

CLAMP ON POWER HiTESTER 3169

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



The photo shows the 3169-21 combined with CLAMP ON SENSORS 9661 and 9669 (optional) for measuring two systems.

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

Offering a new approach to energy-related measurement

such as energy conservation, ISO14001 testing, equipment diagnosis, and harmonics measurement.

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.

Introducing 2 new variations with a thinner cable!

Thin cable type

Large-diameter type

CT9667-03
Cable diameter
 $\phi 13$ mm (0.51")

CT9667-01, -02
Cable diameter
 $\phi 7.4$ mm (0.29")

Thin cable type

Easy to loop around, even in confined spaces

CT9667-01
 $\phi 100$ mm (3.94"), 5000A AC

CT9667-02
 $\phi 180$ mm (7.09"), 5000A AC

CT9667-03
 $\phi 254$ mm (10.00"), 5000A AC

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)

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

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

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.

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.



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 |

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 | 1.500kW | 7.500kW | 15.00kW | 75.00kW |
| | Single-phase 3-wire | 150.00 W | 300.00 W | 1.500kW | 3.000kW | 15.00kW | 30.00kW | 150.0kW |
| | Three-phase 3-wire | 225.00 W | 450.00 W | 2.250kW | 4.500kW | 22.50kW | 45.00kW | 225.0kW |
| | Three-phase 4-wire | 150.00 W | 300.00 W | 1.500kW | 3.000kW | 15.00kW | 30.00kW | 150.0kW |
| 300.00V | Single-phase 2-wire | 150.00 W | 300.00 W | 1.500kW | 3.000kW | 15.00kW | 30.00kW | 150.0kW |
| | Single-phase 3-wire | 300.00 W | 600.00 W | 3.000kW | 6.000kW | 30.00kW | 60.00kW | 300.0kW |
| | Three-phase 3-wire | 450.00 W | 900.00 W | 4.500kW | 9.000kW | 45.00kW | 90.00kW | 450.0kW |
| | Three-phase 4-wire | 300.00 W | 600.00 W | 3.000kW | 6.000kW | 30.00kW | 60.00kW | 300.0kW |
| 600.00V | Single-phase 2-wire | 600.00 W | 1.200kW | 6.000kW | 12.00kW | 60.00kW | 120.0kW | 600.0kW |
| | Single-phase 3-wire | 900.00 W | 1.800kW | 9.000kW | 18.00kW | 90.00kW | 180.0kW | 900.0kW |
| | Three-phase 3-wire | 300.00 W | 600.00 W | 3.000kW | 6.000kW | 30.00kW | 60.00kW | 300.0kW |
| | Three-phase 4-wire | 450.00 W | 900.00 W | 4.500kW | 9.000kW | 45.00kW | 90.00kW | 450.0kW |

| Voltage | Current Connection | CLAMP ON SENSOR 9669 | | |
|---------|---------------------|----------------------|----------|----------|
| | | 100.00 A | 200.00 A | 1.0000kA |
| 150.00V | Single-phase 2-wire | 15.00kW | 30.00kW | 150.0kW |
| | Single-phase 3-wire | 30.00kW | 60.00kW | 300.0kW |
| | Three-phase 3-wire | 45.00kW | 90.00kW | 450.0kW |
| | Three-phase 4-wire | 30.00kW | 60.00kW | 300.0kW |
| 300.00V | Single-phase 2-wire | 30.00kW | 60.00kW | 300.0kW |
| | Single-phase 3-wire | 60.00kW | 120.0kW | 600.0kW |
| | Three-phase 3-wire | 90.00kW | 180.0kW | 900.0kW |
| | Three-phase 4-wire | 60.00kW | 120.0kW | 600.0kW |
| 600.00V | Single-phase 2-wire | 120.0kW | 240.0kW | 1.200MW |
| | Single-phase 3-wire | 180.0kW | 360.0kW | 1.800MW |
| | Three-phase 3-wire | 60.00kW | 120.0kW | 600.0kW |
| | Three-phase 4-wire | 90.00kW | 180.0kW | 900.0kW |

