Robit®

Robit Sense Systems

Operator's Manual

Robit iSense

Rig integrated deviation measurement system for Top Hammer applications

Robit Oyj

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Contents

1 Introduction

The Robit S Sense measurement system is used for measuring boreholes in rock drilling.

The measuring system may only be used for purposes for which Robit Plc has given its written consent. The system may not be modified without Robit Plc's written consent. If the system is modified, the plates and documents must be updated to correspond with the new structure.

S Sense Hardware Package

The Robit S Sense standard delivery package contains the following:

- tablet computer
- transceiver
- docking station for the tablet computer
- 230 V power supply for the tablet computer
- 12/24 V power supply for the tablet computer
- charging station for measurement modules
- measuring software and accessories
- operator's manual.

S Sense Installation Package

The Robit S Sense installation package is customized for each drill rig type and contains the following:

- all cables, cable ties and clamps for installation
- transceiver installation bracket
- ram mounts for the tablet computer's docking station.

S Sense Consumables Package

The Robit S Sense Consumables Package is delivered separately and contains the following:

- four (4) measurement sensors
- two (2) adapters
- five (5) drill bits.

1.1 Operator's manual

Please study and observe the operator's manual thoroughly in order to maintain the safety and reliability of the machine.

Robit Plc reserves the right to make changes.

For production-related reasons, the figures and technical specifications in this operator's manual may deviate from the actual product.

Robit Plc cannot be held liable for any material damage or injuries caused by using the device incorrectly or in violation of the instructions.

If you do not understand the instructions or some parts of this manual appear to be missing, please contact Robit Plc.

Thank you for choosing Robit Plc as your systems supplier. We are confident that we will fulfil your expectations regarding both usability and the availability of services.

Maintaining the operator's manual

Keep the manual in good condition and available to the operator and service personnel.

Ordering a manual

You can order a manual from Robit Plc's customer service or from our Robit retailer.

1.2 Reading instructions

Warnings

This manual contains warnings, which are indicated with yellow triangles and descriptions of the warning.

Warning:

- Type of hazard!
- Provides a warning of a situation that may cause injury, death and significant equipment or property damage if the appropriate safety instructions are neglected.
- Provides information how to avoid the hazardous situation.

1.3 Copyright

This document may not be copied, presented or supplied to a third party or used for any other purposes without Robit Plc's express permission.

Robit Plc reserves the right to change the values, equipment and service instructions provided in the manual without advance notification.

1.4 Warranty

See the warranty information regarding Robit Plc's general warranty terms.

1.5 Customer service

Company name:	**Robit Plc**
Address:	Vikkiniityntie 9
	FIN-33880 Lempäälä, Finland
Telephone / Telefax:	+358331403400 / +35833670540
E-mail:	robit@robitgroup.com
WWW:	https://www.robitgroup.com/contact-us/

1.5.1 Robit Sense support

Telephone / Telefax:	+358143370412
E-mail:	sense.support@robitgroup.com

2 Safety

The purpose of the safety information is to reduce the number of accidents and prevent personal injury and property damage.

Please read the safety instructions carefully and ensure that you are using the system in a safe manner. Do not use the system in ways other than those described in this manual. An incorrect method of use may be hazardous and cause an accident, fire or electrocution.

You must also observe the instructions appearing on the computer screen and abide by all warnings.

Do not operate the system if its components are damaged.

Use only components and accessories described in this manual.

2.1 General warnings

Warning:

- Electrocution hazard
- The power supply of the measurement module, which is available as an accessory, provides a supply voltage of 230 V.
- Do not touch!

Caution:

- Burn hazard
- The adapter and drill bit can be hot after drilling. Touching hot surface may cause personal injury.
- Wear protective gloves when attaching and detaching drill parts.

Caution:

- Lifting hazard
- The adapter and drill bit are heavy.
- Observe ergonomic lifting methods when attaching and detaching drill parts.

3 System description

For the purpose of calculating the size of demolition charges, it is important to know the exact position, direction and deviation of the drilled holes.

The Robit S Sense system measures the deviation of the hole using inertial navigation provided by gyroscopes and an accelerometer. The measurement is performed upon lifting the drill, and the measurement data is transmitted to a computer in the cabin when the rods are lifted.

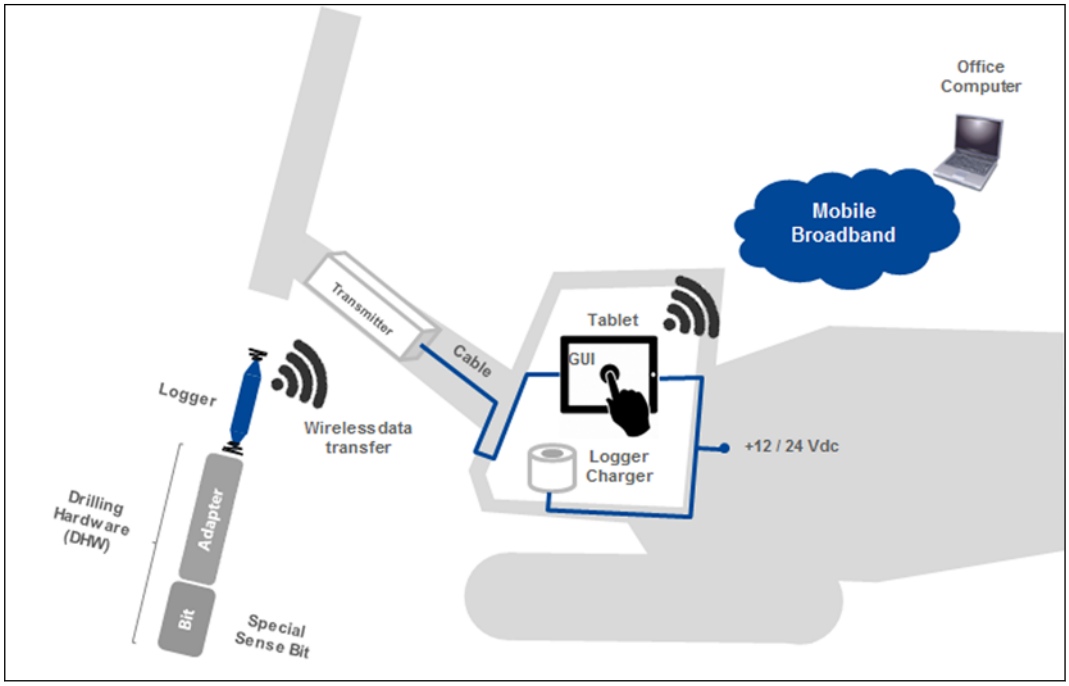
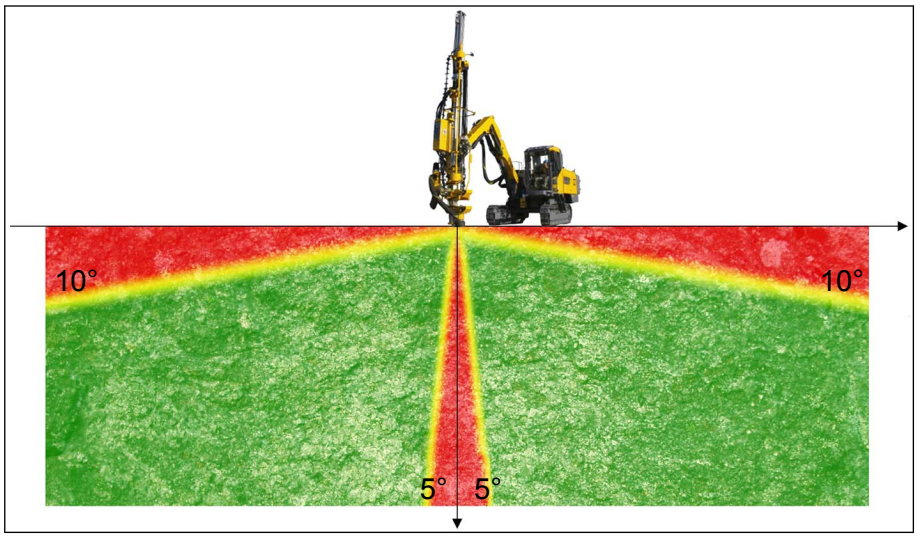


Figure 1. System overview

The Robit S Sense system is easy to use, and it measures each hole you drill. The hole measurement does not slow down drilling or interrupt it for the duration of the measuring. The measurement results are available immediately after drilling. The system also provides a wide range of tools for examining the holes and analysing the field.

Note: Borehole measurement accuracy is affected in certain borehole angles. System azimuth accuracy decreases in red zones. Inclination accuracy is not affected by the borehole angle.



3.1 System components

The Robit S Sense measuring system consists of the following components:

1. Measurement module
2. Adapter for the measurement module
3. S Sense compatible drill bit
4. Transceiver and cable
5. Tablet PC, dock, support and accessories
6. Measurement software
7. Measurement module charger and accessories

3.2 Operating principle

The Robit Sense measurement software is a versatile tool for measuring boreholes. The measurement data can be saved in a database, where it can be viewed after drilling or at a later time.

Holes can be measured in two ways: 1) select a site and field before measurement, which allows you to define what hole to measure, or 2) drill and measure a hole first and decide afterwards whether or not you wish to save it in a site. All holes measured in a field can be viewed simultaneously, which provides a good overall view of the holes throughout the field. A measured hole does not need to be connected to a worksite. Instead, it can be saved in the database separately.

Selecting a field before drilling a hole

1. Select the site, level and field.
2. Select the hole to be drilled.
3. Press the Drill here button.
4. Drill the hole normally.
5. Once the hole has been drilled, press the Start lifting the rods button.
6. Enter the starting angle and length of the hole.
7. Maintain the rod stationary for the time shown on the screen.
8. Mark rod replacement points using the rod replacement button.
9. Once the drill has been lifted, the hole measurement data is transferred to the computer.

10. The data for the drilled hole is linked to the selected hole automatically.

Drilling without selecting a field

1. Press the Start drilling button.
2. Select the measurement module.
3. Press the Drill new hole button.
4. Drill the hole normally.
5. Once the hole has drilled, press the Start lifting the rods button.
6. Enter the starting angle and length of the hole.
7. Maintain the rod stationary for the time shown on screen.
8. Mark the rod replacement points using the rod replacement button.
9. Once the drill has been lifted, the hole measurement data is transferred to the computer.
10. Attach the measurement data to the hole.
    a. Download the data from the measurement module.
    b. Select the worksite, level and field where the data is to be saved. If you do not select a site for the hole, it will be saved independently in the database.
    c. Select the hole from the drilled field.
    d. Link the transferred information to the drilled hole.

