

Conductivity probe: Model CDC40101, CDC40103, CDC40105, CDC40110, CDC40115, CDC40130

Safety Information

Precautionary Labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed.



Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user.
Note: For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal.

Overview

Figure 1 on page 2 shows the graphite, 4-pole CDC401 series conductivity probe. The CDC40105, CDC40110, CDC40115 or CDC40130 rugged conductivity probe is available with a 5, 10, 15 or 30 meter cable. The CDC40101 or CDC40103 standard conductivity probe is available with a 1 or 3 meter cable. The conductivity probe provides measurement of electrical conductivity, salinity, resistivity or total dissolved solids (TDS) in wastewater, drinking water and general applications.

Specifications

Specifications are subject to change without notice.

| Specification | Details |
|-------------------------|--|
| Conductivity range | 0.01 $\mu\text{S/cm}$ to 200.0 mS/cm |
| Cell constant | 0.40 $\text{cm}^{-1} \pm 10\%$ |
| Conductivity resolution | 0.0 to 19.99 $\mu\text{S/cm}$: 0.01 $\mu\text{S/cm}$ 20.0 to 199.9 $\mu\text{S/cm}$: 0.1 $\mu\text{S/cm}$ 200 to 1999 $\mu\text{S/cm}$: 1 $\mu\text{S/cm}$ 2.00 to 19.99 mS/cm: 0.01 mS/cm 20.0 to 200.0 mS/cm: 0.1 mS/cm |
| Conductivity accuracy | $\pm 0.5\%$ of reading |
| TDS range | 0 to 50,000 mg/L as NaCl |
| TDS accuracy | $\pm 0.5\%$ of reading |
| TDS resolution | 0.0 to 19.99 mg/L: 0.01 mg/L 200 to 1999 mg/L: 1 mg/L 2.00 to 19.99 g/L: 0.01 g/L 20.0 to 50.0 g/L: 0.1 g/L |
| Salinity range | 0 to 42 (ppt) (‰) |
| Salinity accuracy | ± 1 parts per thousand (ppt) (‰) |
| Salinity resolution | 0.01 parts per thousand (ppt) (‰) |
| Temperature range | -10.0 to 110.0 °C (14 to 230 °F) |
| Storage temperature | 0 to 40 °C (32 to 104 °F) |
| Temperature accuracy | ± 0.3 °C (± 1.09 °F) |
| Minimum sample depth | 45 mm (1.77 in.) |
| Dimensions | Diameter: 14 mm (0.55 in.), Length: 103 mm (4.06 in.), Total length: 220 mm (8.66 in.), Cable length (standard): 1 or 3 meter (3.28 or 9.84 ft); Cable length (rugged): 5, 10, 15 or 30 meter (16.4, 32.8, 49.2, or 98.4 ft) |
| Cable connection | Digital output and connector compatible with HQd meters |
| Warranty | Sensor is covered by a 1 year warranty |

