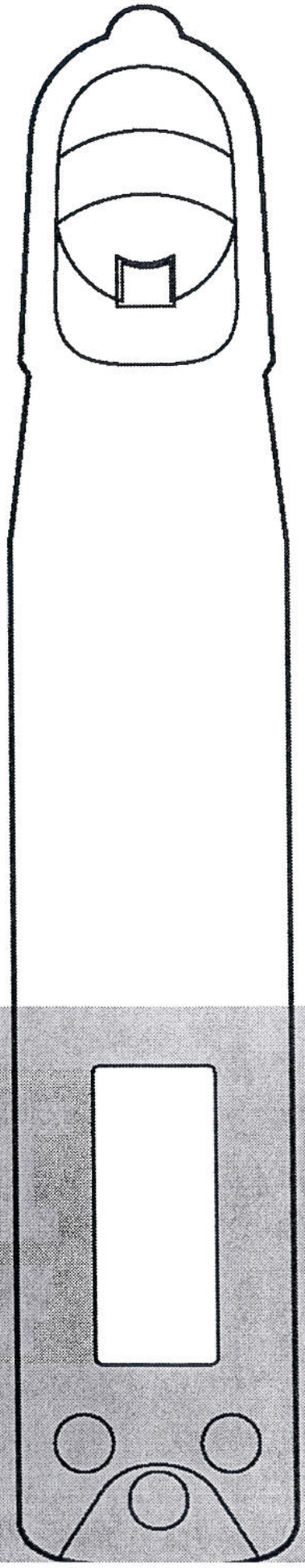
HORIBA



B-34X

COMPACT NO_3^- METER

twin NO_3^-

Instruction Manual

CODE:GZ0000096109B

Preface

This manual describes the operation of the COMPACT NO_3^- METER B-34X.
Be sure to read this manual before using the product to ensure proper and safe operation of the instrument.
Also safely store the manual so it is readily available whenever necessary.
Product specifications and appearance, as well as the contents of this manual are subject to change without notice.

Warranty and Responsibility

The product delivered to you is covered by HORIBA's warranty for a period of one (1) year.
If any malfunction or damage attributable to HORIBA's responsibility should occur during this period, necessary repairs or replacement of parts shall be made free of charge by HORIBA.
The warranty does not cover the following:

- Any malfunction attributable to improper operation
- Any malfunction attributable to repair or modification by any party not authorized by HORIBA
- Any malfunction attributable to the use in an improper environment
- Any malfunction attributable to violation of the instructions in this manual
- Any malfunction attributable to operations in the manner not specified in this manual
- Any malfunction attributable to natural disasters, or accidents or mishaps not involving HORIBA
- Any deterioration in appearance attributable to corrosion, rust, and so on.
- Consumables and replacement of consumables
- Products of other companies

HORIBA shall not be liable for any damages resulting from any malfunctions of this product, any erasure of data, or any other uses of this product.

Trademarks

Generally, company names and brand names are either registered trademarks or trademarks of the respective companies.

Conformable Directive

This equipment conforms to the following directives and standards:

CE

Directives: the EMC Directive 2004/108/EC, in accordance with Article 10 (1) of the Directive

Standards: [the EMC Directive]
EN61326-1:2006 Class B, Portable test and measurement equipment

- **Information on Disposal of Electrical and Electronic Equipment**

The crossed out wheeled bin symbol shown on the product or accompanying documents indicates separate collection for waste electrical and electronic equipment (WEEE) under the WEEE Directive 2002/96/EC in the European Union.
This product should not be disposed of as unsorted household waste.

Your correct disposal of WEEE will contribute to reducing wasteful consumption of natural resources and protecting human health and the environment from potential negative effects caused by hazardous substances in products.
Contact your supplier for information on applicable disposal methods.

FCC Rules

Any changes or modifications not expressly approved by the party responsible for compliance shall void the user's authority to operate the equipment.