| Voltage | Current Connection | AC FLEXIBLE CURRENT SENSOR CT9667-01, -02, -03 | |
|---------|---------------------|---|----------|
| | | 500.00 A | 5.0000kA |
| 150.00V | Single-phase 2-wire | 75.00kW | 750.0kW |
| | Single-phase 3-wire | 150.0kW | 1.500MW |
| | Three-phase 3-wire | 225.0kW | 2.250MW |
| | Three-phase 4-wire | 150.0kW | 1.500MW |
| 300.00V | Single-phase 2-wire | 150.0kW | 1.500MW |
| | Single-phase 3-wire | 300.0kW | 3.000MW |
| | Three-phase 3-wire | 450.0kW | 4.500MW |
| | Three-phase 4-wire | 300.0kW | 3.000MW |
| 600.00V | Single-phase 2-wire | 300.0kW | 3.000MW |
| | Single-phase 3-wire | 600.0kW | 6.000MW |
| | Three-phase 3-wire | 900.0kW | 9.000MW |
| | Three-phase 4-wire | 300.0kW | 3.000MW |

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

SCREEN WIRING CIRCUIT

★ Magnetic voltage adapters for hard-to-clip terminals

New magnetic detect 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.

INTEG. CIRCUIT1 2002/05/19 18:47:43

ACTIVE POWER U 150V

CONSUMP. WP+ 1.383311

REGEN. WP- -0.000001

REACTIVE POWER WQ+ 1.343161

START TIME 2002/05/18

STOP TIME 2002/05/19

ELAPSED TIME

SCREEN CIRCUIT

GRAPH CIRCUIT1 2002/07/15 12:20:20

THD LEVEL ORD 01 0.7009 A

U 150V x 1.00

I 5A x 1.00

WIRING 1P2W

CIRCUIT x1

PLL U1 60Hz

INTVL. 30min

SCREEN CH ITEM LIN/LOG HOLD

★ 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

U1 201.1 V 0deg

U2 201.1 V -120deg

U3 200.9 V 119deg

I1 9.98 A -29deg

I2 9.99 A -149deg

I3 9.99 A 90deg

WIRING 3P4W

CIRCUIT x1

PLL U1 50Hz

INTVL. 1min

VOLT INPUT OK PHASE I1-U1 OK

CURR INPUT OK PHASE I2-U2 OK

VOLT PHASE OK PHASE I3-U3 OK

CURR PHASE OK VOLT BALANCE OK

SCREEN HOLD

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.

MAIN INST. CIRCUIT1 2002/05/19 17:05:23

MAIN AVE. CIRCUIT1 2002/05/19 17:12:31

MAIN MIN. CIRCUIT1 2002/05/19 17:12:28

MAIN MAX. CIRCUIT1 2002/05/19 17:12:28

U1 201.11 V I1 9.992 A U 300V x 1.00

U2 201.11 V I2 9.997 A I 10A x 1.00

U3 201.00 V I3 9.994 A I 10A x 1.00

Uave 201.06 V Iave 9.994 A I 10A x 1.00

P1 1.7435kW Q 2.9921kvar

P2 1.7462kW S 6.0278kVA

P3 1.7437kW PF 0.8685

P 5.2329kW f 50.010 Hz

WP+ 0.00000kWh 0:00:00

WIRING 3P4W4I

CIRCUIT x1

PLL U1 50Hz

INTVL. 1min

SCREEN MINIMUM HOLD

★ 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.

Master control

Simultaneous operation

Synchronous with master

3169-20

3169-20

MEMORY RECORDER

Simultaneous control for signals from equipment

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 flexibility 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.



When using a 512 MB PC card

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 |

| 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) |

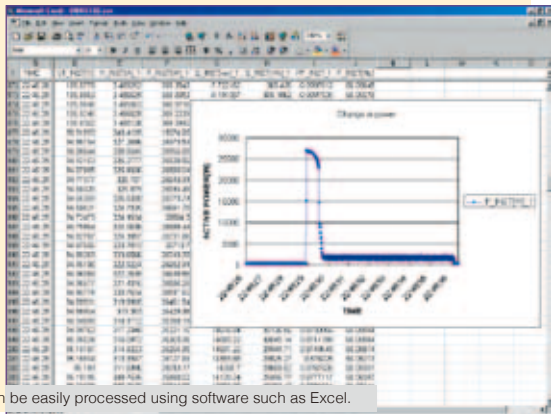
Measurement conditions: When saving all items using normal measurement, the number of days in parentheses indicate normal measurement + harmonics measurement, maximum measurement period of one year

★ 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.