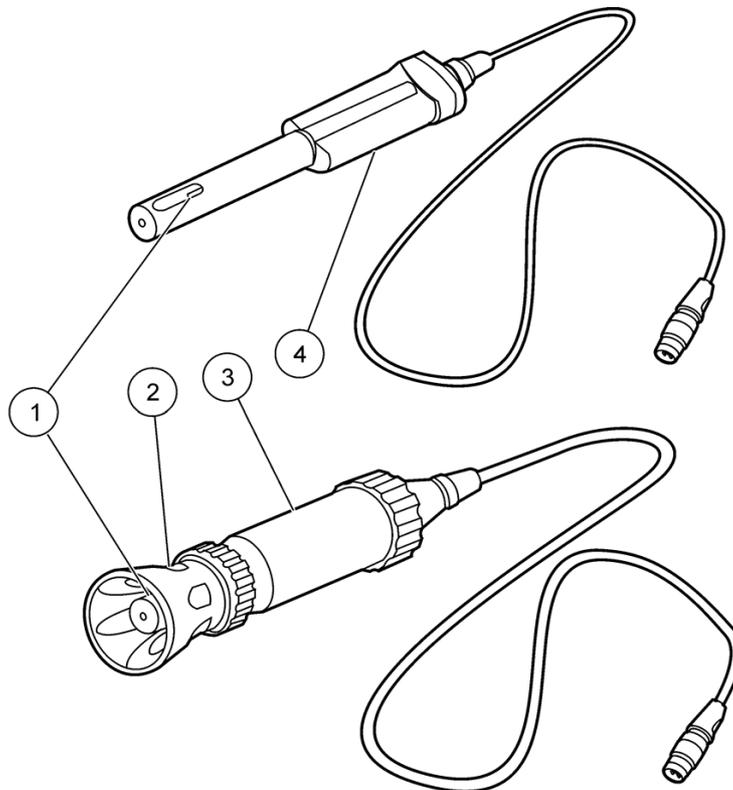


Figure 1 Conductivity probe overview

| | | | |
|---|---|---|---|
| 1 | Temperature sensor and 4-pole graphite design conductivity cell | 3 | Rugged probe (5, 10, 15, or 30 meter cable) |
| 2 | Shroud (rugged model) | 4 | Standard probe (1 or 3 meter cable) |

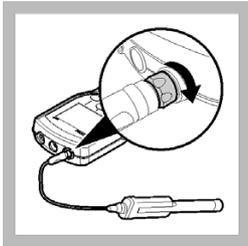
Calibration

Before calibration:

| |
|--|
| The probe must have the correct service-life time stamp. Set the date and time in the meter before attaching the probe. |
| It is not necessary to recalibrate when moving a calibrated probe from one HQd meter to another if the additional meter is configured to use the same calibration options. If the additional HQd meter uses different calibration options (e.g. calibration standards or acceptance criteria), calibrate the probe or change the method settings to select a different method. |
| Tighten the probe locking nut securely when connecting the probe to the meter. |
| The meter will automatically correct the calibration measurement to the selected reference temperature (20 or 25 °C) using the default NaCl-based, non-linear temperature coefficient. Settings can be changed in the CDC401 calibration options. |
| If any two probes are connected, push the UP arrow to change to the single display mode in order to show the Calibrate option. |
| Use the conductivity standard solution on the Calibration screen or change the standard in the CDC401 Calibration Options menu. |
| A new method can be created if custom calibration or measurement settings are desired. |
| Refer to Push EXIT until the meter returns to the measurement mode. on page 9 for calibration errors. |
| Stir gently. Avoid resting the probe on the bottom or sides of the container. |
| Do not dilute conductivity standards and samples. |

Calibration Notes

- Probes are initially calibrated at the factory. However, regular calibration by the user is recommended for the best measurement accuracy.
- The calibration is recorded in the probe and the data log. The calibration is also sent to a PC, printer, or flash memory stick if connected.
- The cell constant is derived from the calibration standard.
- Additional conductivity standards can be selected in the Calibration Options menu.
- Perform a user calibration for applications that require greater accuracy and precision.



1. Connect the probe to the meter.



2. Select **Calibrate**. The display will show the required conductivity standard solution.



3. Rinse the probe with deionized water. Put it in the standard solution so that the temperature sensor is completely submerged.



4. Select **Read**. The display will show **Stabilizing...** and a progress bar as the probe stabilizes.



5. When the value reaches stabilization, the temperature corrected value will display. Push **Done** to view the calibration summary.



6. Push **STORE** to accept the calibration and return to the measurement mode.

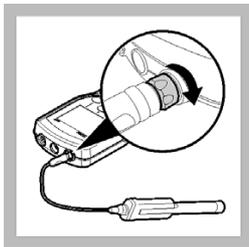
Measurement

Before measurement:

| |
|--|
| The probe must have the correct service-life time stamp. Set the date and time in the meter before attaching the probe. |
| The probe is factory calibrated and ready for use. For applications that require greater accuracy and precision, perform a user calibration (Calibration on page 2). Routine calibrations are required. |
| Tighten the probe locking nut securely when connecting the probe to the meter. |
| If complete traceability is required, enter a sample ID and operator ID before measurement. |
| Refer to Push EXIT until the meter returns to the measurement mode. on page 9 for measurement errors. |
| To display other parameters (TDS, salinity or resistivity), select the CDC401 settings, then select parameter. |
| To deploy the rugged probe at a distance, toss the probe with a gentle underhand throw. Do not swing the probe by the cable as this may cause injury to the user, will cause severe strain on the cable, and will shorten the service life of the probe. Damage under these conditions is not covered by the product warranty. |
| When using the CDC401 probe with the LDO101 probe to perform auto salinity correction, set the CDC401 probe to measure salinity. Refer to the LDO101 probe instruction sheet for complete instructions. |

Measurement notes

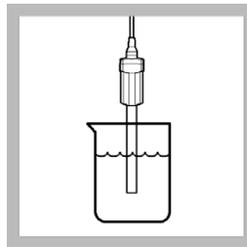
- Data is stored automatically in the data log when **Press to Read** or **Interval** is selected in the Measurement mode. When **Continuous** is selected, data will be stored only when **Store** is selected.



