Leica iCON site

How-To Guide
Version 7.5
English

- when it has to be **right**

Leica Geosystems

PART OF HEXAGON

Introduction

Purchase

Congratulations on the purchase of a Leica iCON site software.

☞ This guide is intended to introduce you to the iCON site software, and explain how it connects and operates with other Leica Construction products. It can act as a quick field reference manual, whilst also providing concise information relating to configuration, data transfer, and the functionality contained within different field applications.

☞ The content of this document is subject to change without prior notice. Ensure that the product is used in accordance with the latest version of this document.

Updated versions are available for download at the following Internet address:

https://myworld.leica-geosystems.com > myDownloads

Validity of this manual

This manual applies to the Leica iCON site software.

Available documentation

Name	Description/Format		PDF
Leica iCON site How-To Guide	This guide is intended to introduce you to the iCON site software, and explain how it connects and operates with other Leica Construction products. Included are detailed descriptions of special settings and functions.	–	✓

Refer to the following resources for all Leica iCON site documentation/software:

- the Leica USB documentation card
- https://myworld.leica-geosystems.com

Symbols

The symbols used in this manual have the following meanings:

Type	Description
☞	Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

☞ Some features are only accessible when using a specific instrument, for example a Total Station. In appropriate sections of this manual, this will be indicated with special icons: **TPS** for Total Station, **GPS** for a GPS instrument, or **TPS** + **GPS** for both instrument types.

Trademarks

- Windows® is a registered trademark of Microsoft Corporation in the United States and other countries

All other trademarks are the property of their respective owners.

myworld

https://myworld.leica-geosystems.com offers a wide range of services, information and training material.

With direct access to myWorld, you are able to access all relevant services whenever it is convenient for you.

The availability of services depends on the instrument model.

Service	Description
myProducts	Add all products that you and your company own and explore your world of Leica Geosystems: View detailed information on your products and update your products with the latest software and keep up-to-date with the latest documentation.
myService	View the current service status and full service history of your products in Leica Geosystems service centres. Access detailed information on the services performed and download your latest calibration certificates and service reports.
mySupport	Create new support requests for your products that will be answered by your local Leica Geosystems Support Team. View the complete history of your support requests and view detailed information on each request in case you want to refer to previous support requests.
myLearning	Welcome to the home of Leica Geosystems online learning! There are numerous online courses – available to all customers with products that have valid CCPs (Customer Care Packages).
myTrustedServices	Add your subscriptions and manage users for Leica Geosystems Trusted Services, the secure software services, that assist you to optimise your workflow and increase your efficiency.
mySmartNet	Add and view your HxGN SmartNet subscriptions and user information. HxGN SmartNet delivers high-precision and high-availability GNSS network correction services in real time. The HxGN SmartNet Global family offers Network RTK with RTK bridging and Precise Point Positioning (PPP) services. These services work exclusively with Leica Geosystems GS sensors, providing the highest accuracy. Combined, they ensure HxGN SmartNet coverage everywhere.
myDownloads	Downloads of software, manuals, tools, training material and news for Leica Geosystems products.

Table of Contents

1 Operating Principles

1.1 System Overview

Instruments and connectivity

iCON site is pre-configured to be compatible with following Leica Total Station/GPS instruments:

Function	Name	Connectivity with controller
Manual Total Station	Leica Builder Leica iCON iCB60 Leica iCON iCB50 Leica iCON iCB70	Cable Short-range Bluetooth
Robotic Total Station	Leica PowerTracker Leica iCON iCR50 Leica iCON iCR60 Leica iCON iCR70 Leica iCON iCR80 Leica iCON iCR80S Leica TS16, TS60 Leica MS60	Cable Short-range Bluetooth Long-range Bluetooth
GPS antenna and receiver	Leica iCON iCG30 Leica iCON iCG60 Leica iCON iCG70	Cable Short-range Bluetooth

☞ For further information on the specific instrument, please refer to the associated manual provided with the product.

Data storage, connectivity of controller

The 7" controller can record and store data internally. Data can be transferred to an Office PC using a USB connection.

Device	Internal storage
7"	128 GB hard drive

☞ For further information on the specific instrument, please refer to the associated manual provided with the product.

Firmware updates

Before installing any firmware updates, tap **System** and then **Active Licences** to check the maintenance status. Ask your agency or your Leica Geosystems representative for information about maintenance renewal.

☞ iCON site will conduct a maintenance check before any update installation.

Software Update

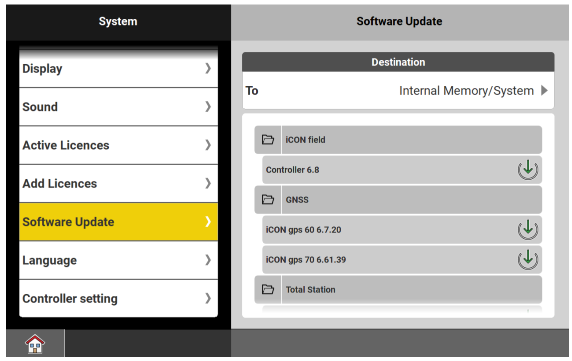
It is possible to download software/firmware updates for the following devices:

- iCON field software
- iCON iCG60
- iCON iCG70
- iCON iCR70/iCON iCR80/iCON iCR80S
- iCON iCB50/iCON iCB70
- iCON iCT30

1. When the controller is connected to the internet and a new iCON sofware version is available, a notification message is shown. The new iCON version can be downloaded from **Settings > System**.

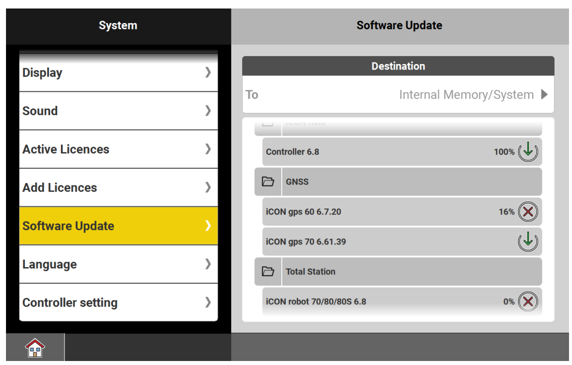
☞ An orange dot on the System button indicates that a new software version is available for download.

2. Go to **System > Software Update**.



The new installation/firmware files can be stored to the Internal Memory/System or to an external memory device (for example, USB).

3. Tap the buttons to start downloads.



It is possible to operate the software while downloading a newer version. Once the download is finished, a notification message appears in the Map View. Downloaded files can be transferred to GNSS antennas or Total Stations to upgrade these devices.

☞ When a new firmware version for a device is available, an orange indicator appears on the download icon.

System information

To retrieve system information, tap **System** and then **About**.

- The software version and the build installed are displayed.
- This software contains copyright-protected software that is licensed under various open source licenses. The copyright information and a link to detailed information is displayed.
- The MAC ID of the hardware the software runs on is displayed as well.

☞ An internet connection is needed to view the detailed copyright information.

Activate optional features

The software offers some optional features or applications like **Roading**. Such optional features are licensed.

☞ A list of optional features can be found in the Equipment List on myWorld.

Activating features protected by an entitlement

Features that are protected by an entitlement can be activated on the controller unit or on an instrument with a display unit by tapping **System** and then **Add Licences**. Enter the entitlement received from your representative and tap .

To update an entitlement tap the button that can be found in the Function bar at the bottom of the screen.

☞ An internet connection is needed to activate an entitlement.

Activating features protected by a license key TPS

Some features are protected by license keys that need to be uploaded to the instrument from an SD card or a USB flash drive.

- On TPS with display license upload can be handled directly on the TPS instrument.
- For TPS without display license upload has to be steered via the controller.

Below short instructions on uploading licenses using the controller are given.

☞ For further information ask your agency or your Leica Geosystems representative.

1. Insert the memory device into the instrument and turn the instrument on. Make sure that the instrument is properly connected to the controller.
2. Tap **Devices**, then tap on next to the instrument name to edit its profile.
3. Tap **Sensor Utilities**, then tap **Upload licence key** in the Sensor Utilities screen.
4. Select the license *.key file to be uploaded and tap the **Start Upload** button.

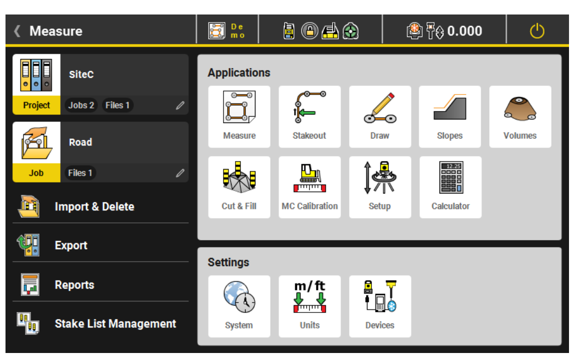
1.2 The Software User Interface

1.2.1 Equipment

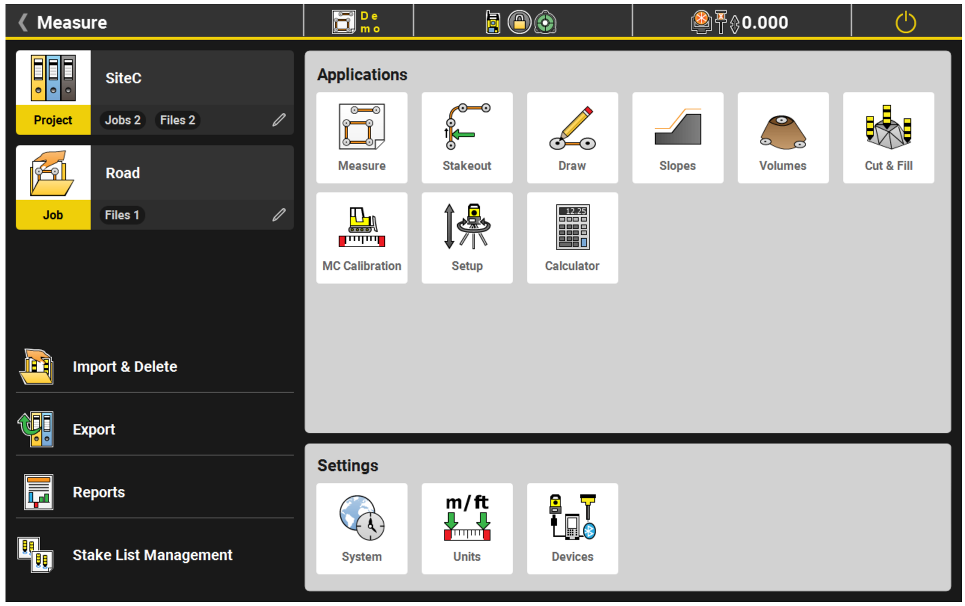
Display formats

iCON site is available in different display formats, depending on the equipment you are using:

5" Landscape:



7" and 10" Landscape:



The applications used in each display format have the same functionality.

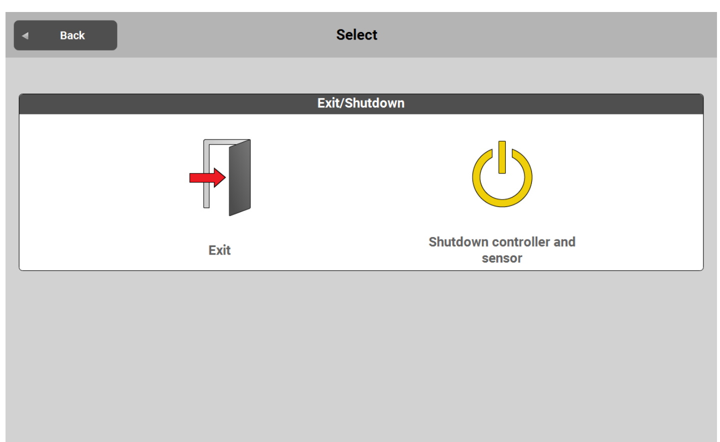
1.2.2 Navigation Concept

Startup

1. **iCON site** software starts automatically after the device is switched on.
2. In case the iCON site software was exited, you can re-enter by selecting **iCON** from the Start menu or Desktop within Windows.

Logout/Shutdown

The **Power key** in the Home Menu navigates to the **Exit/Shutdown** screen, giving the following options:

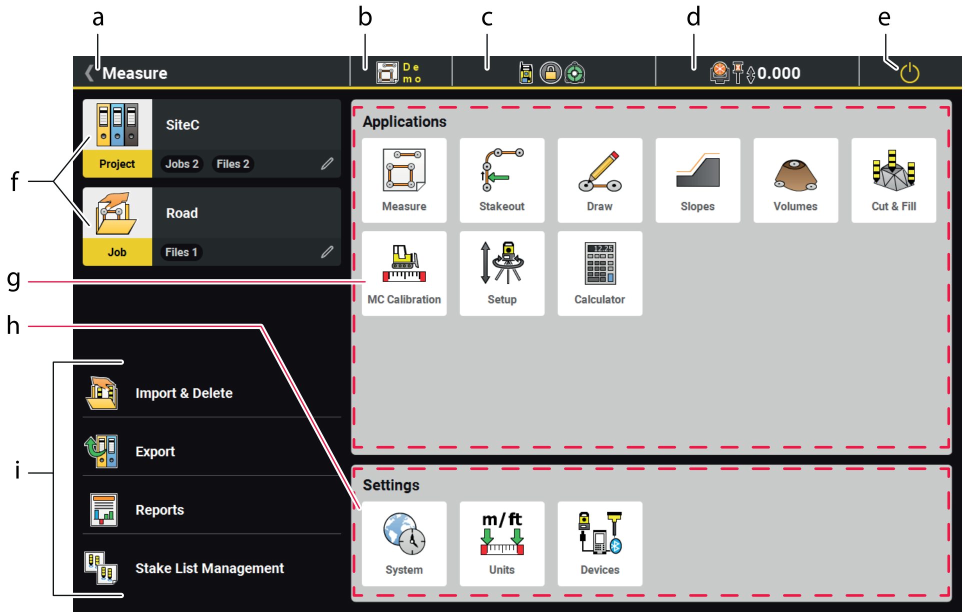


- **Exit**:
  Closes iCON site.
- **Shutdown controller and sensor**:
  Shuts down controller and connected sensor.

Principles of operation

Upon launching iCON site, **Home Menu** is the first screen to be displayed.

Description of the Home Menu elements:



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a	Back key for last used application	e	Power button
b	Icon of last used application	f	Project and jobs management
c	Status bar 1	g	Applications container
d	Status bar 2	h	Settings container
		i	Data management

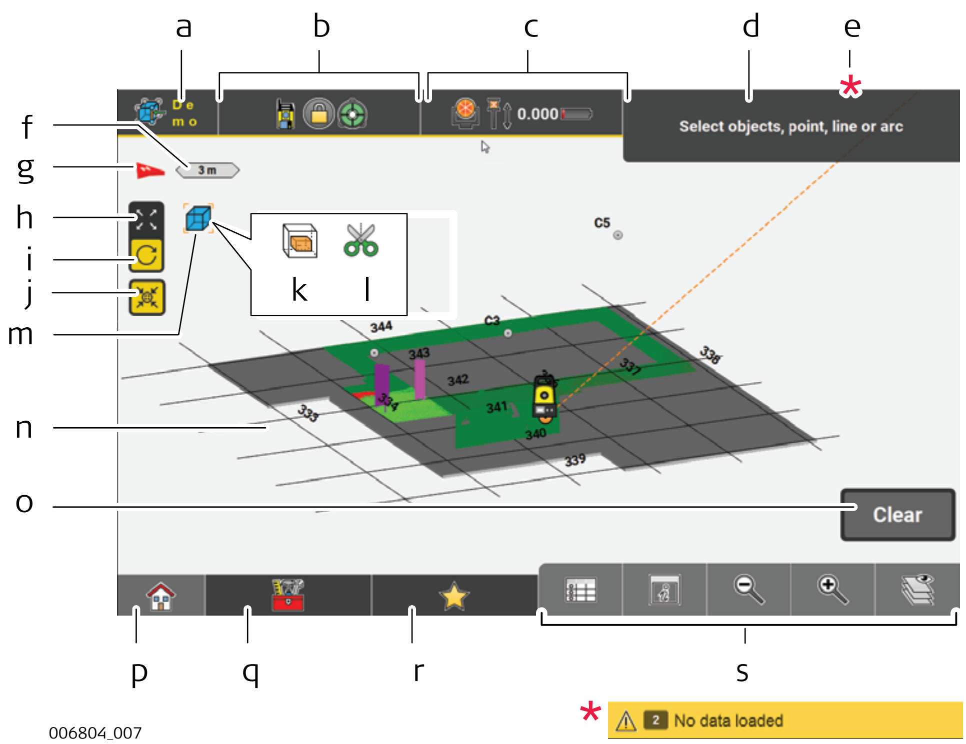
Element	Description
Status bar	Contains icons that indicate status of the controller, and the connected instrument. In the Home Menu, the Status Bar is minimised and read-only.
Power button	Exit the software or shutdown the controller and sensor.
Project and jobs management	Contains options to manage projects and jobs.
Data management	Contains options to import, export or delete data, to manage stakeout lists and to create reports.
Applications container	Displays the different applications available for use.
Settings container	Contains options for editing user information, units and tolerances, and connected device settings. Licenses can be added here.

☞ The software allows for a user configurable content of the Home Menu, using the **User Permissions** feature. Therefore the Home Menu configuration may differ from the one shown in this manual. Refer to User Permissions for more information.

Applications

Once an application is selected, you are directed to the Map screen.

Description of the Map screen elements:



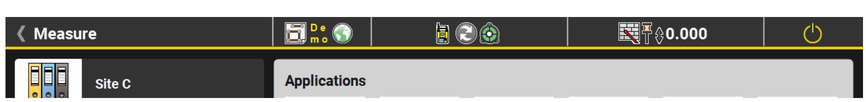
a	Application key	k	Limit Box indicator
b	Status 1	l	Clipping Filter indicator
c	Status 2	m	Isolation mode indicator
d	Information bar	n	Main map area
e	Warning bar (only displayed if there is an issue)	o	Measure bar
f	Scale bar	p	Home key
g	North indicator	q	Toolbox
h	Button for panning mode	r	Favourites
i	Button for rotation mode (3D)	s	Map handler
j	Button for auto-centring the map view		

Element	Description
Application key	Displays name of current active project, active job and active coordinate system. Displays Leica ConX status information, if Leica ConX licence is activated. Displays TPS setup information, when connected to a total station. Displays Base Station information, when connected to an iCON iCG70.
Status 1	Displays status of connected Total Station or GPS instrument. Contains options to directly edit function/status of the instrument.

Element	Description
Status 2	• **For TPS**: displays status of target, for example pole and prism information, and controller. • **For GPS**: displays status of the communication devices (radio or modem). Contains options to edit relative settings.
Warning bar	Displays any issues with the operation that may compromise usability.
Information bar	Displays information about the current measurement, the selected points, and all configured values. Tap and hold to configure.
North indicator and scale bar	Indicates scale and orientation of display. Tap the North indicator to reset the map to 2D view.
Indicator for Clipping Filter	Displayed if Clipping Filter mode is active. Allows quick access to the Clipping Filter function.
Indicator for Limit Box	Displayed if Limit Box mode is active. Allows quick access to the Limit Box function.
Indicator for Isolation mode	Displayed if Isolation mode is active. Allows quick access to the Isolate function.
Main map area	Graphically displays pre-loaded data and measured data.
Measure bar	Displays main command keys, for example **Measure** or **Store**. Tap and hold to configure the Measure bar.
Home key	Navigates back to the Home Menu.
Toolbox	Contains functions relevant to the active application.
Favourites	Contains Camera, Calculator and TPS setup, when connected to a TPS. You can add Measure Bar functions into the Favourites. Refer to Measure bar for information about configuring Favourites.
Map handler	Change zoom level and view mode. Define data displayed in the main map area. Access to point list.

☞ Depending on the specific application being used, different functionality is present.

☞ If you tap the **Home** key while in an application, you return to the Home Menu. The Title bar contains a **Back** key with an option of navigating directly back to the **previous application**, for example **Measure**:

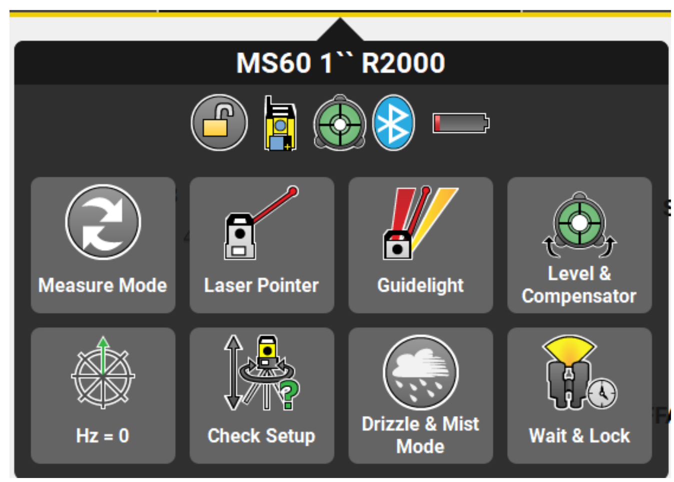


Status bar TPS

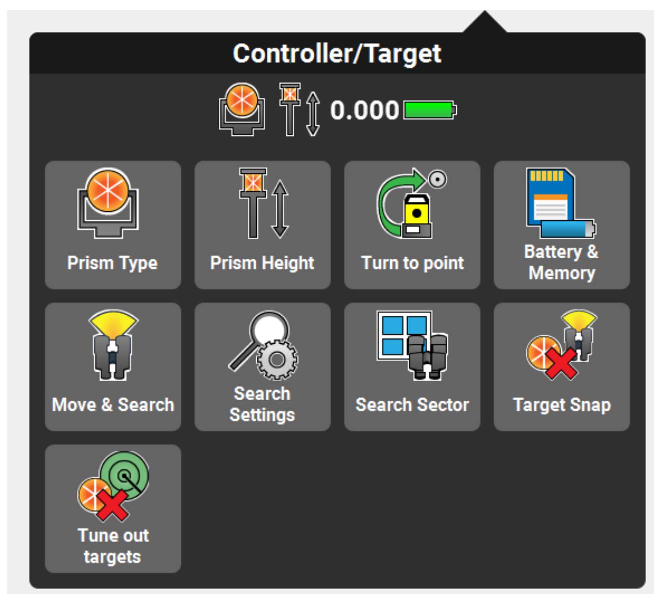
Status bar displays the status of the controller, the status of the connected instrument, pole and prism information, and information about the current application. It consists of three keys:

a Application key
b Status 1
c Status 2

Key	Description
Application key 	• Displays key information about the current job, project and application. • An additional icon displays the current status of **Leica ConX** or any other cloud services. • Once tapped, the Application key allows you to access the **Station information** details by tapping **Station Info** as well as the details of the active cloud service by tapping the current status icon of the respective cloud service.
Status 1 	Instrument status. Tap the Status Bar to get access to more information/functionality. ☞ Availability of information/functionality depends on the connected Total Station.



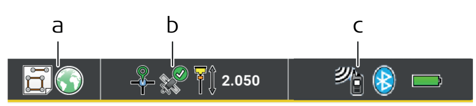
Key	Description
	• Select the **Measure Mode** from **Single Manual**, **Single Auto**, and **Continuous with lock**. • Select **Visibility** settings. Not available for iCON iCR70/iCON iCR80. • Switch **Laser Pointer**, **Guidelight**, and **Compensator** on or off. • Use **Hz = 0** to easily set the current orientation as zero orientation. • Use the **Check Setup** function to start a Total Station setup check. • Switch **Drizzle & Mist Mode** on or off. Only available for iCR Total Stations. Improves the search and lock behaviour in bad weather conditions. • Use **Wait & Lock** to make the Total Station lock onto the prism when you walk with the prism through the line of sight of the telescope. Only available for iCR80/iCR80S with an active a dynamic lock license. ☞ With an active dynamic lock license **Wait & Lock** can also be set as an automatic search setting in case of losing the prism. See also: Automatic search settings step-by-step
Status 2  	Pole and controller status. Tap the Status Bar to get access to more information/functionality.



Key	Description
	• Define **Prism Type** and **Prism Height**. • Use **Turn to point** to simply select a point and have the Robotic Total Station automatically turned to that point. • Battery and memory status is also displayed. • Start the **Move & Search** pilot. • Prism search controls are found in the **Search Settings**. • Use **Search Sector** to define a sector for the automatic prism search, which helps to reduce prism location time. • To ban fixpoints from a PowerSearch set **Target Snap** to **On**. PowerSearch will then ignore prisms with known position. All prisms used for a station setup calculation and all measured control points are excluded from any PowerSearch. ☞ **Target Snap** can only be used with a iCON iCR60, iCON iCR70, iCON iCR80, TS16, TS60, MS60 and the appropriate license. • With **Tune out targets** the Leica iCON iCR60, TS16, TS60, MS60, iCON iCR80 or iCON iCR70 (with additional licence) starts a scan: the Total Station searches three times the full circle and scans for target points. All scanned targets are included in the Exclusion List. An existing Exclusion List is overwritten. All points within the Exclusion List are excluded for automatic or manual prism searches.

Status bar GPS

Status bar displays the status of the controller, the connected instrument, position quality information, and information about the current application. It consists of three keys:



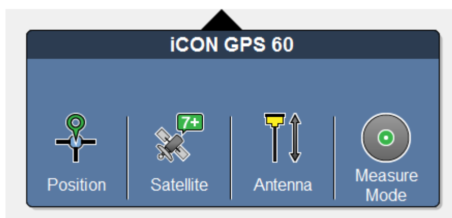
a Application key
b Status 1
c Status 2

Key	Description
Application key 	• Displays key information about the current job, project, application and the active coordinate system. • An extra icon displays the current status of **Leica ConX** or **BIM 360 Docs**. Once tapped, the Application key allows you to access the **Leica ConX Information** details by tapping the current **Leica ConX** status icon.

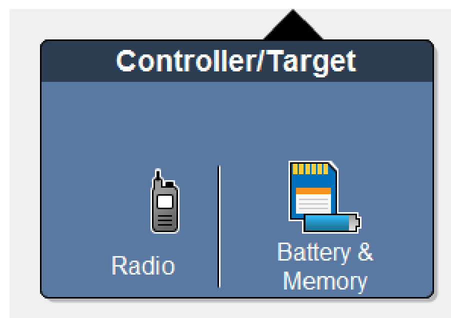
Key	Description
Status 1 	Instrument/Antenna status. • Displays position, tilt angles and satellite information. • Allows you to alter the antenna height and to activate tilt functionality. • Select the **Measure Mode**, for the instrument used as rover. Refer to 1.3.5 Measure Mode for more information. ☞ Tilt functionality is only available for the iCON iCG70 antenna.
Status 2 	Communication status. • Displays connection status of radio, modem and Bluetooth. • Displays battery and memory status.

☞ **Status 1** and **Status 2** contain more information/functionality once tapped, allowing the status of the antenna to be monitored and changed, and the position quality to be reviewed.

Status 1:



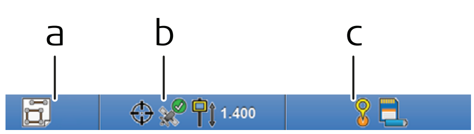
Status 2:



Status bar for internal GPS GPS

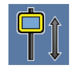
The status bar is only available when the profile for internal GPS is set up and no other profile is active. Refer to 1.5.6 Setting up a GPS Profile for the Internal GPS of the controller.

Status bar displays the status of the controller, position quality information, and information about the current application. It consists of three keys:



a Application key
b Status 1
c Status 2

Key	Description
Application key 	• Displays key information about the current job, project, application and the active coordinate system. • An additional icon displays the current status of **Leica ConX** as well. Once tapped, the Application key allows to access the **Leica ConX Information** details by tapping the current **Leica ConX** status icon.

Key	Description
Status 1 	Controller/Internal GPS status:  Tap to display position information.  Tap to display satellites information.  Tap to alter the controller height.  Tap to select the **Measure Mode**, for the instrument used as rover. Refer to 1.3.5 Measure Mode for more information.
Status 2 	• Indicates that internal GPS is enabled. • Displays battery and memory status.

Warning bar

Displays any issues that are affecting operation.

☞ The number on the Warning bar indicates the total number of warnings that are currently active.

The warning bar can be tapped to display the full message, which:

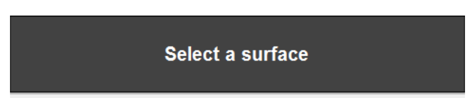
- displays further information about the problem(s),
- provides navigation to areas where the problem can be fixed.

☞ By pressing **OK** without fixing the problem, the warning will be ignored until it is detected again.

Information bar

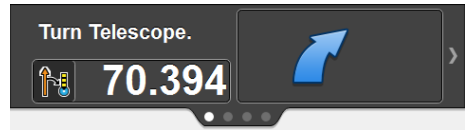
Displays information that is relevant to the current action being carried out. This will be in one of three forms:

- Guidance text whilst carrying out functions.



- Data from last made measurement.

- Directional guidance whilst staking out.



The white dots at the base of the Information bar indicate the total number of active pages, which can be scrolled through by tapping on the left hand side or right hand side of the Information bar.

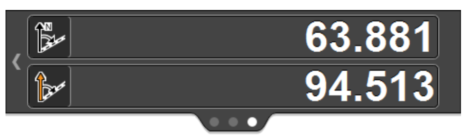
Configure the Information bar

The display format and content of the Information bar can be configured according to your preferences.
Tap and hold for 2 seconds within the Information bar area.
A menu is displayed where you can define the number of pages in the Information bar, and the amount of content on each page. The content available depends on the connected instrument.

Depending on the application, different help pictures are available to demonstrate the meaning of the Information bar values. To display the help pictures, tap the info button at the top right corner.

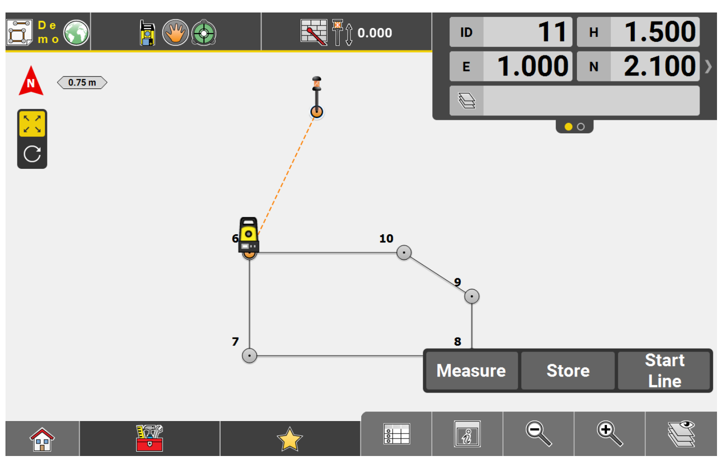
☞ Several help pictures may be available in the Info bar help screen. Scroll down to display all available pictures.

If you put the same value into more than one box, the text and icon size will enlarge, as shown in the examples. This can be useful to focus on specific values.



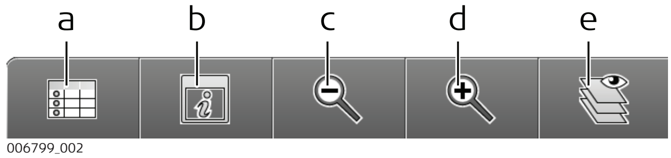
Main map area

The main area of the screen displays all points, lines, and arcs that have been measured, as well as any other data that is loaded to the active job.

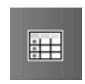


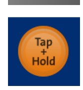
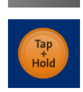
Map handler

The Map handler is available whenever the **Map screen** is open.



a Point List, including Point search and Point edit
b Continuous Centring, Toggle between Map view and Arrow view, Orientation Configuration, Viewing options, Configure the 5" or 7" multiview display
c Zoom out, Zoom to full extent
d Zoom in, Smart Zoom
e Map View manager

Key		Description
Point List, including Point search		• Shows a list of points. • Points can then be edited, created, deleted, but also certain properties can be edited for points, the same value can be applied to multiple points. • Allows you to make a Point search. Refer to 2.5 Point List, Searching for a Point for more information.

Key		Description
View panel		Depending on the application, following options are available: • Turn **Continuous Centering** of the measured position **On** or **Off**. • Toggle between **Map view** and **Arrow view** in the main map area. • Use **Orientation Config** to define the view direction of the Arrow view and the Bullseye view. • Use **Viewing Options** to configure which attributes are shown for each point in the map. • Use **Limit Box** to reduce the amount of visible data in the map view. • Use **Isolate** to reduce the number of visible IFC objects by hiding single objects or several objects of a specific object class. • Turn on **Quick Codes** to get the code list displayed on the left-hand side of the screen for quick access. • **Multiview Config**: Allows you to configure the 5“ or 7" **multiview display**. • **Side View** is a kind of cross-section view and only available when using **Stake Elevation**. • In 5“ or 7“ display mode, with Multiview active, use **Stakeout Point List** to get the points to be staked displayed. • Use **Perspective View** to change from the standard 2D Map view to the perspective 3D view.
Zoom in, Smart Zoom	 	• Zoom in. • Smart Zoom: **Tap and hold** to enable Smart Zoom functionality. Refer to 1.4.1 Smart Zoom for more information.
Zoom out, Zoom to full extent	 	• Zoom out. • Smart Zoom: **Tap and hold** to display full extent of loaded data with location of data being indicated by a surrounding blue box.
Map View manager		Select which data from the active project is displayed and selectable in the Map screen. Refer to Map View manager for more information.

Measure bar

The Measure bar contains the main commands you will use whilst working, for example **Measure**, **Store**, and **Code**. It consists of between one and three keys, for example:

You can configure the content of the keys according to how you want to work.

Tap and Hold on the Measure bar for two seconds to configure. A configuration menu opens, where different commands can be specified. Available commands differ slightly, depending on the open application.

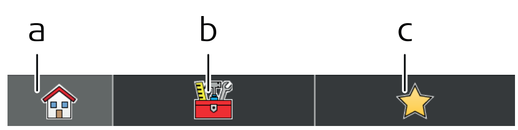
☞ For some tasks the Measure bar will be automatically altered to allow for the operation to be completed. Once the task is finished, the Measure bar will return to the user defined state.

☞ Information about Favourites menu configuration:

- Within the Measure bar configuration screen, **Tap and Hold** any key to add it to the **Favourites** menu. This provides easy access to the functions you are likely to use regularly, by simply selecting it from the **Favourites** key.
- To remove a key from Favourites, open the **Favourites** menu, and **tap and hold** the relevant key.

Function bar

The Function bar contains a link to the Home Menu, and all functionality relevant to the open application. It also contains a calculator, and in some applications it will contain a link to Setup. Depending on the open application, function and appearance of the Function bar differs slightly.



006802_002

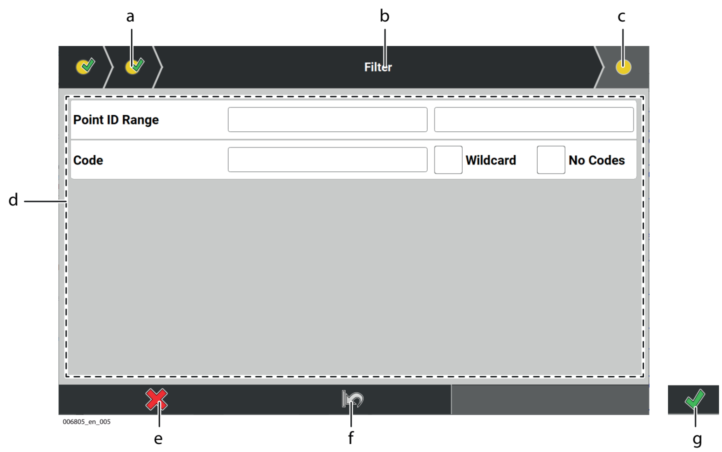
a Home key
b Toolbox
c Favourites

Key		Description
Home key		Navigates back to the Home Menu.
Toolbox		Contains functions relevant to the open application.
Favourites		Contains different functions that can be defined according your requirements. Refer to Measure bar (Information about Favourites menu configuration) for information about configuring Favourites.

Wizards

A number of Wizards facilitate common works. Each Wizard leads you through a series of steps, where settings and statuses can be changed.

Example of Wizard Page



a	Previous Wizard step	e	Cancel and exit
b	Current Wizard step	f	Reset to default settings
c	Next Wizard step	g	Accept changes and continue
d	Wizard step content		

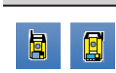
Element	Description
Previous Wizard step	Allows to return to previous Wizard step, if applicable.
Current Wizard step	Shows title of Wizard step that is displayed.
Next Wizard step	Move to next Wizard step by tapping this key. It is only possible to move to the next step once all required fields are defined in the current setup.
Wizard step content	Settings that can be edited by tapping each individual key.
Cancel and exit	Exits the Wizard immediately, with no changes saved.
Reset to default settings	Resets all changed settings back to default value.
Accept changes and exit	Save changes and finish Wizard. Only active once all Wizard steps have been completed.

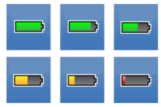
1.2.3 Icons

Description

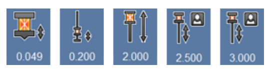
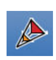
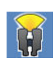
Icons provide information related to basic instrument and controller status. Displayed icons depend on which instrument is used, and the instrument configuration.

Status bar: General icons

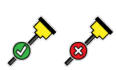
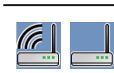
Icon	Description
	Indicates connected instrument.

Icon	Description
	Indicates memory or data storage device type. Displayed in the Battery & Memory screen, accessible through Status 1 or Status 2.
	Indicates battery status.