WARNING

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Contents

1 Contents of Sets

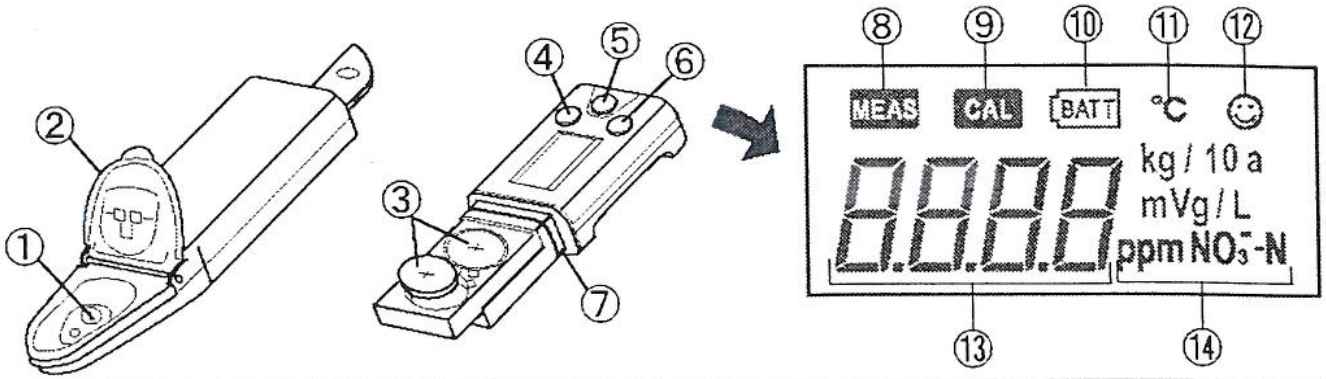
1.1 Items in package

Set (meter model)		For crops (B-341)	For soil (B-342)	For general use (B-343)
Sensor		1	1	1
Meter	B-341	1	–	–
	B-342	–	1	–
	B-343	–	–	1
Meter case		1	1	1
Storage case		1	1	–
Carrying case	For B-341	1	–	–
	For B-342	–	1	–
Batteries	CR2032	2	2	2
Dedicated standard solutions	30 ppm	–	1	–
	150 ppm	–	–	1
	300 ppm	1	1	–
	2000 ppm	–	–	1
	5000 ppm	1	–	–
Fluid dropper		5	5	1
Cleaning solution bottle	250 mL	1	1	–
Crop sample press		1	–	–
Medical cup	For diluting samples	3	–	–
Extraction bottle		–	3	–
Spoon for soil sampling		–	2	–
Filter paper holder cover		–	2	–
Filter papers	Pack of 100	–	1	–
Tweezers		–	1	–
Instruction manual	For all models	1	1	1
Quick-start manuals	For B-341	1	–	–
	For B-342	–	1	–

1.2 Consumable parts sold separately

Part No.	Name	Type	Application
90880009000	Sensor	No. 0243 (NO_3^- ions)	B-341, B-342, B-343
90880013000	Standard solutions	Y044 30 ppm	B-342 (low concentration)
90880014000		Y045 150 ppm	B-343 (low concentration)
90880011000		Y042 300 ppm	B-341 (low concentration), B-342 (high concentration)
90880012000		Y043 2000 ppm	B-343 (high concentration)
90880010000		Y041 5000 ppm	B-341 (high concentration)
90880016000	Filter paper holder cover	Y047	B-342
90880015000	Filter papers	Y046 Pack of 100	B-342

2 Part Names and Functions



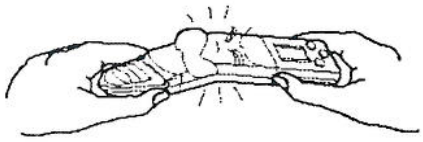
No.	Name	Description
①	Flat sensor	Consists of a liquid junction (A) and response membrane (B). Both A and B must be covered by the sample to enable accurate measurement (see page 6).
②	Light shield cover	A cover used to shield the sensor from light. Since the sensor is affected by light, attach the light shield cover before starting measurement. When using model B-342 (soil model), replace this cover with the filter paper holder cover and use the dedicated filter paper.
③	Lithium batteries	CR2032 (×2)
④	MEAS (measure) switch	Used during measurement. Press this switch for 0.5 second to evaluate the stability of the measured value. The measured value is finalized and then locked. Pressing and holding this switch for at least 5 seconds enters the special setting modes. See "8 Special Setting Modes" (page 16).
⑤	ON/OFF switch	Press and hold for at least 2 seconds to turn the power ON or OFF.
⑥	CAL (calibrate) switch	Press and hold for at least 2 seconds to calibrate the meter.
⑦	Waterproofing gasket	A gasket used to make the meter waterproof.
⑧	MEAS icon	Flashes during measurement, and lights steadily when the measured value has been finalized.
⑨	CAL icon	Flashes during calibration, and lights steadily when calibration has finished.
⑩	Battery alarm icon	Lights when the batteries are low and need to be changed.
⑪	Temperature alarm icon	Flashes when the measuring environment temperature is out of range (not between 5°C and 40°C).
⑫	Stability icon	Lights only when the measured value has stabilized.

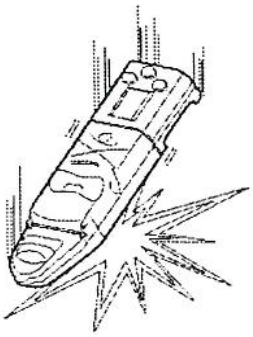
No.	Name	Description
⑬	Measured value display	Flashes when the measurement result is out of range. When "Hi" is displayed, the measurement result is too high. Dilute the sample and take another measurement.
⑭	Measurement unit display	The default setting is "ppm NO_3^-". One of the special setting modes lets you change the measurement units. See "8.1 Special setting mode 1 (measurement unit selection)" (page 17).

3 Handling Precautions

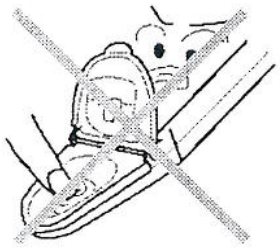
Always observe the precautions below.

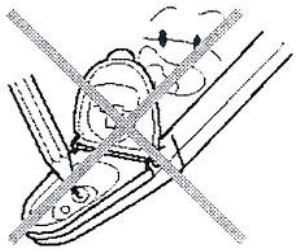
- Neither the meter nor sensor is waterproof by itself. The sensor must be securely mounted on the meter before use.
- Never drop the meter or apply excessive force to it.



