Instruction Manual

pH 5+ pH/°C
pH 6+ pH/°C/mV
Ion 6+ pH/°C/mV/Ion

OAKTON®

EUTECH INSTRUMENTS
Technology Made Easy…

CE

ISO 9001

68X576801 Rev 0 07/2011

Table of Contents

1. INTRODUCTION

Thank you for selecting our pH 5+, pH 6+, or Ion 6+ portable meter. This microprocessor-based handheld instrument is both economical and easy to use.

The pH 5+ measures pH and temperature (^{o}C).

The pH 6+ and Ion 6+ measure pH, mV (ORP) and temperature (^{o}C).

The Ion 6+ can also measure direct ion concentration of various ions (mono and divalent) using an ion selective electrodes (ISE). The mV mode is also useful for ISEs.

The 5+/6+ series meters advance our popular 5/6 series meters that were introduced in 1998.

Each meter includes alkaline “AAA” batteries, a rubber armor / stand, and instruction manual. Please refer to **Section—7 Replacements and Accessories** for information on additional accessories and calibration solutions.

We take great pride in every instrument we manufacture and hope this one serves you well.

*If you are viewing an electronic PDF version of this manual, look for **bold and underlined hyperlinks** in the Table of Contents and elsewhere. Clicking on them will immediately take you to the corresponding location in the manual.*

**Find other helpful tips listed in grey boxes like this one!*

2. GETTING STARTED

Description of Keypad Functions

The pH 5+ and pH 6+ have four keys, while the Ion 6+ has six keys on its splash-proof keypad as shown here:

pH 5+ / pH 6+

Ion 6+

ON / OFF	Powers the meter on and off. Upon power on, the meter automatically begins in the measurement mode that was last used.
MODE MODE / INC	**MODE:** Selects measurement modes (pH, mV, Ion (Ion6+ only), & Temperature). With meter off, press and hold MODE or MODE/INC to access the bUF (buffer), CAL (calibration), and ELE (electrode) setup menus while powering on. Press MODE or MODE/INC again to change setup menus. **INCREMENT**: (INC) for Temperature setting and calibration.

CAL	**CALIBRATE:** Press to begin calibration of the selected mode. Press again during calibration to abort calibration and return to measurement mode without confirming any values. During setup mode, function is similar to “escape” or “go back”, returning to the previous screen. With meter off, press and hold CAL to select the reset menu (rSt) while powering on.
▲	Increase value or scroll up in Setup or Cal modes.
▼	Decrease value or scroll down in Setup or Cal modes.
HOLD / ENTER	**HOLD:** Freezes measured reading—indicated by “**HO**”. Press again to resume live reading. **ENTER:** Confirms values in calibration mode. Confirms selections in setup mode.

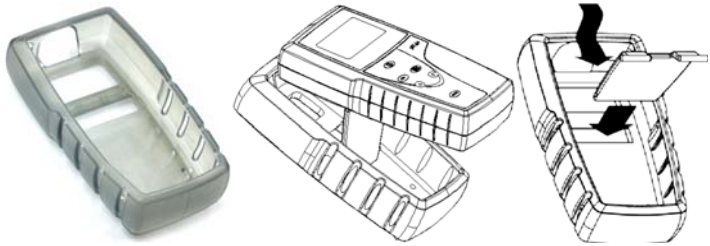
Description of LCD Annunciators

The custom LCD consists of 3½-digit segments which uses annunciators for pH, mV or °C (Temperature). No annunciator is shown in Ion mode. Other annunciators include “**HO**” (when **HOLD** function is activated) and “**LO**” (low battery condition).

Inserting & Removing the Rubber Armor / Stand

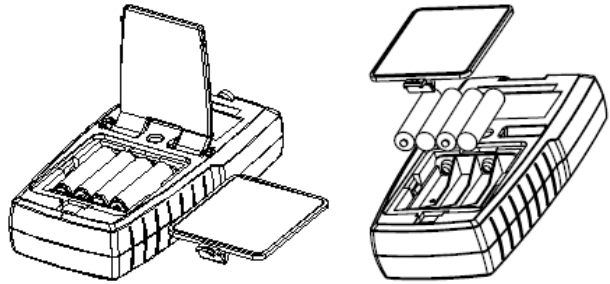
Before removing the meter from the rubber armor, disconnect any electrodes. Push out from the bottom edges of meter until it is completely out of boot.

