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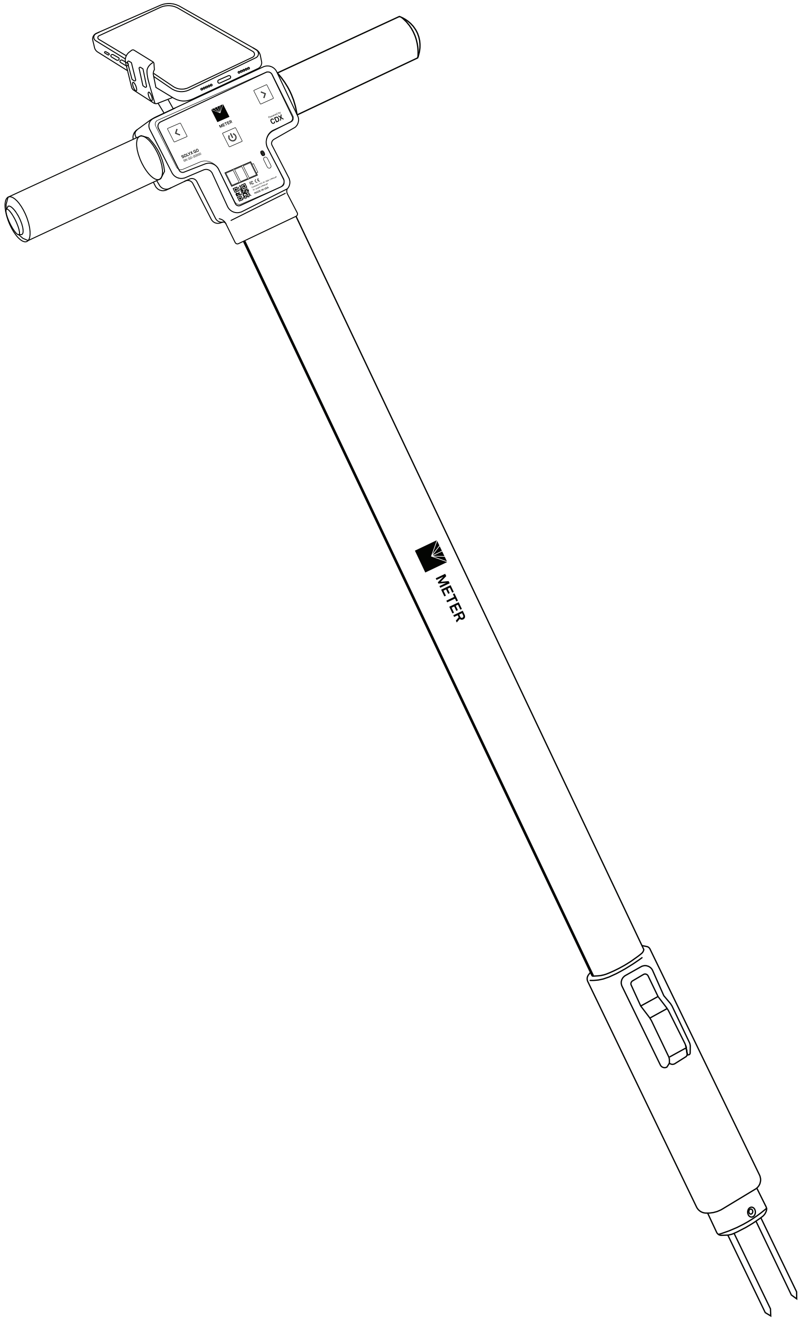
METER
CDX
METER

1. INTRODUCTION

Thank you for choosing the SOLYX GO from METER Group. This user manual provides SOLYX GO complex dielectric sensor information for operation, maintenance, and theory.

Unlike other METER sensors, this tool is designed to be a maintenance-free, yet portable, complex dielectric sensor for collecting measurements of volumetric water content (VWC), temperature, and electrical conductivity (EC) around a playing surface, municipal park or research field. The SOLYX GO can be used in minerals soils, many types of growing media, and other porous materials. Monitoring capabilities include volumetric water content (VWC), temperature, and EC. VWC and EC are determined using complex dielectric technology. The sensor uses a 70-MHz frequency, which minimizes textural and salinity effects, making the SOLYX GO accurate in most mineral soils. A thermistor is used to measure temperature.

Use this manual to learn about sensor features and for descriptions of how to use the sensor successfully. METER recommends taking a few test measurements with the sensor using the SOLYX GO app (Section 2.2) before going to the field.

Prior to use, verify the SOLYX GO arrived in good condition:

- SOLYX GO CDX sensor
- Wall mount
- Power adapter and cable
- Lightning adapter for iPhone 14 and older
- Wear gauge

2. OPERATION

Please read all instructions before operating the SOLYX GO to ensure it performs to its full potential.

⚠ PRECAUTION

METER sensors are built to the highest standards, but misuse, improper protection, or improper installation may damage the sensor and possibly void the manufacturer's warranty. Before integrating SOLYX GO into a system, make sure to follow the recommended installation instructions and have the proper protections in place to safeguard sensors from damage. If using sensors in a lighting-prone area, do not attempt measurements with active lightning.

2.1 INSTALLATION

Follow the steps described below to start using the SOLYX GO and collecting data.

UNBOXING THE SOLYX GO

The SOLYX GO is shipped partially charged. Remove from the box and press the power button to check the unit is working. The Bluetooth light should be blinking and battery level indicator lights illuminated.

Once in use, monitor the battery level on the device or in the SOLYX GO app. Charge by plugging into a wall outlet.

NOTE: The SOLYX GO has the ability to provide power to the phone used to take readings; however the battery will require more frequent charging when using this feature.

DOWNLOAD THE SOLYX GO APP

The SOLYX GO App (powered by USGA DEACON) is required to use the SOLYX GO. Download the SOLYX GO mobile app for IOS or android by searching SOLYX GO in the mobile app store, or using the QR Code.

CONTROL PANEL OVERVIEW

Press the power button to turn on the SOLYX GO (Figure 1). Press and hold power button to turn off. Check the battery level light indicator to determine when charging is necessary (battery level can also be checked on the SOLYX GO app).

The Bluetooth indicator light will blink when it is ready to pair and will be constant when paired (see Section 2.2 for detailed pairing instructions).

The **Take Reading** buttons both start a reading. Use whichever one is preferred (designed for left- or right-handed ease of use).

