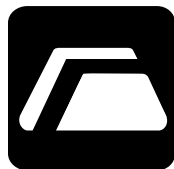


NEO-2 Meter

User's Guide



MesaLabs

Part No. 11.9050 Rev. C

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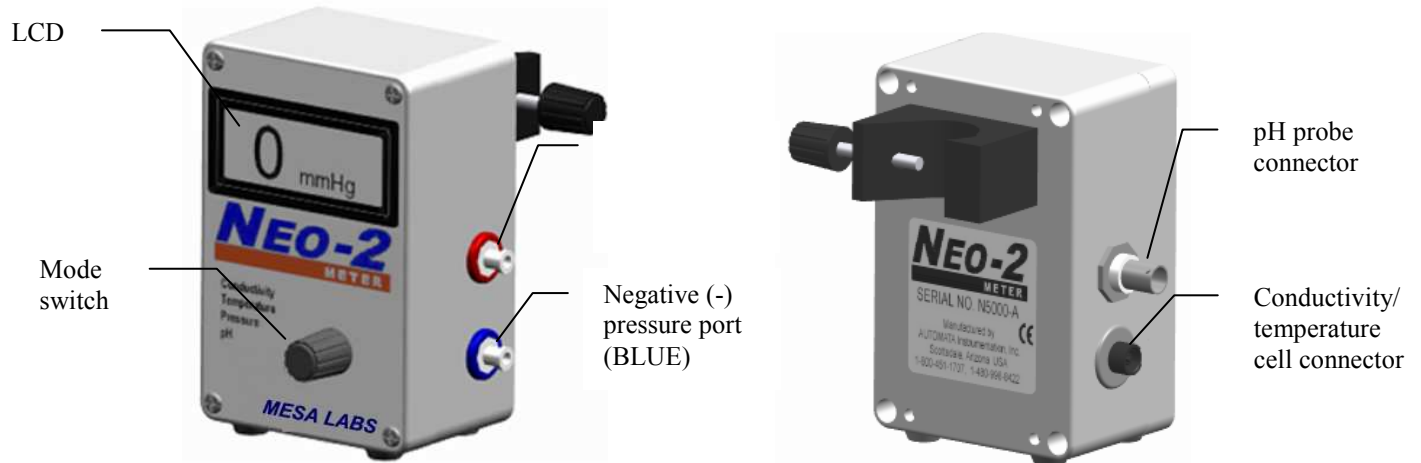
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Product Overview

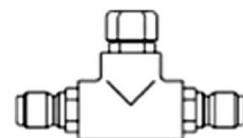
The NEO-2 Meter is a precision test instrument that measures conductivity, temperature, pressure, and pH of liquids. The measurement system is composed of a base unit, a conductivity/temperature cell, pressure sensor and a pH probe (optional accessory). The base unit contains electronic circuitry, a differential pressure transducer, mode switch, liquid crystal display (LCD), and a 9-volt battery. The conductivity/temperature cell and pH probe connect to the base unit with cables. Positive and negative pressure ports are located on the side of the base unit.



Conductivity/Temperature Cell



pH Probe



In-line pH adapter

Applications for Use

The NEO-2 Meter may be used by hemodialysis personnel to test conductivity, temperature, pressure, and pH of the dialysate solution used with hemodialysis delivery systems. The NEO-2 Meter may also be used to test the pH and conductivity of acid and sodium bicarbonate dialysate concentrates and water used in hemodialysis applications.