To insert meter into the armor, slide in from the top of meter before pushing the bottom edges of meter into position. Tilt the stand at the back of meter for table top usage as desired.



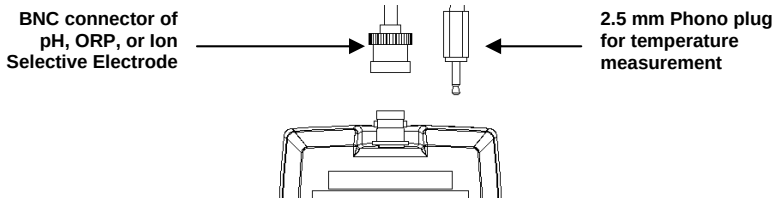
Inserting New Batteries

The "**LO**" annunciator alerts you when battery power is running low. Power off the meter before removing the batteries. After removing the rubber armor, push the battery cover in the direction of the arrow and lift up—no screwdriver is required. Note the polarity of batteries before inserting into position.



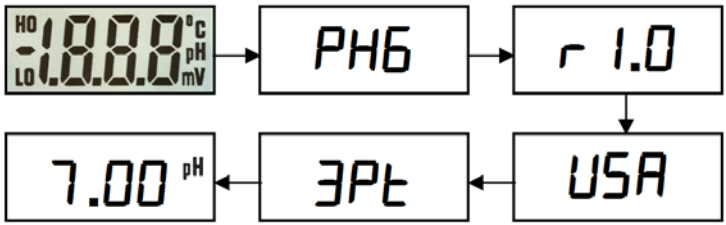
Connecting Electrodes and Temperature Sensor

Align the BNC connector slots with the posts of meter's socket and rotate connector clockwise until it locks—do not force. To remove, rotate the connector in counter-clockwise direction until it unlocks, and slide the connector off the socket. Insert the mini phono jack of temperature sensor into the socket on the meter. Unplug the phono jack to perform measurements without temperature compensation (25° C default).



Powering the Meter On

Press ON/OFF. All LCD segments will display momentarily during the self-diagnostic test, before scrolling the model number, software revision, pH buffer group, and number of pH calibration points selected before returning to the measurement mode:



If a temperature probe is not connected, either 25.0°C (factory default) or the last calibrated temperature value is used. If a temperature probe is connected, the current measured temperature is used.

Note: The Ion 6+ will display " **- - -** " in Ion concentration mode if the meter has not been calibrated or if the meter has been reset. See **Section 3—Ion Calibration**.

"Or" (Over range) and "Ur" (Under range) indicates the reading exceeds the maximum or minimum measurement range. See **Section 6—Specifications**. However, the most likely reason for these error messages is that the electrode is not connected or broken.

3. CALIBRATION

3.1 pH Calibration

The 5+ and 6+ meter is capable of calibrating up to 5 pH values using the USA or NIST buffer groups, or 2 pH values using the Low Ionic buffer group. All new calibration values will automatically override existing calibration data. The non-volatile memory will retain calibration values upon power shut-off, and battery removal.

For best results, periodic calibration with known accurate standards is recommended. Calibrate with standards that bracket your intended measuring range while including a neutral standard (i.e. pH 7.00, 6.86, 6.97). For example, if you expect to measure samples from pH 6.2 to pH 9.5, calibration using 4.01, 7.00, and 10.01 will work well.

To eliminate temperature errors associated with the pH electrode, attach the automatic temperature compensation (ATC) probe for best accuracy. Without temperature compensation, pH accuracy will worsen as samples deviate from 25 ºC and pH 7.

Always rinse electrodes with clean water before and after each calibration or sample measurement to avoid cross-contamination.

The following calibration standards are automatically recognized;

Buffer Group	Available pH Calibration Values
USA (USA)	**1.68, 4.01, 7.00*, 10.01, 12.45**
NIST (nSt)	**1.68, 4.01, 6.86*, 9.18, 12.45**
Pb (Pb)	**4.10, 6.97**

**These are the only values suitable for a one-point calibration*

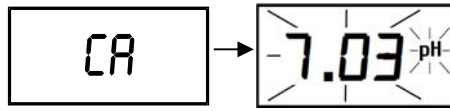
See **Section 3.1—Changing the pH Buffer Group** to select a different buffer group.