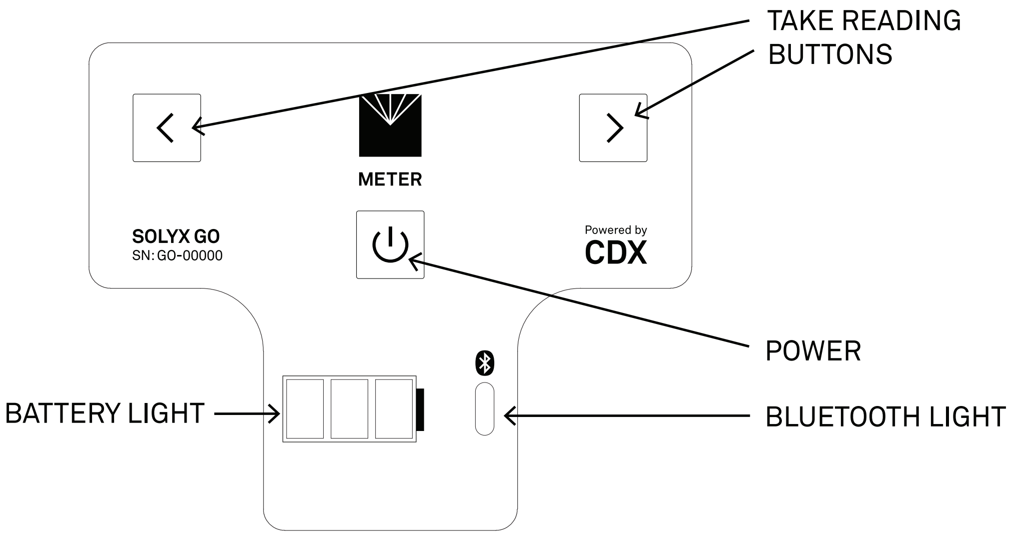

Figure 1 Control panel overview

CONNECTING THE SOLYX GO TO ZENTRA CLOUD

The SOLYX GO requires a ZENTRA Cloud 2.0 account with an organization set up within the account in order to take readings and upload those readings to ZENTRA Cloud. Create a ZENTRA Cloud 2.0 account by going to app.zentracloud.io.

Detailed instructions to get started are provided at, docs.zentracloud.io/l/en/article/4rzmtkxn5i-create-account, and in brief below:

1. Sign up
    a. Open a browser and go to app.zentracloud.io
    b. Select the **Sign Up** tab

c. Enter name, eamil address, and a password
d. Agree to the Privacy Policy and Terms of Service
e. Click **Sign Up**

2. Verify account
   a. Open the verification email and click **Verify Account**
   b. Enter email and password to verify account and click **Login**
3. Create organization
   a. Select **Add Device**
   b. Enter a company or organization name
   c. Select timezone
   d. Enter serial number printed the SOLYX GO at the bottom of the control panel.

In the SOLYX GO app, select the ZENTRA cloud 2.0 organization created in the above steps. The organization name should show top left on the **Dashboard** in the SOLYX Go app (Figure 2).

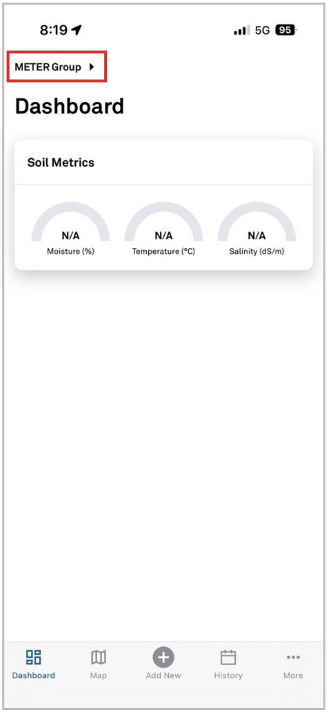

Figure 2 Organization name will be available in the SOLXY GO app Dashboard

Data will be available for download from the **Devices** section of ZENTRA Cloud 2.0 under **handhelds**.

2.2 PERFORM A SOIL TEST

Ensure the SOLYX GO is turned on by pressing the power button. The battery LED should be illuminated and the Bluetooth LED should be blinking. If the LED lights do not light up, charge the SOLYX GO.

Follow these steps to pair Bluetooth with the SOLYX GO and complete a soil test:

1. Open the SOLYX GO app and select **Add New** from the bottom navigation bar (Figure 3).

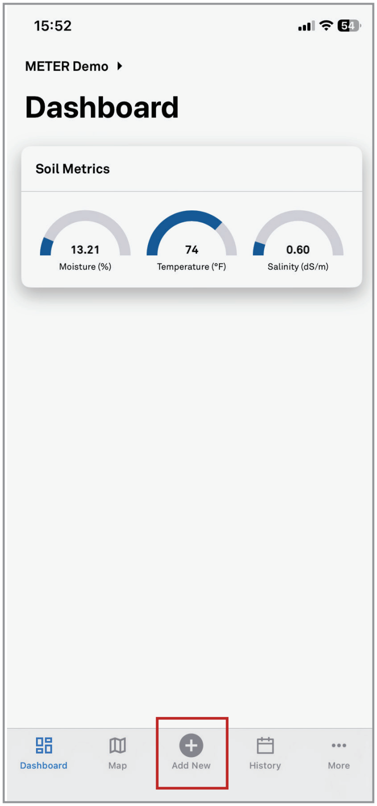

Figure 3 Add New on SOLYX GO app dashboard

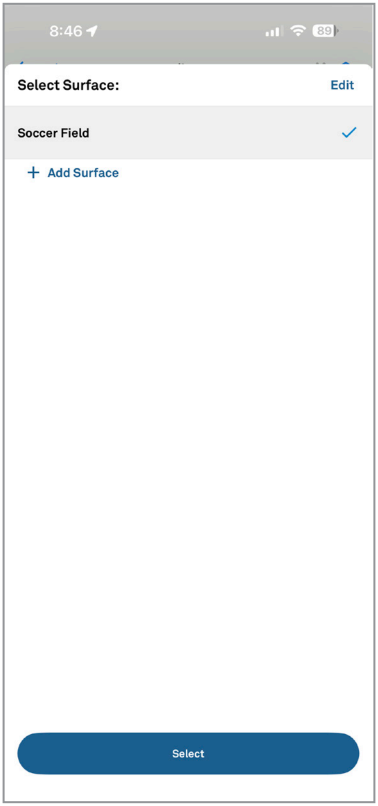

Figure 4 Select Surface to go to Soil Test

2. Connect to the SOLYX GO on the connection screen.
3. Check a surface and press select (Figure 4**)**.

   The **Soil Test** screen will automatically load (Figure 6, Figure 7, & Figure 9).
4. Go to the desired location for soil test and insert the SOLYX GO fully into the ground (Figure 5).

⚠ WARNING

WARNING: When installing sensors in rocky soils, use care to avoid bending sensor needles.

