

Operation Manual

PORTABLE SPEEDY TYPE
EUTROPHICATION METER
HC-1000



CENTRAL KAGAKU CO., LTD.

1. Introduction

This manual is written for users of the Eutrophication Meter Model HC-1000.

This simplified instrument measures the nitrogen and phosphorus contents of water. Both substances are principal contributory factors for the eutrophication of water areas.

With this instrument, each one of the nitrous acid nitrogen ($\text{NO}_2\text{-N}$), nitric acid nitrogen ($\text{NO}_3\text{-N}$) and ammonia nitrogen ($\text{NH}_4\text{-N}$) is measurable as the nitrogen content of water, and inorganic phosphate ($\text{PO}_4\text{-P}$) is measured directly as the phosphorous content of water.

The meter requires only the "addition of exclusive reagents" for measurements and can be operated even by the untrained. Our successful development of unique reagents has virtually eliminated the conventional troublesome steps for reagent preparation. Its digital display indicates measured values in mg/l units and allows no reading errors. Moreover, the meter can be operated on either DC or AC power, making it best suited for field measurements as well as for laboratory use.

Although this HC-1000 Eutrophication Meter is extremely stable, read this manual thoroughly to ensure accurate trouble-free measurements for a long period of time.

2. Specifications

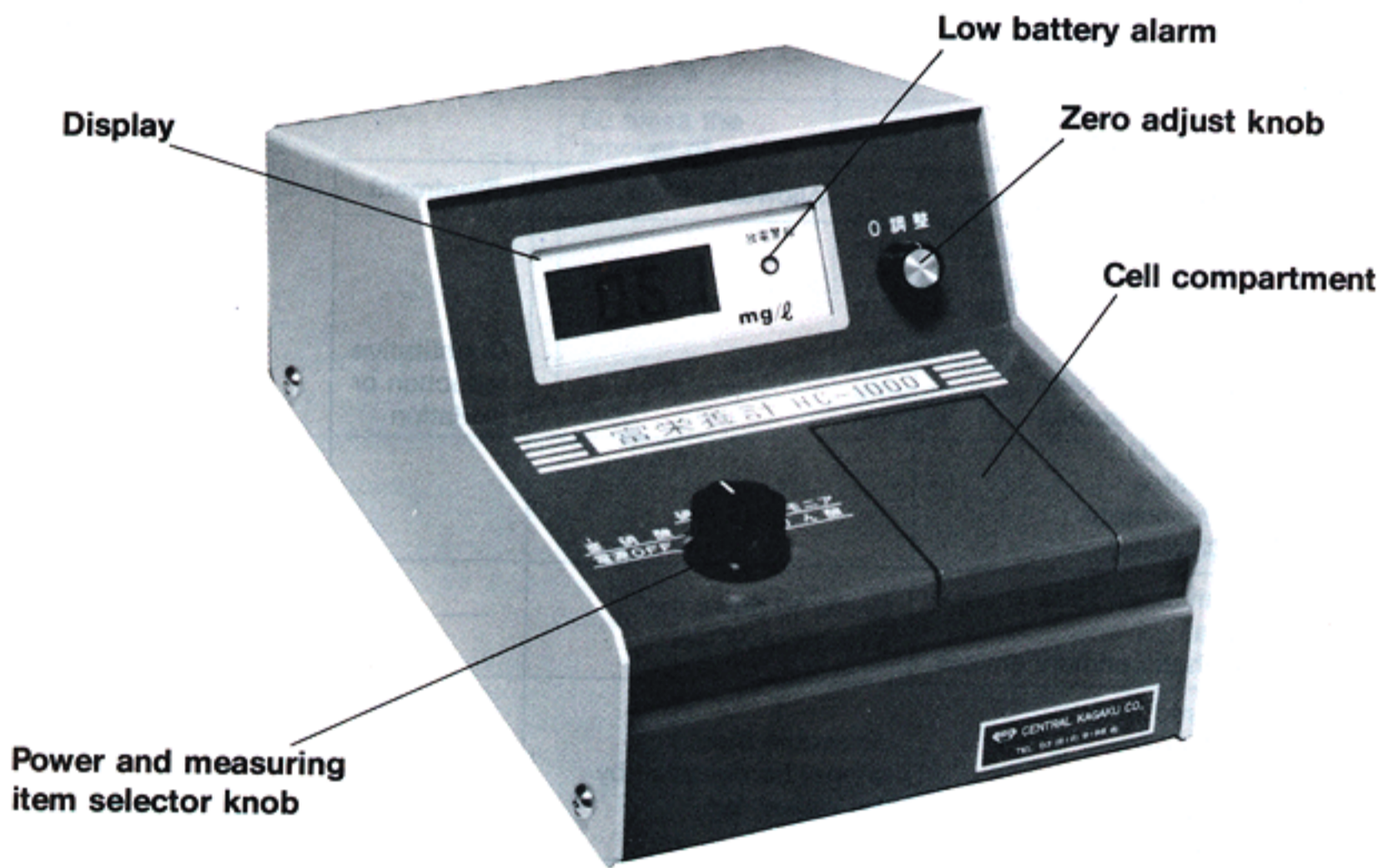
2-1. Specifications

- 1) Measuring method:
Absorptiometry using coloration reagents
- 2) Measuring items:
Nitrous acid nitrogen (NO₂-N)
Nitric acid nitrogen (NO₃-N)
Ammonia nitrogen (NH₄-N)
Inorganic phosphate (PO₄-P)
- 3) Measuring range:
Nitrous acid nitrogen: 0-0.2 mg/l, down to the third decimal place
Nitric acid nitrogen: 0-2.0 mg/l, down to the second decimal place
Ammonia nitrogen: 0-0.7 mg/l, down to the second decimal place
Inorganic phosphate: 0-1.0 mg/l, down to the second decimal place
- 4) Measuring accuracy:
Nitrous acid nitrogen: + 0.01 mg/l, approx. 10 minutes required for coloration
Nitric acid nitrogen: ± 0.05 mg/l, approx. 5 minutes required for coloration
Ammonia nitrogen: ± 0.02 mg/l, approx. 20 minutes required for coloration
Inorganic phosphate: ± 0.02 mg/l, approx. 20 minutes required for coloration
- 5) Display:
Direct display of concentration in mg/l units, 3-digit digital
- 6) Light source:
