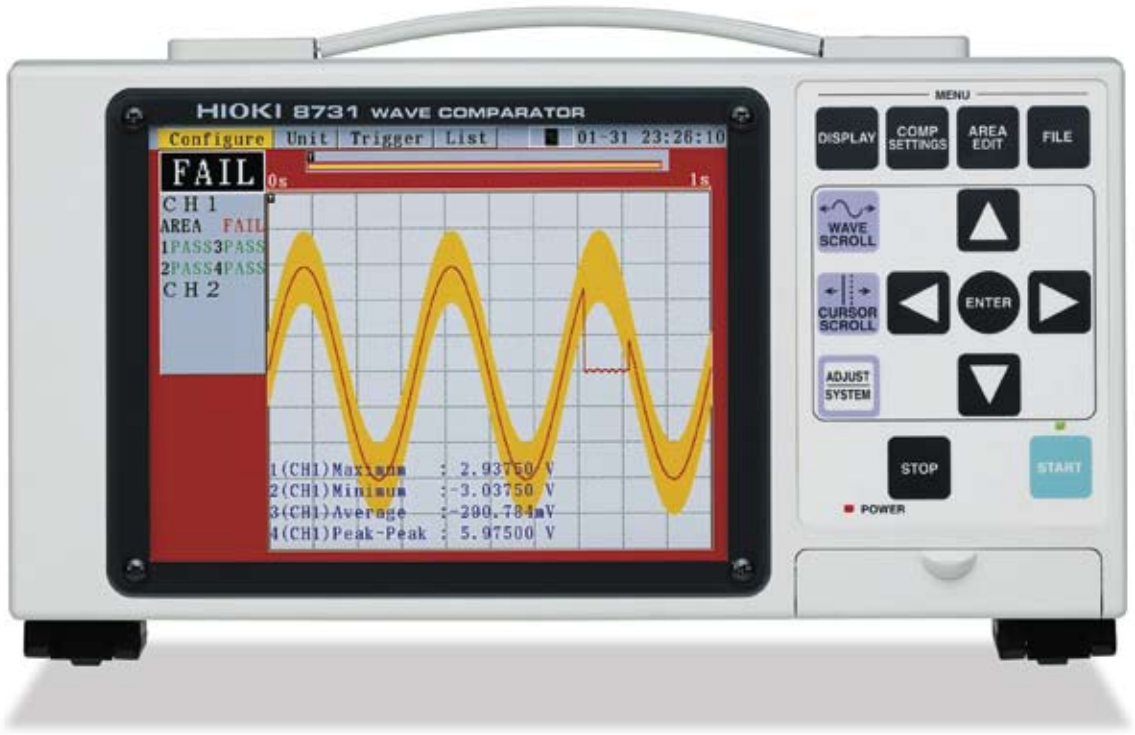
HIOKI

Enhance your production lines

WAVE COMPARATOR 8730-10/8731-10

Recorders



CE

Ideal for automatic testing in manufacturing environments

Simple operation for quick PASS/FAIL evaluation

The WAVE COMPARATORs **8730-10/8731-10** are purpose-designed instruments focusing on the superb waveform evaluation functions of the **HIOKI** MEMORY HiCORDER series. Specifically engineered in shape and functionality for seamless integration into production lines, the units are reasonably priced and easy to operate. Compared to the more expensive multi-functional devices, the **8730-10/8731-10** can accomplish a specific number of tasks with optimum efficiency. Define a range and perform area evaluation, conduct numeric evaluation using upper and lower thresholds, or perform both of these functions all at the same time.