3.2.1 Measurement module and adapter

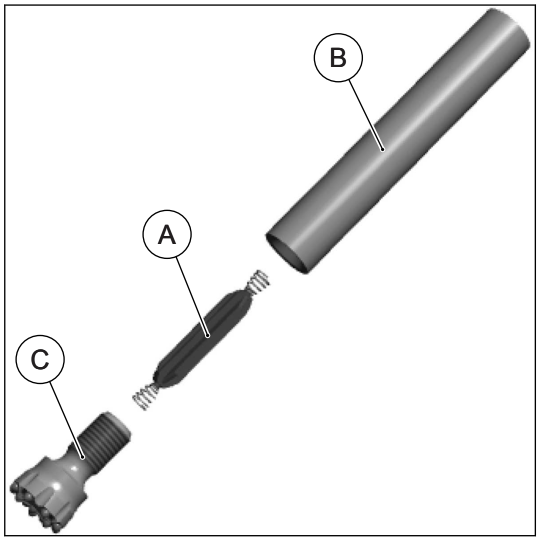


Figure 2. Measurement module and adapter

The measurement module (A) measures the drilled hole. The measurement module is cast in a protective urethane case. The module features multiple motion detectors, a transmitter, internal memory and a wirelessly-charged battery. To activate the module, place it in the charging station.

The measurement module is installed inside the hollow adapter (B) between the drill bit (C) and rod. The measurement module is protected by two springs when it is installed in the adapter.

The measurement module uploads data to the cabin computer when it is in the vicinity of the transceiver. The measurement data is deleted once it has been transferred to the computer. If the transfer is unsuccessful, the data will remain on the module until it has been transferred to the computer. The data in the measurement module's memory will not be lost even if the battery is drained in the middle of the measurement.

The adapter must be attached to the drill bit in the correct position or it may break.

3.2.2 Transceiver

The transceiver is fastened to the dust collection box with a protective metal piece. The transceiver communicates wirelessly with the measurement module. The transceiver connected to the cabin computer with a USB cable. The USB connector is protected inside the case.

If multiple transceivers are used in the area, their signals may become mixed. This may interfere with the connection of the measurement modules to the transceiver.

The transceiver circuit board features indicator lights that illustrate the status of the device. The positions and locations of the indicator lights are described in the Troubleshooting section.

3.2.3 Tablet computer

The Robit Sense measurement system is operated by means of the computer's touch screen.

3.2.4 Charging station

The measurement module's charging station charges the measurement module wirelessly when the module is placed in the designated slot. The charging power and charge of the measurement module battery can be viewed on the computer screen when the module is in the charging station.

To activate a measurement module, place it in the charging station.

The charging station features two indicator lights that indicate the status of the charging station. Table 1 presents all the possible statuses of the charging station.

Standby	Charging	Charging complete	Error	
			Limited charging power	Foreign object
Green light on	*Green light blinking*	*Green light on*	*Green light blinking*	*Green light off*
Red light on	*Red light off*	*Red light off*	*Red light blinking*	*Red light blinking*

The charging station takes its power from the USB port in the computer dock.

3.3 User interface

The user interface of the Robit Sense S system is designed to be used with a touch screen or mouse. The Robit Sense measurement software can be used to design drilling fields, measure drilled holes, and inspect and analyse measurements with a range of powerful graphical view and tools.

Figure 3. Robit Sense measurement software

3.3.1 Cloud synchronization

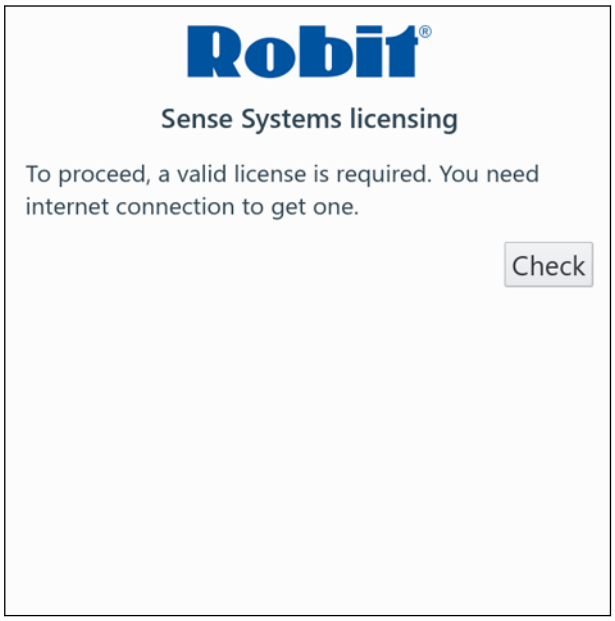
The cloud synchronization icon  briefly appears in the user interface when data has been successfully synchronized with the Sense Cloud Service.

If the synchronization fails for some reason, the synchronization error icon  is displayed. This icon disappears after successful data synchronization.

3.4 Licensing

During startup, the software automatically checks that the current license is valid. The license validity period is displayed at the bottom of the home screen.

If a license cannot be acquired automatically, the software prompts you to check the availability of licenses.



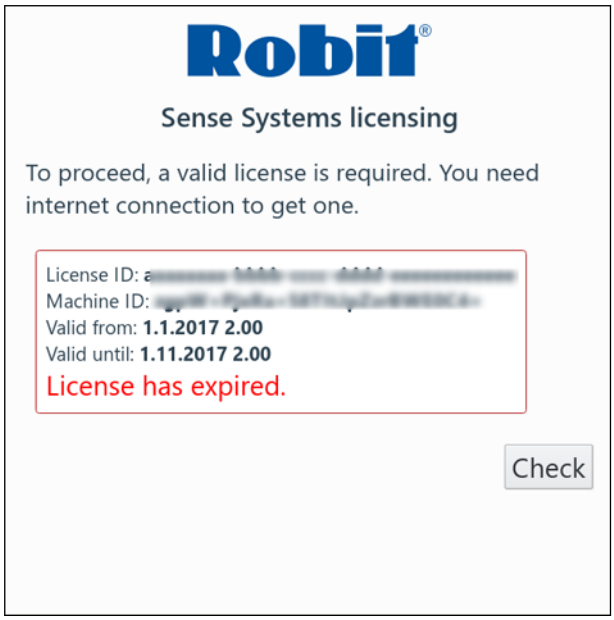
Click the Check button.The software contacts the licensing server and checks if the tablet is registered in the Sense Cloud.

If a license is available, the software displays the licensing information in a confirmation window. Click Proceed.

If a license cannot be acquired, you need to enter the organizational registration code. Click Submit to send the code.

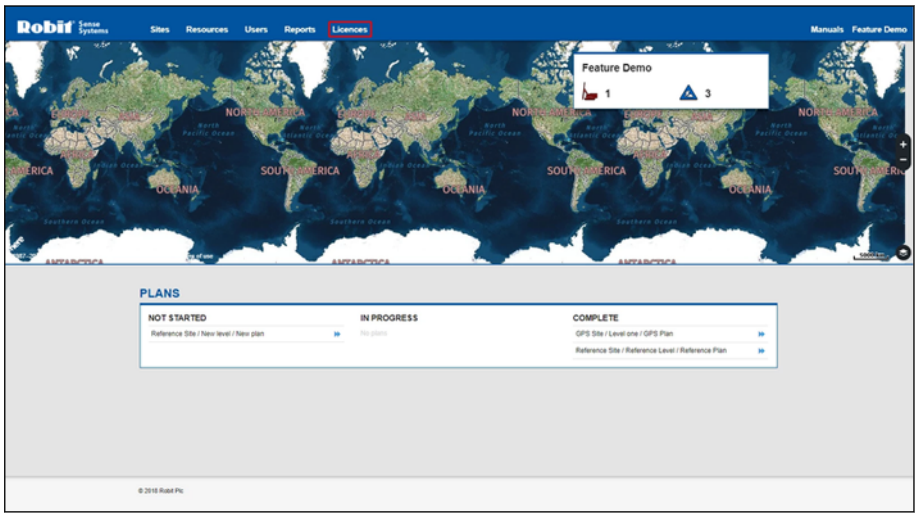
Your Company Administrator can order the organizational registration code from *https://www.sensesystems.com*.

If the licensing period has expired, an error message is displayed. Contact Robit Plc. for more details.

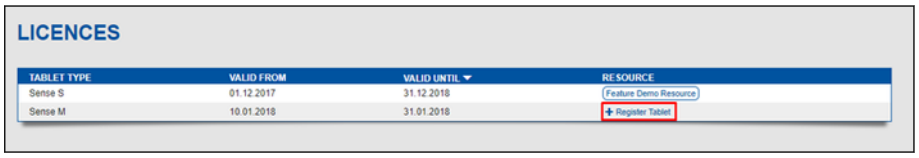


3.4.1 Registering a tablet

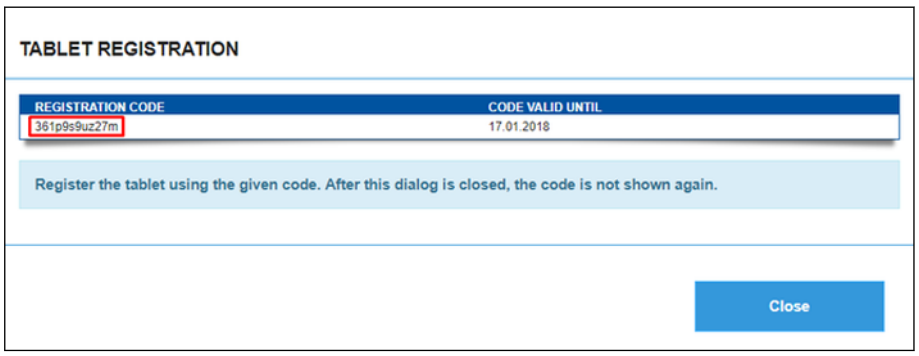
If the tablet computer's measurement software asks for a registration code, log into *https://www.sensesystems.com* with your credentials and go to the *Company* view.