Light-emitting diode (LED), switching system
Green (central wavelength: 555nm), for NO₂-N and NO₃-N measurement
Red (central wavelength: 695nm), for NH₄-N and PO₄-P measurement
- 7) Power supply:
Either AC or DC (four Ni-Cd UM-3 batteries)
AC: 100V, 50/60Hz
DC: UM-3 Ni-Cd × 4 (usable during recharge)
- 8) Dimensions:
160 width × 250 depth × 130 height (mm)
- 9) Weight:
Approx. 2.9kg

2-2. Standard accessories

Item	Description	Qty
Sample cell	Exclusive cell, 18 × 40mm, 5ml	20
Exclusive reagents(for 100 tests)	For NO ₂ -N, 100ml	1
	For NO ₃ -N, 500ml	1
	For NH ₄ -N, A 50ml B 50ml	1 1
	For PO ₄ -P A 250ml (for 250 tests) B 25 capsules (//)	1 1
	Miscellaneous	Ni-Cd battery (UM-3)
	Power cord	1
	Tube fuse	2
	Vinyl cover	1
	Operator's manual	1
	Phosphate coloration reagent preparation bottle (with 10ml mark), 15ml wide-mouthed	1
	Cell cleaning brush	1

3. Controls and Components



4. Sample Preparation and Interferences

4-1. Sample preparation

Each sample should be measured immediately after it is collected. If immediate measurement is not possible, store the sample according to the method specified by the JIS K 0101 or JIS K 0102, but measure it as soon as possible.

The samples for the measurement of total nitrogen, organic nitrogen or Kjeldahl nitrogen, or of total phosphorus, polymeric phosphate or organic phosphorus should be pretreated according to the JIS K 0101 or JIS K 0102, prior to measurement.

4-2. Interferences

1) Nitrogen measurement

	Interfering Substance	Allowable Limit	Treatment
NO ₂ -N	Oxidizing agents Residual chlorine Permanganates Dichromates Halogeno-salts Reducing agents Iron (II) Sulfites Thiosulfate Chlorides	_____	Quantitative reduction or oxidation
	Ammonium salts Urea Aliphatic primary amines	Below 10 times the amount of NO ₂ -N	_____
	Colored ions Copper Nickel Cobalt Chromium	Allowable if color cannot be detected by the naked eye	_____
NO ₃ -N	Practically no interference by common coexistent substances'		
NH ₄ -N	Aromatic amines	Even very small amounts interfere	_____
	Hydroxylamine	_____	Hydrogen peroxide oxidation
	Cl ⁻ SO ₄ ²⁻ NO ₃ ⁻	Below 200ppm per ppm of NH ₄ -N in terms of NH ₃	_____
	NO ₂	Below 500ppm per ppm of NH ₄ -N in terms of NH ₃	_____
	SO ₃ ²⁻	Below 10ppm per ppm of NH ₄ -N in terms of NH ₃	_____
	S ²⁻	Below 1ppm per ppm of NH ₄ -N in terms of NH ₃	_____