Always use fresh pH buffer solutions for calibration. Do not reuse buffer solutions as they change with prolonged exposure to air (especially pH 10 buffer) resulting in decreased measurement accuracy. Promptly seal containers and store solutions in a dark, dry, cool environment.

pH Calibration Procedure

1. Turn on the meter and select pH mode by pressing MODE if necessary.

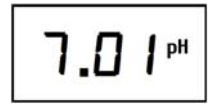
2. Press CAL to begin pH calibration mode. "CA" (calibrate) will display briefly. Notice that the pH reading and "pH" annunciator will both blink.



3. Pour pH buffer calibration standard solution into a clean, dry container and dip your pH electrode and temperature probe in the solution. Swirl gently or stir and wait for reading to stabilize (approx. 30 seconds depending on your electrode condition).

4. When the pH reading has stabilized, the pH annunciator will stop blinking. Press HOLD ENTER to confirm the value. "CO" (confirm) will display briefly. The pH value is automatically adjusted to the buffer value shown from your selected buffer group. The example below shows a successful pH 7.00 calibration at 25 °C.

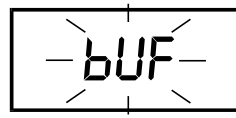
5. For a one-point calibration with pH 7.00 or pH 6.86 only, press CAL to return to measurement mode. However for highest accuracy—perform a multiple-point calibration. Repeat steps 3 & 4 with additional pH buffer calibration standards. When you have completed the preset number of calibration points, the meter will automatically save the calibration, cease blinking, and begin pH measurement.



Q: *My meter, electrode & buffers are new—why does my pH 10 buffer read "10.06"?*
A: *Temperature influences pH. While pH 10 buffer is 10.00 at 25 °C / 77 °F, at 20 °C / 68 °F it is actually 10.06! This is why it is always best to record the temperature as well as the pH reading!*

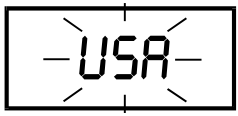
Changing the pH Buffer Group

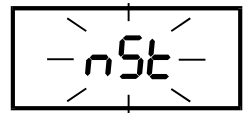
1. Power off the meter while in pH mode. Press and hold MODE then press ON/OFF. If successful, "bUF" will blink on the display. Release both keys.

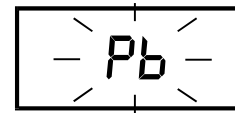


2. Press HOLD/ENTER to enter the buffer group selection mode.

3. Press MODE to toggle between the available pH buffer groups:

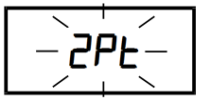


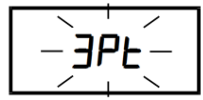


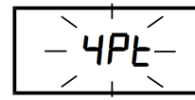


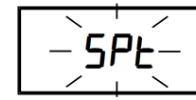
4. Press HOLD/ENTER to confirm the pH buffer group. Note: If Pb is selected, measurement mode will begin. If USA or nSt is selected, proceed to step 5.

5. Press MODE to toggle between the desired number of calibration points (Pt). Note: During pH calibration mode, the meter will automatically complete calibration after the number of points selected here has been completed.









6. Press HOLD/ENTER to confirm the number of calibration points. The meter will automatically begin to measurement mode.

To abort the buffer group selection or go back one step, press CAL.

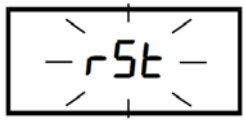
Resetting User Calibrated Values

The meter can be completely reset to factory default values, or partially reset for calibration values only using the procedure below.

Reset Type	Description
No (nO)	No reset is performed; meter returns to measurement
Calibration (CAL)	Reset of either pH, mV, Ion, or Temperature calibration depending on the selected mode*
Factory (FCt)	Reset of all calibration values and user settings to factory default settings

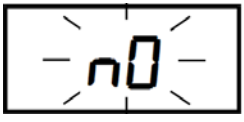
**For calibration reset, measure in the mode that you want to reset prior to step 1 below.*

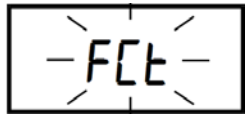
1. Power off the meter. Press and hold CAL then press ON/OFF. If successful," rSt" will blink on the display. Release both keys.