You will see a list of licences. Select an available licence to register the tablet with by clicking the Register Tablet text. If the list does not have an available licence, contact Robit personnel.



A window with a registration code will open.



Write or copy the code into the registration code field on the tablet computer's Measurement UI Software. Click Submit to send the code.

Review your licence information on the tablet computer and click Proceed to start using the software.

4 Operating instructions

Before first use

Ensure that the transceiver is installed correctly in the device and that the transmitter cable is properly attached to the boom.

Ensure that the measurement module charging station is installed correctly in the cabin and that the power cable is connected.

Ensure that the computer is installed correctly in the cabin and that it does not prevent the use of other drill rig devices and instruments. Make sure that the computer does not obstruct the visibility out of the cabin in a way that makes driving or operating the rig dangerous.

4.1 Installing a measurement module

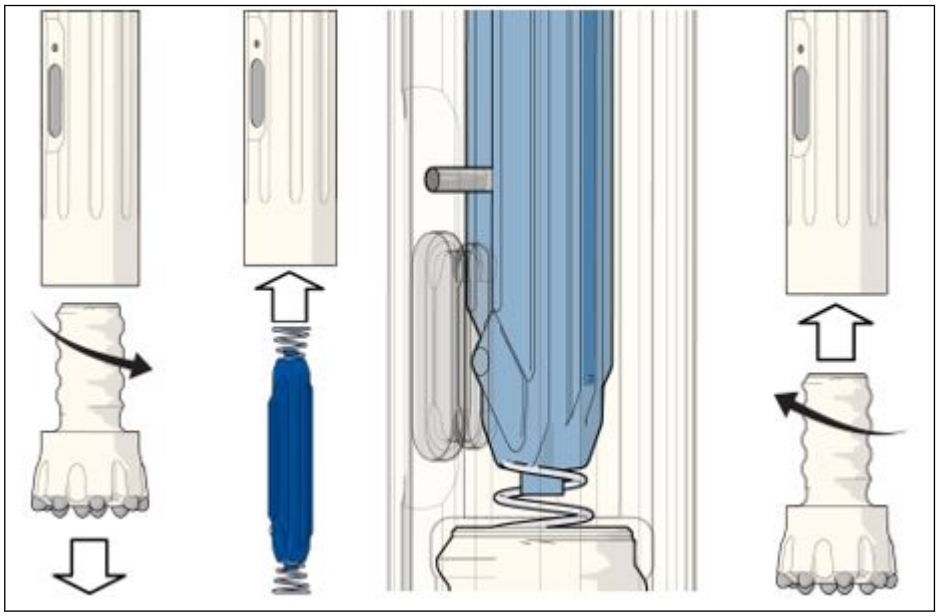


Figure 4. Installing a measurement module

Procedure

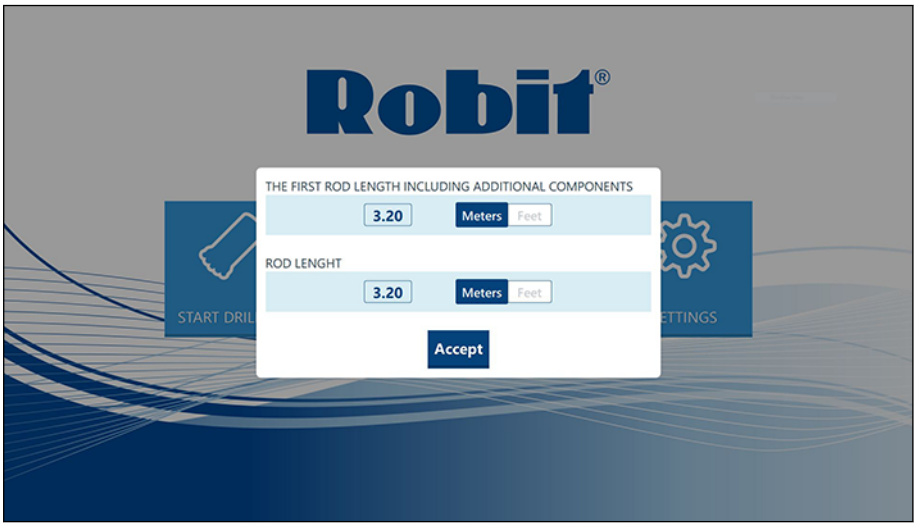
1. Detach the drill bit from the adapter.
2. Check that the measurement module has a spring at both ends.
3. Insert the measurement module in the adapter with the antenna facing down.
4. Ensure that the guide pin is above the antenna in the groove and that the antenna is aligned with the communication window.
5. Attach the drill bit to the adapter.

4.2 Starting up the software

Procedure

1. Start up the Robit Sense software by tapping the software icon on the tablet computer.

2. Once the software has been activated, enter the lengths of the rods in either metres or feet.



Note: The first rod length must also include the additional components, i.e. the first rod, the measurement module adapter and the drill bit.

Once the rod settings have been approved, the program moves to the home screen where you can select the desired function.

4.3 Measuring modes

Two measuring modes are available in the S Sense software: *Continuous mode* for normal drilling conditions and *Interval mode* for tough drilling conditions.

You can select the measuring mode in the Settings > Measurement settings view.

- In continuous mode, the measurement is continuously active and the operator records timestamps at each rod length when the coupling is clamped for uncoupling. This mode is suitable when threads uncouple easily and percussion and flushing are rarely needed during the measurement process. The continuous mode is sensitive to correct working methods.
- The interval mode is suitable for demanding ground conditions when threads get stuck and percussion is often needed for uncoupling. The interval mode maximizes accuracy in tough conditions.

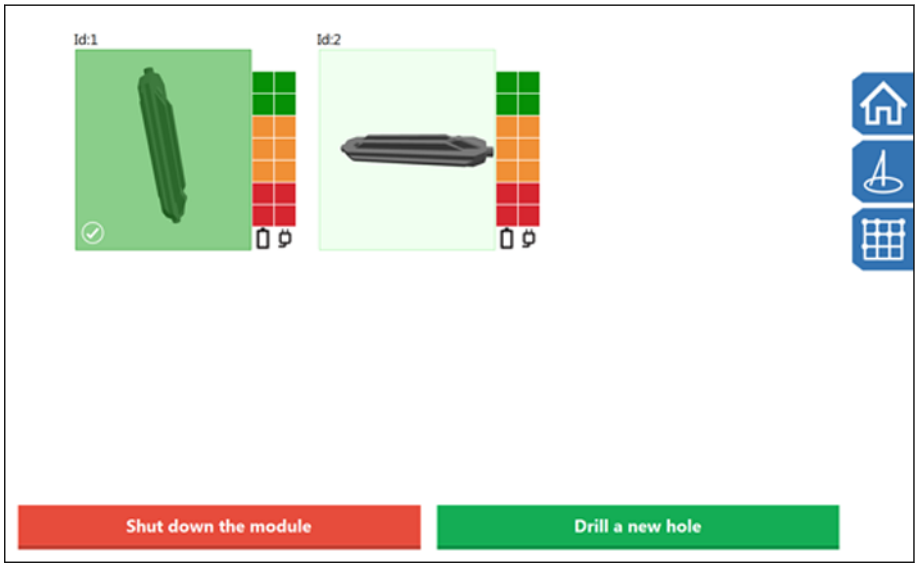
4.4 Measuring view

The process of measuring a borehole is initiated in the measuring view. You can access the measuring view with the Start drilling button in the home menu.

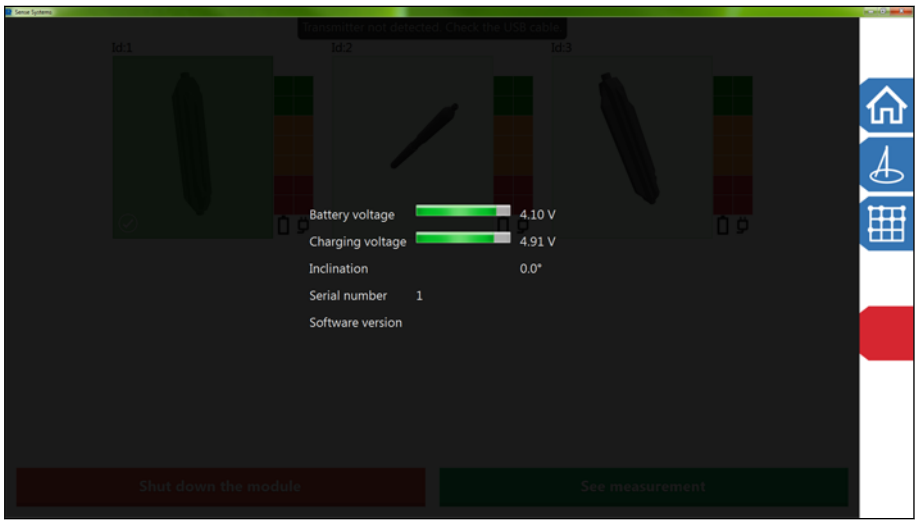
You can also access the measuring view by selecting the hole in the Site view and clicking the Measure here button.

The measurement modules connected to the transmitter are shown in the measurement module view. The view indicates the measurement module identifiers, battery charges, the battery power of modules being charged and the position of the modules. Up to five measurement modules can be connected to the transmitter simultaneously.

A module in the charging station can be identified by the charging power indicator shown next to the battery charge status. Other modules can be identified by moving a module and checking which module moves on the display.