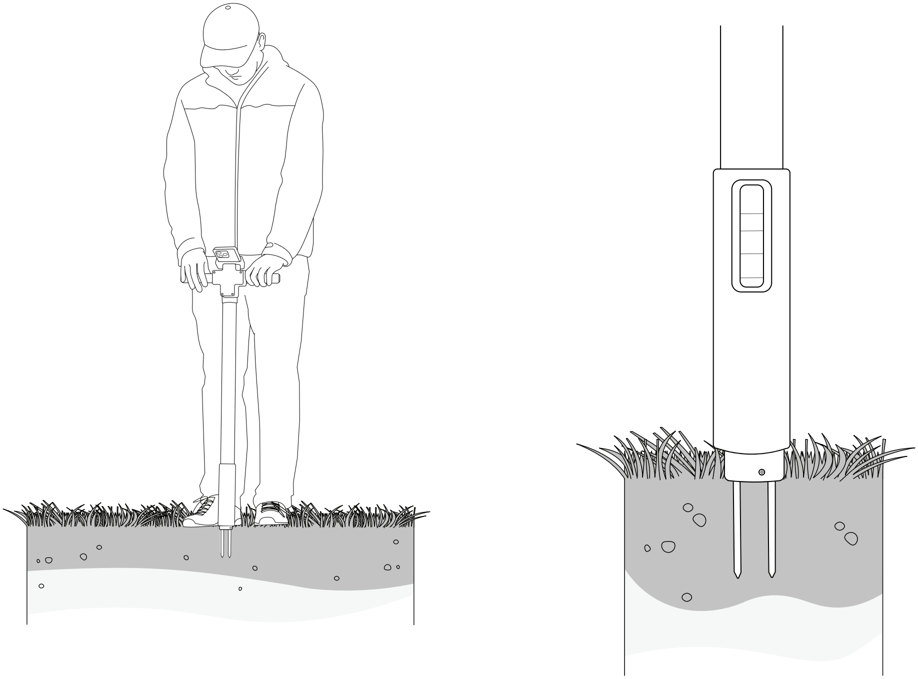

Figure 5 Insert SOLYX GO into the ground to take measurement

5. Press one of the two **Take Reading** buttons on the control panel (Figure 1).
6. Repeat steps 4 and 5 until all of the desired locations for that site have been measured.

   The SOLYX GO app will show and track location as soil tests are taken at different locations. If the position of the GPS dot indicator is not accurate, press the blue botton in the bottom right of the map to turn GPS tracking off (Figure 6).
7. Press **Complete Test** when all soil tests for the site are completed and save results to the calendar (Figure 7).

   All soil tests will be stored in the Calendar section organized by date collected. Test data can be viewed by selecting **History (**Figure 8**)**.

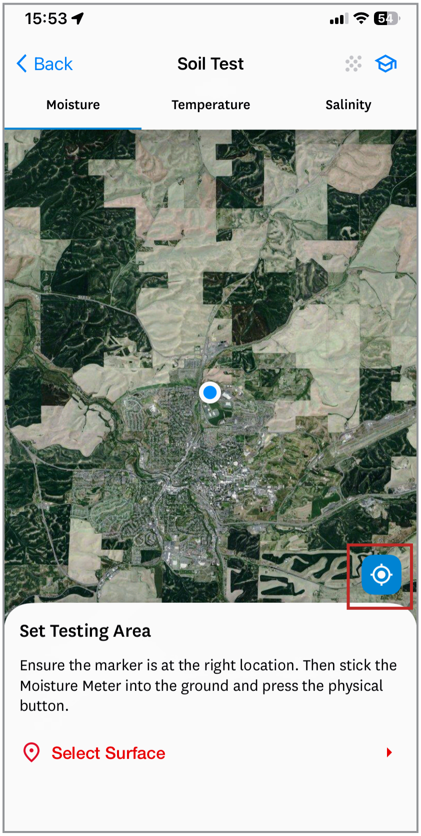

Figure 6 GPS tracking toggle on/off

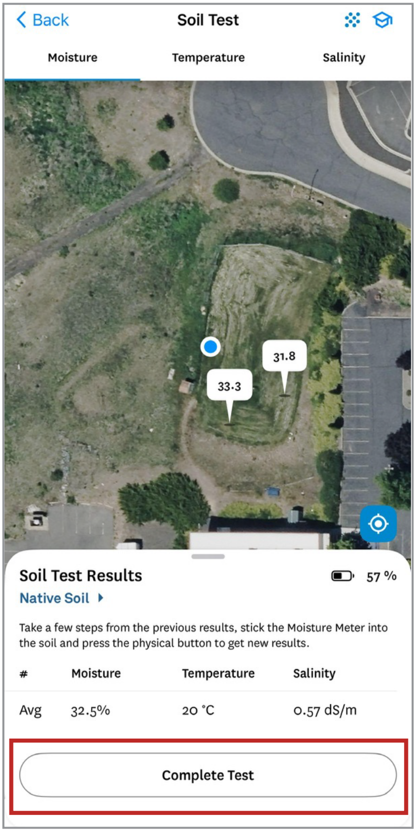

Figure 7 Complete Test

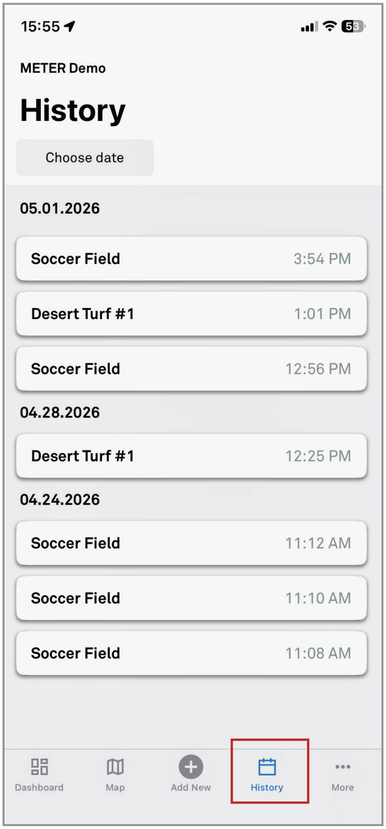

Figure 8 History on SOLYX GO app dashboard

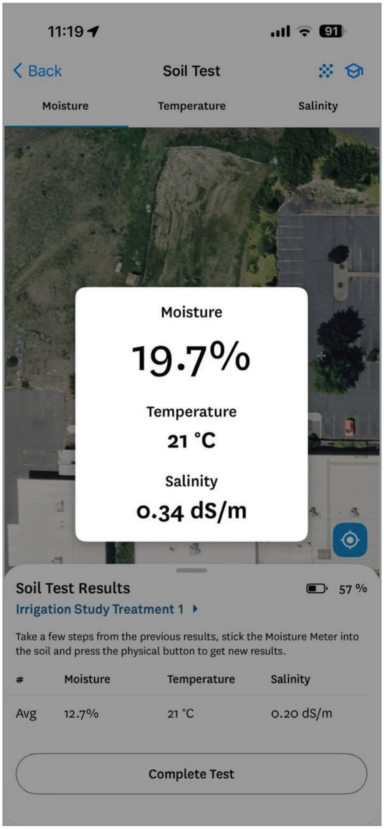

Figure 9 View of test data

3. SYSTEM

This section describes the specifications, components, and theory of the SOLYX GO complex dielectric sensor.