Status bar: Total Station specific icons, TPS

Icon	Description
	Indicates prism lock setting.
	Indicates the selected prism.
	Indicates prism height setting. Allows you to define two user settings for prism height.
	Indicates measure mode.
	Indicates compensator/level status.
	Indicates that a geometric scale factor is applied to the project.
	Indicates that a PowerSearch is running.

Status bar: GPS specific icons, GPS

Icon	Description
	**Position status** Displays the current position solution: fixed, xRTK, float, navigated, and no position.
	**Number of visible satellites** Displays the number of satellites used in position calculation with the current satellite settings.
	**Tilt functionality of antenna** When tilt functionality is activated, the antenna icon displays the status of initialisation: ready or not initialised.
	**Radio status** Displays the real-time mode of the radio.
	**Modem status** Displays the real-time mode of the modem.
	**SmartLink status** Displays the SmartLink status converging or converged.

Cloud Services - status icons

Icon	Description
Status bar:	
	Internet connection not established.
	Internet connection established.
	Connected to the web page of the currently used cloud service.
	Remote view/control in progress.

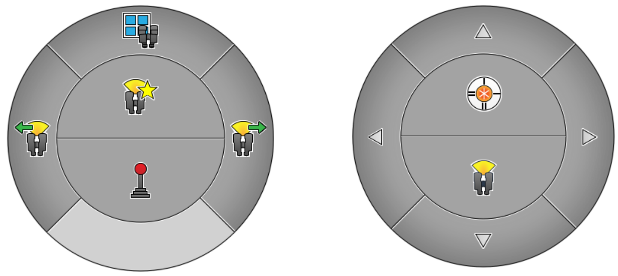
Map screen icons

Icon	Description
	User Point
	Control Point
	Point being staked
	Staked and stored within tolerance
	Staked and stored outside tolerance
	Delete point
	Point with one or several linked images.
	Reference Line
	Selected Line
	Target point position. Measured; within tolerance; outside tolerance

Move & Search Pilot icons, TPS

The Move & Search Pilot is available in the **Status 2** menu.

It is only available when connected to a Robotic Total Station. It enables remote control of the vertical and horizontal rotation of the telescope on the Total Station. PowerSearch[1], an intelligent prism search method, can be triggered from this control.



Icon	Description
	Switch to Joystick control.
 	PowerSearch left/right. Activates an intelligent prism search in the specified direction.
	Activates a PowerSearch of a predefined "window". This window can be defined in **Search Sector** in Status 2.
	Activates a local PowerSearch. If no prism is found, a full PowerSearch occurs.
	Switch to PowerSearch.
	ATR search. Instrument searches locally for a prism.
   	Moves instrument in specified direction. Tap key again to increase speed. Three speeds are available.
	Cancel current search.

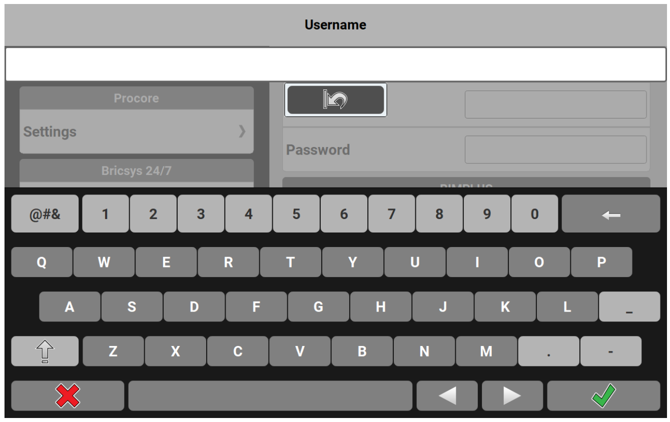
☞ To close the Move & Search Pilot, tap outside the control, in the Map screen.

1.2.4 The Keyboard

Special keys and functions

The iCON software includes a keyboard whenever user interaction requires the input of information, like names, login data, descriptions, IDs, values.

[1] Depending on the connected total station called SpeedSearch or AutoSearch instead.



Key	Description
@#&	Toggles between standard QWERTY keyboard and special characters when necessary. Dot, dash and underscore are available on the standard keyboard as well.
	Backspace. Tap and hold deletes the whole entry. Alternatively, tap 
	Move cursor left. Tap and hold moves the cursor to the beginning of the text.
	Move cursor right. Tap and hold moves the cursor to the end of the text.

For distance values, like instrument or reflector height, you can additionally:

- Switch between distance values in **Meter** or **Feet Fractional**. — Meter / /
- When using **Feet Fractional** switch to using **Feet Decimals** by tapping the decimal delimiter symbol. — .
- Toggle between distance values in **International Feet** or **US Survey Feet**. — Int / US

☞ Independent of the unit chosen for entering values, the values will be converted to the currently set system unit when tapping .

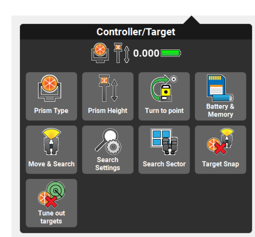
1.3 General Working Information

1.3.1 Prism Types and Prism Heights TPS

Description

Settings for **Prism Type**  and **Prism Height**  can be found in the Status bar 2 accessible from any application, except **Draw**.

Status 2



Set prism type step-by-step

1. From within the current application, tap  in the Status bar and select **Prism Type** .

A subscreen displays the last three Prism types used, with the currently active Prism type being highlighted.

2. To display all Prism types, tap the expand button. 

3. Select the prism type you want to use by tapping the relevant symbol, either from the default or the user-defined ones, for example **Leica 360**.

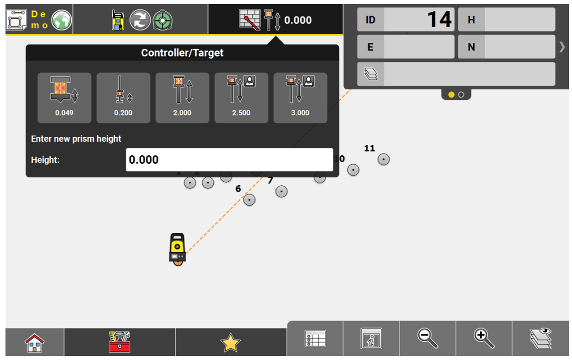
☞ To define a User Prism, tap one of the relevant icons. Or alternatively, to edit an existing User Prism, **tap and hold** the relevant icon. The **User-Definable Prism** screen pops up. Enter the Leica or the absolute constant in [mm] and tap  to confirm. 

4. *The software proceeds with the current application and the newly set prism type active.*

☞ The user defined prism is stored within the software and on the instrument. Therefore it will be available on a second instrument, for example when a Controller is connected to the instrument.

Set prism height step-by-step

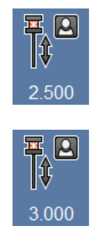
1. From within the current application, tap  in the Status bar and select **Prism Height** .



2. Choose from pre-defined prism heights, either from the default or the user-defined ones, by tapping on the relevant icon. Alternatively, tap on the height entry field, enter the desired height and tap ✓ to confirm.

   ☞ To enter the prism height in another unit, first clear the entry field, then select the unit and finally enter the height value.

☞ To define the user-defined prism height, **tap and hold** one of the relevant icons. The numerical keyboard pops up. Enter the desired height and tap ✓ to confirm. The new height is set under the user-defined icon.



☞ When you select reflectorless or tape, the default height is set to 0.000 m. When you select any prism mode again, the prism height is set back to the original setting.

Default prism heights

Prism type	Default height		
	[m], for CPR1 poles	[ft decimal], for CPR2/3 poles	[ft fractional], for CPR2/3 poles
Reflectorless, Tape	0.000	0.000	$0^{0}/_{0}$
MPR122 without pole	0.049	0.162	$0^{5}/_{32}$
MPR122 with pole plate or tip	0.200	1.000	$1^{0}/_{0}$
MPR122 with pole	2.000	6.500	$6^{1}/_{2}$
MPR122 User Defined 1 or 2	0.000	0.000	$0^{0}/_{0}$

1.3.2 Working with the AutoPole

1.3.2.1 Overview

AutoPole functionality

Functionalities are listed according to the individual sales variants.

Functionality	AP20 H	AP20 ID	AP20 T	AP20
PoleHeight	✓	–	✓	✓
Tilt Compensation	–	–	✓	✓
TargetID	–	✓	–	✓

☞ AP20 can only be used in combination with an AP Reflector Pole (CRP4, CRP5, CRP4 and GLS51F).

☞ Establish a Bluetooth connection between the AP20 and the field controller or the total station in order to be operative. Use the connection wizard.

Supported connection types

Supported

AP20 (all variants) with TPS

☞ A robotic TPS must be connected to a controller first. Then connect to AP20.

Instrument	iCR80		iCR80S		iCR70	
Handle	CCD6	CCD18	CCD6	CCD18	CCD6	CCD18
AP20 AP20 T	-	✓	-	✓	-	✓
AP20 H AP20 ID	✓	✓	✓	✓	✓	✓

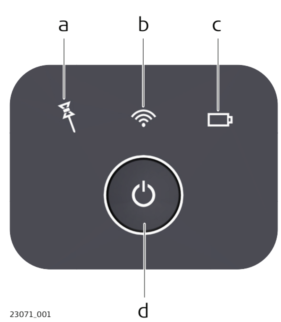
TS16 and MS60 can also be used.

Not supported

- AP20 (all variants) with GNSS (no PoleHeight)
- Onboard use case

Description of the AP20 ON/OFF button and status LEDs

Diagram



a Tilt Compensation LED
b Connectivity LED
c Power LED
d ON/OFF button

Description of the LED Indicators

LED	LED Status	Status of the Instrument
Tilt Compensation LED	off	Tilt compensation is unavailable or switched off.
	green	Tilt compensation is activated, compensation values are stored. Tilt compensation is being applied to the point measurement.

LED	LED Status	Status of the Instrument
	red	Tilt compensation is activated, but currently not being applied to the point measurement.
Connectivity LED	off	AP20 is not powered or module is not ready.
	green	Bluetooth is visible for other instruments and ready for connecting.
	blue	Bluetooth has connected.
Power LED	off	Battery is not connected, flat or AP20 is switched off.
	green	Power is 21% - 100%.
	red	Power is 11% - 20%. The remaining time for which enough power is available depends on the type of survey, the temperature and the age of the battery.
	flashing red	Power is low (<10%).

1.3.2.2 PoleHeight

Description

The AP Reflector Pole can be extended to any of the given snap-lock positions in order to overcome obstacles.

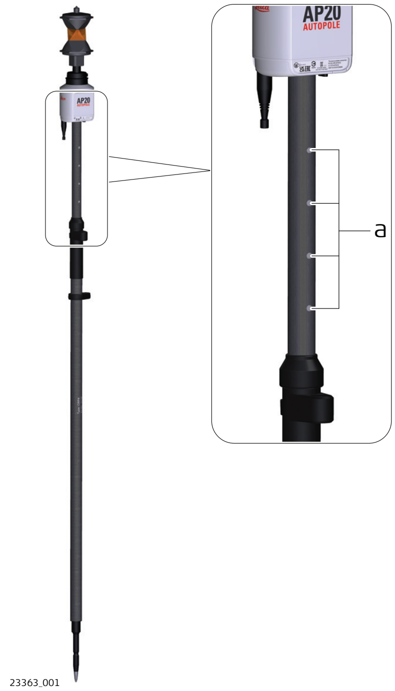
As soon as a snap-lock position is reached, the attached AP20 receives the detected height from the AP Reflector Pole and transmits it to the field software of the connected total station or field controller.

The transmitted height corresponds to the current length between prism centre and pole tip, which is equivalent to the printed scale on the pole and the height input field within the field software.

☞ Valid height detection is limited to the snap-lock positions. Intermediate positions are indicated as invalid. Enter the height manually.

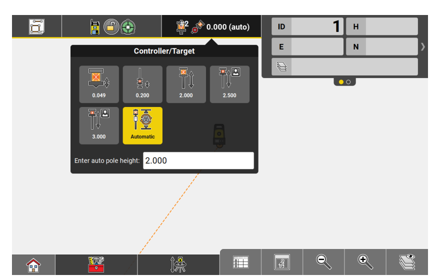
☞ Optional pole extensions are not taken into account.

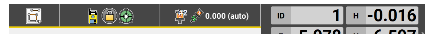
Diagram



a Snap-lock positions

PoleHeight step-by-step

Action		Result
☞	PoleHeight is only supported with sales variants AP20 H, AP20 T and AP20.	
☞	PoleHeight can be used if the controller is connected to a robotic TPS instrument.	
☞	When using an AP20 T, an AP20 H or an AP20 make sure that **AutoPole** is selected as prism type.	
1.	In any app: Open the **Controller/Target** container from the status bar.	
2.	Tap **Prism Height**.	
3.	To turn PoleHeight ON: Tap on the **Auto height** feature. To turn PoleHeight OFF: Select any predefined height or enter the height manually.	
4.	Extend or compress the pole physically to overcome obstacles.	

Action		Result
5.	If **Auto height** is used, the correct value is displayed in the status bar.	
6.	Measure or stake a point. The current height is applied to the coordinate calculation.	

1.3.2.3 Tilt Compensation

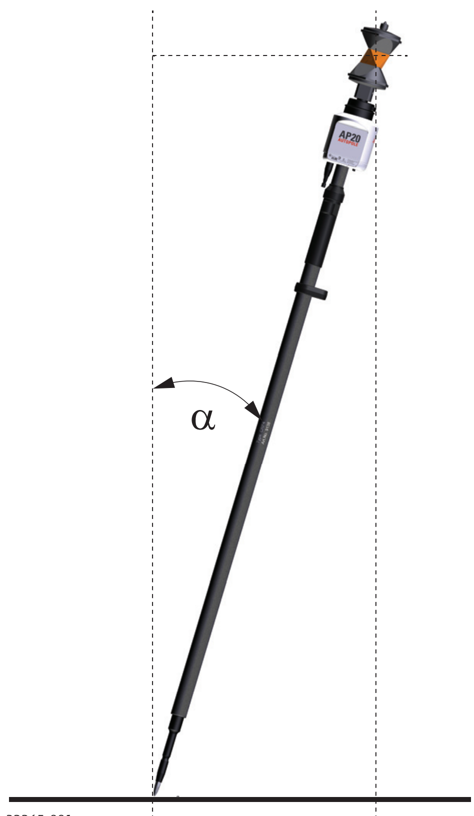
Description

The AP Reflector Pole can be held in a slanting position over the point to be measured without checking the circular bubble on the pole.

When measuring a point, the pole tip must be stable on the point while the pole should be in slight movement. Tilt compensation is indicated by an icon and the Tilt LED and is maintained by natural pole movement, for example while moving to the next point to be measured.

Measurements are reliable and accurate even if the pole is not levelled as the tilt values are calculated by an Inertial Measurement Unit. Tilt values contain information about the 3D position of the pole.

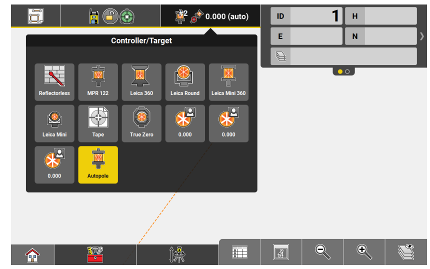
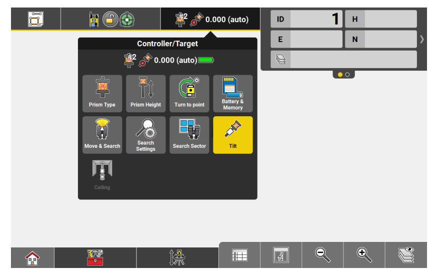
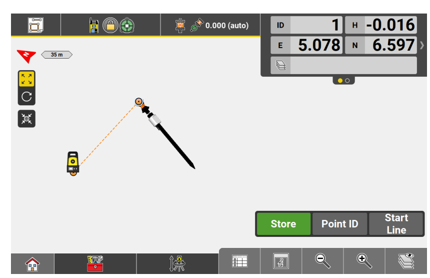
Diagram



α Tilt

Tilt Compensation step-by-step

Action		Result
☞	Tilt Compensation is only supported with sales variants AP20 T and AP20 when the controller is connected to a robotic total station via CCD18.	

Action		Result
☞	Tilt Compensation can be used if the controller is connected to a robotic TPS instrument.	
1.	In any app: Open the **Controller/Target** container from the status bar.	
2.	Tap **Prism Type**.	
3.	Select **AutoPole**.	
4.	To turn Tilt Compensation ON or OFF: Tap on the **Controller/Target** container and select **Tilt**.	
☞	Tilt Compensation is not supported within the **Setup, Sets of Angles** and **2-Face** app.	
☞	**Ceiling** becomes available for selection when Tilt Compensation is ON. Tap on the **Controller/Target** container and select  in order to automatically measure the point on the ceiling, no matter how the pole is tilted.	
5.	Tap **Start** in the measure bar.	
6.	Move the pole for initialisation. Walking to the layout point is sufficient. The **Start** button changes to a green **Store** to indicate that the tilt compensation is being applied.	
☞	The Tilt LED on the AP20 and the symbol for the pole in the status bar indicate when a tilt compensated measurement is possible. Refer to Description of the AP20 ON/OFF button and status LEDs.	
7.	Measure or stake a point.	

1.3.2.4 TargetID

Description

TargetID provides an automatic target search and identification on-the-fly.

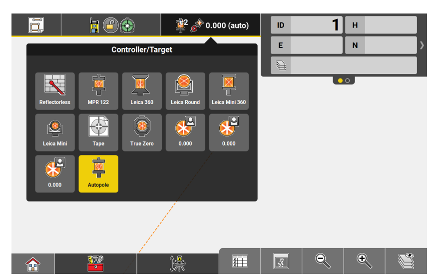
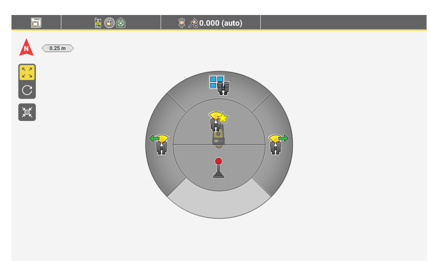
The common search methods, such as PowerSearch, are extended with an additional verification of an ID which is transmitted from the AP20.

While the total station is performing a search, it ignores any other target or foreign reflections and only stops and locks onto the target above the AP20.

Diagram

a TargetID window, 360° coverage

TargetID step-by-step

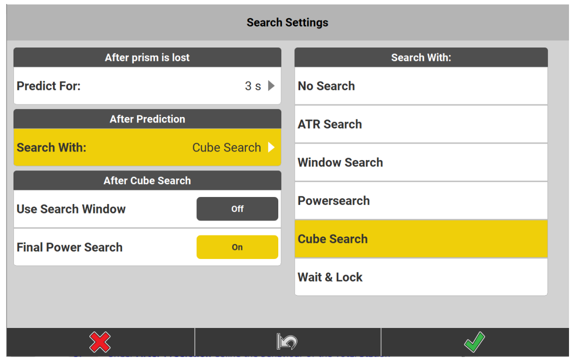
Action	Result
☞	TargetID is only supported with sales variants AP20 ID and AP20.
☞	TargetID can be used if the controller is connected to a robotic TPS instrument.
1.	In any app: Open the **Controller/Target** container from the status bar.
2.	Tap **Prism Type**.
3.	To turn the TargetID ON: Select **AutoPole** as prism type from the status bar. To turn the TargetID OFF: Select any pre-defined or user defined prism, except **AutoPole**. 
4.	Start a prism search. 
☞	The search includes identification on-the-fly and only stops at and locks onto the target above the AP20.

1.3.3 Automatic Search TPS

Automatic search settings step-by-step

1. From within the current application, tap the Pole and controller status bar (Status 2).

And select **Search Settings**.



In the **Search Settings** screen define the behaviour of the Total Station after a prism loss.

2. Select a period of time during which the software shall calculate the predicted position of the prism after the prism has got lost. Within this time period, the system automatically searches for the prism at the calculated position. If no prism is found, the search at the Total Station is stopped or it continues with the next option, according to the settings under **After Prediction**.

☞ For iCR80/iCR80S with an active dynamic lock license you can also select **Wait & Lock** to make the Total Station lock onto the prism when you walk with the prism through the line of sight of the telescope.
This feature can also be activated on demand using the **Wait & Lock** function from the Instrument status bar (Status 1). See also: Status bar

3. Under **After Prediction** define the behaviour of the Total Station when the prism is not found at the predicted position.
Set **Search With:** to:
- **No Search**, to prevent the Total Station from starting a prism search.
- **ATR Search**, to start an ATR search.
- **Cube Search**, to start a dynamic PowerSearch. This is a search, performed in a cubic area with defined dimensions around the last known position.
- **Window Search**, to start a search within the defined search window. That window is defined in **Search Sector**.
- **Powersearch**, to start a PowerSearch.

4. When using **ATR Search** or the **Cube Search**, additionally define the behaviour after an unsuccessful prism search.
   - To start a search within the defined search window set **Use Search Window** to **On**.
   - Set **Final Power Search** to **On**, to start another - and final - PowerSearch.

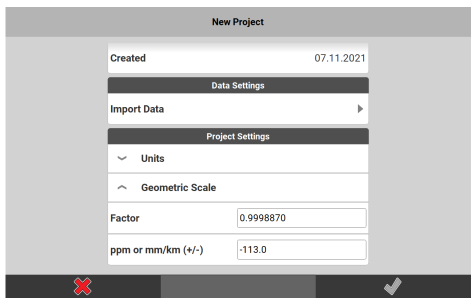
   ☞ **Cube Search** can only be used with a iCON iCR60, iCON iCR70, iCON iCR80S or iCON iCR80 Total Station and the appropriate license.

   Final Power Search is also available when using **Window Search**.

1.3.4 Geometric Scale Factor TPS

Description

The geometric scale factor is used to correct distances for the distortion introduced by the use of a map projection.



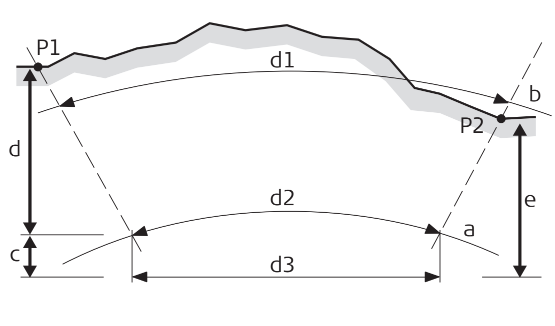
The geometric scale factor can only be set when creating a project. Input the desired value under **Geometric Scale**.

☞ You can input either the **Factor** or the **ppm or mm/km (+/-)** value. If a scale factor is entered, the ppm value will be updated accordingly and vice versa.

☞ The entered scale factor value affects only all Total Station measurements, GPS measurements are not affected.

☞ An additional icon  is displayed in the Status Bar, when a geometric scale factor is applied to a project.

Explanation



P1, P2	Known points
d1	Ground distance
d2	Ellipsoid distance
d3	Grid distance

a	Sea level
b	Elevation, 1000 m
c	Height Scale factor
d	Map Projection Scale factor
e	Combined Scale factor

Relation of ground distance to grid distance:

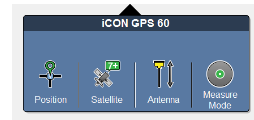
- Scale to central meridian and distance from central meridian defines the Map Projection Scale factor, while the height above reference defines the Height Scale factor.
- Both, the map projection and height scale factors define the PPM scale factor.

1.3.5 Measure Mode GPS

Description

Settings for **Measure Mode** can be found in the Status bar accessible from any application, except **Draw**.

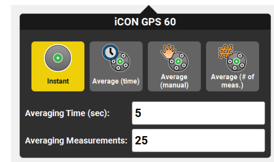
Status 1:



Set Measure Mode step-by-step

1. From within the current application, tap in the Status bar and select **Measure Mode**.

   A subscreen opens automatically, with the currently active measurement mode high-lighted.



2.
   - Select **Instant** to have the current position measured and recorded immediately after pressing **Measure**, when back in the application. **Instant** is the default setting.
   - Define a time period according to your needs at **Averaging Time (sec):**. Now select **Average (time)** as measurement mode. When you press **Average** back in the application, the instrument measures for the time period defined and record the calculated average data.
   - Select **Average (manual)** as measurement mode. Back in the application press **Start** to start measuring. Press **Stop** to stop the measuring manually. A screen pops up showing the relevant information. You can store the calculated average data or refuse them.
   - Define the number according to your needs at **Averaging Measurements:**. Now select **Average (# of meas.)** as measurement mode. When you press **Average** back in the application, the instrument performs the number of measurements defined and records the calculated average data.
3. *The software proceeds with the current application and the newly set measurement mode active.*

☞ These **Measure Mode** settings are relevant for the instrument used as rover.

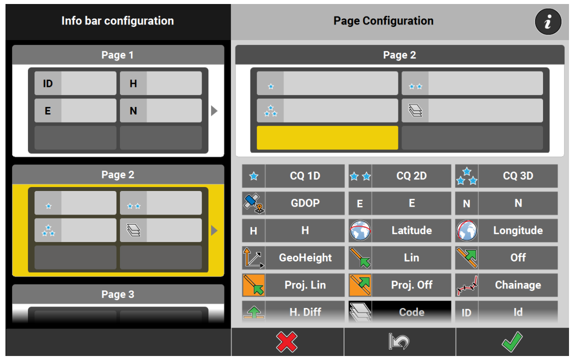
1.3.6 Coordinate Quality Value GPS

Display coordinate quality values step-by-step

☞ Coordinate quality values are recorded together with every GPS measurement. Like other measuring information, these CQ values can be arranged to be displayed in the Information bar.

1. **Tap and hold** for 2 seconds within the Information bar area.
2. Within the **Info bar configuration** screen, tap on the arrow of the page you want to integrate the CQ values.

3. Select the CQ values to display: **CQ 1D** for the height information, **CQ 2D** for the plain information and **CQ 3D** for the combination of both. Tap when finished. Tap again in the **Info bar configuration** screen to confirm.



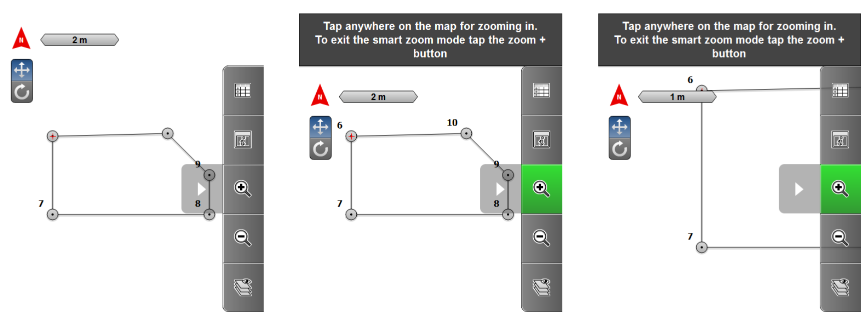
☞ In the Information bar, the CQ values are shown with one star for height, two stars for plain and three stars for the combination.

1.4 Map View: Functions and Configuration Options

1.4.1 Smart Zoom TPS + GPS

Enable Smart Zoom step-by-step

1. **Tap and hold** from the **Map handler** to enable Smart Zoom functionality. The function is accessible in all applications and all map views. Map turns to Smart Zoom mode, turns to green , automatic centring is turned off.
2. Tap anywhere on the map, where you want to zoom, even on blank space. Map is centred to the tapping area and zoomed in by one zoom level.
3. Proceed as many times as desired. When the zoom limit is reached a warning is displayed.



☞ Smart Zoom functionality is not available, if the map is in **Bullseye** view, **Arrow** view, or **Cross Section** view.

☞ To display the full extend of the active data **tap and hold** from the **Map handler**.

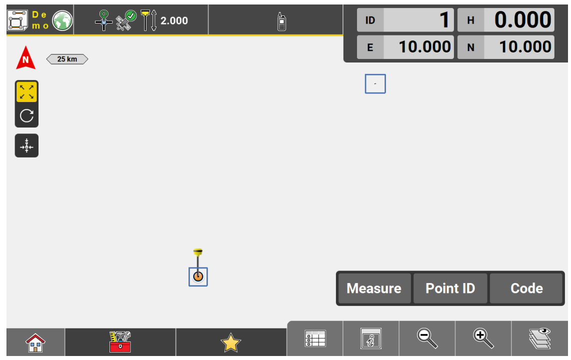
Disable Smart Zoom

Tap the green to disable Smart Zoom functionality.

☞ Automatic centring remains off until manually turned on again.

Enable Smart Zoom to specific data sets

1. **Tap and hold** from the **Map handler** to enable Smart Zoom to specific data sets. The function is accessible in all applications and all map views. Automatic centring is turned off.



The locations where data can be found are indicated by blue squares.

2. Tap a square to zoom in to the specific data set.

☞ To select another data set tap and hold again. The map view will be zoomed to full extent showing all data sets in blue squares.

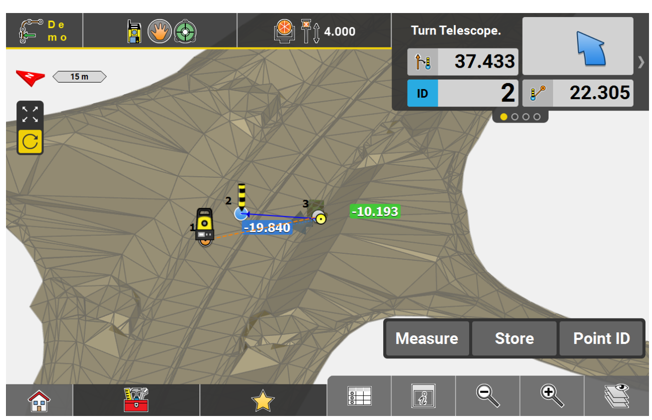
☞ Smart Zoom functionality is not available, if the map is in **Bullseye** view, **Arrow** view, or **Cross Section** view.

1.4.2 Additionally Available View Modes

Rotation mode (3D view) step-by-step

1. To change from panning mode to rotation mode, tap .

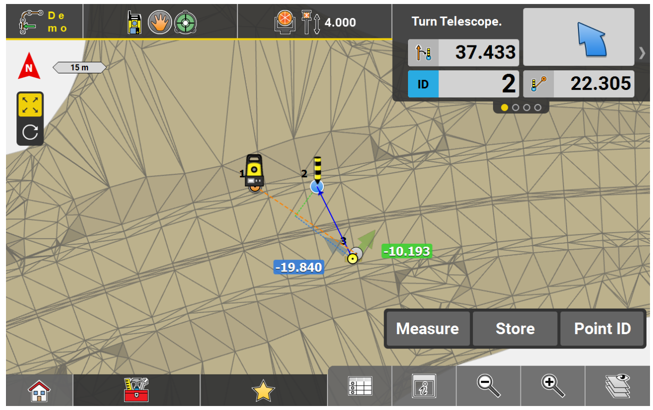
Now it is possible to rotate the current view three-dimensional. The North indicator changes accordingly as well.



2. Tap to freeze the current 3D view and enable panning mode again.

☞ You can also pan the Map view using two fingers without the need to change to panning mode.

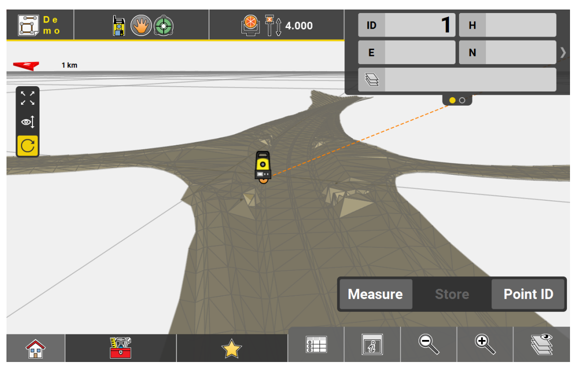
☞ Tap the **North indicator** to set the view back to the standard Map view.



Perspective view step-by-step

☞ iCON site offers a perspective view.

1. To change from the standard Map view to the perspective view, tap **View** and enable **Perspective View**.



The map view changes to perspective view.
The North indicator changes accordingly as well.

2. To change the height of the perspective camera, tap and pan up or down.

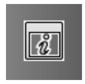
☞ To move the position of the perspective camera, tap and drag the map in the required position.

To rotate the view in three-dimensional direction, tap and drag the map in the required direction.

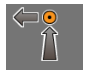
3. To disable the perspective view, tap **View** and deselect **Perspective View**.

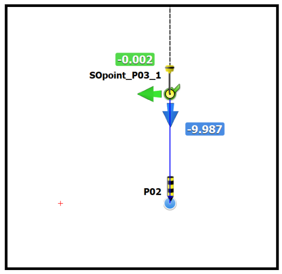
Arrow view

Use the **Arrow** view when staking out points. The arrow view displays the pole position in relation to a user-defined orientation direction (refer to Configuring the Orientation direction within 1.4.4 Defining the Orientation Configurations). Arrows and corresponding distances are displayed to indicate how to find the point to be staked.

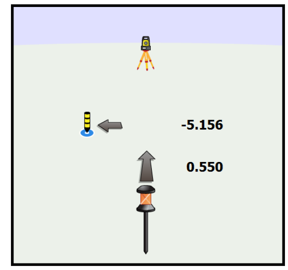
1. Tap  to access **View** in the Map handler.

2. Tap **Arrow** to toggle between **Map** view and Arrow view.





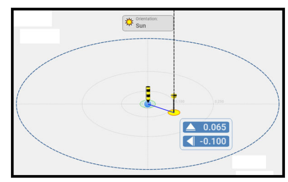
Map View



Arrow view

☞ Activate Multiview to display Map view and Arrow view side by side.

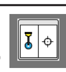
☞ Once the pole/rover is within 2 m distance to the selected point, both Map and Arrow view are automatically changing to a Bullseye view.
Dynamic labels show the distance to the target in X and Y directions with reference to the defined orientation. See also: Configuring the Orientation direction. When the current position is within tolerance, the labels turn to a green colour.
To select a different point to be staked in the Arrow view and Bullseye view, tap anywhere in the Map.



Bullseye view

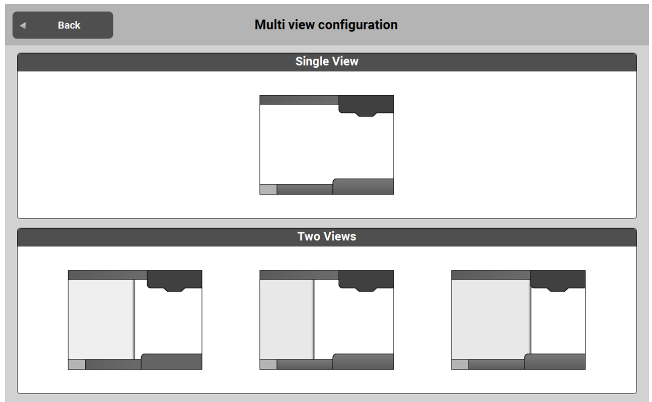
Multiview

1. Tap  to access **View** in the Map handler.

2. Tap  to access **Multi view configuration**.

☞ In 5“ display mode, the split-screen option "2/3 and 1/3" is not available.

3. In the **Multi view configuration** screen, select the required View.



The Map screen is then divided into separate screens.

☞ To change the **active section**, tap in the relevant section. The Map handler zoom controls are effective in the active section.

1.4.3 Continuous and Automatic Centring

Centring the Map View

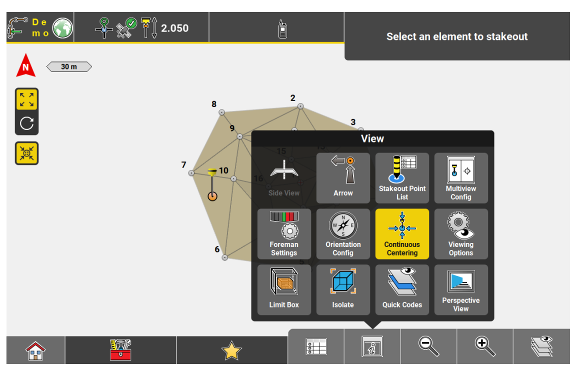
In order to make the map view automatically being centred, tap the  button at the top left side of the map view. To switch automatic centring off, tap the button again.

☞ As soon as you pan the map view, automatic centring is automatically turned off.

You can also activate **Continuous Centering** via the **Map Handler>View** function. See also: Map handler

When **Continuous Centering** is active, the map view will always be centred at the measuring position. When inactive, the map view will be centred when the measuring position reaches the edge of the map.

☞ By default, Automatic and Continuous Centering are switched on.



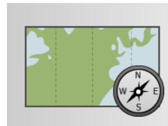
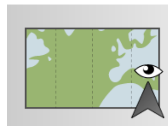
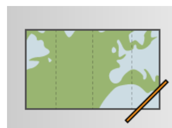
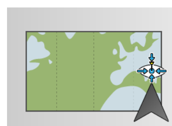
1.4.4 Defining the Orientation Configurations

Configuring the map orientation

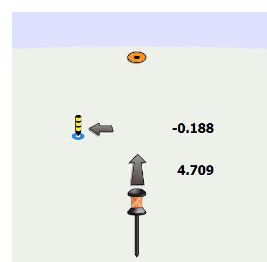
Access **View** in the Map handler and tap **Orientation Config** to define the map orientation.

☞ The current active Orientation is highlighted in yellow.

Overview of the available orientation methods

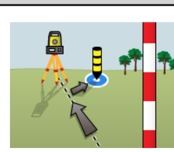
Method		Description
NESW		North, east, south and west: Aligns the map view according to the compass orientation selected.
Movement		Aligns the map view dynamically according to current moving direction.
Line		Aligns the map view according to a reference line selected. The line can be defined with a start point and an end point, but a multi-line is also possible.
Heading		Available with **iCON iCG70T** when tilt functionality is active. Aligns the map view dynamically according to the antenna heading.

