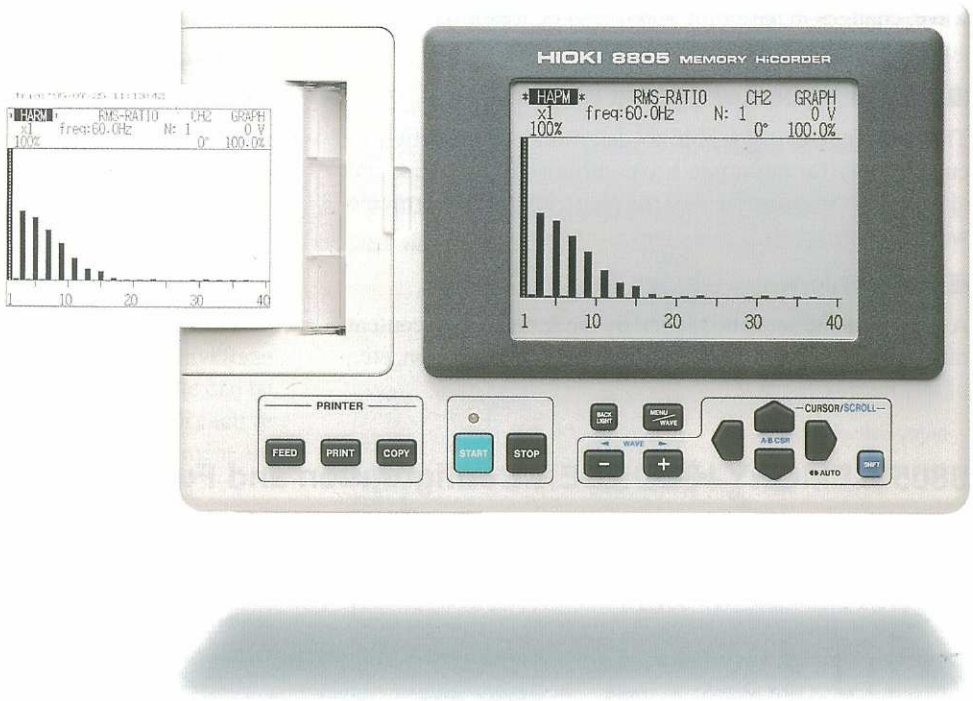
HIOKI

1998

8805 MEMORY HiCORDER

Recorders



For Instantaneous Analysis or Time-Series Analysis of Harmonic Waves the Flow to or from Commercial Power Systems

The **8805 MEMORY HiCORDER**, a B5 book-sized recorder, is similar to the 8804 Memory Hi-Corder except that harmonic wave analysis functions have been added, making it capable of instantaneous analysis and time-series analysis of harmonic waves. This unit can be used to measure and analyze harmonic wave currents that flow into or out of commercial power systems as well as harmonic wave components superimposed over power supply line voltage.

ISO9001
CERTIFICATE No. JMI-0216

This product has been manufactured in conformity with the ISO9001 international standard on Quality Control and Quality Assurance.

ISO14001
CERTIFICATE No. JQA-E-90091

HIOKI is certified under the international standard ISO 14001 for environmental management systems.

Clearly Displays the Actual State of Harmonic

Harmonic wave analysis requires simple operations

Main Features of the 8805 MEMORY HiCORDER

■ Two harmonic wave analysis modes

In addition to permitting instantaneous harmonic wave analysis on any wave from the base wave to the 40th order wave, changes in harmonic waves can be measured and recorded in a time series.

■ Determination of current direction

This unit makes it possible to determine the direction of current flow for harmonic wave current of all orders, and also permits measurement of the phase angle and harmonic wave power.

■ Harmonic wave trigger

A trigger can be set to be tripped by the actual value, content ratio, active power, power phase angle, total distortion, etc., of any harmonic wave.