1. Connect the probe to the meter.



2. Rinse the probe with deionized water and blot dry with a laboratory wipe.



3. Put the probe into the sample so that the temperature sensor is completely submerged.



4. Select **Read**. The display will show **Stabilizing...** and a progress bar as the probe stabilizes in the sample.



5. The stabilized value will automatically correct the measurement to the selected reference temperature (20 or 25 °C). Repeat steps 2. and 3. for additional measurements.

Run check standard

The run check standard feature validates instrument performance between sample measurements. Use the run check standard feature for periodic or user-defined interval measurement of a traceable standard solution.

Set the criteria for check standards from the Check Standards Options menu.

Access control must be off or a valid password must be entered before any of the check standard method options can be changed.

1. Select **Run Check Standard** from the Meter Options menu.
2. Obtain the conductivity standard solution specified on the display.
3. Rinse the probe and Put it in the standard solution until the temperature sensor is completely submerged. Move the probe up or down or gently tap on the beaker to remove air bubbles from the electrode.
4. Select **Read**. The display shows the value of the check standard and either Check Standard Passed or Check Standard Failed.

If the display shows **Check Standard Passed**, select **Done** to proceed with sample measurement.

If the display shows **Check Standard Failed**, the measurement is outside of accepted limits defined by the administrative user and a recalibration is suggested. If the acceptance criteria is set to **Cal Expires on Failure: Yes**, the display will show the calibration icon and a question mark until the probe is recalibrated. To correct the probe calibration and status indicator, calibrate the probe ([Calibration on page 2](#)).

Maintenance

Storage

Between uses, make sure the probe is dry and store it in ambient conditions. Rugged probes may be stored with the shroud installed if the storage container is sufficiently large.

Rugged probe maintenance

The shroud protects the sensor elements during rugged applications. Damage to the sensing elements can occur if the shroud is not installed during field use. Damage under these conditions is not covered under warranty. Before a rugged probe can be cleaned, the shroud must be removed. Install the shroud after the probe is clean.

To remove the shroud:

1. Loosen and remove the locking ring.
2. Slide the shroud and locking ring off the electrode.

To install the shroud:

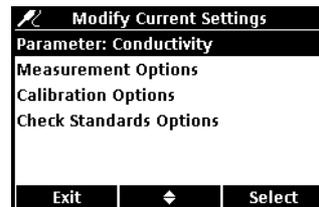
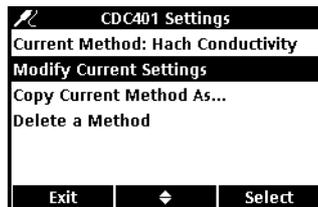
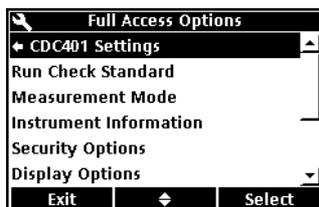
1. Put the locking ring on the electrode with the threads toward the glass bulb.
2. Slide the shroud on the electrode until it is against the locking groove.
3. Hand-tighten the locking ring on the shroud.

Clean the probe

- For general contaminants, rinse the electrode with deionized water and gently wipe dry with a clean cloth.
- For greases and oils, soak the electrode with detergent solution and warm water. Thoroughly rinse the electrode with deionized water and gently wipe dry with a clean cloth.
- For mineral buildup, soak the electrode in a dilute 10% hydrochloric acid (HCl) solution for less than 5 minutes. Thoroughly rinse the electrode with deionized water and gently wipe dry with a clean cloth.

Advanced operation

Parameter-specific settings can be changed through the Full Access Options menu. Details about menu navigation, available options and how to change them are given in the screens, tables and procedures throughout this section.



The settings that can be changed are shown in [Table 1](#).