2. Press HOLD/ENTER to enter the reset menu.

3. Press MODE to toggle between No Reset (nO), Calibration Reset (CAL), or Factory Reset (FCt). Press CAL to cancel.





4. Press HOLD/ENTER to confirm the selected reset type. The meter will automatically begin measurement mode.

3.2 Ion Calibration (Ion 6+ only)

Ion measurement requires an ion selective electrode (ISE)—sold separately. An ISE will measure one specific ion of interest—such as ammonia or fluoride.

The available calibration values for the Ion 6+ are 0.1, 1.0, 10.0, 100.0, and 1000 ppm. Choose any 2 or 3 consecutive values to use and prepare the corresponding ion calibration solutions.

Refer to your ion selective electrode manual for important information regarding electrode maintenance, sample preparation, use of calibration standards, and ionic strength adjustment.

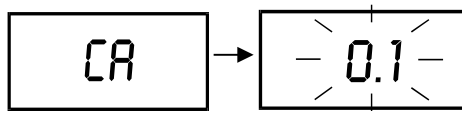
Always rinse electrodes with clean water before and after each calibration or sample measurement to avoid cross-contamination.

The Ion 6+ will show "- - -" when ion calibration is required.

Ion Calibration Procedure (Ion 6+ only)

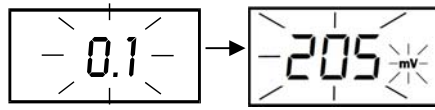
1. Turn on the meter and select ion mode by pressing MODE if necessary. **For best results, begin Ion calibration with your lowest calibration standard and finish with your highest calibration standard value. Ex) 1.0, then 10, then 100.**

2. Press CAL to begin ion calibration mode. "CA" (calibrate) will display briefly. The ion calibration value "0.1" will blink.



3. Dip the ISE into your standard solution. Add ISA if required. Swirl gently or stir. Select the desired ion standard using ▲ to choose a higher standard or ▼ to choose a lower standard. Press HOLD ENTER to confirm the desired standard.

4. The displayed mV reading corresponds to the selected ppm value. Notice that the mV reading and "mV" annunciator will both blink.

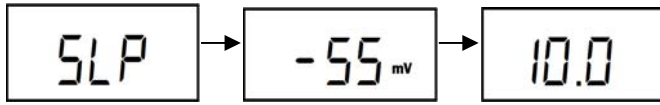


5. When the mV reading has stabilized, the mV annunciator will stop blinking. Press HOLD ENTER to confirm the value. "CO" (confirm) will display briefly. The display will show the next highest calibration standard value. Rinse the electrode with clean water.

6. Repeat steps 3 & 4 & 5 once for a 2-point calibration or twice for a 3-point calibration using additional ion calibration standard(s).

7. Press CAL to complete a 2-point calibration. When a 3-point calibration has been performed, the meter automatically completes the calibration.

8. A successful calibration will show "SLP" (slope) followed by the mV/decade value, the display will cease blinking and begin ion measurement.



Error message "Er2" is displayed if CAL is pressed after only one point calibration has been completed. Recalibrate using minimum of 2 points.

Error message "Er4" is displayed if CAL is pressed when the completed calibration points are not consecutive. Recalibrate with calibration standards that are 1 decade apart from each other.

Error message "Er3" is displayed if the calibration is not successfully stored into memory. This occurs when the slope is <15 mV/decade or >90 mV/decade.

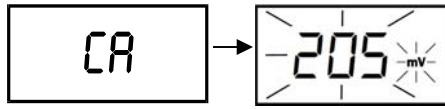
3.3 Millivolt (mV) Calibration (6+ only)

Oxidization Reduction Potential (ORP or Redox) as measured by an ORP electrode in mV units is not a precise measurement, but is useful as a relative indicator. As such, mV offset adjustment is not meant to enhance accuracy, but rather to make readings comparable to a reference.