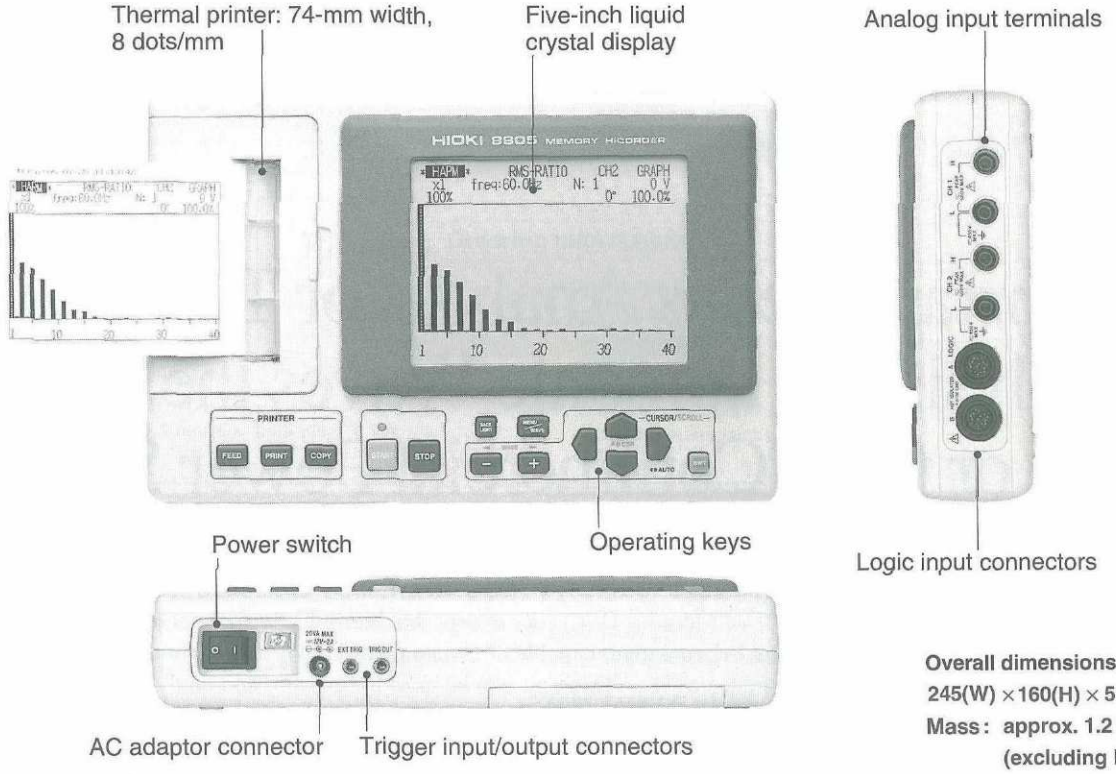
■ General-purpose recorder

This unit can be used as a general-purpose recorder that permits measurement of two analog channels and eight logic channels simultaneously.

■ Three-way power supply

This unit can be powered either by size 3 alkaline dry cells, a special nicad battery pack, or a special AC adapter, making this unit highly suitable for use in the field.

8805 MEMORY HiCORDER Configuration and Functions



Overall dimensions:
245(W) × 160(H) × 51(D) mm
Mass: approx. 1.2 kg
(excluding batteries)

Automatic AC adapter/battery switching

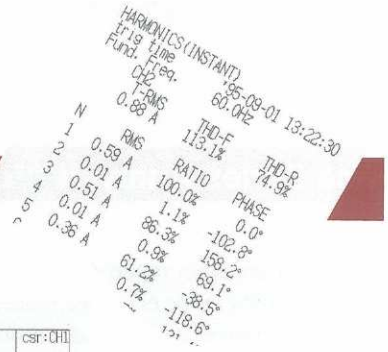
The AC adapter is given priority as a power supply. Therefore, if the batteries and AC adapter are both used simultaneously, battery power is not consumed. In addition, if the AC power supply is lost, recording operations are not hindered because the batteries are automatically switched in as the power supply.

LCD with backlight can be read even in dark surroundings

A semi-transparent LCD with backlight is used for the display, so the display can be read in bright or dark surroundings. The Memory HiCorder lets the operator check analysis results or waveforms on the screen and then can print out a record of the required data.

Waves Using the Latest Technology

Five Instantaneous Analysis Modes



The 8805 can analyze harmonic wave components (from base wave to 40th-order wave) included in power supply line voltage and current with a base frequency ranging from 45 to 65 Hz. Five types of analysis of each order of harmonic waves from an input waveform can be performed: effective value, content ratio, phase angle, active power, and power phase angle. The measured results can be displayed and recorded as a spectral graph or as numeric data.

Harmonic wave power measurement *

By inputting voltage on CH1 and current on CH2 (via clamp-on probes), and using CH2 as the current waveform for scaling, the active power and power phase angle can be measured for each order of harmonic waves. Reactive power, apparent power, and power factor measurement are also possible.