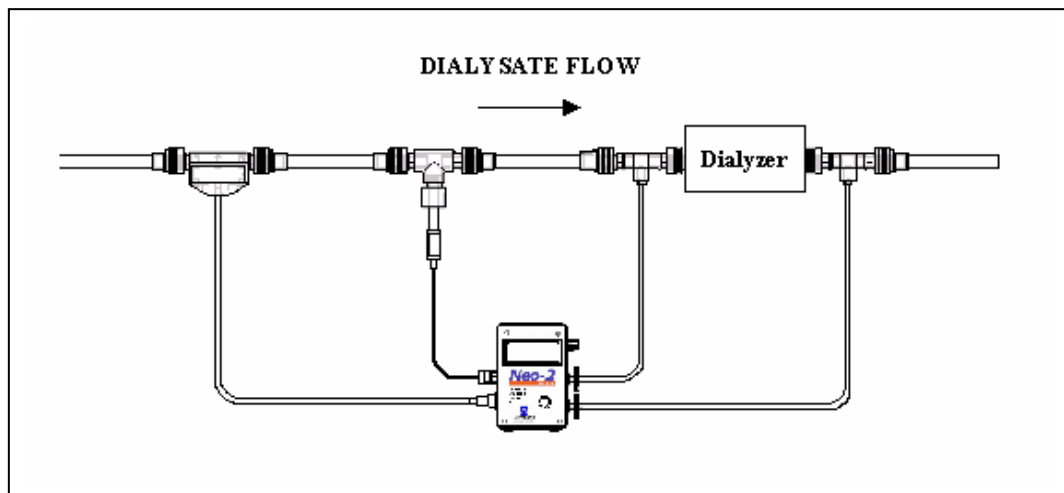
Principles of Operation

Conductivity and temperature measurements are taken as solution flows through the conductivity/temperature cell. Differential pressure measurements are taken using an in-line adapter that uses plastic tubing to connect to the positive and negative pressure ports. pH measurements may be taken using an in-line adapter attached to the dialysate line or by directly inserting the pH probe into solution. Each measurement may be taken independently of another or simultaneously.

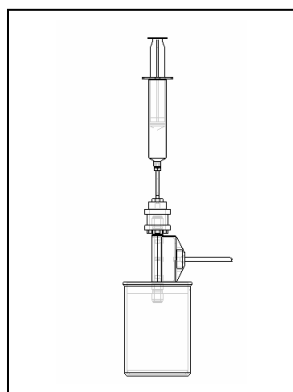
Measurements are shown on the display. The user may view the desired parameter by rotating the mode switch. The scroll feature displays readings sequentially without user interaction. User prompts guide the user through the calibration process.

A liquid may be tested using one of the following methods:

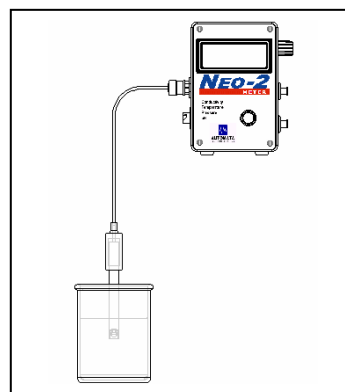
In-line Setup for Hemodialysis Delivery Systems



(Conductivity/temperature, pressure, and/or pH)



Sampling
(Conductivity/
temperature)



Dip
(pH)

Cautions and Storage

Cautions

Verify accurate function of your test instrument before taking measurements or whenever inaccurate readings are suspected.

When calibrating your instrument, use a standard that is traceable to the National Institute of Standards and Technology (NIST) or an equivalent standards organization.

For conductivity calibration, use sodium chloride (NaCl) standard solution. The NEO-2 Meter is temperature-compensated for sodium chloride (NaCl) solution. Using other solutions, such as potassium chloride (KCl) may result in inaccurate calibration.

Do not use the NEO-2 Meter in place of the hemodialysis delivery system's primary sensors, controls, and/or monitors.

DO NOT use the NEO-2 Meter to test the hemodialysis delivery system while a patient is being dialyzed.

DO NOT submerge your instrument in liquids. DO NOT allow liquids to enter the enclosure or the measurement cell connectors.

Always use clean, dry transducer protectors on the pressure ports to prevent liquids from entering the instrument and damaging the pressure transducer.

Do not use abrasive cleaning agents and/or full strength bleach or acid to clean the base unit or cells as this will cause damage.

Federal law restricts the use of this device to sale by or on the order of a physician.

Storage

Conductivity/temperature cell: Rinse the cell interior thoroughly with reverse osmosis (RO) water before storing.

pH Probe: Rinse thoroughly with RO water and store with 4.00 pH buffer solution in In-Line Fitting. Cap both ends with the caps provided.

