HIOKI

New

# 3290, 3290-10
# CLAMP ON AC/DC HiTESTER

Field Measuring Instruments

## Current Measurement at DC and from 1 Hz AC, with Comprehensive Integrating Functions

**Choice of Three Sensors:**
20, 200 and 2000 A ranges

**Choice of Measurement Modes:**
DC, AC+DC, AC and PEAK

**Choice of Recording Outputs:**
RMS, waveform, frequency and integral value

**Choice of Response Times:**
switches in three steps

**Filter Function:**
fc = 550 Hz to suppress undesired harmonics


### 3290-10 Functions

**Current integral measurement**
(obtain polarity-specific integrated DC values)

**Operating time/duty measurement**


## Independent sensors for convenient portable measuring

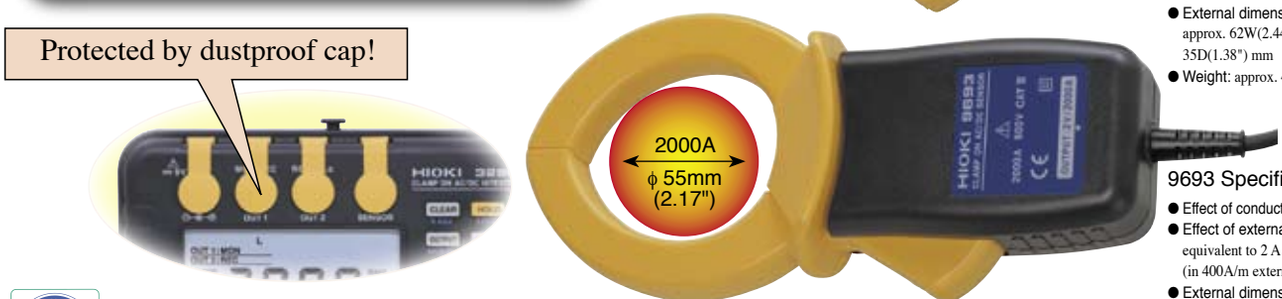
* Measurement cable can be up to 100m(328.1ft) long


### 9691 Specifications

- Effect of conductor position: ±1.0% or less
- Effect of external magnetic field: equivalent to 0.5 A or less (in 400A/m external magnetic field)
- External dimensions: approx. 53W(2.09") × 129H(5.08") × 18D(0.71") mm
- Weight: approx. 230 g(8.1oz)


### 9692 Specifications

- Effect of conductor position: ±0.5% or less
- Effect of external magnetic field: equivalent to 0.7 A or less (in 400A/m external magnetic field)
- External dimensions: approx. 62W(2.44") × 167H(6.57") × 35D(1.38") mm
- Weight: approx. 410 g(14.5oz)




### 9693 Specifications

- Effect of conductor position: ±0.7% or less
- Effect of external magnetic field: equivalent to 2 A or less (in 400A/m external magnetic field)
- External dimensions: approx. 62W(2.44") × 196H(7.72") × 35D(1.38") mm
- Weight: approx. 500 g(17.6oz.)

ISO14001
JQA-E-90091

INTERNET HIOKI Website
http://www.hioki.co.jp/
HIOKI company overview, new products, environmental considerations and other information are available on our website.

Sensor Common Specifications
- Cable length: 2m (6.56 ft) ● Maximum circuit voltage: 600V
- Applicable standards: Safety: EN61010-2-032:1995, CAT III 600V, Pollution Class 2, EMC: EN61326:1997+A1:1998+A2:2001

# ■ Comprehensive Basic Current Measurement Functions of the 3290

All functions needed for measuring DC and AC current and distortion waveforms in a single instrument

## Current range table (common to 3290 and 3290-10)

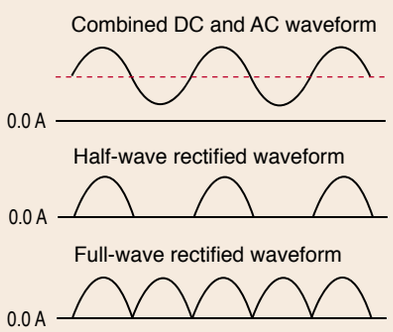
| Sensor Used | Frequency Range | Rated Input | Measurement Range | Max. Display | | Output Terminal Voltage |
|---|---|---|---|---|---|---|
| | | | | Normal Measurement | Peak Measurement | |
| **9691** | DC to 10 kHz (-3 dB) | 100 Arms 150 Apeak | 20.00 A | 25.00 A | 50.0 A | 100 mV/A |
| | | | 200.0 A | 105.0 A | 150.0 A | 10 mV/A |
| **9692** | DC to 20 kHz (-3 dB) | 200 Arms 300 Apeak | 20.00 A | 25.00 A | 50.0 A | 100 mV/A |
| | | | 200.0 A | 210.0 A | 300.0 A | 10 mV/A |
| **9693** | DC to 15 kHz (-3 dB) | 2000 Arms 2840 Apeak | 200.0 A | 250.0 A | 500 A | 10 mV/A |
| | | | 2000 A | 2100 A | 3000 A | 1 mV/A |