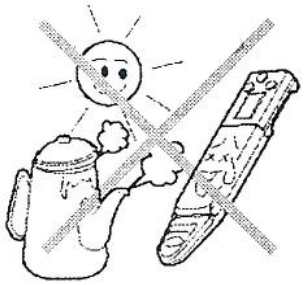


- The sensor is made of PVC, so may become scratched if not handled with care.





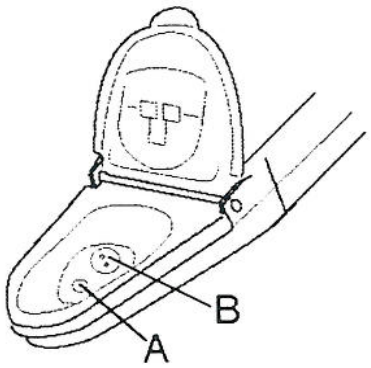
- Do not leave the meter in areas of direct sunlight or high temperature/ humidity.
- Do not clean the meter with organic solvents.



- When using the meter for the first time or after several weeks of disuse, the sensor may be slow to respond (react). In this case, add some drops of standard solution to the sensor and wait 10 minutes to an hour before use (there is no need to turn the power ON).
- Do not measure samples such as the following, since they may damage the sensor or shorten its life: Organic solvents, oils, adhesives, cement, alcohols, concentrated acid (pH 0 to pH 2), concentrated alkaline (pH 12 to pH 14) or surfactants.
- Some sample types (such as highly oily crop pressings) may not yield stable measured values.

4 Read Before Use

- Wash off any calibration fluid that comes into contact with hands or other exposed skin. If fluid gets in eyes, rinse them immediately and see a doctor.
- White powder may appear on the liquid junction (A) of the sensor when using the meter in low-humidity environments, and solution may appear on it when using the meter in high-humidity environments. The appearance of this powder or solution is normal. Simply rinse it off with water before use.

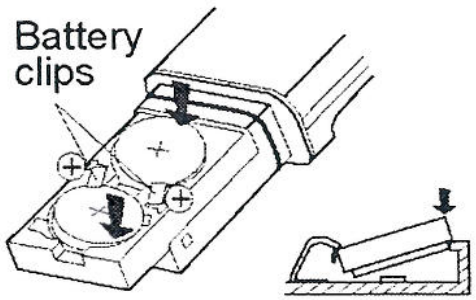


- The sensor's response membrane (B) is made of PVC. Since the PVC's plasticizer may seep into the sample used for measurement, never drink a sample after measurement.
- The batteries provided at time of purchase are for trial piece so may have a short life.
- When replacing batteries, replace both at once with new batteries.
- Never dispose of used batteries in open flame or attempt to recharge them. Keep used batteries out of reach of children. If used batteries are swallowed, see a doctor.
- The battery alarm icon lights when the battery voltage is low. Replace the batteries when the battery alarm icon lights. You may not be able to turn the meter's power ON/OFF when the battery voltage is low.
- The sensor is a consumable part. Replace it with a new one if it becomes damaged or its performance deteriorates (sensors cannot be repaired).
- To keep the meter waterproof, check that the waterproofing gasket is:
  - Not scratched or dirty
  - Properly seated in the groove with no twisting or warping

5 Setup and Replacing the Sensor and the Batteries

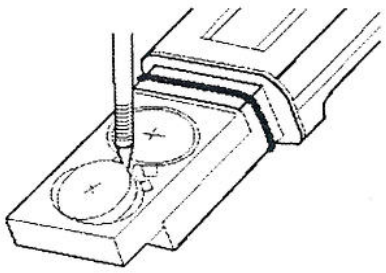
Setup the Batteries

Slide both batteries into the battery clips as shown so that the plus sides (+) are facing upwards. Be sure to use only CR2032-type batteries.



Replacing the Batteries

Use a ball-point pen or other instrument to pry the batteries out from the clips as shown.
Always replace both batteries; never use a new battery with an old one.

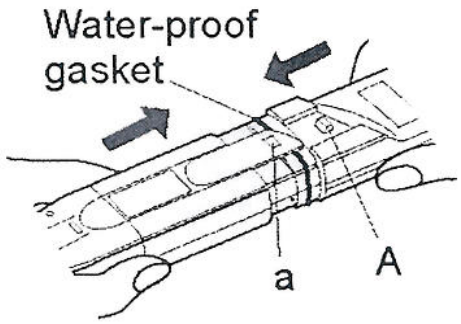


Setup the Sensor

Slide the sensor onto the unit body so that tongue "A" (on the back of the main body) fits into hole "a" as shown. It is now ready to use.

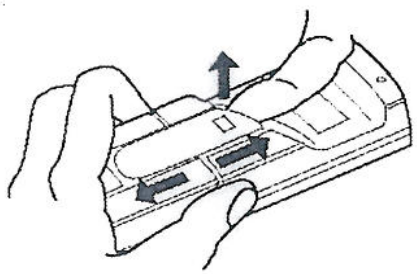
Note:

Be careful not to twist the water-proof gasket.