3.1 SPECIFICATIONS

MEASUREMENT SPECIFICATIONS

Volumetric Water Content (VWC)	
Range	
Mineral soil calibration	0.00–0.72 m^3/m^3
Real dielectric permittivity (ε_r)	1 (air) to 80 (water)
NOTE: The VWC range is dependent on the media used for sensor calibration. A custom calibration will accommodate the necessary ranges for most substrates.	
Resolution	0.001 m^3/m^3
Accuracy	
Generic calibration	±0.03 m^3/m^3 typical in mineral soils
Medium specific calibration	±0.01 m^3/m^3 in any porous medium
Real dielectric permittivity (ε_r)	± 1 ε_r (unitless)
Dielectric Measurement Frequency	
70 MHz	
Temperature	
Range	−40 to +60 °C
Resolution	0.1 °C
Accuracy	±0.3 °C from 0 to +60 °C ±1 °C from −40 to 0 °C
NOTE: Temperature measurement for applicable sensor may not be accurate if sensor is not fully immersed in the medium of interest due to longer equilibration time.	
Bulk Electrical Conductivity (EC)	
Range	0–20 dS/m (bulk)
Resolution	0.001 dS/m
Accuracy	±(5% + 0.01 dS/m) from 0–10 dS/m ±8% from 10–20 dS/m

PHYSICAL SPECIFICATIONS

Dimensions	
Handle Width	34.5 cm (13.6 in)
Length/Height	108 cm (42.5 in)
Needle Length	
3.81 or 7.62 cm (1.5 or 3.0 in)	
IP Rating	
IP 67	
Operating Temperature Range	
Minimum	−40 °C
Typical	N/A
Maximum	60 °C

NOTE: Sensors may be used at higher temperatures under certain conditions; contact Customer Support for assistance.

COMPLIANCE

EM ISO/IEC 17050:2010 (CE Mark, DoC upon request)	CE
2014/30/EU (EMC) via EN 61326-1:2013	
2011/65/EU (RoHS) via EN 63000:2018	
CISPR 11:2024 Group 2 Class A	

COMPLIANCE STATEMENTS

This device complies with Canadian ICES-001 (Group 2 Class A).

This device has been tested and found to comply with the limits for Industrial, Scientific, and Medical (ISM) equipment pursuant to Part 18 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in commercial, industrial, or business environments.

This equipment generates, uses and can radiate radio frequency energy and may cause harmful interference to radio communications. If this device does cause harmful interference to radio or television reception, which can be determined by turning the device off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the device and receiver.

Responsible Party: METER Group Inc, 2365 NE Hopkins Ct, Pullman, WA, 99163, USA, +1-509-332-2756

3.2 COMPONENTS

The SOLYX GO sensor measures soil moisture, temperature, and EC of soil using stainless steel needles (Figure 10).

- SOLYX GO sensors measure dielectric permittivity, soil moisture, and bulk electrical conductivity by applying the 70MHz signal to one needle with the other needle as the reference for the measurement
- SOLYX GO sensors measure temperature with an embedded thermistor.

⚠ CAUTION

Do not use the SOLYX GO in frozen soil conditions.

The unit also has the capability to maintain the charge of the phone being used in conjunction with the SOLYX GO. If the unit is not used for maintaining a charge on a phone, the battery within the SOLYX GO should last all season. If phone charge is being maintained, the SOLYX GO battery life decreases significantly.

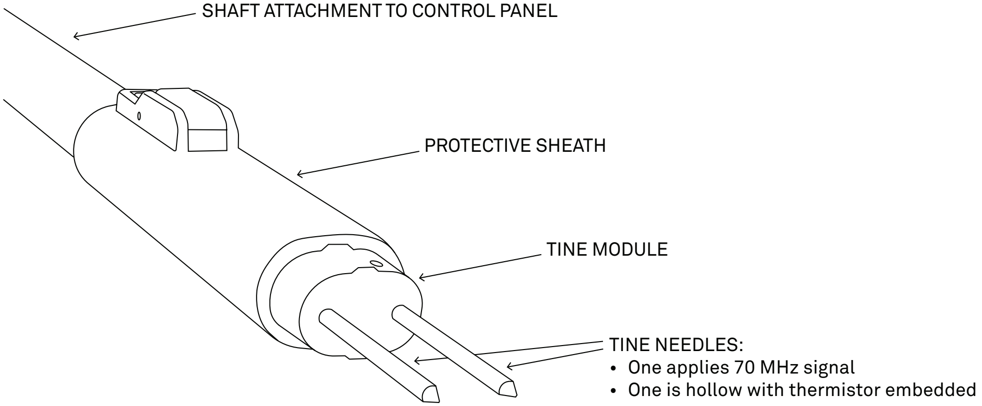

Figure 10 SOLYX GO Sensor components

The SOLYX GO VWC measurement sensitivity is contained within a 173.26 cm^3 volume roughly depicted in Figure 11, or 120.77 cm^3 volume for 1.5-in needles shown in Figure 12. Please see the application note Measurement volume of METER volumetric water content sensors (meter.ly/webarticle-volumetric-water-content-sensors) for testing protocol and more thorough analysis.

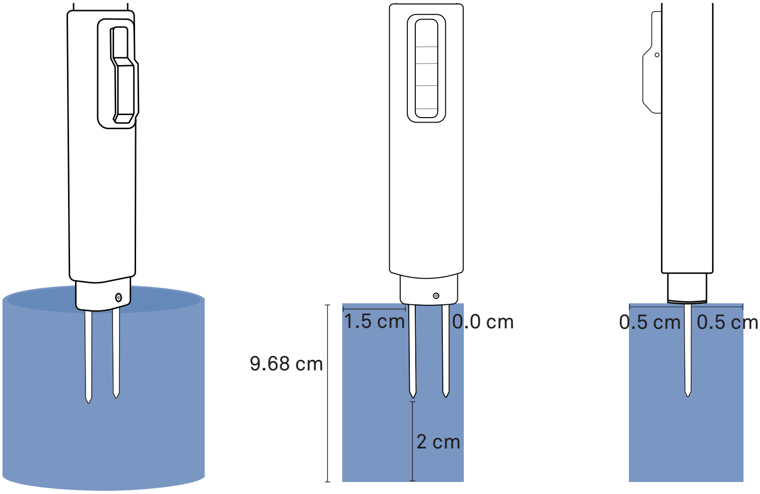

Figure 11 VWC volume of influence 7.62-cm (3-in) needles

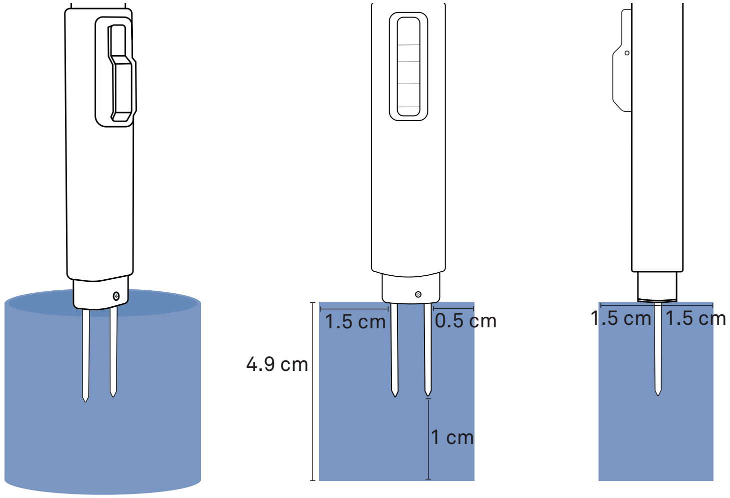

Figure 12 VWC volume of influence 3.81-cm (1.5-in) needles

NOTE: The SOLYX GO provides instantaneous or near-instantaneous measurements; however because of the sensitivity of the measurement of the sensor head, the SOLYX GO is not well suited for spot measurements of VWC.