Store your instrument away from extreme temperatures.

Keep the original packaging in the event the instrument must be returned for service.

Taking Measurements

Instrument modes: conductivity, temperature, pressure, pH, and calibration are capitalized and enclosed in [BRACKETS].

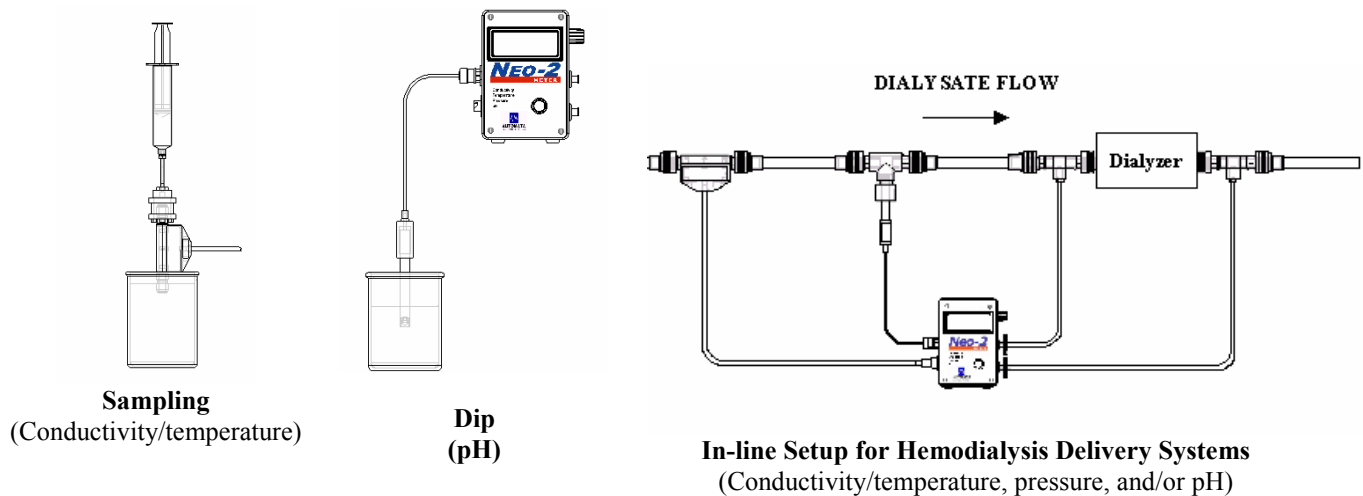
Display symbols and user prompts are capitalized and enclosed in "QUOTATIONS."

Click means to press and release the mode switch once.

CAUTION: Verify calibration of your instrument before each use. See "Instrument Calibration" if calibration is needed.

DO NOT use the NEO-2 Meter to test the hemodialysis delivery system while a patient is being dialyzed.

- 1) Connect the desired cell and/or adapters to the instrument. Choose one of the following methods:



- 2) Click the mode switch twice to turn the meter on. It will turn on in the mode last used. Select the desired parameter by rotating the mode switch in either direction. Take readings when the readings stabilize.
- 3) To manually turn the meter off, press and hold the mode switch for 3 seconds. Otherwise, it will turn off automatically after 30 minutes to preserve battery life.

To activate the scroll feature: While the meter is on, click the mode switch. "SCROLL" will appear in the upper right corner of the display and the meter will begin scrolling through each mode in this order: conductivity, temperature, pressure, pH. The meter will automatically skip [CONDUCTIVITY] and [TEMPERATURE] if the cell is not connected. To deactivate the scroll feature, press or rotate the mode switch.

- 4) Rinse the cell interior, pH probe, and adapters thoroughly with reverse osmosis (RO) water after use. See "Cautions and Storage" for storage instructions.

Instrument Calibration

Verify accurate calibration of the conductivity, temperature, pressure, and pH functions before use or whenever inaccurate readings are suspected.

To enter [CALIBRATION] mode, turn the meter on and rotate the mode switch until the display reads “CLICK TO ENTER CALIBRATION MODE”. Click the mode switch.