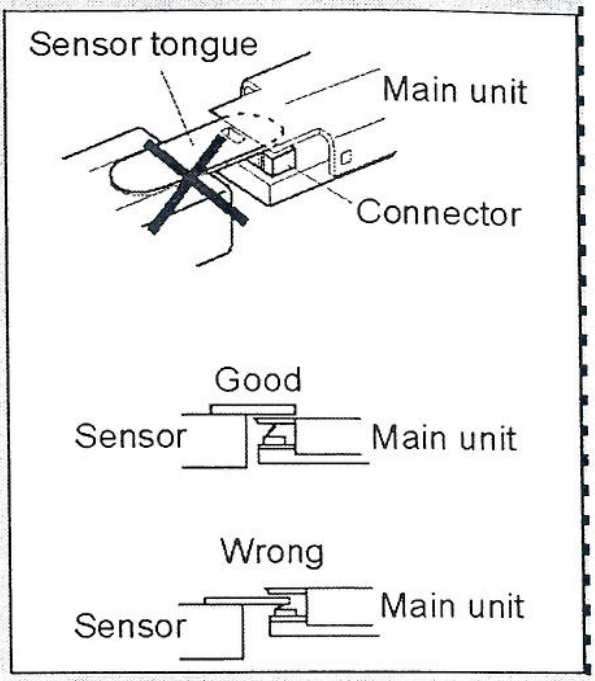
Replacing the Sensor

Lift the hole "a" and slide the sensor away from the main body. Then pull out the sensor all the way from the main body.



Precautions

- As shown here, make sure that the sensor tongue is inserted correctly in between the main unit case and the connector. Be careful so as not to damage the connector.
- When removing the sensor, carefully wipe off any drops of sample remaining on the waterproof gasket. Do not let any water get inside the main body.
- When replacing the sensor or the batteries, be sure that the meter is turned off.

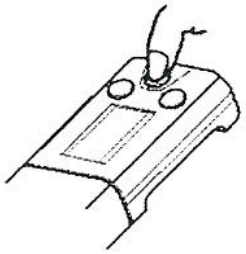


6 Calibration

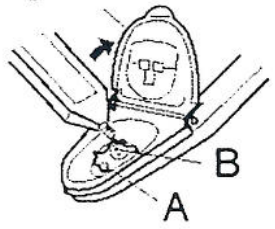
6.1 One-calibration mode

At time of purchase, the meter is set to the one-calibration mode.

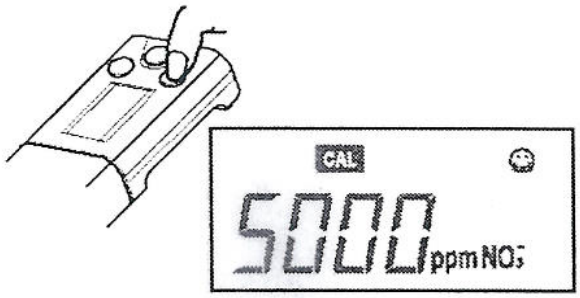
1. **Press and hold the ON/OFF switch for at least 2 seconds to turn the power ON.**



2. **Open the light shield cover and add enough of the high-concentration standard solution drop-by-drop to cover the space between A and B.**
   Washing the sensor with standard solution beforehand enables more accurate calibration.



3. **Close the light shield cover and press the CAL switch for at least 2 seconds until the CAL icon flashes.**



4. **When the calibration has been finalized, the CAL icon changes from flashing to steadily lit, and the standard solution concentration is displayed along with the ☺ icon.**
   The meter has not been calibrated if the CAL icon remains flashing and doesn't become steadily lit, or if "Err" (the error display) appears. In this case, check that the standard solution concentration is correct. Wash the sensor thoroughly and calibrate it again.

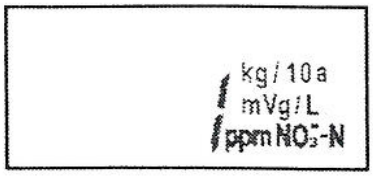
5. **Wash the sensor with tap water and remove any adhering droplets to ready it for measurement.**

6.2 Two-calibration mode

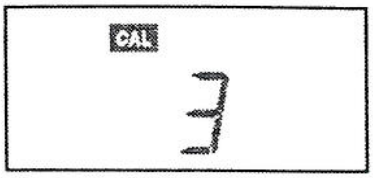
Select the two-calibration mode from the special setting modes.
Perform two calibrations when you want higher-precision measurement.

1. Follow the steps below to set the two-calibration mode.

① Press and hold the MEAS switch for at least 5 seconds to enter the special setting modes. All the LCD elements light, then the display on the right appears.

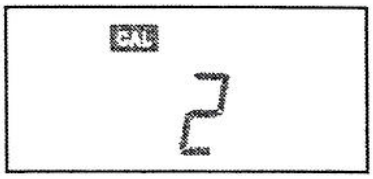


② Press and hold the CAL switch until the CAL icon and the number 3 appear.



③ Press the MEAS switch once (0.5 second) to display the number of calibrations currently set. When one calibration is set, the number 1 appears.

④ Press the CAL switch to display the number 2.



⑤ Press the MEAS switch. The two-calibration mode is now set, and the meter returns to the standard measurement mode.