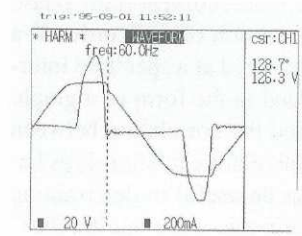
Current direction discrimination *

The 8805 can determine whether the current being measured is inflow from the power supply system or outflow from the load side on the basis of the phase angle and the active power between the voltage/current of each order of the harmonic wave. When the angle is ±90¡ or more and the power is negative, the current is outflow current, so the source of harmonic waves can be determined

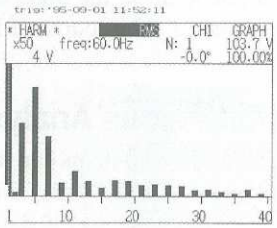
* Power and phase angle (power flow direction) are possible only with single-phase, 2-wire lines.

Total distortion

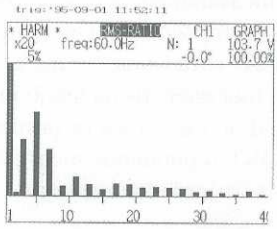
The total distortion can be measured either as the ratio of all harmonic waves versus the total effective value, or as the ratio of all harmonic waves versus the base wave.



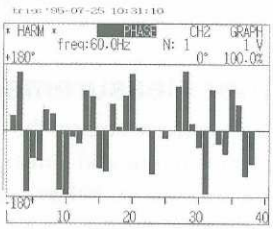
Input waveform



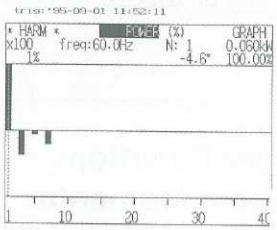
①Effective value



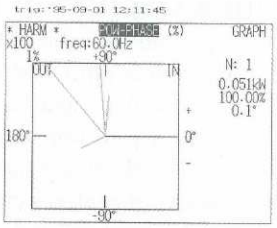
②Content ratio



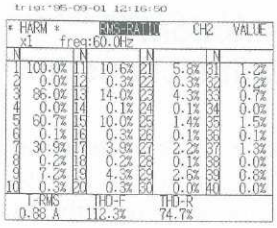
③Phase angle



④Active power



⑤Power phase angle

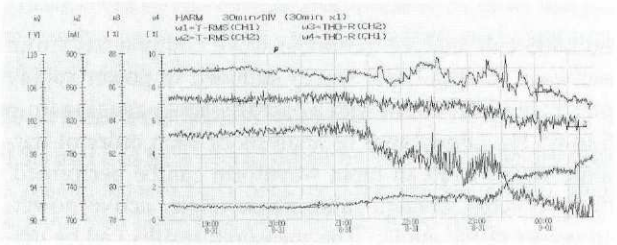


Numeric data

Long-term Recording Capabilities Make the the Source of Harmonic Wave Interference

Time Series Analysis Mode: Shows Changes in Harmonic Waves Over Time

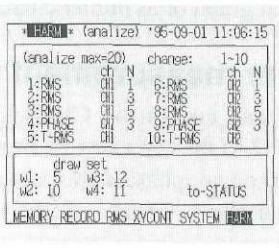
Time series analysis mode permits continuous measurement of changes in the effective value, content ratio, phase angle, active power and total distortion of each order of a harmonic wave. Data can be measured at a specified interval and then displayed or recorded in the form of a graph. By monitoring over a long period the correlation between harmonic waves and time and the relative relationships between phenomena, the 8805 can be useful in determining and eliminating the source of harmonic wave interference.



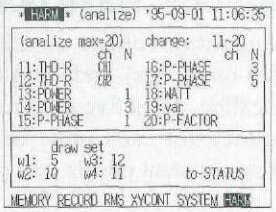
Time series recording

Simultaneous Analysis of up to 20 Items

A maximum of 20 items can be set for simultaneous analysis in time-series analysis. The measurement period can be set from three hours to 150 days, during which the measurement results are stored in memory. After measurement is completed, a combination of any four phenomena involving a specified item can be displayed on the screen or printed out. When the time axis is CONT (continuous measurement), the last 15 divisions can be recorded in memory.

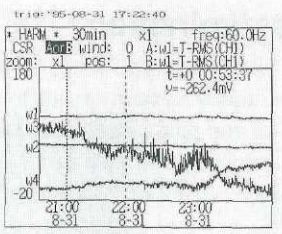


Analysis item setting

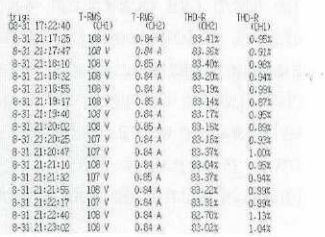


Cursor Measurement

On the waveform screen, the cursor can be used to read the measurement time and numerous analyzed values. "Waveforms" or "numeric values" can also be selected for output to the printer.



