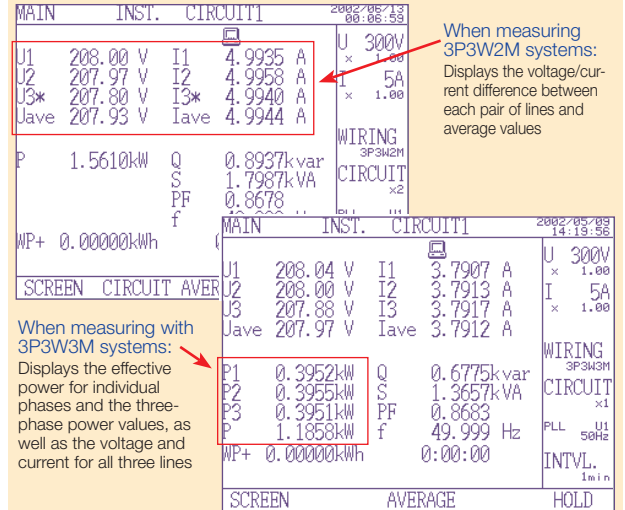
A slight reduction in power consumption due to changes in the inverter motor operating patterns or temperature settings equals to an energy-saving effect.

The **3169-20/21** allows you to view changes that are hard to determine from numerical data alone.

Accurate recording of momentary fluctuations in power, etc.

Simultaneous recording of power volume

★ Unbalanced loads are an enemy to energy saving activities. Solve your problems with careful management of power lines.

Unbalanced 3-phase loads can result in a damaged power line.

To provide detailed management of measurements, the **3169-20/21** displays voltage and current for all three lines even when measuring just two circuits (3P3W2M). Further, because the effective power for each phase is displayed based on a virtual center point when measuring the voltage and current for all three lines (3P3W3M), the units can also be used to implement energy saving measures and power management systems.

When measuring 3P3W2M systems: Displays the voltage/current difference between each pair of lines and average values

When measuring with 3P3W3M systems: Displays the effective power for individual phases and the three-phase power values, as well as the voltage and current for all three lines
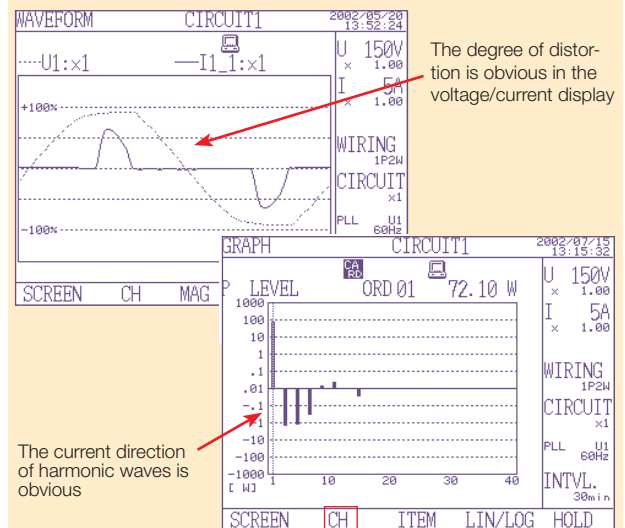
★ Harmonics cause wasted power

Did you think that harmonics and energy saving activities were unrelated?

Due to a spread in equipment that uses semiconductor control devices, such as inverters, power quality has decreased. Also, power consumed in harmonic components is all wasted power. Harmonic control and management are essential for energy conservation.

The degree of distortion is obvious in the voltage/current display

The current direction of harmonic waves is obvious

You can switch channels to easily check the harmonics for each circuit

★ Print out results for on-site confirmation **Options**

PRINTER 9442

AC ADAPTER 9443-02
For the **9442**

RS-232C CABLE 9721
Cord length for connecting to the **9442**: 1.5 m(4.92ft)

Dimensions and weight : Approx.160W (6.30")× 66.5H(2.62") × 17D(0.67") mm, approx.580g(20.5oz.)