Enter security passcode by rotating the mode switch in either direction. Click the mode switch. (NOTE: Default security passcode is 10. To change the security passcode, refer to “Customizing the Security Passcode” located in this section.)

Select one of the following by rotating the mode switch in either direction: “CONDUCTIVITY”, “TEMPERATURE”, “ZERO PRESSURE”, “POS/NEG PRESSURE”, “7.0 PH”, “4.0 AND 10.0 PH”, “DISPLAY CONTRAST”. “CAL” will appear in the upper right corner of the display.

To exit [CALIBRATION] mode and save your changes, press and hold the mode switch for 3 seconds.

Calibrating Conductivity

Each range must be calibrated separately. Use the appropriate solution for each range as shown in the table below.

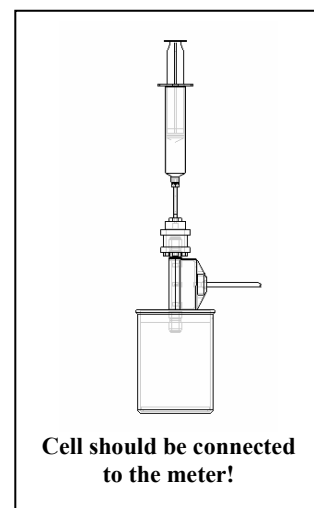
Recommended Standard Solution Values (mS/cm)			
RANGE	.020 to 1.999	2.00 to 19.99	20.0 to 199.9
SOLUTION VALUE	1	14.0	100

CAUTION: Use only sodium chloride (NaCl) standard solution. The NEO-2 Meter's conductivity function is temperature-compensated for NaCl solution. Other solutions, such as potassium chloride (KCl), may result in inaccurate calibration.

You will need:

- ✓ Conductivity standard solution
- ✓ Cell Cleaning Syringe with Female Hansen®-Female Luer Adapter attached
- ✓ Clean, dry container such as a glass beaker (approx. 100 ml) or
- ✓ Sample tray (P/N 303110001 – available from MESA LABS)

- 1) Connect the cell cleaning syringe to either conductivity/temperature cell Hansen® connector.
- 2) Enter calibration mode and select “CONDUCTIVITY”. A value will appear with “CAL” in the upper right corner of the display.
- 3) Rinse the container with the standard solution you will be using to eliminate contaminants. Discard the rinse solution. Pour at least 50 ml of fresh solution into the rinsed container.
- 4) Insert the unattached Hansen® connector into the solution as shown and draw solution through the cell. While solution is flowing and when the reading stabilizes, adjust the reading until it matches the standard solution value.
- 5) Repeat step 4 to confirm that the displayed reading matches the solution value.



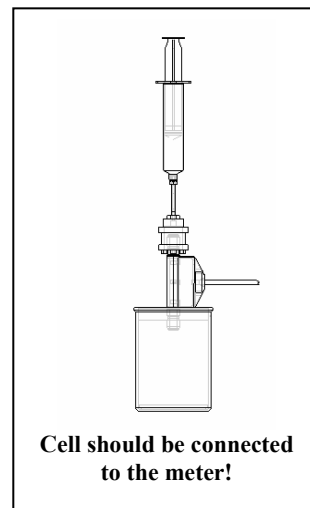
- 6) Repeat steps 3 – 5 for each conductivity range.
- 7) To save your changes, press and hold the mode switch for 3 seconds.

Calibrating Temperature

You will need:

- ✓ NIST-traceable Thermometer with 0.1° C resolution; accuracy ± 0.05 ° C or better.
- ✓ Cell Cleaning Syringe
- ✓ Temperature-controlled, circulating solution bath

- 1) Submerge the thermometer into the solution bath at approximately 25° C and allow reading to stabilize.
- 2) Connect the cell cleaning syringe to either conductivity/temperature cell Hansen[®] connector.
- 3) Enter calibration mode and select "TEMPERATURE". A value will appear with "CAL" in the upper right corner of the display.
- 4) Insert the unattached Hansen[®] connector into the solution as shown and draw solution through the cell. While solution is flowing and when the reading stabilizes, adjust the reading until it matches the thermometer reading.
- 5) Repeat step 4 to confirm that the displayed reading matches the thermometer reading.
- 6) To save your changes, press and hold the mode switch for 3 seconds.