Optional Model 9400 CARRYING CASE stores everything together

## ◆ Features

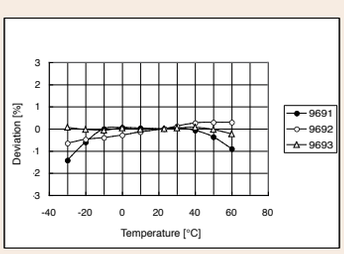
- ❍AC+DC mode measures true rms current of full- and half-wave rectified waveforms and inverter output waveforms from 1 Hz
- ❍Peak mode measures the maximum waveform amplitude of in-rush current at device startup
- ❍Maximum, Minimum and Mean value modes easily measure current variations in lines with severely fluctuating loads
- ❍Simultaneous waveform and rms output enables rms and waveform or frequency fluctuations to be externally recorded together
- ❍Selectable measurement response time enables setting the instrument response to suit changes in load current
- ❍LPF (fc = 550 Hz) filters out unnecessary harmonic currents and noise

### Measures rms properly in the AC+DC Mode

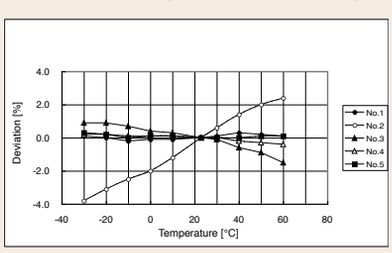



### Clamp-On Current Sensor Temperature Characteristics

Example of temperature sensitivity characteristics




Example of zero-point temperature characteristic (Model 9693 SENSOR)



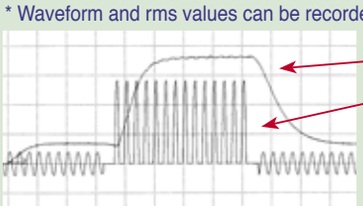

* The Hall-effect current detection element in each sensor has a specific zero-point temperature characteristic that manifests as deviation (scatter)

# Enhanced Low-Frequency Current Measurement Analysis Capabilities

## ■ Measures current from 1 Hz, such as that used for inverter motor control.

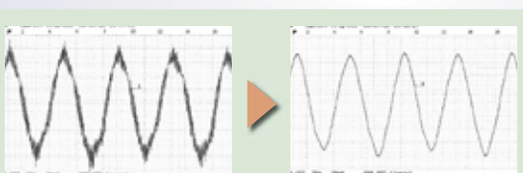
Inverter motor current and rms waveforms are recorded simultaneously. Simultaneous recording of control signals is the best method for evaluating and analyzing such devices during product development and maintenance.


* Waveform and rms values can be recorded simultaneously (MON & REC Mode)



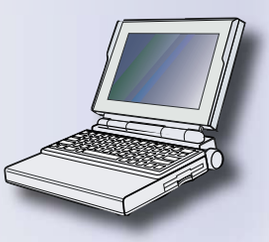

Recording Current Consumption of a Hair Dryer

Current Recording



* Recording basic waveform component with 3290 filter function active

Data saved to PC Card at worksite. After returning to the office, data can be analyzed and stored on a PC.



# ■ Comprehensive Current Integral Functions of the 3290-10

Integral functions such as battery charging/discharging, integral AC current and repeat integral measurements are fully supported. In addition, the "Operating Time/Rate" function shows the operating state of loads.

