HIOKI

INSTRUCTION MANUAL

2332-20

POWER METER MODULE

HIOKI E. E. CORPORATION

Contents

Introduction

Thank you for purchasing the HIOKI “Model 2332-20 POWER METER MODULE”. To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

Inspection

When you receive the instrument, inspect it carefully to ensure that no damage occurred during shipping. In particular, check the panel switches, and connectors. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

Accessory

Instruction manual 1

Options

9695-02	CLAMP ON SENSOR (50 Arms)
9695-03	CLAMP ON SENSOR (100 Arms)
9661-01	CLAMP ON SENSOR (500 Arms)
9765*	CLAMP ON SENSOR (5 Arms) (See "When using Model 9765 " (p.9))
9238	CLAMP SENSOR CABLE

* Not complied with the CE marking.

Safety Notes

⚠DANGER This instrument is designed to comply with IEC 61010 Safety Standards, and has been thoroughly tested for safety prior to shipment. However, mishandling during use could result in injury or death, as well as damage to the instrument. Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from instrument defects.

This manual contains information and warnings essential for safe operation of the instrument and for maintaining it in safe operating condition. Before using it, be sure to carefully read the following safety precautions.

Safety Symbols

	In the manual, the ⚠ symbol indicates particularly important information that the user should read before using the instrument.
	The ⚠ symbol printed on the instrument indicates that the user should refer to a corresponding topic in the manual (marked with the ⚠ symbol) before using the relevant function.
	Indicates a grounding terminal.
	Indicates DC (Direct Current).
	Indicates AC (Alternating Current).

The following symbols in this manual indicate the relative importance of cautions and warnings

⚠DANGER	Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
⚠WARNING	Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
⚠CAUTION	Indicates that incorrect operation presents a possibility of injury to the user or damage to the instrument.
NOTE	Indicates advisory items related to performance or correct operation of the instrument.

Other Symbols

	Indicates the prohibited action.
❖	Indicates the location of reference information.

Accuracy

We define measurement tolerances in terms of f.s. (full scale) and rdg. (reading) values, with the following meanings:

- f.s. (maximum display value or scale length)
  The maximum displayable value or scale length. This is usually the name of the currently selected range.
- rdg. (reading or displayed value)
  The value currently being measured and indicated on the measuring instrument.

Measurement categories (Overvoltage categories)

This instrument complies with CAT III safety requirements.
To ensure safe operation of measurement instruments, IEC 61010 establishes safety standards for various electrical environments, categorized as CAT I to CAT IV, and called measurement categories. These are defined as follows.

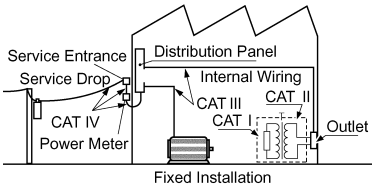
CAT I Secondary electrical circuits connected to an AC electrical outlet through a transformer or similar device.

CAT II Primary electrical circuits in equipment connected to an AC electrical outlet by a power cord (portable tools, household appliances, etc.)

CAT III Primary electrical circuits of heavy equipment (fixed installations) connected directly to the distribution panel, and feeders from the distribution panel to outlets.

CAT IV The circuit from the service drop to the service entrance, and to the power meter and primary overcurrent protection device (distribution panel).

Higher-numbered categories correspond to electrical environments with greater momentary energy. So a measurement device designed for CAT III environments can endure greater momentary energy than a device designed for CAT II.
Using a measurement instrument in an environment designated with a higher-numbered category than that for which the instrument is rated could result in a severe accident, and must be carefully avoided.
Never use a CAT I measuring instrument in CAT II, III, or IV environments.
The measurement categories comply with the Overvoltage Categories of the IEC60664 Standards.



Notes on Use

Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.

⚠ DANGER

- The maximum input voltage is as follows;
  U INPUT : 300 Vrms, 424.3 V peak
  CLAMP SENSOR INPUT : 1.5 Vrms, 2.2 V peak
  Attempting to measure voltage in excess of the maximum input could destroy the instrument and result in personal injury or death.
- The maximum rated voltage between input terminals and ground is 300 Vrms. Attempting to measure voltages exceeding 300 Vrms with respect to ground could damage the instrument and result in personal injury.

⚠ WARNING

- **Do not allow the instrument to get wet, and do not take measurements with wet hands.**
  This may cause an electric shock.
- **Do not use the instrument where it may be exposed to corrosive or combustible gases.**
  The instrument may be damaged.
- **Do not use the instrument near a source of strong electromagnetic radiation, or near a highly electrically charged object.**
  These may cause a malfunction.

⚠CAUTION

- **Operation and Installation environment.**
  This instrument should be installed and operated indoors only, between 0 and 50°C and 80% RH or less.
- **This instrument is not designed to be entirely water- or dust-proof.**
  Do not use it in an especially dusty environment, nor where it might be splashed with liquid. This may cause damage.

  When the module is used in a dusty environment, place it in a dustproof case and take measures to ensure heat dissipation.
- **Do not store or use the instrument where it could be exposed to direct sunlight, high temperature or humidity, or condensation.**
  Under such conditions, the instrument may be damaged and insulation may deteriorate so that it no longer meets specifications.
- **To avoid damage to the instrument, protect it from physical shock when transporting and handling.**
  Be especially careful to avoid physical shock from dropping.
- **Do not obstruct the ventilation holes.**
  Ventilation holes for heat radiation are provided on the top and rear panels of the instrument. Leave sufficient space around the ventilation holes and install the instrument with the holes unobstructed. Installation of the instrument with the ventilation holes obstructed may cause a malfunction or fire.
- **When using the instrument in the case, drill ventilation holes.**
  Drill ventilation holes or install a ventilation fan to prevent heat buildup.

Wiring

⚠WARNING

- A qualified electrician shall perform the wiring to prevent electric shock.
- Connect the module to a power source that matches the rating in order to prevent fire.
- Ensure that the power supply, input, and output are correctly wired according to the wiring diagram. (See the chapter on "Preparations" in the instructions manual for each module.) This will prevent fire, malfunction, and errors.
- Avoid live-line electrical work to prevent electric shock, module malfunction due to short-circuiting or opening of the CT secondary side, overheating, and fire.
- Use cables of the proper sizes for the rated current. This will prevent module errors due to broken wire, malfunction due to opening of the CT secondary side, overheating, and fire.
- Use crimp connectors suitable for the cable sizes. This will prevent module errors due to broken wire, malfunction due to opening of the CT secondary side, overheating, and fire.
- When tightening the screws, confirm that all screws are securely tightened. A loose screw may result in module errors or the generation of high voltage on the CT secondary side, which may cause fire or electric shock.