2. Add enough of the low-concentration standard solution drop-by-drop to cover the space between A and B, then close the light shield cover.

3. Press the CAL switch for at least 2 seconds.
The CAL icon flashes.

4. When the CAL icon changes from flashing to steadily lit, the first calibration has been finalized.
The first calibration must be finalized before you can perform the second calibration.

5. Remove the low-concentration standard solution.

6. **Add enough of the high-concentration standard solution drop-by-drop to cover the space between A and B, then press the CAL switch for at least 2 seconds.**

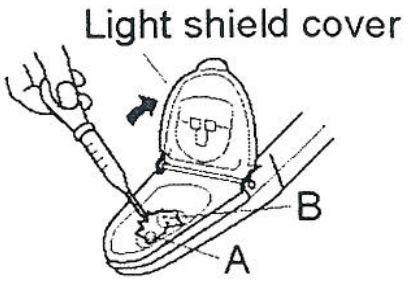
7. **When the CAL icon changes from flashing to steadily lit, the second calibration has been finalized, and the standard solution concentration is displayed.**
   - The sensor has not been calibrated if the CAL icon remains flashing, or if "Err" (the error display) appears. In this case, check that the standard solution concentration is correct. Wash the sensor thoroughly and calibrate it again.
   - If the two calibrations failed and the standard solution concentration is correct, the sensor's performance has deteriorated, so replace it with a new one (part No. 90880009000).

8. **Wash the sensor with tap water and remove any adhering droplets to ready it for measurement.**

7 Measurement

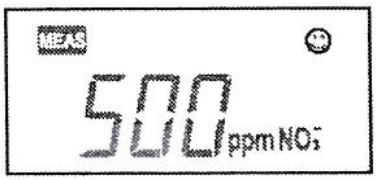
7.1 Measurement on a flat surface

1. Open the light shield cover and add enough of the sample drop-by-drop to cover the space between A and B.

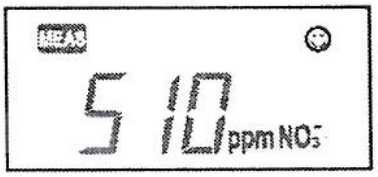


2. Close the light shield cover.

3. When the stability icon ☺ appears, press the MEAS switch.* MEAS icon flashes and measurement starts.



4. When the measured value has been finalized, the MEAS icon changes from flashing to steadily lit, and the displayed value is locked.



5. Read the displayed value.
Once the measured value has been finalized, the displayed value does not change until you press the MEAS switch again to make the MEAS icon disappear. To take the next measurement, press the MEAS switch to make the MEAS icon disappear, then repeat the previous steps.

* When you don't need to lock the measured value, read the value displayed when the stability icon ☺ appears. There is no need to press the MEAS switch in this case.

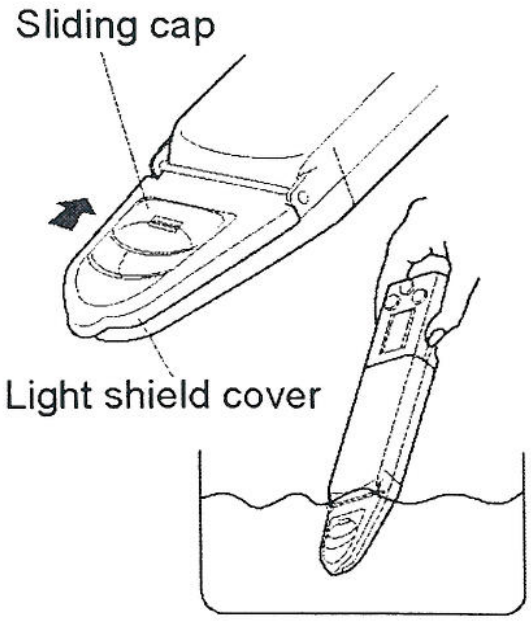
7.2 Submerged measurement

1. Open the light shield cover's sliding cap, submerge the sensor in the sample and shake it gently 2 or 3 times.

2. When the stability icon ☺ appears, press the MEAS switch. The MEAS icon flashes and measurement starts.

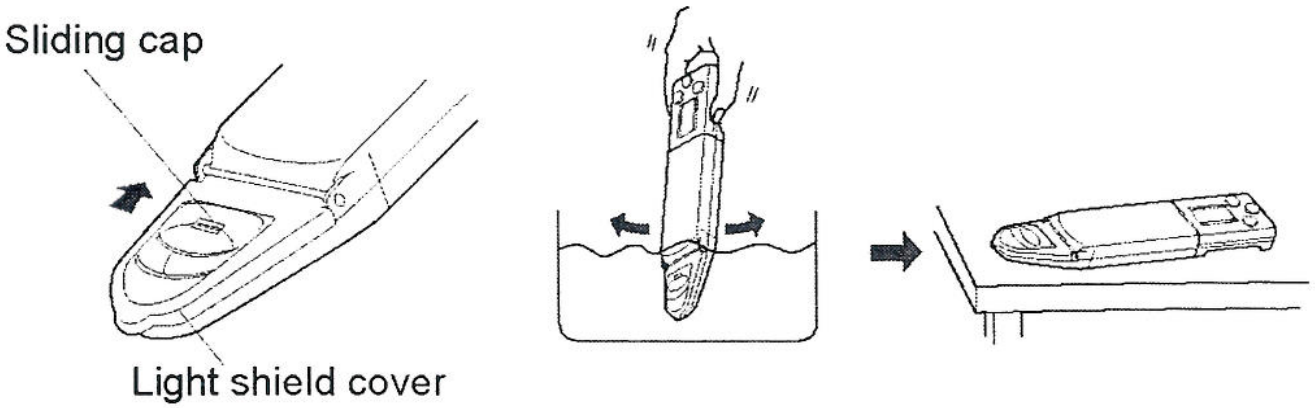
3. When the measured value has been finalized, the MEAS icon changes from flashing to steadily lit.