3.3 THEORY

The following sections explain the theory of complex dielectric permittivity, volumetric water content, correcting electrical conductivity and dielectric for temperature, pore water electrical conductivity, and saturation extract (EC).

3.3.1 COMPLEX DIELECTRIC PERMITTIVITY

The metal electrodes of the SOLYX GO, surrounded by a material (i.e. soil) of relative permittivity, ε forms a capacitor, with capacitance:

$$C_s = C_0\,\varepsilon \tag{Equation 1}$$

where $C_0\,\varepsilon$ is a geometric factor determined by the shape of the electrodes ($C_0 = C_s$ in air). Likewise, if the material is electrically conductive, with conductivity σ [S/m], the sample will also display a conductance:

$$G_s = \frac{C_0}{\varepsilon_0}\,\sigma \tag{Equation 2}$$

At low frequency, sample capacitance and conductance can be regarded as elements in parallel. In this case, the total admittance is simply the sum of the two admittances:

$$\boldsymbol{Y}_s = i\omega C_s + G_s \tag{Equation 3}$$

where ω is the angular frequency of the applied voltage and $i = \sqrt{-1}$. Capacitance and conductance are represented by real quantities (C_s and G_s), whereas the admittance of their parallel combination ($\boldsymbol{Y}_s$) is a complex number (bold fonts). From Equation 3, the current through the conductor is always in phase with the excitation source, while the current through the capacitor is $\pi/2$ out of phase (the corresponding phasors are orthogonal). This reflects the different nature of the polarization and conduction processes, whereby the energy is respectively conserved and dissipated.

Combining equations 1, 2, and 3, obtains:

$$\boldsymbol{Y}_s = i\omega C_o\left(\varepsilon - i\,\frac{\sigma}{\omega\varepsilon_o}\right) \tag{Equation 4}$$

It is then convenient to define a (relative) extended permittivity as:

$$\boldsymbol{\eta} = \varepsilon - i\,\frac{\sigma}{\omega\varepsilon_o} \tag{Equation 5}$$

and represent the system as a capacitor filled with a material of complex permittivity $\boldsymbol{\eta}$:

$$\boldsymbol{Y}_s = i\omega C_o\boldsymbol{\eta} \tag{Equation 6}$$

The complex permittivity $\boldsymbol{\eta}$ fully describes the electromagnetic behavior of materials, as it accounts for both polarization and conduction. In particular, it determines the admittance of electrodes surrounded by a sample. Hence, from measurements of Y_s, $\boldsymbol{\eta}$ can be estimated using Equation 6, or more sophisticated models.

So far, the energy losses have been confined to transport of charges (conduction). This is an approximation, valid again at low frequencies. At high frequencies, polarization also gives rise to energy dissipation. This is because polarization, i.e. the rearrangement of molecules in response to an electric field, is not instantaneous. When the field changes very rapidly, the molecules don't have sufficient time to rearrange completely. With a twofold result:

i. the polarization over one cycle is partially diminished, and
ii. it is slightly delayed relative to the electric field.

This delay implies that the response is no longer in phase with the excitation: an orthogonal component arises, therefore the process must be described by a complex quantity. This is the complex dielectric permittivity:

$$\boldsymbol{\varepsilon} = \varepsilon' - i\varepsilon'' \qquad \textbf{Equation 7}$$

where ε' and ε'' (both frequency dependent) respectively account for the energy storage and losses arising from polarization. In presence of polarization losses, the real permittivity ε in Equation 5 must be replaced by the complex permittivity in Equation 7. The extended permittivity (which combines polarization and conduction) then becomes:

$$\boldsymbol{\eta} = \varepsilon' - i\left(\varepsilon'' + \frac{\sigma}{\omega\varepsilon_o}\right) \qquad \textbf{Equation 8}$$

Substituting this expression in Equation 6, finds that the sample can be represented by a capacitance and a conductance in parallel (both real), of values:

$$C_s = C_o\,\varepsilon' \qquad \textbf{Equation 9}$$

$$G_s = \frac{C_o}{\varepsilon_o}\left(\sigma + \omega\varepsilon_o\varepsilon''\right) \qquad \textbf{Equation 10}$$

Note that the polarization losses ε'' are included in the conduction term G_s. Therefore, capacitance and conductance in the equivalent circuit should not be identified with the polarization and conduction processes, but rather as the conservative and dissipative components of the overall interaction of the material with an electromagnetic field. It also follows from Equation 10 that one has only access to the total dissipation, due to both conduction and polarization. As long as a single frequency is probed, the two individual contributions are indistinguishable. The term in parenthesis in Equation 10 is the high frequency conductivity. Since the d.c. value, σ, is of interest, some reasonable assumptions about ε'' are made to estimate σ from measured G_s. In particular, assume that ε'' in a porous medium is proportional to the value corresponding to pure water, the proportionality factor being the volume fraction of water. At 70 MHz, this value is typically small, and even a rough estimate of ε'' should yield sufficiently accurate measurements of σ.

The SOLYX GO measures Y_s, converts it to η using Equation 6, then converts that to dielectric constant and conductivity using Equation 8 and the discussion following it.

Next is the description of the measurement of the sample admittance. The following figure shows the circuit the SOLYX GO uses to make the measurement.

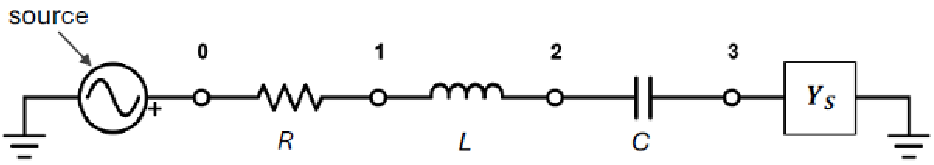

Figure 13 Measurement circuit for the SOLYX GO

R, L, and C are reference components in the SOLYX circuitry across which voltage differences are measured. Excite the circuit with a 70 MHz source, and measure the amplitudes of the voltages at nodes 0, 1, 2, and 3. Compute the amplitude ratios V_0/V_3, V_1/V_3, and V_2/V_3. These voltage ratios or gains, and the values of the reference components, provide the information needed to find Y_s. The solution is most readily explained graphically, rather than by equations. Figure 14 is a graph of the complex admittance plane.

