



Thermo Scientific™ Orion™ Conductivity Cells

User Guide

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Introduction

DuraProbe™ 4-Electrode Conductivity Cells

Thermo Scientific Orion DuraProbe cells are durable and extremely accurate under a wide range of conditions.

1. DuraProbe conductivity cells 013005MD, 013010MD, 013025MD, 013005A, and 013010A, are epoxy/graphite, have a nominal cell constant of 0.475 cm^{-1} and are intended for field or laboratory use.

Measurement range is 1 $\mu\text{S/cm}$ to 200 mS/cm .

2. DuraProbe conductivity cells 013605MD and 013610MD are epoxy/graphite, have a nominal cell constant of 0.55 cm^{-1} and are intended for field or laboratory use.

Measurement range is 10 $\mu\text{S/cm}$ to 200 mS/cm .

2-Electrode Conductivity Cells

1. 2-Electrode conductivity cells 011010A and 011010 are glass/platinum, have a nominal cell constant of 1.0 cm^{-1} and are intended for laboratory use.

Measurement range is 1 $\mu\text{S/cm}$ – 200 mS/cm .

2. 2-Electrode conductivity cells 011020A and 011020 are glass/platinum, have a nominal cell constant of 0.1 cm^{-1} and are intended for laboratory use and ultra-pure water.

Measurement range is 0.1 $\mu\text{S/cm}$ to 100 $\mu\text{S/cm}$.

3. 2-Electrode conductivity cells 011050MD and 011050 are epoxy/platinum, have a nominal cell constant of 1.0 cm^{-1} and are intended for field or laboratory use.

Measurement range is 1 $\mu\text{S/cm}$ – 20 mS/cm .

4. 2-Electrode conductivity cells 011510MD is epoxy/graphite, have a nominal cell constant of 1.0 cm^{-1} and are intended for field or laboratory use.

Measurement range is 10 $\mu\text{S/cm}$ – 200 mS/cm .

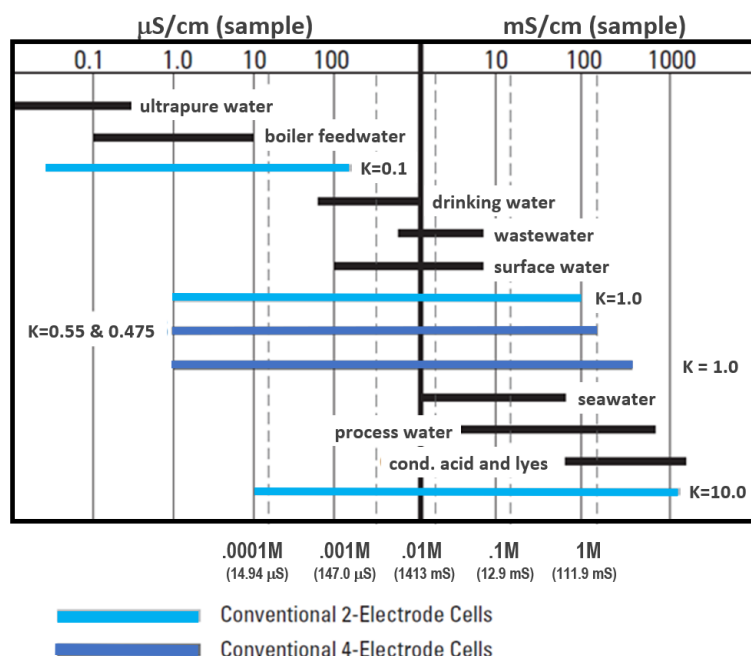
5. 2-Electrode conductivity cell 013016MD is steel (V4A), has a nominal cell constant of 0.1 cm^{-1} and is intended for lab use and ultra-pure water.

Measurement range is 0.01 $\mu\text{S/cm}$ to 300 $\mu\text{S/cm}$.

6. 2-Electrode conductivity cell 018020MD is glass/platinum, has a nominal cell constant of 10 cm^{-1} and is intended for high electrolyte concentration solutions.

Measurement range is 10 $\mu\text{S/cm}$ – 2000 mS/cm .