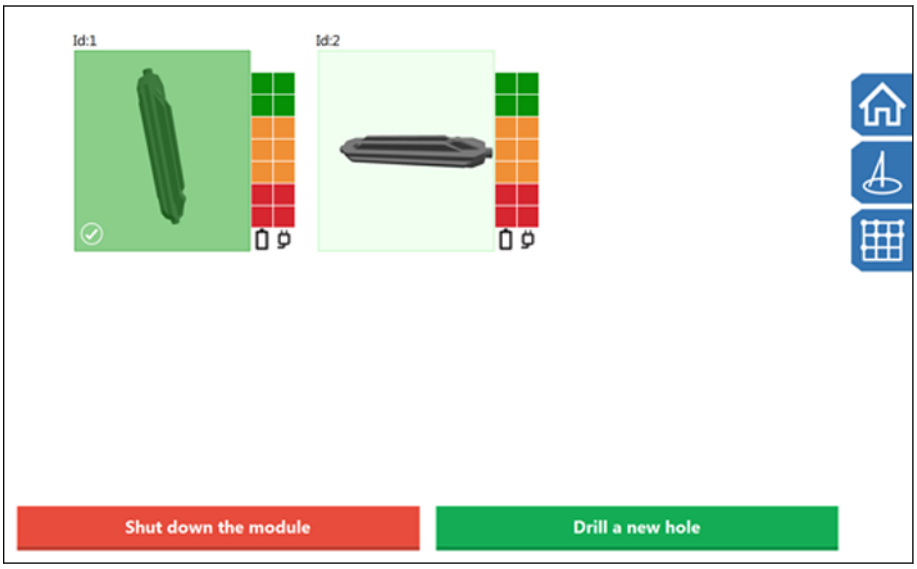
You can view detailed information about the selected logger by clicking the measurement module image.



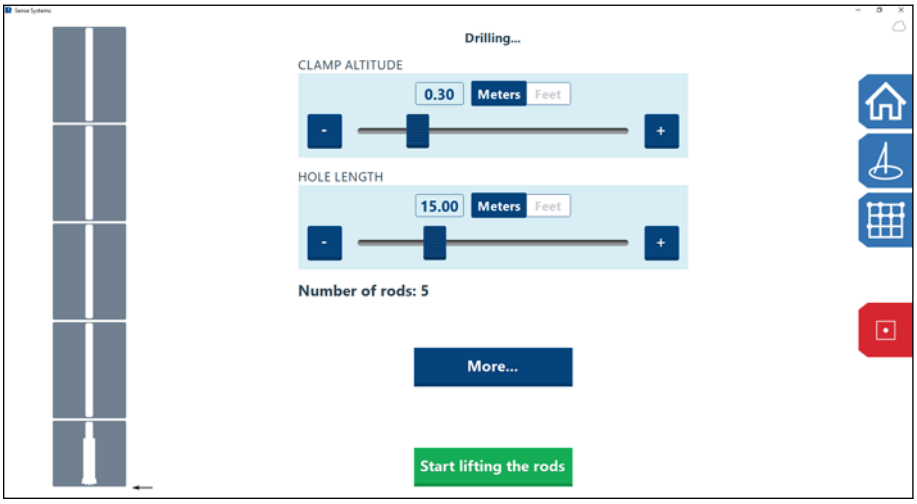
4.4.1 Measuring a borehole in continuous mode

Procedure

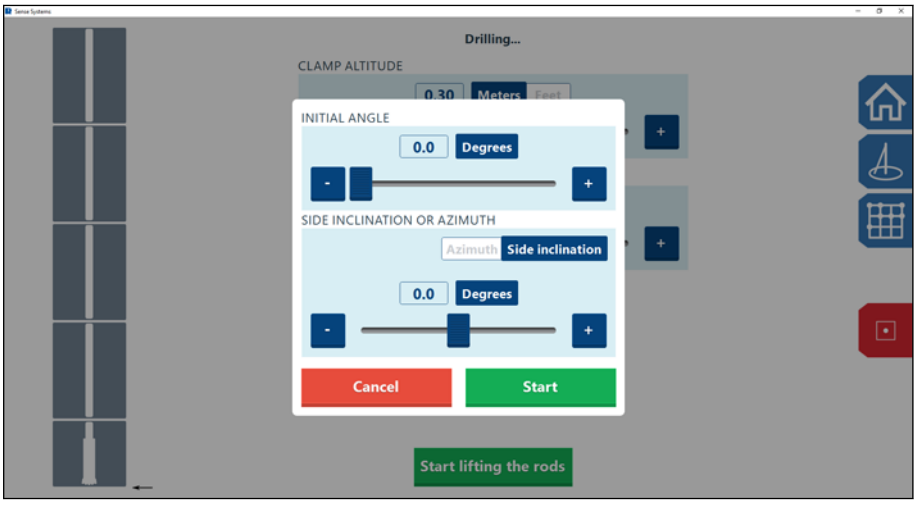
1. Press the measurement module image to select a logger installed in the drill. Select Drill a new hole to start drilling and measurement.



2. Enter the clamp altitude and hole length using the sliders or the + and - buttons. Once the hole has been drilled, you can begin saving the measurement by pressing the Start lifting the rods button.



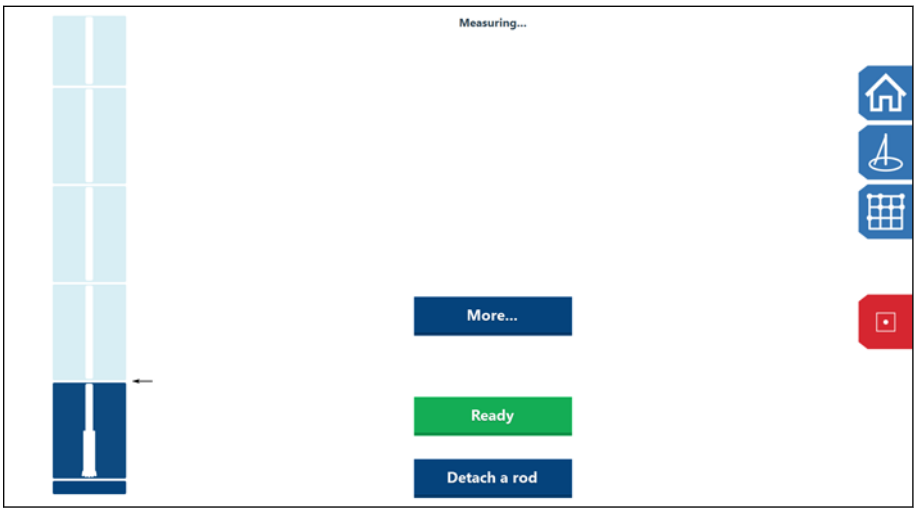
3. Enter the initial angle and side inclination or azimuth values using the sliders or the + and - buttons.



4. Press Start to start measurement. The first timestamp is recorded immediately when Start is pressed. After the timestamp is recorded, start lifting the rods out of the borehole and record timestamps at each rod change position.

Tip: The measuring accuracy is best when the rods are lifted in as straight and stable a manner as possible. It is particularly important to avoid percussion and fast rotation speeds (> 60 rpm).

5. Mark the rod changes by pressing the Detach a rod button when the rod is locked between the clamps.



Note: Do not move the rods during the timestamp recording. Hold the rod in place until the timer and text on the display disappear.

Once the rod change has been marked, the program returns to the measurement view.

6. Uncouple the rod and continue lifting the rest of the rods.

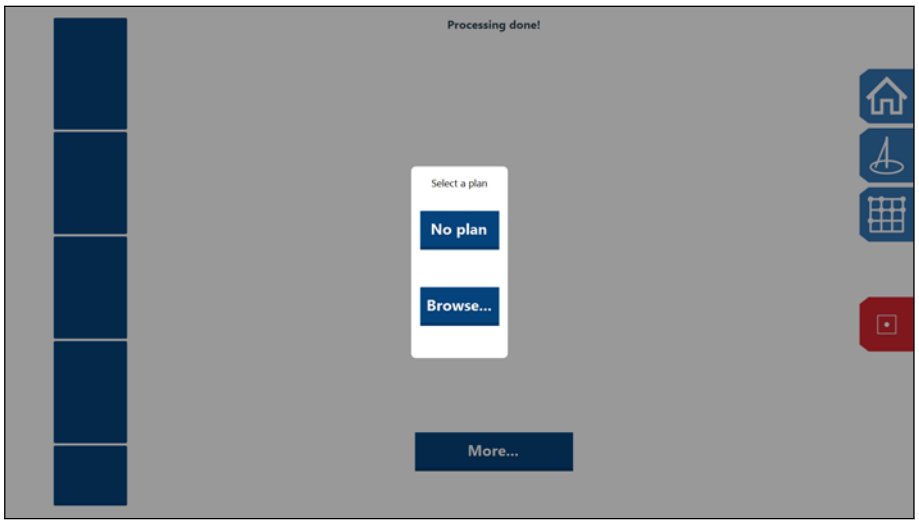
Note: The left side of the display shows the lifting progress and how many rods remain to be lifted.

7. Once the final rod has been lifted, mark the final timestamp and end the measurement by pressing Ready.

Tip: Mark the final timestamp while the drill bit is still a little inside the borehole.

The measurement is transferred to the computer immediately when the adapter's communication window is turned to face the transceiver.

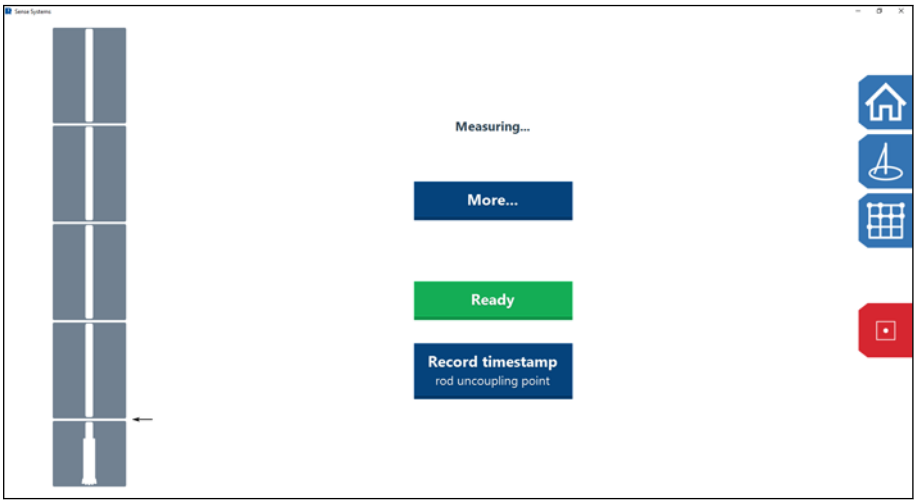
Once the measurement has been received, it can be saved for the desired field. If the measurement has been initiated by selecting a hole in the field, the measurement is automatically saved for the selected hole. If a site or position is not indicated for the hole, it is saved without location data.



4.4.2 Measuring a borehole in interval mode

Procedure

1. Lift the rods to where they will be uncoupled and take the coupling between the clamps.
2. Record a measurement point by pressing the Record timestamp button.