⚠WARNING

- Be sure to tighten the screws within the specified torque. Excessive torque may damage the terminals. Inadequate torque may result in module errors or the generation of high voltage on the CT secondary side, which may cause fire or electric shock.
- Ensure that the power supply module and input are OFF until all wiring work is finished. This will prevent module trouble and electric shock.
- Ensure that the power supply module and input are OFF when connecting or disconnecting the module to the system. This will prevent electric shock, errors, and malfunction.

⚠CAUTION

- Avoid using an unused terminal for relaying or any other purpose to prevent electric shock, errors, and malfunction.
- Do not connect a current sensor other than the specified clamp sensor directly to this module. Excessive input may result in module malfunction.
- Be careful to avoid dropping the clamps or otherwise subjecting them to mechanical shock, which could damage the mating surfaces of the core and adversely affect measurement.
- Measurements are degraded by dirt on the mating surfaces of the clamp-on sensor, so keep the surfaces clean by gently wiping with a soft cloth.
- If power supply noise poses a problem, use of a noise filter is recommended.
- Avoid stepping on or pinching cables, which could damage the cable insulation.

⚠CAUTION

- Keep the cables well away from heat sources, as bare conductors could be exposed if the insulation melts.
- When the clamp sensor is opened, do not allow the metal part of the clamp to touch any exposed metal, or to short between two lines, and do not use over bare conductors.
- When the power and signal lines may be subject to a lightning-induced surge, install a lightning arrester between another device or module connected to this module and line to protect the system.
- U INPUT terminals (U1 and U2) share the N terminal and inputs to the terminals are not insulated from each other. Beware of electric shock and short-circuiting.
- The CLAMP SENSOR INPUT terminals are not insulated from the U INPUT terminals. Beware of electric shock and short- circuiting.

When using Model 9765

⚠DANGER

- To avoid short circuits and potentially life-threatening hazards, never attach the product to a circuit that operates at more than 30 VAC, or over bare conductors.
- This product should only be connected to the secondary side of a breaker, so the breaker can prevent an accident if a short circuit occurs. Connections should never be made to the primary side of a breaker, because unrestricted current flow could cause a serious accident if a short circuit occurs.

Preliminary Checks

- Before using the instrument the first time, verify that it operates normally to ensure that the no damage occurred during storage or shipping. If you find any damage, contact your dealer or Hioki representative.
- Before using the instrument, make sure that the insulation on the cables is undamaged and that no bare conductors are improperly exposed. Using the product in such conditions could cause an electric shock, so contact your dealer or Hioki representative for repair.

Overview Chapter 1

1.1 Product Overview

The 2332-20 is a measurement module of the Hioki "Smart Site" (remote measurement system). This module measures and records power at regular intervals.
And the voltage, current, active power, reactive power, power factor, active energy within an interval, and frequency are also can be measured.
The 2332-20 is used with the power supply module, communications module, and module base.

Number of measurement circuits	1P2W: 1 to 6 circuits 1P3W, 3P3W: 1 to 3 circuits
Voltage input	200 V range
Current Input	Clamp sensor

(Conceptual image)

NOTE Do not use this module as a wattmeter or watt-hour meter for business transactions.

1.2 Major Features

- This is a clamp-type wattmeter used for a 70 to 260 VAC single-phase line to a 3-phase, 3-wire line.
- One module measures a common voltage on up to six single-phase/2-wire circuits, three single-phase/3-wire circuits, or three 3-phase/3-wire circuits.
- The recording interval is selectable from 1 second to 60 minutes.
- The maximum, minimum, and average measurements during the recording interval can be recorded (with sampling once a second).
- The module is equipped with an alarm assessment function.

Rough Estimate of Storable Data Quantity and Time

The amount of data that can be stored and duration of storage vary depending on the circuits to be measured, selected measurement end condition (memory full stop or endless), and recording mode. Use the table below as a guide.

Wiring	Measurement circuit	Reference page
1P2W	Six circuits	page 14
	Five circuits	page 15
	Four circuits	page 16
	Three circuits	page 17
	Two circuits	page 18
	One circuit	page 19
1P3W/3P3W	Three circuits	page 20
	Two circuits	page 21
	One circuit	page 22

NOTE

- When the alarm log is ON, the frequency of occurrence of alarms increases, and the recording period will be shortened.
- In MAX/MIN/AVE recording mode or instantaneous value + MAX/MIN/AVE recording mode, you can select measurement items. For example, the duration of storage is about 1.5 times longer when you select MAX/MIN in MAX/MIN/AVE mode, and 3 times longer when you only select MAX.
- The duration of storage under "endless" is the minimum duration of storage.

1P2W Measurement of six circuits

	Memory full stop			Endless		
	Instantaneous Value	MAX/ MIN/AVE	Instantaneous value + MAX/ MIN/AVE	Instantaneous Value	MAX/ MIN/AVE	Instantaneous value + MAX/ MIN/AVE
Quantity of storable data	3510	1410	1080	3042	1222	936
Recording interval						
1sec.	50min.	20min.	15min.	50min.	20min.	15min.
2sec.	1.5hours	40min.	30min.	1.5hours	40min.	30min.
5sec.	4.5hours	1.5hours	1.5hours	4hours	1.5hours	1hour
10sec.	9.5hours	3.5hours	3hours	8hours	3hours	2.5hours
15sec.	14.5hours	5.5hours	4.5hours	12.5hours	5hours	3.5hours
20sec.	19.5hours	7.5hours	6hours	16.5hours	6.5hours	5hours
30sec.	1day	11.5hours	9hours	1day	10hours	7.5hours
1min.	2days	23.5hours	18hours	2days	20hours	15.5hours
2min.	4.5days	1.5days	1.5days	4days	1.5days	1day
5min.	12days	4.5days	3.5days	10.5days	4days	3days
10min.	24days	9.5days	7.5days	21days	8days	6.5days
15min.	37days	14.5days	11days	32days	12.5days	9.5days
20min.	49days	19.5days	15days	42days	16.5days	13days
30min.	73days	29days	22.5days	63days	25days	19.5days
60min.	146days	59days	45days	127days	51days	39days