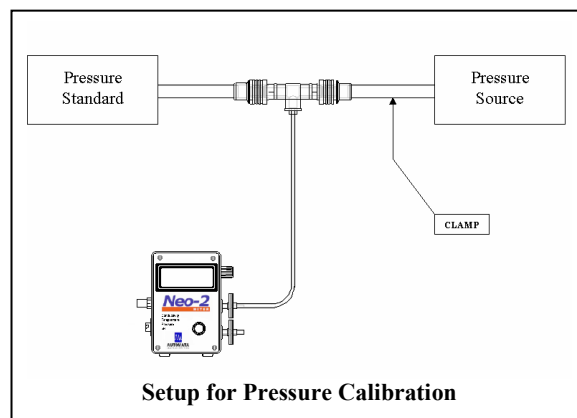
Calibrating Pressure

You will first zero pressure, then calibrate positive/negative pressure as described.

You will need:

- ✓ Mercury manometer or other pressure standard with 1 mmHg resolution; accuracy ± 2 mmHg or better.
- ✓ In-line pressure adapter
- ✓ Pressure source

- 1) Enter calibration mode and select "ZERO PRESSURE". A value will appear with "CAL" in the upper right corner of the display.
- 2) Open both pressure ports to atmosphere. Rotate the mode switch in either direction to automatically adjust to "0". Click the mode switch.
- 3) Rotate the mode switch and select "POS/NEG PRESSURE". A value will appear with "CAL" in the upper right corner of the display.
- 4) Using the in-line pressure adapter, connect the positive pressure port, the pressure standard, and the pressure source as shown.
- 5) Create pressure to +800 mmHg and clamp the pressure source line. Adjust the reading until it matches that of the pressure standard. Remove the clamp to release the pressure.
- 6) Connect the in-line pressure adapter to the negative pressure port and repeat step 5. Note that the NEO-2 will display negative pressure.
- 7) To save your changes, press and hold the mode switch for 3 seconds.



Calibrating the pH Function

pH must be calibrated at three values: 4.0, 7.0, and 10.0.

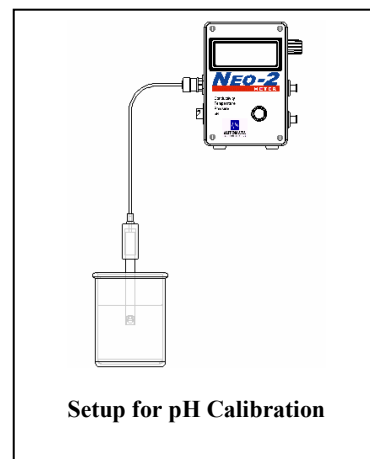
You will need:

- ✓ 7.0, 4.0 and 10.0 pH buffer solutions
- ✓ Container such as a glass beaker (approx. 100 ml) or
- ✓ Sample tray (P/N 303110001 – available from MESA LABS)

For maximum efficiency, prepare three containers with 7.0, 4.0 and 10.0 pH buffer solutions as outlined below before beginning.

Rinse the pH probe with RO water between calibrations with the different pH buffer solutions.

- 1) Unscrew the pH probe from the In-Line fitting.
- 2) Rinse a clean, dry container with 7.0 pH buffer solution. Discard the rinse solution. Pour at least 50 ml of fresh solution into the rinsed container.
- 3) Enter calibration mode and select “7.0 PH”. A value will appear with “CAL” in the upper right corner of the display.
- 4) Insert the pH probe into the solution and stir in a circular motion to thoroughly hydrate the sensing and reference electrodes. When the reading stabilizes, rotate the mode switch in either direction to automatically adjust to “7.0”. Click the mode switch.
- 5) Select “4.0 AND 10.0 PH”. A value will be shown with “CAL” in the upper right corner of the display.
- 6) Rinse a clean, dry container with 4.0 pH buffer solution. Discard the rinse solution. Pour at least 50 ml of fresh solution into the rinsed container.
- 7) Insert the pH probe into the solution and stir in a circular motion to thoroughly hydrate the sensing and reference electrodes. When the reading stabilizes, rotate the mode switch in either direction to automatically adjust to “4.0”. Click the mode switch.
- 8) Repeat steps 5 – 6 with 10.0 pH buffer solution.
- 9) To save your changes, press and hold the mode switch for 3 seconds.