Commercial ORP solutions are commonly used as a check standard—a meter/electrode system is verified to be close to a given value although adjustments are not made. These solutions can be used as a calibration standard in which adjustments are made in an attempt to match the ORP value, however results are often difficult to reproduce.

1. Turn on the meter and select mV mode by pressing MODE if necessary. Dip the ORP electrode into a solution with a known mV value (e.g. Zobel, Light's, quinhydrone, or iodidetriiodide) and provide brief or slow stirring.

2. Press CAL to begin mV calibration mode. "CA" (calibrate) will display briefly. The un-adjusted mV value will blink.



3. Use MODE INC (pH 6+) or ▲▼ (Ion 6+) to adjust the reading to the desired value. The maximum adjustment is ± 50 mV.

4. When the reading has stabilized, the mV annunciator will stop blinking. Press HOLD ENTER to confirm the value. "CO" (confirm) will display briefly. The meter will automatically save the calibration, cease blinking, and begin mV measurement.

3.4 Temperature Calibration

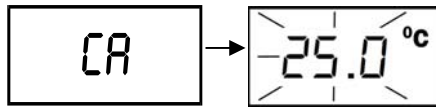
With Temperature Probe (Automatic Temperature Compensation)

The thermistor sensor used for temperature measurement is accurate and stable, so frequent calibration isn't required. Temperature calibration is recommended upon electrode replacement, whenever the temperature reading is suspect, or if matching against a certified thermometer is desired.

If temperature calibration will be performed, be sure that the thermometry source being used as a reference is accurate!

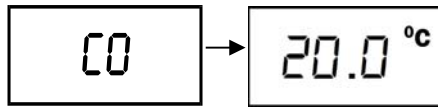
1. Turn on the meter and select °C mode by pressing MODE if necessary. Connect the temperature probe and place it into a solution with a known accurate temperature such as a constant temperature bath or NIST-traceable thermometer. Allow adequate time to stabilize.

2. Press CAL to begin temperature calibration mode. "CA" (calibrate) will display briefly. The un-adjusted °C value will blink.



3. Compare the measured value of the 5+/6+ temperature probe with the reference thermometer. Use MODE/INC (pH 5+ and pH 6+) or ▲▼ (Ion 6+) to adjust the reading to the desired value. The maximum adjustment is ± 5 °C.

4. Press HOLD/ENTER to confirm the value. "CO" (confirm) will display briefly. The meter will automatically save the calibration, cease blinking, and begin °C measurement.



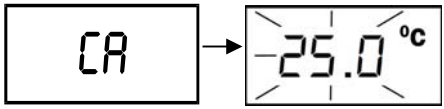
Without Temperature Probe (Manual Temperature Compensation)

If a temperature probe is not connected, the meter compensates for pH response based on the factory default value at 25.0 °C. This default temperature can be manually adjusted using the procedure below.

For nearly all applications however, Automatic Temperature Compensation (ATC) is recommended for best accuracy.

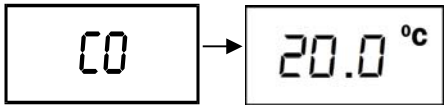
1. Turn on the meter and select °C mode by pressing MODE if necessary. Disconnect the temperature probe.

2. Press CAL to begin temperature calibration mode. "CA" (calibrate) will display briefly. The factory default temperature (25.0 °C value will blink.



3. Use MODE INC (pH 5+ and pH 6+) or ▲▼ (Ion 6+) to adjust the reading to the desired value. The maximum adjustment is ± 0 to 100 °C.

4. Press HOLD ENTER to confirm the value. "CO" (confirm) will display briefly. The meter will automatically save the calibration, cease blinking, and begin °C measurement with the new default temperature.



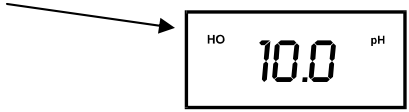
4. MEASUREMENT

Taking Measurements

1. Before measurement, rinse the pH/ORP electrode or Ion Selective Electrode and temperature probe with clean water.
2. Power on the meter. Press MODE key to select your desired mode of operation (pH, mV, Ion, or Temperature).
3. Dip both probes gently into an aqueous test sample, swirl or stir gently and allow the reading to stabilize.