1P2W Measurement of five circuits

	Memory full stop			Endless		
	Instanta-neous Value	MAX/ MIN/AVE	Instanta-neous value + MAX/ MIN/AVE	Instanta-neous Value	MAX/ MIN/AVE	Instanta-neous value + MAX/ MIN/AVE
Quantity of storable data	4095	1657	1275	3549	1436	1105
Recording interval						
1sec.	1hour	20min.	20min.	50min.	20min.	15min.
2sec.	2hours	50min.	40min.	1.5hours	40min.	30min.
5sec.	5.5hours	2hours	1.5hours	4.5hours	1.5hours	1.5hours
10sec.	11hours	4.5hours	3.5hours	9.5hours	3.5hours	3hours
15sec.	17hours	6.5hours	5hours	14.5hours	5.5hours	4.5hours
20sec.	22.5hours	9hours	7hours	19.5hours	7.5hours	6hours
30sec.	1day	13.5hours	10.5hours	1day	11.5hours	9hours
1min.	2.5days	1day	21hours	2days	23.5hours	18hours
2min.	5.5days	2days	1.5days	4.5days	1.5days	1.5days
5min.	14days	5.5days	4days	12days	4.5days	3.5days
10min.	28days	11.5days	8.5days	24.5days	9.5days	7.5days
15min.	43days	17days	13days	37days	14.5days	11.5days
20min.	57days	23days	17.5days	49days	19.5days	15days
30min.	85days	35days	26.5days	74days	29.5days	23days
60min.	171days	69days	53days	148days	60days	46days

1P2W Measurement of four circuits

	Memory full stop			Endless		
	Instanta-neous Value	MAX/ MIN/AVE	Instanta-neous value + MAX/ MIN/AVE	Instanta-neous Value	MAX/ MIN/AVE	Instanta-neous value + MAX/ MIN/AVE
Quantity of storable data	4912	2010	1552	4257	1742	1345
Recording interval						
1sec.	1hour	30min.	20min.	1hour	20min.	20min.
2sec.	2.5hours	1hour	50min.	2hours	50min.	40min.
5sec.	6.5hours	2.5hours	2hours	5.5hours	2hours	1.5hours
10sec.	13.5hours	5.5hours	4hours	11.5hours	4.5hours	3.5hours
15sec.	20hours	8hours	6hours	17.5hours	7hours	5.5hours
20sec.	1day	11hours	8.5hours	23.5hours	9.5hours	7hours
30sec.	1.5days	16.5hours	12.5hours	1day	14.5hours	11hours
1min.	3days	1day	1day	2.5days	1day	22hours
2min.	6.5days	2.5days	2days	5.5days	2days	1.5days
5min.	17days	6.5days	5days	14.5days	6days	4.5days
10min.	34days	13.5days	10.5days	29.5days	12days	9days
15min.	51days	20.5days	16days	44days	18days	14days
20min.	68days	27.5days	21.5days	59days	24days	18days
30min.	102days	42days	32days	89days	36days	28days
60min.	205days	84days	65days	177days	73days	56days

1P2W Measurement of three circuits

	Memory full stop			Endless		
	Instantaneous Value	MAX/ MIN/AVE	Instantaneous value + MAX/ MIN/AVE	Instantaneous Value	MAX/ MIN/AVE	Instantaneous value + MAX/ MIN/AVE
Quantity of storable data	6142	2557	1980	5323	2216	1716
Recording interval						
1sec.	1.5hours	40min.	30min.	1hour	30min.	20min.
2sec.	3hours	1hour	1hour	2.5hours	1hour	50min.
5sec.	8.5hours	3.5hours	2.5hours	7hours	3hours	2hours
10sec.	17hours	7hours	5.5hours	14.5hours	6hours	4.5hours
15sec.	1day	10.5hours	8hours	22hours	9hours	7hours
20sec.	1day	14hours	11hours	1day	12hours	9.5hours
30sec.	2days	21hours	16.5hours	1.5days	18hours	14hours
1min.	4days	1.5days	1day	3.5days	1.5days	1day
2min.	8.5days	3.5days	2.5days	7days	3days	2days
5min.	21days	8.5days	6.5days	18days	7.5days	5.5days
10min.	43days	17.5days	13.5days	37days	15days	11.5days
15min.	64days	26.5days	20.5days	55days	23days	17.5days
20min.	85days	36days	27.5days	74days	30.5days	23.5days
30min.	128days	53days	41days	111days	46days	36days
60min.	256days	107days	83days	222days	92days	72days

1P2W Measurement of two circuits

	Memory full stop			Endless		
	Instanta-neous Value	MAX/ MIN/AVE	Instanta-neous value + MAX/ MIN/AVE	Instanta-neous Value	MAX/ MIN/AVE	Instanta-neous value + MAX/ MIN/AVE
Quantity of storable data	8190	3510	2730	7098	3042	2366
Recording interval						
1sec.	2hours	50min.	40min.	1.5hours	50min.	30min.
2sec.	4.5hours	1.5hours	1.5hours	3.5hours	1.5hours	1hour
5sec.	11hours	4.5hours	3.5hours	9.5hours	4hours	3hours
10sec.	22.5hours	9.5hours	7.5hours	19.5hours	8hours	6.5hours
15sec.	1day	14.5hours	11hours	1day	12.5hours	9.5hours
20sec.	1.5days	19.5hours	15hours	1.5days	16.5hours	13hours
30sec.	2.5days	1day	22.5hours	2days	1day	19.5hours
1min.	5.5days	2days	1.5days	4.5days	2days	1.5days
2min.	11days	4.5days	3.5days	9.5days	4days	3days
5min.	28days	12days	9days	24.5days	10.5days	8days
10min.	57days	24days	18.5days	49days	21days	16days
15min.	85days	37days	28days	74days	32days	24.5days
20min.	114days	49days	38days	99days	42days	33days
30min.	171days	73days	57days	148days	63days	49days
60min.	341days	146days	114days	296days	127days	99days

1P2W Measurement of a circuit

	Memory full stop			Endless		
	Instanta-neous Value	MAX/ MIN/AVE	Instanta-neous value + MAX/ MIN/AVE	Instanta-neous Value	MAX/ MIN/AVE	Instanta-neous value + MAX/ MIN/AVE
Quantity of storable data	12285	5580	4387	10647	4836	3802
Recording interval						
1sec.	3hours	1.5hours	1hour	2.5hours	1hour	1hour
2sec.	6.5hours	3hours	2hours	5.5hours	2.5hours	2hours
5sec.	17hours	7.5hours	6hours	14.5hours	6.5hours	5hours
10sec.	1day	15.5hours	12hours	1day	13hours	10.5hours
15sec.	2days	23hours	18hours	1.5days	20hours	15.5hours
20sec.	2.5days	1day	1day	2days	1day	21hours
30sec.	4days	1.5days	1.5days	3.5days	1.5days	1day
1min.	8.5days	3.5days	3days	7days	3days	2.5hours
2min.	17days	7.5days	6days	14.5days	6.5days	5days
5min.	43days	19days	15days	37days	16.5days	13days
10min.	85days	39days	30days	74days	34days	26days
15min.	128days	58days	46days	111days	50days	40days
20min.	171days	78days	61days	148days	67days	53days
30min.	256days	116days	91days	222days	101days	79days
60min.	512days	233days	183days	444days	202days	158days