2) Phosphorus measurement

	Interfering Substance	Coexistent Level	Influence
PO ₄ -P	Arsenic (V)	1/20 the amount of phosphate ions	+4% error
	Cl ⁻ I ⁻ Br ⁻	75mg 6mg 25mg	Approx. -5% error
	SO ₄ ⁻ (excluding the content of the molybdenum reagent)	500mg 1g	Approx. +3% error Approx. +5% error
	Silica	50 times the amount of phosphate ions	Approx. +5% error
		2mg	No problem if sample is allowed to stand for 15 min. or more since decoloration occurs 15 min. after addition of reagent

5. Measuring Procedures

5-1. NO₂-N (Diazonium salt method)

- 1) Set the measuring item selector knob to the "Nitrous acid."
- 2) Have two exclusive sample cells available.
- 3) Put 5ml of deionic water into one cell and 5ml of test water into the other.
- 4) Add 1ml of the NO₂-N reagent to each of the cells.
- 5) Stopper the cells tightly.
- 6) Vigorously shake them several times.
- 7) Allow them to stand for 10 minutes.
- 8) Wipe and clean the sides of the deionic water cell and then place it in the cell compartment. Adjust the meter with the zero adjust knob so that "0" appears on the display. One minute later, confirm that the

"0" still appears on the display. There may be a zero-point drift after adjustment. Readjust if necessary.

- 9) Wipe and clean the sides of the test water cell. Remove the deionic water cell from the compartment and install the test water cell instead. Read the value from the display. This value represents the NO₂-N concentration of the test water.

Caution: This measuring method is subject to the influence of the sample temperature. Keep the sample temperature within a range of 25-30° C during measurement.

5-2. NO₃-N (Diphenylamine method)

- 1) Set the measuring item selector knob to the "Nitric acid."
- 2) Have two exclusive sample cells available.
- 3) Put 1ml of deionic water into one cell and 1ml of test water into the other.
- 4) Add 5ml of the NO₃-N reagent to each of the cells.
- 5) Stopper the cells tightly.
- 6) Vigorously shake them several times (small amounts of heat will evolve during this step).
- 7) Allow them to stand for 5 minutes.
- 8) Wipe and clean the sides of the deionic water cell and place it in the cell compartment. Adjust the meter with the zero adjust knob so that "0" appears on the display. One minute later, confirm that "0" still

appears on the display. There may be a zero-point drift after adjustment. Readjust if necessary.

- 9) Wipe and clean the sides of the test water the compartment and install the test water cell instead. Read the value from the display.

This value represents the NO₃-N concentration of the test water.

Caution: This measuring method is subject to the influence of the sample temperature. Keep the sample temperature within a range of 25-30° C during measurement.

5-3. NH₄-N (Indophenol method)

- 1) Set the measuring item selector knob to the "Ammonia."
- 2) Have two exclusive sample cells available.
- 3) Put 5ml of deionic water into one cell and 5ml of test water into the other.
- 4) Add 0.5ml of the NH₄-N reagent (A) to each of the cells.
- 5) Stopper the cells tightly and then shake them vigorously.
- 6) Open the cells and add 0.5ml of the NH₄-N reagent (B) to each of the cells.
- 7) Stopper the cells again and shake them vigorously.
- 8) Allow them to stand for 10 minutes.
- 9) Wipe and clean the sides of the deionic water cell and place it in the cell compartment. Adjust the meter with the zero adjust

knob so that "0" appears on the display. One minute later, confirm that "0" still appears on the display. There may be a zero-point drift after adjustment. Readjust if necessary.

- 10) Wipe and clean the sides of the test water cell. Remove the deionic water cell from the compartment and install the test water cell instead. Read the value from the display. This value represents the NH₄-N concentration of the test water.

Caution: This measuring method is subject to the influence of the sample temperature. Keep the sample temperature within a range of 25-30° C during measurement.