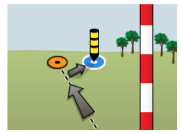
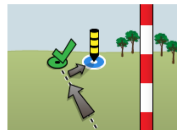
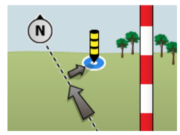
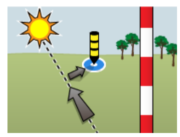
Configuring the Orientation direction

1.	Access **View** in the Map handler.	
2.	Tap **Orientation Config** to display the available orientation methods. *The current active Orientation is highlighted in yellow.*	
3.	Tap an orientation method to change the view direction of the Arrow view and the Bullseye view.	 Example: **Known Point**

Overview of the available orientation methods

☞ Depending on the connected device, different orientation methods are available. The method **TPS** is only available for TPS devices. For **GPS** there are the additional methods **Sun** and **North** instead of TPS.

Method		Description
TPS		**TPS** only: Aligns the view along the line of sight, from pole to Total Station.

Method		Description
Known Point		Aligns the view from pole to another point of the map. That point needs to be selected during configuration to this method.
Last Point		Aligns the view from pole to the last staked and stored point.
North		**GPS** only: Aligns the view from pole to North direction of the coordinate system.
Sun		**GPS** only: Aligns the view from pole to the direction of the sun.

1.4.5 Viewing Options **TPS** + **GPS**

☞ When a text is too long for its text field, **tap and hold** the text and the complete text is displayed as running text.

Selecting the point information in the map step-by-step

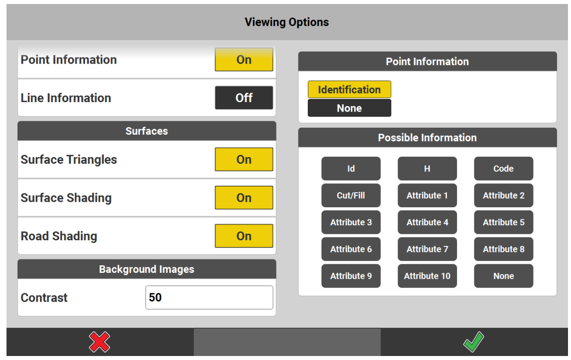
☞ By default, the sole information for a point shown in the map is the Point ID. Anyway, iCON site allows you to configure to show two different information for all points in the map, one above and one below the point symbol.

1. From within the current application, access **View** in the Map handler and tap **Viewing Options**.

☞ Displaying the **Point Information** can easily be switched **On**/**Off** using the relevant key.

☞ Within the **Draw** application, **Line Dimension** is additionally available. Switch it **On** to have the 2D length displayed for relevant elements.

2. To change the point information above the point symbol, activate the upper button in the section **Point Information**.
To change the point information below the point symbol, activate the lower button in the section **Point Information**.



3. Now select the information you want to be displayed. Select from:
    1. **Id**: The name or **Point ID** of the point.
    2. **H**: The **Height** of the point.
    3. **Code**: The **Code** (or layer name) of the point.
    4. **Cut/Fill**: The stored **Cut/Fill** value for a stakeout point.
    5. **Attribute 1** to **Attribute 10**: Point attributes from imported HeXML files.
    6. **None**: No information is displayed at the selected position.
4. Tap ✔ to accept the settings and return to the map.

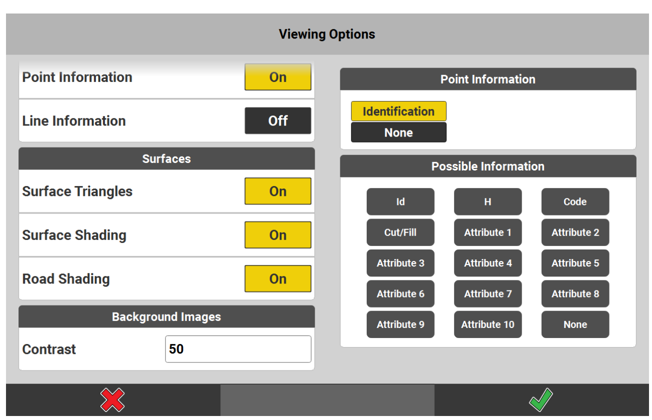
☞ The settings for these viewing options are used, independent from the Project or Job. It is possible to define and use different settings for the different applications.

☞ The information is shown according to the current settings, in the chosen distance unit and the number of decimals set.

Show or hide line names

If necessary, line names can be displayed in map view. If enabled, the line name is displayed to the centre of a line segment or a polyline.

1. From within the current application, access **View** in the Map handler and tap **Viewing Options**. 
2. **Line Information** is set to **Off** by default.
   To display the line information in map view, set **Line Information** to **On**.



3. Tap ✔ to accept the settings and return to the map.

Set the visibility of points in the map step-by-step

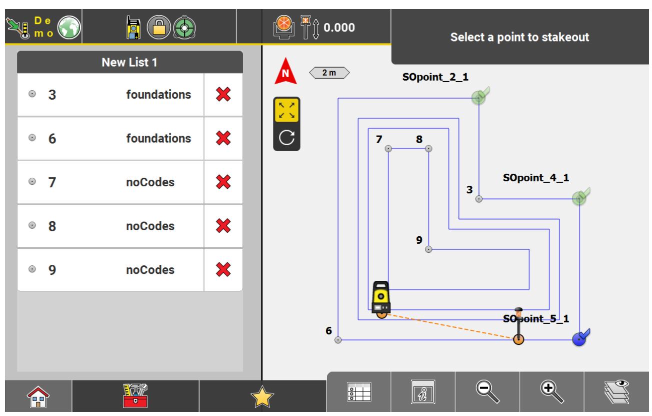
1. When laying out numerous points, the map view may start to look crowded. It might become difficult to discern between different elements such as reference points, staked points, control points or lines.
   You have 2 options to reduce the number of visible elements during stakeout procedure:
   - **Fade Staked Points**
     Already staked points are displayed in faded colour.
   - **Stakeout List Points Only**
     Only points of the active stakeout list and the corresponding lines and arcs are displayed. This option includes the fading of staked points.

2. From within the current application, access **View** in the Map handler and tap **Viewing Options**.
   

3. To activate the fading of points, set **Fade Staked Points** to **On**.
   To hide all points and lines not belonging to the active stakeout list, set **Stakeout List Points Only** to **On**.

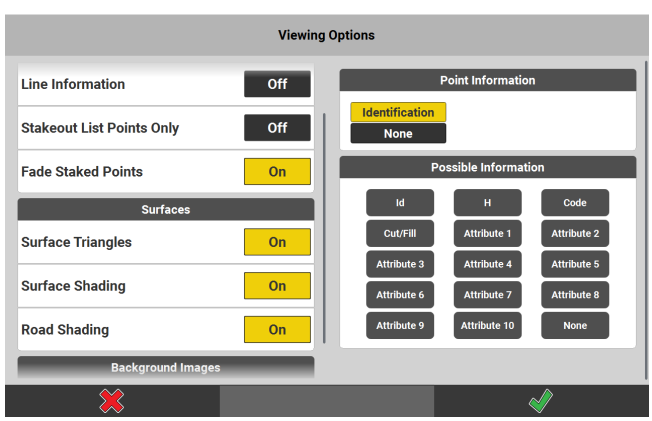
4. Tap ✔ to confirm.

☞ *Map view with option "Stakeout List Points Only" being activated:*



Surfaces viewing options

1. From within the current application, access **View** in the Map handler and tap **Viewing Options**.
   



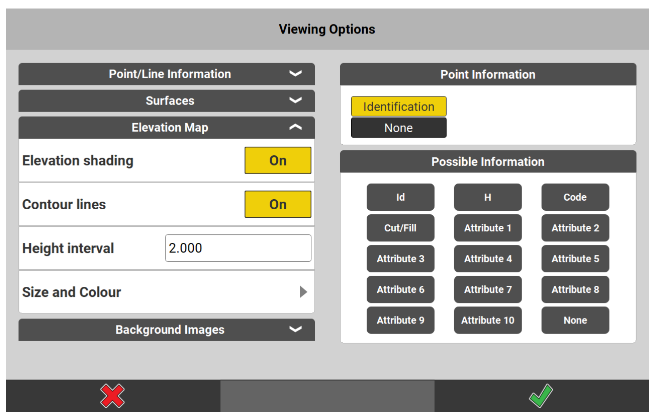
2. If needed, set the graphical appearance for **Surfaces**:
   - Set **Surf. Triangles** to **On** to display triangles between surface points.
   - Set **Shading** to **On** to have the surface triangles displayed in different shades.
   - Set **Surf. Triangles** and **Shading** to **On** to have a combination of both displayed.
   - Set **Road Shading** to **On** to have the road design displayed in different shades. When this setting is **On** it is possible to select the cross slopes directly from the map in Roading application.

3. Tap ✓ to accept the settings and return to the map.

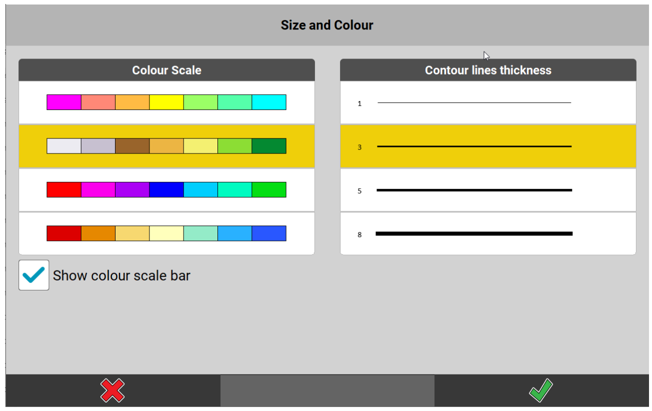
☞ The settings for these viewing options are used, independent from the User, Project, Job or application used.
The information is shown according to the current settings, in the chosen distance unit and the number of decimals set.

Viewing options for Elevation Map

1. From within the current application, access **View** in the Map handler and tap **Viewing Options**.



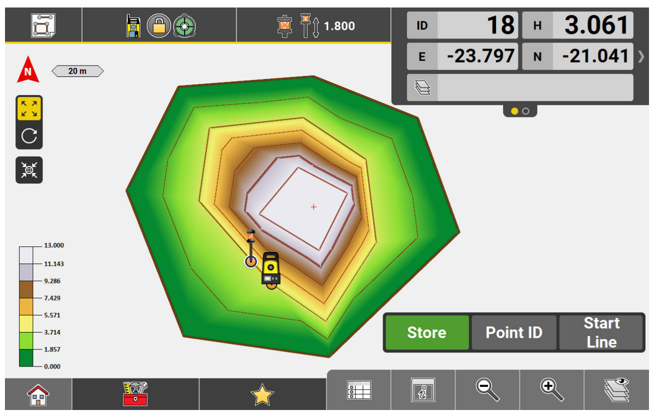
2. If needed, set the graphical appearance for **Elevation Map**:
   - Set **Elevation shading** to **On** to have the slopes of a surface displayed in different shades according to their elevation.
   - Set **Contour lines** to **On** to have contour lines displayed.
   - Enter a **Height interval** at which contour lines shall be displayed.
   - Tap on **Size and Colour** in order to customise the colour of the surface shading and the thickness of contour lines.



You can choose your preferred colour palette and the thickness for displaying the contour lines. Tap and select **Show colour scale bar** *to have a scale bar for the colour shading displayed in the Map View.*

To confirm your selection tap .

To discard any changes tap .



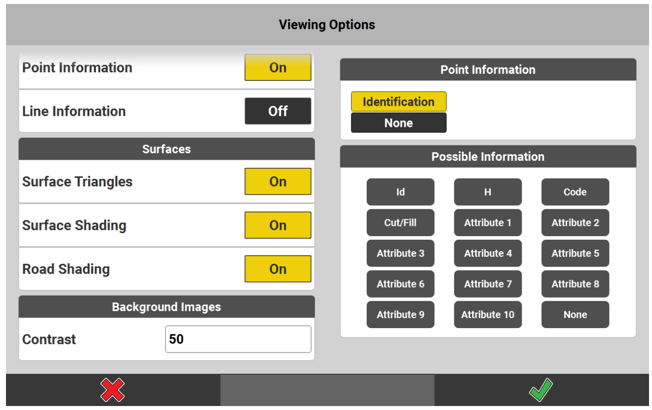
3.	Back in the **Viewing Options** page tap to accept the settings and return to the Map View.

☞ The settings for these viewing options are used, independent of the User, Project, Job or application used.
The information is shown according to the current settings, in the chosen distance unit and the number of decimals set.

Contrast of Background Image

If needed, change the contrast of an imported background image.

1.	From within the current application, access **View** in the Map handler and tap **Viewing Options**. 
2.	For **Contrast** within **Background Images**, enter a value between 0 and 100. • Value is 0: The background image is not visible. • Value is 100: The background image is fully visible.



3. Tap ✓ to accept the settings and return to the map.

☞ The settings for these viewing options are used, independent from the User, Project, Job or application used.

Using an online map as background image

If needed, the online map from "Bing maps" can be used as background image in map view. Before you can enable the map as background image, you need to get a key for using Bing maps.

Steps to get the key for using Bing maps

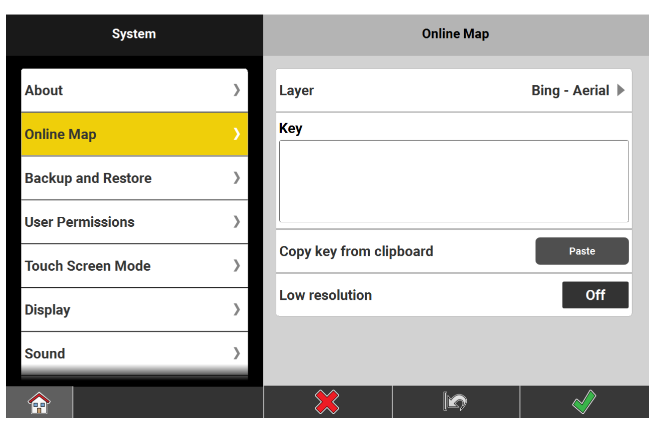
1. Open the link https://www.bingmapsportal.com/ in a web browser.
2. If you already have an account, sign in. Otherwise, create an account.
3. In the account settings, access "My keys" and request a new key.
4. Save the key as *.txt file.

Steps to enable Bing maps

☞ Requirements:
- Internet connection is established.
- A coordinate system is loaded to the active project.
- Measured or imported data are loaded to the active project or software is connected to a GPS sensor.

1. Select **System** from the Home Menu.

2. Select **Online Map**.



3. Enter the key for the online map or copy it from the *.txt file.
To paste the key from clipboard, tap **Paste**.

4. To display the online map in satellite view, set the layer mode to "Aerial".
To display the online map in standard view, set the layer mode to "Road".

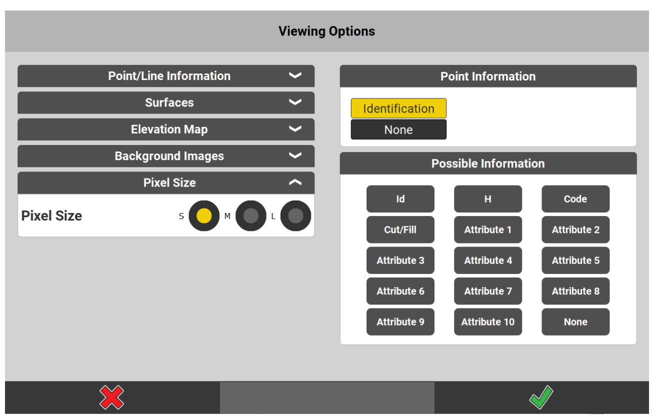
5. Tap ✓ to activate the online map and return to the map view.

Online map is displayed as background image in map view.

☞ To turn off the online map, set the layer mode to "None".

Pixel Size

1. From within the current application, access **View** in the Map handler and tap **Viewing Options**.

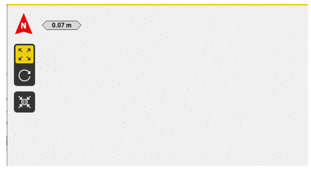
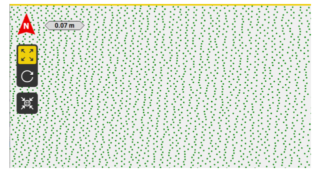
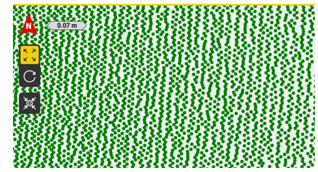


2. If needed, set the size with which points in point clouds shall be displayed to **M** (medium) or **L** (large).

This enhances the visibility of single points when you zoom in to the cloud.
*Default size is **S** (small).*

3. Tap ✓ to accept the settings and return to the Map View.

☞ The settings for these viewing options are used, independent of the User, Project, Job or application used.
The information is shown according to the current settings, in the chosen distance unit and the number of decimals set.

Pixel Size S	Pixel Size M (at same zoom level)	Pixel Size L (at same zoom level)
		

1.4.6 Reducing the Number of Visible Elements/Objects in Map View

Isolating IFC objects in the map view

☞ The **Isolate** function for IFC objects is only available in the **Layout Objects** and the **Verification** applications.

The isolation mode allows you to reduce the number of visible IFC objects to a single object or to several objects of a specific object class. This function correlates to the visibility settings of the **IFC Tree View** (refer to Using IFC Tree View step-by-step).

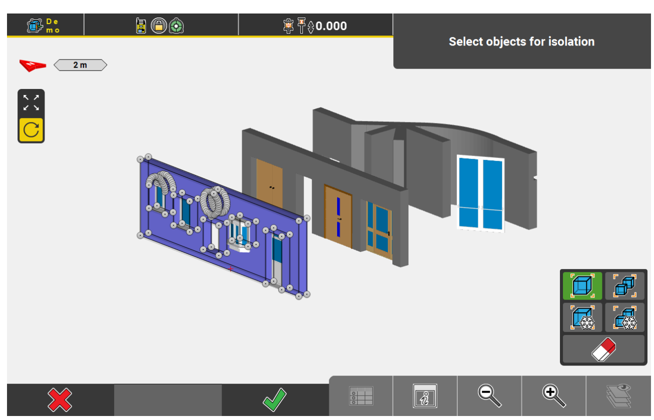
Isolating IFC objects step-by-step

☞ Make sure that an IFC file is loaded and activated in the Map View manager.

1. From within the **Layout Objects** application, access **View** in the Map handler and tap **Isolate**. 

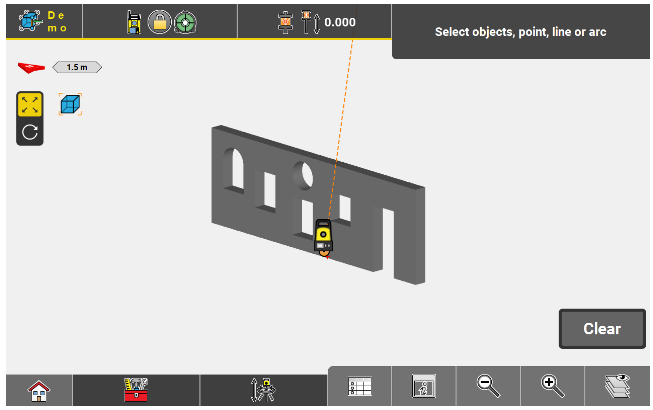
2. *The isolation screen is displayed.*
   The isolation screen allows you to define the objects that should be visible in isolation mode.

3. Choose the desired selection method (Object  or Class ) and select one or several objects for isolation mode.



Selected objects are highlighted in blue, all objects to be hidden are displayed in their original colour.

4. Tap the Accept button to activate the isolation mode and return to the map view.

5. 

The map view is displayed in isolation mode. Only the selected objects are visible.

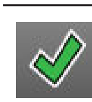
To indicate that isolation mode is active, the Isolate icon is displayed in the top left corner of the map view. The icon disappears when all objects are visible in the map view.

☞ Tap the icon to quickly access the isolation screen.

☞ When isolation mode is active, the **Isolate** option is highlighted in yellow when accessing **View** in the Map handler.

☞ You can use the Limit Box function to further reduce the amount of visible data. Refer to Limit Box.

Toolbar in the isolation screen

Toolbar button	Description
	**Selection method: Object** Activate this button to select specific objects for isolation mode. Only the selected objects will be visible. ☞ This button is activated by default.
	**Selection method: Class** Activate this button to select all objects belonging to a specific object class at once. It is sufficient to select just one object. All other objects belonging to the same class will also be visible in the isolation mode.
	Tap this button to deselect all selected objects or to turn off the isolation mode and make all objects visible again.
	Tap this button to discard all changes and return to the map view. If applicable, the previously made isolation settings are being kept.
	Tap this button to activate the isolation mode and return to the map view.

Hiding IFC objects in the map view

☞ The **Isolate** function for IFC objects is only available in the **Layout Objects** and the **Verification** applications.

The isolation mode allows you also to reduce the number of visible IFC objects by hiding single objects or several objects of a specific object class. This function correlates to the visibility settings of the **IFC Tree View** (refer to Using IFC Tree View step-by-step.

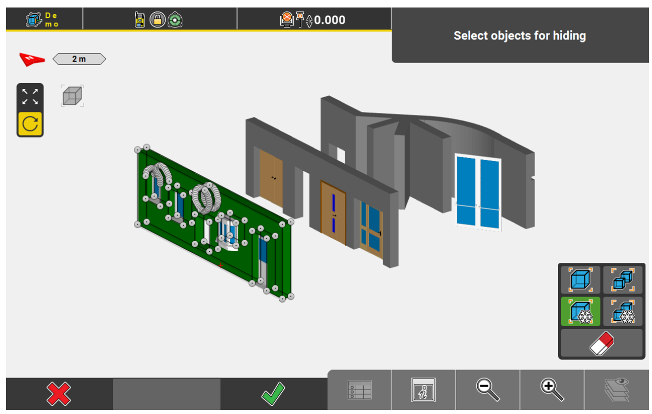
Hiding IFC objects step-by-step

☞ Make sure that an IFC file is loaded and activated in the Map View manager.

1. From within the **Layout Objects** application, access **View** in the Map handler and tap **Isolate**.

2. *The isolation screen is displayed.*
The isolation screen allows you to define the objects that should be hidden in isolation mode.

3. Choose the desired selection method (Object or Class) and select one or several objects to be hidden.



Selected objects to be hidden are highlighted in green, remaining objects are displayed in their original colour.

4. Tap the Accept button to activate the isolation mode and return to the map view.

5.

To indicate that isolation mode is active, the Isolate icon is displayed in the top left corner of the map view. The icon disappears when all objects are visible in the map view.

☞ Tap the icon to quickly access the isolation screen.

☞ When isolation mode is active, the **Isolate** option is highlighted in yellow when accessing **View** in the Map handler.

☞	You can use a combination of the isolating and hiding functions. Select objects for isolation first, then select objects to be hidden.
☞	You can use the Limit Box function to further reduce the amount of visible data. Refer to Limit Box.

Toolbar in the isolation screen

Toolbar button	Description
	**Selection method: Object** Activate this button to select specific objects for isolation mode. The selected objects will be hidden. ☞ This button is activated by default.
	**Selection method: Class** Activate this button to select all objects belonging to a specific object class at once. It is sufficient to select just one object. All other objects belonging to the same class will also be hidden in the isolation mode.
	Tap this button to deselect all selected objects or to turn off the isolation mode and make all objects visible again.
	Tap this button to discard all changes and return to the map view. If applicable, the previously made isolation settings are being kept.
	Tap this button to activate the isolation mode and return to the map view.

Isolating DXF elements in the map view

☞ Available for iCON build and iCON site Plus.

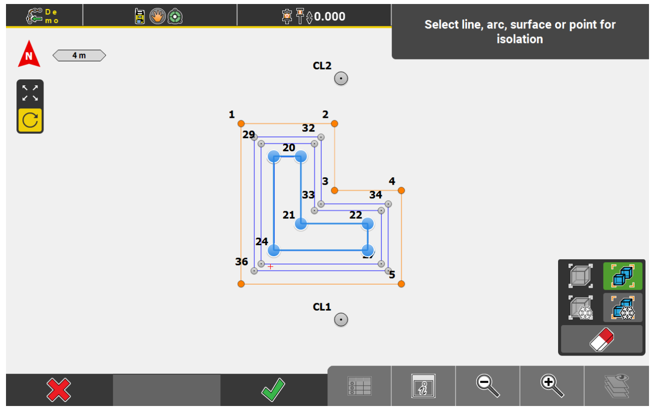
☞ The **Isolate** function for DXF elements is available in all applications except the **Layout Objects** application.

The isolation mode allows you to reduce the number of visible DXF elements based on the DXF layers. This function correlates to the settings of the **Map view manager** (refer to 2.4 Displaying Data).

Isolating DXF elements step-by-step

☞	Make sure that a DXF file is loaded and activated in the Map View manager.
1.	From within any application (except **Layout Objects**), access **View** in the Map handler and tap **Isolate**. 
2.	*The isolation screen is displayed.* The isolation screen allows you to define the DXF layers that should be visible in isolation mode.

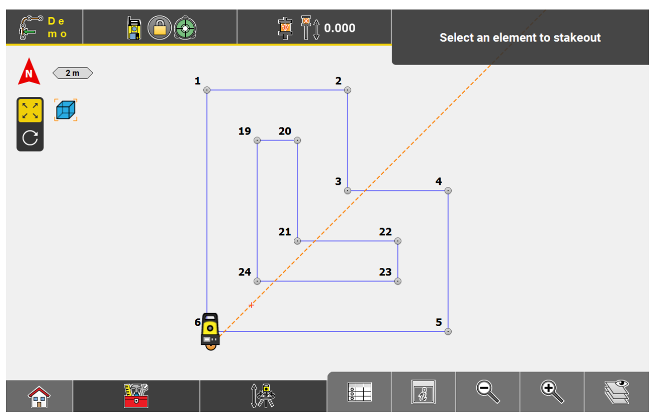
3. Select a line, point or arc of a specific DXF layer that should be visible in isolation mode.



As soon as an element is selected, a preview of the isolation mode is given: selected elements are highlighted in blue, elements of the same layer are highlighted in orange. All elements to be hidden are displayed in their original colour.

4. Tap the Accept button to activate the isolation mode and return to the map view.

5. *The map view is displayed in isolation mode. Only the selected elements/layers are visible.*



To indicate that isolation mode is active, the Isolate icon is displayed in the top left corner of the map view. The icon disappears when all elements are visible in the map view.

☞ Tap the icon to quickly access the isolation screen.

☞ When isolation mode is active, the **Isolate** option is highlighted in yellow when accessing **View** in the Map handler.

☞ You can use the Limit Box function to further reduce the amount of visible data. Refer to Limit Box.

Toolbar in the isolation screen

Toolbar button	Description
	☞ This button is deactivated by default when working with DXF files.
	**Selection method: Layer** When selecting a DXF element, all objects belonging to the same layer are also selected for isolation mode. ☞ This button is activated by default.
	Tap this button to deselect all selected elements or to turn off the isolation mode and make all objects visible again.
	Tap this button to discard all changes and return to the map view. If applicable, the previously made isolation settings are being kept.
	Tap this button to activate the isolation mode and return to the map view.

Hiding DXF elements in the map view

☞ Available for iCON build and iCON site Plus.

☞ The **Isolate** function for DXF elements is available in all applications except the **Layout Objects** application.

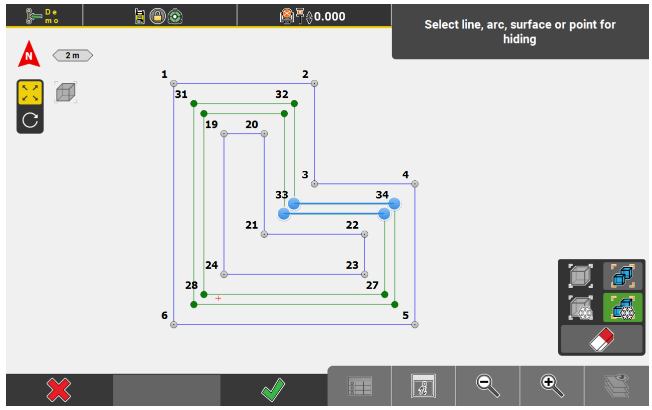
The isolation mode allows you to reduce the number of visible DXF elements based on the DXF layers. This function correlates to the settings of the **Map view manager** (refer to 2.4 Displaying Data).

Hiding DXF elements step-by-step

☞ Make sure that a DXF file is loaded and activated in the Map View manager.

1.	From within any application (except **Layout Objects**), access **View** in the Map handler and tap **Isolate**.	
2.	*The isolation screen is displayed.* The isolation screen allows you to define the DXF layers that should be hidden in isolation mode.	

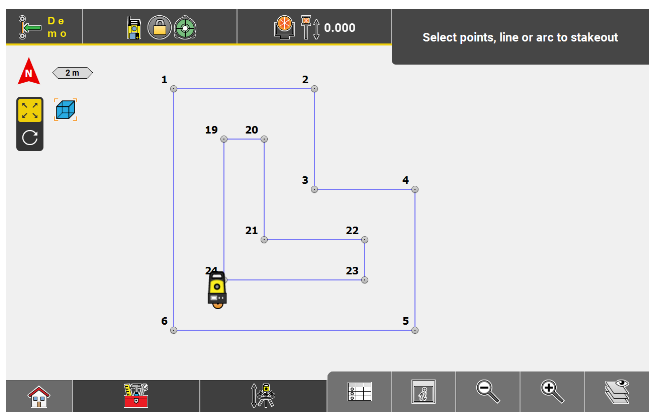
3. Select a line, point or arc of a specific DXF layer that should be hidden in isolation mode.



As soon as an element is selected, a preview of the isolation mode is given: selected elements are highlighted in blue, elements of the same layer are highlighted in green. All remaining elements are displayed in their original colour.

4. Tap the Accept button to activate the isolation mode and return to the map view.

5. *The map view is displayed in isolation mode. The layers of the selected elements are hidden.*



To indicate that isolation mode is active, the Isolate icon is displayed in the top left corner of the map view. The icon disappears when all elements are visible in the map view.

☞ Tap the icon to quickly access the isolation screen.

☞ When isolation mode is active, the **Isolate** option is highlighted in yellow when accessing **View** in the Map handler.

☞ You can use the Limit Box function to further reduce the amount of visible data. Refer to Limit Box.

Toolbar in the isolation screen

Toolbar button	Description
	☞ This button is deactivated by default when working with DXF files.
	**Selection method: Layer** When selecting a DXF element, all objects belonging to the same layer are also selected for isolation mode. ☞ This button is activated by default.
	Tap this button to deselect all selected elements or to turn off the isolation mode and make all objects visible again.
	Tap this button to discard all changes and return to the map view. If applicable, the previously made isolation settings are being kept.
	Tap this button to activate the isolation mode and return to the map view.

Limit Box

☞ Available for iCON build and iCON site Plus.

This function allows you to reduce the amount of visible data in the map view by defining the dimensions of a so-called limit box.

Data filtered by the limit box can be:

- **Point Cloud** and **Design** data
- User-created data, such as points, lines and arcs that have been measured or created in apps such as **Draw** or **Divide and Offset**.
  See also: How to Sketch a Plan

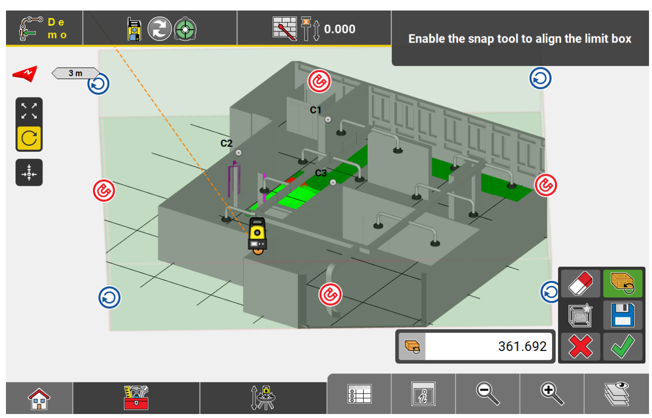
☞	The **Limit Box** function has replaced and now also serves as elevation filter.
☞	The **Limit Box** function is available in all applications. For some applications an additional licence is required.

1. From within the current application, access **View** in the Map handler and tap **Limit Box**. 
The Limit Box toolbar is displayed. A transparent box is created around all active data in the map.

2.
   - You can define the limit box by shifting all six faces of the box. The active faces are highlighted in a darker colour.
     - **Top and bottom face:** Tap and hold the blue circles (the filled blue circle for the top face) and drag them up and down. Alternatively, enter the values of the desired elevation range.

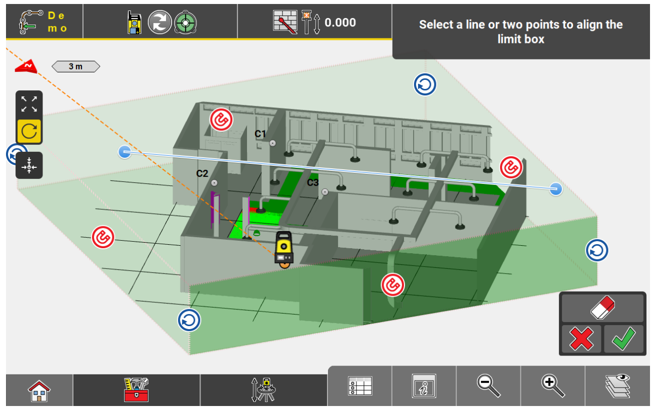
       

     - **Left and right face:** Tap and hold the red circles (the filled red circle for the right-hand side face) and drag them left and and right.
     - **Front and back face:** Tap and hold the green circles (the filled green circle for the back side face) and drag them back and and forth.
   - To rotate the limit box around its vertical axis, tap  and enter the desired rotation angle or tap and hold one of the dark blue circles in one of the corners and drag the corner around.



The limit box preview is updated according to the changes.

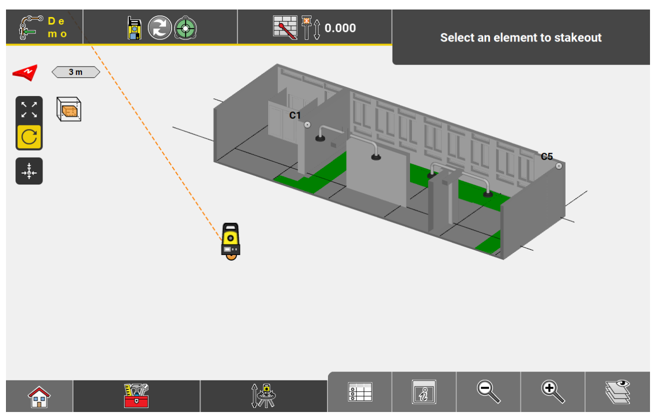
   - To align the limit box tap one of the mid point circles  to enable the snap tool and select a line or two points. Tap  to align the limit box.



The limit box preview is updated according to the changes.

- To reset the limit box to the fullest extent possible, tap .
- To discard the changes and return to the map view, tap .
- To save the current limit box configuration, tap .
- To reset the limit box to the last saved configuration tap 

3. To accept and activate the changes of the limit box, tap .



Elements outside the defined limit box disappear from the map view. While the Limit Box is active, the Limit Box icon is displayed in the top left corner of the map view.

☞ Tap the Limit Box icon to quickly access the Limit Box function. The icon disappears when the limit box is reset to the total extent. 

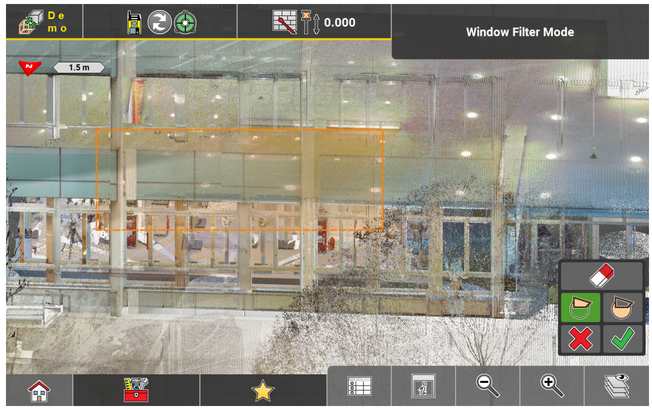
☞ When the Limit Box is active, the Limit Box option is highlighted in yellow when accessing **View** in the Map handler.

Clipping Filter

This function allows you to reduce the amount of visible point cloud data in the map view.

☞ The **Clipping Filter** function is only available when the licence "Grid & Scan" is active.

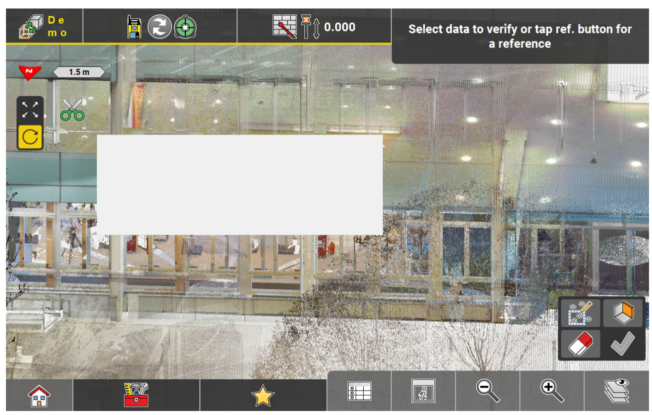
1. From within the current application, access **View** in the Map handler and tap **Clipping Filter**. 
   The Clipping Filter toolbar is displayed.
2. Define the clipping area by tapping as many points as desired for the area corners.