1P3W/ 3P3W Measurement of three circuits

	Memory full stop			Endless		
	Instantaneous Value	MAX/ MIN/AVE	Instantaneous value + MAX/ MIN/AVE	Instantaneous Value	MAX/ MIN/AVE	Instantaneous value + MAX/ MIN/AVE
Quantity of storable data	5115	2047	1575	4433	1774	1365
Recording interval						
1sec.	1hour	30min.	20min.	1hour	20min.	20min.
2sec.	2.5hours	1hour	50min.	2hours	50min.	40min.
5sec.	7hours	2.5hours	2hours	6hours	2hours	1.5hours
10sec.	14hours	5.5hours	4hours	12hours	4.5hours	3.5hours
15sec.	21hours	8.5hours	6.5hours	18hours	7hours	5.5hours
20sec.	1day	11hours	8.5hours	1day	9.5hours	7.5hours
30sec.	1.5days	17hours	13hours	1.5days	14.5hours	11hours
1min.	3.5days	1day	1day	3days	1day	22.5hours
2min.	7days	2.5days	2days	6days	2days	1.5days
5min.	17.5days	7days	5days	15days	6days	4.5days
10min.	36days	14days	10.5days	30.5days	12days	9days
15min.	53days	21days	16days	46days	18days	14days
20min.	71days	28days	21.5days	62days	24.5days	18.5days
30min.	107days	43days	33days	92days	37days	28days
60min.	213days	85days	66days	185days	74days	57days

1P3W/ 3P3W Measurement of two circuits

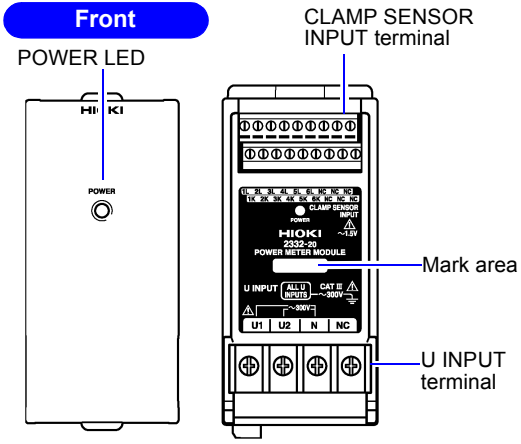
	Memory full stop			Endless		
	Instanta-neous Value	MAX/ MIN/AVE	Instanta-neous value + MAX/ MIN/AVE	Instanta-neous Value	MAX/ MIN/AVE	Instanta-neous value + MAX/ MIN/AVE
Quantity of storable data	6825	2790	2152	5915	2418	1865
Recording interval						
1sec.	1.5hours	40min.	30min.	1.5hours	40min.	30min.
2sec.	3.5hours	1.5hours	1hour	3hours	1hour	1hour
5sec.	9hours	3.5hours	2.5hours	8hours	3hours	2.5hours
10sec.	18.5hours	7.5hours	5.5hours	16hours	6.5hours	5hours
15sec.	1day	11.5hours	8.5hours	1day	10hours	7.5hours
20sec.	1.5days	15.5hours	11.5hours	1day	13hours	10hours
30sec.	2days	23hours	17.5hours	2days	20hours	15.5hours
1min.	4.5days	1.5days	1day	4days	1.5days	1day
2min.	9days	3.5days	2.5days	8days	3days	2.5days
5min.	23.5days	9.5days	7days	20.5days	8days	6days
10min.	47days	19days	14.5days	41days	16.5days	12.5days
15min.	71days	29days	22days	62days	25days	19days
20min.	95days	39days	29.5days	82days	34days	25.5days
30min.	142days	58days	45days	123days	50days	39days
60min.	284days	116days	90days	246days	101days	78days

1P3W/ 3P3W Measurement of a circuit

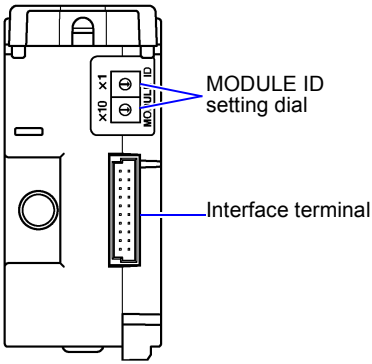
	Memory full stop			Endless		
	Instantaneous Value	MAX/ MIN/AVE	Instantaneous value + MAX/ MIN/AVE	Instantaneous Value	MAX/ MIN/AVE	Instantaneous value + MAX/ MIN/AVE
Quantity of storable data	10237	4387	3412	8872	3802	2957
Recording interval						
1sec.	2.5hours	1hour	50min.	2hours	1hour	40min.
2sec.	5.5hours	2hours	1.5hours	4.5hours	2hours	1.5hours
5sec.	14hours	6hours	4.5hours	12hours	5hours	4hours
10sec.	1day	12hours	9hours	1day	10.5hours	8hours
15sec.	1.5days	18hours	14hours	1.5days	15.5hours	12hours
20sec.	2days	1day	18.5hours	2days	21hours	16hours
30sec.	3.5days	1.5days	1day	3days	1day	1day
1min.	7days	3days	2days	6days	2.5days	2days
2min.	14days	6days	4.5days	12days	5days	4days
5min.	36days	15days	11.5days	30.5days	13days	10days
10min.	71days	30days	23.5days	62days	26days	20.5days
15min.	107days	46days	36days	92days	40days	30.5days
20min.	142days	61days	47days	123days	53days	41days
30min.	213days	91days	71days	185days	79days	62days
60min.	427days	183days	142days	370days	158days	123days

1.3 Name and Function of the Parts

Front



Back



POWER LED

Goes on or flashes when power is supplied to the module.
Remains on, flashes, or changes to another color according to the state of the module.

Monitoring and warning display

Lit in green : Data being recorded.
Flashing in green : Standing by.
Lit in yellow : Alarm output.
Flashing in yellow : one of the following[*1]

- The voltage is outside the effective input range.
- The current is out of range.
- The active power is a negative value.