Input specifications

Measurement line type	Single-phase 2-wire, single-phase 3-wire, three-phase 3-wire, three-phase 4-wire
Number of systems that can be measured (for systems that share the same voltage)	4 systems (1p2W), 2 systems (1P3W, 3P3W2M) 1 system (3P3W3M, 3P4W,3P4W4I)
Measurement line Frequency	50/60Hz
Input methods	Voltage: Insolated inputs (except between U1, U2, U3 and N) Current: Isolated input using a clamp-on sensor
Input resistance (50/60 Hz)	Voltage: 2.0 MΩ ± 10% (differential input) Current: 200 kΩ ± 10%
Maximum input	Voltage input: 780 Vrms AC, peak value: 1103 V Current input: 1.7 Vrms AC, peak value: 2.4 V
Maximum rated voltage to earth	Voltage input terminals: 600 Vrms AC (50/60 Hz)
Measurement range	**Voltage**: 150.00/300.00/600.00 V **Total display range**: Within 0.4 to 130% of the range (zero is suppressed for less than 0.4%) **Effective measurement range**: Within 5 to 110% of the range **Current** CLAMP ON SENSOR 9694 : 500m/ 1/ 5 A CLAMP ON SENSOR 9695-02 : 500m/ 1/ 5/ 10/ 50 A CLAMP ON SENSOR 9660 : 5/ 10/ 50/ 100 A CLAMP ON SENSOR 9695-03 : 5/ 10/ 50/ 100 A CLAMP ON SENSOR 9661 : 5/ 10/ 50/ 100/ 500 A CLAMP ON SENSOR 9669 : 100/ 200/ 1k A FLEXIBLE CLAMP ON SENSOR CT9667 : 500/ 5k A **Total display range**: Within 0.4 to 130% of the range (zero is suppressed for less than 0.4%) **Effective measurement range**: Within 5 to 110% of the range **Power**: 75.000W to 9.0000MW Depends on voltage/current combination and measured line type (see Measurement Range Configuration Tables) **Total display range**: Within 0 to 130% of the range ("0W" display indicates zero rms voltage and/or current) **Effective measurement area**: Within 5 to 110% of the range
VT ratio settings	0.01 to 9999.99
CT ratio settings	0.01 to 9999.99 (* A different CT ratio can be set for each system.)

Measurement Specifications

Measurement items	Voltage, current, active power[1], reactive power[2][3], apparent power,[4] power factor[3], integrated value, frequency, harmonics
Measurement accuracy (50/ 60Hz, power factor = 1)	Voltage: ±0.2% rdg. ±0.1% f.s. Current: ±0.2% rdg. ±0.1% f.s. + clamp sensor accuracy Active power: ±0.2% rdg. ±0.1% f.s. + clamp sensor accuracy Clamp-On Sensor 9661 accuracy: ±0.3% rdg. ±0.01% f.s. (Accuracy depends on clamp sensor. See page 7 for the accuracy of each model, and page 7 for combined accuracy of Model 3169-20 and each clamp sensor.)
Display update rate	Approx. 0.5 sec (except when using a PC card while accessing the internal memory, or when performing RS-232C communications)
Display averaging circuit	OFF, 2, 5, 10, 20 times (for movement averaging)
Measurement method	Simultaneous digital sampling of voltage and current, PLL synchronization or a fixed clock (50/60 Hz)
Sampling frequency	128 points/cycle
A/D converter resolution	16bits

[1] Polarity display: For consumption: no symbol, for regeneration: "-"

[2] Using the reactive power measurement method: ON: Measures the reactive power directly using the reactive power measurement method, OFF: Calculates the reactive power from the measurement values for voltage, current, and active power

[3] Polarity display: For lag phase (LAG: current is slower than voltage): no symbol, For lead phase (LEAD: current is faster than voltage) : "-" (Reactive power measurement method "ON")