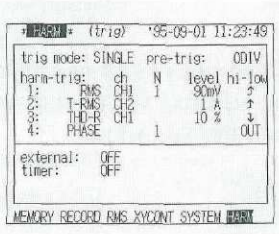
Cursor measurement



Numeric value printing

Harmonic Wave Trigger Function: Permits Capture of Exact Moments

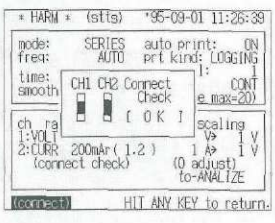
The 8805 permits a trigger to be set according to the effective value, content ratio, active power value, power phase angle, total effective value, or total distortion for any harmonic wave. Up to four conditions can be set, and the sources can be OR'ed together. In instantaneous analysis mode, a variety of analyses can be performed at the instant the trigger is tripped, while in time series mode the trigger can be used to start recording.



Trigger setting

Connection Check Function: Prevents Reversed Connections for Clamps, etc.

This function calculates the active power; if the result is negative, the 8805 determines that connections have been reversed. This function prevents misoperation of the 8805.



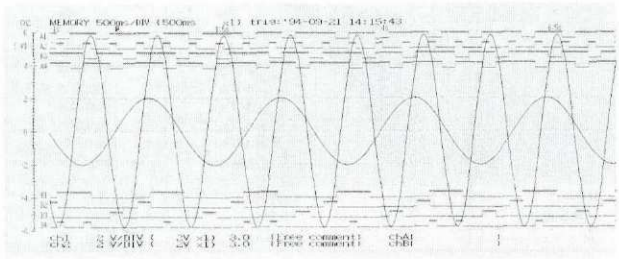
Wiring check

8805 Useful for Determining and Eliminating

The 8805 Can Also Be Used as a General-Purpose Recorder

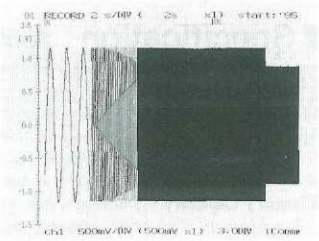
Memory recorder function

The input signal is first converted to digital form and stored in memory, and then is available for display and printing, thus allowing transient events to be captured reliably. It is also possible to make X-Y plots for any pair of channels.



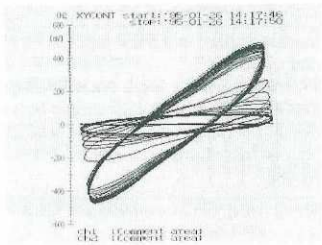
Recorder function

Display and printout are possible in real time at a maximum speed of 5mm/second (2 seconds/division). For screen display only, a maximum speed equivalent to 50mm/second (200ms/division) is possible. The sampling speed is fast at 400kS/s (a 2.5µs cycle), making it possible to record an AC signal envelope, for example. In addition, the waveform over the most recent 200 divisions is stored in memory and can be printed out again later.



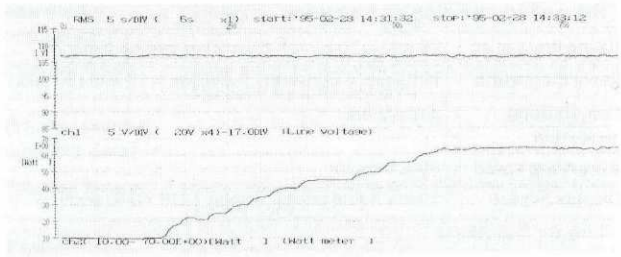
X-Y recorder function

An X-Y composite waveform created from two signals can be monitored in real time on the display. There are no restrictions on the recording time, and the composite waveform can be printed out again later.



Effective value recorder function

This function can be used with a 50/60Hz AC signal or with direct current. The waveforms of three 50/60Hz components are sampled at high speed at a fixed rate of 250µs and the effective values are calculated. These calculations are repeated 16 times per second, and the changes in level are recorded. This function is convenient for recording fluctuations in power supply voltages.



Other convenient functions

- A variety of trigger systems, such as a trigger that detects a momentary voltage drop in a commercial power supply line
- Logging function that permits printing of numeric values
- Six types of numeric value calculation functions, such as P-P value and mean value
- 1/2 compression of the voltage axis that permits recording of 240V AC waveforms
- Setting condition registration function that can register four measurement conditions
- Cursor measurement function that makes it possible to read numeric values from waveform data
- Scaling function that converts measured values to the desired value or unit system.