ISO 9001 JMI-0216

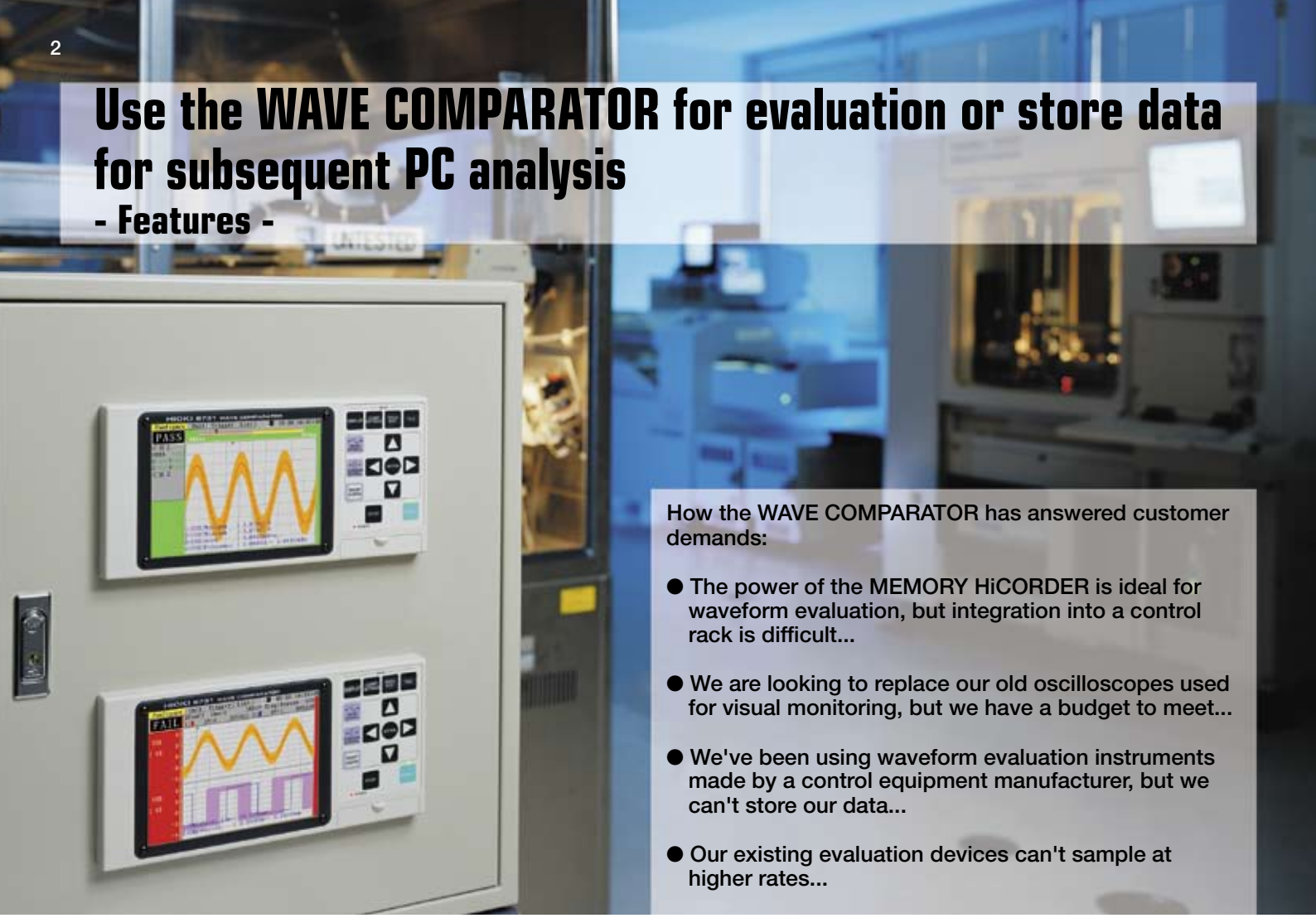
ISO14001 JQA-E-90091

INTERNET HIOKI Website http://www.hioki.co.jp/

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

Use the WAVE COMPARATOR for evaluation or store data for subsequent PC analysis

- Features -



How the WAVE COMPARATOR has answered customer demands:

- The power of the MEMORY HiCORDER is ideal for waveform evaluation, but integration into a control rack is difficult...
- We are looking to replace our old oscilloscopes used for visual monitoring, but we have a budget to meet...
- We've been using waveform evaluation instruments made by a control equipment manufacturer, but we can't store our data...
- Our existing evaluation devices can't sample at higher rates...

What the HIOKI 8730-10/8731-10 WAVE COMPARATOR can offer you:

Low price and easy operation

Compared to the **HIOKI MEMORY HiCORDER 8835-01**, waveform evaluation can be implemented at less than half the cost. Operation flow is suitable for a production line environment. The memory capability of the multi-function **MEMORY HiCORDER** has been streamlined for a single purpose. The setup screen employs Windows-like pull-down menus for easy operation.

Physically designed for integration in production lines

All operation switches and the display screen are arranged on the front panel, while the measurement input and control input/output connectors are located on the rear. The metal plate enclosure is flat on all sides to facilitate installation in a rack or a control panel. Handles and feet are removable and can be mounted on the top if desired.

Resistant to tough working environments

The sheet key switches have a flat surface and are accommodating to environments where grease or other contaminants exist. There are no openings between the controls and the unit chassis, so that the keys cannot be gummed up by dust, etc. The PC Card slot on the front panel is equipped with a lid that provides basic dust proofing, which automatically closes when a PC Card is inserted.

Versatile external control

The external control connectors are isolated and allow connection also of a sequencer or other device with separate ground potential. If 24V DC is externally supplied, the control signals can operate at 24V. Using the internal isolated 5V power supply for control is also possible. Separate evaluation result output signals are provided for area and numeric evaluation. The two-channel model has a dedicated output for each channel.

Conveniently store data on PC Cards

Data compatibility with the **HIOKI MEMORY HiCORDER 8835-01** also makes it easy to display and print waveform data on the **8835-01**, as well as conduct further data analysis. An evaluation area created on the **MEMORY HiCORDER 8835-01** can be used or edited on the **WAVE COMPARATOR 8730-10/8731-10**.

High-speed operation with 1M-sample/second

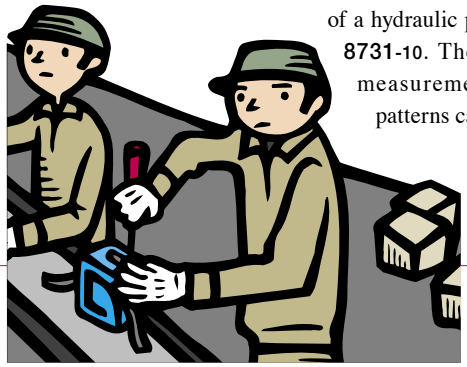
The high sampling speed of the **8730-10/8731-10** is ideal for not only conventional mechanical systems but also electrical applications. The sampling frequency is 1/100 of the time axis range, resulting in 1-μs sampling at 100 μs/DIV.

Suitable for a wide range of uses. Realize your own ideas.

- Application examples -

Motor operation testing

Waveform evaluation can be used to test whether a motor is operating normally. To do this, the actual waveform is compared to the control signal tolerance range. Because the **8730-10/8731-10** allows storing of measurement data on a PC Card, test data management can be implemented easily.



Hydraulic pressure testing

X-Y waveforms such as pressure/flow of a pump or pressure/stroke of a hydraulic press can be tested with the two-channel model **8731-10**. The two inputs are suitable for X-Y waveform measurement, and Lissajous and other donut-shaped patterns can also be evaluated.