[4] Polarity display: No polarity

General Specifications

Operating environment	Indoors, up to 2000m (78.74ft) ASL, Pollution degree 2
Operating temperature and humidity	0 to 40°C, 80% RH or less (non-condensating)
Storage temperature and humidity	-10 to 50°C, 80% RH or less (non-condensating)
Withstand voltage (50/60 Hz for 15 sec.)	**5.55 kVrms AC**: Between the voltage input terminal and the 3169 casing, **3.32 kVrms AC**: Between the voltage input terminal and the current input terminal/external interface terminal, **2.3 kVrms AC**: Between the power supply and the 3169 casing, **1.39 kVrms AC**: Between the power supply and the current input terminal/external interface terminal
Power supply	100 to 240 V AC, 50/60 Hz, Maximum rated power: 30VA
Dimensions and mass	Approx.210(8.27″)W × 160(6.30″) H × 60D(2.36″) mm (excluding protrusions), Approx.1.2 kg(42.3oz.) (3169-20, 3169-21)
Conforming standards	Safety: EN61010,measurement category III (anticipated transient overvoltage 6000V) EMC: EN61326 ClassA, EN61000-3-2, EN61000-3-3
Accessories	**voltage cord set L9438-53** (1) (1 cord each of black, red, yellow, and blue), voltage cord (1), input cord label (1), operating manuals (2) (Advanced edition and Quick Start Guide), CD-R (1) (RS-232C interface operating manuals and CSV conversion Software), **connection cable 9441** (1) (for the 3169-21 only)

Measurement screen

Instantaneous value display	Voltage, current, active power, reactive power, apparent power, power factor, frequency, average voltage, average current, (average values are for each system)
Average value display	Voltage, current, active power, reactive power, apparent power, power factor, frequency, average voltage, average current * The average value from the beginning of time series measurement until the present.
Maximum/minimum value display	Voltage, current, active power, reactive power, apparent power, power factor, frequency * The maximum/minimum value from the beginning of time series measurement until the present.
Integrate display	Integrated value Active power (consumption/regeneration) Reactive power (lag/lead) * The total integrated value from the beginning of time series measurement.
Demand volume display (Integrated value within the specified interval)	Integrated value Active power volume (consumption/regeneration) Reactive power volume (lag/lead) * The integrated value within each specified interval (latest value).
Demand value display (average value within the specified interval)	Active power (consumption), reactive power (lag), power factor * The demand value within each specified interval (previous value).
Maximum demand value display (average value within the maximum specified interval)	The maximum demand value since the beginning of time series measurement and the time and date it occurred.
Harmonics list	List of the items measured for the specified harmonic (numerical value). (including the total value and total harmonic distortion factor (THD-F/THD-R))
Harmonics graph	Bar graph or vector diagram of the items measured for the specified harmonic. (cursor measurement, magnification update, with a linear/LOG axis selection function)
Waveform display	Voltage and current waveforms (with a magnification update function)
Measurement value enlargement display	Select and enlarge up to 5 items from the instantaneous value display.

Recording Specifications

Data output destinatio	PC card 9728, internal memory, or printer 9442
Output Interval	Standard interval: 1, 2, 5, 10, 15, or 30 seconds, or 1, 2, 5, 10, 15, 30, or 60 minutes *Maximum measurement period: 1 year Fast interval: A single waveform, or 0.1, 0.2, or 0.5 seconds *Only instantaneous values are output
Storage format	Measurement data: CSV format (binary format when using the fast interval setting) Waveform data:Binary format Screen data:BMP format Settings data:CSV format
Measurement start method	Manual or time (year, month, day, hour, minute)
Measurement stop method	Manual, time, or timer (1 seconds to 8784 hours)

Data output item		
	Instantaneous values	Voltage, current, active power, reactive power, apparent power, power factor, frequency, average voltage, average current, (average values are for each system) * The instantaneous value for interval output.
	Average value	Voltage, current, active power, reactive power, apparent power, power factor, frequency, average voltage, average current, (average values are for each system) * The average value for each interval.
	Maximum/ minimum value	Voltage, current, active power, reactive power, apparent power, power factor, frequency * The maximum/minimum value for each interval (no event details provided).
	Integrated value	Active power (consumption/regeneration), Reactive power (lag/lead) * The total value since the beginning of time series measurement, and the power volume for each interval.
	Demand value	Active power (consumption), reactive power (lag), power factor * The value for each interval.
	Maximum demand value	The maximum demand value since the beginning of time series measurement and the time and date it occurred.
	Harmonic	Each order harmonic wave (level, content percentage, and phase angle), total value, THD-F/THD-R: the instantaneous, maximum, minimum, and average values for each recording interval
	Waveform	Waveform (Voltage or current)
	Status information	Exceeds the voltage/current crest factor, PLL unlock, power failure, exceeds the display limit
Print items	**Numerical values:** Prints the data selected as the data output item (during time series measurement). **Waveform:** Hard copy of the screen (printing of each interval not available)