The defined clipping area is highlighted in orange.

3.
- To clip all point cloud data inside the defined area, activate the button .
- To clip all point cloud data outside the defined area, activate the button .
- To cancel and return to the map view without clipping, tap .

To accept and apply the clipping for the defined area, tap .



All data inside/ outside the defined clipping area are faded out in the map view. While a clipping filter is active, the Clipping Filter icon is displayed in the top left corner of the map view.

4. To apply another clipping filter on top, open the **Clipping Filter** toolbar again and repeat the previous steps.

☞ To erase all applied clipping filters, open the **Clipping Filter** toolbar, select  and tap  to accept.

☞ Tap the Clipping Filter icon to quickly access the Clipping Filter function. The icon disappears when no clipping filters are applied. 

☞ When the Clipping Filter is active, the **Clipping Filter** option is highlighted in yellow when accessing **View** in the Map handler.

1.4.7 Special Options for IFC Files

IFC object selection using QR-code

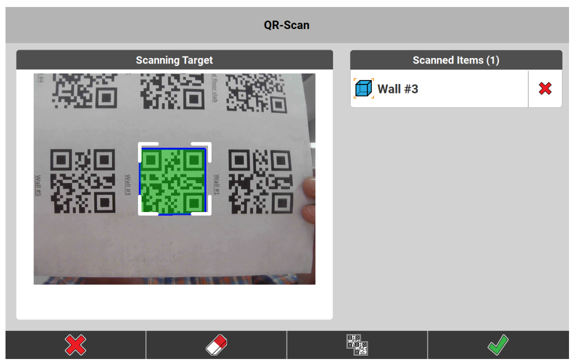
☞ In order to use IFC object selection by scanning a QR-code your entitlement needs to include the QR Code Reader license plus active licenses for Verification, Layout Objects and/or Checks.

In the apps you can use a QR-code to select objects:

App	Use case
Verification	For using an object as reference See also: Verify data using a reference step-by-step
Layout Objects	For selecting points and lines to layout See also: Layout objects step-by-step
Checks	For checking length, angles and areas of an object See also: How to do checks step-by-step

☞ iCON supports the following QR-Scan structure: ObjectID:XXXXXXXXXXX

1. Tap in the toolbar or tap the **QR-Scan** button in the Measure bar.



The QR-Scan page is displayed.

2. Tap to accept.

☞ Tap to switch from **single** scanning mode to **multiple** scanning mode.
In single scanning mode only the code within the white frame will be scanned.
In multiple scanning mode all codes within the camera view will be scanned simultaneously.

Using IFC Tree View step-by-step

☞ **IFC Tree View** is only available in the **Layout Objects** application.

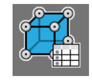
The IFC Tree View allows you to display the tree structure of an imported IFC file, to select/deselect objects within the tree structure and to hide/show objects in the map view.

Using the **Map view manager**, it is possible to predefine which IFC entities of the IFC file should be visible in the IFC Tree View and the map. Refer to 2.4 Displaying Data.

Access and navigation within the tree view

☞ In 7" display mode or in onboard mode of an iCB/iCR with KDU, activate Multiview to display IFC Tree View and map side by side.

1. From within the **Layout Objects** application, access **View** in the Map handler and tap **IFC Tree View**.



The tree view of the IFC file is displayed.

2. Tap the "closed folder" icon to expand the tree view.
All subordinate object groups or objects are displayed.
Tap the "open folder" icon to collapse the tree view.
All subordinate object groups or objects are hidden.

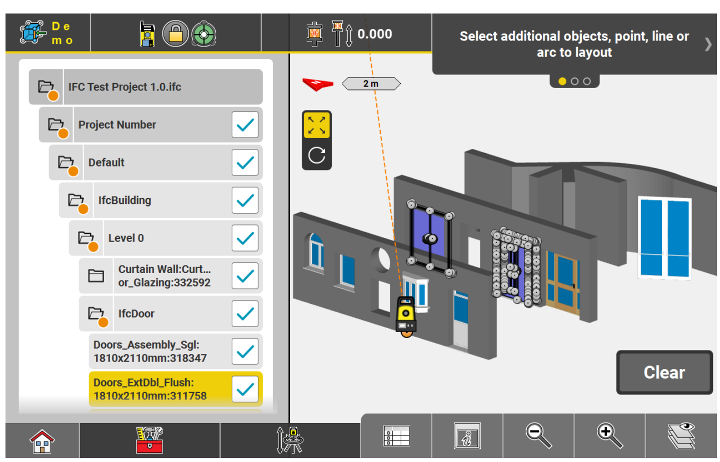
☞ If no folder icon is displayed, the lowest possible level of the tree view is reached.

☞ When the IFC Tree View is active, the **IFC Tree View** option is highlighted in yellow when accessing **View** in the Map handler.

Select/deselect objects using the tree view

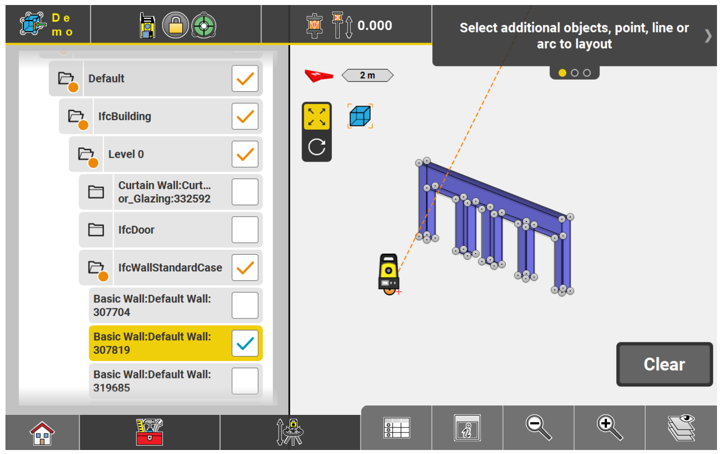
- Tap the name of an object to select or deselect it.
- Tap the name of an object group to select or deselect all of its subordinate objects/object groups.
- It is not possible to select hidden objects/object groups.

Selected objects/object groups are highlighted in blue in the map view and in yellow in the tree view. All superordinate objects/object groups of a selected object are marked with an orange dot.



Show/hide objects using the tree view

- To hide an object in the map view, uncheck its checkbox in the tree view.
  The object is hidden in the map and cannot be selected anymore. For all superordinate objects of the hidden object, the colour of the checkmark in the tree view changes to orange.
- To hide all subordinate objects of an object group in the map view, uncheck the checkbox of the object group in the tree view.
  All subordinate objects of the object group are hidden in the map and cannot be selected anymore.
- To show a hidden object/object group, activate the checkbox in the tree view.



When one or more objects are hidden in the map view, the **Isolate** icon is displayed in the top left corner of the map view. The icon disappears when all objects are visible in the map view.

Tap the icon to quickly change the isolation settings. Refer to Isolating IFC objects in the map view.

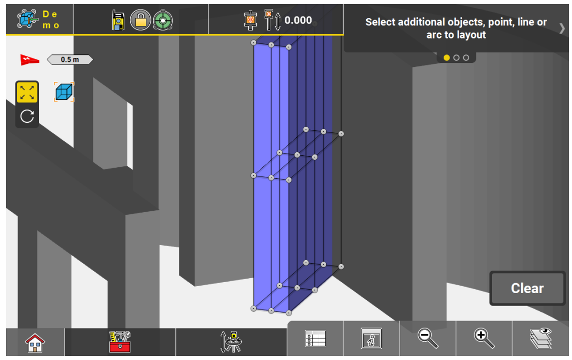
Customise the wireframe of an IFC object step-by-step

If necessary, you can customise the wireframe of an IFC object to reduce the number of displayed points on the wireframe. When selecting an IFC object after customising it, only the defined wireframe points are displayed on the IFC object.

If the option **Detect Hangers** has been enabled during import of the IFC file, it is not possible to customise the IFC wireframes of this file. To be able to customise the wireframes, ensure to disable the option when importing an IFC file.
Refer also to the specific section on importing IFC files in the paragraph Importing data to the project step-by-step.

The customised wireframe of an IFC object can be saved as profile to the active project. When importing other IFC files to the project, the saved profile is automatically applied to all IFC objects of the same type within the imported file.

1. Within the application **Layout Objects**, select the IFC objects to be customised.



2. Select **Point Creation** from the toolbox. 

The toolbar for point creation is displayed.

 Tap this button to start Window Selection mode. This mode allows you to select several points at once by defining a selection area.

 Activate this button to create centre points for the selected elements.

 Activate this button to create mid-points for the selected elements.

 Activate this button to create endpoints for the selected elements.

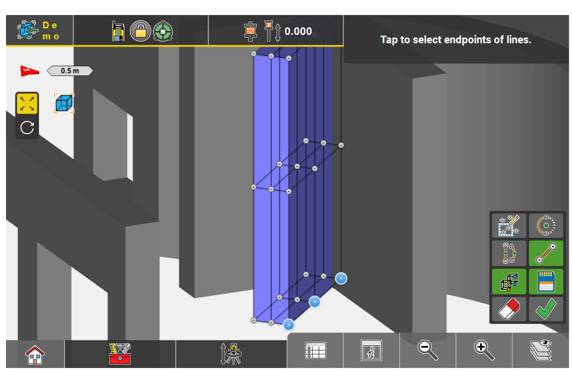
 Before accepting, activate this button to copy the customised wireframe definition onto other IFC objects of the same type that are within the IFC file and active in the map.

 Before accepting, activate this button to save the customised wireframe to the current active project.

 Tap this button to deselect all selected elements and reset the wireframe to the original.

 Tap this button to accept the defined wireframe points and save the customised wireframe.

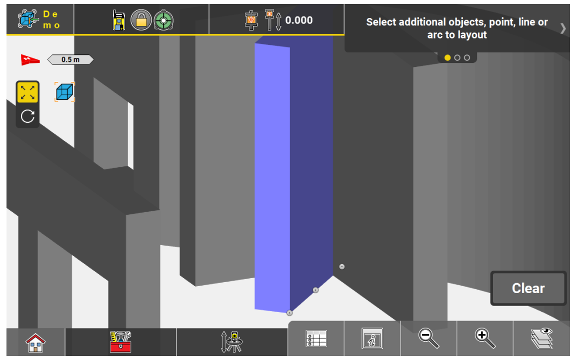
3. Select lines, arcs or circles and activate the corresponding toolbar button to create midpoints, centre points or endpoints for the selected elements. Follow the onscreen instructions.
For quick selection or deselection, use the **Window Selection** mode.



The custom wireframe points are highlighted in blue.

☞ To copy the wireframe definition to other objects or to save the wireframe definition as profile, ensure to activate the respective buttons before saving the customised wireframe.

4. To accept and save the customised wireframe, tap ✓.

☞ 

When the IFC object is selected again, only the user-defined wireframe points are visible.

Displaying IFC attributes in the information bar

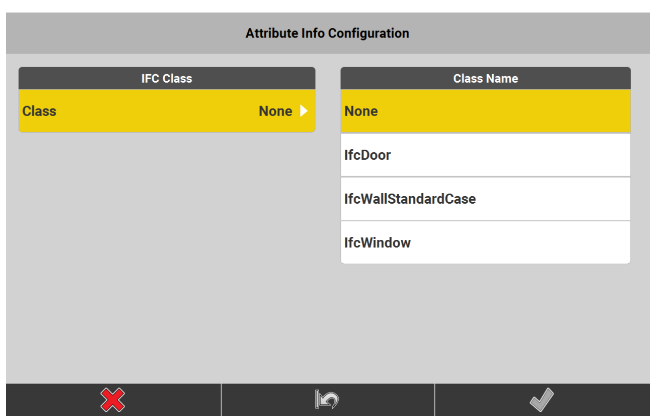
☞ **Attribute Info Config** is only available in the **Layout Objects** application.

The **Attribute Info Config** function allows you to assign up to ten IFC attributes of an object class to a value in the information bar. Thus, the IFC attributes of an object can be quickly looked up in the information bar when selecting the object.

Assigned IFC attributes will be copied to the point information when laying out the IFC object. See also: Layout objects step-by-step

1. From within the **Layout Objects** application, access **View** in the Map handler and tap **Attribute Info Config**.
   The Attribute Info Config screen is displayed.

2. **Selecting an object class**
   - To select an object class, tap the field **IFC Class**.
   - In the section **Class Name**, tap the name of an object class to change its attribute settings.

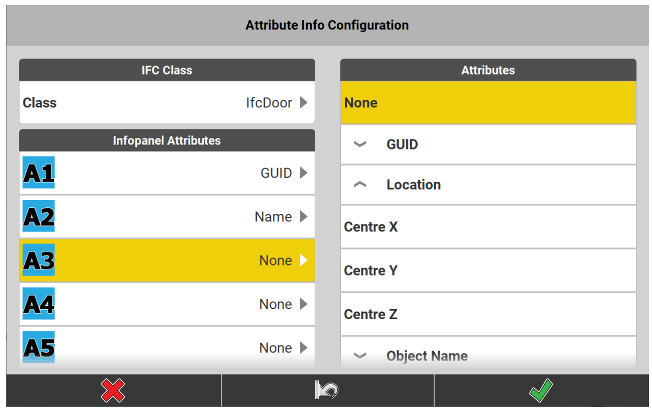


☞ If one or several objects of the same class are selected when accessing the **Attribute Info Config** function, the field **IFC Class** already displays the corresponding object class. The section **Infopanel Attributes** is displayed.

3. **Assigning Attributes to an information bar value**

The section **Infopanel Attributes** displays the attribute settings of the selected object class. By default, Attribute 1 A1 is set to **GUID** and Attribute 2 A2 is set to **Name**. Attributes 3 to 10 are by default set to 'None'.

- Tap any of the attributes within **Infopanel Attributes** to display the section **Attributes**. The section contains a list of all available attributes for the selected object class.
- Tap an attribute name to assign it to the respective information bar value (A1-A10).
- Repeat these steps for as many attributes as desired (max. 10).



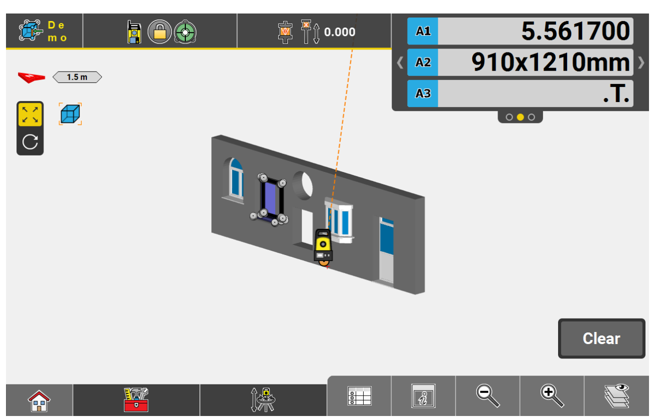
☞
- Tap to reset all attribute settings of the selected object class to the default values.
- Tap to discard all changes and return to the map view.

4. Tap to accept the changes and return to the map view.

☞ To display the attributes of an object, select the object and scroll through the pages of the information bar.

☞ To display the desired information bar values (A1-A10), configure the information bar. Refer to Information bar.

Example for displaying attributes in the information bar:

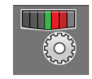


1.4.8 Foreman Settings

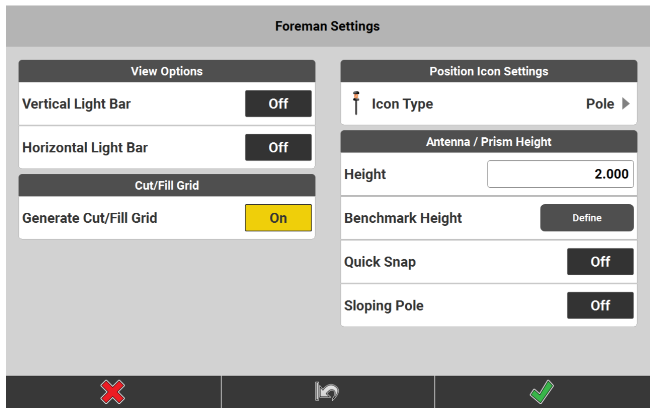
☞ Unavailable for iCON iCG30.

Viewing options for foreman

☞ In 7" display mode, settings for foreman view are available.
To use these advanced **Foreman Settings**, the Surface Pilot licence is needed. Ask your agency or your Leica Geosystems representative for information about licensing.

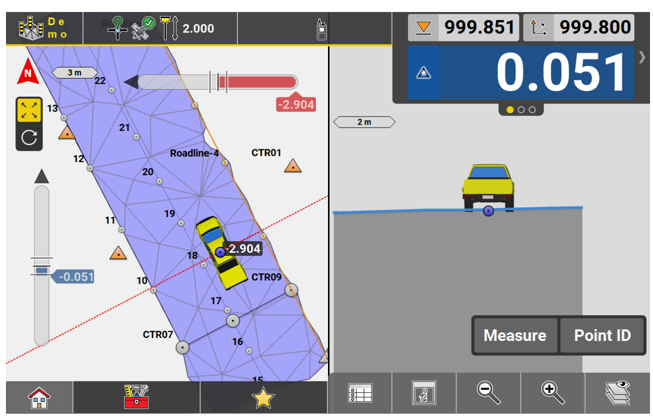
1. Access **View** in the Map handler and tap **Foreman Settings**. 

Following screen is displayed:



2.
- Set **Vertical Light Bar** to **On**: a vertical light bar shows the height deviation in an optical form.
- Set **Horizontal Light Bar** to **On** as a guidance along a reference line.
- Set **Vertical Light Bar** and **Horizontal Light Bar** to **On** to have a combination of both displayed.
- Set **Generate Cut/Fill Grid** to **On** to allow grid logging in **Cut & Fill**. Refer to 12.2 Cut & Fill Grid Logging.

3. Tap  to accept the settings and return to the map.



☞ Dynamic labels show the Cut & Fill value and the horizontal offset to the reference line. The vertical light bar behaves in accordance with the Cut & Fill colour scheme. When your current position is in tolerance, the label turns green.

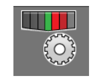
☞ The arrows indicate the direction of movement necessary in order to reach a position that is within tolerance.

☞ The light bars can be relocated. Tap and hold the lightbar and drag it to desired position on the screen.

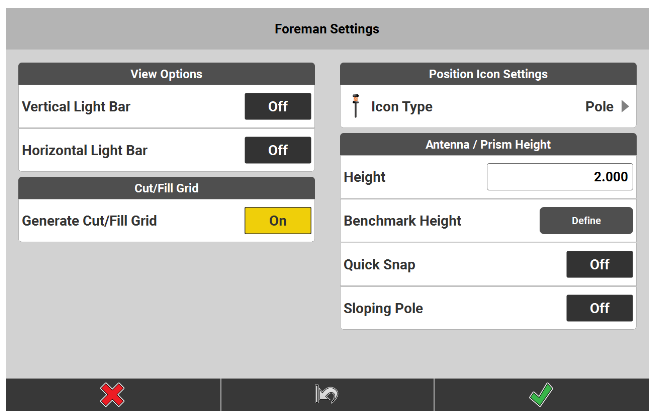
☞ The settings for these viewing options are used, independent from the User, Project, Job or application used.
The information is shown according to the current settings, in the chosen distance unit and the number of decimals set.

Pole mode

1. Access **View** in the Map handler and tap **Foreman Settings**.



2. Tap the arrow button beside **Icon Type**.
Select **Pole** to enable pole mode and to display the pole icon. **Pole** is the default setting.



3.
   - Enter the target **Height** or define the benchmark height for the target height calculation.
   - If using the QuickSnap adapter with iCON iCG60 or iCON iCG70, set **Quick Snap** to **On**.
   - Set **Sloping Pole** to **On** to have the entered target height used perpendicular to a reference surface instead of the vertical height projection. For detailed information, refer to Sloping Pole and Vehicle Configuration.

   ☞ The **Height** value entered is the "real" target height, whether a pole is used or an antenna on a vehicle roof.

   ☞ The antenna/prism height can be also defined from a known point. Tap **Define** to select the benchmark point or height. It is important that the antenna/prism is positioned on the benchmark point.

   ☞ To use the **Sloping Pole** feature a design or reference surface must be selected. Therefore this feature is available in some applications only.

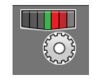
4. Tap ✓ to accept the settings and return to the map.

☞ The settings for these viewing options are used, independent from the User, Project, Job or application used.
The information is shown according to the current settings, in the chosen distance unit and the number of decimals set.

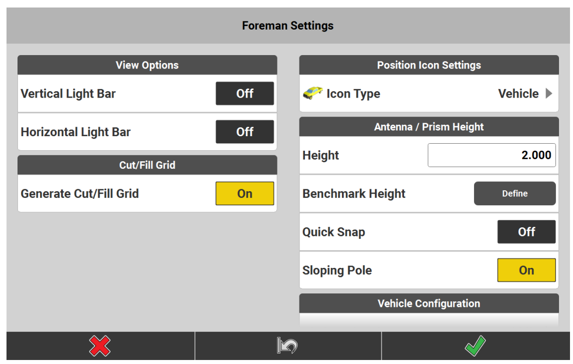
Vehicle/Machine mode

☞ To use the iCON software with a vehicle or machine, the Surface Pilot licence is needed.
For information on milling machines, refer to Milling machine mode.

1. Access **View** in the Map handler and tap **Foreman Settings**.



2. Tap the arrow button beside **Icon Type**.
Select the desired vehicle or machine type to enable vehicle/machine mode and to display the respective vehicle icon.
   - Vehicle
   - Dozer
   - Scraper
   - Tractor



3.
   - Enter the target **Height** or define the benchmark height for the target height calculation.
   - If using the QuickSnap adapter with iCON iCG60 or iCON iCG70, set **Quick Snap** to **On**.
   - Set **Sloping Pole** to **On** to have the entered target height used perpendicular to a reference surface instead of the vertical height projection. For detailed information, refer to Sloping Pole and Vehicle Configuration.

☞ The **Height** value entered is the "real" target height, whether a pole is used or an antenna on a vehicle roof.

☞ The antenna/prism height can be also defined from a known point. Tap **Define** to select the benchmark point or height. It is important that the antenna/prism is positioned on the benchmark point.

☞ To use the **Sloping Pole** feature a design or reference surface must be selected. Therefore this feature is available in some applications only.

4. **Vehicle Configuration**
   - Define the position of the **Blade Ref. Point** in relation to the vehicle icon.
   - Enter values for **Line Offset**, **Offset left edge** and **Offset right edge**.

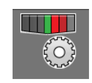
   For detailed information, refer to Sloping Pole and Vehicle Configuration.

5. Tap ✓ to accept the settings and return to the map.

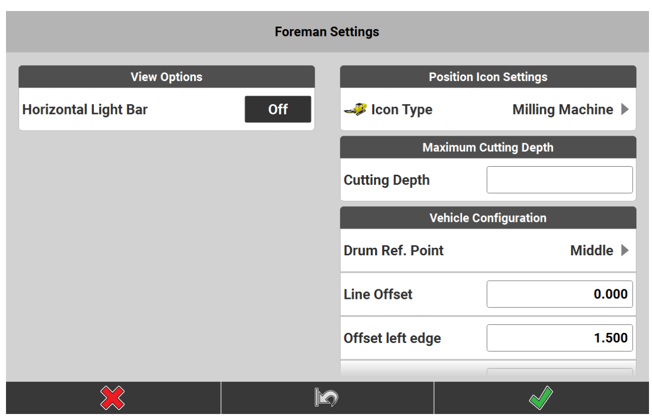
Milling machine mode

☞ To use the iCON software with a milling machine, the Milling Pilot licence is needed.

1. Access **View** in the Map handler and tap **Foreman Settings**.



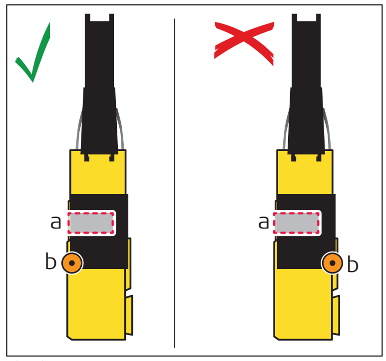
2. Tap the arrow button beside **Icon Type**.
   Select the vehicle type **Milling Machine** to display the milling machine icon.



3. Enter the maximum cutting depth value of the milling machine.
   Different milling machines have different maximum cutting depths. During milling, the software checks the height deviation between existing and design surface. If the height deviation is greater than the defined cutting depth, a warning is displayed in milling view. Areas where the cutting depth limit of the machine is exceeded need to be milled again.

   ☞ The maximum cutting depth value is empty by default. If no value is entered, there are no checks for cutting depth.

☞ If the drum width is shorter than the machine width, mount the GPS/GNSS antenna within the drum width.



18396_001

a Drum position
b GPS/GNSS antenna position

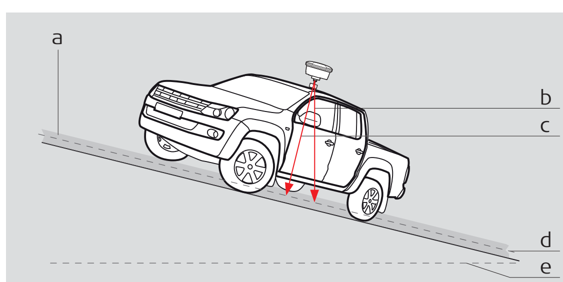
4. **Vehicle Configuration**
- Define the position of the **Drum Ref. Point** in relation to the vehicle icon.
- Enter values for **Line Offset** (value needs to be negative when the prism/GNSS position is behind the drum), **Offset left edge** and **Offset right edge**.

For detailed information, refer to Sloping Pole and Vehicle Configuration.

5. Tap ✔ to accept the settings and return to the map.

Sloping Pole and Vehicle Configuration

Sloping Pole explanation:



012245_001

a Sloped design or reference surface
b Vertical projection of target height
c Perpendicular projection of target height = **Sloping Pole** set to **On**
d Sloped surface, at antenna position
e Theoretical horizontal

Vehicle Configuration

The Vehicle Configuration settings influence how the vehicle icon is displayed in map view.

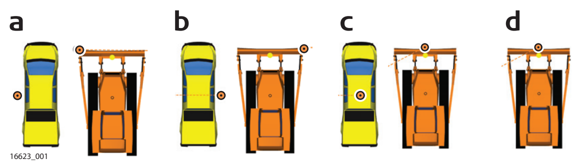
Blade Ref. Point/Drum Ref. Point

By default, the "Blade Ref. Point" or zero point of the vehicle icon is located in the middle of the vehicle and on ground level, where the tires touch the ground.

- For the dozer icon, the default zero point is located at the middle of the blade.
- For the scraper or tractor icon, the default zero point is located at the middle of the trailer.
- For the milling machine icon, the default zero point is located at the middle of the milling drum.

Edit the Blade Ref. Point setting to define the position of the zero point in relation to the vehicle icon.

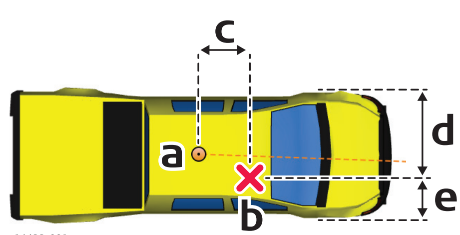
☞ When the antenna/prism is mounted on a mast, select the option Mast. The zero point is the actual position.
When the antenna/prism is mounted on the roof of the vehicle, select Middle, Left or Right. The zero point is calculated based on the current position and the entered offset values.



a Left
b Right
c Middle
d Mast

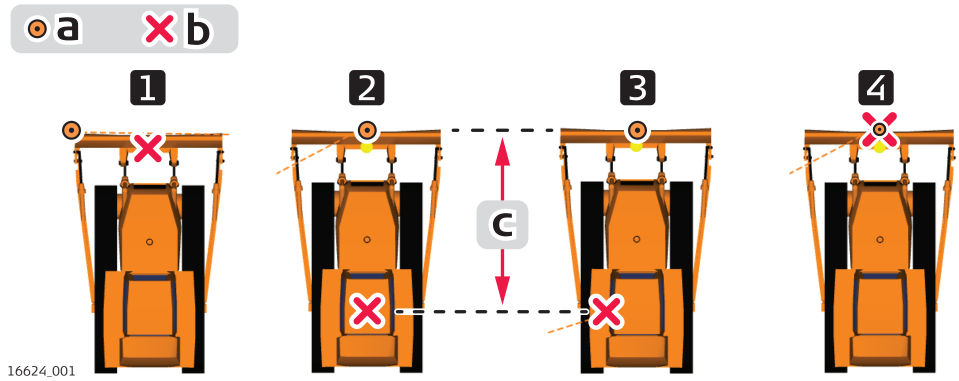
Offset values

To define the width of the displayed vehicle icon, enter the offset values for left edge (d) and right edge (e). Offsets are measured from the actual position of the antenna/prism on the vehicle (b) to the edges of the vehicle. The vehicle width determines the lane width of the Cut/Fill Grid.
To define the Line Offset(c), measure the distance between the actual position of the antenna/prism on the vehicle (b) and the desired position of the zero point (a).
When the zero point is behind the antenna/prism, enter a positive value for Line Offset; when the zero point is in front of the antenna/prism, enter a negative value.



a Default zero point
b Example: Actual position of the antenna/prism on the vehicle
c Line Offset
d Offset left edge
e Offset right edge

Examples



a Default zero point
b Example: Actual position of the antenna/prism on the vehicle
c Line Offset

	1	2	3	4
Default zero point	Left	Middle	Middle	Mast[2]
Line Offset	0	Negative value	Negative value	0
Offset left edge / Offset right edge	Equal	Equal	Not equal	Equal

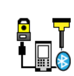
1.5 Setting up Communications and Connecting Instruments

1.5.1 Create an Instrument Profile

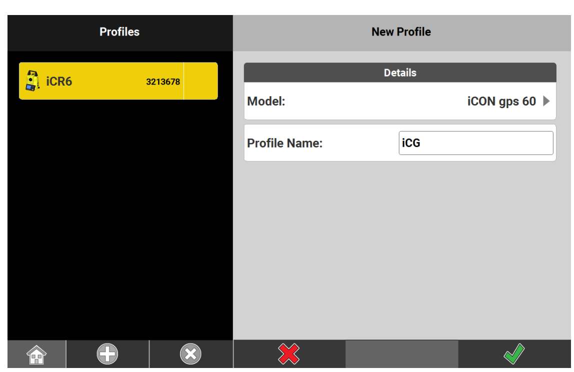
Create an instrument profile step-by-step

In order to connect the controller to an instrument, an instrument profile must be created.

1. Select **Devices** from the Home Menu.



2. Tap to create a new profile.



The "New Profile" screen is displayed.

3. Select the desired **Model:**.
If applicable, enter a **Profile Name:**.
Tap .

[2] Zero point = actual position

☞ To set up a **GPS profile for the iCON iCG30/iCON iCG70**, proceed to 1.5.2 Setting up a GPS Profile for iCON iCG30/iCON iCG70.
To set up a **GPS profile for the iCON iCG60 and other antenna models**, proceed to 1.5.5 GPS Profile Setup for iCON iCG60 and Other Antenna Models .
For a **Total Station profile** proceed to 1.5.7 Total Station Profile Setup .

1.5.2 Setting up a GPS Profile for iCON iCG30/iCON iCG70 GPS

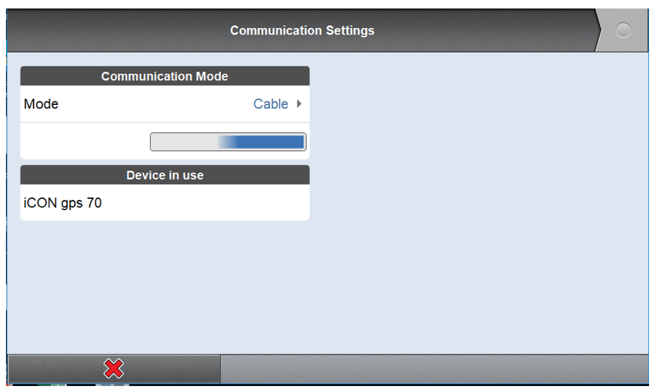
☞ Some settings are only accessible when using an iCON iCG70.

Connection and basic configuration

1. To define the Communication method between instrument and controller tap **Mode**, within the **Communication Mode** container.

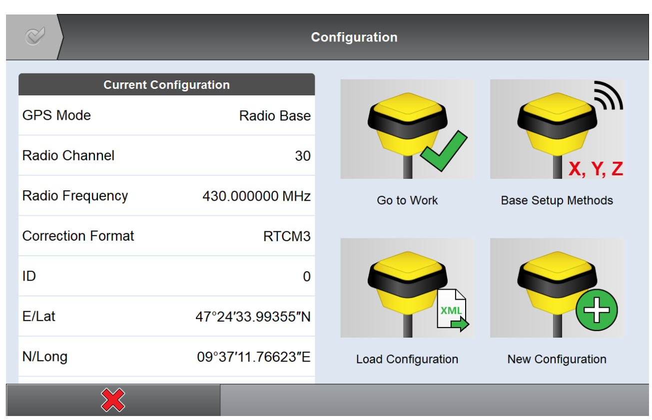
   ☞ Ensure that the iCON iCG70 antenna is set up accordingly and ready for connection.

2.
   - For **Cable** connection, ensure that the cable is connected. Once the instrument is connected, it changes from white to yellow in the search list.
   - For **Bluetooth**, press the **Start Search** key. Select the relevant instrument profile from **Search Results**.



Tap the next Wizard step  to proceed.

3. *The current configuration of the antenna is displayed.*

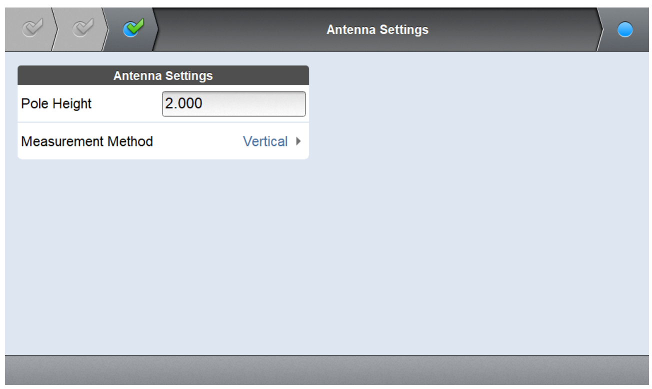


Choose one of the three options:

- **Go to Work**
  Allows you to use the current configuration of the antenna and to start working directly.
  Refer to Option "Go to Work".
- **Load Configuration**
  Allows you to load an antenna profile either from the internal memory, from a connected storage device or from Leica ConX.
  Refer to Option "Load Configuration".
- **New Configuration**
  Allows you to create an antenna profile.
  Refer to Option "New Configuration".
- **Base Setup Methods** is available.
  Available, if the antenna is set up as base. Allows you to change the base point for the existing profile.
  Refer to Defining a base point.

Option "Go to Work"

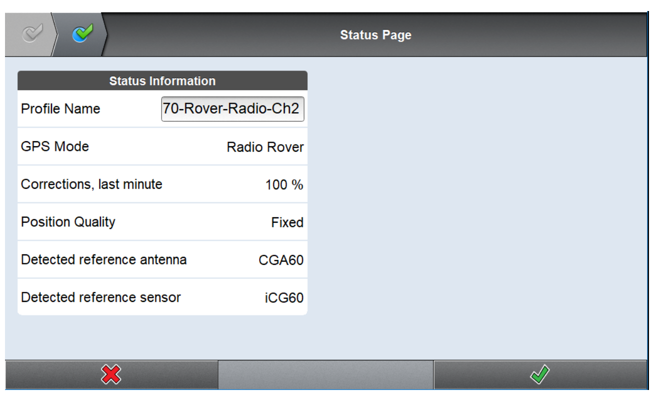
☞ If the antenna is set up as Base, the following wizard step is displayed additionally:



Enter the pole height of the antenna.

Tap the next Wizard step  to proceed.

☞ If the antenna is set up as Rover, the following wizard step is displayed directly.

1. 

   If desired, edit the name of the profile.

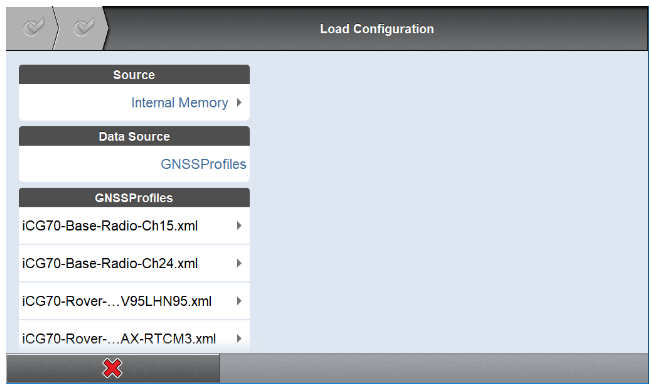
2.
- Tap to save the profile.
  Upon saving the profile, the "Profiles" screen is displayed.
- Tap to cancel.

☞ To edit the profile settings, tap the arrow button to the right of the profile name.

3. Tap the profile name to start working.
A progress bar is displayed during initialisation. Once the device is ready, the main screen is displayed.