Compact and Lightweight Unit (B5 Size/1.2kg)

Memory recorder function recording times
(maximum recording length 800/400 divisions)

Time/division	Sampling interval	Using CH1 channel (800 divisions)	Using both channels (400 divisions)
200µs/div.	2.5µs	0.16s	0.08s
400	5	0.32s	0.16s
1ms/div.	12.5	0.8s	0.4s
2	25	1.6s	0.8s
5	62.5	4s	2s
10	125	8s	4s
20	250	16s	8s
50	625	40s	20s
100	1.25ms	1m20s	40s
200	2.5	2m40s	1m20s
500	6.25	6m40s	3m20s
1s/div.	12.5	13m20s	6m40s
2	25	26m40s	13m20s
5	62.5	1h 6m40s	33m20s
10	125	2h13m20s	1h 6m40s
30	375	6h40m	3h20m
1min/div.	0.75s	13h20m	6h40m
2	1.5	26h40m	13h20m

Recorder / effective value recorder function recording times
(length 10 m, approx. 990 divisions) *1

Time/division	Sampling interval	Time to exhaust paper, using two channels
200ms/div. 500 1s/div.	Recorder function: 2.5 µs (fixed)	Unlimited (screen only); effective value recorder function not available
2s/div		Approx. 33 minutes; effective value recorder function not available
5	(Recorder function: 2.5 µs (fixed) (Effective value recorder function: 250 µs (fixed)	Approx. 1 hour 22 min
10		Approx. 2 hours 45 min
30		Approx. 8 hours 15 min
1min/div.		Approx. 16 hours 30 min
2		Approx. 1 day 9 hours
5		Approx. 3 days 10 hours 30 min
10		Approx. 6 days 21 hours
30		Approx. 20 days 15 hours
1hour/div.		Approx. 41 days 6 hours

*1 This assumes that 10 cm of the length of the recording paper is not used, for a total of 990 divisions.

■ Specification 8805 MEMORY HiCORDER (Accuracy figures at 23± 5°C)

Basic specification

Measurement functions	Memory recorder, recorder, X-Y recorder, effective value recorder (50/60 Hz or DC only), single – phase harmonic wave analysis
Memory capacity	(Analog 9 bits + logic 4 bits) × 64k words/channel (using CH1 channel) or 32k words/channel (using 2 channels)
Backup function	Waveform data, clock, and settings for approx. 8 years at 25 °C
Power supply	Six R6/AA alkali batteries, 9420 battery pack (rapid rechargeable from AC adaptor), or 9418 AC adaptor
Operating time	Approx. 2 hours using alkali batteries; approx. 1 hour using 9420 battery pack. * Manganese batteries cannot be used. Nickel-cadmium batteries other than the 9420 battery pack cannot be used. For alkali batteries the operating time may vary depending on variations from one manufacturer to another and on the use pattern of the unit.
Supplied accessories	Recording paper (1 roll), 9574 connection leads (1.7 m) (2 sets)

Recording and display functions

Recording paper	74 mm × 10 m, roll thermal recording paper
Recording width	Full scale 6 divisions; 1 division = 10 mm (80 dots)
Longitudinal resolution	8 rows/mm
Recording speed	max. 5 mm/s
Display Screen	5-inch liquid crystal display (320 × 240 pixels)

Trigger functions

Sources	Channel 1/logic group A, channel 2/logic group B, external, and timer; each source on/off, logical AND/OR of sources
Trigger types	Level, window, logic pattern, voltage drop (MEM only) / effective value trigger (effective value REC only)
Connectors	External inputs/outputs 3.5 mm dia. mini-jacks

Memory recorder function

Time axis	18 ranges: 200 µs to 2 minutes/division; time axis magnification 3 settings, ×2 to ×10; compression 6 settings 1/2 to 1/100
Sampling period	1/80 of time axis range setting (min. 2.5 µs)
Recording length	20 to 400 divisions (using 2 channels), * 800 divisions (using 1 channel)
Pre-trigger	Fraction of recording before trigger event: 10 settings, 0 to 100%, and -95%.
Other functions	Parameter calculations (six values including minimum and maximum), measurement axis zoom function, partial print.

Recorder function

Time axis	13 ranges: 200 ms to 1 hour/division; 200 ms to 1 s display only; time axis compression 5 settings 1/2 to 1/50
Sampling period	2.5 µs fixed (400 kS/s)
Recording length	20 to 400 divisions, and continuous
Other functions	Measurement axis zoom function, reprinting of portion in memory (last 200 divisions).