External Interface Specifications

PC card	Up to 528 MB,settings data, measurement data, screen data, waveform data
D/A output (3169-21 only)	**Number of output channels**: 4 channels **Output items** For instantaneous values:Voltage, current, average voltage, average current, Active power, reactive power, apparent power, power factor, frequency, **For Integrated value**:Active power (consumption/ regeneration) or reactive power (lag/lead), **For harmonics**:Each harmonic order (level, content percentage, and phase angle), total value, THD-F/THD-R **Output level:** ±5V DC/f.s. **Output resistance:** 100Ω ±5% **Output update rate:** For each cycle of measurement input (when a measurement item other than harmonics is set), For every 16 cycles of measurement input (when harmonics is set as the measurement item)
RS-232C	Printer 9442 or PC connected to an RS-232C interface
External I/O	**Control input:** Start/stop control for time series measurement, data storage **Control output:** LOW level is output during time series measurement. **Control signal level:** A 0/5 V logic signal or a short-circuit/release contact signal

■ Measurement accuracy (Guaranteed accuracy period : 1 year)

Voltage	Current/active power
±0.2%rdg.±0.1%f.s.	±0.2% rdg. ±0.1% f.s. + clamp-on sensor accuracy

Conditions of guaranteed accuracy	:	After 30 minutes of warm-up, sine-wave input, PF=1
Temperature and humidity for guaranteed accuracy	:	23°C ±5°C, less than 80% relative humidity
Fundamental waveform range for guaranteed accuracy	:	45 to 66 Hz
Display area for guaranteed accuracy	:	Effective measurement area

● Table of current and active power accuracy with clamp-on sensor combinations

Current rang	9694	9695-02	9660, 9695-03	9661	9669	CT9667
0.5A	±0.5%rdg.±0.3%f.s.	±0.5%rdg.±2.1%f.s	–	–	–	–
1A	±0.5%rdg.±0.2%f.s.	±0.5%rdg.±1.1%f.s	–	–	–	–
5A	±0.5%rdg.±0.12%f.s.	±0.5%rdg.±0.3%f.s	±0.5%rdg.±0.5%f.s.	±0.5%rdg.±1.1%f.s.	–	–
10A	–	±0.5%rdg.±0.2%f.s	±0.5%rdg.±0.3%f.s.	±0.5%rdg.±0.6%f.s.	–	–
50A	–	±0.5%rdg.±0.12%f.s	±0.5%rdg.±0.14%f.s.	±0.5%rdg.±0.2%f.s.	–	–
100A	–	–	±0.5%rdg.±0.12%f.s.	±0.5%rdg.±0.15%f.s.	±1.2%rdg.±0.2%f.s.	–
200A	–	–	–	–	±1.2%rdg.±0.15%f.s.	–
500A	–	–	–	±0.5%rdg.±0.11%f.s.	–	±2.2%rdg.±0.4%f.s.
1000A	–	–	–	–	±1.2%rdg.±0.11%f.s.	–
5000A	–	–	–	–	–	±2.2%rdg.±0.4%f.s.

Reference: Accuracy of the CLAMP ON SENSORE
9694,9695-02, 9695-03, 9660, 9661, 9667, and 9669
- **9694** (rated for 5 A)　 : ±0.3%rdg.±0.02%f.s.
- **9695-02** (rated for 50 A) : ±0.3%rdg.±0.02%f.s.
- **9695-03** (rated for 100 A): ±0.3%rdg.±0.02%f.s.
- **9660** (rated for 100 A) : ±0.3%rdg.±0.02%f.s.
- **9661** (rated for 500 A) : ±0.3%rdg.±0.01%f.s.
- **9669** (rated for 1000 A) : ±1.0%rdg.±0.01%f.s.
- **CT9667** (rated for 5000 A) : ±2.0%rdg.±0.3%f.s.
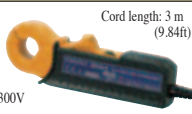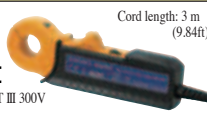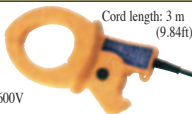 (500 A range: For 50 to 500 A input)
  (5000 A range: For 500 to 5000 A input)
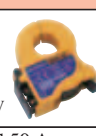
* f.s. is the sensor's rated primary current value.