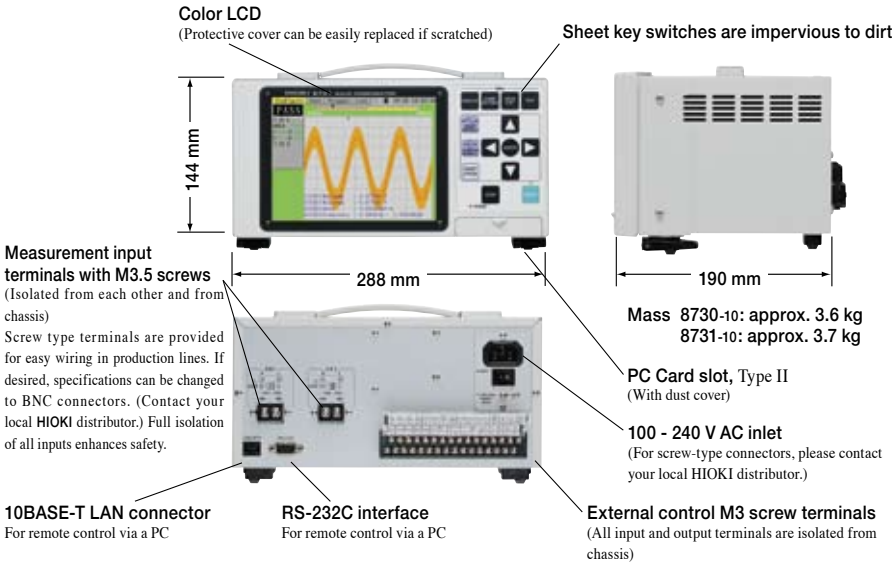
Gear pre-load testing

Machining precision is an important factor for assuring that driving force transmission gears mesh smoothly. Torque fluctuations that arise during gear rotation can be measured and evaluated with the **WAVE COMPARATOR**. Automatic storing of waveform data for each sample makes data handling simple and quick.

Welding quality check

Simply monitoring the current value often is not enough to evaluate the quality of a welding step. Especially in automated lines where welding robots are used, evaluation of current waveform patterns is highly useful for checking and maintaining quality.

■ External view and dimensions



Screw-on type feet can be easily removed. Use the feet when placing the unit directly on a work surface. When mounting the unit on top of a control installation, screw fastening is possible by removing the plastic extensions and fitting the supplied left/right brackets.

Remove the handle and feet for easy rack-mounting. Versions to match either JIS or EIA standards are available. Please contact your local **HIOKI** distributor for details.

The WAVE COMPARATORs as seen installed in a control panel. Please contact your local **HIOKI** distributor for details.

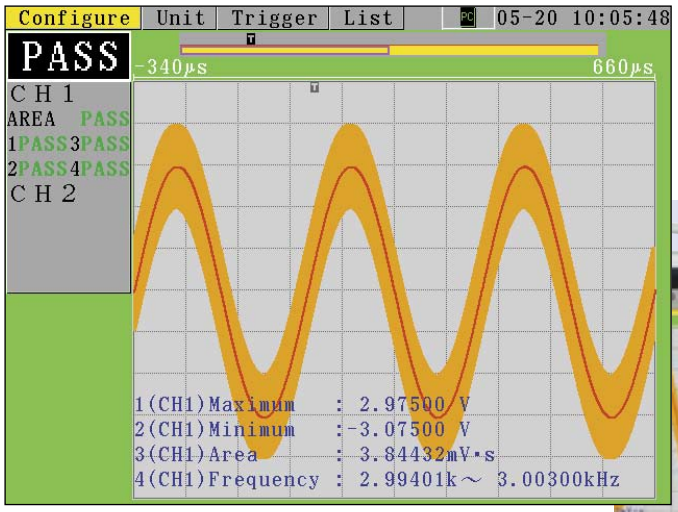
Large handle for convenient portability and transport. By angling the feet, the instrument can be positioned as desired for easy viewing.

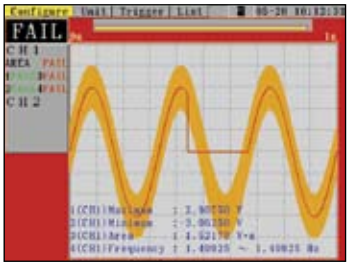
Basic steps for area evaluation

- Operation examples -

Simple operation

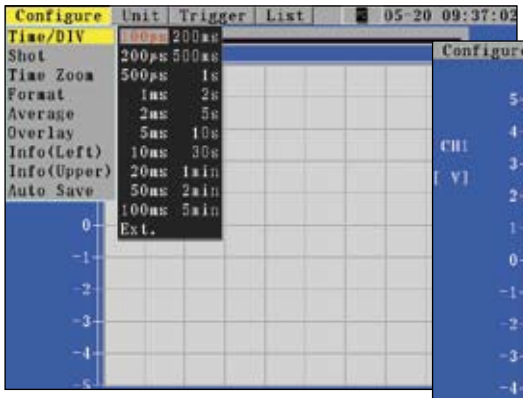
Simultaneously perform area and numeric evaluation. The screen shown below is an example for a PASS result, using a green background. The overall evaluation result is shown at the top left, with details shown below this and numeric results displayed at the bottom of the screen.