Holding & Releasing a Reading

To freeze or hold a displayed reading, press HOLD ENTER. The "**HO**" annunciator indicates that the **HOLD** function is activated. Press HOLD ENTER again to deactivate the **HOLD** function. The meter reverts to current measurement mode, and the "**HO**" annunciator will disappear.



5. TROUBLESHOOTING

Problem	Cause	Solution
No display	Batteries absent or installed incorrectly	Insert batteries using correct polarity
"**LO**"	Low battery	Replace batteries.
" - - - " on display	Ion 6+ requires calibration	Perform either 2 or 3 point ion calibration
Unstable reading	a) Dry electrode b) Dirty electrode c) Temperature changing	a) Hydrate / soak pH electrode b) Clean electrode c) Allow time for electrodes and solution to stabilize
Not able to calibrate	a) Display freezes b) Faulty electrode c) Inaccurate buffer	a) Release reading by pressing HOLD ENTER. b) Replace electrode. c) Use fresh buffer solutions
Err	mV out of range	Check the probe/ solution
Er 1	Buffer value is out of tolerance	Use new calibration solution & recalibrate. Ensure correct pH buffer group was selected.
Er2	Ion calibration exited after 1 point calibration	Perform at least 2 point ion calibration before exiting. (Ion 6+)
Er3	ISE slope not within the specified tolerance	Re-calibrate. Check Ion Selective Electrode & refer to ISE manual (Ion 6+)
Er4	Ion calibration points are not 1 decade apart	Perform calibration with consecutive values. For example, use 1, 10, & 100 , not 1 & 100 (Ion 6+)
Er5	Upon exit of calibration mode, a 1-point calibration was attempted with a pH buffer other than 7.00 or 6.86.	Repeat pH calibration using one or more points which include either 7.00 (USA) or 6.86 (NIST) standards.
Or	Over range: reading exceeds maximum value	Ensure that the value being measured is within the range of the selected mode. Confirm that electrode(s) are connected and working properly.
Ur	Under range: reading exceeds minimum value	

6. SPECIFICATIONS

Model		pH 5+	pH 6+	Ion 6+
Ion Range	0.01 to 0.99; 1.0 to 199.9; 200 to 1999			✓
Resolution	0.01 / 0.1 / 1			✓
Accuracy	± 1 % full scale			✓
Calibration Points	2 or 3 consecutive points; (0.1, 1.0, 10.0, 100.0, 1000)			✓
pH Range	0.00 to 14.00 pH	✓	✓	✓
Resolution	0.01 pH	✓	✓	✓
Accuracy	± 0.01 pH	✓	✓	✓
Slope Range	80 to 120%	✓	✓	✓
Calibration Points	2 to 5 points	✓	✓	✓
Buffer Groups	1.68, 4.01, 7.00, 10.01, 12.45 (USA) 1.68, 4.01, 6.86, 9.18, 12.45 (NIST) 4.10, 6.97 (Pb)	✓	✓	✓
Temperature Range	0.0 to 100.0 °C	✓	✓	✓
Resolution	0.1 °C	✓	✓	✓
Accuracy	± 0.5 °C	✓	✓	✓
Compensation	Automatic / Manual (0 to 100 °C)	✓	✓	✓
Millivolt Range	-1000 to +1000 mV		✓	
Millivolt Range	-500 to 500 mV			✓
Resolution	± 1 mV; ± 0.1 mV between –200 to 200 mV		✓	✓
Accuracy	± 2 mV; ± 0.2 mV between –200 to 200 mV		✓	✓

Features	
Auto-Buffer Recognition	Yes
Hold Function	"**HO**"
Auto Shut Off	After 17 minutes
Low Battery Indication	"**LO**"
Operating Temperature	0 to 50 °C
Power Requirements	(4) x 1.5V AAA Alkaline Batteries (included)
Battery Life	500 hours
Meter Dim./Weight	15.7 x 8.5 x 4.2 cm / 255 g