Option "Load Configuration"

☞ When selecting the option **Load Configuration**, the following wizard step is displayed:



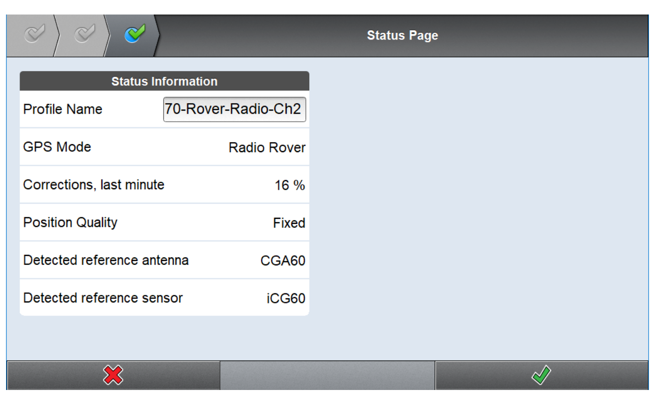
☞ A profile can be loaded either from the internal memory, from a connected storage device or from Leica ConX. Ensure that the profile is stored within the folder **GNSS Profiles**, otherwise it is not available for import.

1. To define the source of the profile, tap **Source**.

2. Select a profile from the list "GNSS Profiles".
The configuration of the profile is displayed.

3.
- Tap the next Wizard step to proceed.
- Tap to cancel.

4. If desired, edit the name of the profile.



- Tap to load the profile.
- Tap to cancel.

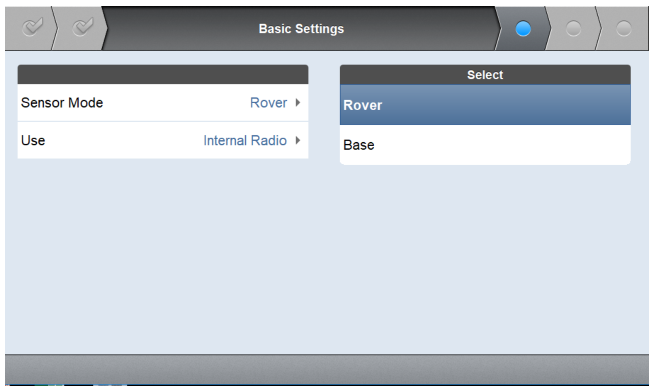
☞ *Once the profile is loaded, the "Profiles" screen is displayed.*

To edit the profile settings, tap the arrow button to the right of the profile name.

5. Tap the profile name to start working.
A progress bar is displayed during initialisation. Once the device is ready, the main screen is displayed.

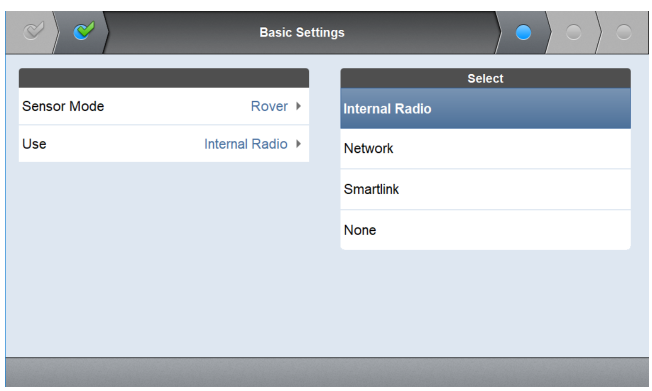
Option "New Configuration"

☞ When selecting the option **New Configuration**, the following wizard step is displayed:



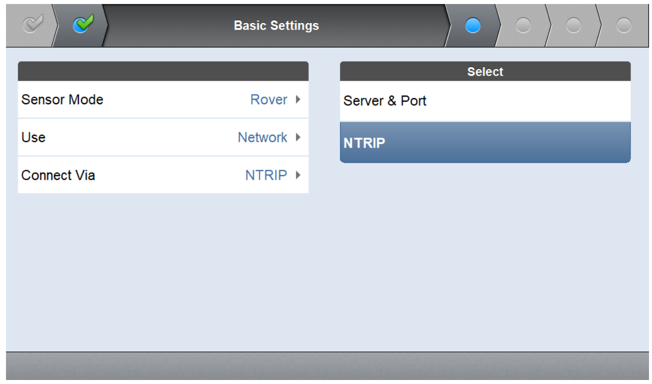
1. **Basic Settings**
To define the setup type, choose base or rover for **Sensor Mode**.

2. For **Use**, define the communication method.



☞ **SmartLink** can only be used with an iCON iCG70 and the appropriate license.
SmartLink is a service that increases the position accuracy without the need of having a base. The convergence time after activating SmartLink can be up to 30 minutes.
For Radio Rover and Network Rover profiles, SmartLink is enabled by default. To disable SmartLink, edit the profile. Refer to 1.5.3 Editing a GPS Profile (Editing the profile configuration).

☞ If you set up the antenna as Network Rover, you also need to define a connection method.



3.	Tap the next Wizard step to proceed.	
	☞	Depending on the defined setup type, number and content of the following wizard steps vary. Refer to the respective paragraph in step 4.:
4.	**Radio Rover using internal radio** • Define the settings for the internal radio. Tap the next Wizard step to proceed. • Define the antenna settings. Tap the next Wizard step to proceed. • If desired, edit the name of the profile. Tap ✓ to save the profile.	
	Network Rover using NTRIP connection • Define the settings for NTRIP connection. Tap the next Wizard step to proceed. • Define the Mountpoint settings. Mountpoints are downloaded automatically. Tap the next Wizard step to proceed. • Define the antenna settings. Tap the next Wizard step to proceed. • If desired, edit the name of the profile. Tap ✓ to save the profile.	
	Network Rover using Server connection • Define the settings for server connection. Tap the next Wizard step to proceed. • Define the antenna settings. Tap the next Wizard step to proceed. • If desired, edit the name of the profile. Tap ✓ to save the profile.	

Rover using SmartLink

- Define the antenna settings. Select the reference frame of the coordinate system in use.
  A SmartLink solution is independent from a reference station or network. Therefore the link to the reference frame of the used coordinate system is not given anymore. The coordinates need to be transformed into the reference frame of the coordinate system.

☞ The usage of an incorrect reference frame can create a position error bigger than the accuracy of a SmartLink solution (> 6 cm).

- Tap the next Wizard step to proceed.
- If desired, edit the name of the profile. Tap ✓ to save the profile.

Base Setup

- Define the settings for the internal radio. Tap the next Wizard step to proceed.
- Define the antenna settings. Tap the next Wizard step to proceed.
- Define a base point. Refer to Defining a base point.
  Tap the next Wizard step to proceed.
- If desired, edit the name of the profile. Tap ✓ to save the profile.

☞ Options in the **Antenna Settings screen** :

- Enter the pole height.
- Activate or deactivate **Tilt** option.
- If Tilt is deactivated, define the measurement method.

☞ *Upon saving the profile, the "Profiles" screen is displayed.*

To edit the profile settings, tap the arrow button ❯ to the right of the profile name.

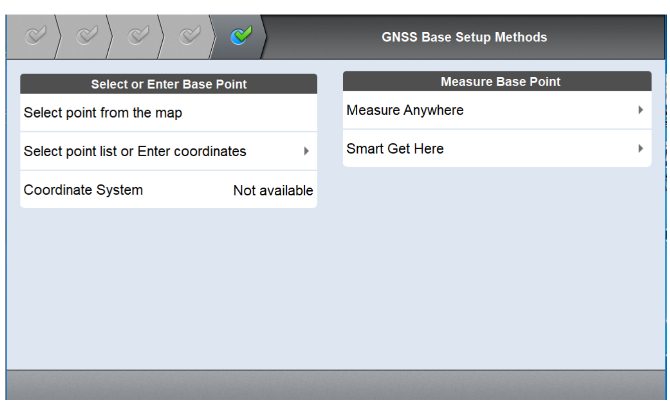
---

5. Tap the profile name to start working.
   A progress bar is displayed during initialisation. Once the device is ready, the main screen is displayed.

Defining a base point

When setting up the antenna as base, you need to define a base point. The base point should be within a distance of maximum 20 m.

During profile setup, the following wizard step is displayed:



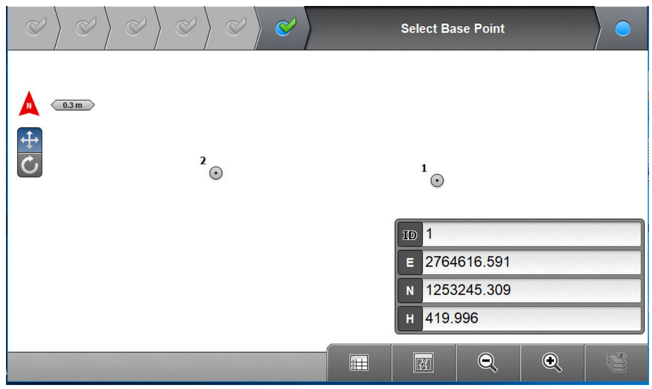
There are five options for defining a base point. Refer to the corresponding section:

- Select a base point from the map
- Select a base point from the list
- Enter a base point
- Measure a base point: Measure Anywhere
- Measure a base point: Smart Get Here

Select a base point from the map

☞ If no coordinate system is loaded to the project, it is not possible to select a base point from the map.

1. Tap **Select point from the map**.



2. Tap a point to select it.
The coordinate fields are updated with the coordinates of the selected point.
You can also edit the coordinate fields.

3. Tap the next wizard step to proceed with the profile setup.

☞ The status page is displayed. The defined base point is stored in the point list, with the code "Base Point" assigned to it.

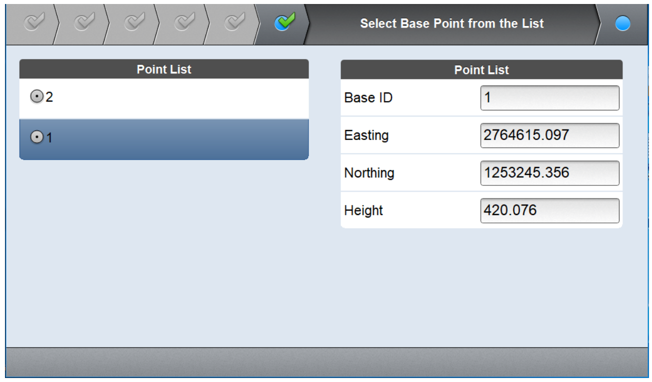
4. Tap ✓ to save the profile.

Select a base point from the list

☞ If no coordinate system is loaded to the project, it is not possible to select a base point from the list. You can only enter WGS coordinates. If a coordinate system is loaded, you can also enter the local coordinates.

1. Tap **Select point list or Enter coordinates**.

The available points are listed according to their distance to the current position, with the nearest point listed first.



2. Tap a point to select it.
   The coordinate fields are updated with the coordinates of the selected point.
3. Tap the next wizard step to proceed with the profile setup.

☞ The status page is displayed. The defined base point is stored in the point list, with the code "Base Point" assigned to it.

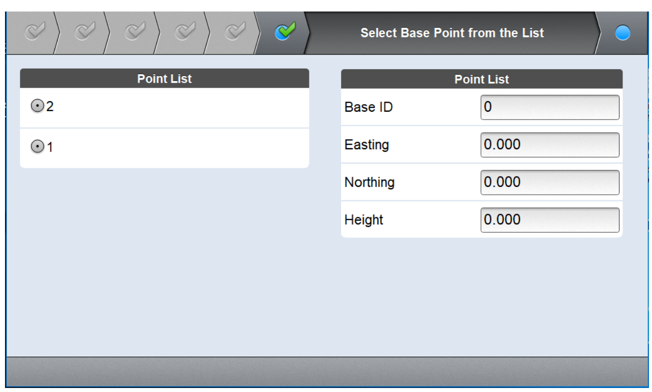
4. Tap ✔ to save the profile.

Enter a base point

☞ If no coordinate system is loaded to the project, you can only enter WGS coordinates. If a coordinate system is loaded, you can also enter the local coordinates.

1. Tap **Select point list or Enter coordinates**.

By default, the coordinates are set to zero.



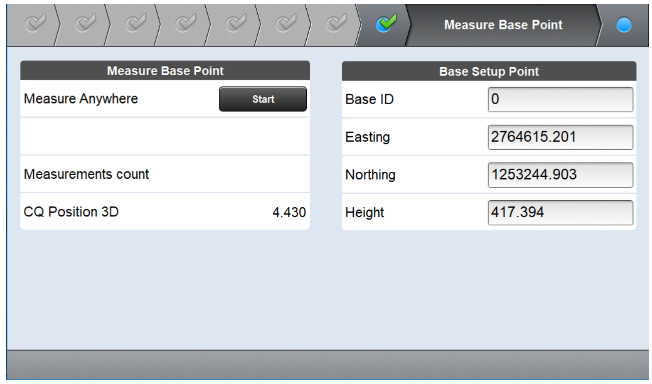
2. Enter the desired coordinate values.
3. Tap the next wizard step to proceed with the profile setup.

☞ The status page is displayed. The defined base point is stored in the point list, with the code "Base Point" assigned to it.

4. Tap ✔ to save the profile.

Measure a base point: Measure Anywhere

1. Tap Measure Anywhere.



2. To start measuring, tap **Start**.
The number of measurements is displayed. The field "CQ Position 3D" displays the current quality of the measurements.
3. If the quality of the measurement is sufficient, tap **Stop** to store the measured base point.
4. Tap the next wizard step to proceed with the profile setup.

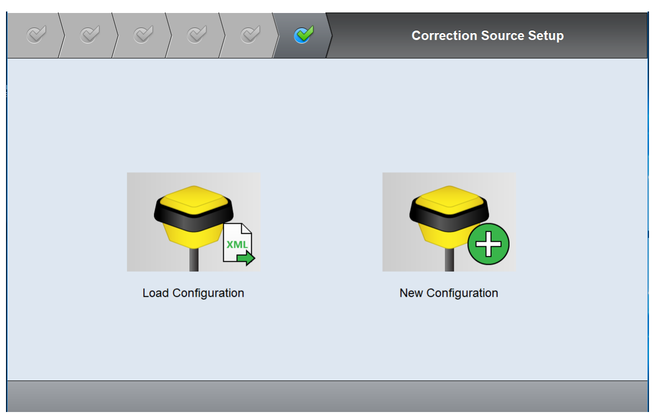
☞ The status page is displayed. The defined base point is stored in the point list, with the code "Base Point" assigned to it.

5. Tap ✓ to save the profile.

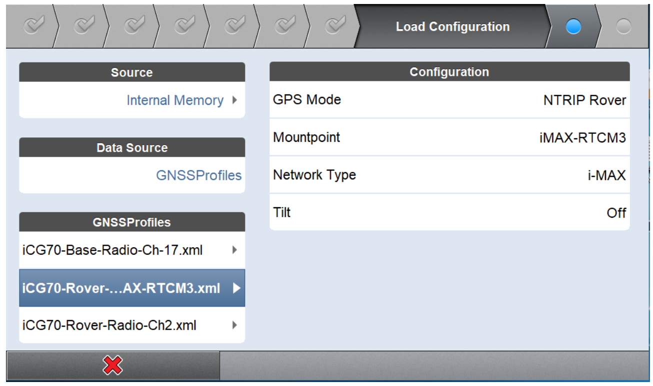
Measure a base point: Smart Get Here

☞ This function determines the current coordinates of the instrument with high accuracy and uses the thus calculated position as the base point.

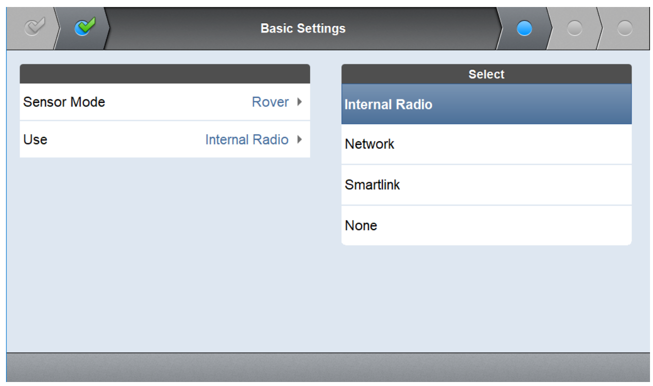
1. Tap Smart Get Here.
2. Set up a new rover profile.



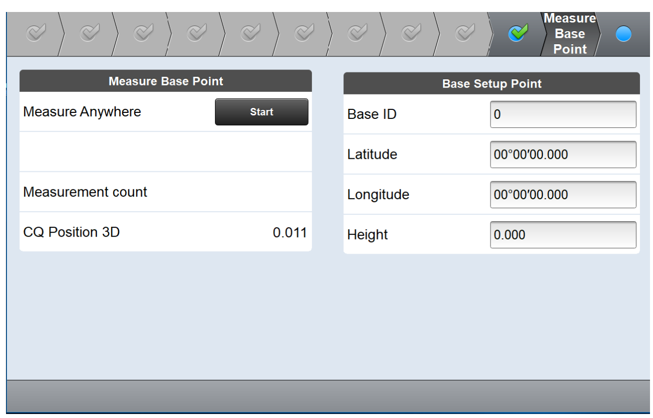
☞ You can also load an existing rover profile.



3. For a radio rover profile, define the internal radio settings. For a network rover profile, define the network and mountpoint settings.



4. Tap the next wizard step.
To start measuring, tap **Start**.



5. If the quality of the measurement is sufficient, tap **Stop** to store the measured base point.

6. Tap the next wizard step to proceed with the profile setup.

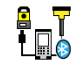
☞ The status page is displayed. The defined base point is stored in the point list, with the code "Base Point" assigned to it.

7. Tap ✔ to save the profile.

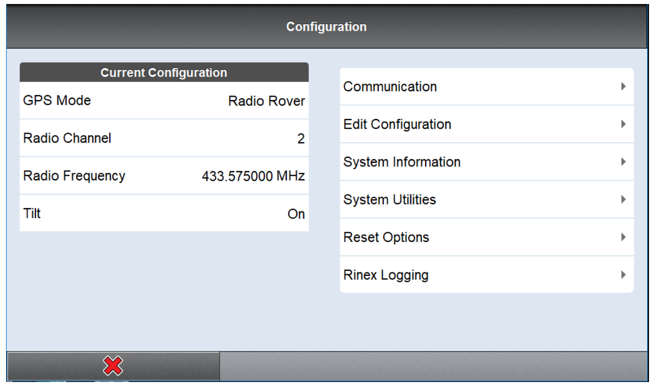
1.5.3 Editing a GPS Profile GPS

Editing the profile settings

1. Select **Devices** from the Home Menu.
   The "Profiles" screen is displayed.



2. To edit the profile settings, tap the arrow button to the right of the profile name.
   The "Configuration" screen is displayed.



3.
   - To edit the communication settings, tap **Communication**.
     Refer to Editing the communication settings.
   - To edit the profile configuration, tap **Edit Configuration**.
     Refer to Editing the profile configuration.
   - To display detailed information on sensor, measurement engine, internal radio or on licences, tap **System Information**.
     Refer to Displaying the system information.
   - To upload a firmware update or a licence key, tap **System Utilities**.
     Refer to Uploading firmware updates or licence keys.
   - To reset the antenna, tap **Reset Options**.
     Refer to Resetting the antenna.
   - To record RINEX data, tap **Rinex Logging**.
     Refer to Recording RINEX data.

Editing the communication settings

In the "Configuration" screen, tap **Communication**.
The "Communication Settings" screen is displayed.

1. To define the Communication method between instrument and controller tap **Mode**, within the **Communication Mode** container.
2.
   - For **Cable** connection, ensure the cable is connected. Once the instrument is connected, it changes from white to yellow in the search list.
   - For **Bluetooth**, press the **Start Search** key. Select the relevant instrument from **Search Results**.
3. Tap to save changes.

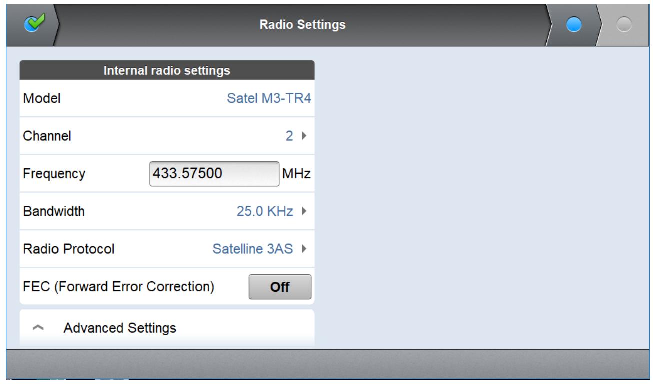
Editing the profile configuration

1. In the "Configuration" screen, tap **Edit Configuration**.
   The wizard for profile configuration is displayed.

☞ Some functionalities in the advanced settings are licenced. Ask your agency or your Leica Geosystems representative for information about licensing.

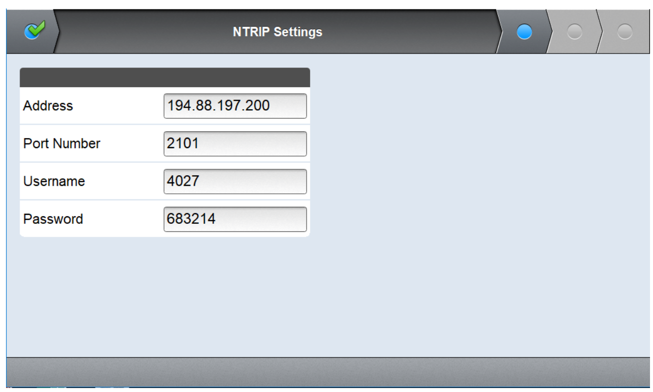
☞ Depending on the already defined profile setup, number and content of the available wizard steps vary. Refer to the respective paragraphs.

2. **Wizard step "Radio Settings"**



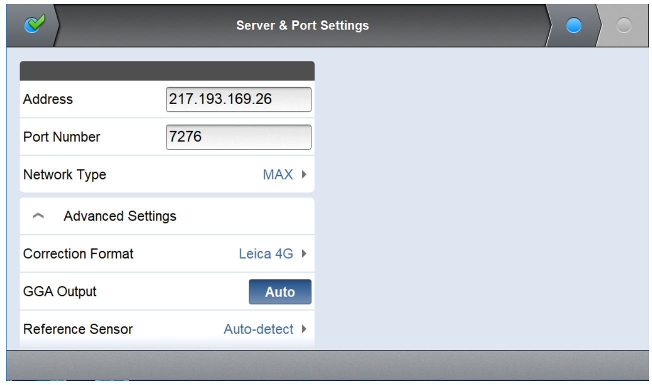
Define the settings for the internal radio. Tap the next Wizard step to proceed.

Wizard step "NTRIP Settings"



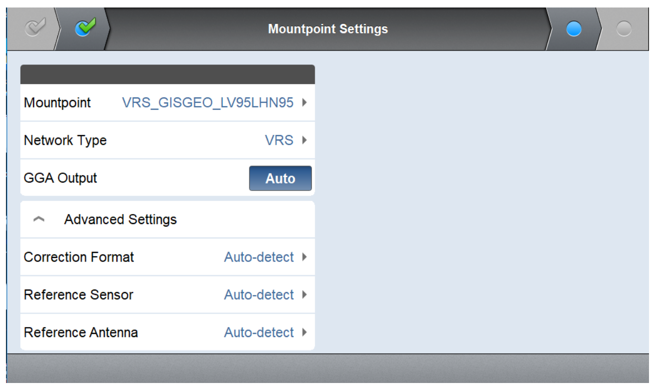
Define the settings for NTRIP connection. To check if the connection works, tap .

Wizard step "Server & Port Settings"



Define the settings for server connection. Tap the next Wizard step  to proceed.

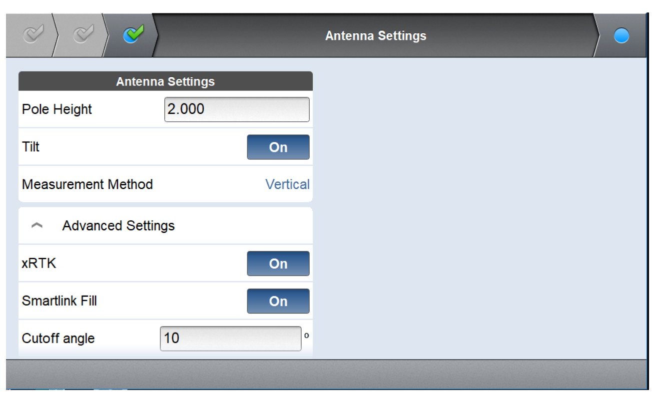
3. **Wizard step "Mountpoint Settings" (only for NTRIP)**



Mountpoints are downloaded automatically.

Tap the next Wizard step  to proceed.

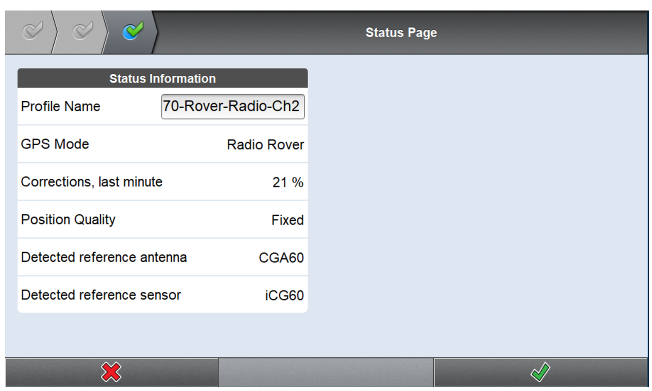
4. **Wizard step "Antenna, Satellites"**



- **Tilt**: Switch on or off as necessary.
- **Measurement Method**:
  - Vertical: The vertical height reading is the height difference between the bottom end and the top end of the pole.
  - Height Hook: If setting up using a tripod, the measurement required is the vertical height from the height hook to the ground.
- **xRTK**:
  xRTK is a slightly less accurate RTK position type, typically 5 to 10 cm, automatically providing more availability for phase fixed positions with a reliability of 99%. Recommended when working in heavy canopy environments.
- **Cut-off angle**:
  below this defined angle satellites will not be taken into account for calculations.
- **Glonass**, **Galileo**, **Beidou**:
  Switch the satellite channels on or off.
- **SmartLink Fill/SmartLink**:
  SmartLink Fill is a correction service delivered via Satellite to bridge RTK corrections outages for long periods of time, for example 10 minutes. Use SmartLink Fill to work for longer without the consistent usage of the RTK infrastructure.
  When SmartLink service is available, the option SmartLink is displayed instead of SmartLink Fill.

Tap the next Wizard step to proceed.

5. **Wizard step "Status Page"**
Overview of the current profile configuration is displayed.



If desired, edit the name of the profile. Tap to save changes.

Displaying the system information

In the "Configuration" screen, tap **System Information**.
The "System Information" screen is displayed.

1. To display detailed information, tap an item in the list:
   - Sensor Info
   - Measurement Engine
   - Licences
2. Tap to return to the "Configuration" screen.

Uploading firmware updates or licence keys

In the "Configuration" screen, tap **System Utilities**.
The "System Utilities" screen is displayed.

1. To choose an upload option, tap an item in the list:
   - Upload Firmware
   - Upload Licence key
2. **Upload Firmware**
   The version number of the currently installed firmware is displayed.
   - To upload a firmware update, insert an SD card with the firmware file into the antenna. Ensure that the firmware file is within the system folder.
     For antennas without SD card slot:
     Depending on the antenna type, the upload must be done using the USB stick or the firmware file must be on the controller in the folder C:\Users\Public\Documents\Leica Geosystems\GS_Server_LMC\SD Card\System.
   - As soon as an firmware file is available, it is displayed below the section **Available Version**.
   - To select a file for upload, tap the file name.
   - Tap **Start Update**.

   ☞ If the maintenance date is not valid, an error message is displayed.

   Upload Licence key
   - To upload a licence key, copy the licence file into the folder "GNSSProfiles" on the controller.
     Once the licence file is copied, the new licence key is available for upload.
   - To access the licence key, synchronise the controller with the antenna, then edit the antenna profile settings.
     Select **System Utilities > Upload Licence key** in the "Configuration" screen.
   - Select the new licence key file.
   - Tap **Start Upload**.

   ☞ Restart or reconnect the antenna to ensure that all licence changes are displayed correctly in the software.
3. Tap ✔ to save changes and to return to the "Configuration" screen.

Resetting the antenna

In the "Configuration" screen, tap **Reset Options**.
The "Reset Options" screen is displayed.

1. To choose a reset option, tap an item in the list:
   - Reset an almanac
   - Reset an antenna
   - Reset an antenna list
2. **Reset an almanac**
   To reset the almanac on the antenna, tap **Start**.
   The current almanac is deleted and a new almanac is downloaded.

   ☞ Downloading a new almanac can take up to 15 minutes.
   While resetting the almanac, the fixed position is lost.

Reset an antenna
To reset the antenna to factory settings, tap **Start**.

☞ After reset, the antenna needs to be reconnected to the controller.

Reset an antenna list
To reset the antenna list, tap **Start**.
The currently stored antenna list is reset to factory settings.

☞ Make sure that no list.ant file is in the System folder of the SD card before starting the reset.

3. Tap ✓ to return to the "Configuration" screen.

Recording RINEX data

☞ To record RINEX data you need to have a RINEX licence.

☞ Ensure that an SD card is inserted into the antenna.
For more information on the setup for data recording, refer to the user manual of the antenna.

In the "Configuration" screen, tap **Rinex Logging**.
The "Rinex Logging" screen is displayed.

1. Tap **Start/Stop**.
2. To start recording data, tap **Start**.
3. To stop recording data, tap **Stop**.

Select the output type for storing the recorded data.

4. Tap ✓ to return to the "Configuration" screen.

1.5.4 Uploading the Antenna List GPS

Upload the antenna list

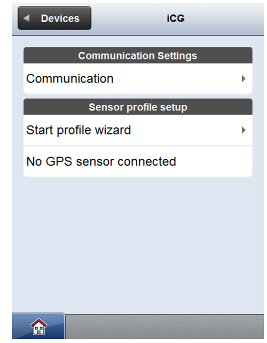
1. Put the LIST.ANT file in the system folder of the SD card delivered with the antenna.
For antennas without SD card slot:
Depending on the antenna type, the upload must be done using the USB stick or the firmware file must be on the controller in the folder C:\Users\Public\Documents\Leica Geosystems\GS_Server_LMC\SD Card\System.
2. Insert the SD card into the respective slot within in the battery compartment of the antenna.
3. Reboot the antenna.
During reboot the antenna list file is automatically imported.

☞ You can reset the antenna list using the iCON field software. Refer to Resetting the antenna (1.5.3 Editing a GPS Profile).

1.5.5 GPS Profile Setup for iCON iCG60 and Other Antenna Models GPS

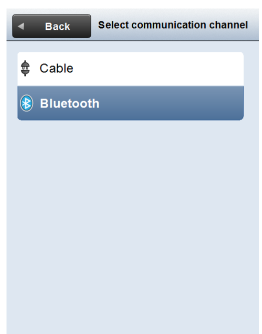
Define communication method step-by-step

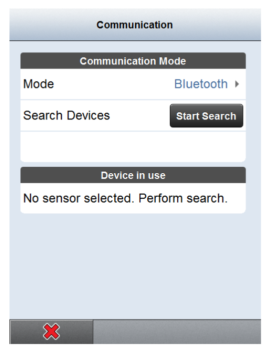
1. To define the Communication method between instrument and controller tap **Communication**, within the **Communication Settings** container.



☞ Ensure the GPS instrument is set accordingly.

2.
- For **Cable** connection, ensure the cable is connected. The connected instrument is displayed in **Search Results**.
- For **Bluetooth**, press the **Start Search** key. Select the relevant instrument profile from **Search Results**.



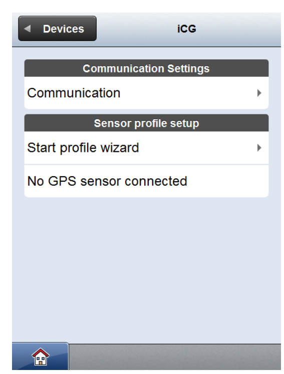


☞ Once the instrument is connected, it changes from white to blue in the search list. Tap ✓ .

Sensor profile setup

To create a GPS Profile, additional settings must be defined. Select from these two Profile Setup modes:

- **Profile Wizard**: Set up most of the common configurations for Base, Local Rover and Network Rover. Includes optional access to additional settings.
  It is also possible to complete a Profile Wizard before connecting to the instrument.
- **Profile from Sensor**: Automatically creates a new profile with the settings that are currently set on the instrument. Work with the instrument can begin immediately.



Profile Wizard

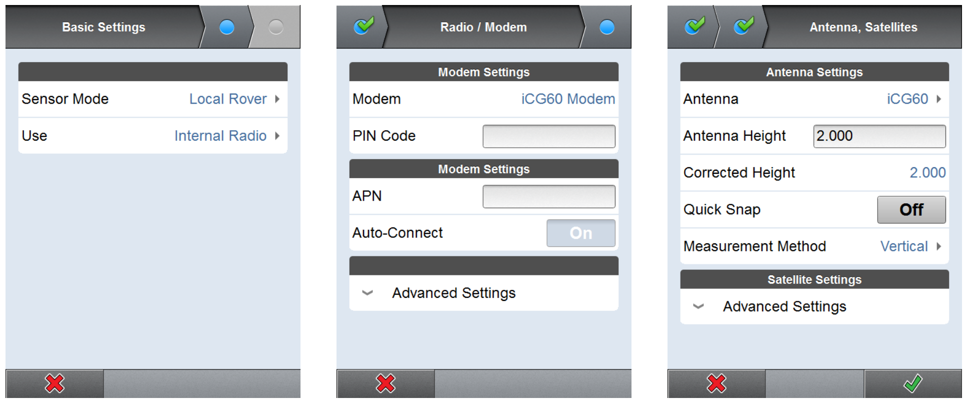
The Profile Wizard consists of three steps:

- **Basic Settings**: Set **Sensor Mode**, and **RTK Device Use**.
- **Radio / Modem**: Define **Radio / Modem** settings, and **Correction Format**.
- **Antenna, Satellites**: Define **Antenna** and **Satellite** settings.

To receive RTK corrections via tablet select **Controller** as the RTK Device **Use** in the **Basic Settings** screen.

For Satel radios frequency and bandwidth can be changed.

The software supports **GPS L2C**, **GPS L5**, **Glonass**, **Galileo**, and **Beidou**.



Expand **Advanced Settings** to make additional selections where relevant.

Tap when step 3 is completed.

For a **Network Rover** with **NTRIP connection** some important **Advanced Settings** can be carried out in **Antenna, Satellites**: Switch the satellite channels on or off, define a cut-off angle, and switch **xRTK** and **SmartLink**.

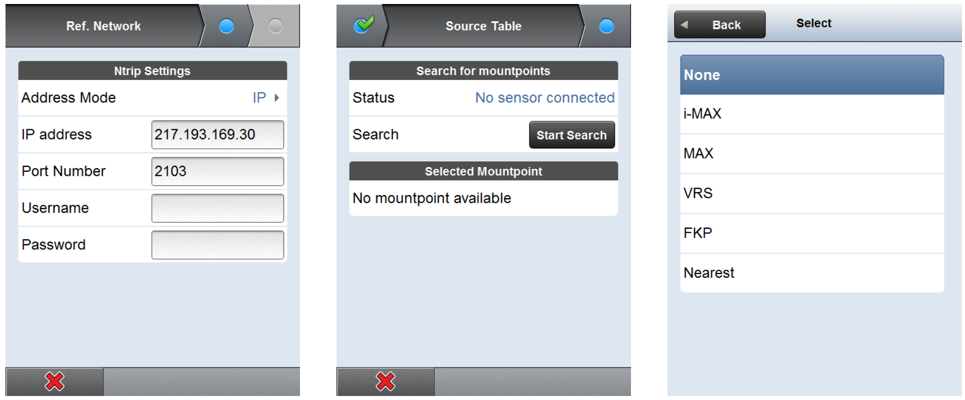
- Following **satellite channels** are available: **GPS L2C**, **GPS L5**, **Glonass**, **Galileo**, and **Beidou**.
- **Cut-off angle**: below this defined angle satellites will not be taken into account for calculations.
- **xRTK**: xRTK is a slightly less accurate RTK position type, typically 5 to 10 cm, automatically providing more availability for phase fixed positions with a reliability of 99%. Recommended when working in heavy canopy environments.
- **SmartLink**: SmartLink is a correction service delivered via Satellite to bridge RTK corrections outages for long periods of time, for example 10 minutes. Use SmartLink to work for longer without the consistent usage of the RTK infrastructure.

The SmartLink functionality is licenced. Ask your agency or your Leica Geosystems representative for information about licensing.

The following table describes the two different antenna height measuring methods:

Method	Description
Vertical	The vertical height reading is the height difference between the bottom end and the top end of the pole.
Height Hook	If setting up using a tripod, the measurement required is the vertical height from the height hook to the ground.

☞ If setting up a **Network Rover** with **NTRIP connection** to a reference network, a further three Wizard steps will be shown:



☞ After creating a Base profile, there is an option to navigate directly to Base Station Setup. Refer to 5 How to Setup a GPS Base Station for more information.

☞ Once a profile has been created, connection to the instrument is automatically established each time the software is launched. This is providing that the instrument is turned on with the correct communication method, and the relevant instrument profile is selected in the **Profiles** screen.

☞ To edit profile settings later, tap the arrow to the right of the profile name in the **Profiles** screen.

1.5.6 Setting up a GPS Profile for the Internal GPS of the controller

Using the internal GPS

You can set up a GPS profile to use the internal GPS of the controller for rough navigation.

☞ Do not use the internal GPS for high accuracy layout or measure tasks.

Necessary driver

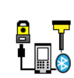
For CC80 controllers delivered with v4.5 or higher, the necessary driver is already installed.