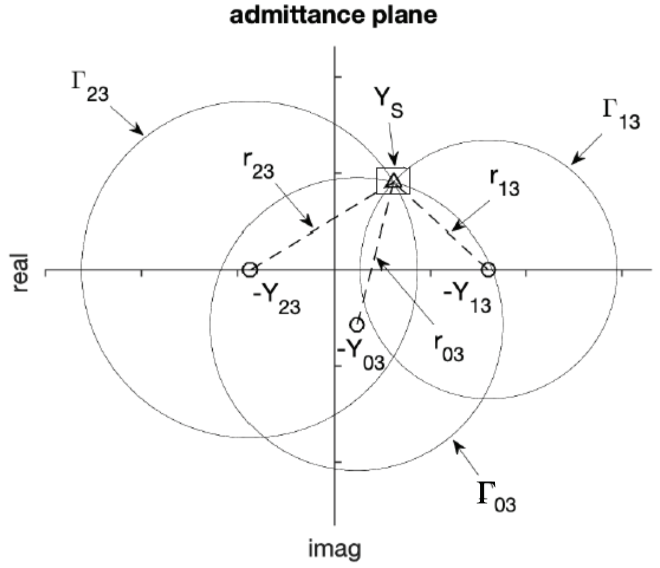

Figure 14 Complex admittance plane graph

The locations of the reference component admittances are shown as the circle centers, Y_{03}, Y_{13}, and Y_{23}. Y_{23}, on the left, is for the capacitor and Y_{13}, on the right, is for capacitor and inductor. Neither of those has any imaginary part. Y_{03} includes the resistor, so it has both real and imaginary parts. The radius of each circle is proportional to its gain or voltage ratio. The circles intersect at a common point, and that point is the sample admittance, Y_s, which is needed to find the dielectric and conductivity of the sample.

It should be clear that three circles are not needed to determine the intersection. Two circles would give the same answer, but using the additional third circle provides several advantages. One advantage is that it gives a self-consistency check. The probe is working correctly if with each combination of circles the sample admittance is the same. It can also provide reliable readings when a sample causes two of the circles to come together in ways that give uncertain results. Having all three results also improves the precision of the measurement by a factor of about 2, over having just two circles.

The SOLYX GO solves for the three intersections, determines the self-consistency, and determines a weighting factor for each intersection based on the sensitivity of the computed admittance to the circle radius (from the voltage ratios). The sample admittance is then computed as a weighted average of the three intersections.

The technology used in the SOLYX GO is called CDX. That comes from the circles and is short for Complex Dielectric through Intersections.

3.3.2 CORRECTING ELECTRICAL CONDUCTIVITY AND DIELECTRIC FOR TEMPERATURE

The electrical conductivity of ionic solutions increases with temperature about 2% per degree C. Since bulk electrical conductivity is sampled over a range of temperatures, it is helpful to adjust the values back to a single temperature value. The one typically used is 25 °C. The SOLYX GO sensor bulk EC measurements are corrected to EC at 25 °C using the equation:

$$\sigma_{25} = \frac{\sigma_T}{1 + 0.019(T-25)}$$ **Equation 11**

where T is the temperature at the time of measurement.

The dielectric constant of water and solutions is also temperature dependent, and decreases with increasing temperature by around 0.5%/C. The temperature dependence of the dielectric of water in soil, however, is harder to predict, and depends on how tightly the water is bound. The value in soil can even be positive. Not correcting the dielectric constant for temperature often gives better water content than correcting it. For that reason, it is left uncorrected. If the user wants to correct it, however, Equation 11 is used with a constant of -0.005 instead of 0.019.

3.3.3 VOLUMETRIC WATER CONTENT

The primary job of the SOLYX GO is the measurement of water content. Since water has a much larger dielectric constant than most other soil constituents, the dielectric measurement will be strongly influenced by the amount of water present in the soil. Other factors will, however, affect the reading. A commonly used dielectric mixing model used to predict bulk dielectric is:

$$\varepsilon_b = \left[\theta\varepsilon_w^{\beta} + \phi\varepsilon_s^{\beta} + (1 - \theta - \phi)\varepsilon_a^{\beta}\right]^{\frac{1}{\beta}}$$

Equation 12

where θ is the volumetric water content (m^3/m^3), ϕ is the fraction of solids (m^3/m^3) (bulk density divided by particle density), β is an empirical constant, and the w, s, and a subscripts on epsilon are for water, soil (or solids) and air. Solving for volumetric water content gives:

$$\theta = \frac{\varepsilon_b^{\beta} + \phi\left(\varepsilon_s^{\beta} - \varepsilon_a^{\beta}\right) - \varepsilon_a^{\beta}}{\varepsilon_w^{\beta} - \varepsilon_a^{\beta}}$$

Equation 13

This equation should make a couple of things clear. One is that dielectric sensors measure *volumetric*, not *gravimetric* water content (determined by oven drying). Another is that factors other than water content affect the reading, so there can't be a universal calibration equation relating water content to dielectric for soil. A few equations for typical soils and other media are provided below, but some media or soils may require their own calibration.

For soils, β is often set to 0.5. If it is assumed the dielectric of water is 81, of soil solids is 4 and air is 1, then Equation 13 simplifies to:

$$\theta = \frac{\sqrt{\varepsilon_b} - \phi - 1}{8}$$

Equation 14

Here are some calibration equations that are recommended for the SOLYX GO:

For mineral soils the equation is the same form as Equation 14

$$\theta\left(\frac{m^3}{m^3}\right) = 0.0985\sqrt{\varepsilon_b} - 0.159$$

Equation 15

3.3.4 PORE WATER ELECTRICAL CONDUCTIVITY

One of the most important things the SOLYX GO can do is provide measurements of the quantities required to determine the electrical conductivity of the water in the soil pores. In the past this could only be determined by extracting water from the soil and measuring the EC in the laboratory. Pore water EC is a direct measure of the osmotic stress to which a growing plant is subjected, and therefore directly relates to plant performance. The SOLYX GO sensor measures ε_b and σ_b simultaneously in the same soil volume. It is therefore well suited to this calculation.

METER uses the Hilhorst (2000) equation to compute pore water EC. It is:

$$\sigma_P = \frac{\varepsilon_w \sigma_b}{\varepsilon_b - \varepsilon_{\sigma_b = 0}}$$

Equation 16

where $\varepsilon_{\sigma_b = 0}$ is the permittivity of the soil when the conductivity goes to zero. Hilhorst recommended a value of 4.1 for mineral soil, but this is soil or substrate dependent. For substrates like rock wool or coir, a value around 2 works well. Since the denominator can be small, or even zero at low water content, causing predicted pore water values to become very large, this equation should not be used at low water content. Best results are obtained at water contents above 0.05 m^3/m^3.

3.3.5 SATURATION EXTRACT EC

The electrical conductivity of a saturated extract from the soil is often used to classify soils. If someone says a soil has an EC of 4, that would be its saturation extract EC. It is a measure of the amount of salt in the soil. It is determined by saturating a soil sample with distilled water, extracting some of the water, and measuring its EC. The pore water EC of a soil that has been saturated with distilled water is the same as the saturation extract EC. The saturation extract EC can be computed from the pore water EC using

$$\sigma_e = \sigma_P \left(\frac{\theta_s}{\theta} \right)$$

Equation 17

where θ_s is the saturation volumetric water content.