5-4. PO₄-P (Molybdenum blue method)

- 1) Prepare the phosphate coloration reagent.
* This reagent should be prepared just before each use (it cannot be stored for subsequent use).
Preparation:
Add one-capsule amount of the phosphate ion reagent (B) to 10ml of the phosphate ion reagent (A). Shake well until the reagent (B) dissolves away. It takes more than 10 minutes for the dissolution of the reagent (B).
- 2) Set the measuring item selector knob to the "Phosphate."
- 3) Have two exclusive sample cells available.
- 4) Put 5ml of deionic water into one cell and 5ml of test water into the other.
- 5) Add 1ml of the phosphate coloration

reagent to each of the cells.

- 6) Stopper the cells and shake well.
- 7) Allow them to stand for 20 minutes.
- 8) Place the deionic water cell in the cell compartment and zero-adjust the meter with the zero adjust knob.
- 9) Remove the deionic water cell from the compartment and install the test water cell instead. Read the value from the display. This value represents the PO₄-P concentration of the test water.

Caution: This measuring method is subject to the influence of the sample temperature. Keep the sample temperature within a range of 25-30° C during measurement.

6. Operating Precautions

- 1) When the power is turned on, put a water-filled sample cell in the cell compartment and keep it in place until measurement is begun.
- 2) The reagents being used contain a strong acid or alkali. Avoid direct contact with the skin or clothes. If accidentally you should get them on the skin or clothing, wash them away with plenty of running water.
- 3) The reagents should be stored in a refrigerator. If they exceed their expiring dates, replace them with fresh ones.
- 4) The reagents have neither toxicity nor carcinogenicity.
- 5) The measuring apparatus used for the measurement of the reagents should be washed thoroughly after use.
- 6) The cells used should be cleaned with water and the accessory brush, rinsed with running water and then with distilled water, allowed to dry, and stored. (Do not use a detergent since it may damage the cells and causes measurement errors. Take care not to damage the cells when brushing them.)
- 7) Use of the same sample cells is recommended for the measurement of the same items. Avoid using the cells for the measurement of different items. (Reason: The $\text{NO}_2\text{-N}$ reagent contains phosphate, while the $\text{PO}_4\text{-P}$ reagent contains ammonium ions)
- 8) Always clean the sides of the cell before placing it in the cell compartment since measuring light passes through these portions.

7. Precautions for Battery Operation

- 1) This instrument uses four rechargeable UM-3 Ni-Cd batteries.
- 2) During AC operation, the batteries are charged at the same time.
- 3) The batteries are charged automatically when the AC power cord is plugged into an AC outlet even when the power switch is in the OFF position.
- 4) When the instrument is operated on battery power (for field measurements, etc.), the batteries are consumed depending on the operating time. Always charge the batteries for a period of time nearly equal to the time when the instrument is operated on battery power.
- 5) The red alarm lamp begins to flash if the batteries run out. If the alarm lamp is activated, charge the batteries for continuous 15 hours or so.
- 6) The batteries allow approx. 300 charge/discharge cycles of operation. In other words, the life of the batteries terminates after they are charged about 300 times. Replace with new batteries when necessary.
- 7) Observe the polarity when installing the batteries.

8. Maintenance

- 1) When the cell compartment cover is opened, you can see the lamp to the left (green lamp when the selector is in the "Nitrous acid" or "Nitric acid" position, or dark red lamp when the selector is in the "Phosphate" position) and the sensing surface of the Silicon Bluecell to the right. Dust or soils on these components may cause errors in regard to the displayed value. Utmost care should be taken to keep dust or liquid spills away from the cell compartment. If these components are soiled, wipe soils off with clean absorbent cotton.
- 2) Do not leave the cell compartment cover open when the cell compartment is empty. This may deteriorate sensor sensitivity.
- 3) Always keep the sides of the cell clean. Do not soil or damage the cell sides.
- 4) The display is of the liquid crystal type. Do not expose the display to direct sunlight, which shortens the life of the liquid crystal element.
- 5) Always place the accessory vinyl cover (black) over the instrument when not in use. This protects the liquid crystal element from deteriorating.

9. Waste Liquid Disposal

The waste liquids resulting from the measurements contain strong acid or alkali. Neutralize them before disposal, or collect them in a

container and ask a waste disposal company for their disposal. Do not discard them haphazardly.

10. Optional Accessories

Measuring apparatus	Qty
Auto-handling pipette, 5ml	1
Auto-handling tip	5
Auto-handling pipette, 1ml	1
Auto-handling tip	10

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