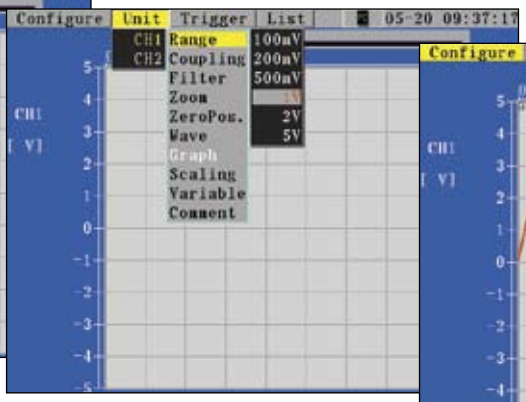


This is a FAIL result screen.
The background is red, making the status easy to discern also from a distance.

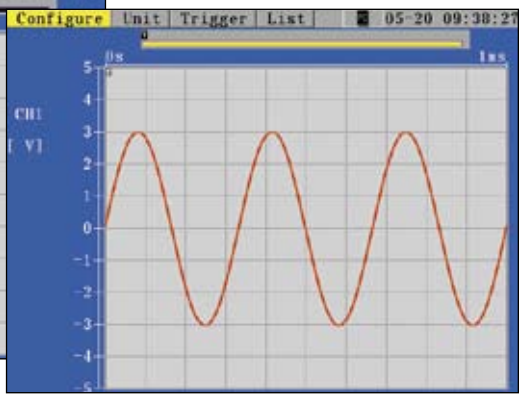
Operation is very simple, using the cursor keys while watching the screen. To accept a setting, press SET. To switch between different screens, use the MENU keys at the top.



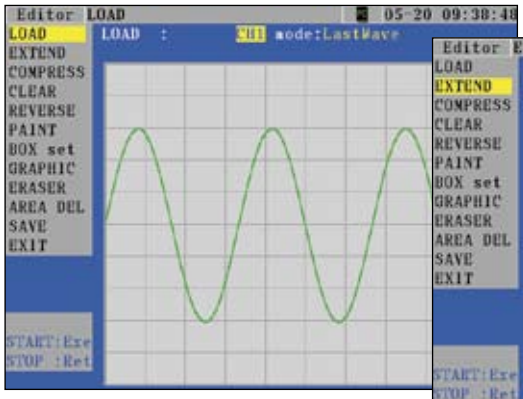
The "Configure" menu at the top of the screen opens a list for controlling the time axis and making other settings. In the above example, 1DIV = 100µs is selected.



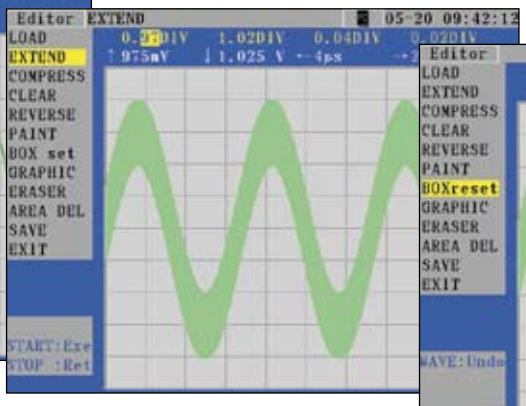
The "Unit" menu at the top of the screen opens a list for controlling the voltage range and making other settings. In the above example, 1DIV = 1V is selected.



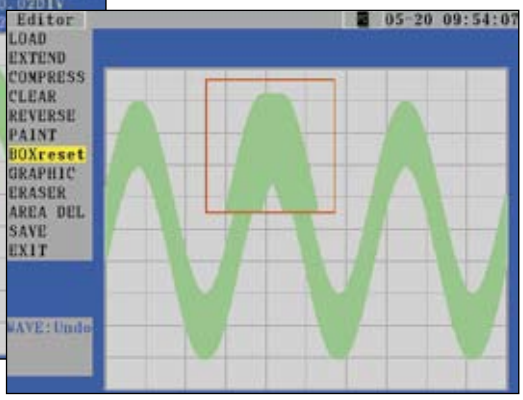
Measure a "Good" waveform and use it to create an evaluation area.



Load the measured waveform into the "Editor" window. (You can also create a new area from scratch without loading a waveform.)



Based on the loaded waveform, create an evaluation area by expanding the graph in the vertical and horizontal plane. The amount of shift is specified in DIV increments.



By placing a box frame around a section, you can enlarge or reduce a specific segment of the area.

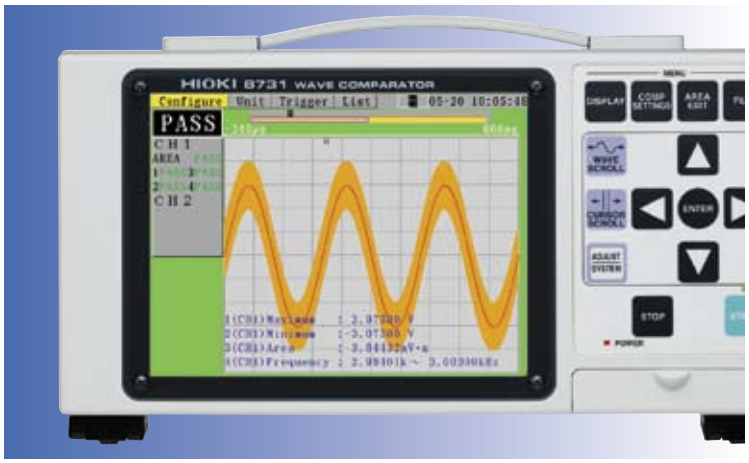
Model 8731-10 has two inputs for simultaneous evaluation of two waveforms

- Operation examples -

Two channels for further enhanced performance

The inputs of Model **8731-10** (2-channel model) are shown below. The M3.5mm screw terminals are convenient when designing the wiring layout of a production line. For different requirements, specifications can also be changed to BNC connectors. (Please contact your local HIOKI distributor for details.) For safety, all inputs are isolated from chassis ground and from each other.