## ◆ Features

❍Polarity-specific integral function measures battery charging and discharging with one instrument (positive, negative and total integral values)
❍Operating time/Rate display function measures load operating status (with settable threshold value)
❍Polarity-specific peak current display function measures peak battery charge and discharge current with one instrument
❍Repeat measurement and data storage function lets you easily conduct the same measurement up to 20 times and then save that data in the unit's memory.
❍Time-limited mean value display function shows the mean value within a specific integration time (can be used in combination with repeat measurement)
❍External DC power capability enables long-term measurements under battery power

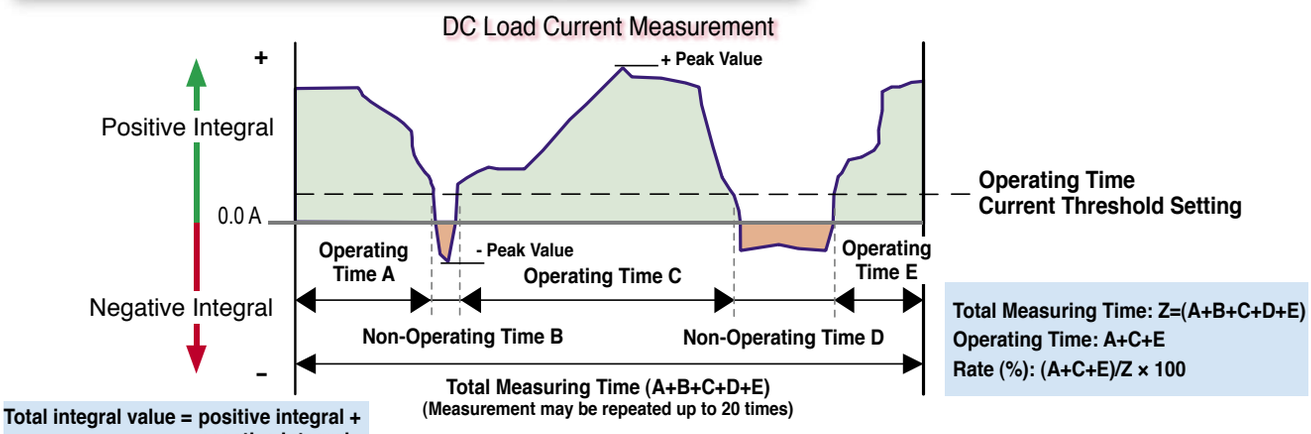
## Current Integral Range Table

* Integration interval can be up to 2000 hours

| Sensor Used | Current Range | Integral Range (5 ranges) | Measurement Range |
|---|---|---|---|
| 9691/9692 | 20 A | 10.000 Ah to 100.00 kAh | 0 to ± 210.0 kAh (9691)<br>0 to ± 420.0 kAh (9692) |
| | 200 A | 100.00 Ah to 1000.0 kAh | |
| 9693 | 200 A | 100.00 Ah to 1000.0 kAh | 0 to ± 4200 kAh |
| | 2000 A | 1000.0 Ah to 10000 kAh | |

### Convenient Repeat Measurement Function

Integral measurements during a specified interval can be repeated continuously up to 20 times.
Integral and numerical measurement data values (maximum, minimum, mean and peak) plus operating time and duty are stored in internal memory. Saved data can be recalled and verified at any time.




## 3290/3290-10 Function Comparison

| Specification | | 3290 | 3290-10 |
|---|---|---|---|
| Current Measurement | Measurement modes | DC, AC+DC, AC (RMS/MEAN) | DC, AC+DC, AC (RMS) |
| | Peak value display | Displays absolute value (of waveform peak) | Displays polarities independently (±peak value of waveform, in DC mode) |
| | Maximum/minimum value display | Displays maximum, minimum and mean values | Maximum and minimum values (in AC and AC+DC modes) |
| | AC filter function | In AC and AC+DC modes, filter (fc = 550 Hz) ON/OFF | |
| | DC filter function | During DC and AC+DC waveform output, filter (fc = 1 Hz) ON/OFF | During DC waveform output, filter (fc = 1 Hz) ON/OFF |
| | Separate AC/DC output function | Separate output of AC content and DC content | – |
| | Output (connector 1) | Current waveform (2-V range)/rms current (2-V DC range) switchable | |
| | Output (connector 2) | Rms current/Low-battery warning switch | Current integral value (selectable +, -, total, 1-V DC/range) |
| Integral Measurement | Timer settings | – | 1 min. to 99 hours, 59 min (for repeated measurement up to 20 times) |
| | Elapsed time display | | Hours:minutes (up to 2000 hours) |
| | Mean value time limit display | | Mean value = integral value / integration time |
| | Output (connector 1) | | Selectable current waveform or rms current |
| | Output (connector 2) | | Current integral value (selectable +, -, total, 1-V DC/range) |
| Rate Measurement | Rate | – | Rate = operating time / total measurement time |
| | Operating time measurement | | Displayed operating time: Hours:minutes (up to 2000 hours) |
| Frequency Measurement | Range setting | Auto/manual ranging | Auto ranging |
| | Output (connector 1) | Frequency value (1-V DC/range) | – |
| | Output (connector 2) | Rms Current | |
| Data Storage | | – | Peak, maximum, minimum, mean value, integral value, operating time,rate |
| Bar Graph Display | | When DC center is zero, bar graph can display 10X magnification | Display of number of memorized data points |
| Display Refresh Rate | | N: twice/second, F: 4 times/second (3290-10 is 10 times/second), S: once/3 seconds * 3290-10 DC mode is once/second | |
| Measurement Response Time Switching | | F: 0.2 s, N: 0.8 s, S: 8 s switching | |
| Power Supply | | Battery and AC adapter | Battery, AC adapter, external battery (8.4 to 15.6 V DC) |