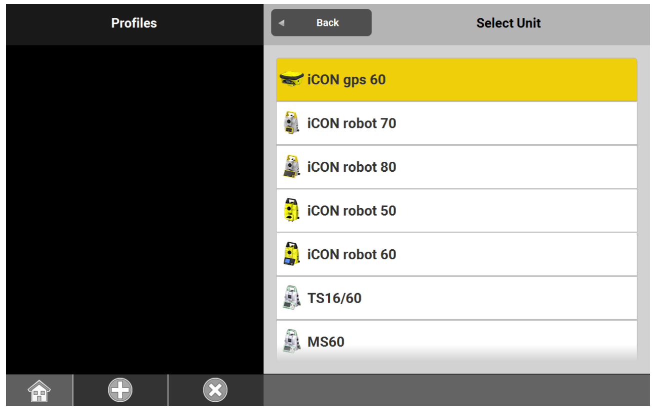
For CC80 controllers upgraded to v4.5 or higher, download and install the necessary driver from **myWorld** under the section **CC8x Controller**.

- For CC80 running **Windows 8**:
  CC80-MK1-Component_internalGPS.exe
- For CC80 running **Windows 10**:
  CC80-MK2-Component_internalGPS.exe

☞ Before installing the driver, make sure that iCON is not running.

Setup step-by-step

1.	Select **Devices** from the Home Menu.	
2.	Tap ⊕ to create a profile.	
3.	Select **Internal GPS**. Enter a **Profile Name:**.	



4. Tap ✓ to save the profile.
Once the internal GPS is ready, the main screen is displayed.

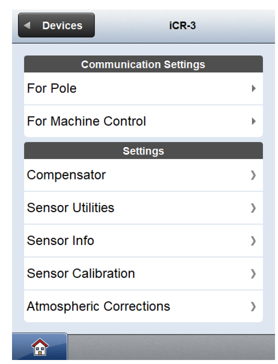
☞ When using the internal GPS, the status bar and map view icon in an application are adapted accordingly. Refer to Status bar for internal GPS .
To enter the controller height, tap the status bar 1 and select **Antenna:**.

1.5.7 Total Station Profile Setup TPS

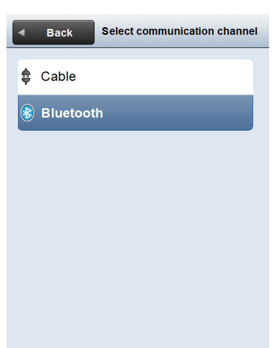
Define communication method step-by-step

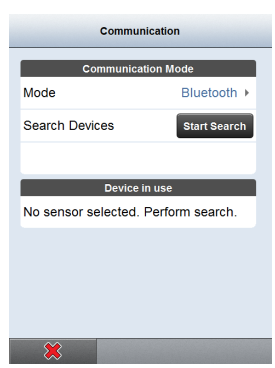
1. To define the Communication method between instrument and controller select **For Pole**, within the **Communication Settings** container.

   ☞ Ensure that the Total Station is set accordingly.



2.
   - For **Cable** connection, ensure that the cable is connected. The connected instrument is displayed in **Search Results**.
   - For **Bluetooth**, press the **Start Search** key. Select the relevant instrument from **Search Results**.





☞ Once the instrument is connected, it changes from white to yellow in the search list. Tap ✓ .

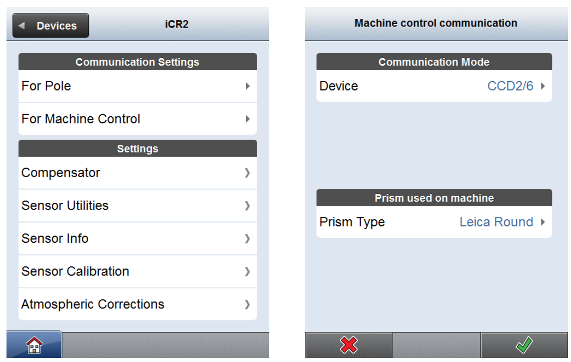
☞ Once a profile has been created, connection to the instrument is automatically established each time the software is launched. Precondition for this automatic connection: the instrument is turned on with the correct communication method, and the relevant instrument profile is selected in the **Profiles** screen.

☞ To edit profile settings later, tap the arrow to the right of the profile name in the **Profiles** screen.

Machine communication

Within the iCON iCR50 and the PowerTracker profiles it is also possible to define communication settings between **Instrument** and **Machine**.

1. Within the **Communication Settings** container, tap **For Machine Control**.
2. From here, define the **Communication Mode** and the **Prism used on machine**.



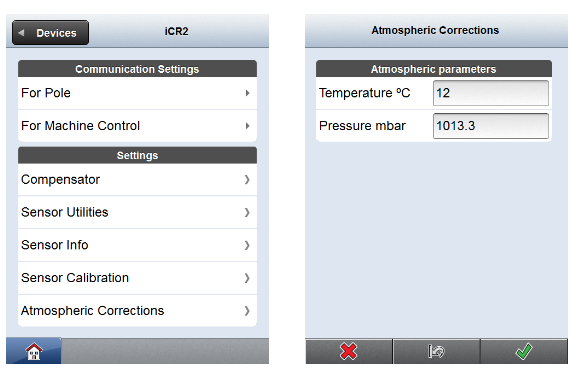
3. Tap ✓ when finished.

☞ To switch from Survey Mode to Machine Control Mode, tap the Machine Control key on the profile name in the **Profiles** screen. A **Machine mode switch** screen is displayed while the switch is ongoing. Tap the key to switch back to Survey Mode.

Atmospheric corrections

Within a Total Station profile it is also possible to define atmospheric correction settings.

1. Within the **Settings** container, tap **Atmospheric Corrections**.
2. Input the desired values for **Temperature** and **Pressure**.



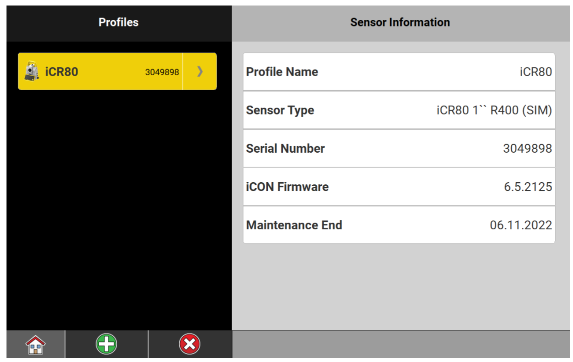
3. Tap when finished.

To reset to default settings tap .

☞ The values for **Temperature** and **Pressure** are displayed and must be entered according to the current unit settings.

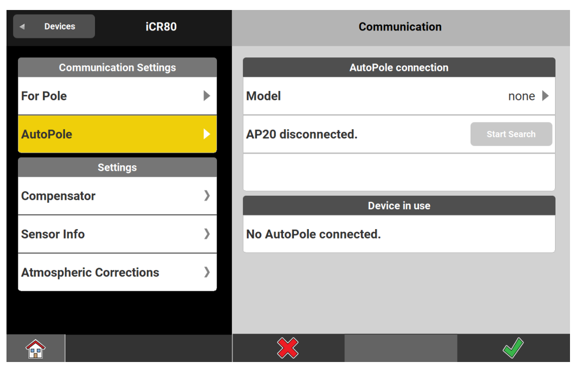
Editing TPS profile for using AutoPole step-by-step

1. To establish a connection to AutoPole edit the profile settings for the total station.
Tap the arrow on the right-hand side of the profile name in the **Profiles** screen.



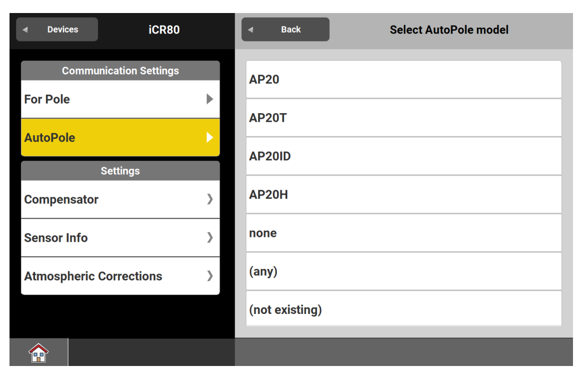
AutoPole is not supported with GNSS.

2. Under **Communication Settings** tap on "AutoPole".



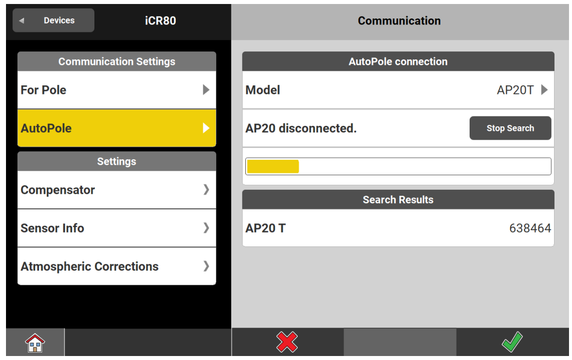
The Communication page is displayed.

3. Tap on **Model** and select the pole model/sales variant that you want to connect to.



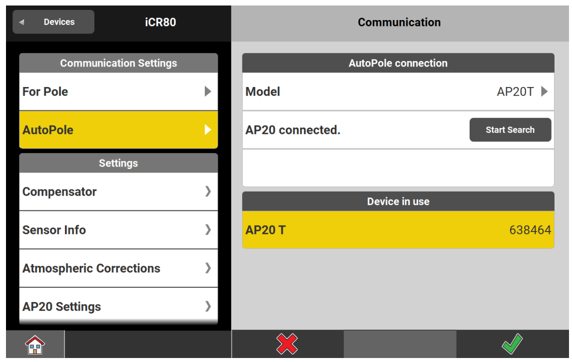
☞ For information on the different models/sales variants see: Overview

4. Back in the **Communication** page tap "Start Search".



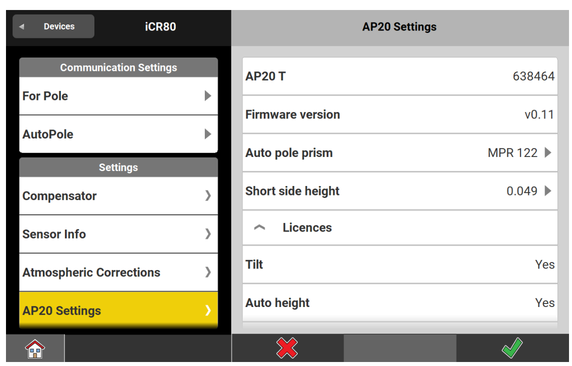
If a pole of the selected model is in reach it will be listed under Search Results.
If more than one pole is in reach all will be listed.

5. Tap on the AP20 to be used.



6. Tap ✓.

Tap **AP20 Settings**,



You can select a different Auto pole prism and select a suitable Short side height.
To see which licenses are active tap the arrow on the left-hand side of Licences to open the drop-down information box.

Tap ✓, then tap the **Home** button.

AP20 is ready for being used.

☞ For information on working with AutoPole in any of the apps see: Overview.

2 Projects, Jobs, Data, and Settings

2.1 Projects and Jobs

Projects and jobs overview

iCON site allows the simple location and transfer of data between **instrument**, **controller** and **office**.

Imported reference and control data is stored in iCON site, within individual **Projects**. **Jobs** can be created and carried out within these projects. **Reports**, **measured data** and **calculated results** are stored to the active job, ready for exporting.

This allows you to create a project with specific reference and control data, and then carry out multiple jobs within this project.

Projects:
- Imported data
    - Control data
    - Reference data
    - Coordinate systems
    - Codelists
    - Road data
    - Background images
    - GNSS Profile
    - Point Cloud data

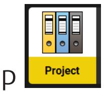
Jobs:
- Output:
    - Reports
    - Measured data
    - Calculated results

☞ Jobs are created within the active project. All imported data is available for all jobs within that project.

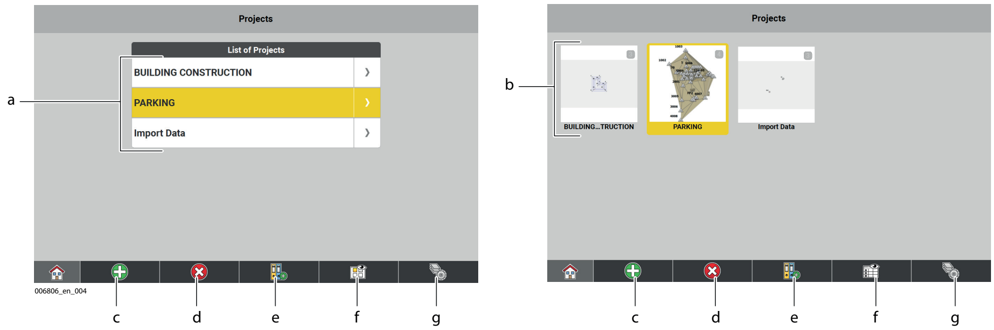
Example of a basic data flow/storage directory structure

```
Projects
|
|-- Project 1
|   |-- Imported data
|   |-- Jobs
|       |-- Job 1
|           |-- Reports
|           |-- Measured data
|           |-- Calculated results
|       |-- Job 2
|       |-- Job 3
|       |-- Job 4
|
|-- Project 2
|-- Project 3
|-- Project 4
```

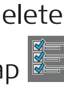
Projects

To create, edit, select or delete a project, tap  in the Home Menu.

Projects page is displayed. The current active project is highlighted in yellow.



a Select or edit project (list view mode)
b Select or edit project (thumbnail view mode)
c Create project
d Delete project
e Import project
f Toggle view mode
g Define sorting

Function	Process
Select or edit project	• To **select** a project, tap on it. *Once a project is selected, it becomes the active project. The software returns to the Home Menu automatically.* • To **edit** a project in list view mode, tap the arrow button to the right of the project name. To edit a project in thumbnail view mode, tap and hold the project thumbnail. If needed, edit project name and description. To load more data to the project, tap **Import & Delete** in the Home Menu.
Create project 	To create a project, tap this button and enter project name and description. To load data to the project, tap **Import Data**. To define a geometric scale factor, input the desired value at **Geo Scale Factor**. To define a local reference height, tap on **Project Height Shift** and enter a **Shift** value. The Information bar can be configured to show both, the local reference height (**ProjH**) and the height above sea level (**H**). See also: Information bar.
Delete project 	To delete one or more projects, tap this button and select the projects to be deleted. To select and delete all projects, tap .

Function	Process
Import project	Complete projects can be imported to the current device.
Toggle view mode	To activate list view mode, tap this button.
	To activate thumbnail view mode, tap this button.
Define sorting	Tap to define a sorting method: • As imported/created • Alphabetical • Last used on top

☞ Data can also be loaded to the active project using **Import & Delete**, refer to Importing data to the project step-by-step.

☞ Projects are not backwards compatible: it is not possible to use a project with an older version of the Leica iCON site software.

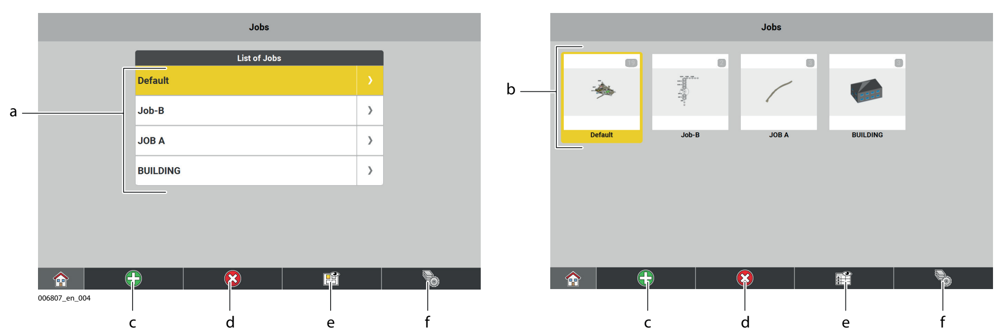
Jobs

☞ Creating, editing, selecting and deleting jobs follows the same process as with projects.

Tap 

in the Home Menu.

Jobs page is displayed. The current active job is highlighted in yellow.



a Select or edit job (list view mode)
b Select or edit job (thumbnail view mode)
c Create job
d Delete job
e Toggle view mode
f Define sorting

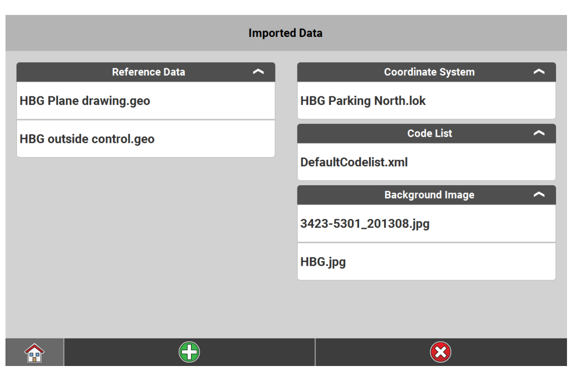
Function		Process
Select or edit job		• To **select** a job, tap on it. *Once a job is selected job, it becomes the active job. The software returns to the Home Menu automatically.* • To **edit** a job in list view mode, tap the arrow button to the right of the job name. To edit a job in thumbnail view mode, tap and hold the job thumbnail. If needed, edit job name and description. Select the active data for the job, such as reference files, coordinate system, codelists, etc.
Create job		To create a job, tap this button and enter job name and description. To activate or deactivate data in the job, tap **View Data**.
Delete job		To delete one or more jobs, tap this button and select the jobs to be deleted. To select and delete all jobs, tap .
Toggle view mode		Tap this button to activate list view mode.
		To activate list view mode, tap this button.
Define sorting		To activate thumbnail view mode, tap this button.

☞ To activate coordinate systems and codelists, tap **View Data** in the Edit Job/New Job screen.
Other imported data, such as reference files or control files, can also be activated or deactivated using the **Map view manager**, refer to 2.4 Displaying Data.

2.2 Import, Export, or Delete Data

Importing data to the project step-by-step

1. Select **Import & Delete** from the Home Menu.



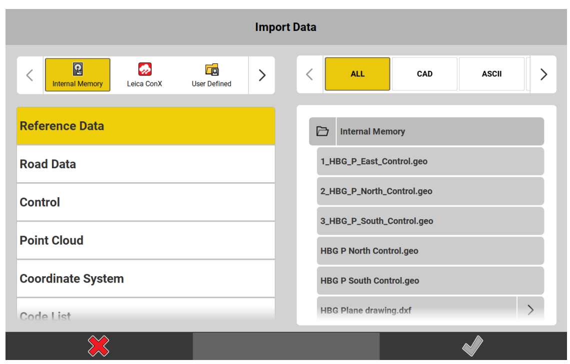
All data that is already loaded to the active project is displayed.

2. Tap to import more data.

3. To define the **Source** to import data, tap the respective button for Internal Memory, User Defined, the connected storage device or connected cloud service, such as Leica ConX (if configured).

☞ If you select **User Defined**, you can import data from any folder that can be found under C:\Users on the controller. When selecting **User Defined** for the first time, you will be forwarded to the **User Defined Path** screen. Select the folder where your data is stored and tap to accept your selection. The selected folder will be remembered. Tap and hold the **User Defined** button in order to select a different folder.

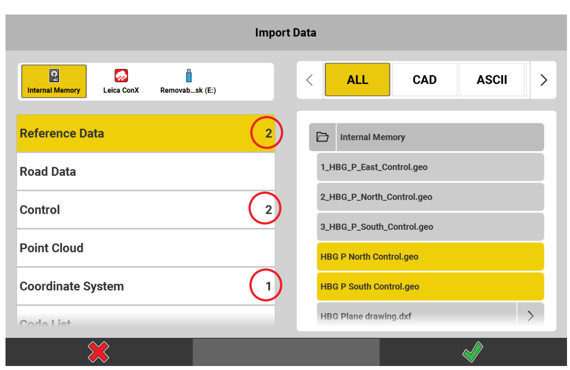
4. Select the type of data to import. Select from:
- **Reference Data**
- **Road Data**
- **Control**
- **Point Cloud** (if license available)
- **Coordinate System**
- **Code List**
- **Background Image**
- **GNSS Profile**



All files that are available for import are displayed on the right side.

5. After selecting the type of data, you can further filter the displayed files by file format, for example DXF, ASCII or PDF.
Tap on the name of desired file format.

6. Use the tree view on the right side to select the files for import:
- Tap a file name to select a file for import.
- To expand or collapse a folder, tap the folder icon.
- To select or deselect all files within a folder, tap the folder name.



For each data type, the software counts the number of selected files and displays it to the right of the data type name. Collapsed folders that contain selected files are marked with an orange dot.

☞ For certain file types (TXT, CSV, DXF, IFC and others) you can define import settings.

To edit the import settings of a file, tap the arrow button ❯ . Refer to the following notes for each file type.

7. Once the required data is selected, tap ✔ to import.

All selected data is imported, and available in the active project.

☞ **Speciality for importing layer-based formats like DXF, DWG, IFC and others:**

Before the import starts, a file is checked for its size. If a file is too large, deselect layers to reduce the file size. Then import the necessary data.

☞ **Specifically for importing Coordinate Systems:**

- To import a coordinate system that is stored locally on the controller, set the **Source** to **Internal Memory**, and select the coordinate system from the list below. It is also possible to select a coordinate system from a subfolder.
- To use a coordinate system ("transformation set") that is streamed from a reference network as part of an **RTCM3** or **LEICA4G** message, set the **Source** to **Via Network** (no further selection needed). Then the controller is ready to receive the coordinate system.

☞ **Specifically for importing ASCII files (txt, csv):**

- It is possible to import ASCII files with up to 10 attribute columns.
- It is possible to import ASCII files with different distance units.
- It is possible to select the field separator.
- It is possible to select between Latitude/Longitude units.
- It is possible to skip header rows.

☞ **Specifically for importing JPG or TIFF files:**

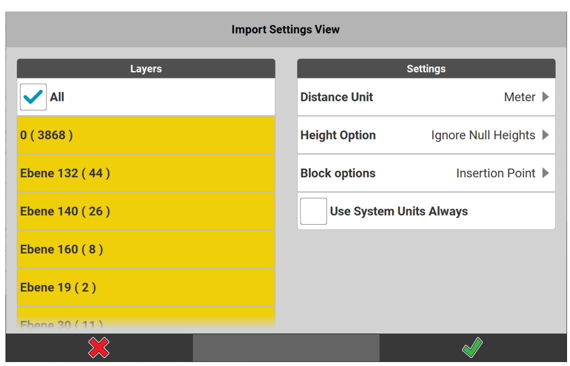
- Only import georeferenced JPG or TIFF files. Georeferenced images come together with a world file (*.jgw or *.tfw) that ensures the correct placing of the background image on the map. The image file and the world file must have the same file name.

☞ **Specifically for importing DXF files:**

- It is possible to import and stake out a Helix data set.
- It is possible to import 3D solids, but only for visualisation purposes.
- The status of layers set in the CAD software is kept during import. Layers that are turned off and/or locked are automatically turned off and/or locked after import, as well.
  See also: Map View manager
- It is possible to import splines as a series of lines.

Import settings for DXF files:

- Select the layers to be imported from the DXF file. The checkbox **All** is activated by default.
- The **Distance Unit** will automatically be set if a unit has been specified in the DXF file. If not, the system unit will be used. Tap the arrow in order to select a unit. For "Feet"/"Inches" select between "Feet Decimals"/ "Inches" or "US Survey Feet Decimal"/"US Survey Inches".
- Select **Use System Units Always** in order to make system units be used for all imported entities.
- If the DXF file includes height information, the default setting for import of heights is **Ignore Null Heights**. Points with height zero will be imported as 2D points.
  Tap the arrow in order to select **Use All Heights** and make points with height zero be imported as 3D points, or select **Do Not Use Heights** and make all points be imported as 2D points.
- If the DXF file includes block information, the default setting is to import the **Insertion Point** as well for every block. The insertion point is stored on an extra layer called 'xxx_Insert' and can be turned on/off via the Map View manager. See also: Map View manager
  Tap the arrow and select **Explode** in order to disassemble the blocks and select/use them in the software. Insertion points of block layers are not imported and layers for insertion points are neither created nor available via the Map View Manager. Select **Ignore** in order to make block elements not be imported at all. The layer shown in the Map View manager will be empty.
- Tap to accept.

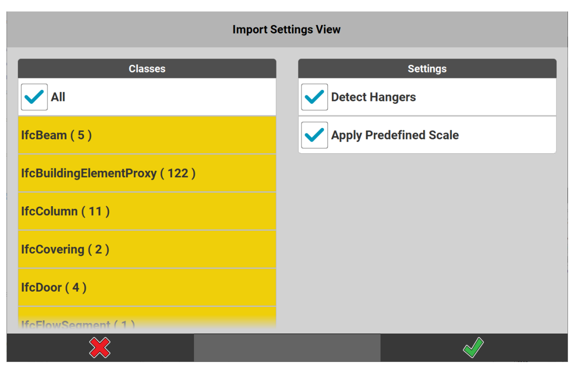


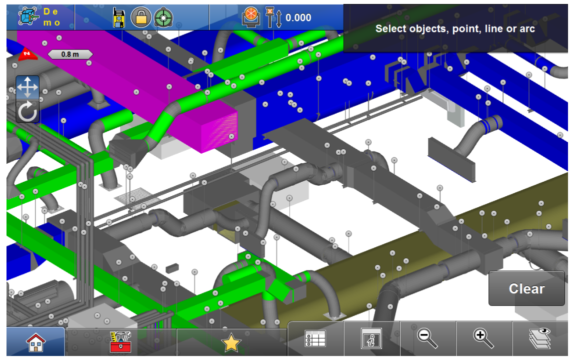
☞ **Specifically for importing IFC files:**

- Importing IFC files requires either the **Layout Objects** or the **Verification** licence.
- IFC files consist of a set of **IFC entities** (e.g. ifcBeam, ifcWall). Tap the arrow button to choose which of these entities should be imported. After a successful import, a message is displayed informing about the number of imported IFC entities.
- **Importing GTP points:**
  GTP is an object type in Autodesk Revit, which represents a point. iCON can automatically detect these objects in an IFC file and import them as reference file points.
- **Importing Points of Interest:**
  Points of Interest are points which exist in an IFC file. They are automatically detected from mechanical, electrical and plumbing objects. Upon import the IFC file is scanned. If certain objects are detected, for example cable tray hangers or pipe clevis, points are generated. The points can be used to stake out the objects. The complex wireframe of these objects is reduced. For example, in the case of air conditioning ducts, the complex mesh is replaced by centrelines and points.
  A *.GEO file is created during import. From this *.GEO file, you can create a stakeout list for auto staking.

Import settings for IFC files:

- Select the IFC entities to be imported. By default, all list items are selected. To select or deselect all list items, tap **All**. To select or deselect a single list item, tap the requested list item.
- To check the file for hangers during the import, activate the check box **Detect Hangers**.
- To import IFC files with settings predefined in the model, activate the check box **Apply Predefined Scale**. IFC files in US Survey feet can be imported without additional steps in the CAD software.
- Tap ✓ to accept the import settings.





The imported GTP points are shown in 3D in Map View.

Available import formats

Import data	Import formats
Reference Data	• Possible import formats are *.txt, *.csv, *.dxf, *.geo, *.gsi, *.xml (LandXML, HeXML), *.ifc, *.kof, *.TRM, *.DWG, *.SHP and *.PDF (2D). • The DXF import offers a special feature called **Height Option**: select from **Ignore Null Heights**, **Use All Heights**, and **Do Not Use Heights**. • The XML format can include up to 10 attributes, which can be used in Point Search, in the map **Viewing Options**, and in the Information bar within **Stakeout**. • Importing IFC files requires the licence for the **Layout Objects** application. • SHP files which are defined in metres can be imported. SHP files with link to a coordinate system are not supported.
Road Data	Possible import formats are *.L3D, *.lin, *.lmd, and *.xml (LandXML, HeXML).
Control data	Possible import formats are *.txt, *.csv, *.geo, *.gsi, and *.xml (LandXML, HeXML).
Coordinate System	Possible import formats are *.lok, TRFSET.dat, *.xml (LandXML, HeXML), *.dc (Trimble format) and *.loc (Carlson format).
GNSS Profiles	It is possible to import iCON iCG30/iCON iCG70 profiles.
Background Image	Possible import format is *.dxf, *.jpg, and *.tiff.
Code List	Possible import formats are *.cod, *.xml (LandXML, HeXML) and *.csv.
Point Cloud data	Possible import formats are *.sdb, XML files with multiple *.sdb files, *.pts, and *.E57.

Importing data using QR-Scan step-by-step

Point information can be imported reading a QR-code.

☞ To be able to use the QR-Scan function your entitlement needs to include the QR-Code Reader licence.

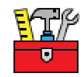
☞ iCON supports the following QR-Scan structure:
ID:xx|E:xxx.xxx|N:xxx.xxx|H:xxx.xxx|C:xxxxx|A1:xxx|...
Up to 10 Attribues (A1,...,A10) can be defined.

QR-Scan functionality is available in the applications:

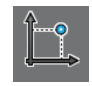
- Stakeout (iCON site)/Layout Points (iCON build)
- Verification
- Draw (iCON site)/Sketching (Layout Points)
- TPSSetup

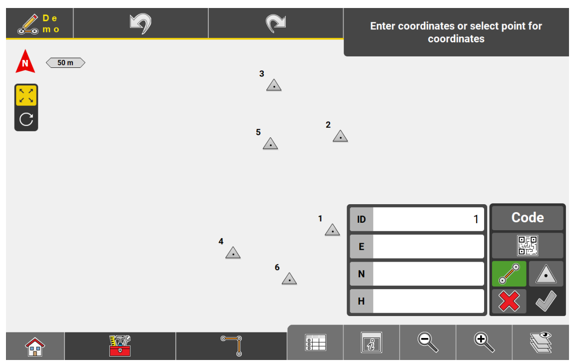
QR-code function in New Point tool:

1. In the applications **Stakeout**/**Layout Points**, **Draw**/**Sketching** or **Verification** open the Toolbox.



2. Tap New Point.





The fields to enter point details are displayed.

3. Tap to start the QR-code scan.
Use **CODE** to define and apply a code for every point recorded.
Enable or disable **draw line** as required. Only available in the **Draw**/**Sketching** app.
Tap to store the scanned point as Control Point.

The QR-Scan page is displayed.

4. Tap ✓ to accept.

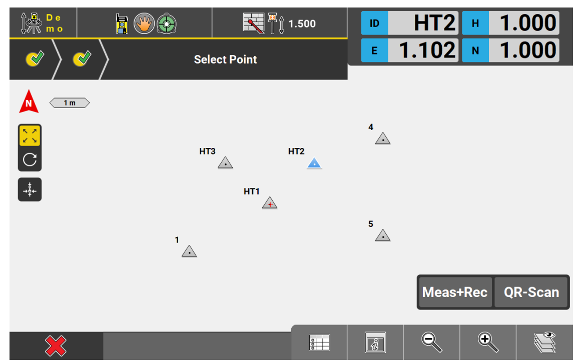
☞ Tap to switch from **single** scanning mode to **multiple** scanning mode.
In single scanning mode only the code within the white frame will be scanned.
In multiple scanning mode all codes within the camera view will be scanned simultaneously.

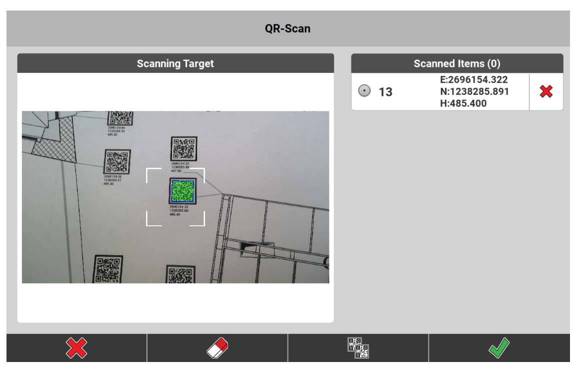
For TPSSetup the QR-Scan functionality is available in the methods:

- Coordinates
- Heights

QR-Scan function in TPS Setup applications:

1. In step 3 of the setup procedure tap the **QR-Scan** button.





The QR-Scan page is displayed.

2. Tap ✓ to accept.

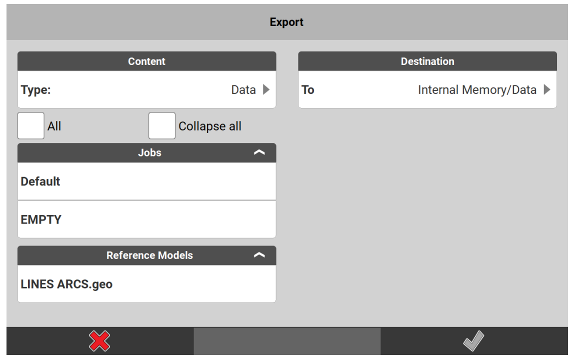
☞ Tap to switch from **single** scanning mode to **multiple** scanning mode.
In single scanning mode only the code within the white frame will be scanned.
In multiple scanning mode all codes within the camera view will be scanned simultaneously.

☞ In TPSSetup applications a scanned point will be stored as Control Point automatically.

Exporting data step-by-step

It is possible to export content to the internal memory, to a connected storage device or to a Cloud server (if configured).

1. Select **Export** from the Home Menu.



The Export screen is displayed.

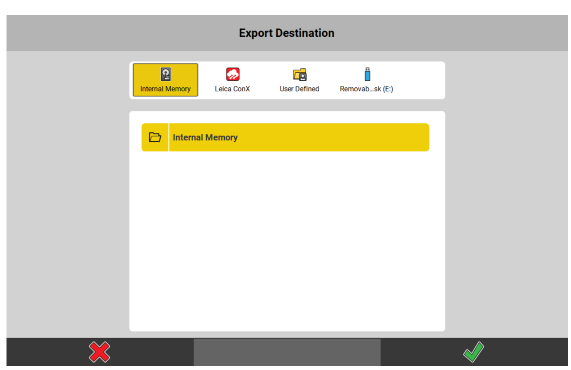
2. To define the content type to be exported, tap the row below the section **Content**. Select from:
   - **Data**
   - **Coordinate System**
   - **Code Lists**
   - **Reports**
   - **Projects**
   - **Stakeout Lists**
   - **GNSS Profile**
   - **Drill Patterns**
   - **Machine Calibration**
   - **TPS Calibration**
   - **Point Cloud**

   The relevant content available to be exported is displayed on the left side of the Export screen.

☞ When exporting **Data**, it is possible to select a job as well and export a subset of job data this way.

3. Select the content to be exported.
   It is possible to select multiple list items. Tap each individual list item or activate the checkbox **All** to select all items at once.

4. To define the destination of the exported content, tap the row below the section **Destination**.



It is possible to export data to a subfolder.
Select the desired destination, then tap  to accept and return to the Export screen.

5. Select the file format to which the selected data should be exported.

☞ For some file formats, additional options can be defined. Tap the arrow button ❯ beside the format name.

Specifically for exporting DXF files it is possible to:

- Select a distance unit for export. The unit information will be written to the DXF file.
- Choose between data being exported as either 2D or 3D.
- Export attributes as block. When this option is activated, then Point symbol and attributes are bundled in the CAD program display.
- Select **Stakeout Attributes** in addition to **Coordinate Attributes** to be shown as visible text in the DXF file. **Coordinate Attributes** are selected by default but can be deselected if desired.
- Enter a size for text and symbol. Both will be resized accordingly in the DXF file. Default value is "5", the maximum value is "500". Recommended sizes are dependent on the size of area. For an area of 100 m^2 a text and symbol size of "5" is recommended, for an area of 1000m^2 preferably use size "40".
- **Job data separation**. When this option is activated, then the jobname is added to the new layer as prefix.
- **Use Description as Layer**. When this option is activated, then instead of the code, the code description is exported as a layer.

Specifically for exporting ASCII files (txt, csv) it is possible to:

- Include up to 10 attribute columns when exporting to ASCII files.
- Include WGS84 coordinates and select the unit format for Latitude and Longitude. Available unit formats are **Deg Min Sec (DD.MMSSSSS)** or **Deg Dec**.

6. To start the export, tap ✔.
The content is exported as specified.

Available export formats

Export data	Export formats
Data	Possible export formats are *.csv, *.dxf, *.geo, *.gsi, *.xml (LandXML, HeXML), *.kof, *.llc, *.plm, and *.txt.
Coordinate System	Possible export formats are *.lok, *.dc (Trimble format) and *.xml (LandXML, HeXML).
Code Lists	Possible export format is *.xml (LandXML, HeXML) and *.csv.
Reports	Possible export formats are *.csv, *.html, *.pdf, and *.txt, depending on the report to export.
Projects	Projects are exported as a copy to the selected data storage device.
Stakeout Lists	Possible export formats are *.txt, *.csv, *.gsi, *.geo, *.kof and *.dxf.
GNSS Profile	Profiles are exported as a copy to the selected data storage device.
Drill Patterns	Possible export formats are *.xml (IREDES standard) for MC1 and *.kof for VisualMachine (kof contains the bottom points of the holes).

Export data	Export formats
Machine Calibration	Machine Calibration files can be exported to removable disk for file transfer to machine control systems.
TPS Calibration	TPS sensor calibration reports can be exported to USB stick for documentation purposes. The report is exported with extension ".*calibration*".
Point Cloud	Possible export formats are *.pts and *.xml. One or more *.sdb files can be selected. When exporting to *.xml, a HeXML file will be created together with an additional folder containing the *.sdb files. ☞ Export to HexML requires the *.sdb file(s) to contain the necessary setup data.

Deleting data step-by-step

1. Select **Import & Delete** in the Home Menu.

All data that is already loaded to the active project is displayed.

2. Tap and select the data to be deleted:
   - To select several list items, tap the requested list items.
   - To select all list items at once, tap **Select all**.