Sample Ranges



Conductivity measurement units are:

1 mho = 1 S (Siemen) = 1,000 mS = 1,000,000 μS

The figure above represents the general guidelines for choosing a cell by application. Performance characteristics of some cells may vary.

Required Equipment

1. Thermo Scientific benchtop meter such as the Star A112, A212, A215, or Versa Star Pro, or portable meter such as Star A122, A222, A322, A325, or A329.
2. Thermo Scientific Orion conductivity cell.
 - The 013005MD, 013010MD, 013025MD, 0130605MD, 013610MD, 011050MD, 011510MD, 013016MD and 018020MD conductivity cells have a connector that is compatible with the Star Series conductivity meters.
 - The 013005A, 013010A, 011010A, and 011020A conductivity cells have a connector that is compatible with the older 555A, 550A, 162A, 136S, 135A, 131S and 130A conductivity meters.
 - The 011010, 011020, and 011050 conductivity cells have a connector that is compatible with the A+ Series conductivity meters.
3. Conductivity standard solutions (see ordering info).

4. Optional Magnetic stirrer or Orion stirrer probe, Cat. No. 096019 9compatible with benchtop meters).

5. Beakers, plastic or glass.

6. Distilled or deionized water.

Optional Accessories

The following protective guards are available for 013005MD, 013010MD, 013025MD, 013005A, 013010A, 013005D and 013010D conductivity cells:

- Cat. No 013045 - Stainless steel protective guard
- Cat. No. 080045 - Stainless steel and plastic protective guard
- Cat. No. 081045 - Plastic protective guard

Calibration

A conductivity cell is formed by two square electrodes spaced a certain distance apart. The cell constant (K) is defined as the ratio of the distance between the electrodes (d) to the electrode area (A). However, the fringe-field effect (AR) alters the electrode area, therefore $K = d / (A + AR)$. It is normally impossible to measure the fringe-field effect, so the actual cell constant of a conductivity cell is calculated using a standard solution with a known conductivity value. Calibration is essential since the cell constant can vary as much as 10% from the nominal cell constant and the actual cell constant may change over time. Calibration frequency depends on the type of conductivity cell and the application. The most common methods of calibration are manual or automatic calibration.

An automatic calibration (Auto Cal) is performed by entering the nominal cell constant in the meter, immersing the conductivity cell in a Thermo Scientific Orion conductivity standard and initiating the calibration. When the reading stabilizes, the meter displays the calibration standard value at 25 °C. Once the calibration is accepted, the meter calculates and displays the actual cell constant.

To override the autocalibration, you can:

1. Enter the calibration standard value at the measured temperature, or
2. Enter the calibrated cell constant (from the label on the cable or the calibration certificate) through the "cell K" calibration function.

Note: Refer to the meter user guide for detailed calibration instructions.

Conductivity Cell Storage

Conductivity cells can be stored in distilled or deionized water between measurements. For overnight storage or long-term storage, conductivity cells should be thoroughly rinsed and stored dry.

Maintenance

DuraProbe Cleaning Recommendations

Contaminant	Cleaning Solution	Recommended Time
Water soluble contaminants	Rinse with deionized water	No limit
Lubricants and oils	Soak in warm water and liquid detergent	No limit
Lubricants and oils	Soak in ethanol or acetone	No more than 5 minutes
Lime or hydroxide coating	Soak in 10% acetic acid or 10% hydrochloric acid	No limit

2-Electrode Cleaning Recommendations

Contaminant	Cleaning Solution	Recommended Time
Water soluble contaminants	Rinse with deionized water	No limit
Lubricants and oils	Soak in warm water and liquid detergent	10 to 30 minutes
Lubricants and oils	Soak in ethanol or acetone (glass cells only)	10 to 30 minutes
Lime or hydroxide coating	Soak in 10% acetic acid or 10% hydrochloric acid	10 to 30 minutes

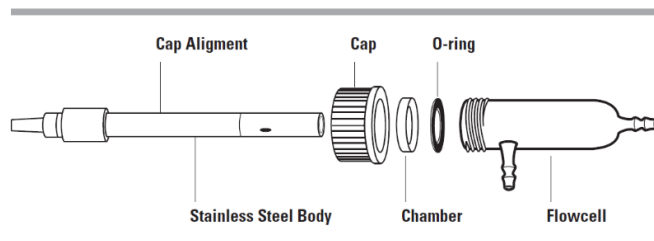
Conditioning

Cell conditioning is recommended to optimize the performance of the 011050MD and 011050 conductivity cells in high range conductivity samples.