4. Read the displayed value.



7.3 Scoop measurement

1. **Open the light shield cover's sliding cap, submerge the sensor in the sample, and shake it 2 or 3 times. Scoop up some of the sample into the meter, then place the meter on a desktop or other flat surface.**
   After scooping up some of the sample, check you have taken enough to cover the space between A and B.



2. **Close the light shield cover's sliding cap.**

3. **When the stability icon ☺ lights, press the MEAS switch.**
   The MEAS icon flashes and measurement starts.

4. **When the measured value has been finalized, the MEAS icon changes from flashing to steadily lit.**

5. **Read the displayed value.**

CAUTION

- Although the meter is waterproof, avoid submerging it completely during measurement. If the meter is accidentally dropped in water, remove it immediately and wipe it dry.

7.4 After measurement

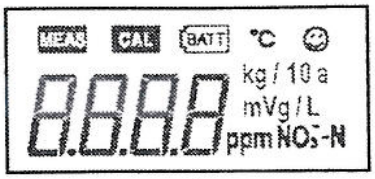
1. **Press the ON/OFF switch (2 seconds) to turn the power OFF.**

2. **Wash the sensor in tap water, and shake off any drops adhering to the sensor electrodes or meter.**

3. **Store the meter with the light shield cover's sliding cap closed.**
   Do not store the meter with immersing the sensor in liquid.

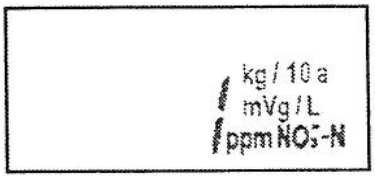
8 Special Setting Modes

To enter the special setting modes, press and hold the MEAS switch for at least 5 seconds while in the measurement mode. All the LED display elements appear, then the meter enters the special setting modes.



With all display elements shown

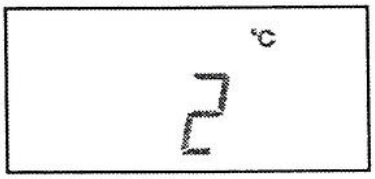
↓ Changes automatically.



Special setting mode 1 → **Set the desired measurement unit (page 17)**

Used to select the measurement unit.

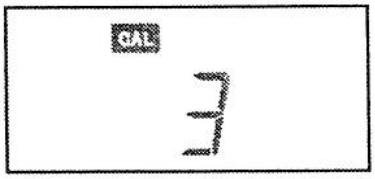
↓ CAL switch*



Special setting mode 2 → **Display the temperature (page 18)**

Used to set the temperature measurement mode.

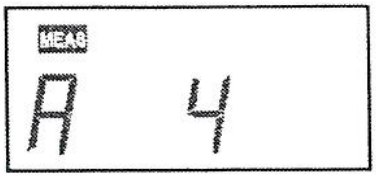
↓ CAL switch*



Special setting mode 3 → **Set the number of calibrations (page 19)**

Used to select one calibration or two calibrations.

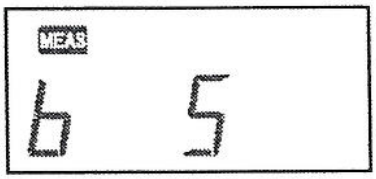
↓ CAL switch*



Special setting mode 4 → **Set the coefficient (page 20)**

Multiplies each measurement result by the set coefficient (between 0.01 and 9.90) before displaying the result. The default setting is 1.00.

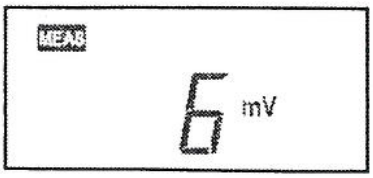
↓ CAL switch*



Special setting mode 5 → **Set the constant (page 21)**

Adds the set constant (between -1000 and 1000) to each measurement result before displaying the result. The default setting is 0.

↓ CAL switch*



MEAS switch

Special setting mode 6 → **Display the sensor voltage (page 21)**

Displays the voltage output from the sensor.
Displays 3-digit voltages in 0.1 mV units.

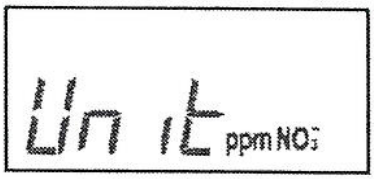
↓ CAL switch*
Returns to special setting mode 1.

* You can also toggle among the special setting modes continuously by pressing and holding the CAL switch.