3.3.6 TEMPERATURE

The SOLYX GO has an internal thermistor in one of the two needles to measure temperature. To get a more accurate soil temperature measurement, the SOLYX GO may need to be put into the ground for at least 30 s to 60 s. The duration in soil needed depends on the difference between the sensor temperature at the start of the measurement and the soil temperature. The greater the temperature difference between the sensor and the soil, the longer the sensor needs to be in the soil to achieve accuracy.

4. SERVICE

This section describes the calibration and maintenance of the SOLYX GO. Troubleshooting solutions and customer service information are also provided.

4.1 CALIBRATION

The previous section provided a mineral soil calibration for SOLYX GO. The SOLYX GO is not sensitive to variations in soil texture or EC because it is a true dielectric sensor (see theory Section 3.3).

The generic calibration equation should result in reasonable absolute accuracy; ± 0.03 m^3/m^3 for most mineral soils. The potting soil equation should provide a good approximation for soilless growing media (i.e., potting soil, perlite, or peat moss). For added accuracy, customers are encouraged to perform soil-specific calibrations. For more information on how to calibrate sensors or to learn about METER calibration service (calibrations performed for a standard fee), see soil sensor calibration (meter.ly/how-to-cal-soil-sensors) or contact Customer Support.

4.2 CLEANING AND MAINTENANCE

SOLYX GO may be returned to METER for maintenance in the following areas: system inspection, parts replacement, and instrument cleaning. Replacement parts can also be ordered from METER. Contact Customer Support for more information.

If the sensor needles become contaminated with oils from contact with skin or another source, it is necessary to clean the needles to ensure accurate EC readings in salty soils with bulk EC greater than 10 dS/m.

1. Clean each needle using a mild detergent such as liquid dish soap and a nonabrasive sponge or cloth.

   NOTE: Avoid detergents that contain lotions or moisturizers.

2. Rinse the sensor and needles thoroughly with tap or deionized (DI) water.

   NOTE: Do not touch the needles with an ungloved hand or bring them in contact with any source of oil or other nonconducting residue.

SOLYX GO TINES MAINTENANCE

The tines of the SOLYX GO will wear over time. Use the wear gauge calibration tool included to check if tine replacement is needed.

Place the gauge vertically on top of the base of the tine module (Figure 15)

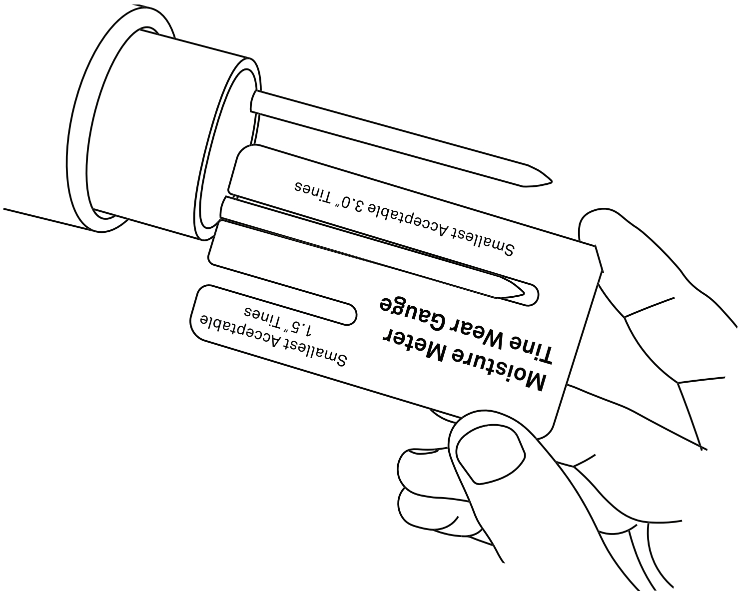

Figure 15 Tine gauge

If the tines can pass through the opening in the Wear Gauge, they are out of calibration. Follow the steps below to replace the tines:

1. Remove both Phillips head screws at either end of SOLYX GO tines module (Figure 16).

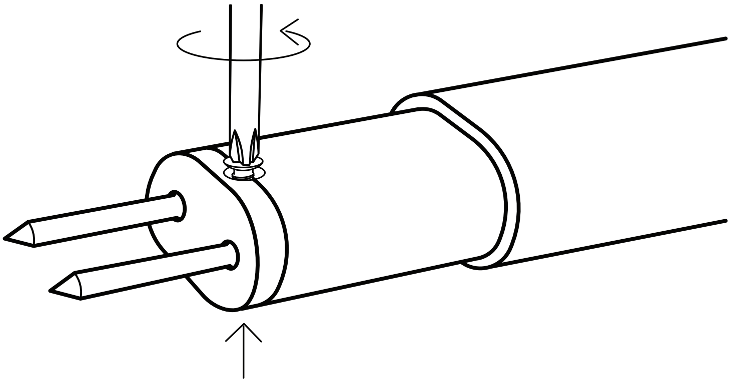

Figure 16 Remove screws

2. Remove tine module (Figure 17).

   If needed, loosen using a flathead screwdriver in the notch where the sensor makes contact with the metal shaft.