1. Pour the conditioning solution, Cat. No. 011001, into a beaker.
2. Soak the conductivity cell in the conditioning solution overnight and up to 72 hours.
3. Remove the cell from the conditioning solution and thoroughly rinse with deionized water.
4. Blot the cell dry with a lint-free tissue.
5. Dispose of the used conditioning solution.

Flow Cell

The 013016MD conductivity cell includes a detachable flow cell, Cat. No. 013017. To ensure a proper seal of the flow cell assembly, slide the cap onto the conductivity cell, then slide the chamber onto the conductivity cell, and finally slide the O-ring gasket onto the conductivity cell. The flow cell can then be placed over the conductivity cell and screwed into the cap. Do not force the conductivity cell into the pre-assembled flow cell; the O-ring will be forced into the flow cell. Plumb the flow cell to flow upward and flow out of the side arm.



Probe Guards

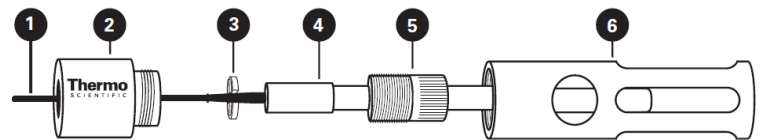
Protective probe guards can be used when conditions require additional protection for the probe or additional weight for submersion. The protective probe guards are intended for use with 013005MD, 013010MD, 013025MD, 013005A, 013010A, and 013030A conductivity cells.

Insert the probe cable (1) into the slot in the clamping ring (3) with the recessed side placed on the top of the probe cap (4). Insert the probe connector into the threaded side of the retainer (2) and pull the cable through the hole until the clamping ring is seated flush in the retainer. Slide the

probe retainer nut (5) over the probe body and screw it into the retainer threads until hand tight. Do not overtighten the probe retainer nut. Screw the probe body sleeve (6) onto the retainer threads until hand tight.

Remove the probe body sleeve (6) by unscrewing it. Remove the probe retainer nut (5) from the retainer (2) by unscrewing it. Slide the probe out of the retainer so that the clamping ring (3) can be removed without obstruction. Continue pulling the probe cable (1) through the retainer, taking care not to lose the clamping ring. Slide the clamping ring away from probe cap (4) and off of the strain relief so that it can easily be removed from the probe cable.

To prevent loss of components, reassemble the protective sleeve before storing the assembly. Note: Do not place excessive force on the probe cable when disassembling as this may damage the cable.



Troubleshooting

The most important principle in troubleshooting is to isolate the components of the system and check each in turn. The components of the system are the meter, conductivity cell, standard and sample.

Meter

The meter is the easiest component to eliminate as a possible cause of error. Thermo Scientific Orion meters include an instrument checkout procedure. Consult the meter user guide for instructions and verify that the instrument operates as indicated.

Conductivity Cell

Rinse the cells thoroughly with distilled water and follow the cleaning procedures in the Conductivity Cell Maintenance section. If readings continue to be erratic and unstable, platinum cells should be replaced.

Standards

The quality of results depends greatly upon the quality of the standards. Always prepare fresh standards when problems arise.

Sample

If the cell works properly in standards but not in the sample, look for possible interferences or substances that could affect the response of the cell or physically damage the cell. If possible, determine the composition of the sample and check for problems.

Customer Services

Warranty Information

Thermo Fisher Scientific warrants to the original purchaser of any new merchandise that all items will be free of defects in material and workmanship for the periods set forth below, when used under specified and normal

operating conditions, in accordance with the operating limitation and procedures given in the instruction manuals, and when not subjected to accident, alteration, abuse or misuse of Thermo Fisher Scientific's products in unspecified applications, for unauthorized procedures, or with third-party products may void the warranty.