Note: Do not move the rods during the timestamp recording.

Tip: Turn off the flushing as it interferes with the measurement. After the timestamp has been taken, flushing can be turned back on, but should be kept as low as the ground conditions allow.

3. Uncouple the rod and place it in the rod magazine.

Tip: As the measurement is paused between the timestamps, percussion may be used to uncouple stuck threads.

4. Bring down the shank and couple the next rod.

Note: The left side of the display shows the lifting progress and how many rods remain to be lifted.

5. Before lifting the next rod length, record a measurement point by pressing the Detach a rod button.
6. Uncouple the rod from the drill string and continue the rod lifting process.

Note: Do not move the rods during the timestamp recording.

7. Continue lifting the next rod length.

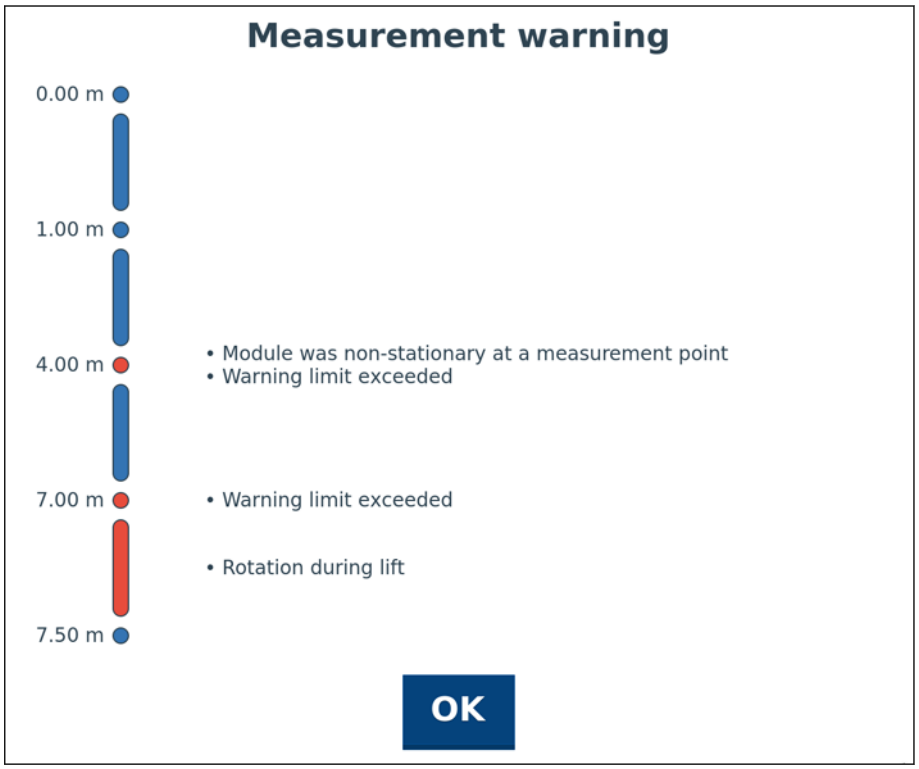
Tip: Keep the lift as steady as possible and avoid any rotation during the lift. If rotation needs to be used due to e.g. collapsing ground conditions, set your machine's rotation speed below 60 RPM and keep the total rotation time to a minimum.

4.4.3 Measurement quality view

After each measurement, the system displays a measurement quality view which helps in spotting and improving accuracy affecting issues.

The measurement quality view contains e.g. the following measurement quality observations:

- Rotation warnings
- Non-stationary warnings for each timestamp.



Press OK to close the measurement quality view.

4.4.4 Modify measurement

The total trajectory of a borehole is measured as a combination of two separate measuring methods:

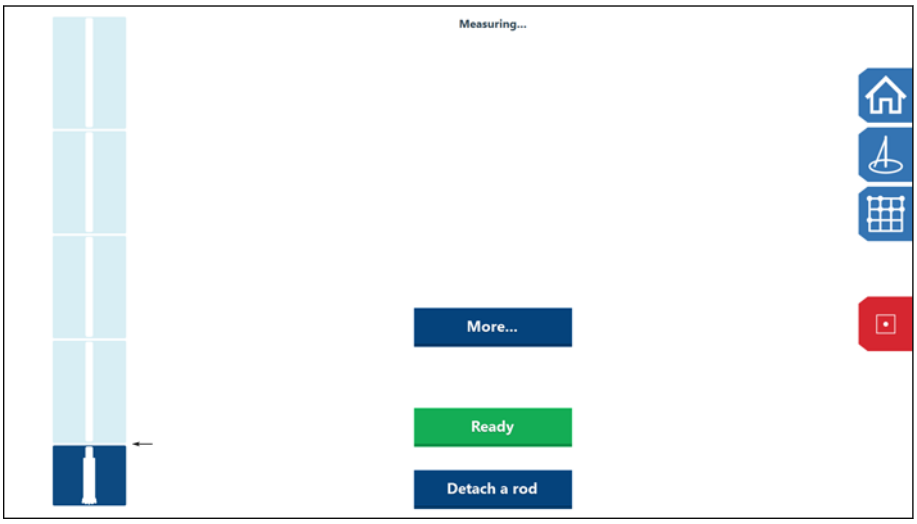
1. Inclination angle measured by the triaxis accelerometer is an absolute point-specific value at each rod uncoupling point when timestamps are taken.
2. Azimuth angle measured by the gyroscopes as a change between two measurement points, i.e. rod uncoupling points where timestamps are recorded.

The measurement accuracy can be adversely affected by high energy occurrences that are sometimes necessary during the lifting of rods in standard procedures, namely high-speed rotation and loose hammering.

The modify measurement feature can be used in order to increase Azimuth angle accuracy during measurement. Use this feature to avoid measuring mistakes caused by percussion or high drill bit rotation speed.

Procedure

1. Lift the rods to where they would normally be uncoupled and take the coupling between the clamps.
2. Record a measuring point by pressing the Detach a rod button.

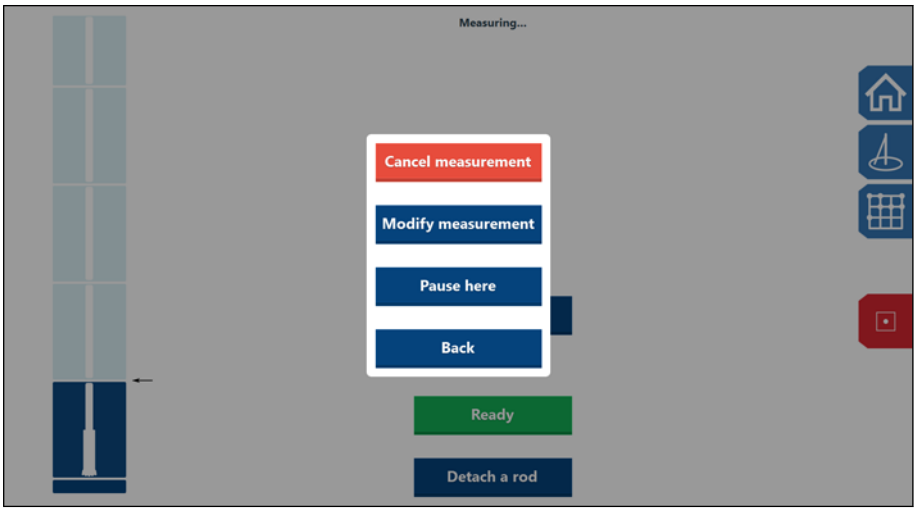


A timestamp is created.

3. Use percussion to loosen the threads, uncouple the rod and place it in the rod magazine. Bring down the shank and couple the next rod.

Note: Before using the Modify measurement feature, try to clamp the coupling at the exact same point where you recorded a timestamp in Step 2. This improves the measurement accuracy.

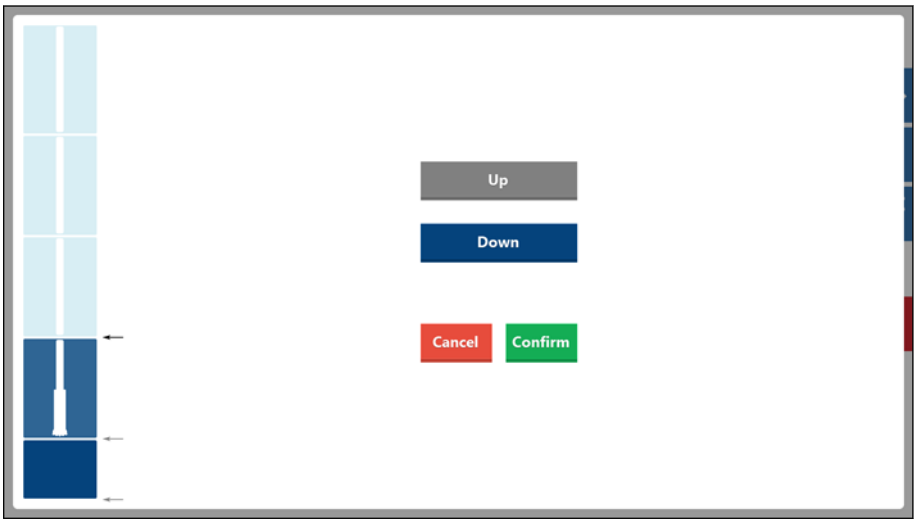
4. Press More... to access measurement options.



a) Press Cancel measurement to cancel the entire borehole measurement.
b) Press Modify measurement to modify current measurement.
c) Press Pause here to pause the measurement process.
d) Press Back to return to the measurement view.

5. Press Modify measurement to modify current measurement.

   The blinking arrow on the left of the screen indicates where the system expects you to record the next timestamp. It is one step ahead of the current position as rods have not yet been lifted.



a) Press Down once to bring the system to the correct depth. The arrow indicating the current measuring point moves down one step.

Note: Do not shake the rods!

b) Press Confirm to continue borehole measurement or Cancel to cancel modifications.