Lit in red : Non-recoverable error occurred. [*2]
Flashing in red : Recoverable error occurred. [*3]

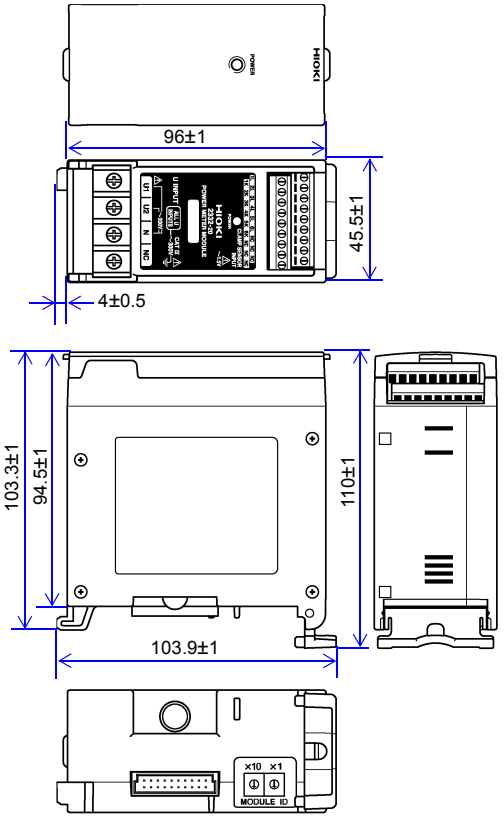
*1: You can select a POWER LED monitoring mode on the PC applications software. Use the current monitoring mode to only measure electric current (without voltage input). Otherwise, use voltage/current/power monitoring mode.

- Voltage/Current/Power Monitoring Mode
  The LED will start flashing in yellow when any of the following events occurs:
  Flashing in yellow indicates one of the following:
  The voltage is outside the effective input range.
  The current is out of range.
  The active power is a negative value.
- Current Monitoring Mode
  The LED will start flashing in yellow in case of the following event:
  The current is out of range.

*2: The module needs repair. Contact your dealer or Hioki representative.
*3: The same module ID may be used by another module.

Mark area	Use this area to make a note of the object to measure or the module ID. Use an ink pen, since pencil lead may rub off.
CLAMP SENSOR INPUT terminal	Connect the output of clamp sensors to these terminals (for 6 channels).
U INPUT terminal	Connect voltages to be measured to these terminals.
MODULE ID setting dial	Use the dial to set the module's identification No.

1.4 Dimension Diagrams



(unit: mm)

Settings Chapter 2

2.1 Setting the Module ID

You can connect up to 63 measurement modules to one communications module.

Setting Procedure

Use the module ID setting dial to set the ID No. of the module to a number from 01 and to 63. (You cannot set a number other than the above.)

NOTE

- Ensure that the set ID is not used for any other module connected to the same communications module.
- The ID numbers of modules need not be consecutive.
- Setting the ID to 99, then turning on the power resets all internal settings to the defaults.
- The module ID and COM ID (communications module ID) are not related and can be set independently.

Preparations Chapter 3

3.1 Installing the Module

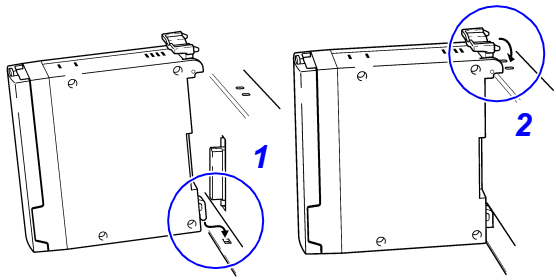
3.1.1 Installing the Module Base

⚠CAUTION Do not mount the module base on the ceiling where it may fall off.

Fasten the module base to a DIN rail or the wall according to the procedure described in the 2391 or 2392 series MODULE BASE instruction manual.

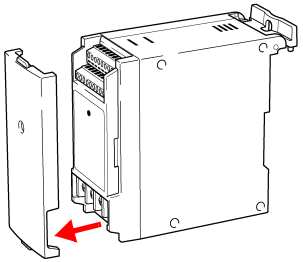
3.1.2 Mounting a Module on the Module Base

Mount a module on the module base as shown below. Ensure that the lever clicks.



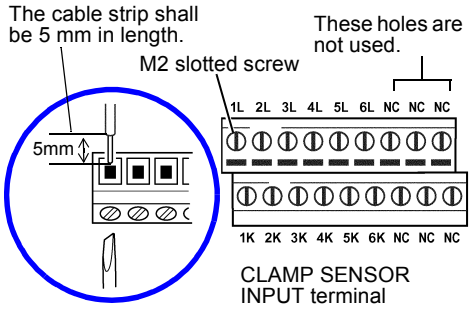
3.2 Connecting the Clamp Sensor to Module

1. Remove the cover from the module.



2. Use a flathead screwdriver to loosen the screw on the CLAMP SENSOR INPUT terminal.

3. Insert the cable of the clamp sensor into the square hole on the CLAMP SENSOR INPUT terminal, then tighten the screw (to a tightening torque of 0.25 N•m).



❖ Wiring: page 36

Clamp Sensors

- 9695-02 (50 A)
- 9695-03 (100 A)
- 9661-01 (500 A)
- 9765 (5 A, For CT secondary side)

Cables

The 9695-02/03 Clamp-on Sensors have a terminal-block structure.
You can use various types of cables.

Cables (Recommended)

- 600 V vinyl-insulated 0.9 mm^2 cable or equivalent
- 300 V vinyl-insulated 0.75 mm^2 cable or equivalent

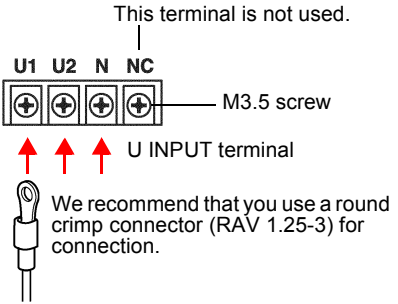
The cable strip shall be 5 mm in length.

The 9238 CLAMP SENSOR CABLE (3 m) is optionially available.

NOTE Note that measurement may be adversely affected by external noise or the electromagnetic environment when using cable longer than 3 meters.

3.3 Connecting the Voltage Cable to the Module

Connect voltage cables to the U INPUT terminals (at a tightening torque of 0.8 N•m).



❖ Wiring: page 36

Cables (Recommended)

600 V vinyl-insulated 0.9 mm^2 cable or equivalent

3.4 Connecting to the Measured Line

⚠DANGER

- In order to prevent electric shock and short-circuit accidents, shut off the power to the line to be measured before connecting the clamp sensors and voltage cords.
- U INPUT terminals (U1 and U2) share the N terminal; inputs to these terminals are not insulated from each other. Be careful to avoid electric shock and short-circuiting.
- The CLAMP SENSOR INPUT terminals are not insulated from the U INPUT terminals. Be careful to avoid electric shock and short-circuiting when using the U INPUT terminals.
- To avoid short circuits and potentially life-threatening hazards, never attach the clamp sensor to a circuit that operates at more than the maximum rated voltage, or over bare conductors.
- Clamp sensor should only be connected to the secondary side of a breaker, so the breaker can prevent an accident if a short circuit occurs. Connections should never be made to the primary side of a breaker, because unrestricted current flow could cause a serious accident if a short circuit occurs.