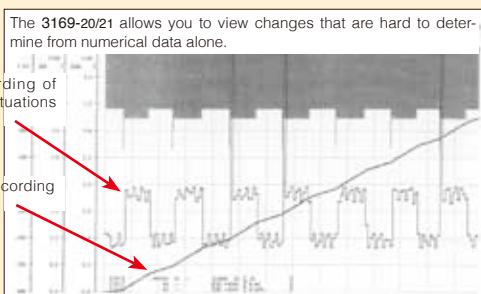
Results can be easily processed using software such as Excel.

★ 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 RECORDER 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.



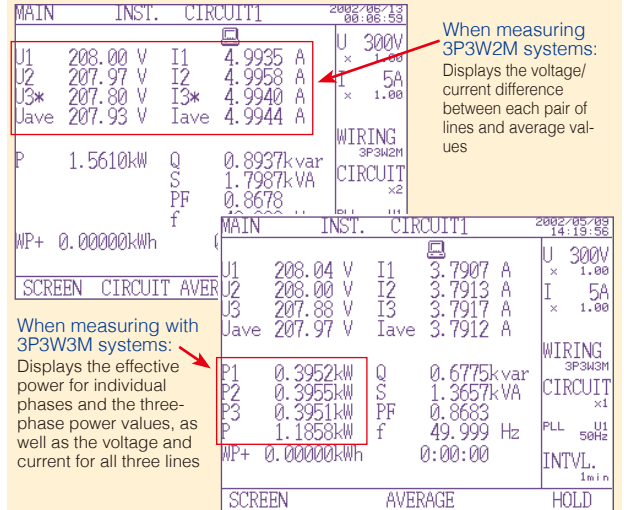
Accurate recording of momentary fluctuations in power, etc.

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.

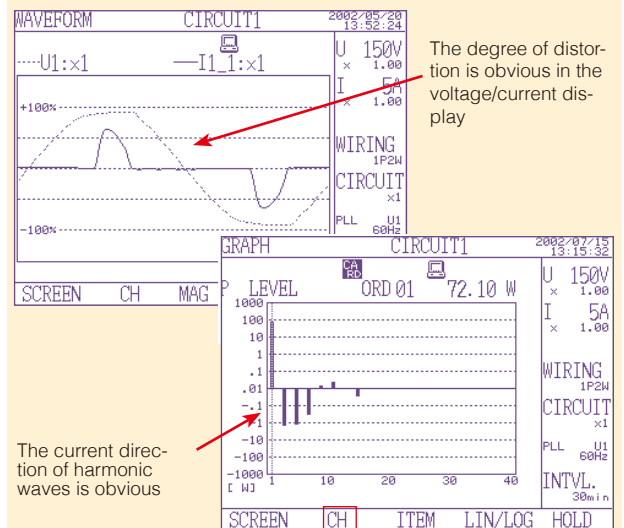
To provide detailed management of measurements, the 3169-20/21 displays voltage and current for all three lines even when measuring just two circuits (3P3W2M). Further, because the effective power for each phase is displayed based on a virtual center point when measuring the voltage and current for all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



★ 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.



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

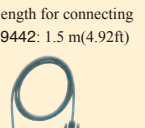
★ Print out results for on-site confirmation

Options

PRINTER 9442

AC ADAPTER 9443-02

RS-232C CABLE 9721



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

Cord length for connecting to the 9442: 1.5 m (4.92ft)

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 AC FLEXIBLE CURRENT SENSOR CT9667-01 : 500/ 5k A AC FLEXIBLE CURRENT SENSOR CT9667-02 : 500/ 5k A AC FLEXIBLE CURRENT SENSOR CT9667-03 : 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 destination | 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 (Accuracy guaranteed for 1 year, Post-adjustment accuracy guaranteed for 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 range | 9694 | 9695-02 | 9660, 9695-03 | 9661 | 9669 | CT9667 ^{-01 -02 -03} |
|---------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------------------------|
| 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 SENSOR

- 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.
 - CT9667-01 (rated for 5000 A) : ±2.0%rdg±0.3%f.s.
 - CT9667-02 (rated for 5000 A) : ±2.0%rdg±0.3%f.s.
 - CT9667-03 (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)

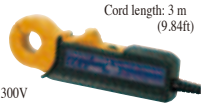
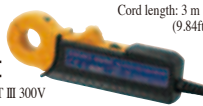


* f.s. is the sensor's rated primary current value.