Note: The table of accuracy for different clamp-on sensor combinations indicates the measurement accuracy for each current range of the **3169-20/21**. (The accuracy for each clamp-on sensor is converted and displayed according to the **3169-20/21** current measurement range.)

Apparent power accuracy	:	±1 dgt. for the calculation obtained from each measurement value
Reactive power accuracy	:	When using the reactive power measurement method ±0.2% rdg. ±0.1% f.s. + clamp-on sensor accuracy When not using the reactive power measurement method ±1 dgt. for the calculation obtained from each measurement value
Integration accuracy	:	±1 dgt. for the measurement accuracy of effective power, reactive power, and apparent power
Power factor accuracy	:	±1 dgt. for the calculation obtained from each measurement value
Frequency accuracy	:	±0.5% rdg. ±1dgt.

Frequency characteristic	:	Fundamental waveforms up to the 50th order ±3% f.s. + measurement accuracy (of a 45- to 66-Hz fundamental waveform)
Temperature characteristic	:	Within ±0.03% f.s./°C
Effect of in-phase voltage	:	Within ±0.2% f.s. (600 Vrms AC, 50/60 Hz, between voltage input terminal and case)
Effect of external magnetic field	:	Within ±1.5% f.s. (in a magnetic field of 400 A/m rms AC, 50/60 Hz)
Power factor influence	:	±1.0% rdg. (45 to 66 Hz, power factor = 0.5, for effective power measurement)
Effect of reactive factor	:	±1.0% rdg. (45 to 66 Hz, reactive factor = 0.5, when using the reactive power measurement method)
Real-time clock accuracy	:	±10 ppm ±1 second (23°C) (within ±1.9 sec/day (23°C))

■ Option Specifications

| CLAMP ON SENSOR	9694	9660	9661	9669
Appearance	CE CAT Ⅲ 300V Cord length: 3 m (9.84ft)	CE CAT Ⅲ 300V Cord length: 3 m (9.84ft)	CE CAT Ⅲ 600V Cord length: 3 m (9.84ft)	CE CAT Ⅲ 600V Cord length: 3 m (9.84ft)
Primary current rating	AC 5 A	AC 100 A	AC 500 A	AC 1000 A
Output voltage	AC 10mV/A	AC 1mV/A	AC 1mV/A	AC 0.5mV/A
Accuracy Amplitude (45 to 66 Hz)	±0.3%rdg.±0.02%f.s.	±0.3%rdg.±0.02%f.s.	±0.3%rdg.±0.01%f.s.	±1.0%rdg.±0.01%f.s.
Phase (45 Hz to 5 kHz)	Within ±2°	Within ±1°	Within ±0.5°	Within ±1°
Frequency characteristic	Within ±1.0% at 40 Hz to 5 kHz (deviation from accuracy)			Within ±2.0% at 40 Hz to 5 kHz (deviation from accuracy)
Effect of external magnetic field	Equivalent to 0.1 A or less (with a magnetic field of 400 A/m AC)			Equivalent to 1 A or less (with a magnetic field of 400 A/m AC)
Effect of conductor position	Within ±0.5%			Within ±1.5%
Maximum rated voltage to earth	300 V rms	300 V rms	600 V rms	600 V rms
Maximum input (45 to 66 Hz)	50 A continuous	130 A continuous	550 A continuous	1000 A continuous
Measurable conductor diameter	Less than φ 15 mm(0.59")	Less than φ 15 mm(0.59")	Less than φ 46 mm(1.81")	Less than φ 55 mm(2.17"), 80(3.15") × 20 (0.79")mm bus bar
Dimensions and weight	46W(1.81") × 135H(5.31") × 21D(0.83") mm, 230g(9.9oz.)	46W(1.80") × 135H(5.31") × 21D(0.83") mm, 230g(9.9oz.)	77W(3.03") × 151H(5.94") × 42D(1.65")mm, 380g(12.7oz.)	99.5W(3.92") × 188H(7.40") × 42D(1.65") mm, 590g(20.8oz.)