6. Record a new timestamp by pressing the Detach a rod button.
7. Continue the rod lifting process normally.

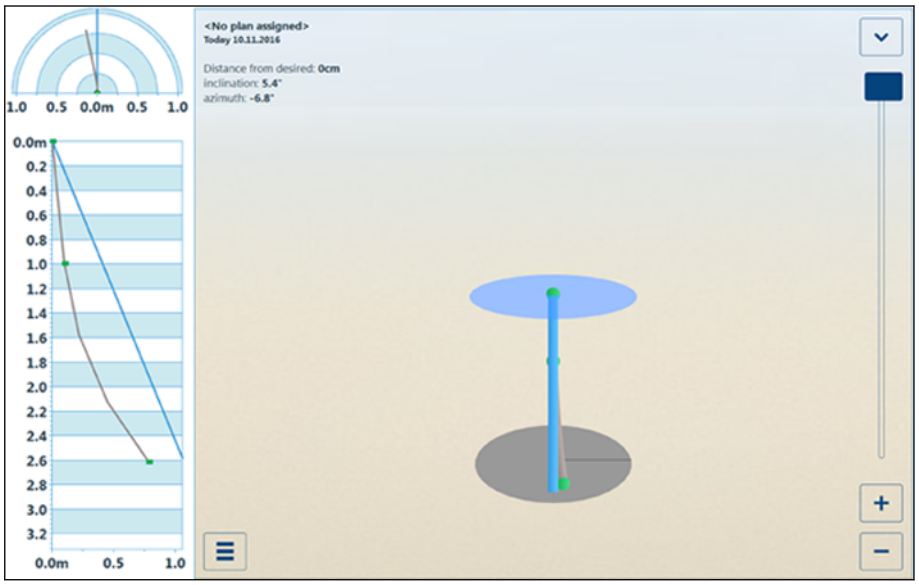
4.5 Results view

Measured holes can be examined in the inspection view. To access this view, click the Results button in the home menu.

You can also view the measurement results by selecting the desired hole in the site view and pressing the Inspect button.

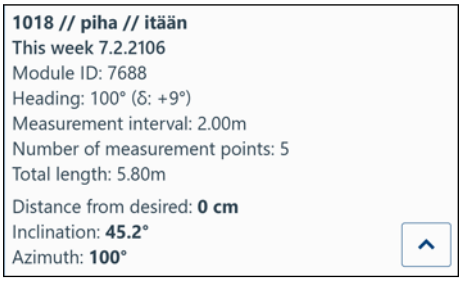
4.5.1 Inspecting measured holes

In the drill hole inspection view, the holes are presented in an interactive 3D view and a 2D planar view. The 3D view can be turned as well as zoomed in and out. The cross-section plane in the view can be moved.



Procedure

1. Open the additional information for a drilled hole by clicking the v button at the upper edge of the view. Close the information by clicking the ∧ button.



   The additional information window contains the following data:

   - Site, level and plan information
   - Measurement date
   - Measurement module ID
   - Compass heading including declination. Declination (in this case +9 degrees) is derived from the latest GPS position of the tablet computer.
   - Measurement interval
   - Number of measurement points
   - Total hole length
   - Distance from the desired hole position
   - Hole inclination
   - Hole Azimuth value.

2. The hole being inspected can be changed by clicking the Menu button at the bottom edge of the view.
3. You can view more detailed information on the hole in the planar views on the left by moving the blue cross-section plane.

   The upper planar view indicates the azimuth of the hole. The starting direction is always shown as up in the view. The lower planar view shows the angle and length of the hole as well as its deviation from the planned specifications.

4.6 Site view

The site view displays the selected drilling plan. The way in which the drilling plan is presented can be selected with the Site button in the side menu. The 2D/3D icon below the button indicates which mode is selected.

To access the site selection and creation view, click the Drilling plan button in the start or side menu.

By selecting a hole in the drilling field, you can navigate directly to measuring the hole in question or viewing a measured hole. Measured holes can also be moved, deleted and supplemented with additional data.

In the 3D view, the bottoms of the boreholes are assumed to be at equal depth. The ground level in the 3D view is determined based on the measurements conducted. It can then be used to facilitate finding holes and to draw a graphical presentation of a hole's direction and azimuth. In other words, the vertical alignment of the holes is derived from the bottom and is horizontal in relation to the surface.

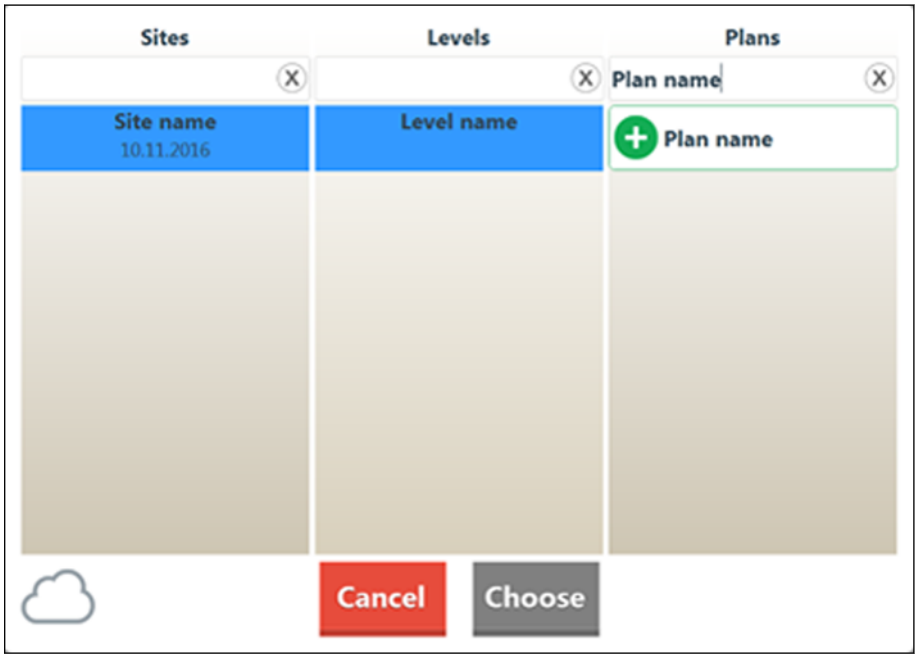
During hole measurement, the starting direction is always assumed to be the same, so all the holes in the field begin in the same direction: directly up. If the starting direction of a hole differs from the assumed direction, the graphical presentation will not match the drilled hole. The starting angle is defined before drilling and set as the hole's starting angle for measurement.

4.6.1 Creating a new field

A new drilling plan can be created via the Menu button in the lower left corner.

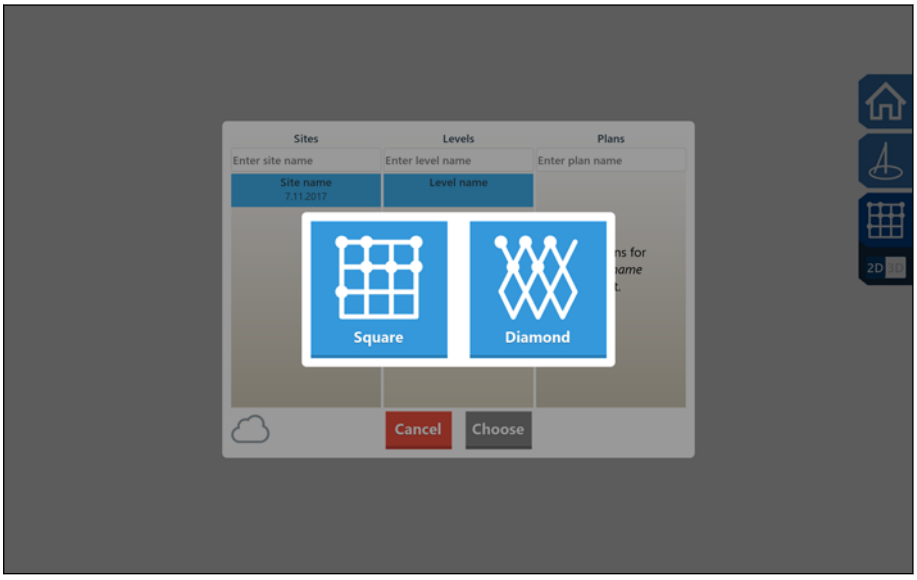
Procedure

1. Enter a name for the site, level and drilling plan. You can also select an existing drilling plan.

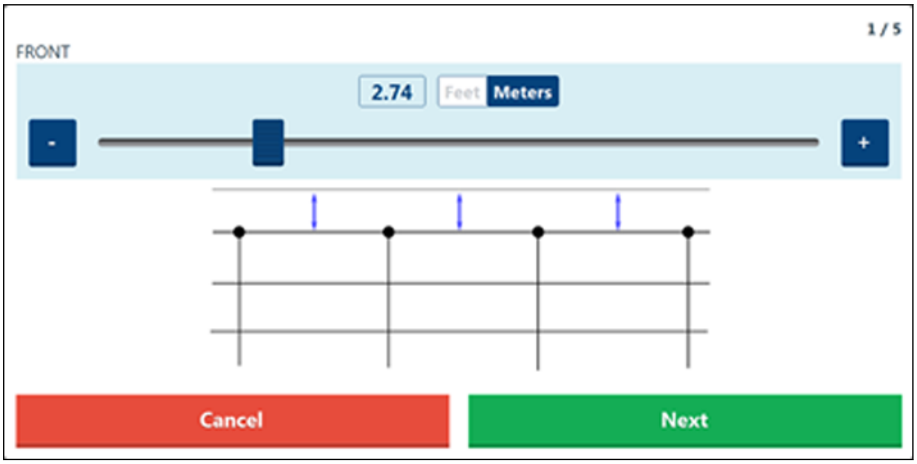


By tapping the cloud icon, you can see the fields stored in the cloud service but have not been used locally.