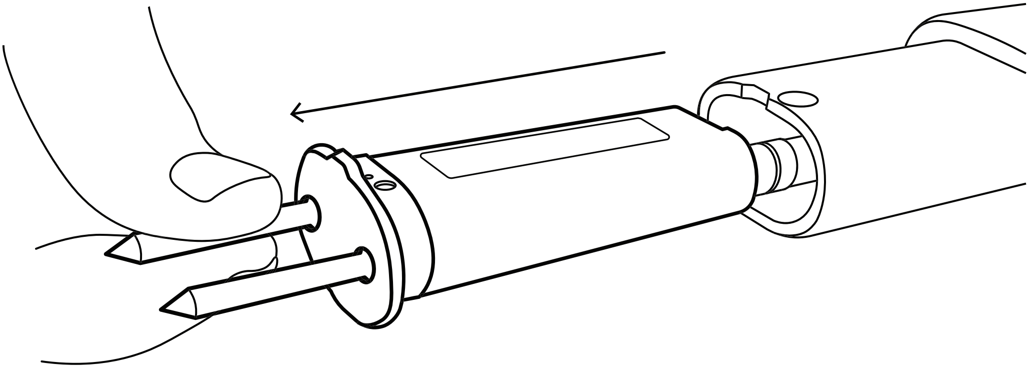

Figure 17 Remove tine module

3. Unscrew the M8 cable connector from the module and pull the connector out (Figure 18).

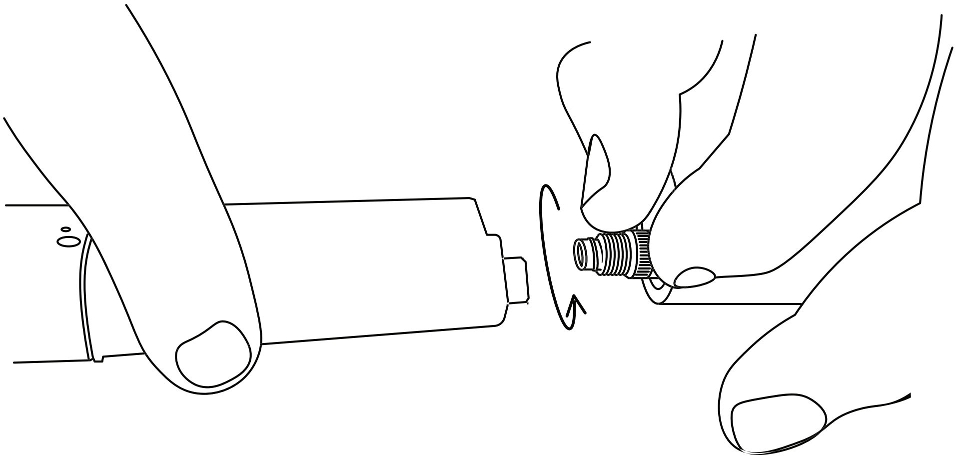

Figure 18 Unscrew the M8 cable connector

4. Connect to the new replacement tines by lining up the pins with the corresponding holes on the module and connecting the M8 cable (Figure 19).

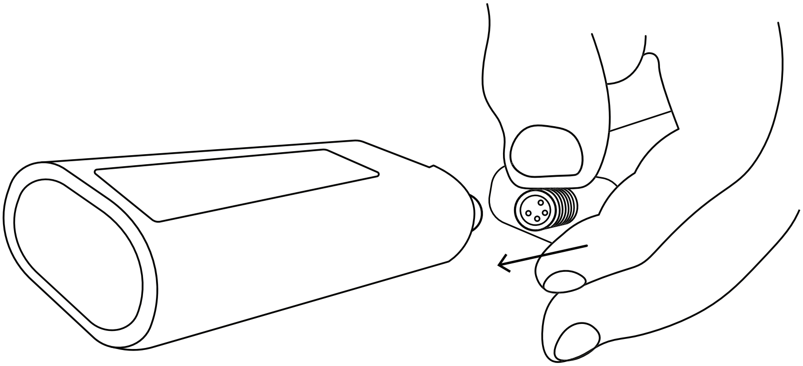

Figure 19 Connect new replacement tines

5. Push the tine module back into the metal shaft (Figure 20).

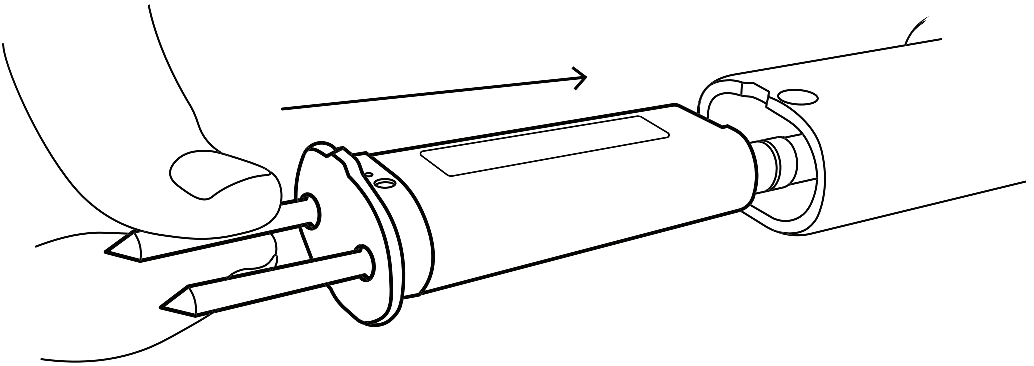

Figure 20 Push new tine module into metal shaft

6. Record a measurement to check that the replacement tine module is functioning (Section 2.2).
7. Screw the two Phillips head screws into the unit to secure the new module.

4.3 TROUBLESHOOTING

Table 1 lists common problems and their solutions. If the problem is not listed or these solutions do not solve the issue, contact Customer Support.

Table 1 Troubleshooting the SOLYX GO

Problem	Possible Solutions
SOLYX GO not responding	Check the M8 cable for damage and proper connection. If the cable is damaged, contact Customer Support. If the M8 cable is undamaged, connected but the SOLYX GO is still not responsing, check the Bluetooth and battery lights to indicate power is in the unit. If the unit is not turning on, plug it in and verify that it is charging. Connect to SOLYX GO in the app and check Bluetooth indicator light. If the light is solid, unit is connected to SOLYX GO app. If the SOLYX GO unit isn't showing up on the add new tab of the app, contact Customer Support. Attempt to take a measurement. Failure for unit to turn on or trigger a measurement may indicate an issue with the buttons on the overlay. Contact Customer Support about a replacement overlay and additional troubleshooting steps.
Sensor reading too low (or slightly negative)	Check for air gaps around sensor needles. These could be produced below the surface of the substrate when the needle contacts a large piece of material and pushes it out of the way, or if the sensor is not inserted perfectly linearly. Ensure the calibration equation being used is appropriate for the media type. There are significant differences between substrate calibrations, so be sure to use the one specific to the substrate (example calibration equations Section 3.3.3).
Sensor reading too high	Check to make sure that the media was not packed excessively or insufficiently during sensor installation. Higher density can cause sensor reading to be elevated. Ensure the calibration equation being used is appropriate for the media type. There are significant differences between calibrations, so be sure to use the one most suitable to the substrate, or consider developing a substrate-specific calibration for the particular medium. Some substrates have an inherently high dielectric permittivity (soils of volcanic origin or high titanium, for instance). If the substrate has a dry dielectric permittivity above 6, a custom calibration may need to be performed.

4.4 CUSTOMER SUPPORT

NORTH AMERICA

Customer service representatives are available for questions, problems, or feedback Monday through Friday, 7:00 am to 5:00 pm Pacific time.

Email:	support.environment@metergroup.com sales.environment@metergroup.com
Phone:	+1.509.332.5600
Fax:	+1.509.332.5158
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EUROPE

Customer service representatives are available for questions, problems, or feedback Monday through Friday, 8:00 to 17:00 Central European time.

Email:	support.europe@metergroup.com sales.europe@metergroup.com
Phone:	+49 89 12 66 52 0
Fax:	+49 89 12 66 52 20
Website:	metergroup.com

If contacting METER by email, please include the following information:

Name	Email address
Address	Instrument serial number
Phone	Description of the problem

NOTE: For products purchased through a distributor, please contact the distributor directly for assistance.

4.5 TERMS AND CONDITIONS

By using METER instruments and documentation, you agree to abide by the METER Group, Inc. Terms and Conditions. Please refer to metergroup.com/terms-conditions for details.

REFERENCES

Hilhorst, M. A. (2000) A pore water conductivity sensor. Soil Sci. Soc. Am. Journal. Https://doi.org/10.2136/sssaj2000.6461922x

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