Effective value recorder (50/60 Hz or DC only)

Time axis	9 ranges: 5 s to 1 hour/division; time axis compression 5 settings 1/2 to 1/50
Sampling period	250 µs fixed (4 kS/s)
Recording length	20 to 400 divisions, and continuous
Other functions	Measurement axis zoom function, reprinting of portion in memory (last 200 divisions).

X-Y recorder function

Sampling period	200 µs ("dot" mode); minimum 400 µs ("line" mode)
Recording time	Indefinite superimposition
Display and print	6 × 6 divisions (printout 60 mm × 60 mm, 80 dots/division)

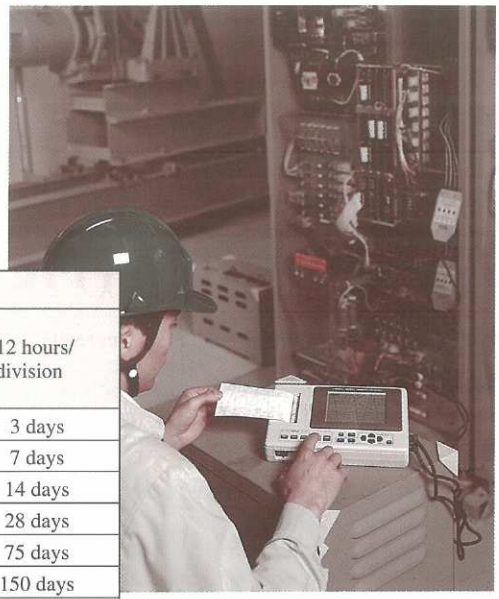
Auxiliary functions

Scaling (readout conversion of measurement axis only), setting saving function, clock, cursor readout, comment entry, list and gauge printing, logging printing

Inputs

Number of channels	Two analog channels (inputs isolated) plus eight logic channels
Measurement ranges	20mV to 100V/division; 12 ranges; full scale (f.s.) = 6 divisions; maximum: 500 V (DC + AC peak); RMS recorder: up to 50V/division; harmonic wave analysis: from 10mV to 50V/division.
Amplitude accuracy	±1% f.s. (DC); ±3% f.s. (RMS; 50/60 Hz ±2 Hz and DC)
Zero position	From -0.4 division to +6.4 division, in 0.1 division steps
Zero position accuracy	±1% f.s.
Frequency characteristics	DC to 100 kHz -3 dB
Input resistance and capacitance	1 MΩ±1%; approx. 5 pF (at 100 kHz)
Maximum floating voltage	450 V AC/DC, input channels to frame and between channels
Anti-Aliasing Filter	4th-Orver Active Type Low-Pass Filter Cutoff Frequency: 4.84 kHz (-3dB) * The Filter is turned on automatically by the harmonic wave analysis function.

Suited for Use in the Field



Time series analysis recording time (80 samples/division)					
Time axis / Number of analyses (recording length)	30 minutes/ division	1 hour/division	3 hours/division	6 hours/division	12 hours/ division
20 (6division)	3 hours	6 hours	12 hours	1 day	3 days
20 (12division)	6 hours	12 hours	1 day	3 days	7 days
10 (30division)	12 hours	1 day	3 days	7 days	14 days
5 (60division)	1 day	2 days	7 days	14 days	28 days
2 (150division)	3 days	6 days	18 days	37 days	75 days
1 (300division)	6 days	12 days	37 days	75 days	150 days
20 (*)	CONT	CONT	CONT	CONT	CONT

(*) The most recent 15 divisions of the analysis data are stored in memory.

8805 Harmonic Wave Analysis Section

General Specifications	
Input settings	Set to either voltage input or current input* * When current input is set, set the current-voltage conversion value for scaling.
Basic frequency range	45 Hz to 65 Hz Automatic setting or manual setting (0.1 Hz resolution)
Analysis orders	Base wave to 40th order
Analysis frequency band	45Hz to 2.6kHz
Amplitude accuracy (display ×1)*	Base wave to 20th order: ± (1.5% rdg. + 5 dgt.) 21st order to 40th order: ± (3% rdg. + 5 dgt.)
Phase accuracy* (content ratio 10%)	(Base wave to 20th order) ± 3.5° (21st order to 40th order) ± 7.5°
Sampling frequency	200 S/s fixed
Number of FFT calculations	512 points (samples per one cycle of base wave)
Waveform memory capacity	9 bits × 8k words/channel
Memory capacity for harmonic wave calculations	32 bits × 24k words