Calibrating Display Contrast

Alter the contrast of the display to allow for easier viewing.

- 1) Enter calibration mode and select “DISPLAY CONTRAST”. A random set of two-digit values will appear with “CAL” in the upper right corner of the display.
- 2) Rotate the mode switch clockwise to lighten the display and counterclockwise to darken the display.
- 3) To save your changes, press and hold the mode switch for 3 seconds.

Customizing the Security Passcode

Change the security passcode to prevent unauthorized calibration. Be sure to write down your security passcode in a secure place for future reference.

You will need:

- ✓ Standard or Phillips® screwdriver

- 1) Turn the meter on and rotate the mode switch until the display reads “CLICK TO ENTER CALIBRATION MODE”. Click the mode switch.
- 2) Loosen all four enclosure screws and carefully remove the front cover.
- 3) Press and hold the white pushbutton located on the back of the circuit board attached to the front cover.
- 4) Rotate the mode switch in either direction until desired security passcode is displayed. Release the pushbutton. The default security passcode “10” will be displayed.
- 5) Rotate the mode switch until the new customized security passcode is displayed. Click the mode switch to enter [CALIBRATION] mode. Press and hold the mode switch for 3 seconds to exit [CALIBRATION] mode and save the new passcode settings.
- 6) Replace the cover. Take care to align the edges of the front and back covers to ensure proper sealing.
- 7) Tighten the housing screws. DO NOT overtighten—this may damage the enclosure.

Resetting to Default Calibration Values

Resetting to default calibration values will initialize **ALL** pH and pressure calibration, display contrast, and security passcode settings.

You will need:

- ✓ Standard or Phillips® screwdriver

- 1) Turn the meter on and rotate the mode switch to the [PRESSURE] mode.
- 2) Loosen all four enclosure screws and carefully remove the front cover.
- 3) Press and hold the white pushbutton located on the back of the circuit board attached to the front cover until two short beeps are heard. Release the pushbutton immediately upon hearing the two short beeps.
- 4) Replace the cover. Take care to align the edges of the front and back covers to ensure proper sealing.
- 5) Tighten the housing screws. DO NOT overtighten—this may damage the enclosure.

Care & Maintenance

Replacement pH probes, accessories, and standard solutions are available from MESA LABS or your local distributor.

Replacing the Battery

When the low battery indicator appears in the upper left hand corner of the display, replace the battery as soon as possible. The instrument will continue to function normally until the battery voltage drops below a critical limit. At that time, the low battery indicator will be shown on an otherwise blank display and the instrument will turn off after 2 seconds. *Instrument functions are inoperable when the low battery indicator is the only symbol displayed!*

To replace the battery:

You will need:

✓ Standard or Phillips® screwdriver

- 1) Loosen all four enclosure screws and remove the front cover.
- 2) Remove the battery and replace it with a fresh 9-volt battery, observing the proper polarity.
- 3) Replace the cover. Take care to align the edges of the front and back covers to ensure proper sealing.
- 4) Tighten the housing screws. DO NOT overtighten—this may damage the enclosure.

Replacing the pH Probe

If the pH probe is stored properly, it will provide several years of trouble-free service. When the stabilization time becomes long, it is time to replace it. Refer to the “Replacement Parts” section.

Cleaning and Disinfecting

Base Unit

Wipe the exterior of the instrument with a soft, damp cloth.

CAUTION: DO NOT submerge your instrument in liquids. DO NOT allow liquids to enter the enclosure or the measurement cell connectors. Do not use abrasive cleaning agents and/or full strength bleach or acid to clean the base unit, conductivity/temperature cell, or pH probe as this will cause damage.