8.1 Special setting mode 1 (measurement unit selection)

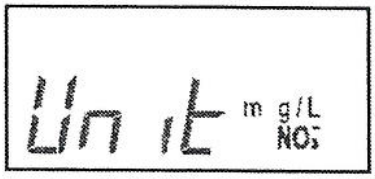
1. **In special setting mode 1, press the MEAS switch for 0.5 second.**
   The display used to set the measurement unit appears.

2. **Each time you press the CAL switch for 0.5 second, the display changes in the order shown below.**
   Pressing and holding the CAL switch changes the display continuously.



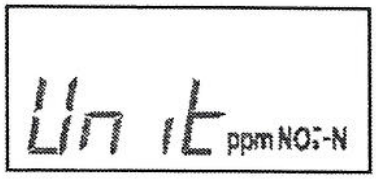
Unit: ppm
Displays the concentration of nitric acid ions (NO_3^-) in ppm.

↓ Press the CAL switch for 0.5 second.



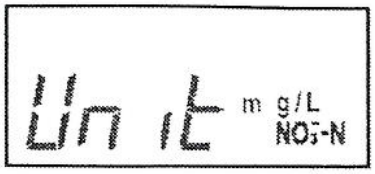
Unit: mg/L
Displays the concentration of nitric acid ions (NO_3^-) in mg/L.

↓ Press the CAL switch for 0.5 second.



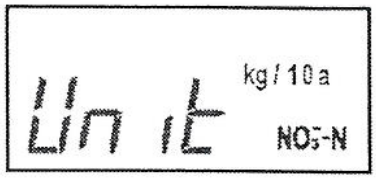
Unit: ppm
Displays the concentration of nitrate nitrogen in ppm.

↓ Press the CAL switch for 0.5 second.



Unit: mg/L
Displays the concentration of nitrate nitrogen in mg/L.

↓ Press the CAL switch for 0.5 second.
Models B-341 and B-343 return to the display for concentration of nitric acid ions (NO_3^-) in ppm.



Unit: kg/10a
Displays the quantity of nitrate nitrogen per 10 a (ares). This unit can only be selected on model B-342, and only applies to measurements of samples adjusted to a ratio of 1 part soil per 5 parts water.

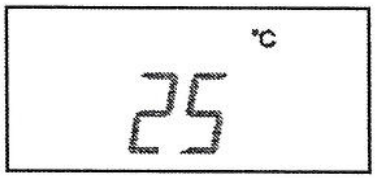
↓ Press the CAL switch for 0.5 second.
Returns to the display for concentration of nitric acid ions (NO_3^-) in ppm.

3. **After setting the desired measurement unit, press the MEAS switch for 0.5 second.**
   The selected measurement unit is now set, and the meter returns to the standard measurement mode.

8.2 Special setting mode 2 (temperature display)

This mode is used to check the temperature of the measuring environment. The measurement precision of this mode is not guaranteed, so use displayed values as guidelines.

1. **In special setting mode 2, press the MEAS switch for 0.5 second.**
   The ambient temperature is displayed using the sensor's built-in temperature sensor.



2. **To return to the standard measurement mode, press the MEAS switch for 0.5 second.**

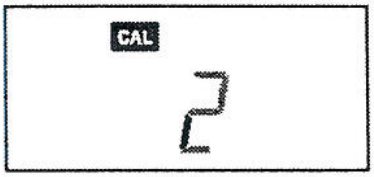
8.3 Special setting mode 3 (selection of number of calibrations)

1. **In special setting mode 3, press the MEAS switch for 0.5 second.**
   The number of calibrations currently set is displayed.

2. **Each time you press the CAL switch for 0.5 second, the display toggles between one calibration and two calibrations.**
   Press and hold the CAL switch to toggle the display continuously.

One calibration

↓ Press the CAL switch for 0.5 second.



Two calibrations

↓ Press the CAL switch for 0.5 second.

Returns to the display for one calibration.

3. **After selecting the desired number of calibrations, press the MEAS switch for 0.5 second.**
   The selected number of calibrations is now set, and the meter returns to the standard measurement mode.

8.4 Special setting mode 4 (measured value compensation by multiplication)

Sets a mode that multiplies each measurement result by the set coefficient (between 0.1 and 9.90).
Set the desired coefficient when using dilute or concentrated samples. The default setting is 1.00.
Once you have set a coefficient, each measurement result is multiplied by the set value before being displayed.

1. **In special setting mode 4, press the MEAS switch for 0.5 second.**
   The currently set coefficient is displayed.

2. **The value increases each time you press the CAL switch for 0.5 second.**
   Pressing and holding the CAL switch changes the value continuously. When the value reaches 9.90, it returns to 0.01.

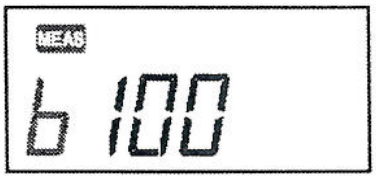
3. **When you have selected the desired coefficient, press the MEAS switch for 0.5 second.**
   The meter returns to the standard measurement mode.