Thermo Scientific Orion Conductivity Cells are warranted as follows:

Twenty-four (24) months from date of purchase by Buyer or thirty-six (36) months from date of shipment from Seller, whichever is earlier:

- DuraProbe 4-electrode conductivity cells

Twelve months (12) from date of purchase by Buyer or eighteen (18) months from date of shipment from Seller, whichever is earlier:

- 2-electrode conductivity cells

“Out-of-Box” warranty – should any of the following products fail to work when first used, contact Seller immediately for replacement:

- Lab Solutions
- Lab Standards
- General accessories.

THE WARRANTIES DESCRIBED ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER STATUTORY, EXPRESSED OR IMPLIED. ALL OTHER WARRANTIES OF MERCHANTABILITY AND

FITNESS FOR A PARTICULAR PURPOSE, AND ALL OTHER WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE, EXCEPT TITLE, ARE HEREBY OVERRIDDEN AND EXCLUDED. NO LIABILITY SHALL ATTACH TO THERMO SCIENTIFIC EITHER IN CONTRACT OR IN TORT, FOR ANY PERSONAL INJURY, DEATH, DAMAGE TO PROPERTY, LOSS OF PROFITS, DAMAGES, COSTS, CHARGES, LIABILITIES OR EXPENSES, WHETHER DIRECT OR INDIRECT, CONSEQUENTIAL OR OTHERWISE, WHICH ARISE OUT OF OR IN CONJUNCTION WITH THE SALE OR USE OF THIS PRODUCT.

The customer's sole and exclusive remedy is the return of defective components or sub-assemblies to Thermo Fisher Scientific for repair or replacement or, at Thermo Fisher Scientific's option, refund of the purchase price.

Warranty Shipments/Returns/Adjustments

A warranty claim must be made promptly and must be received during the applicable warranty period by Thermo Fisher Scientific or your authorized Thermo Fisher Scientific distributor. If it becomes necessary to return a product for repair and/or adjustment, prior authorization from Thermo Fisher Scientific or your Thermo Fisher Scientific- authorized distributor must be obtained. Instructions as to how and where these products should be shipped will be provided by Thermo Scientific or your Thermo Scientific-authorized distributor.

Any product or component returned for examination and/or warranty repair shall be sent to Thermo Fisher Scientific in MA, or any of their authorized representatives. All items must be returned at the customer's cost (freight prepaid), quoting a return authorization number that is available from the Service department. All products or components repaired or replaced under warranty will be returned to the customer at Thermo Fisher Scientific's cost using UPS (United Parcel Service) or an equivalent service.

In all cases, Thermo Fisher Scientific or your Thermo Fisher Scientific-authorized distributor has sole responsibility for determining the cause and nature of failure, and Thermo Fisher Scientific's or the distributor's determination with regard thereto shall be final.

All parts that are replaced under warranty will become the property of Thermo Fisher Scientific.

Replacement Parts

Replacement parts can be ordered from Thermo Fisher Scientific or your Thermo Fisher Scientific-authorized distributor. Use only Thermo Fisher Scientific products or Thermo Fisher Scientific-approved products. Thermo Fisher Scientific shall not be liable for damage to or malfunction of the system, which it deems was caused by the use of unauthorized materials.

Assistance

For any questions or if you require assistance, contact our Technical Support Specialists:

- Email WLP.techsupport@thermofisher.com
- Within the United States, call 1-800-225-1480
- Outside the United States, call +1-978-232-6000

For additional product information, contact your local authorized dealer, Thermo Scientific Orion technical sales representative or contact us using the WLP information as it may appear on the page back of this user manual.

Visit www.thermofisher.com to view Thermo Scientific Orion products and download product literature, user manuals and manuals, software updates, and additional application and technical resources.

Probes and Accessories



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Great Britain



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Deutschland



Conformità WEEE. Questo prodotto deve rispondere alla direttiva dell'Unione Europea 2012/19/EU in merito ai Rifiuti degli Apparecchi Elettrici ed Elettronici (WEEE). È marcato col seguente simbolo. Thermo Fisher Scientific ha stipulato contratti con una o diverse società di riciclaggio/smaltimento in ognuno degli Stati Membri Europei. Questo prodotto verrà smaltito o riciclato tramite queste medesime. Ulteriori informazioni sulla conformità di Thermo Fisher Scientific con queste Direttive, l'elenco delle ditte di riciclaggio nel Vostro paese e informazioni sui prodotti Thermo Fisher Scientific che possono essere utili alla rilevazione di sostanze soggette alla Direttiva RoHS sono disponibili sul sito thermofisher.com/WEEERoHS.