Conductivity/Temperature Cell

When cared for properly, the conductivity/temperature cell has an indefinite lifespan.

Periodic cleaning with a mild bleach solution (1%) or mild acid (such as NEO-CARE or vinegar) will minimize hard deposits and bacteria from forming on the conductivity/temperature cell sensors. *Deposits on the cell sensors may cause inaccurate readings.*

To disinfect, draw a mild bleach solution (comprised of 1 part household bleach and 99 parts RO water) or NEO-CARE Cell Cleaning Solution through the cell using the Cell Cleaning Syringe. Allow it remain in the cell for at least 10 minutes. Rinse thoroughly with RO water.

pH Probe

Wipe with a mild soap solution. Rinse thoroughly with RO water. Store with 4.0 pH buffer solution in the In-Line Fitting capped on both ends to extend the life of the pH reference electrode.

In-line Adapters: Soak in a mild bleach solution for 10 minutes. Rinse thoroughly with water.

Specifications¹

Technical Specifications			
	RANGE	RESOLUTION	ACCURACY
CONDUCTIVITY *	100.0 to 199.9 mS	1.0 mS	± 8% of reading
	20.0 to 99.9 mS	0.1 mS	± 2.0 mS
	2.00 to 19.99 mS	0.01mS	± 0.1 mS
	.020 to 1.999 mS	0.001 mS	± 0.01 mS
TEMPERATURE	10.0° to 90.0 °C	0.1° C	10.0° to 40.0° C: ±0.2° C 41.0° to 90.0° C: ±1.0° C
PRESSURE	Gauge: -700 to +1000 mmHg	1 mmHg	± 5 mmHg
	Differential: -1000 to +1500 mmHg	1 mmHg	± 1% of reading
pH	1.0 to 12.0 pH units	0.1 pH unit	± 0.1 pH unit

*Temperature-compensation: 15° to 45°C.

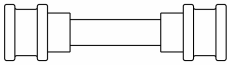
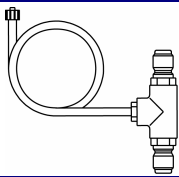
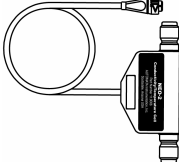
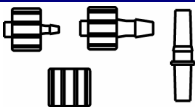
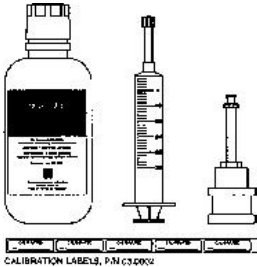
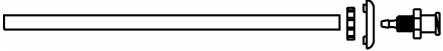
Physical Specifications			
DIMENSIONS	WEIGHT	POWER	BATTERY TYPE
H 4.85" x W 4.1" x D 3.4" 12.3 x 10.4 x 8.6 cm	1.16 lbs./525 g	Battery	9V Alkaline

¹ Specifications are subject to change without notice.

Replacement Parts

The following replacement parts are available from MESA LABS or your local distributor.

Replacement Parts

	Description	Quantity	Part Number
	In-Line Adapter	2	91.0027
	Pressure Adapter	1	91.0031
	Conductivity/Temperature Cell	1	11.9006
	Luer Fittings Kit	5 of each fitting	91.0011
	Cell Cleaning Kit	1	02.0029
	NEO-2 Pressure Port Replacement Kit	1	91.0003-1 (red) 91.0003-2 (blue)
NEO-2 Meter User's Guide		1	11.9050
Sample tray		1	303110001

Solutions



MESA LABS standard solutions are certified traceable to NIST Standard Reference Materials and are sealed with tamper-evident packaging.