7. REPLACEMENTS AND ACCESSORIES

Item Description	Part number Ordering Code	
	Eutech Instruments	Oakton Instruments
pH 5+ with ATC probe	ECPH501PLUS 01X244911	35613-50
pH 5+ with pH and ATC probes	—	35613-52
pH 5+ with pH and ATC probes and solutions in hard carrying case	ECPH502PLUSK 01X244912	—
pH 5+ with pH/ATC probe and solutions in hard carrying case	ECPH503PLUSK 01X244913	35613-54
pH 6+ with ATC probe	ECPH601PLUS 01X245025	35613-20
pH 6+ with pH and ATC probes	—	35613-22
pH 6+ with ATC probe and solutions in hard carrying case	ECPH601PLUSK 01X245028	—
pH 6+ with pH and ATC probes and solutions in hard carrying case	ECPH602PLUSK 01X245026	—
pH 6+ with pH/ATC probe and solutions in hard carrying case	ECPH603PLUSK 01X245027	35613-24
Ion 6+ with ATC probe	ECION601PLUS 01X256409	35613-80
Ion 6+ with pH and ATC probes and solutions in hard carrying case	ECION602PLUSK 01X256410	35613-82
ATC Probe, Stainless Steel, 84 x 3 mm	PH5TEM01P 01X021804	35613-05
pH electrode, plastic, gel-filled, single-junction	ECFC7252101B 01X099412	59001-65
pH electrode, plastic, gel-filled, double-junction	ECFC7252201B 01X099417	35641-51
pH electrode, glass, refillable, double-junction	ECFG7370101B 93X218819	35805-04
pH/ATC electrode, plastic, gel-filled, single-junction	ECFE7352901B 01X218964	35811-71

Item Description	Part number Ordering Code	
	Eutech Instruments	Oakton Instruments
pH/ATC electrode, plastic, gel-filled, double-junction	—	35811-72
ORP electrode, plastic, gel-filled, single-junction	ECFC7960101B 01X256612	59001-75
ORP electrode, plastic, gel-filled, double-junction	ECFC7960201B 01X256613	59001-77
pH 1.68 buffer solution, 480 mL bottle	ECBU1BT	00654-01
pH 4.01 buffer solution, 480 mL bottle (1 pint)	ECBU4BT	00654-00
pH 4.01 buffer sachets, 20 mL x 20 pcs.	ECBU4BS	35653-01
pH 6.86 buffer solution, 480 mL bottle	ECBU686BT	00654-03
pH 7.00 buffer solution, 480 mL bottle (1 pint)	ECBU7BT	00654-04
pH 7.00 buffer sachets, 20 mL x 20 pcs.	ECBU7BS	35653-02
pH 9.18 buffer solution, 480 mL bottle	ECBU918BT	00654-07
pH 10.01 buffer solution, 480 mL bottle (1 pint)	ECBU10BT	00654-08
pH 10.01 buffer sachets, 20 mL x 20 pcs.	ECBU10BS	35653-03
pH 12.45 buffer solution, 480 mL bottle	ECBU12BT	00654-12
pH 4.01, 7.00, & 10.01 buffer pack, 480 mL bottles	—	05942-10
Electrode Storage Solution	ECRE005	00653-04
Electrode Cleaning Solution	ECDPCBT	00653-06

8. WARRANTY

This meter is supplied with a warranty against significant deviations in material and workmanship for a period of **THREE** years from date of purchase whereas probe with a **SIX** month warranty.

If repair or adjustment is necessary and has not been the result of abuse or misuse within the designated period, please return – freight prepaid – and correction will be made without charge. Eutech Instruments will determine if the product problem is due to deviations or customer misuse.

Out of warranty products will be repaired on a charged basis.

Exclusions

The warranty on your instrument shall not apply to defects resulting from:

- Improper or inadequate maintenance by customer
- Unauthorized modification or misuse
- Operation outside of the environment specifications of the products

9. RETURN OF ITEMS

Authorization must be obtained from our Customer Service Department or authorized distributor before returning items for any reason. A “Return Goods Authorization” (RGA) form is available through our authorized distributor. Please include data regarding the reason the items are to be returned. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Eutech Instruments will not be responsible for damage resulting from careless or insufficient packing. A restocking charge will be made on all unauthorized returns.

NOTE: Eutech Instruments Pte Ltd reserves the right to make improvements in design, construction, and appearance of products without notice.

For more information on our products, please contact our channel partner or visit our websites listed below:

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