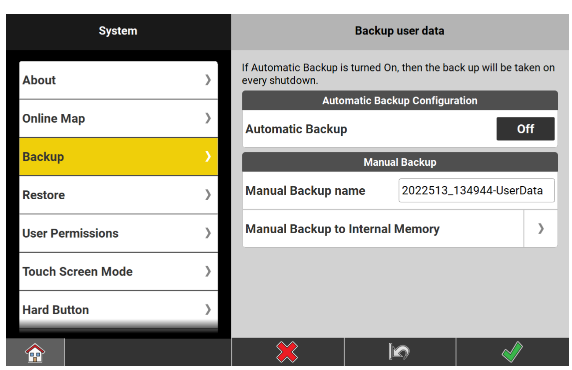
3. Tap to delete the selected data.

   Tap to cancel.

2.3 Backup and Restore Data and Settings

Backup

1. Select **System** from the Home Menu and tap **Backup**.



☞ To exit the screen, tap.

There are two options for creating backup files of all data and settings in the iCON software.

Automatic Backup

If automatic backup is enabled, the software generates a backup file each time the iCON software is exited. By default, automatic backup is "On".

Automatically generated backup files can either be stored to the internal memory or to a USB flash drive. For automatic backup, maximum five backup files can be kept. Once a newer backup file is generated on top of these existing five, the oldest backup file is deleted automatically.

1. Select **System** from the Home Menu and tap **Backup**.

2. To change the setting for automatic backup, set **Automatic Backup** to **On** or **Off**.

☞ To reset to default settings, tap .

Tap ✓ to confirm the settings.

Manual Backup

A backup file can be generated manually at any time.

Manually generated backup files can be stored either to the internal memory or to a USB stick. For manual backup, the number of files that can be stored depends on the available memory size of internal memory or USB stick.

☞ If necessary, insert a USB stick into the controller.

1. Select **System** from the Home Menu and tap **Backup**.

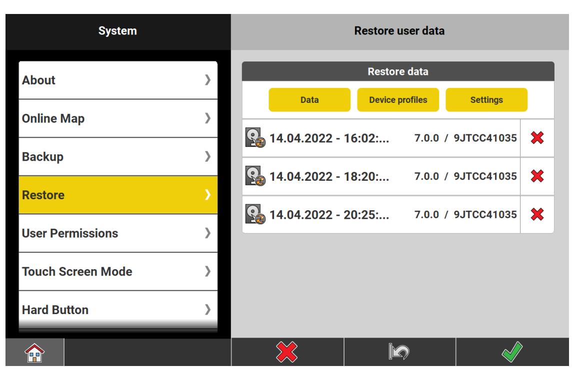
2. To select the file location for the manually generated backup file, tap the arrow button ❯ .
Choose between internal memory or USB stick.

3. To start the manual backup process, select **Manual Backup** and tap ✓ .

☞ In order to store all data and settings to the backup file, the iCON software must restart. Confirm the message.

Restore

1. Select **System** from the Home Menu and tap **Restore**.



All existing backup files are listed. An icon indicates the backup option used and the file location of the backup file. See below for further information.

2.	*Data, Device profiles and Settings can be restored separately.* Tap the button to exclude one or the other from being restored. ☞ The button turns "black" and the components it indicates will not be restored.
3.	Tap the name of the desired backup file. *The file name is highlighted yellow.*
4.	To start the restore process, tap ✓.
5.	*To restore all data and settings of a backup file, the iCON software must restart.* Confirm the message.
☞	To delete a backup file, tap the ✗ button to the right of the respective file.

Icon	Backup option used	File location
	Automatic	Internal memory
	Manual	Internal memory
	Automatic	USB stick
	Manual	USB stick

2.4 Displaying Data

Display point information

1.	To view detailed information of a stored point, **tap and hold** the desired point on the map screen.
2.	The toolbox in the Point Information screen allows you to edit or delete the point, and to link or unlink the point to images taken with the camera.
☞	For points with one or several linked images, the point symbol on the map changes:

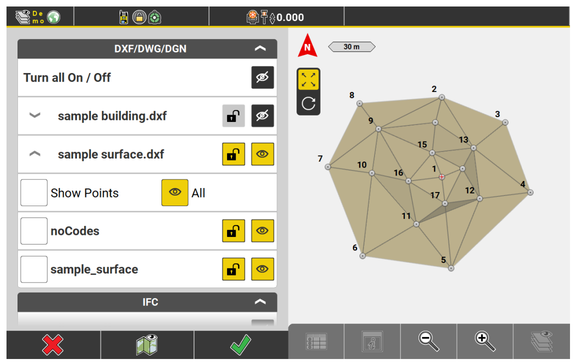
Toolbox functions

Function	Description
Edit Point	Tap to edit the point. • Edit the values of the point: **Point ID**, **Easting**, **Northing**, **Height**, and **Code/Layer**. • **Code/Layer** can be entered and the point can be defined as **Control Point** by setting the **Create Control Point** key to **On**. • Tap ✓ to accept, then confirm the following warning message.

Function		Description
Link/Unlink		Tap to link images to the point.
Delete Point		Tap to delete the point.

Map View manager

1. Select **Map view manager** from the **Map handler**.
The Map handler is displayed in all applications. All data loaded to the active project can be activated and displayed using Map View manager.



By default, Map View manager is displayed in split screen mode, with a real-time map preview on the right.

☞ To disable the map preview in Map View manager, go to **System>Display** and set "Map Preview on Layer Manager" to **Off**.

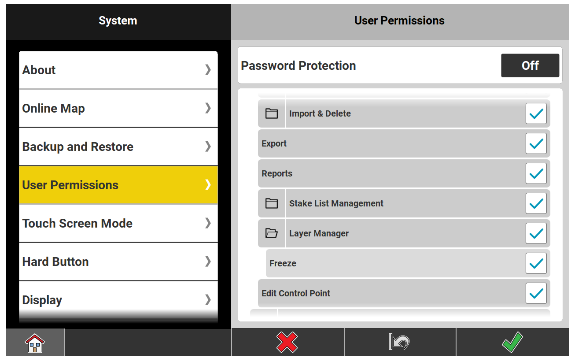
2. To select which data you would like displayed, toggle between  and .

The map preview is updated according to the selected data.

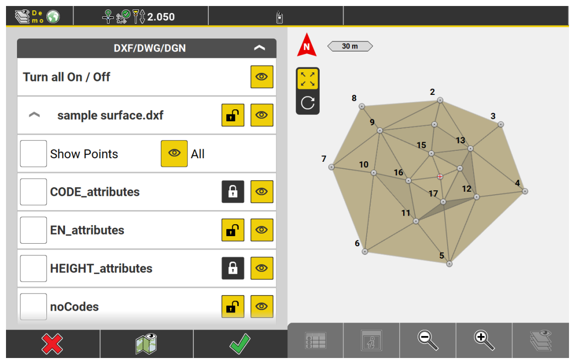
- When layers with many data are switched on or off, the real-time update of the map preview may cause long loading times.

  To pause the real-time update of map preview, tap . The icon changes to .
- If not paused, the map preview can be zoomed, panned and rotated.
- If the viewing options **Isolate** or **Limit Box** are active before opening Map View manager, the corresponding icons are displayed greyed out in the map preview.

☞ To "freeze" specific data items so that they are visible but not selectable in the Map View, go to **System** > **User Permissions** > **Data Handling** > **Layer Manager** and select **Freeze**. Tap  to confirm your selection.



The Map View manager will offer the additional option to **freeze** specific layers for selection.



When the button is "on", elements from the file/layer are selectable. When the button is "off", elements are not selectable.

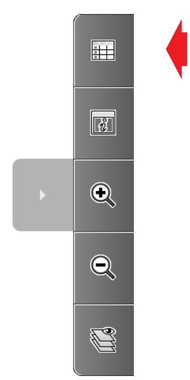
☞ Map View manager only contains data loaded to the current active project. If further data is required, it must first be loaded to the active project.
If codes or layers are included in the imported data file, they can be accessed using a drop-down arrow, and individually turned On/Off.

3. To accept the selected data and return to Map View, tap ✔.
To cancel, tap ✖.

2.5 Point List, Searching for a Point

File List and Point List

Select **Point List** from the **Map handler**.



This function is available in every application that requires the user to select a point from the map.

With this helpful tool it is possible to:
- edit, create or delete points in every application,
- edit point ID, code, prism type and prism height of measured data,
- apply the same value to multiple points,
- define how and based on which attribute the Point List is sorted.

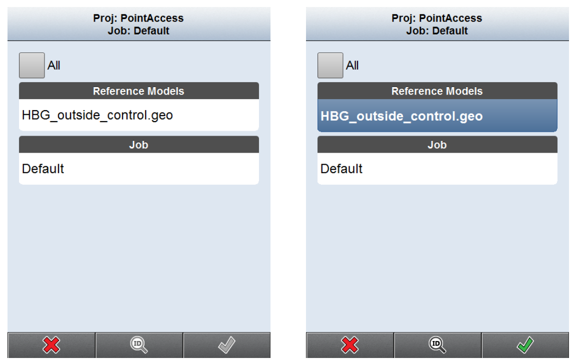
☞ The column order (**E, N, H** or **N, E, H**) corresponds to the setting in **Coordinate Order** (**System** > **Display** > **Coordinate Order**).

☞ Attribute values are displayed in the **Units** and the display mode set (two, three, or four decimals, found in **System** > **Display** > **Display Accuracy**).

How to use Point List step-by-step

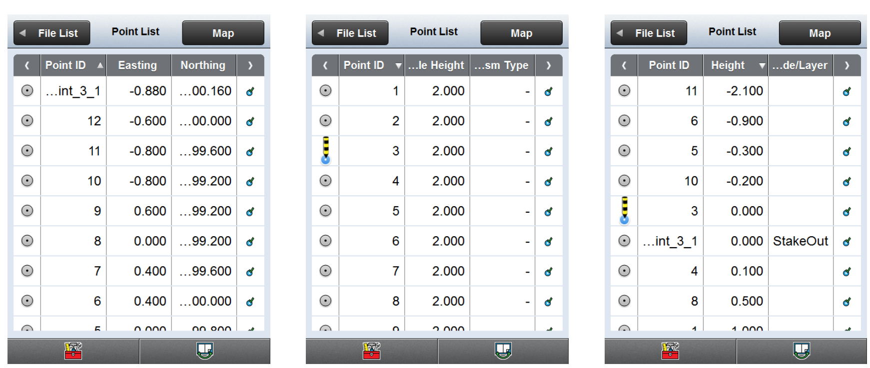
1. Select **Point List** from the **Map handler**.

2. - *A list of available files is opened.*
     Select the files you want the Point List to be created for. Multiple file selection is possible.
   - Tap ✓ to accept the selection and proceed to the Point List.

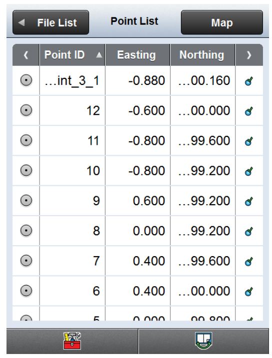


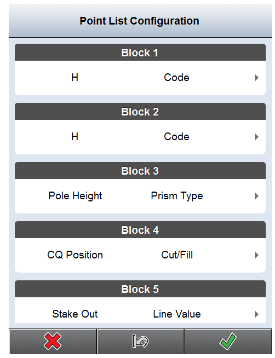
3. *The Point List for the current selection is shown.*
   - The relevant point status is shown in the left hand column.
   - Use ‹ or › to display further data of the shown points.

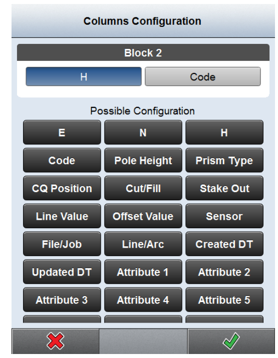
   ☞ Point status and Point ID are always displayed.
   - Use ▼ or ▲ to change between increasing/decreasing sort order.
   - To sort the list according to another value, tap the relevant header, for example **Height**.
   - Tap **File List** to return to the selection of files.



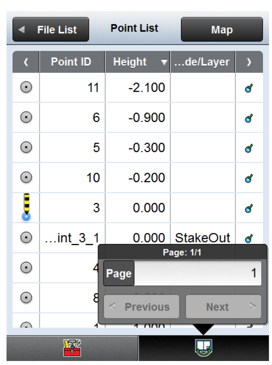
4. • To change the order of the columns, **tap and hold** one of the column headers, for example **Northing**.
• In the **Point List Configuration** screen select the Block you want to change the order for, for example **Block 2**.
• In the **Columns Configuration** screen select the value you want to replace (for example **Code**) and tap the new value to use (for example **Cut/Fill**). Tap to confirm the settings.

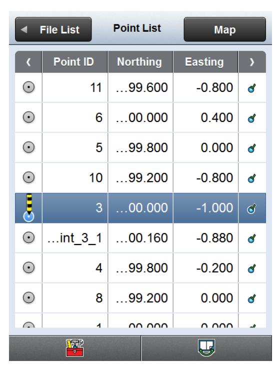


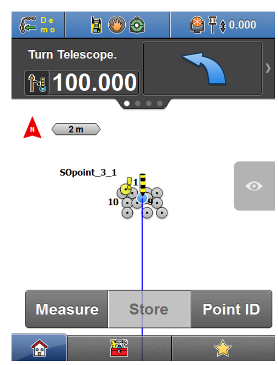




5. • If more than one page is available tap . In the pop-up menu use **Previous** or **Next** to display the corresponding page or enter page number directly.
• To get one certain point selected in the map, tap at the right side of the point row.
• The map is displayed and the selected point is highlighted.



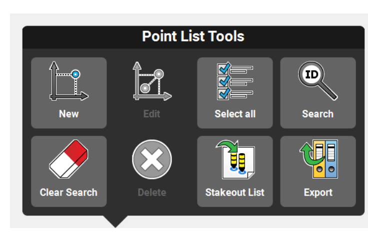




☞ A point selection from Point List is available in applications or functions where point selection is allowed.

Toolbox functions

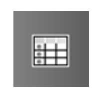
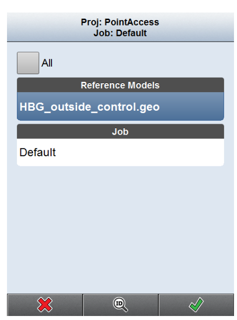
The Toolbox contains some additional functions.



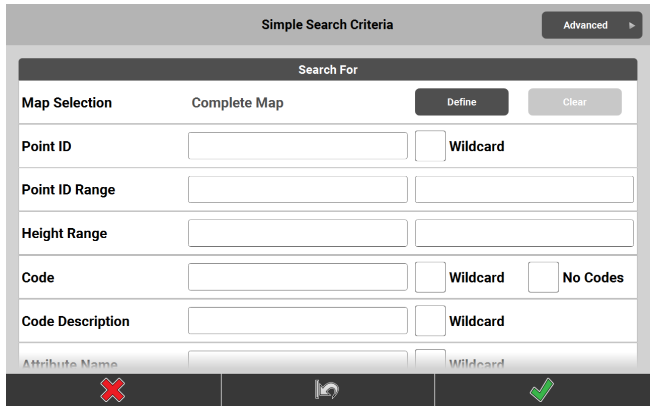
Function	Description
New Point	• Create a new point by: - Entering the required values: **Point ID**, **Easting**, and **Northing**. **Height** is optional but needed for all 3D applications. - Scanning a QR-code. To start the QR-code scan tap . See also: Importing data using QR-Scan step-by-step • A new point can also be created with **Point ID** and **Height**, to be used for Transfer Height during Total Station setup. • **Code/Layer** can be entered and the point can be defined as **Control Point** by setting the **Create Control Point** key to **On**. ☞ If you select a point before selecting this tool all relevant attributes are derived for the new point.
Edit Point	• Multiple point selection is possible. • Select a point, then use this tool to edit values of the point: **Point ID**, **Easting**, **Northing**, **Height**, and **Code/Layer**. **Prism Type** and **Pole Height** are available for measured points. • To change the point into a **Control Point** activate the **Create Control Point** checkbox. • Tap to accept, then confirm the following warning message.
Select all/ **Deselect all**	Select all points for editing or deleting, or quickly deselect all points when already being selected.
Search	Start a Point Search. Refer to Start a Point Search step-by-step for more information.
Clear Search	Clears the results of the last Point Search and displays the full content of the selected files again.
Delete Point	Either first select the point to delete and then the delete function or reversed. Multiple file selection is possible. Tap to accept, then confirm the following warning message.

Function		Description
Stakeout List		To use the **Auto Point Selection** function to stake points automatically, it's necessary to define the list of points using **Stakeout List** first. ☞ In 5" or 7" display mode, with Multiview active, use **Stakeout Point List** to get the points to be staked displayed. It is possible to select the points for staking out from the list.
Export		• Export the selected data. Select the data format for exporting and select the target, for example **Internal Memory**. • When **Removable Disk** (= name of the external data storage device) is selected as target, the exported data can be used on another controller after importing them from the external data storage device. • Select **iCON3D Removable Disk** as target to export the data for machine use. It is possible to create a **New Project** for export or use an existing project on the external data storage device. ☞ Using the **Export** feature, it is possible to select and export a subset of job data.

Start a Point Search step-by-step

1.	Select **Point List** from the **Map handler**.	
2.	Select the file you want to search for points. Multiple file selection is possible.  	
3.	Tap  to display the "Search Criteria" screen.	

By default, the "Simple Search Criteria" screen is displayed.



4. Define the search criteria. Refer to Define search criteria (Simple).

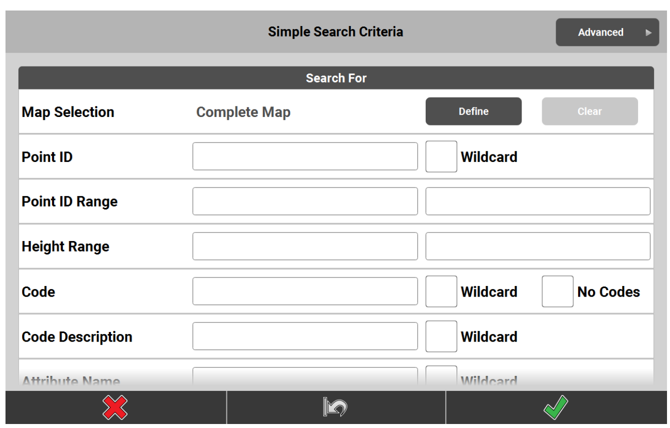
☞ To define advanced search criteria, tap **Advanced**. Refer to Define search criteria (Advanced).

To erase all entered search criteria, tap .

To cancel point search, tap .

5. To start the point search according to the defined criteria, tap .
The search results are displayed in Point List. Refer to Search Results List.
If no matching point data is found, an error message is displayed.

Define search criteria (Simple)

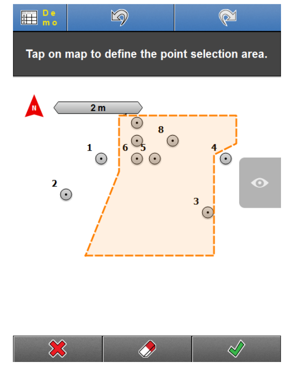


☞ In simple search mode, you can only enter a single value for each search criterion. It is not possible to enter multiple values for the same type of search criterion. To define multiple search criteria, use the advanced search mode.

Different search criteria can be entered together for a combined search, for example **Point ID Range** and **Code**. The result of such a search is a list of points that fit all search criteria.

Search by Map Selection

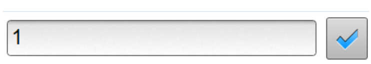
1.	Tap **Define**. *Map view is displayed.*
2.	Tap on the map to create the first corner of the search area.
3.	Tap again to create as many corner points as needed for the search area. Tap ✔ to accept.



☞ The result of this search is a list of points within the defined area.

Search by Point ID

Following search options are available:

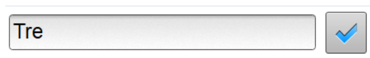
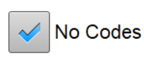
Input	Search result
Exact search Enter the desired value for Point ID. 	A point of which the Point ID matches exactly the input value.
Wildcard search Enter the desired value for Point ID and activate the **Wildcard** checkbox. 	A list of points of which the Point IDs include the input value. For example, if you make wildcard search for point ID "1", the result may be: "1, A1, 10, 212, 301" and so on.
Search by range Enter a start and end value to define a search range. 	A list of points of which the Point IDs are within the defined range. ☞ Point ID Range search is available for numeric and alphanumeric input values. For alphanumeric input values, the entered letters for start and end value have to be identical, for example, A1 to A5 or Tree01-Tree100.

Search by Height Range(Elevation search)

Input	Search result
Enter a start and end value to define a search range. 	A list of points of which the heights are within the defined range. ☞ Wildcard search is not an option for the Elevation search. ☞ Only numeric values can be the input for the Elevation search.

Search by Code

Following search options are available:

Input	Search result
Exact search Enter the desired text for Code.  	A list of points of which the Code matches exactly the input text.
Wildcard search Enter the desired text for the Code and activate the **Wildcard** checkbox.  	A list of points of which the Code includes the input text.
Search for points without codes Activate the checkbox **No Codes**.  	A list of points which have no code applied.

Search by Code Description

Following search options are available:

Input	Search result
Exact search Enter the desired text for Code Description.  	A list of points for which the Code Description matches exactly the input text.
Wildcard search Enter the desired text for Code Description and activate the **Wildcard** checkbox.  	A list of points for which the Code Description includes the input text.

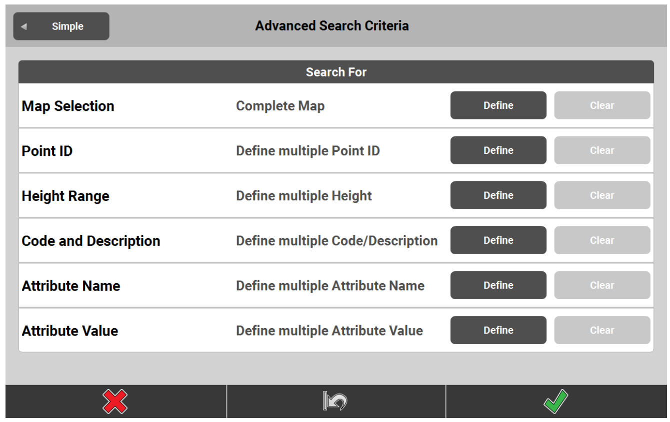
Search by Attribute Name and Attribute Value

Following search options are available:

Input	Search result
Exact search Enter the desired text for **Attribute Name** or **Attribute Value**.  	A list of points of which the attribute values match exactly the input text.

Input	Search result
Wildcard search Enter the desired text for **Attribute Name** or **Attribute Value** and activate the **Wildcard** checkbox.  	A list of points of which the attribute values include the input text.

Define search criteria (Advanced)



☞ In advanced search mode, you can enter multiple values for one type of search criteria.

Different search criteria can be entered together for a combined search, for example **Point ID Range** and **Code**. The result of such a search is a list of points that fulfil all search criteria.

☞ In advanced search mode, the available search criteria and search options are basically the same as described for simple mode.
For a description of the basic search options, such as "exact search, wildcard search, search by range or search by map selection", refer to Define search criteria (Simple).

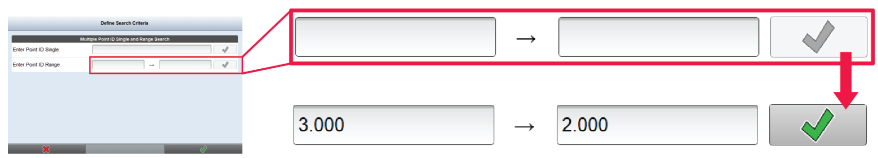
☞ The search criteria Point ID and Point ID Range as well as Code and Code Description are combined.

Available search criteria

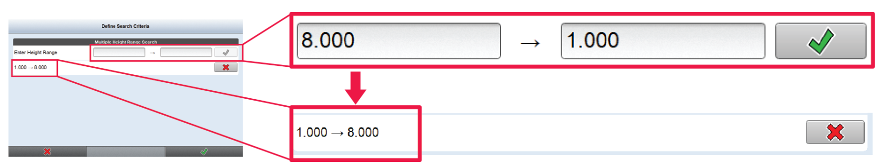
- **Map Selection**:
  Easily define a search area by selecting **Define** and tapping on the map.
- **Point ID**:
  Define multiple Point IDs to be searched for.
- **Height Range**:
  Define multiple height ranges to be searched for.
- **Code and Description**:
  Define multiple codes and code descriptions to be searched for.
- **Attribute Name**
  Define multiple attribute names to be searched for.
- **Attribute Value**:
  Define multiple attribute values to be searched for.

Defining multiple search criteria in advanced mode

1.	Tap the **Define** button beside the search criterion that you want to edit. *The input screen for this search criteria is displayed.* *Exception: For Map Selection, the map screen is displayed.*
2.	**Single editable field:** • Enter a value and tap ✓ at the right of the editable field. *The value is added as a new line.* • To define multiple values repeat as often as necessary. **Two editable fields (range):** Enter two values. The accept button at the right of the editable fields only gets active when values for both fields are entered.

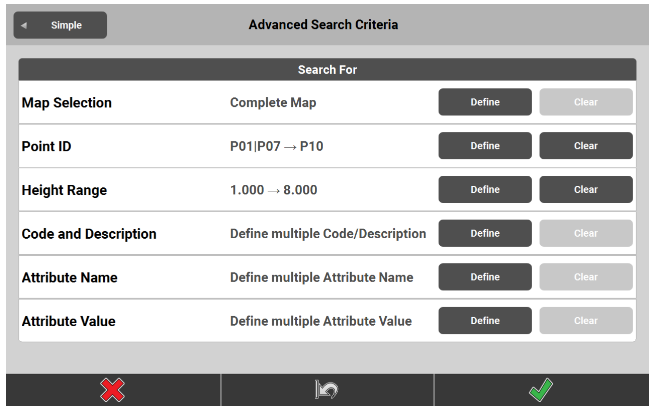


☞	To delete an already defined value, tap ✖ at the right of the line. *The line with this value is deleted from the list.*
☞	**Point ID** Enter Point IDs always as numeric values with an optional alphanumeric prefix. Input values without numbers are not allowed.
☞	**Height Range**: If the value entered first is greater than the second value, the values are automatically switched.



☞	**Code and Description** The editable field for Code Description works also with wildcard option enabled. If you enter and accept a value for code description, the code that has the defined code description, is displayed.
3.	To accept all entered values and return to the overview of advanced search criteria, tap ✓.

The defined values are displayed in the second column of the screen. Example:

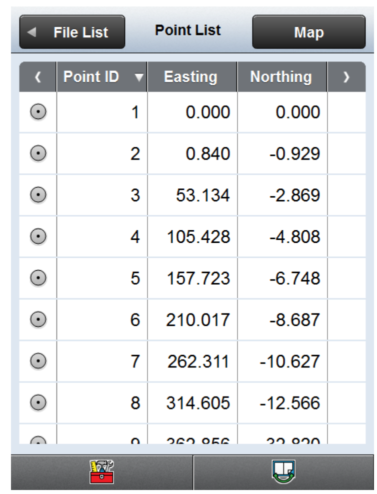


Search Results List

The result of any Point Search is a list of points that fit the search criteria. An example of such a search results list is shown.
Refer to How to use Point List step-by-step for more information about changing the sort order, viewing different values and further functions.

☞ By selecting a point from the results list and tapping **Map**, the map screen appears and the selected point is active, ready to be used within the application.

☞ In case the search output is more than 500 points, an information screen appears. Confirm that screen to display the first 500 points on the list.



2.6 Managing Stakeout Lists

Stake List Management function

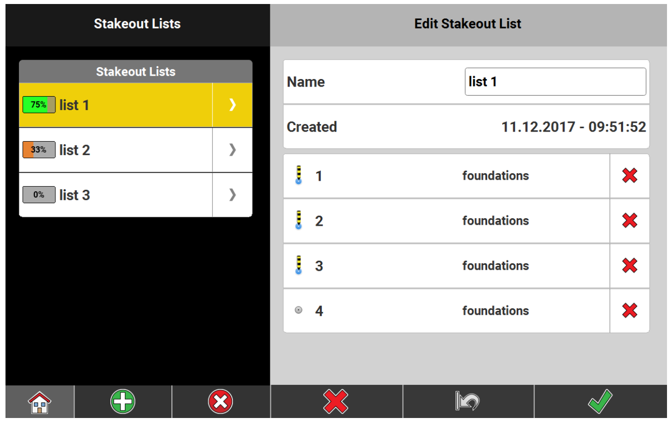
The Stake List Management function offers the following options:

- Getting an overview of available stakeout lists within the active project.
- Checking the work progress of a stakeout list.
- Editing the name of a stakeout list.
- Selecting a stakeout list for staking out.
- Creating or deleting a stakeout list.

The Stakeout Lists screen

To display the Stakeout Lists screen, select **Stake List Management** from the Home Menu.

The section Stakeout Lists displays the available stakeout lists. The currently active list is highlighted in yellow.



To select a different stakeout list for staking out, tap the name of the list. *The selected list gets highlighted.*

To display the content of a stakeout list or to edit its name, tap the arrow button. ❯ *Already staked-out points are displayed greyed out and are marked with a stakeout icon.*

Work progress

A status icon displays the work progress as percentage of the total number of points to be staked out. Additionally, the icon contains a progress bar with changing colours.

Creating a stakeout list based on reference data or the point list

Stakeout list based on reference data

☞ Before creating a stakeout list, ensure that the necessary reference data is imported to the project.

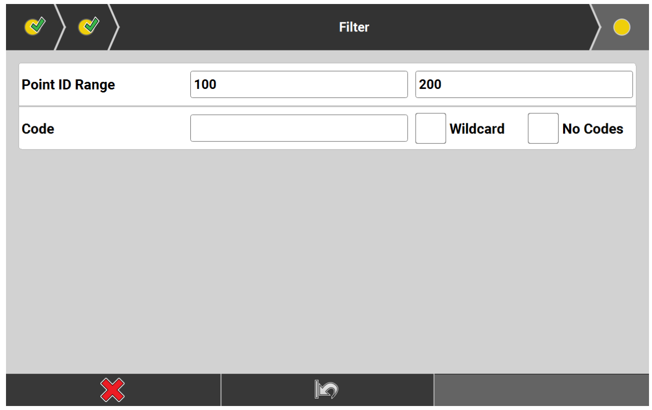
1. To add a stakeout list, tap .
   A wizard leads you through the necessary steps.

☞ To cancel the process and close the wizard, tap within any of the wizard steps.

2. Wizard step "**New Stakeout List**"
   Enter a name for the new stakeout list. Tap the next Wizard step to proceed.

3. Wizard step "**Data**"
   Select the reference data from which you want to import points into the stakeout list. Tap the next Wizard step to proceed.

The wizard step "Filter" is displayed.



4. ☞ Stakeout lists support a maximum of 1000 points, but a reference file may contain much more points. Apply this point filter to reduce the number of points.

   Enter the necessary filter criteria:
   - **Point ID Range**: To define a range of points enter two-point IDs as start and end of the range.
   - **Code**: To filter out points with a specific code, enter a code.
   - **Wildcard**: To search for points with the code attribute containing at least the entered criteria, activate the checkbox.
   - **No Codes**: To include points without a code attribute, activate the checkbox.

   To reset the filter to default values, tap .

5. To start point search, tap the next Wizard step.

   Wizard step "**Preview**"

   The resulting point list is displayed.
   - To edit the filter criteria and start a new point search, tap the previous Wizard step.
   - To delete a single point from the list, tap . To restore all deleted points, tap .
   - To close the wizard and create the stakeout list, tap .

Stakeout list based on point list

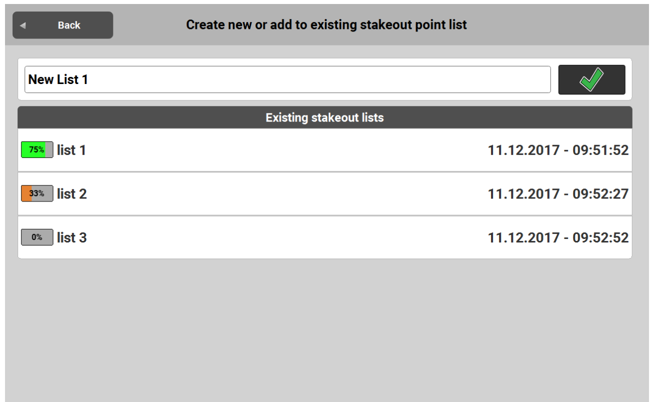
☞ You can use the point list to add points to a new or existing stakeout list.
For detailed information on using the Point list, refer to 2.5 Point List, Searching for a Point.

In the current application, select **Point List** from the **Map handler**.
The Point List screen is displayed.

☞ Regardless of having points selected, the Stakeout List function always adds all points in the point list to the stakeout list. To reduce the number of points to be added, use the Point search function.

1. To add the points to a new or existing stakeout list, select **Stakeout List** from the toolbox.

Following screen is displayed:



☞ To return to map view without creating a stakeout list for the created points, tap **Back**.

- To add the points to a new stakeout list, enter a name and tap ✓.
- To add the points to an existing stakeout list, tap the respective row in the list.

A message is displayed, informing about the number of points added to a new or existing stakeout list.

Tap OK to return to map view.

Exporting a stakeout list

If desired, you can export an individual stakeout list or all stakeout lists within a project.

☞ Points in the stakeout list that already have been staked out, are not included in the exported file.

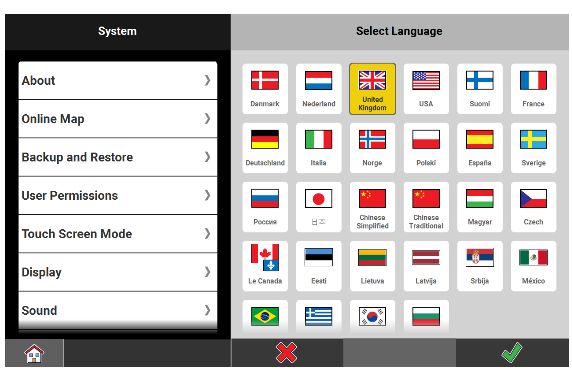
For detailed information about possible export formats and how to export files, refer to Exporting data step-by-step.

2.7 Settings

Language settings

☞ Numerous languages are available to run the software with.

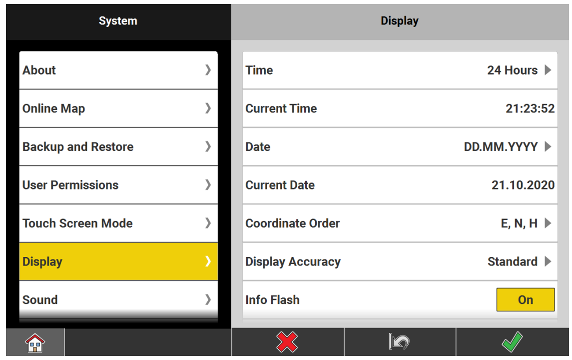
1. To set a specific language select **System** from the Home Menu.
2. Select **Language**.



3. Tap on the flag for the desired language.
Tap ✓ to accept.

Display settings

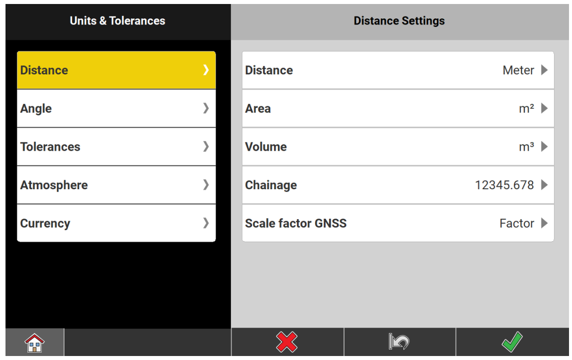
1. To configure the date and time settings and basic display settings select **System** from the Home Menu.
2. Select **Display**.



Element	Options	Description
Time format	**24 Hours**, **12 Hours**	Selected format is adopted throughout the application.
Date format	**DD.MM.YYYY**, **MM.DD.YYYY**, **YYYY.MM.DD**	Selected format is adopted throughout the application.
Coordinate Order	**E, N, H** **N, E, H**	Selected format is adopted throughout the application.
Display Accuracy	**Simple**, **Standard**, **Precise**	Defines the decimal place: **Simple**: 0.12 **Standard**: 0.123 **Precise**: 0.1234 Selected format is adopted throughout the application.
Map Background Colour	**White**, **Default**, **Grey**, **Dark Grey**	Allows for adapting the background colour of the map view.
Info Flash	**On**, **Off**	When set to **On**, a confirmation flashes over the Information bar for certain processes, for example when storing a point.
Map Preview on Layer Manager	**On**, **Off**	When set to **On**, the map preview is enabled in Map View manager. Refer to Map View manager.
Information preview for points	**On**, **Off**	When set to **On**, a preview window pops up showing the values to be stored for the currently measured point, for example Point ID, coordinates, assigned code and attributes. Refer to Information preview for points.

Units settings

1. To configure the units settings for **Distance** and **Angle** select **Units** from the Home Menu.

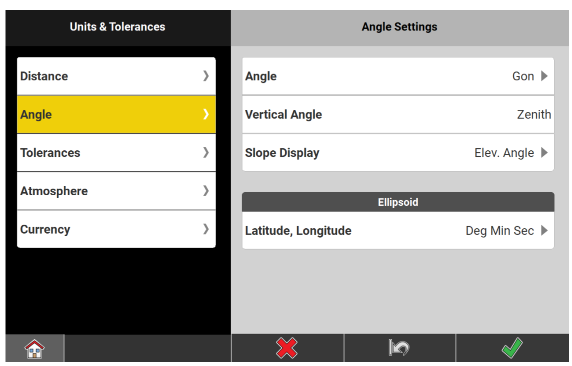


Distance is selected by default.