## Model 3290 and 3290-10 Specifications (accuracy guaranteed at 23 ±5°C(73 ±9°F), 80% RH or less, non-condensating) ■ Period of guaranteed accuracy: 1 year

| Combined accuracy with 9691 or 9692 | | | Measurement frequency f | | | | |
|---|---|---|---|---|---|---|---|
| Mode | Range | Response time setting | DC | 1 ≤ f < 10Hz | 10 ≤ f < 45Hz | 45 ≤ f ≤ 66Hz | 66Hz < f ≤ 1kHz |
| DC | 20.00 A | – | ±1.3%rdg.±10dgt. | – | – | – | – |
| | 200.0 A | | ±1.3%rdg.±5dgt. | | | | |
| AC+DC<br>AC RMS | 20.00 A | FAST | ±1.3%rdg.±12dgt.<br>(when AC + DC is set only) | – | – | ±1.3%rdg.±8dgt. | ±2.3%rdg.±8dgt.<br>(9691: up to 500Hz) |
| | | NOMAL<br>SLOW | | ±2.0%rdg.±8dgt.<br>(when AC + DC, SLOW is set only) | ±1.3%rdg.±8dgt. | | |
| | 200.0 A | FAST | ±1.3%rdg.±7dgt.<br>(when AC + DC is set only) | – | – | ±1.3%rdg.±3dgt. | ±2.3%rdg.±3dgt.<br>(9691: up to 500Hz) |
| | | NOMAL<br>SLOW | | ±2.0%rdg.±3dgt.<br>(when AC + DC, SLOW is set only) | ±1.3%rdg.±3dgt. | | |
| AC MEAN<br>(only 3290) | 20.00 A | – | – | – | – | ±1.3%rdg.±8dgt. | ±2.3%rdg.±8dgt. |
| | 200.0 A | | | | | ±1.3%rdg.±3dgt. | ±2.3%rdg.±3dgt. |

| Combined accuracy with 9693 | | | Measurement frequency f | | | | |
|---|---|---|---|---|---|---|---|
| Mode | Range | Response time setting | DC | 1 ≤ f < 10Hz | 10 ≤ f < 45Hz | 45 ≤ f ≤ 66Hz | 66Hz < f ≤ 1kHz |
| DC | 200.0 A | – | ±1.8%rdg.±10dgt. | – | – | – | – |
| | 2000 A | | ±1.8%rdg.±5dgt. | | | | |
| AC+DC<br>AC RMS | 200.0 A | FAST | ±1.8%rdg.±12dgt.<br>(when AC + DC is set only) | – | – | ±1.3%rdg.±8dgt. | ±2.3%rdg.±8dgt. |
| | | NOMAL<br>SLOW | | ±3.0%rdg.±8dgt.<br>(when AC + DC, SLOW is set only) | ±2.3%rdg.±8dgt. | | |
| | 2000 A | FAST | ±1.8%rdg.±7dgt.<br>(when AC + DC is set only) | – | – | ±1.3%rdg.±3dgt. | ±2.3%rdg.±3dgt. |
| | | NOMAL<br>SLOW | | ±3.0%rdg.±3dgt.<br>(when AC + DC, SLOW is set only) | ±2.3%rdg.±3dgt. | | |
| AC MEAN<br>(only 3290) | 200.0 A | – | – | – | – | ±1.3%rdg.±8dgt. | ±2.3%rdg.±8dgt. |
| | 2000 A | | | | | ±1.3%rdg.±3dgt. | ±2.3%rdg.±3dgt. |

| Frequency range (accuracy range) | Maximum display | Accuracy |
|---|---|---|
| 10.00Hz (1.00 to 10.00Hz) | 12.50Hz | ±0.3%rdg.±1dgt. |
| 100.0Hz (10.0 to 100.0Hz) | 125.0Hz | |
| 1000Hz (100 to 1000Hz) | 1000Hz | ±1.0%rdg.±1dgt. |

| 3290-10 Specifications | Accuracy |
|---|---|
| Integral value display | Current measurement accuracy ±1 dgt |
| Measurement time | Not more than ±0.2 s deviation per hour (@23°C(73°F)) |
| Output connector voltage | Display accuracy ±2 mV |