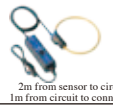
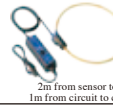
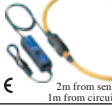


Note: The table of accuracy for different clamp-on sensor combinations indicates the measurement accuracy for each current range of the 3169-20/21. (The accuracy for each clamp-on sensor is converted and displayed according to the 3169-20/21 current measurement range.)

| | |
|-------------------------|--|
| 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**

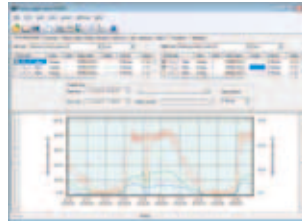
| CLAMP ON SENSOR | 9694 | 9660 | 9661 | 9669 |
|-----------------------------------|---|---|--|---|
| Appearance |  Cord length: 3 m (9.84ft) CAT III 300V |  Cord length: 3 m (9.84ft) CAT III 300V |  Cord length: 3 m (9.84ft) CAT III 600V |  Cord length: 3 m (9.84ft) CAT III 600V |
| Primary current 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. Phase (45 Hz to 5 kHz): Within ±2° | Amplitude (45 to 66 Hz): ±0.3%rdg±0.02%f.s. Phase (45 Hz to 5 kHz): Within ±1° | Amplitude (45 to 66 Hz): ±0.3%rdg±0.01%f.s. Phase (45 Hz to 5 kHz): Within ±0.5° | Amplitude (45 to 66 Hz): ±1.0%rdg±0.01%f.s. Phase (45 Hz to 5 kHz): 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.) |

| | CT9667-01 | CT9667-02 | CT9667-03 | 9695-02 | 9695-03 |
|-----------------------------------|---|---|---|---|--|
| Appearance |  2m from sensor to circuit 1m from circuit to connector |  2m from sensor to circuit 1m from circuit to connector |  2m from sensor to circuit 1m from circuit to connector |  CAT III 300V |  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 range) Phase (45 Hz to 5 kHz): Within ±1° | | | Amplitude (45 to 66 Hz): ±0.3%rdg±0.02%f.s. Phase (45 Hz to 5 kHz): Within ±2° | |
| 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 100 mm(3.94") | Less than φ 180 mm(7.09") | Less than φ 254 mm(10.0") | Less than φ 15 mm(0.59") | |
| Dimensions and weight | Sensor thickness: φ7.4mm (0.29") Circuit box: 35W(1.38") × 120H(4.74") × 34D(1.34") mm, 280g (9.9 oz.) | | Sensor thickness: φ13mm (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, 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, integrated active power, integrated reactive power, demand volume, demand value, voltage disequilibrium factor, pulse, harmonics (level, content, phase angle, total value, THD) 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 (reference values). |
| Waveform display | Displays waveform data at specified date and time |

| | |
|------------------|---|
| Harmonic display | 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 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 Report creation method: Standard print Report output settings: Save/load report output settings |



CLAMP ON POWER HITESTER

Order Code: 3169-20 (main unit only, English model)
3169-21 (with D/A output, English model)

Accessories

- Model 3169-20
supplied with the voltage cord L9438-53 (1), and power cord (1)
- Model 3169-21
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, 9695-02, 9695-03, 9660, 9661, CT9667-01, CT9667-02, CT9667-03, 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.

Options

- CLAMP ON SENSOR 9660 (AC 100A)
- CLAMP ON SENSOR 9661 (AC 500A)
- AC FLEXIBLE CURRENT SENSOR CT9667-01 (AC 5000A)
- AC FLEXIBLE CURRENT SENSOR CT9667-02 (AC 5000A)
- AC FLEXIBLE CURRENT SENSOR CT9667-03 (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)

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)

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") x 340H(13.39")
x 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 : ϕ 55 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



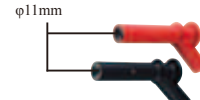
Use only PC Cards (9728) sold by HIOKI.
*Models 9729 1G PC Card and 9780 2G PC Card are not compatible with this device.

CONNECTION CABLE 9440



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

MAGNETIC ADAPTER 9804-01, 02



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; 3PAW - 4 adapters)

Note: Company names and Product names appearing in this catalog are trademarks or registered trademarks of various companies.

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