Table 1 Parameter-specific settings

| Setting | Options |
|------------------------|---|
| Parameter | <ul style="list-style-type: none"> • Conductivity • Salinity • TDS • Resistivity |
| Measurement options | <ul style="list-style-type: none"> • Units • Measurement limits • Temperature correction • Correction factor (if linear temperature correction is selected) • Reference temperature (if a temperature correction is selected) |
| Calibration options | <ul style="list-style-type: none"> • Standard • Calibration reminder • Standard units (if Custom option is selected) • Standard value (if Custom option is selected) • Reference temperature (if Custom option is selected) • Temperature correction (if Custom option is selected) |
| Check standard options | <ul style="list-style-type: none"> • Standard solution for calibration verification • Reminder • Acceptance criteria |

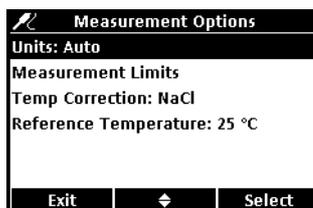
Change measurement options

Methods are groups of default or user defined settings relevant to specific applications. If the meter is set to the default method and the Modify Current Settings option is chosen, the user will be prompted to name the method after changes are entered. The settings are saved with this name to distinguish them from the default method settings, which cannot be changed. The user can then switch to a saved method instead of repeatedly adjusting individual settings. Changes made to a user defined method are automatically saved with the existing name. Multiple methods can be saved for the same probe.

[Table 2](#) lists the five default methods available for the CDC401 conductivity cell.

Table 2 CDC401 default methods

| Setting | Options | Description |
|----------------|-------------------|---|
| Current Method | Hach Conductivity | Default method with conductivity measurement values. Conductivity is typically used for natural water samples. |
| | Hach TDS | Default method with TDS measurement values. TDS is typically used to estimate the amount of total dissolved solids in the sample. Conductivity value will also be displayed in Detailed Reading screen |
| | Hach Salinity | Default method with Salinity measurement values. Salinity is typically used for samples with a high salt content such as sea water. Conductivity value will also be displayed in Detailed Reading screen. |
| | Hach resistivity | Default method with Resistivity measurement values. Resistivity is typically used for ultra pure water applications. |
| | Default | — |



1. Make sure a probe is connected to the meter.
2. Push the **METER OPTIONS** key and select (CDC401) Settings.
3. Select Modify Current Settings.
4. Select Parameter to change the parameter that is shown in the display. Select Measurement Options.
5. Update the settings. Refer to [Table 3](#).

Table 3 Measurement option settings

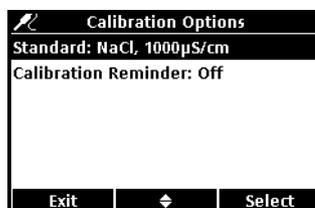
| Setting | Options | Description |
|------------------------|--|---|
| Units—conductivity | Auto (default) µS/cm mS/cm | When auto is selected, the units will automatically change to mS/cm when the sample conductivity is high and µS/cm when the conductivity is low. Select µS/cm or mS/cm to always show the same units. |
| Units—salinity | ‰ (default) g/kg <unitless> ppt (parts per thousand) | Select one of the units for salinity. |
| Measurement limits | Lower limit (default: 0.01 µS/cm; 0 ‰) Upper limit (default: 400000.00 µS/cm; 42 ‰) | The measurement limits can be set to match the acceptable values for the sample. When the measurement is above the upper limit setting or below the lower limit setting, the meter will show an "Out of limits" message. This message is an alert to a potential problem with process conditions. |
| Temperature correction | None Linear NaCl—non-linear (default) Natural water | The conductivity of the sample will change when the temperature changes. Temperature correction will show the conductivity at the user-selected reference temperature. Temperature correction can be changed or turned off when the parameter is set to conductivity, TDS or resistivity. |

Table 3 Measurement option settings (continued)

| Setting | Options | Description |
|---|--------------------------------------|---|
| Correction factor | % per °C (default: 1.90% per °C) | When the temperature correction is set to linear, enter a correction factor based on the sample type. The correction factor may need to be determined experimentally. For example, the factor for ultrapure water vs. a NaCl salt solution is 4.55% vs. 2.125% per °C. |
| Reference temperature | 20 °C 25 °C (default) | When the parameter is set to conductivity, TDS or resistivity, the reference temperature for temperature correction can be changed. |
| TDS form | NaCl (default, factor 0.5) Custom | When the parameter is set to TDS, the conversion factor from conductivity to total dissolved solids can be based on a NaCl solution or on a different solution. To change the factor, select Custom and enter the conversion factor and temperature correction information. |
| Note: Labels and options may vary depending on units selected. | | |

6. If prompted, enter a name for the new method settings. Additional changes made to the settings of an existing method are automatically saved with the same method name.
7. Push **EXIT** until the meter returns to the measurement mode.