Italia



Conformité WEEE. Ce produit doit être conforme à la directive euro-péenne (2012/19/EU) des Déchets d'Equipements Electriques et Electroniques (DEEE). Il est marqué par le symbole suivant. Thermo Fisher Scientific s'est associé avec une ou plusieurs compagnies de recyclage dans chaque état membre de l'union européenne et ce produit devrait être collecté ou recyclé par celles-ci. Davantage d'informations sur la conformité de Thermo Fisher Scientific à ces directives, les recycleurs dans votre pays et les informations sur les produits Thermo Fisher Scientific qui peuvent aider la détection des substances sujettes à la directive RoHS sont disponibles sur thermofisher.com/WEEERoHS.

France



Ordering Information

Refer to the Introduction section for a complete list of conductivity cells.

Product	Qty 10 Pouches	Qty 25 Pouches	Qty 5 60 mL bottle	Qty 1 475 mL bottle
Conductivity Standards				
84 µS/cm conductivity/TDS std.	---	---	---	---
100 µS/cm conductivity/TDS std.	---	---	011008	---
147 µS/cm conductivity std.	01100910	---		---
1413 µS/cm conductivity/TDS std.	01100710	---	011007	---
12.9 mS/cm conductivity/TDS std.	01100610	---	011006	---
111.9 mS/cm conductivity std.	01100510	---	011005	---
DI Water Rinse Pouches	911110	911125	---	---
0.1 M KCl conductivity std	---	---	---	990106
Conditioning solution for 011050/011050MD cells	---	---	---	011001
Conductivity Maintenance – Lab Solutions and Accessories				
Conductivity calibration resistor kit for Orion Star Series conductivity meters, 8 pin MiniDIN connection				1010001
Replacement flow cell				013017
Plastic protective cell guard				081045

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Germany: (49) 6184-90-6321 **India:** (91) 22-6716-2261/2247 **Japan:** (81) 045-453-9175

North America: 1-978-232-6000 Toll Free: 1-800-225-1480 **Singapore:** (65) 6778-6876



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Orion Conductivity Cell Specifications



Conductivity testing in the lab and in the field

Measuring conductivity is essential to your workflow, as it measures the ability to pass electrical flow formed by the concentration of ions. We offer an extensive line of meters, probes, standards, and measurement accessories designed to make your conductivity measurements accurate and reliable.

- built-in temperature compensation
- high, standard, and low conductivity measuring ranges,
- cell constants from 0.1 to 10 cm^{-1} , and
- various probe materials including epoxy/graphite, glass/platinum, and stainless

Specifications					
Cat No.	Description, Cable Length	Range	Nominal Constant	Material	Application
013005MD	4-Cell Rugged DuraProbe, 1.5 m	1 μS .. 200 mS/cm	0.475 cm^{-1}	EP/GPH	Field and Lab, widest range, rugged epoxy/graphite
013010MD	4-Cell Rugged DuraProbe, 3 m	1 μS .. 200 mS/cm	0.475 cm^{-1}	EP/GPH	Field and Lab, widest range, rugged epoxy/graphite
013025MD	4-Cell Rugged DuraProbe, 10 m	1 μS .. 200 mS/cm	0.475 cm^{-1}	EP/GPH	Field and Lab, widest range, rugged epoxy/graphite
013005A	4-Cell Rugged DuraProbe, 1.5 m	1 μS .. 200 mS/cm	0.475 cm^{-1}	EP/GPH	Field and Lab, widest range, rugged epoxy/graphite
013010A	4-Cell Rugged DuraProbe, 3 m	1 μS .. 200 mS/cm	0.475 cm^{-1}	EP/GPH	Field and Lab, widest range, rugged epoxy/graphite
013605MD	4-Cell DuraProbe, 1.5m	10 μS .. 200 mS/cm	0.55 cm^{-1}	EP/GPH	Field and Lab, wide range, rugged epoxy/graphite
013610MD	4-Cell DuraProbe, 1.5m	10 μS .. 200 mS/cm	0.55 cm^{-1}	EP/GPH	Field and Lab, wide range, rugged epoxy/graphite
011010A	2-Cell ChemResistant, 1m	1 μS .. 200 mS/cm	1.0 cm^{-1}	GL/Pt	Chem resistant Lab, standard range for lab applications
011010	2-Cell ChemResistant, 1m	1 μS .. 200 mS/cm	1.0 cm^{-1}	GL/Pt	Chem resistant Lab, standard range for lab applications
011020A	2-Cell Platinized, 1m	0.1 μS .. 100 mS/cm	0.1 cm^{-1}	GL/Pt	Platinized Lab, low conductivity range, ultrapure water