Instantaneous analysis function	
Types of harmonic wave analyses	Effective value, content ratio, phase angle, and harmonic wave active power* for each order of harmonic wave (graph and numeric values) * Analysis possible only when CH1 is set to voltage, and CH2 is set to current Total distortion (All harmonic waves versus total effective value, and all harmonic waves versus base wave)
Types of analyses	Waveform display, effective value, frequency Active power value*, reactive power value*, apparent power value* and power factor* * Analysis possible only when CH1 is set to voltage, and CH2 is set to current
Printing formats	Waveform/graph output, data list output, automatic printout, manual printout, screen copy
Expansion/ compression	× 100 to 1/2, log, six levels
Miscellaneous	Scaling function (units can be input) Cursor readout (Possible for each order of waveform for phase angle, harmonic wave active power, and voltage waveform)

*Note: When using a clamp-on probe, the accuracy of the probe is added in.

Time series analysis function	
Types of analysis functions	Actual value, content ratio, phase angle, total effective value, harmonic wave active power*, power phase angle*, active power*, reactive power*, apparent power*, and power factor* for each order of harmonic wave (graph and numeric values) * Analysis possible only when CH1 is set to voltage, and CH2 is set to current Total distortion (All harmonic waves versus total effective value, and all harmonic waves versus base wave)
Maximum number of simultaneous analyses	Total of 20. Analysis functions can be combined as desired. A maximum of four analyses can be displayed/printed simultaneously.
Time axis	30 minutes/division, 1, 3, 6, 12 hours/division (80 samples/division)
Recording time	Depends on time axis and number of simultaneous analyses
Smoothing processing	On/off
Printout types	Line graph or numeric data for each type of analysis (printout by time display)
Printing interval (numeric data)	1, 8, 16, 40, 80, 160, 400, 800, or 1600 samples
Printing format	Automatic printing, manual printing, partial printing, screen copy
Expansion/ compression	×4 to 1/48, 8 levels (in direction of time axis) ×100 to 1/2, log; 6 levels (in direction of vertical axis)
Miscellaneous functions	Scaling function (unit input also possible), cursor readout, scrolling function

Harmonic wave trigger functions	
Harmonic wave trigger modes	One shot, continuous
Harmonic wave trigger types	Effective value trigger, content ratio trigger, active power trigger, power phase angle trigger, total effective value trigger, total distortion trigger * Can be selected from among the set analyses for the time series analysis function; a maximum of four types can be selected.
Miscellaneous trigger types	External trigger, timer trigger
Pretrigger	0, 5, 10 divisions (time series analysis functions)

Additional functions	
Wiring check function	Calculates the active power value; if a negative value is obtained, the connections are deemed to be reversed.

■ Optional accessory specifications

9306 LOGIC PROBE
Inputs: 4 channels (common ground), digital / contact signal detection
Input resistance: at least 50 kΩ (digital); 2 kΩ (relay contacts)
Threshold level: +1.4 V
Response time: 2 μs maximum

9307 LINE LOGIC PROBE
Inputs: 4 channels (isolate), high/low switching type
Input resistance: at least 100 kΩ (high), 30 kΩ (low)
Detection levels: 170 to 240 V AC, ±70 to 250 V DC (high)
60 to 150 V AC, ±20 to 150 V DC (low)
Non-detection levels: 0 to 30 V AC, ±0 to 43 V DC (high)
0 to 10 V AC, ±0 to 15 V DC (low)
Response time: rising edge 1 ms maximum, falling edge 3 ms maximum (On/off, with high at 200 V DC, low at 100 V DC)

For measurement convenience

9018 CLANP ON PROBE
Measurement ranges: 10/20/50/100/200/500 A
Output voltage: 0.2 V AC for the set range
Accuracy: ±1.5% rdg. ±0.1% f.s. (From 45 to 66 Hz)
Frequency characteristics: From 40 to 3 kHz
(differential from the basic accuracy)
±1% or less
Phase characteristics: ±2.5° or less (From 40 to 3kHz)
Clamp aperture: 46 mm dia.
Circuit voltage: 600 V AC (insulated conductor)

9132 CLAMP ON PROBE
Measurement ranges: 20/50/100/200/500/1000 A
Output voltage: 0.2 V AC for the set range
Accuracy: ± 3% rdg. ±0.5 mV (55 Hz)
Frequency characteristics: From 40 to 1 kHz (differential from 55 Hz) ± 1% or less
Clamp aperture: 55 mm dia., 80 mm wide bus bar
Circuit voltage: 600 V AC (insulated conductor)
Reference data
Phase characteristics: Approx. 3° typ. (50 Hz)
Approx. 1° typ. (200 Hz)