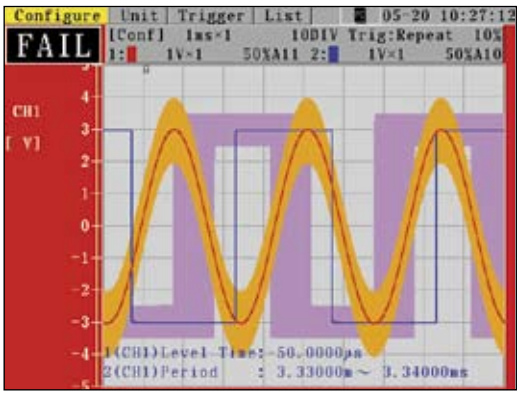
Rear view (input terminals)



Front view (2-channel evaluation example)

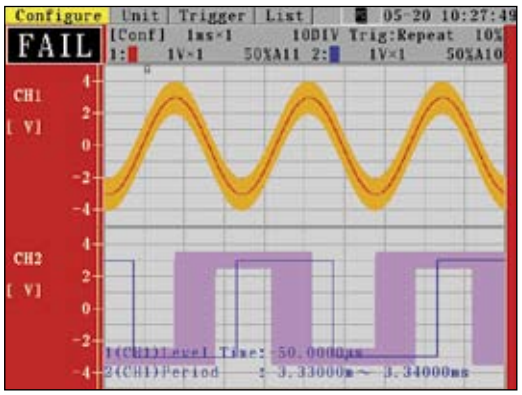
Evaluation screen can be divided into two windows without impairing resolution

When performing 2-channel evaluation with the **8731-10** (2-channel model), you can tile the screen horizontally into two sections. On screen, this means that display resolution is halved, but evaluation precision is not affected. The internal processing memory continues to perform highly accurate evaluation using the full screen resolution.



Full screen display example

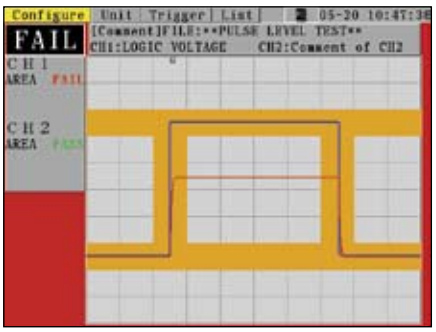
When tiling the screen horizontally, display resolution is reduced by a factor of 2, but...



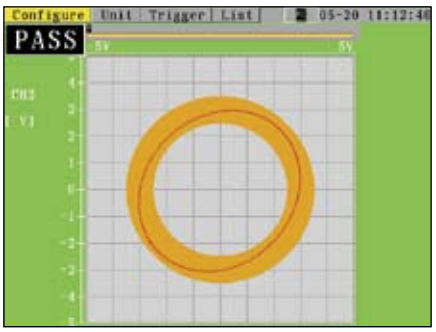
Tiled screen display example: Evaluation is still performed at full screen resolution, so there is no drop in accuracy.

Time axis evaluation of X-Y Lissajous waveform and donut-shaped patterns

Because area evaluation is based on screen display pixels, complex donut-shaped patterns such as shown at right can also be evaluated. Evaluation devices from other manufacturers use A/D conversion and base their area assessment on digital values. Therefore, they can only judge whether nor not the upper and lower limits have been exceeded. Models **8730-10** and **8731-10** on the other hand can also perform FAIL evaluation in the center of the range, something that is not possible with competing products. (X-Y measurement is possible only with Model **8731-10**)



Evaluating a time axis waveform using a donut-shaped area: FAIL evaluation of a pulse with insufficient amplitude



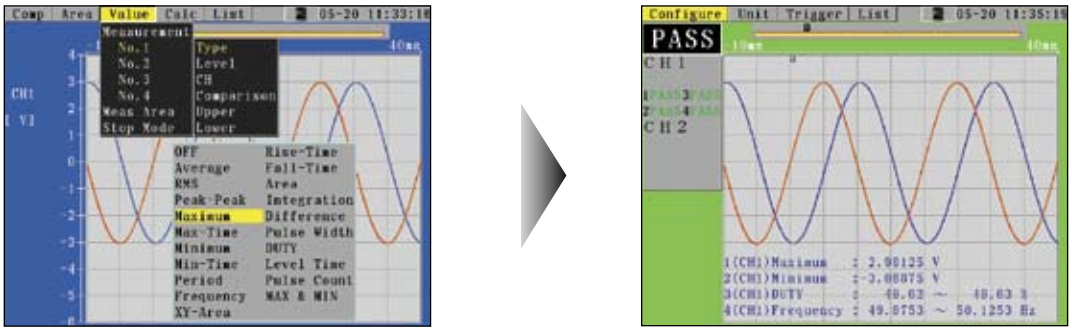
Using 2-channel input for X-Y Lissajous waveform evaluation: Vertical and horizontal voltage input allows Lissajous waveform evaluation.
(Only with Model **8731-10**)

Numeric processing and evaluation, data store capability, communication ready

- Operation examples -

Numeric processing and evaluation functions

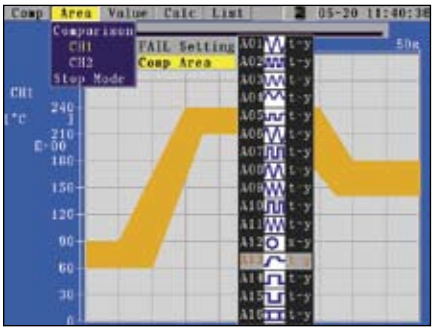
Choice of four different types of numeric evaluation functions available. Upper and lower limits can be set against which the results of numeric processing are to be compared. Besides maximum and minimum values, many other processing items (total 20 items) are also provided. Dual evaluation capability means that area evaluation and numeric evaluation can be performed at the same time. The evaluation result screen shows the overall PASS/FAIL result at the top left, and details on area evaluation and numeric evaluation 1 - 4 below this.