Change calibration options



1. Make sure a probe is connected to the meter.
2. Push the **METER OPTIONS** key and select (CDC401) Settings.
3. Select Modify Current Settings.
4. Select Calibration Options.
5. Update the settings. Refer to [Table 4](#).

Table 4 Calibration option settings

| Settings | Options | Description |
|----------|---|--|
| Standard | 1 D KCl, 111.3 mS/cm, 25 °C 0.1 D KCl, 12.85 mS/cm, 25 °C 0.01 D KCl, 1408 µS/cm, 25 °C 0.1 M KCl, 12.88 mS/cm, 25 °C 0.01 M KCl, 1413 µS/cm, 25 °C 0.001 M KCl, 146.93 µS/cm, 25 °C NaCl, 18 mS/cm, 25 °C NaCl, 1000 µS/cm, 25 °C NaCl, 25 µS/cm, 25 °C NaCl, 0.05%, 1015 µS/cm, 25 °C Seawater (S=35) Custom | Options for conductivity calibration standards |

Table 4 Calibration option settings

| Settings | Options | Description |
|------------------------|--|--|
| Calibration reminder | Reminder repeat: Off, 2 h, 4 h, 8 h, 2 d, 5 d, 7 d Expires: Immediately, Reminder + 30 min, Reminder + 1 h, Reminder + 2 h, Continue Reading | Options for calibration reminders |
| Standard units | (For custom calibration standard only) | Set units for custom calibration standard |
| Standard value | (For custom calibration standard only) | Set values for custom calibration standard |
| Reference temperature | (For custom calibration standard only) | Set reference temperature for custom calibration standard |
| Temperature correction | (For custom calibration standard only) | Set temperature correction for custom calibration standard |

6. If prompted, enter a name for the new method settings. Additional changes made to the settings of an existing method are automatically saved with the same method name.

7. Push **EXIT** until the meter returns to the measurement mode.

Troubleshooting

| Message or symptom | Possible cause | Action |
|---|---|--|
| Probe not supported | Software not updated | Update the HQd software to the newest revision at www.hach.com/SoftwareDownloads . |
| | HQd meter does not support IntelliCAL probe. | Contact a Hach Technical Support Representative. |
| Connect a probe or Probe requires service | Conductivity cell not connected properly | Disconnect, then connect the probe. Tighten the locking nut. |
| | Software not updated | Update the HQd software to the newest revision at www.hach.com/SoftwareDownloads . Refer to the HQd Series meter manual. |
| | Large number of methods stored on probe. | Continue to let probe connect. Do not disconnect probe. |
| | Damaged probe | Verify connectivity with another probe or meter to confirm isolated issue with probe. Contact a Hach Technical Support Representative. |
| Slow response time | Mineral or sample buildup on electrodes | Clean the probe as described. |
| Out of range | Temperature and/or pressure sensor error | Verify that both temperature and pressure sensors are reading accurately |
| | Damaged probe | Replace the conductivity probe or contact a Hach Technical Support Representative. |
| | Sample outside of specifications | Verify that the sample concentration and temperature are within the range of the CDC401. |
| Drifting/Inaccurate readings | Incorrect settings | Measurement options: verify that Temp Correction (Correction Factor if not set as NaCl) and reference temperature are correct. |
| | | Calibration options: verify that Standard Value, Reference Temperature and Temp Correction are correct. |
| | Mineral or sample buildup on cell | Clean the probe as described on page 5. |
| | CO ₂ absorption in LIS/high purity samples | Isolate LIS/high purity samples to prevent sample contamination. |
| Calibration failed - Out of limits/Out of range | Incorrect settings | Measurement options: verify that Temp Correction (Correction Factor if not set as NaCl) and reference temperature are correct. |
| | | Calibration options: verify that Standard Value, Reference Temperature and Temp Correction are correct. |