CLAMP ON SENSOR	CT9667	9695-02	9695-03
Appearance	CE CAT Ⅲ 1000V CAT Ⅳ 600V Cord length: Sensor - circuit: 2 m(6.56ft) Circuit - connector: 1 m(3.28ft)	CE CAT Ⅲ 300V	CE CAT Ⅲ 300V
Primary current rating	AC 500 A, 5000A	AC 50 A	AC 100 A
Output voltage	AC 500 mV f.s.	AC 10 mV/A	AC 1 mV/A
Accuracy Amplitude (45 to 66 Hz)	±2.0%rdg.±0.3%f.s. (for input 10% or more of the renge)	±0.3%rdg.±0.02%f.s.	
Phase (45 Hz to 5 kHz)	Within ±1°	Within ±2°	Within ±1°
Frequency characteristic	Within ±3 dB at 10 Hz to 20 kHz (deviation from accuracy)	Within ±1.0% at 40 Hz to 5 kHz (deviation from accuracy)	
Effect of external magnetic field	1.5%f.s. or less. (in a magnetic field of 400 A/m AC, 50/60 Hz)	Equivalent to 0.1 A or less (with a magnetic field of 400 A/m AC)	
Effect of conductor position	Within ±3.0%	Within ±0.5%	
Maximum rated voltage to earth	1000 V rms (CAT III), 600Vrms (CAT IV)	300 V rms (insulated conductor)	
Maximum input (45 to 66 Hz)	10000 A continuous	60 A continuous	130 A continuous
Measurable conductor diameter	Less than φ 254 mm(10.0")	Less than φ 15 mm(0.59")	
Dimensions and weight	Sensor thickness: φ13 mm (0.51") Circuit box: 35W(1.38") × 120H(4.74") × 34D(1.34") mm, 470g(16.6 oz.)	50.5W(1.99") × 58H(2.28") × 18.7D(0.74")mm, 50g(1.8oz.)	
Power supply	LR06 alkaline battery × 2 (continuous operation max. 7 days) or AC ADAPTER 9445-02/9445-03(optional)	Option : CONNECTION CABLE 9219 Cord length: 3 m(9.84ft)	

POWER LOGGER VIEWER SF1001 Specifications

Supported models	[3169,PW3365-20]*2, PW3360-20, PW3360-21
Supported computer operating systems	Windows 8 (32/64bit) Windows 7 SP1 or later (32/64bit) Windows Vista SP2 or later (32bit) Windows XP SP3 or later (32bit)
Trend graph display function	**Display items:** Voltage, current, active power, reactive power, apparent power, power factor, frequency, **i**ntegrated active power, integrated reactive power, demand volume, demand value, voltage disequilibrium factor, [pulse, harmonics (level, content, phase angle, total value, THD)]*1
	Stacked bar graph display: Up to 16 types of data series can be displayed in an overlay graph
	Cursor measurements: Measurement values can be displayed by the cursor
Summary display function	Displayed items are the same as for the trend Graph Display
	Daily, weekly and monthly report displays: Accumulates and displays daily, weekly and monthly reports over specified period.
	Load factor calculation display: Calculates and displays load factor and demand factor results with daily, weekly and monthly reports
	Time span aggregation: Aggregates data into up to four specified time spans
	CO2 equivalent display: Uses the specified conversion rate to display CO2 equivalent values*2 (reference values).
Waveform display*1	Displays waveform data at specified date and time

Harmonic display*1	**List display:** Displays a list of harmonic data at specified date and time
	Graph display: Displays a bar graph of harmonic data at specified date and time
	Cursor calculation: Calculates measurement data at cursors in waveform and graph displays
Copy function	Captures any display image to the clipboard
Print function	Preview and print content shown on the trend graph, report, [harmonic graph]*1 and settings displays.
	Comment entry (Text comments can be entered in any printout)
	Header/Footer settings: Sets the header and footer for each printout
	Printing support: Any color or monochrome printing supported by the operating system
Report printing	Print (static) contents over a specific time period
	Output contents: Standard or selected output items
	Available output items: Trend graph, summary, daily report, [harmonic list, harmonic graph, waveform]*1
	Report creation method: Standard print
	Report output settings: Save/load report output settings