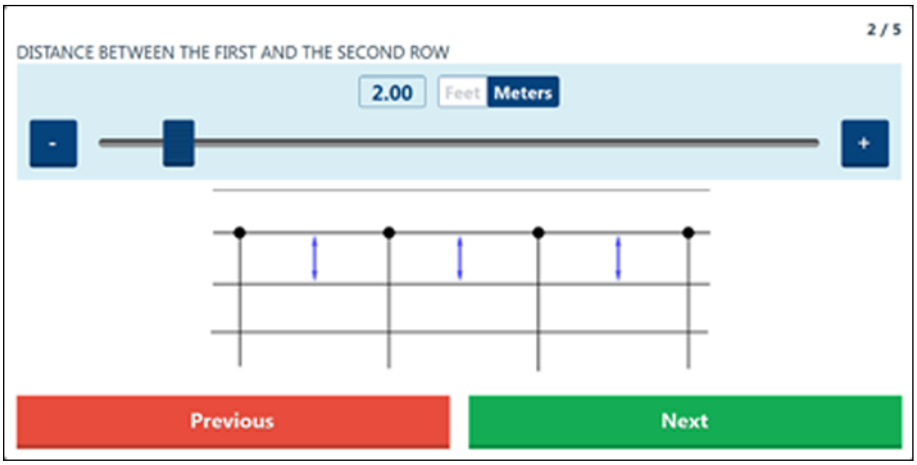
2. Select the shape of the new drilling plan.



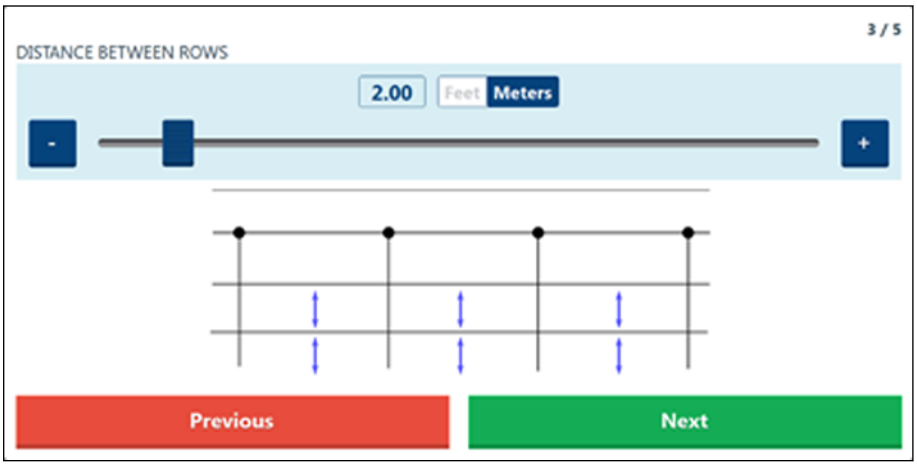
3. Set the distance of the first drilling row from the edge of the slope.



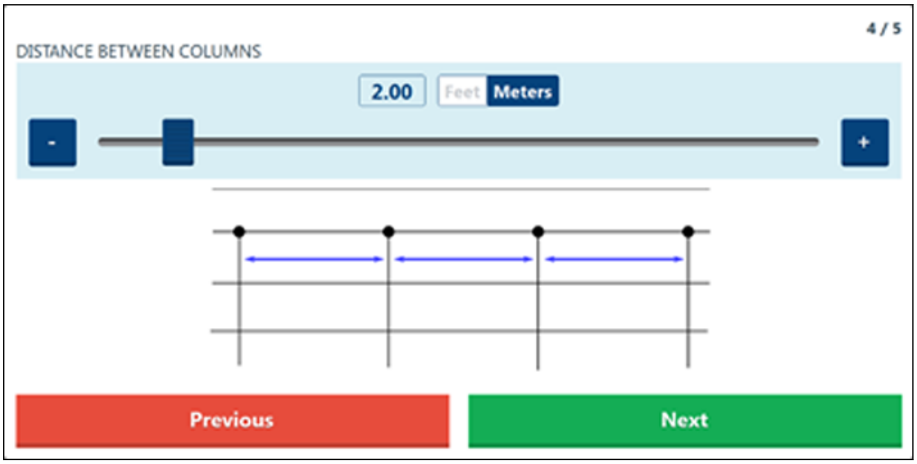
4. Set the distance between the first two rows.



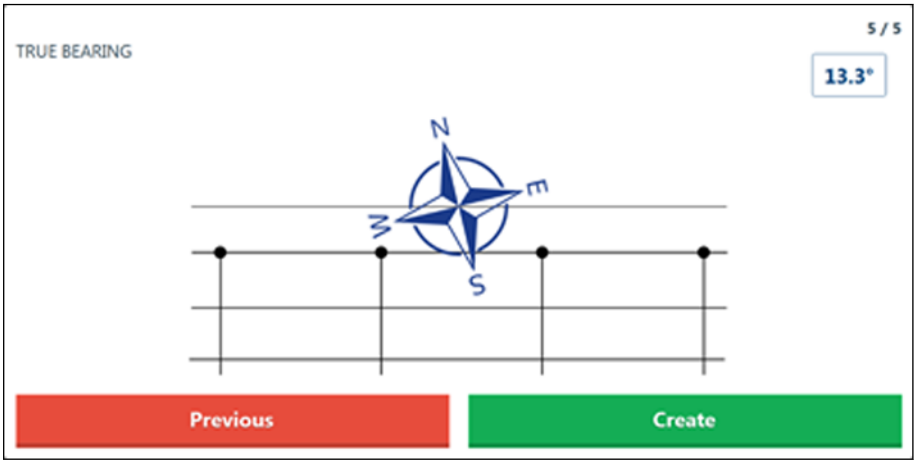
5. Set the remaining row intervals.



6. Set the distance between row columns.



7. Set the true bearing of the field by touching and rotating the compass.

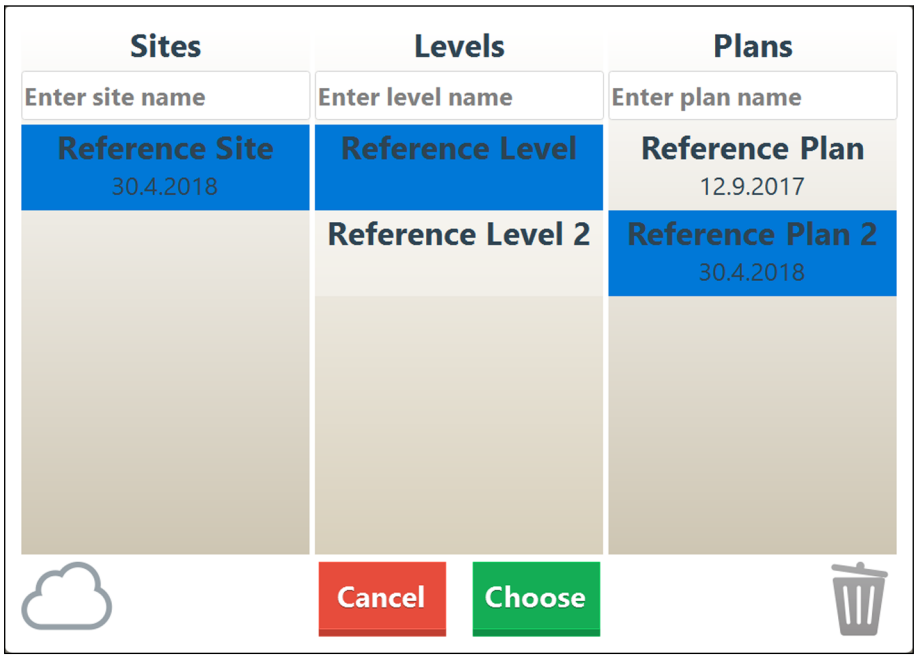


4.6.2 Deleting a site, level or plan

You can delete a site, level or plan via the Menu button in the lower left corner.

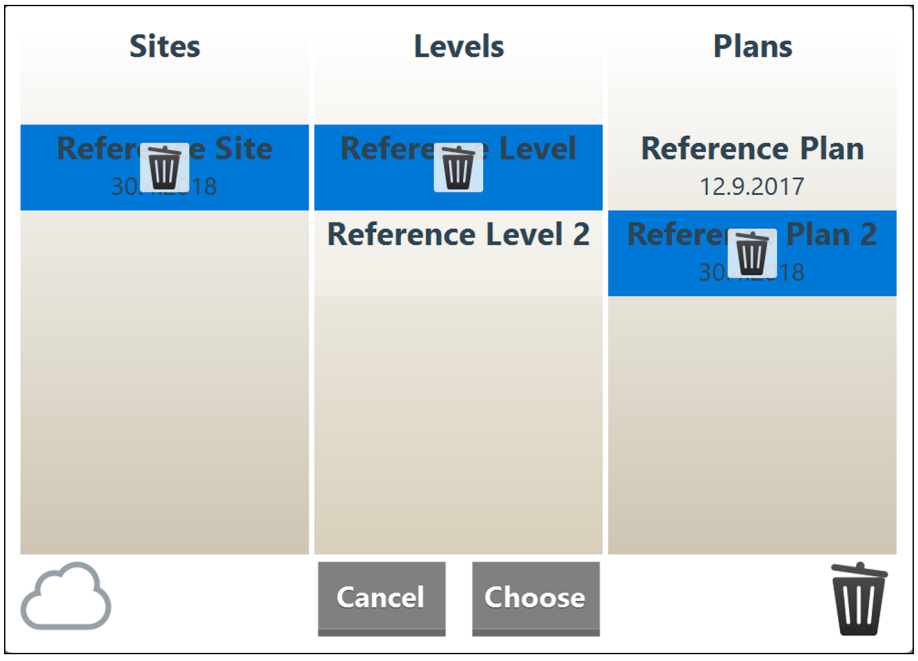
Procedure

1. Select the site, level or drilling plan to be deleted.

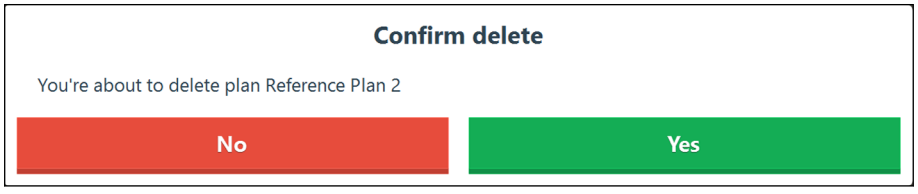


Tap on the trashcan icon the mark the selected item(s) for deletion.