Replacement parts

| Description | Quantity | Item Number |
|---|----------|-------------|
| Conductivity probe, standard with 1 m cable | 1 | CDC40101 |
| Conductivity probe, standard with 3 m cable | 1 | CDC40103 |
| Conductivity probe, rugged with 5 m cable | 1 | CDC40105 |
| Conductivity probe, rugged with 10 m cable | 1 | CDC40110 |
| Conductivity probe, rugged with 15 m cable | 1 | CDC40115 |
| Conductivity probe, rugged with 30 m cable | 1 | CDC40130 |

Accessories

| Description | Quantity | Item Number |
|---|----------|-------------|
| Citizen PD-24 USB handy printer, 120-220 VAC | 1 | 2960100 |
| Color coded probe clips (5 color coded sets) | 10/pkg | 5818400 |
| Glove kit only for HQd meters | 1 | 5828700 |
| Meter stand | 1 | 4754900 |
| Printer paper for PD-24, thermal | 5/pk | 5836000 |
| USB and AC power adapter for HQd meters (included w/HQ40d) | 1 | 5826300 |
| USB keyboard for HQd meters (must have 5826300) | 1 | LZV582 |
| Rugged probe accessories | | |
| Probe depth marker (rugged cable markers) | 1 | 5828610 |
| Rugged field case for 2 probes with up to 5m cables (10 m total) Includes: Empty case and insert for meter and probe storage, (4) containers for sample collection | 1 | 8505500 |
| Rugged field case for three probes with up to 5 m cables (15 m total). Includes same accessories as case 8505500. | 1 | 8505501 |
| Rugged field case for probes with > 5 meter cables (30 m total) Includes: Empty case and insert for meter and two probe storage cavities, space for storage of HQd meter with protective glove | 1 | 8505600 |
| Rugged shroud kit | 1 | 5825900 |
| Standard probe accessories | | |
| Field kit (Includes glove kit and 5 120 mL sample cups) | 1 | 5825800 |
| IntelliCAL probe stand (for standard probes) | 1 | 8506600 |
| Standard probe holder (use with protective glove) | 1 | 5829400 |

Consumables

| Description | Quantity | Item Number |
|--|----------|-------------|
| Certified conductivity standards¹ | | |
| KCl, 1 Demal, 111.3 mS/cm \pm 0.5% at 25 °C | 500 mL | S51M001 |
| KCl, 0.1 Demal, 12.85 mS/cm \pm 0.35% at 25 °C | 500 mL | S51M002 |
| KCl, 0.01 Demal, 1408 μ S/cm \pm 0.5% at 25 °C | 500 mL | S51M003 |
| NaCl, 0.05%, 1015 μ S/cm \pm 0.5% at 25 °C | 500 mL | S51M004 |
| KCl conductivity standards | | |
| 0.1 Molar KCl, 12.88 mS/cm at 25 °C | 500 mL | C20C250 |
| 0.01 Molar KCl, 1413 μ S/cm at 25 °C | 500 mL | C20C270 |
| 0.001 Molar KCl, 148 μ S/cm at 25 °C | 500 mL | C20C280 |
| NaCl conductivity standards | | |
| 25 μ S/cm at 25 °C | 250 mL | S51M013 |

Consumables (continued)

| Description | Quantity | Item Number |
|---|----------|-------------|
| 180 $\mu\text{S/cm}$ at 25 °C | 100 mL | 2307542 |
| 1000 $\mu\text{S/cm}$ at 25 °C | 100 mL | 1440042 |
| 18.00 mS/cm at 25 °C | 100 mL | 2307442 |
| 1990 $\mu\text{S/cm}$ at 25 °C | 100 mL | 210542 |
| 1990 $\mu\text{S/cm}$ at 25 °C | 1000 mL | 210553 |
| Seawater standards | | |
| Seawater standard (S=35), 53 mS/cm at 25 °C | 500 mL | 2714349 |

¹ Certified standards ship with certificates for traceability to Standard Reference Materials

HACH Company World Headquarters

P.O. Box 389

Loveland, Colorado 80539-0389 U.S.A.

Tel (800) -227-4224 (U.S.A. only)

Fax (970) 669-2932

orders@hach.com • www.hach.com

International customers:

Tel +001 (970) 669-3050

Fax +001 (970) 669-2932

intl@hach.com