■Provided functions ●Zero Adjustment (DC and AC+DC) ●Data Hold ●Setting Saving Function:Saves the state of settings ●Key Lock ●Battery Check ●Auto Power Off: about 10 minutes after last key operation, beeper warning available ●Beeper sound on/off

●Temperature characteristic: 0.1 × Specified Accuracy/°C (@0 to 40°C) (0.18 × Specified Accuracy/°F (@32 to 104°F))
●Function display: 21-segment bar graph, over-range (O.L.), low-battery warning (B), Hold (HOLD), auto power off (APS)
●Measurement response time: (1) FAST (0.2 s) for 45+ Hz; (2) NORMAL (0.8 s) for 10+ Hz); (3) SLOW (8.0 s) for 1+ Hz)
* Input: The time for analog output to stabilize after transition from 0 R 90% or from 100 R 10%, setting AC (RMS) or AC+DC
●Display refresh rate: (1) NORMAL: twice per second; (2) SLOW: once per three seconds; (3) FAST: four times per second (ten times per second for 3290-10; (4) Bar graph display: 4 times per second
●Zero suppression: 5 counts
●Range switching: Auto/manual
●Crest factor: 2.5 or less, or the same or less than peak value of connected sensor
●Output impedance: 100 Ω or less

●Output rate:
(1) Rms current (REC_A): 2 V DC/range; (2) Current waveform (MON): 2 V/range; (3) Frequency (REC_Hz)*1: 1 V DC/range (*1. 3290 only)
Combined output connectors (OUT1 & OUT2*2):
(1) Current waveform (MON / MON.FL*1) & rms current (REC);
(2) Current waveform (MON / MON.FL*1) & low-battery detection (B.Lo)
(3) Rms current (REC) & low-battery detection (B.Lo)
(4) Frequency (REC) & rms current (REC) (3290 only)
*1. MON.FL is with fc = 1 Hz filter on,
*2. OUT2 of the 3290-10 is total integral value (Ah), selected from positive, negative or total value
●Operating temperature and humidity: 0 to 40°C (32 to 104°F) @80% RH or less (non-condensating) ●Storage temperature: -10 to 50°C (14 to 122°F) (non-condensating) ●Operating environment: up to 2000m ASL, indoors ●Power source: Four AA-size (LR6) alkaline batteries, or AC adapter Model 3290-10 also accepts 8.4 to 15.6 V external DC power ●Max. power consumption: 500 mVA (using batteries) ●Battery life: approx. 22h (continuous operation)
●Applicable safety standards EMC: EN61010-1:2001, EN61326:1997+A1:1998+A2:2001, EN61000-3-2:2000, EN61000-3-3:1995+A1:2001
●External dimensions, weight: approx. 155W (6.10") × 98H (3.86") × 47D (1.85") mm, approx. 545 g (19.2oz.)●Supplied accessories: Carrying strap (1), AA-size (LR6) alkaline batteries (4)

## ■ Extension Cables Available by Special Order

Connects from the standard 2m (6.52ft) sensor cable to the 3290 or 3290-10 (available lengths are 5, 10, 20, 30, 50 and 100m (16.4, 32.8, 65.6, 98.4, 164.1 and 328.1ft))

Measurement is not available with only the **3290** or **3290-10 CLAMP-ON AC/DC HiTESTER**. A **CLAMP-ON AC/DC SENSOR** (Model 9691, 9692 or 9693) must also be purchased separately.

## ■ Options

**9691 CLAMP-ON AC/DC SENSOR (100 A)**
**9692 CLAMP-ON AC/DC SENSOR (200 A)**
**9693 CLAMP-ON AC/DC SENSOR (2000 A)**
**9445-02 AC ADAPTER**
**9445-03 AC ADAPTER (EU)**
**9094 OUTPUT CABLE**
**9400 CARRYING CASE**
**9199 CONNECTOR ADAPTER (BNC-to-Banana [female])**

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