TO ORDER, CALL 1-800-992-6372

Outside the USA, Contact your local distributor

Description	Value	Size	Order No.
Conductivity Standard Solution mS/cm at 25°C, Shelf life: 12 months Discard 30 days after opening.	1 mS	16 oz./475 ml	02.0037
	14.0 mS	16 oz./475 ml	02.0014
		32 oz./950 ml	02.0027
	100 mS	16 oz./475 ml	02.0036
pH Buffer Reference Standard Solution ± 0.01 at 25°C Shelf life: 18 months Discard 90 days after opening.	4.00 pH (color-coded red)	16 oz./475 ml	02.0032
	7.00 pH (color-coded green)	16 oz./475 ml	02.0030
		32 oz./950 ml	02.0031
	10.00 pH (color-coded blue)	16 oz./475 ml	02.0034
NEO-CARE Cell Cleaning Solution Gently, yet effectively, removes hard deposits and bacterial filming from cell sensors for greater accuracy and extended instrument life. Non-toxic.		16 oz./475 ml	02.0013
		32 oz./950 ml	02.0028
		1 gallon	02.0003

Ensure Standard Solution Accuracy

- ✓ Keep solutions tightly capped to avoid evaporation.
- ✓ Take measurements immediately after pouring — evaporation will cause errors.
- ✓ **Never, EVER** pour used solution back into the bottle.
- ✓ Discard solution the appropriate number of days after opening the bottle or after the expiration date.

MESA LABS Care and Calibration Stations provide a fast, convenient means for rinsing, disinfecting, verifying, and calibrating your NEO-2 and other meters. One-way check valves prevent evaporation and contamination of your standard solutions while minimizing waste. Used solution is expelled through the check valve to a sink or waste container via a drainage tube. Contact MESA LABS or your local distributor for further details.



4-Bottle TRI-STATION pictured at left.

Single Rinse Station pictured at right.



Limited Warranty

MESA LABORATORIES, INC. warrants to the original purchaser of the NEO-2 METER that it will repair or replace, at its option, any malfunctioning or defective part without charge for the terms listed below. Parts used for replacement are warranted for the remainder of the original warranty period. Mesa Laboratories, Inc. will provide labor without charge to the original purchaser for a warranty repair.

PART WARRANTED	WARRANTY TERM*
NEO-2 Meter	12 months
Conductivity/Temperature Cell	12 months

*from date of original purchase

TO OBTAIN WARRANTY SERVICE, the original purchaser must deliver, at its own expense, the product to MESA LABS at the address below:

Mesa Laboratories, Inc.
12100 W. 6th Avenue
Lakewood, Colorado, USA 80228

RETURN AUTHORIZATION is required for warranty repair.

THIS WARRANTY DOES NOT COVER:

- 1) Disposable items such as the battery or pH probe.
- 2) Routine calibration or cell cleaning.
- 3) Defects caused by:
 - a) modification, alteration, repair or service of the product by anyone other than MESA LABS or an authorized service center
 - b) misuse due to negligence or accident
 - c) operation or maintenance of the product in a manner contrary to the manufacturer's instructions

Any express warranty not provided herein, and any remedy for breach of contract that but for this provision might arise by implication or operation of law, is hereby excluded and disclaimed. The implied warranties of merchantability and of fitness for any particular purpose are expressly limited to the terms mentioned above. Some states do not allow limitations on the duration of an implied warranty, so the above limitation may not apply to you.

Under no circumstances shall MESA LABS be liable to the original purchaser or to any other person for any special or consequential damages, whether arising out of breach of warranty, breach of contract, or otherwise. Some states do not allow the exclusion or limitation of special or consequential damages, so the above exclusion or limitation may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state.

For further warranty information, contact Mesa Laboratories, Inc.

Service and Support

MESA LABS offers full repair and calibration services at its corporate headquarters and authorized service depot locations throughout the world.

DO NOT attempt to repair or modify the instrument, as this will void the warranty. Any service required other than battery replacement or calibration must be referred to MESA LABS, an authorized distributor, or service depot.

Please contact Mesa Laboratories, Inc. for further information.

Write to	Mesa Laboratories, Inc. 12100 W. 6 th Avenue Lakewood, Colorado, USA 80228
Telephone	1-800-992-6372 - Toll-free USA/Canada 1-303-987-8000
Fax	1-303-987-8989
Hours	8:00 am - 5:00 pm, MT, Monday-Friday
E-mail	medservice@mesalabs.com
Website	www.mesalabs.com