⚠DANGER

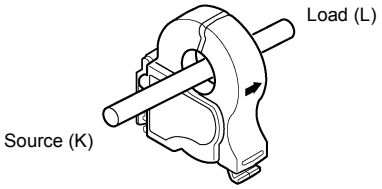
- If the secondary circuit is opened while electricity is being sent through the CT, very high and dangerous voltage may be generated at the secondary side terminal.
- Be sure to cover the measured line when live to avoid electric shock and short-circuiting.

⚠CAUTION

- Avoid stepping on or pinching cables, which could damage the cable insulation.
- Do not input voltage or current to the U INPUT terminals and CLAMP SENSOR INPUT terminals when module power is OFF. This will avoid damaging the module.

Connect the sensors and cables to the measured line according to the connection diagram.

1. Connect the clamp sensors to the line.
2. Connect the voltage cables to the line.



❖ See the connection diagram (page 36) and refer to the instruction manual for the clamp sensor being used.

NOTE

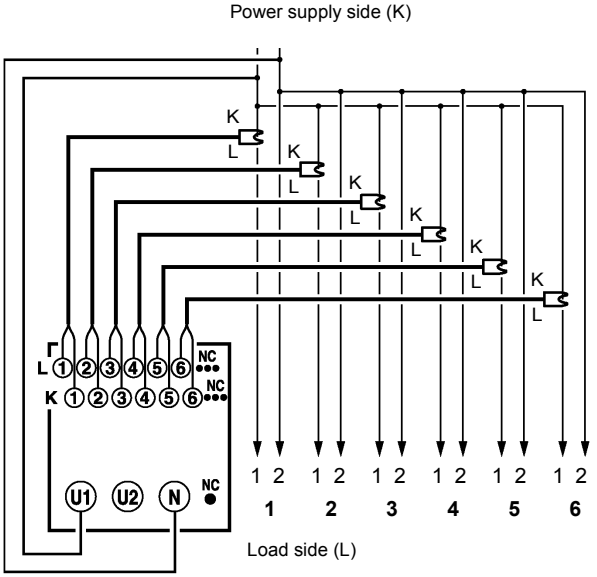
- Ensure that the measured line is correctly set and connection correctly made to ensure accurate measurement.
- Clamp the cladding of the wire by placing the clamp with the arrow on it facing the load side.
- One module measures a common voltage from single-phase/2-wire lines to 3-phase/3-wire lines (up to six single-phase/2-wire circuits, three single-phase/3-wire circuits, or three 3-phase/3-wire circuits).
- When measuring a 3-phase line, be sure to align the phase sequence of the measured line with the order of measurement channels of the module.

Completing Measurement

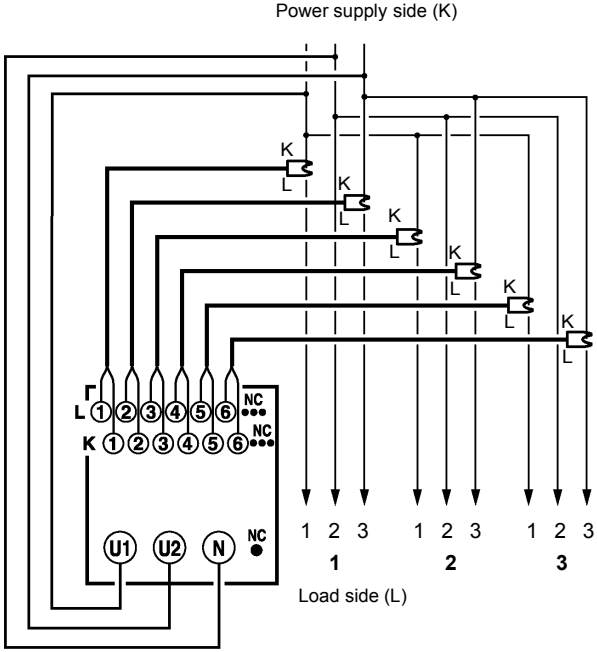
1. Remove the voltage cables.
2. Remove the clamp sensors.

Connection diagram

Single-phase, 2-wire line (1P2W)

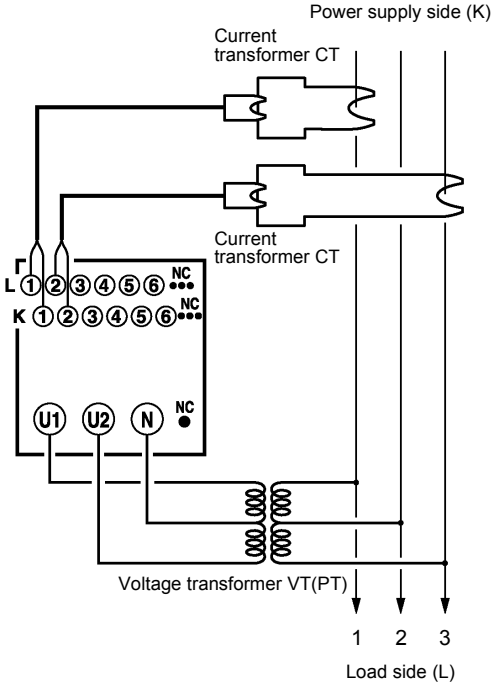


Singe-phase, 3-wire line (1P3W)
3-phase, 3-wire line (3P3W)



Singe-phase, 3-wire line (1P3W)
3-phase, 3-wire line (3P3W)

Using CT and VT (PT) for Single Circuit Measurement



Others Chapter 4

4.1 Alarm Assessment

You can select a measurement item and set the threshold for Hi/Lo assessment.

Measurement item

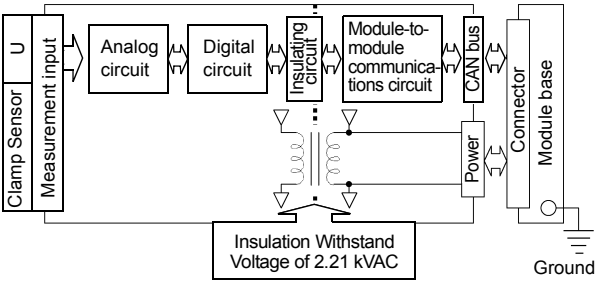
- Voltage
- Current
- Active power
- Reactive power
- Power factor
- Active energy within an interval
- Frequency

If measurement exceeds the threshold, the POWER LED will light in yellow.
External I/O control is available when using the 2341-20 INPUT MODULE and 2342-20 OUTPUT MODULE.