2. Tap on the trashcan icon on the site, level or plan to delete the specific item.



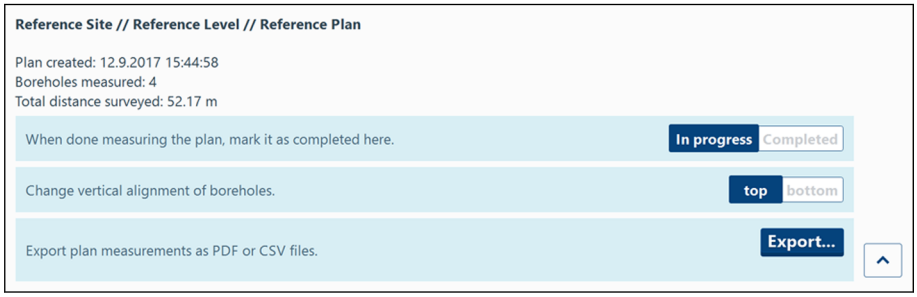
3. Confirm delete by tapping the Yes button or cancel by tapping No.



The selected item is deleted.

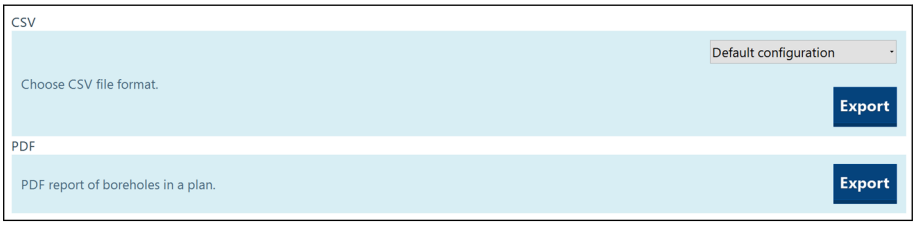
4.6.3 Additional information dialog

You can view additional information about the drilling plan by clicking the v button at the upper edge of the Site view. You can mark the plan as completed, change the vertical alignment of boreholes and export plan measurements. The system supports different export configurations which define how the data is exported.



Procedure

1. Mark the drilling plan as completed by tapping Completed.
2. Change the vertical alignment of boreholes by tapping top or bottom.
3. Export plan measurement data by tapping Export... and select the export configuration for .csv export from the drop-down menu.

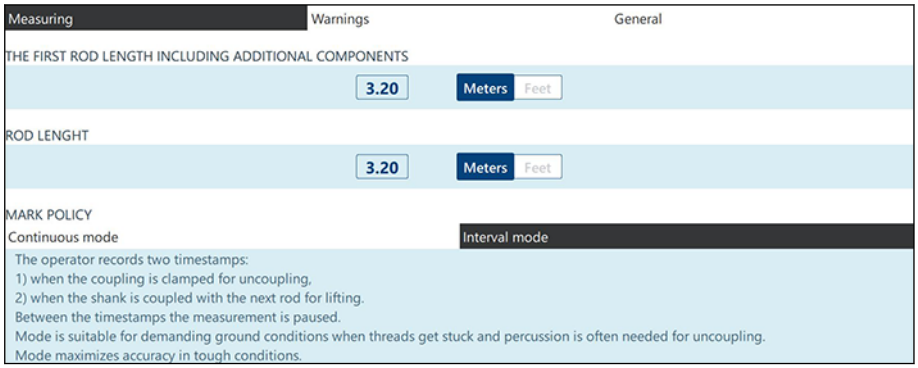


Select Export to export measurement data.

The exported data file is opened automatically.

4.7 Settings view

In the settings view, you can change the lengths of the rods, cable measurement interval, warning settings for inclination and hole deviation, and change the language of the operating system. To access this view, click the Settings button in the home menu.



Note: The first rod length must also include the additional components, i.e. the first rod, the measurement module adapter and the drill bit.

Figure 5. Measuring settings tab

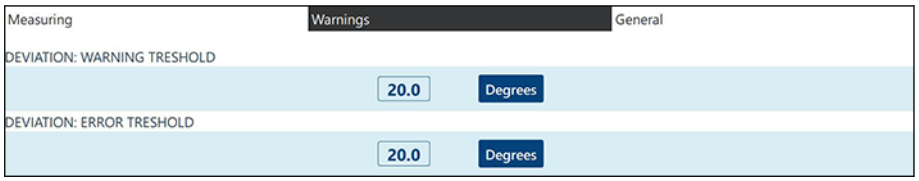


Figure 6. Warning level tab

Figure 7. General settings tab

5 Inspection and service

The following inspections must be performed at regular intervals in order to ensure that the measuring system operates as intended.

Note:

Never use damaged components!

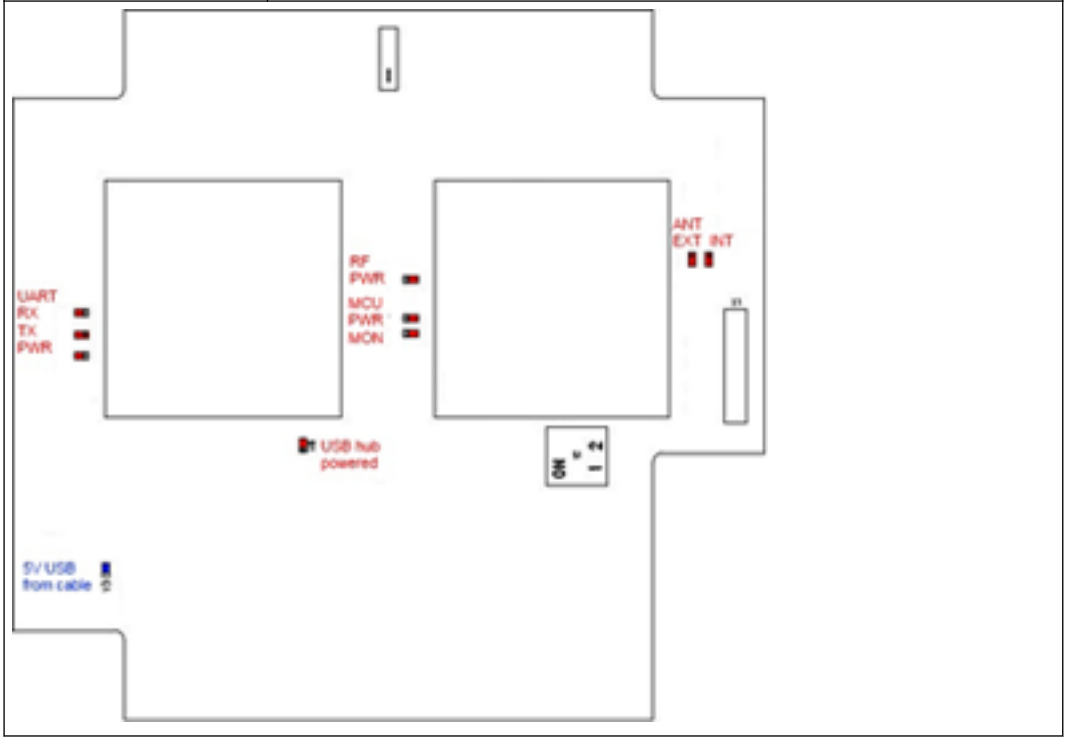
5.1 Daily inspections

- Check that the transceiver and the metal mount are properly fastened and that the transceiver is undamaged.
- Check that the transceiver cable is properly attached to the dust collection box and cannot get in between the moving parts.
- Check that the plug and guide pin of the adapter's data transfer window are intact and in place.
- Check that the cable ties on the boom have not been cut or damaged.
- Check that the protective sleeve of the transceiver cable is undamaged.
- Check that the cable follows the planned installation route and has not been caught in anything.
- Check that the computer dock and the dock support are in good condition, and the joints or locks have not loosened.
- Check that the power sources and cables of the computer and charging station are in good condition.

6 Troubleshooting

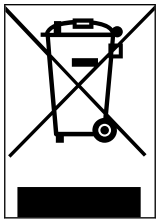
6.1 Indicator lights on the transceiver circuit board

5V-USB from cable	Indicates whether or not the USB cable provides voltage to the circuit board
UART: TX, RX, PWR	Indicates data transfer via the serial port
RF: PWR	Indicates whether or not the radio circuit is on
MCU: PWR, MON	Indicates the status of the microprocessor
ANT: EXT, INT	Indicates the antenna being used
USB hub powered	Indicates whether or not the USB converter gets voltage



7 Environment and recycling

7.1 Disposal of components



Do not dispose of electrical and electronic components with other waste. Separate electrical and electronic devices from other waste in order to avoid environmental and health detriments. If you are unfamiliar with the local recycling instructions, please contact the local retailer.

The batteries used in the product may not be disposed of with other waste. If the product or its battery carries the chemical abbreviations Hg, Cd or Pb, the battery in question contains an amount of mercury, cadmium or lead that exceeds the reference values in EC Directive 2006/66. If the batteries in question are not disposed of appropriately, these substances may be harmful to health or the environment.

Protect natural resources and promote the reuse of the materials. Separate batteries from other waste, and take batteries to a local recycling point.

8 Technical specifications

8.1 Standards

The Robit Sense system components comply with the following standards:

EMC

Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services

EN 301 489-1 Common technical requirements

EN 301 489-3 Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz

EN 301 489-17 Specific conditions for Broadband Data Transmission Systems

RF

EN 300 328 Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonised EN covering the essential requirements of article 3.2 of the R&TTE Directive

EN 300 330-1 Technical characteristics and test methods

EN 300 330-2 Harmonised EN covering the essential requirements of article 3.2 of the R&TTE Directive

RoHS

EN 50581 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

8.2 Licence information

OpenSSL Toolkit

The OpenSSL toolkit stays under a dual license, i.e. both the conditions of the OpenSSL License and the original SSLeay license apply to the toolkit. See https://www.openssl.org/source/license.txt for the actual license texts.

Qt Toolkit

The Qt Toolkit is Copyright (C) 2015 The Qt Company Ltd.

You may use, distribute and copy the Qt GUI Toolkit under the terms of GNU Lesser General Public License version 2.1. See https://raw.githubusercontent.com/qt/qt/4.8/LICENSE.LGPL for the actual license text.

9 Certificates

9.1 CE marking

This system bears the CE marking. This means that the system and its accessories adhere to the applicable directives, norms and regulations.

As proof of compliance with health and safety requirements, Robit Plc supplies an EU/CE certificate with each system sold in the EU/EEC area.

The system meets or exceeds the requirements of the following European standards.

- EN 301 489-1, EN 301 489-3, EN 301 489-17
- EN 300 328
- EN 300 330-1, EN 300 330-2
- EN 50581

10 Appendices