Store evaluation area data and setup parameters for repeat applications

The internal memory of the unit holds information on up to 16 different evaluation areas. Separate area evaluation settings can be stored for each channel. Memory slots are numbered A01 - A16 and can be selected freely. A reduced size graph of the area shape is shown besides each selection, making it easy to pick the one you want.

In addition, 16 different setup parameters can be stored in the internal memory and selected also via external control or key operation.



Convenient data save and transfer functions

Measurement data can be stored on PC Cards which is convenient for archiving test data for production lines.

A LAN connector (10BASE-T) and RS-232C interface are provided as standard features. This lets you link the units to a PC network for easy access to important data.

(**LAN COMMUNICATOR 9333** is required to save data on a PC network, sold separately.)

PC Card Type II slot with dust cover (front panel)

Communication connectors provided as standard equipment (rear panel)

Internal memory storage capacity

Time axis	Sampling period	8730-10 (1 ch)/memory capacity 50 kW Maximum recording length 500 DIV	8731-10 (2 ch)/memory capacity 50 kW/ch Maximum recording length 500 DIV
100µs/DIV	1µs	0.05 s	0.05 s
200µs/DIV	2µs	0.1 s	0.1 s
500µs/DIV	5µs	0.25 s	0.25 s
1ms/DIV	10µs	0.5 s	0.5 s
2ms/DIV	20µs	1 s	1 s
5ms/DIV	50µs	2.5 s	2.5 s
10ms/DIV	100µs	5 s	5 s
20ms/DIV	200µs	10 s	10 s
50ms/DIV	500µs	25 s	25 s
100ms/DIV	1ms	50 s	50 s
200ms/DIV	2ms	1 m 40 s	1 m 40 s
500ms/DIV	5ms	4 m 10 s	4 m 10 s
1s/DIV	10ms	8 m 20 s	8 m 20 s
2s/DIV	20ms	16 m 40 s	16 m 40 s
5s/DIV	50ms	41 m 40 s	41 m 40 s
10s/DIV	100ms	1 h 23 m 20 s	1 h 23 m 20 s
30s/DIV	300ms	4 h 10 m 0 s	4 h 10 m 0 s
1min/DIV	0.6s	8 h 20 m 0 s	8 h 20 m 0 s
2min/DIV	1.2s	16 h 40 m 0 s	16 h 40 m 0 s
5min/DIV	3.0s	41 h 40 m 0 s	41 h 40 m 0 s

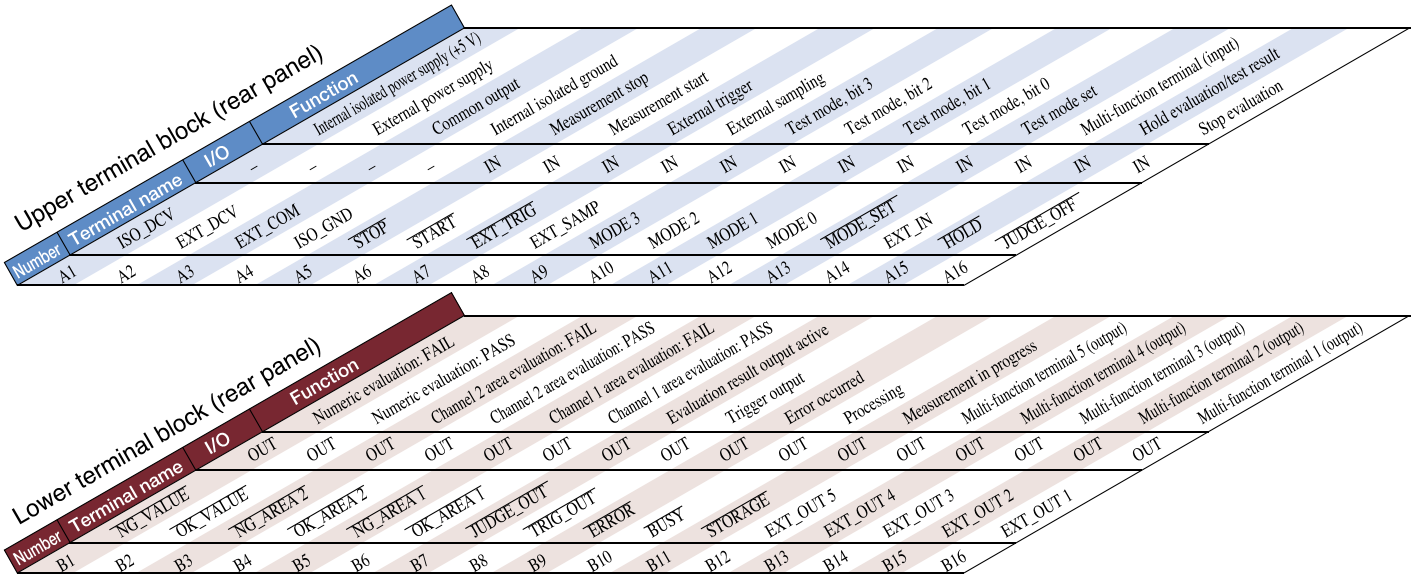
Output timing of evaluation result

- How it works -

External control connectors insulated from chassis

External DC power can be 12V or 24V, and control signal input also operates at this voltage. Using the internal isolated 5V power supply for control is also possible. Because the terminals are isolated from chassis ground, connection of a sequencer, relay bank, or other device with separate ground potential presents no problem.