Find out more at thermofisher.com/water

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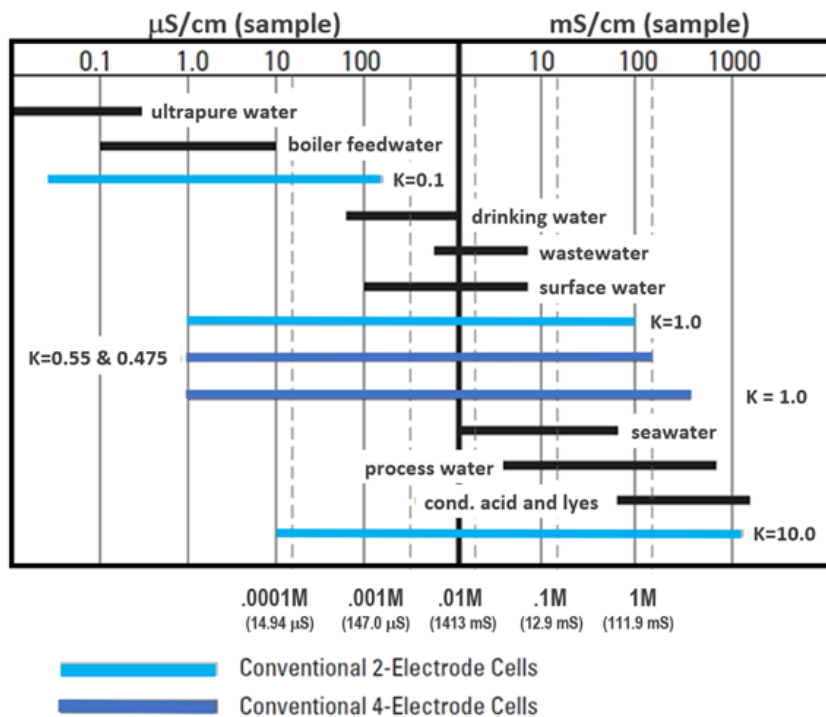
Specifications (continued)					
Cat No.	Description, Cable Length	Range	Cell Constant	Material	Use
011020	2-Cell Platinized, 1m	0.1 μ S .. 100 mS/cm	0.1 cm^{-1}	GL/Pt	Platinized Lab, low conductivity range, ultrapure water
011050MD	2-Cell Precise, 1.5m	1 μ S .. 20 mS/cm	1.0 cm^{-1}	EP/Pt	Precise Lab and field applications, standard range
011050	2-Cell Precise, 1.5m	1 μ S .. 20 mS/cm	1.0 cm^{-1}	EP/Pt	Precise Lab and field applications, standard range
011510MD	2-Cell Rugged, 3m	10 μ S .. 200 mS/cm	1.0 cm^{-1}	EP/GPH	Rugged Field and Lab, standard range
013016MD	2-Cell Ultrapure, 1.5m	0.01 .. 300 μ S/cm	0.1 cm^{-1}	SS/V4A	Ultrapure Water, includes Glass Flow Cell Assembly
018020MD	2-Cell High Range, 1.5m	10 μ S .. 2000 mS/cm	10 cm^{-1}	GL/Pt	Lab High Conductivity Range Flow through or dip cell

Notes:

- EP – Epoxy Body
- GL – Glass Body
- GPH – graphite cell
- Pt – Platinum cell
- V4A – V4A stainless steel cell material

Cell Constants are nominal and should be verified with standards traceable to NIST using the instructions listed in the meter user guide.

Cell Selection – Sample Conductivity range



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