4.2 Insulation of Internal Circuit

⚠CAUTION Insulation is not provided between the measurement input terminals or between the CLAMP SENSOR INPUT terminals and U INPUT terminals. Beware of electric shock and short- circuiting. Moreover, be sure to cover the measured line when live.

In the 2332-20, the input circuit and alarm output are insulated from the CAN bus as shown in the block diagram below. (Withstand voltage: 2.21 kVAC, 50/60 Hz, Response current: 5 mA, 1 minute)



Specifications Chapter 5

5.1 Basic Specifications

Condition of guaranteed accuracy

Condition of guaranteed accuracy	10-minute warming-up time, Sine wave input, Power factor =1, Maximum rated voltage to earth=0 V
Temperature and humidity for guaranteed accuracy	23±5°C(73±9°F), 80%RH or less The ranges above apply unless otherwise specified in each specification.
Guaranteed accuracy period	1 year
Effective measurement range	Voltage: 35%f.s. to 130%f.s. Current: 2%f.s. to 130%f.s. Effective power: 2%f.s. to 130%f.s.
Fundamental frequency range	45 to 66Hz

Measurement items and accuracy specifications

Measurement lines	• Single-phase 2-wire line (1 to 6 circuits) • Single-phase 3-wire line (1 to 3 circuits) • Three-phase 3-wire line (1 to 3 circuits) Measurement circuits are at a common voltage.
Measurement items	Voltage, current, active power, reactive power, power factor, active energy within an interval, and frequency

Measurement item	Single-phase 3-wire line (1 to 6 circuits)	Single-phase 3-wire line, three-phase 3-wire line (1 to 3 circuits)
Voltage	U1	U1, U2
Current	I1, I2, I3, I4, I5, I6	I1, I2, I3, I4, I5, I6
Active power	P1, P2, P3, P4, P5, P6	P1, P2, P3
Reactive power	Q1, Q2, Q3, Q4, Q5, Q6	Q1, Q2, Q3
Power factor	PF1, PF2, PF3, PF4, PF5, PF6	PF1, PF2, PF3
Active energy within an interval	WP+1, WP+2, WP+3, WP+4, WP+5, WP+6	WP+1, WP+2, WP+3
Frequency	FREQ	FREQ

Voltage / Current measurement

Measurement range	• Voltage (U1, U2): 200 V • Current:(I1,I2,I3, I4, I5, I6) 1A,5A,50A,100A,200A,500A,1000A (Depends on the clamp sensor used.) Current range is set for every two channels. (I1, I2)/ (I3, I4)/ (I5, I6) • The VT (PT) ratio cannot be set separately for U1 and U2. • The CT ratio is set for every two channels. (I1, I2)/ (I3, I4)/ (I5, I6)
Measurement accuracy	Voltage: ±1.0%f.s. Current: ±1.0%f.s. + Clamp sensor accuracy

Current range

Clamp Sensor and Its Current Range	2332-20Current Range (Selectable using the PC application)
1 A (100 mV/A)	1 A
9765 5 A (20 mV/A)	5 A
9695-02 50 A (10 mV/A)	5 A
	50 A
9695-03 100 A (1 mV/A)	100 A
9661-01 500 A (1 mV/A)	100 A
	500 A
1000 A (0.5 mV/A)	200 A
	1000 A

Power range

unit: [W]

Current / Volrage/ Wiring		1.000A	5.000A	50.00A	100.0A	200.0A	500.0A	1.000kA
200.0 V	1P2W	200.0	1.000 k	10.00 k	20.00 k	40.00 k	100.0 k	200.0 k
	1P3W 3P3W	400.0	2.000 k	20.00 k	40.00 k	80.00 k	200.0 k	400.0 k

- The range table lists the full scales of voltage and current measurement ranges.
- When the VT (PT) ratio and CT ratio are set, the ranges will be multiplied by (VT (PT) ratio × CT ratio).
- The number of digits of a measurement to display depends on the PC application used.

Active Power Measurement

Measurement range	Effective Power P Voltage range × Current range (see power range table, page 43)
Measurement accuracy	±1.5%f.s.+Clamp sensor accuracy
Polarity	Consumption: No sign Regeneration: "-"

Reactive Power Measurement

Measurement range	Effective Power Q Voltage range × Current range (see power range table, page 43)
Measurement accuracy	±5%f.s.+Clamp sensor accuracy
Polarity	No sign

Active Energy Measurement

Measurement range	Active energy within interval WP + consumed component only
Totalization accuracy	±1.6% f.s. ± clamp sensor accuracy (Note that f.s. is voltage range × current range.)

Power Factor

Measurement range	Power factor PF 0 to 1 (f.s. = 1)
Measurement accuracy	±5%rdg. (At full-scale input of voltage/current with power factor of 1 to 0.5)

Frequency measurement

Measurement range	Frequency FREQ 40 to 70 Hz
Measurement accuracy	±0.5%rdg. (When input is 35% to 130% f.s. of voltage range)
Object to be measured	Voltage U1

Operation Method for Totalization

Start of totalization	The PC application starts measurement.
End of totaliztion	The PC application ends measurement (depending on recording end conditions). For details, refer to specifications of the PC application.

Other Characteristics

Temperature	Within ±0.05 f.s./°C
Effect of maximum rated voltage to earth	Within±0.5%f.s. (Maximum rated voltage to earth 50Hz/60Hz)
Actual time accuracy	±100 ppm (Reference value at temperature from 0 to 50°C without using communications module)
Effect of electromagnetic field	Within ±2.5% f.s. (in field of AC400 Arms/m and 50/60Hz)
Zero suppression	Voltage : Less than 0.5% f.s. of measurement Current : Less than 0.5% f.s. of measurement (less than 0.9% f.s. when using the 9695-02 with 5A range selected) Active power: When voltage or current is 0

5.2 Function Specifications

Recording start/end	Recording is started and ended by PC application. (Immediate start, timed start, or timed end)
Recording method	Interval recording (Total number of pulse are recorded at a set recording interval.)
Recorded data	One data set contains time, voltage, current, effective power, reactive power, power factor, active energy within an interval, frequency