For measurement precision

9270-9272 CLAMP ON SENSORs and 9555 SENSOR UNIT
These current sensors are capable of reliable measurement of distorted AC current waveforms. Each clamp-on sensor operates together with the 9555 unit.
Input ranges: 20 A (9270), 200 A (9271), 20/200 A (9272)
Output voltage: 2 V AC for the set range
Frequency characteristics: 5 Hz to 50 kHz (9270 and 9271) ±2.5% f.s. / 5 Hz to 10 kHz (9272) ±2.5% f.s.
Phase characteristics: 5 Hz to 50 kHz (9270, 9271) ± 1° or less
5 Hz to 10 kHz (9272) ± 2° or less
Clamp aperture: 20 mm dia. (9270 and 9271)
46 mm dia. or 50 × 20 mm bus bar (9272)
Circuit voltage: 600 V AC (insulated conductor)

Just open and use 9379

Holds HiCORDER and accessories 9372

9277-9279 UNIVERSAL CLAMP ON CTs and 9555
These current sensors are capable of reliable measurement of waveforms ranging from DC current to distorted AC current. Each clamp-on sensor operates together with the 9555 unit.
Input ranges: 20 A (9277), 200 A (9278), 500 A (9279)
Output voltage: 2 V AC for the set range
Frequency characteristics: DC to 100 kHz (9277 and 9278) ±5% f.s. / DC to 20 kHz (9279) ±5% f.s.
Phase characteristics: DC to 100 kHz (9277, 9278) ± 5° or less
DC to 20 kHz (9279) ± 5° or less
Clamp aperture: 20 mm dia. (9277 and 9278)
40 mm dia. (9279)
Circuit voltage: 600 V AC, 850 V peak (insulated conductor)

⚠ Danger
Some clamp on testers have clamp portions with non-insulated cores and shieldings. therefore, to avoid short circuits and accidents that could result in injury or death, do not use on bare conductors.

Ordering information

8805 MEMORY HiCORDER

● Optional accessories
9018 CLAMP ON PROBE: 10 to 500 A
9132 CLAMP ON PROBE: 20 to 1000 A
9232 RECORDING PAPER: 10 m, 10 rolls
9305 TRIGGER CORD: 3.5 mm dia. mini-plug, 1.5 m approx.
9306 LOGIC PROBE: 4 channel digital / contact signal on/off detection
9307 LINE LOGIC PROBE: 4 isolated channels AC/DC voltage on/off detection
9372 CARRYING CASE: approx. 300 (H) × 350 (W) × 90 (D) mm, approx. 1.4 kg
9379 CARRYING CASE: approx. 170 (H) × 246 (W) × 83 (D) mm, approx. 400 g
9418-10 AC ADAPTOR: universal 100 to 240 V AC, 12 V DC/2.5 A output
9420 BATTERY PACK: 7.2 V, 700 mAh

* The 8805 Memory HiCorder cannot be used alone. Please also order either the optional 9418 AC adaptor or the 9420 battery pack (uses the 9418 for charging), or alternatively R6/AA alkali dry cells will be required. Please select the power source according to the application; the dry cells can be obtained from normal retail suppliers.
* Manganese batteries cannot be used. Nickel-cadmium batteries other than the 9420 battery pack cannot be used.

220H PAPER WINDER: paper width 70 to 220 mm; 100 V AC (Uses special-purpose adaptor) approx. 190 (H) × 240 (W) × 160 (D) mm, approx. 2.6 kg
9270 CLAMP ON SENSOR: 20 A, 5 Hz to 50 kHz
9271 CLAMP ON SENSOR: 200 A, 5 Hz to 50 kHz
9272 CLAMP ON SENSOR: 20/200 A, 5 Hz to 10 kHz
9277 UNIVERSAL CLAMP ON CT: 20 A, DC to 100 kHz
9278 UNIVERSAL CLAMP ON CT: 200 A, DC to 100 kHz
9279 UNIVERSAL CLAMP ON CT: 500 A, DC to 20 kHz
9555 SENSOR UNIT: forms set with 9270-72, 9277-79

HIOKI
HIOKI E. E. CORPORATION

DISTRIBUTED BY

HEAD OFFICE:
81 Koizumi, Ueda, Nagano, 386-1192, Japan
FAX. 0268-28-0568 / TEL. 0268-28-0562
E-mail:.os-com@hioki.co.jp

■Internet HIOKI web-page http://www.hioki.co.jp/

F8805E3-83M-03K Printed in Japan