8.5 Special setting mode 5 (measured value compensation by addition)

Sets a mode that adds a constant (between -1000 and 1000) to each measurement result. Use this mode when solutions or diluting fluids have a known effect on the measurement. The default setting is 0. Once you have set a constant, the set value is added to each measurement result before it is displayed.

1. **In special setting mode 5, press the MEAS switch for 0.5 second.**
   The currently set constant is displayed.

2. **The value increases each time you press the CAL switch for 0.5 second.**
   Pressing and holding the CAL switch changes the value continuously. When the value reaches 1000, it returns to -1000.



3. **When you have selected the desired constant, press the MEAS switch for 0.5 second.**
   The meter returns to the standard measurement mode.

8.6 Special setting mode 6 (sensor voltage display)

Use this mode when evaluating the sensor performance or creating your own calibration line or curve.

1. **In special setting mode 6, press the MEAS switch for 0.5 second.**
   The voltage value output by the sensor is displayed.

2. **Press the MEAS switch for 0.5 second to return to the standard measurement mode.**

9 Appendix

9.1 Frequently asked questions

Question	Answer
How long is the sensor's service life?	There is no specified value for the sensor life since it varies according to the type of samples measured. It should provide about 1,500 measurements for typical samples. Note that sensor deterioration and failure are not covered by the warranty.
How can I check the sensor's condition?	Measure the low-concentration standard solution provided to check how much the measured concentration value has drifted from the actual concentration. Two calibrations are recommended if the value has drifted by 50% or more.
What do I do if both calibrations fail?	Dirt in the response membrane and liquid junction is the main cause of calibration failure. Wash the sensor thoroughly with water, then gently wipe off the response membrane with a soft cloth or paper. If you still cannot calibrate the sensor, replace it.
What factors impede measurement?	Chloride ions (Cl^-) and oils impede measurement. The measurement error increases when measuring coastal-area soil or oily crops. Measurement error also increases when measuring samples with significantly high electrical conductivity.
How can I eliminate or reduce the factors that impede measurement?	Diluting the sample to a concentration within the measurable range can sometimes reduce factors impeding measurement. Using the OnGuard Ag II chloride ion removal precolumn sold by Dionex Japan is an effective way to remove chloride ions (Cl^-).
Are there any helpful tips or precautions to be aware of during measurement?	The sensor is affected by light, so avoid direct sunlight during measurement. Use the light shield cover. If the light shield cover is missing, use another method to shield the sensor from light, such as covering it with your hand. Note that you cannot use the light shield cover when measuring with special-purpose filter paper and the filter paper holder cover.
	When you have a sufficient quantity of the sample, using it to wash the sensor twice or so before measurement enables more accurate measurement.

Question	Answer
Can I measure high- or low-temperature samples?	The measurement error increases when the sample temperature is different from the measuring environment temperature. Wait until the sample temperature returns to the measuring environment temperature before measuring. Note that you cannot measure samples with a temperature outside the meter's operating temperature range (5°C to 40°C).
Can I prepare standard solutions myself?	Use only the Horiba standard solutions for crops (used with model B-341) and standard solutions for soil (used with model B-342). They are dedicated standard solutions which have had their electrical conductivity specially adjusted for substances other than nitric acid ions. However, you can prepare standard solutions for general scientific use (used with model B-343) yourself by dissolving potassium nitrate in ion replacement water to the specified concentration.
What do I do if the power won't turn ON?	Check that the batteries have been inserted properly. If the batteries are low, replace them both at the same time with new ones.
How do I exit the special setting modes?	Press the ON/OFF switch to turn the power OFF and ON again.
How do I return the settings of all the special setting modes to their default settings?	Remove the batteries, then insert them again. All the settings return to the values they had at time of purchase (the default values).

9.2 Specifications

Set (meter model)		Model for crops (B-341)	Model for soil (B-342)	Model for general use (B-343)
Measurement principle		Ion electrode method		
Sample volume required for measurement		0.3 mL to 2.0 mL		
Measurement range	NO_3^-	100 to 9900 (ppm or mg/L)	30 to 600 (ppm or mg/L)	62 to 6200 (ppm or mg/L)
	NO_3^--N	23 to 2200 (ppm or mg/L-N)	6.8 to 140 (ppm or mg/L-N)	14 to 1400 (ppm or mg/L-N)
	NO_3^--N*1	-	3.4 to 68 (kg/10a)	-
Calibration method		One calibration to 5000 ppm (two calibrations to 300 ppm and 5000 ppm)	One calibration to 300 ppm (two calibrations to 30 ppm and 300 ppm)	One calibration to 2000 ppm (two calibrations to 150 ppm and 2000 ppm)
Reproducibility		±10%*2		
Display		4-digit digital LCD display		
Power		CR2032 coin batteries (×2)		
Waterproofing standard		IP67*3		
Auto power OFF		30 minutes		
Outer dimensions		165 mm × 29 mm × 19 mm (excluding projections)		
Mass		Approx. 52 g (meter only)		
Operating temperature/humidity		5°C to 40°C, 85% relative humidity max. (no condensation)		
Operation switches		3 switches (power, calibration, measurement)		

*1 With soil/water sampling ratio of 1:5.

*2 Using Horiba's prescribed method.

*3 No failure when submerged in water at a depth of 1 meter for 30 minutes. The meter cannot be used underwater.