*1 Supported from Ver. 2.00.0 on.
*2 Supported from Ver. 3.00.0 on.
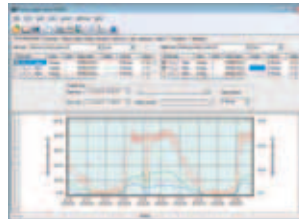
CLAMP ON POWER HiTESTER 3169-20
(supplied with the **voltage cord L9438-53** (1), and power cord (1))

CLAMP ON POWER HiTESTER 3169-21 (with D/A output)
(supplied with the **voltage cord L9438-53** (1), **connection cable 9441** (1) and power cord (1))

> Current and power cannot be measured using the CLAMP ON POWER HiTESTER 3169-20/21 on its own. To perform current and power measurement, make sure you also purchase a CLAMP ON SENSOR (9694, 9660, 9661, CT9667, or 9669) (sold separately).
> Use only PC Cards (9728) sold by HIOKI.
> Compatibility and performance are not guaranteed for PC cards made by other manufacturers. You may be unable to read from or save data to such cards.

Accessory Specifications

VOLTAGE CORD L9438-53

1 cord each of black, red, yellow, and blue, cord length: 3 m(9.84ft)

CONNECTION CABLE 9441

For D/A output (supplied with the 3169-21)
Cord length: 2 m(2.65ft)

■ Options

CLAMP ON SENSOR 9660 (AC 100A)
CLAMP ON SENSOR 9661 (AC 500A)
FLEXIBLE CLAMP ON SENSOR   CT9667 (AC 5000A)
CLAMP ON SENSOR 9669 (AC 1000A)
CLAMP ON SENSOR 9694 (AC 5A)
CLAMP ON SENSOR 9695-02 (AC 50A)
CLAMP ON SENSOR 9695-03 (AC 100A)
CONNECTION CABLE   9219 (for connection to the 9695-02, 9695-03)
CLAMP ON ADAPTER 9290-10 (AC 1500A)
CONNECTION CABLE 9440 (for external I/O)
RS-232C CABLE   9612 (for connection to a PC)

PRINTER 9442
AC ADAPTER 9443-02 (for the 9442, for Europe)
RS-232C CABLE 9721 (for connection to the 9442)
RECORDING PAPER 1196 (25 m(82ft)/10 rolls, for the 9442)
 *When purchasing the **printer 9442**, make sure you also purchase the **RS-232C cable 9721** and **AC adapter 9443-02** so that you can connect it to the 3169-20/21.

CARRYING CASE 9720
POWER LOGGER VIEWER   SF1001
PC CARD 512M 9728
MAGNETIC ADAPTER (1 red adapter)   9804-01
MAGNETIC ADAPTER (1 black adapter)   9804-02

CARRYING CASE 9720-01

A soft type case for storing the **3169-20/21** and its accessories, such as the clamp-on sensors.

Dimensions and weight
: Approx. 445W(17.52") × 340H(13.39") × 150D(5.91") mm, approx. 2.2 kg(77.6oz.)

CLAMP ON ADAPTER 9290-10

Max. 1500 A AC
 (continuous : 1000 A)
Measurable conductor diameter:
 Bus bar : φ55 mm(2.17"), width 80 mm(3.46")
CT ratio: 10:1
 *Used for expanding the measurement ranges of the 9660 and 9661 sensors
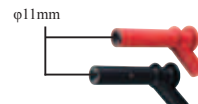Cord length: 3 m(9.84ft)

PC CARD 9728

Use only PC Cards (**9728**) sold by HIOKI.
*Models 9729 1G PC Card and 9780 2G PC Card are not compatible with this device.

CONNECTION CABLE 9440

For external I/O
Cord length: 2m(2.65ft)

MAGNETIC ADAPTER 9804-01, 02

φ11mm

9804-01 Red
9804-02 Black

Magnetic tip for use with the standard
Voltage Cord L9438-53
(generally compatible with M6 pan screws)

> Red and black adapters sold separately. Purchase the quantity and color appropriate for your application.
> (Example: 3P3W - 3 adapters; 3P4W - 4 adapters)

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All information correct as of Aug. 5, 2014. All specifications are subject to change without notice.   3169E17-48B   Printed in Japan