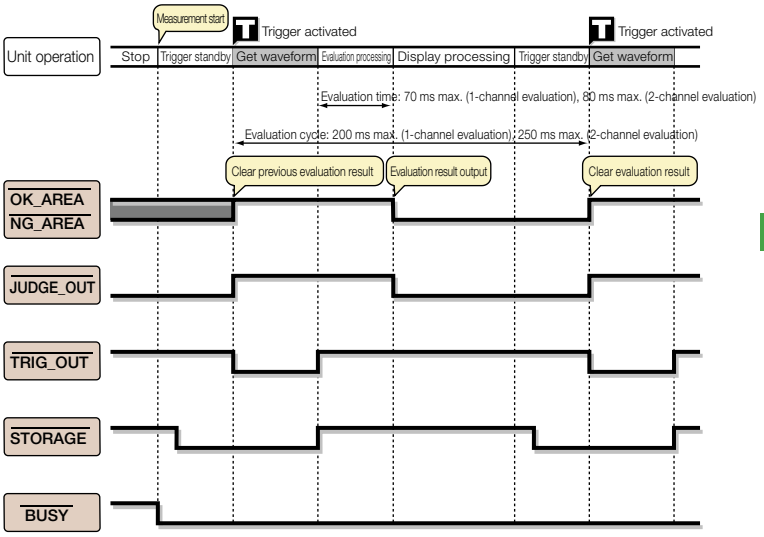
External control connectors provided as standard equipment (rear panel)



Evaluation result output timing

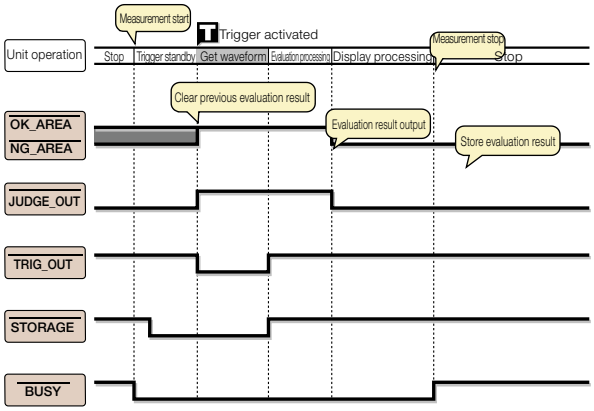
The diagram below shows the evaluation output cycle when performing area evaluation only for a 1kHz sine wave signal. When auto store is selected, data store processing occurs after the evaluation processing step. The evaluation time and evaluation cycle for numerical processing depend on the processing type and recording duration, and also on the evaluation waveform.

Trigger mode: continuous



Setup:
- Time axis range: 100µs/DIV
- Recording length: 10DIV
- Display format: 1screen
- No LAN connection
- A/B cursor display set to OFF

Trigger mode: single



■ Main unit

(Accuracy at 23 ±5°C/73 ±9°F, 30 to 80 % rh after 30 minutes of warm-up time and zero-adjust; accuracy guaranteed for 1 year)

Input	8730 (1ch type)	8731 (2ch type)
Input terminals	Analog 1 channel, M3.5 screw terminals, **Max. rated voltage to earth:** 30Vrms or 60V DC (with input isolated from chassis, the maximum voltage that can be applied between input channel and chassis without damage)	Analog 2 channels, M3.5 screw terminals, **Max. rated voltage to earth:** 30Vrms or 60V DC (with input isolated from chassis, the maximum voltage that can be applied between input channel and chassis and between input channels without damage)
Measurement range (10 DIV full-scale)	100 mV to 5 V/DIV, 6 ranges, allowable AC voltage for measurement/display: 17 Vrms Low-pass filter: 5Hz, 50Hz, 500Hz, 5kHz, 50kHz, 100kHz	
Measurement resolution	Data 1/160 of measurement range (using 12-bit A/D converter)	
Max. sampling speed	1M-Sample/sec (1μ sec period, **8731-10**: simultaneous 2-channels)	
Memory capacity (number of sample data)	Max. 50,000 datas for each channel (12-bit × 50 k-word/ch)	
Accuracy	DC amplitude: ±0.5% f.s. Zero position: ±0.1% f.s.	
Frequency response	DC to 400kHz (±3dB)	
Input impedance/capacity	1MΩ, 20pF (at 100 kHz)	
Maximum input voltage	30Vrms or 60V DC (CAT I, max. voltage that can be applied without damage between input terminals)	

Display/interface

Display	7.2 inch STN color LCD (640 × 480 dots)
Measurement screen	Time axis screen: 1 or 2 screens X-Y screen (model **8731-10** only): 10 DIV × 10 DIV X-Y axis resolution: 40 dots/DIV
Evaluation	Waveform evaluation on reference area (2-channel individual evaluation possible at the model **8731-10**)
Storage Media	PC Card Type II slot, Flash ATA, max. 2 GB Setup parameters/measurement data (binary or text) /evaluation area/screen data/processing result
PC interface	RS-232C (9-pin D-SUB connector), LAN (10BASE-T)