Measurement item	Single-phase 3-wire line (1 to 6 circuits)	Single-phase 3-wire line, three-phase 3-wire line (1 to 3 circuits)
Voltage	U1	U1, U2
Current	I1, I2, I3, I4, I5, I6	I1, I2, I3, I4, I5, I6
Active power	P1, P2, P3, P4, P5, P6	P1, P2, P3
Reactive power	Q1, Q2, Q3, Q4, Q5, Q6	Q1, Q2, Q3
Power factor	PF1, PF2, PF3, PF4, PF5, PF6	PF1, PF2, PF3
Active energy within an interval	WP+1, WP+2, WP+3, WP+4, WP+5, WP+6	WP+1, WP+2, WP+3
Frequency	FREQ	FREQ

Recording mode	• Instantaneous value • MAX/MIN/AVE • Instantaneous value + MAX/MIN/AVE Total 3 modes Set the mode before the start of recording. The types of values for recorded measurement items vary depending on the recording mode. • Instantaneous value mode: instantaneous value • MAX/MIN/AVE recording mode: maximum value, minimum value, and average value • Instantaneous value + MAX/MIN/AVE recording mode: instantaneous value, maximum value, minimum value, and average value
Recording end condition	Memory full stop or indefinite Set the mode before the start of recording.
Data acquisition method	All logging data, data before, at, and after the specified time, or the current instantaneous value (monitored value)
Recording interval	1/2/5/10/15/20/30 sec. 1/2/5/10/15/20/30/60 min.
Alarm	No output LED Warning indication only
Data deletion	All items of data are deleted by PC application. New data will be added to the previous data at the start of recording.
Power outage protection	After recovering from a power outage, the 2332-20 automatically returns to the state held before the outage.

5.3 General Specifications

Input method	• U INPUT: Insulated input (Not insulated from current measurement circuit) • CLAMP SENSOR INPUT: Input insulated by a clamp sensor
Input resistance (50/60 Hz)	• U INPUT: 3.62 MΩ ± 10% (Difference input) • CLAMP SENSOR INPUT: 200 kΩ ± 10%
Measurement method	Digital sampling
Internal memory	512 KB Flash memory
Backup	Recorded data (saved in flash memory) Data loss for up to 2 minutes before and after a power outage may occur.
Clock function	The real time clock (year, month, day, hour, minute, and second) of the communications module is used.
Communication interface	CAN bus
Maximum input voltage	• U INPUT: 300 Vrms, 424.3 V peak • CLAMP SENSOR INPUT: 1.5 Vrms, 2.2 V peak value
Maximum rated voltage to earth	Voltage input (U INPUT) terminal 300 Vrms, 50/60 Hz
Rated supply voltage	+5V±0.3VDC
Maximum rated power	2.5 W

LED display	Used for monitoring and warning Lit in green: Data being recorded. Flashing in green: Standing by. Lit in yellow: Alarm output. Flashing in yellow: one of the following[*1] • The voltage is outside the effective measurement range. • The current is out of range. • The active power is a negative value. Lit in red: Non-recoverable error occurred. [*2] Flashing in red: Recoverable error occurred.[*3] *1: You can select a POWER LED monitoring mode on the PC applications software. Use the current monitoring mode to only measure electric current (without voltage input). Otherwise, use voltage/current/power monitoring mode. • Voltage/Current/Power Monitoring Mode The LED will start flashing in yellow when any of the following events occurs: Flashing in yellow indicates one of the following: The voltage is outside the effective input range. The current is out of range. The active power is a negative value. • Current Monitoring Mode The LED will start flashing in yellow in case of the following event: The current is out of range. *2: The module needs repair. Contact your dealer or Hioki representative. *3: The same module ID may be used by another module.

Dielectric strength	• 3.536 kVAC Between U INPUT terminal and Case (excluding terminal section) • 2.210 kVAC Between U INPUT terminal and interface terminal CLAMP SENSOR INPUT terminal and Interface terminal (50/60 Hz, response current 5 mA, one minutes
Dimensions	Approx. 45.5W × 96H × 94.5D mm (1.79"W × 3.78"H × 3.72"D) (including cover, sans protrusions)
Mass	Approx. 250 g (8.8 oz.) (including cover)
Accessories	Instruction manual
Option	• 9695-02 CLAMP ON SENSOR (50 Arms) • 9695-03 CLAMP ON SENSOR (100 Arms) • 9661-01 CLAMP ON SENSOR (500 Arms) • 9765* CLAMP ON SENSOR (5 Arms) (See "When using Model 9765 " (p.9)) * Not complied with the CE marking. All sensors are the voltage-output type. • 9238 CLAMP SENSOR CABLE
Operating temperature and humidity	0 to 50°C (32 to 122°F), 80%RH or less (with no condensation)
Storage temperature and humidity	-10 to 50°C (14 to 122°F), 80%RH or less (with no condensation)
Operating environment	Indoors, altitude up to 2000 m (6562-ft.)
Applicable standards	Safety EN61010-1:2001 Pollution degree 2 Measurement Category III, (anticipated transient overvoltage 4000 V) EMC EN61326:1997+A1:1998+A2:2001 Class A

Maintenance and Service Chapter 6

6.1 Cleaning

To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.

6.2 Servicing

⚠CAUTION Never modify the instrument. Only Hioki service engineers should disassemble or repair the instrument. Failure to observe these precautions may result in fire, electric shock, or injury.

- If the instrument seems to be malfunctioning, confirm that the cables are not open circuited before contacting your dealer or Hioki representative.
- When sending the instrument for repair, remove the batteries and pack carefully to prevent damage in transit. Include cushioning material so the instrument cannot move within the package. Be sure to include details of the problem. Hioki cannot be responsible for damage that occurs during shipment.
- When transporting the 2332-20 Module or a system containing this module, tape the front of the module or take similar measures to avoid losing internal components.

HIOKI

DECLARATION OF CONFORMITY

Manufacturer's Name: HIOKI E.E. CORPORATION

Manufacturer's Address: 81 Koizumi, Ueda, Nagano 386-1192, Japan

Product Name: POWER METER MODULE

Model Number: 2332-20

Options: 9695-02 CLAMP ON SENSOR
9695-03 CLAMP ON SENSOR
9238 CLAMP SENSOR CABLE
9661-01 CLAMP ON SENSOR
9019-02 VOLTAGE CORD
9019-03 VOLTAGE CORD

The above mentioned products conform to the following product specifications:

Safety: EN61010-1:2001

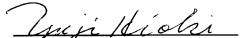
EMC: EN61326:1997+A1:1998+A2:2001
Class A equipment
Equipment intended for use in industrial location

Supplementary Information:

The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

HIOKI E.E. CORPORATION

16 July 2004



Yuji Hioki

President

2332A999-00

HIOKI 2332-20 POWER METER MODULE
Instruction Manual

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