General specifications

Backup functions (at 25°C/ 77°F)	**Clock and setting conditions:** battery life of at least 10 years **Waveform data:** none
Environmental conditions (no condensation)	**Operation:** +5°C (41°F) to +40°C (104°F), 30% to 85% rh **Storage:** -10°C (14°F) to +50°C (122°F), 10% to 85% rh
Compliance standard	**Safety:** EN61010 **EMC:** EN61326
Power requirements	100 to 240V AC (50/60 Hz)
Power consumption	40VA, max.
Dimensions and mass	288mm (11.34in) W × 144mm (5.67in) H × 190mm (7.48in) D, **8730-10**: 3.6kg (127.0oz.) **8731-10**: 3.7kg (130.5oz.)
Supplied accessories	Instruction Manual × 1, Power cord × 1, jumper bracket ×2, external control terminal strip label ×1, Application Disk (Wave Viewer Wv, Communication Commands table) ×1

Function specifications

Measurement functions	Memory recorder with waveform evaluation function. Reference area waveform evaluation (separate 2-channels evaluation possible with the model **8731-10**)
Time axis range	100μs to 5 min/DIV (100 samples/DIV), 20 range settings, external sampling possible up to 1kHz, time axis resolution: 1/100 of range
Waveform expansion/ compression	**Time axis:** ×10, ×5, ×2, ×1, ×1/2, ×1/5, ×1/10, ×1/20, ×1/50, × 1/100, **Voltage axis:** ×10, ×5, ×2, ×1, ×1/2
Recording length	Settable in 1 DIV steps, 10 to 500 DIV (100 points/DIV)
Waveform parameter calculation	Average value, peak value, maximum value, time to maximum value, minimum value, time to minimum value, rms value, cycle, frequency, rise time, fall time, area value, integer value, pulse width, duty cycle, specified level time, differential, pulse count, maximum & minimum value, (only **8731-10,** X-Y area value)
Waveform processing calculations	Four arithmetic operations, absolute value, half-wave rectification (from version 1.10 or later)
Other functions	Cursor-based measurement (A-B cursor time difference, potential difference, frequency, cursor potential, time from trigger), Scaling, variable, automatic loading of setup parameters from PC Card at power-up, automatic store, overwrite, test mode store (16 setup configurations and 16 evaluation area settings can be stored in internal memory), averaging processing (2, 4, 6, 8, 16 times)

Trigger functions

Trigger sources	CH1 - CH2 (only CH1 for **8730-10**)/external (falling edge trigger)/ timer. ON/OFF switching for each source; all OFF results in free-run trigger; AND/OR between trigger sources
Trigger types (analog)	**Level:** Digital setting of voltage. Triggered when set value is exceeded in UP or DOWN direction. **Window:** When entering or exiting a level range defined by upper or lower limit **Period:** When rising or falling edge of set voltage does not fall within cycle range
Other functions (trigger related)	Trigger filter (OFF/0.1 to 10DIV), trigger level resolution (0.25% f.s., full scale = 10DIV), pretrigger (0 to 100%), trigger output (open collector, active LOW)

External control terminals

Terminal type	M3 screw type (isolated from chassis), **maximum rated voltage to earth:** 30Vrms or 60V DC (between inputs and chassis)
Power supply terminals	Maximum external input voltage V_{EXT} max: 30V DC Minimum external input voltage V_{EXT} min: 5V DC Internal power supply output voltage: 5V ±0.5V, 40mA (total)
Input terminals	External trigger, start, stop, external sampling, test mode select, hold, evaluation stop, multi-function • Signal level HIGH: (V_{EXT} -1.0) to V_{EXT} [V] • Signal level LOW: 0 to 1.0 [V]
Output terminals (evaluation output available in 2 channels separately)	Trigger output, area evaluation 1 (PASS/FAIL), area evaluation 2 (PASS/FAIL), numeric evaluation (PASS/FAIL), evaluation output active, error, processing, measurement in progress, multi-function • Open collector: 0 to +30V, pull-up resistor 10kΩ, max. sink current 140mA • Signal level HIGH: (V_{EXT} -1.0) - V_{EXT} [V] (non-load condition) • Signal level LOW: 0 to 1.0 [V]
Evaluation output (evaluation time/evaluation cycle determined under HIOKI sample test conditions)	**Evaluation mode:** FAIL when waveform leaves area at one point/ FAIL when waveform is fully out of area **Stop conditions:** OK, NG, OK & NG (waveform store at stop possible) **Evaluation time:** 70ms max. (1-channel evaluation), 80ms max. (2-channel evaluation) **Evaluation cycle:** 200ms max. (1-channel evaluation), 250ms max. (2-channel evaluation)

8730-10 WAVE COMPARATOR (1ch)
8731-10 WAVE COMPARATOR (2ch)

- Wiring hardware for signal input M3.5 terminals and control input/output M3 terminals is not supplied.
- Rack mounting capability (JIS/EIA) is available as special order. Please contact your **HIOKI** distributor for details.

Supplied with PC Card adapter

PC Card Precaution

*Use only PC Cards 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.*

- **PC CARD 128M 9726** (128 MB capacity)
- **PC CARD 256M 9727** (256 MB capacity)
- **PC CARD 512M 9728** (512 MB capacity)
- **PC CARD 1G 9729** (1 GB capacity)

Precaution for PC Card Use

*The PC Cards listed at left can only be used in the **WAVE COMPARATOR 8730-10/8731-10** if the firmware is Ver. 1.30 or later.*

LAN CABLE 9642
Supplied with cross conversion cable, straight Ethernet cable, length: 5m (16.4ft)

LAN COMMUNICATOR 9333
Application software to create a LAN connection with Windows 95/98/Me, or Windows NT 4.0/2000/XP.

HIOKI
HIOKI E. E. CORPORATION

DISTRIBUTED BY

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