2.
   - For **Distance** select from **Meter**, **US Survey Feet Fractional**, **US Survey Feet Decimal**, **Feet Fractional**, or **Feet Decimals**.
   - For **Area** select from **m²**, **Hectare**, **US ft²**, **US Acres**, **Int ft²**, or **Int Acres**.
   - For **Volume** select from **m³**, **Int ft³**, **US ft³**, or **yd³**.
   - For **Chainage** select one of the predefined settings.
   - For **Scale factor GNSS** select between **Factor** and **ppm or mm/km**.

   Tap to save changes.

3. Select **Angle**.



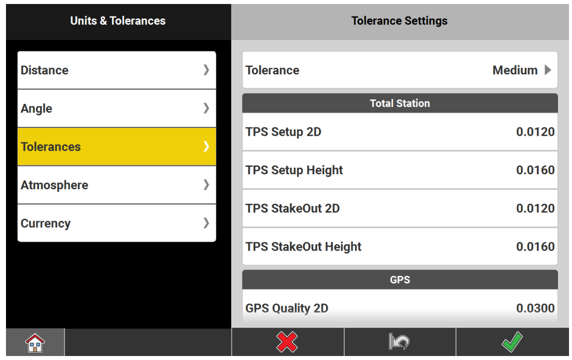
4.
   - For **Angle** select from **Gon**, **Deg Min Sec**, or **Deg Dec**.
   - For **Vertical Angle** the sole setting is **Zenith**.
   - For **Slope Display** select from **H:V**, **V:H**, **%**, or **Elev. Angle**.
   - For **Latitude, Longitude** select between **Deg Min Sec** or **Deg Dec**.

   Tap to save changes.

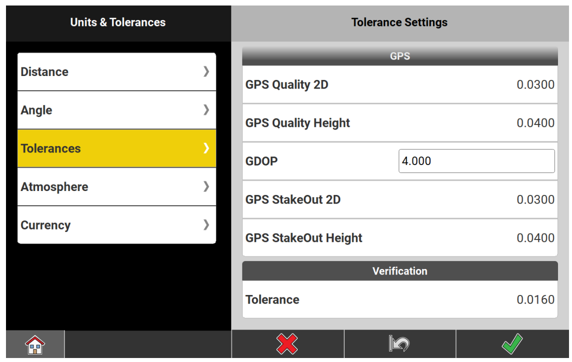
Tolerance settings

1. Tolerance settings can be altered in **Units** .

2. Select **Tolerances**.



The screen contains tolerance settings for Total Station and GPS.



The tolerance setting for Verification report is only available with the respective licence.

---

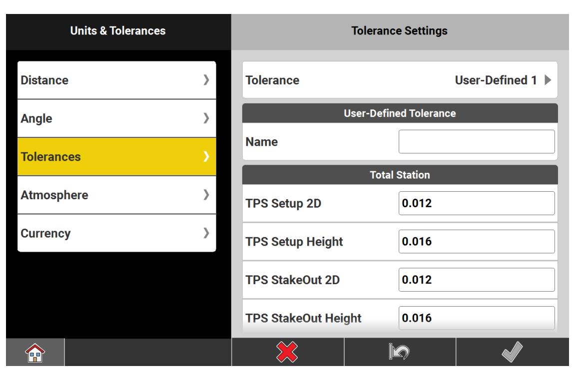
3. In the **Tolerance Settings** screen, define the **Tolerance** level.
Select from three predefined tolerance sets:
   - **Tolerant**
   - **Medium**
   - **Precise**

   Or select a user-defined tolerance set.

---

4. Tap ✓ to save changes.

☞ To define a user-specific tolerance set:
- Tap one of the relevant icons.
- Give the tolerance set the desired name.
- Enter the desired tolerance values for **Total Station** and **GPS**. Both values must be set! By default the **Medium** values are set.
- When finished tap ✓ to confirm.
- Up to ten user-defined tolerances can be stored.

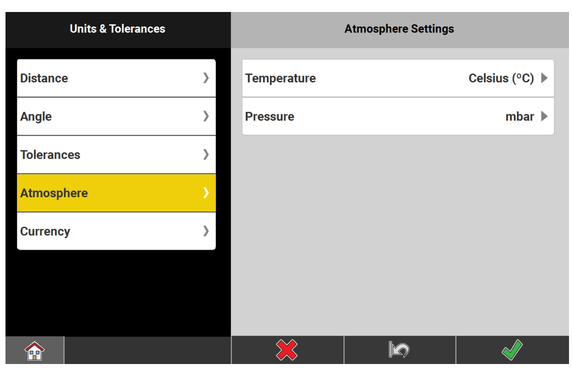


Adopted tolerance values differ according to the connected instrument, and the active application:

	Tolerance level		
	Tolerant	**Medium**	**Precise**
Total Station			
TPS Setup 2D	0.0300 m	0.0120 m	0.0030 m
TPS Setup Height	0.0400 m	0.0160 m	0.0040 m
TPS StakeOut 2D	0.0600 m	0.0120 m	0.0060 m
TPS StakeOut Height	0.0800 m	0.0160 m	0.0080 m
GPS			
GPS Quality 2D	0.0600 m	0.0300 m	0.0150 m
GPS Quality Height	0.0800 m	0.0400 m	0.0200 m
GDOP	5.0	4.0	3.0
GPS StakeOut 2D	0.0600 m	0.0300 m	0.0150 m
GPS StakeOut Height	0.0800 m	0.0400 m	0.0200 m
Verification	0.0800 m	0.0160 m	0.0080 m

Atmospheric unit settings

1. Atmospheric unit settings can be altered in **Units** m/ft .
2. Select **Atmosphere**.

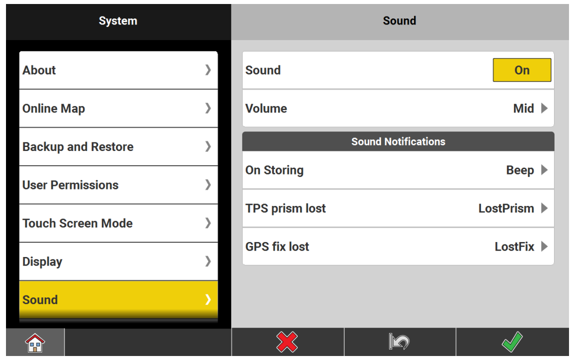


3. In the **Atmosphere Settings** screen, set the units for **Temperature** and **Pressure**.
   - For **Temperature** select between **Celsius (ºC)** and **Fahrenheit (ºF)**.
   - For **Pressure** select from **mbar**, **mmHg** and **inHg**.
4. Tap ✓ to save changes.

Sound notification

1. To configure the sound notification settings, select **System** from the Home menu.

2. Select **Sound**.



3. In the Sound Settings screen:
   - Switch sound on and off.
   - Select Sound **Volume** level from **Low**, **Mid**, or **High**.
   - For **On Storing**, **TPS prism lost**, and **GPS fix lost** select sound file for notification. Tap to listen to the relevant demo sound.

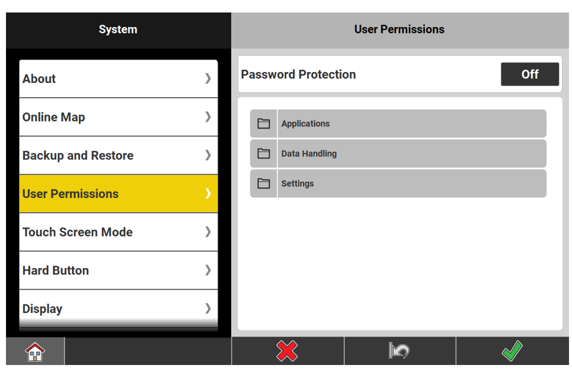
4. Tap to save changes.

User Permissions

☞ The software allows for a user-configurable content of the Home Menu. Therefore it is possible to configure the Home Menu to show selected features only. These settings can be password protected.

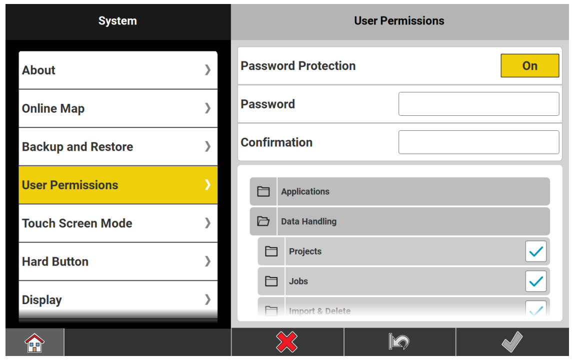
1. To configure the User Permissions settings select **System** from the Home Menu.

2. Select **User Permissions**.

3. 

   The "User Permissions" screen is displayed.

4. Switch **Password Protection** on and off. When switching the protection on, enter a password and confirm that password.



To change user permissions or rather the content to be displayed and features to be available , tap to expand to the full extend for **Applications** or **Data Handling** or **Settings** .

5. Now simply tap the checkbox for each application or feature to be displayed on or off.
Selection is possible for:
- All **Applications** installed and activated by license.
- The **Data Handling** features:
  - Projects
  - Jobs
  - Import & Delete
  - Export
  - Reports
  - Stake List Management
  - Layer Manager
  - Edit Control Point
- The Settings for:
  - Units
  - Clouds
  - Laser Settings
  - Prism Type
  - Localization from File

To save changes, tap .

Touch Screen Mode

1. Select **System** from the Home Menu. Tap **Touch Screen Mode**.

2. Tap the row **Touch Screen Mode** to define the operation mode. Tap an item in the list to select it.
- Touch or pen operation.
- Touch operation in wet conditions. Pen is disabled.
- Touch or pen operation or touch operation with gloves.

Tap to save changes.

☞ If the Hard Button setting is configured accordingly, you can also toggle the touch screen mode with the Rotation button on the controller. Refer to Button configuration.

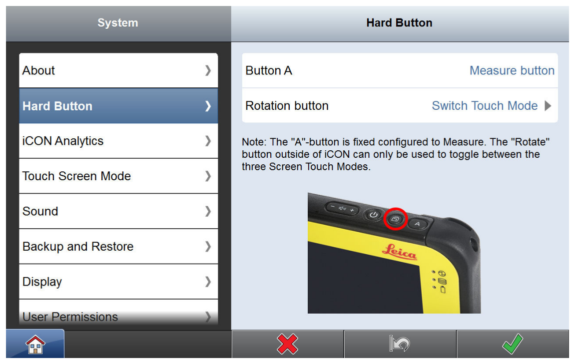
Button configuration

Hard Button configuration on the CC70/CC80 controller

When using the iCON software on the CC70/ CC80 controller, it is possible to configure the functions of the Rotation button.

1. Select **System** from the Home Menu. Tap **Hard Button**.

Following screen is displayed:



The Measure function is always assigned to the Button A.

2. Tap the row **Rotation button** to assign one of the following functions to the button:
   - Switch Touch Screen Mode
   - Snipping tool
   - Camera
   - Store on demand
   - Start/Stop Line
   - Screen Recording
     To start recording, tap the Rotation button. To stop recording, exit iCON. The recording file is saved on the desktop.
   - Point ID
   - Codes
   - Measure
   - Windows button
   - None

3. Tap  to save changes.

Hard Button configuration on the CC200 controller

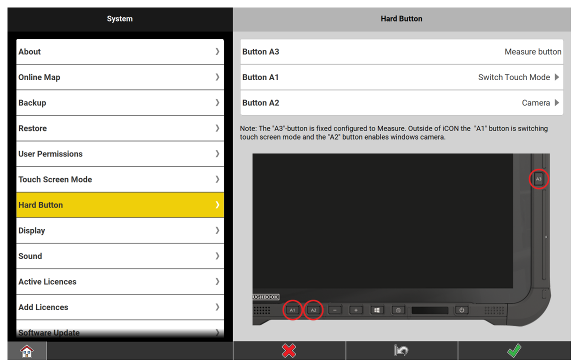
When using the iCON software on the CC200 controller, it is possible to configure the functions of the following buttons:

25907_001

A1 - configurable
by default set to 'Switch Touch Mode'
A2 - configurable
by default set to 'Camera'
A3 - not configurable
always set to 'Measure'

1. Select **System** from the Home Menu. Tap **Hard Button**.

Following screen is displayed:



☞ The Measure function is always assigned to button A3.

2. Tap the row **Button A1** or **Button A2** to assign one of the following functions to the buttons:
   - Switch Touch Screen Mode
   - Snipping tool
   - Camera
   - Store on demand
   - Start/Stop Line
   - Screen Recording
     To start recording, tap the Button A1. To stop recording, tap the Button A2. The recording file is saved on the desktop.
   - Point ID
   - Codes
   - Measure
   - None

3. Tap  to save changes.

Necessary driver for screen recording

For controllers delivered with v5.0 or higher, the necessary driver is already installed.

For controllers upgraded to v5.0 or higher, download and install the necessary driver (CCxx-MKx-Component_screenRecording.exe) from **myWorld** under the relevant section for your controller.

☞ Before installing the driver, make sure that iCON is not running.

3 Applications

Available applications

The following applications are available within iCON site:

- **Setup**
  Determine Total Station instrument orientation and station coordinates using Total Station measurements.
  Refer to 4 How to Setup a Total Station for more information.
- **Base Setup**
  Establish a Base station to transmit position corrections to a rover.
  Refer to 5 How to Setup a GPS Base Station for more information.
- **Coordinate System**
  Create a coordinate system for GPS measurements.
  Refer to 6 How to Create a New Coordinate System for more information.
- **Measure**
  Collect and display point and line information using the connected instrument.
  Refer to 7 How to Measure and Record Data for more information.
- **Checks**
  Select or measure points or lines to check geometries.
  Refer to 9 How to Do Checks for more information.
- **Draw**
  Draw and display points, lines and arcs without a connected instrument.
  Refer to 10 How to Sketch a Plan for more information.
- **Stakeout**
  Place marks in the field at predetermined points.
  Refer to 11 How to Stake Out for more information.
- **Cut & Fill**
  The heights of measured points are compared against the heights of a Terrain Model.
  Refer to 12 How to Stake Out Surfaces for more information.
- **Verification**
  Use surfaces, objects, point clouds or patterns as a reference and compare them to measured (as-built) surfaces, objects, point clouds or patterns.
  Refer to 13 How to Use Verification for more information.
- **Roading**
  Place marks in the field along predetermined road lines and cross sections.
  Refer to 14 How to Stake Out Roads for more information.
  Roading is an optional application. Ask your agency or your Leica Geosystems representative for information about licensing.
- **Volumes**
  Allows surfaces to be measured and volumes to be calculated from these surfaces.
  Refer to 16 How to Handle Volumes for more information.
- **Slopes**
  Allows you to do checks on a defined slope, to find the Daylight line or the Daylight point, and to stake and mount the batter board.
  Refer to 17 How to Handle Slopes for more information.
  Slopes is an optional application. Ask your agency or your Leica Geosystems representative for information about licensing.

- **MC Calibration**
  Perform a simple and quick workflow for a Machine calibration.
  Refer to 18 How to Use Machine Calibration for more information.
- **Leica ConX**
  With a connection between the controller and the Leica ConX web page, this tool offers:
  - a remote user to access the controller to view or control iCON site.
  - to exchange data between the controller and a remote web page.
  - a remote user to track the current position of the sensor.

  Refer to 20.1 How to Use Leica ConX for more information.
  To use this functionality an account is needed for the Leica ConX web page. The license is handled on the controller. Ask your agency or your Leica Geosystems representative for information about licensing and how to get an account.
- **Autodesk BIM 360 Docs**
  An online file storage and sharing platform which allows to download or upload standard files, such as PDF, DXF, DWG or IFC.
  Refer to 20.2 How to Use AutodeskBIM 360 Docs for more information.
- **Procore**
  A construction project management software which allows to collaborate on projects and share access to documents, planning systems and data.
  Refer to 20.3 How to Use Procore for more information.
- **Bluebeam Studio**
  A construction project management software which allows to collaborate on projects and share access to documents, planning systems and data.
  Refer to 20.5 How to Use Bluebeam Studio for more information.
- **Bricsys 24/7**
  A construction project management software which allows to collaborate on projects and share access to documents, planning systems and data.
  Refer to 20.4 How to Use Bricsys 24/7 for more information.
- **BIMPLUS**
  A construction project collaboration platform designed by Allplan to coordinate and exchange project data.
  Refer to 20.6 How to Use BIMPLUS for more information.

☞ The following chapters explain how to use the different applications.

4 How to Setup a Total Station TPS

4.1 Control Points

Adding control points to a job

For some setup procedures, control points need to be available in the current job. There are different ways to add control points to a job.

Importing control points	You can import a list of control points. Refer to Importing data to the project step-by-step. ☞ When importing TPS control points, information on prism type and height is only imported for file types *.geo and *.xml. After importing the control points, add missing information using the toolbox function **Edit** in the point list. Refer to 2.5 Point List, Searching for a Point.
Defining new points as control points	When creating new points in the point list, you can define them as control points. Refer to 2.5 Point List, Searching for a Point (Toolbox function **New**). ☞ After creating a TPS control point, add the information about prism type and height using the toolbox function **Edit**.
Turning existing measured points into control points	• Open the point list and select an existing measured point. • Use the toolbox function **Edit** to turn the point into a control point. • For TPS points define prism type and height and the coordinates of the new control point. Refer to 2.5 Point List, Searching for a Point (Toolbox function **Edit**).
Defining measured points as control points	In the **Measure** application, activate the toolbox function **Control Point** to define measured points as control points. • To measure and store a control point, press **Start**. All measured points are stored as control points. • For TPS points select the correct prism type and height (refer to 1.3.1 Prism Types and Prism Heights). ☞ The information about the currently selected prism type and height is stored together with the measured control point.

Creating control points in the Draw/ Sketching application

Create a single control point

- Select the toolbox function **New Point**.
- Enter the coordinates for the new point.
- Tap  to activate the **Control Point** function or select **Control Point** in the toolbox.
- Tap ✓ to create the control point.

Create several control points along a line

- Select the toolbox function **Start Point**.
- Define direction of the line, distance from the start point and height.
- Select **Control Point** in the toolbox.
- Tap **x1** and enter the desired number to create several control points along a line.
- Tap ✓ to create the control points.

Information about prism type and prism height for TPS points

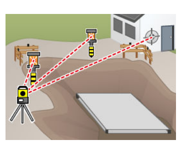
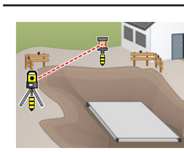
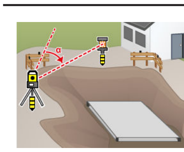
The information about prism type and height of a control point only needs to be defined once. There are two possibilities to define this information:

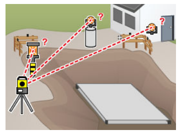
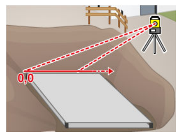
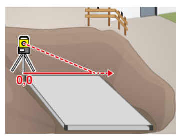
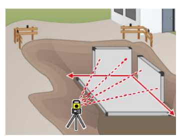
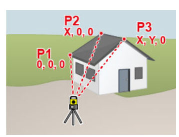
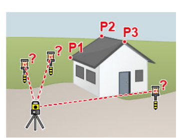
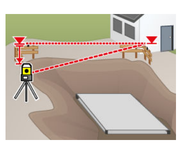
- Define this information directly after adding control points to a job by using one of the previously described methods.
- Define this information when using a setup procedure with coordinates for the first time:
  Before measuring an existing control point, select the correct prism type and height. The information about the currently selected prism type and height is stored together with the measured control point.

☞ The next time you start a setup procedure, this information is automatically set for each control point. You can directly select and measure the control points for setup.

4.2 Setup Methods

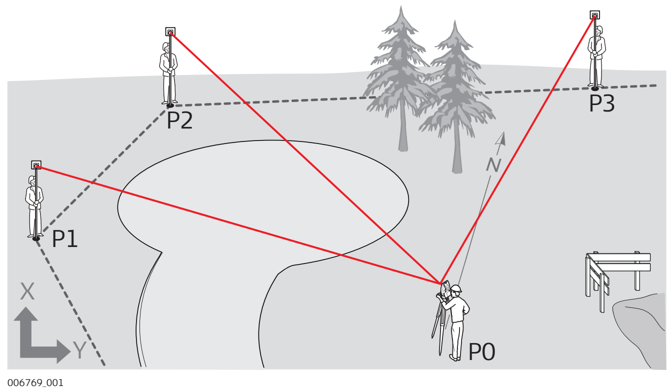
Setup Methods

Method		Availablilty			
		iCON site	iCON site Plus	iCON build	iCON build Plus
	Coordinates Anywhere	✓	✓	✓	✓
	Coordinates Over known point	✓	✓	✓	✓
	Coordinates Set Orientation	✓	✓	✓	✓

Method		Availablilty			
		iCON site	iCON site Plus	iCON build	iCON build Plus
	Coordinates Setup Pilot	✓	✓	✓	✓
	Control Line Anywhere	–	✓	✓	✓
	Control Line Over 1st point	–	✓	✓	✓
	Control Line As Built Walls	–	✓	✓	✓
	Tilted plane Set Reference Plane	☞ License of its own If licensed then available in: ✓	✓	✓	✓
	Tilted plane Restore Reference Plane	☞ License of its own If licensed then available in: ✓	✓	✓	✓
	Heights Transfer height anywhere	–	✓	✓	✓
	Heights Over reference point	✓	✓	✓	✓

4.3 Setup Anywhere with Given Coordinates TPS

General description



P0	Station (sought)
P1...	Known points

Given:

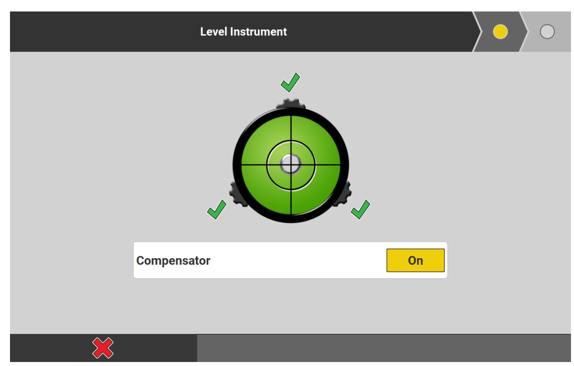
- Control points are active within the current job. Refer to Control Points.
- Instrument positioned anywhere on site.

Setup anywhere with given coordinates step-by-step

1. Select **Setup** from the Home Menu. 

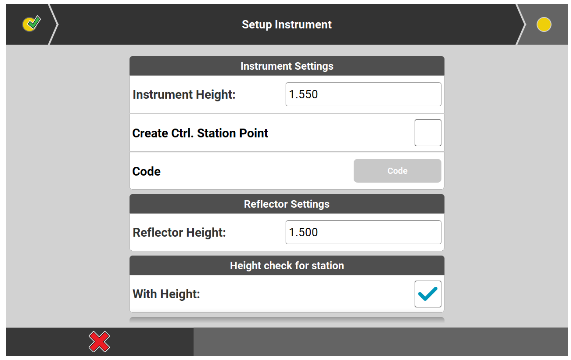
2. Select **Anywhere**.
   For an overview of available setup methods refer to Setup Methods.

3. Level instrument, then tap the next Wizard step  to proceed.



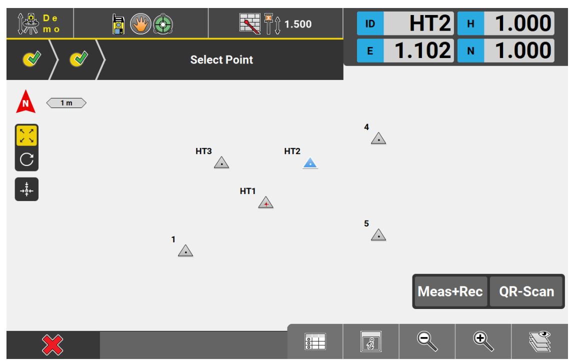
4. Enter a **Station Name** (iCON site/iCON build Plus only).
   Enter **Instrument Height** and **Reflector Height**, if needed.
   The **Create Ctrl. Station Point** tick box allows to define the station as control station point. In that case it's also possible to assign a code to that station point.

   ☞ If you want to check the Total Station setup periodically activate the option using the **Prompt for Setup Checks** tick box and set the **Check time (Hours):** as required. According to the time set you will be reminded repeatedly to check the setup.

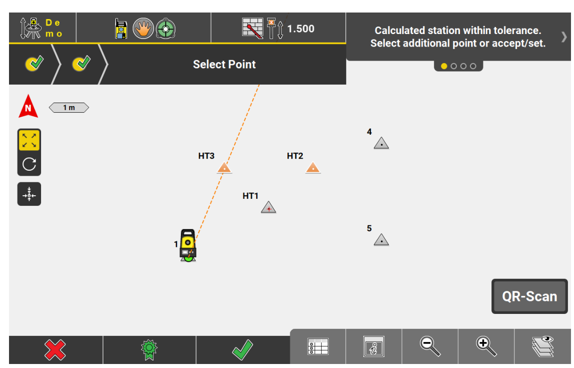


5. Proceed to the next step, where the Map screen is displayed. Tap a point to select it as the first point to measure.
Aim telescope to target point, then press **Measure**, then **Store**, or press **Meas+Rec**, if configured. Repeat for a second point.

☞ Alternatively, tap **QR-Scan** to scan point information.
To be able to use the QR-Scan function your entitlement needs to include the QR-Code Reader QR Code Reader licence.
For further information refer to: Importing data using QR-Scan step-by-step



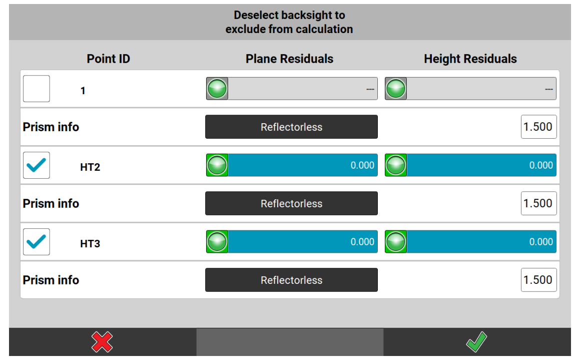
6. If the station is within tolerance,
tap ✔ to accept.



☞ To measure further points, tap the relevant point, then **Measure** and **Store**.

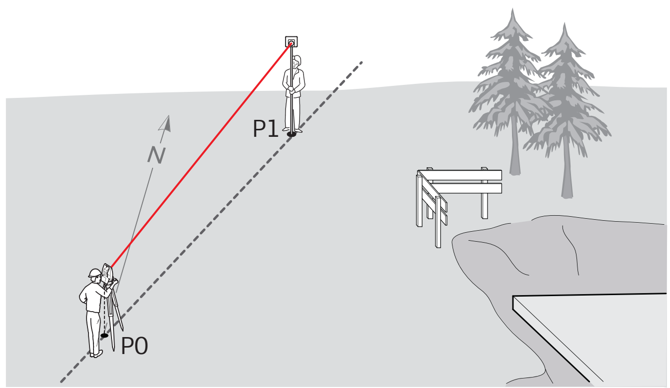
☞ When at least two points have been measured, the **Residuals** screen can be accessed by tapping [button], where inaccurate measurements can be removed.

Tap ✔ to accept station position.



4.4 Setup over One Known Point with Second Known Point TPS

General description



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P0	Station (sought)
P1	Known point

Given:

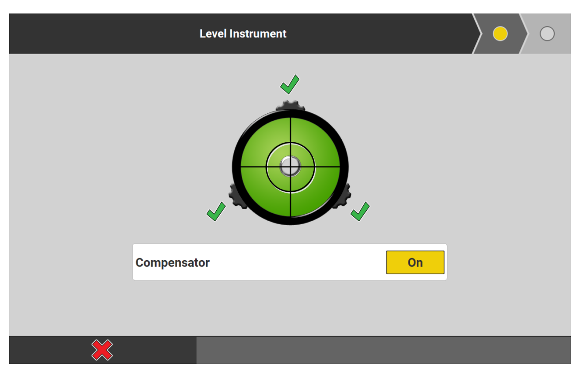
- Control points are active within the current job. Refer to Control Points.
- Instrument positioned over a known point.

Setup over one known point with second known point step-by-step

1. Select **Setup** from the Home Menu.

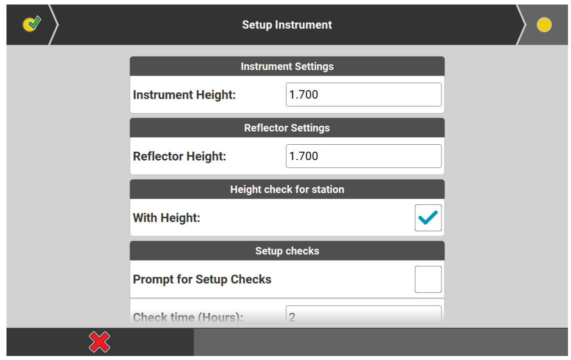
2. Select **Over known point**.
For an overview of available setup methods refer to Setup Methods.

3. Level instrument, then tap the next Wizard step [button] to proceed.

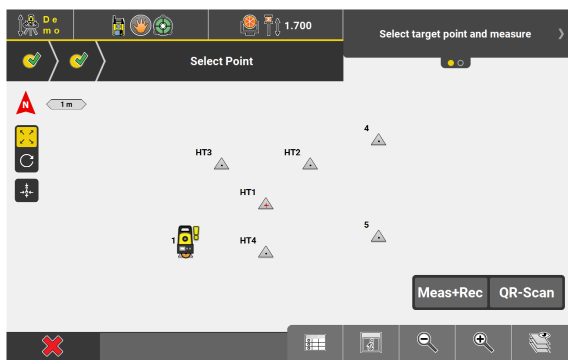


4. Enter **Instrument Height** and **Reflector Height**. Use the **With Height:** tick box to save the station with the height value.

☞ If you want to check the Total Station setup periodically activate the option using the **Prompt for Setup Checks** tick box and set the **Check time (Hours):** as required. According to the time set you will be reminded repeatedly to check the setup.

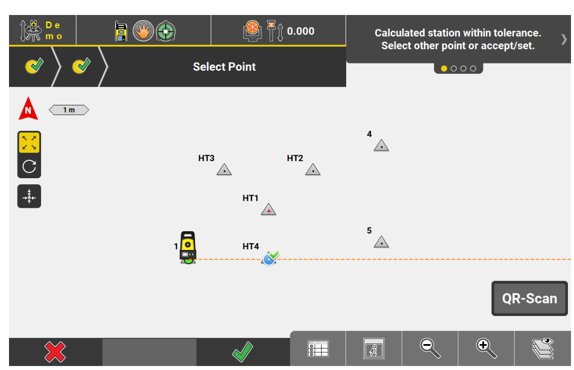


5. Proceed to the next step, where the Map screen is displayed. Select the **Station Point**, and select a **Target Point**.
Aim telescope to target point, then press **Measure**, then **Store**, or press **Meas+Rec**, if configured.



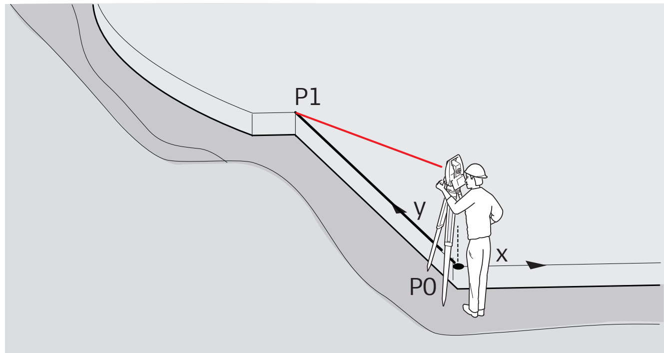
☞ Alternatively, tap **QR-Scan** to scan point information.
To be able to use the QR-Scan function your entitlement needs to include the QR-Code Reader QR Code Reader licence.
For further information refer to: Importing data using QR-Scan step-by-step

6. If the station is within tolerance, tap ✓ to accept. If out of tolerance, re-measure to the target point, or to a new target point.



4.5 Set Station Orientation TPS

General description



006771_001

P0	Station
P1	Direction point

Given:

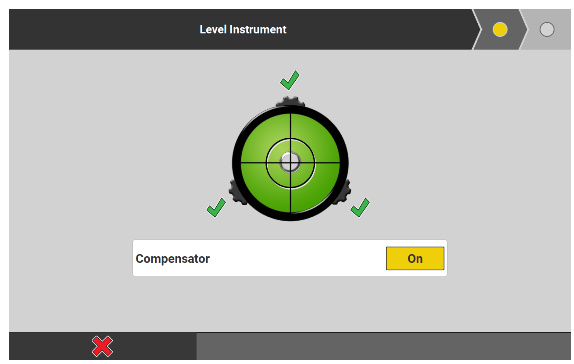
- Control points are active within the current job. Refer to Control Points.
- Instrument set up over a known point.

Set station orientation step-by-step

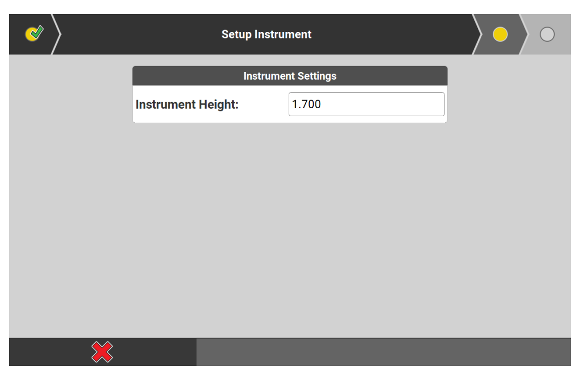
1. Select **Setup** from the Home Menu.

2. Select **Set Orientation**.
For an overview of available setup methods refer to Setup Methods.

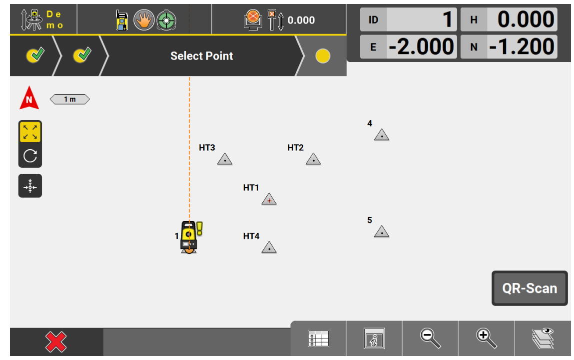
3. Level instrument, then tap the next Wizard step  to proceed.



4. Enter **Instrument Height**, then proceed to the next Wizard step.



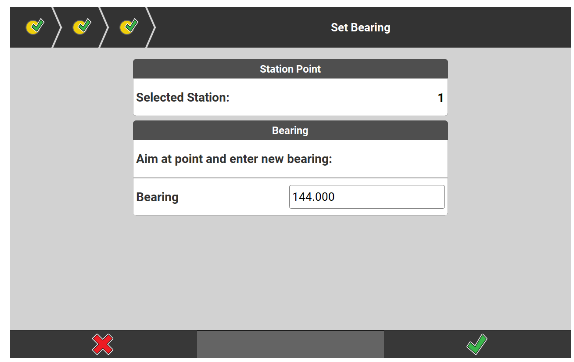
5. Select **Station Point**, and tap the next Wizard step.



☞ Alternatively, tap **QR-Scan** to scan point information.
To be able to use the QR-Scan function your entitlement needs to include the QR-Code Reader QR Code Reader licence.
For further information refer to: Importing data using QR-Scan step-by-step

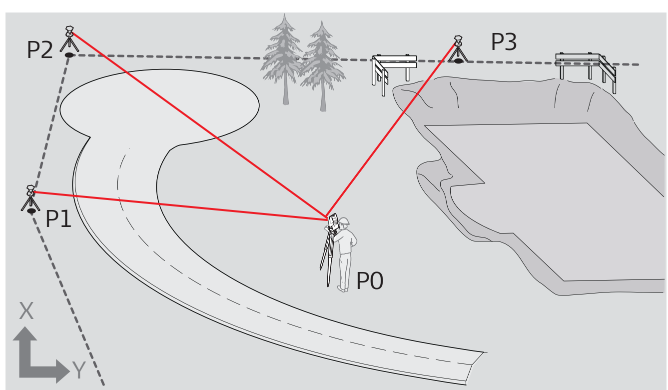
6. Aim telescope in the required direction, and enter a **Bearing**.

Tap ✔ to accept.



4.6 Setup using Setup Pilot TPS

General description



007082_001

P0	Station (sought)
P1...	Known points, with prism

Given:

- Control points are active within the current job. Refer to Control Points.
- For the automated robotic version, at least three control points with prism available on site. Prism type and prism height set for each of these control points using Point List functionality.
- Instrument positioned anywhere on site.
- For the manual approach with iCB and iCR instruments, control points with prism type have to be in the point list. These points can have all prism type, including tape or reflectroless.

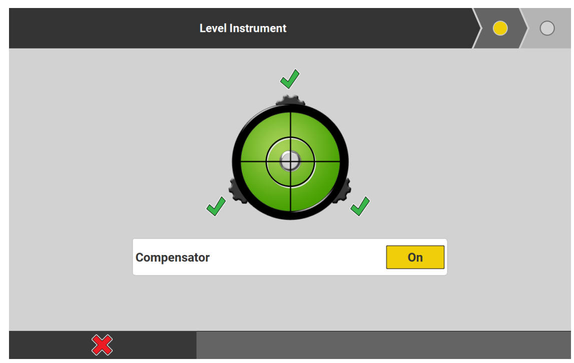
Setup using Setup Pilot step-by-step

☞ When using **Setup Pilot** it is not necessary to select points on the screen but simply measure at least three control points (fixed prisms) in the field. The position of the station is automatically calculated.

1. Select **Setup** from the Home Menu.

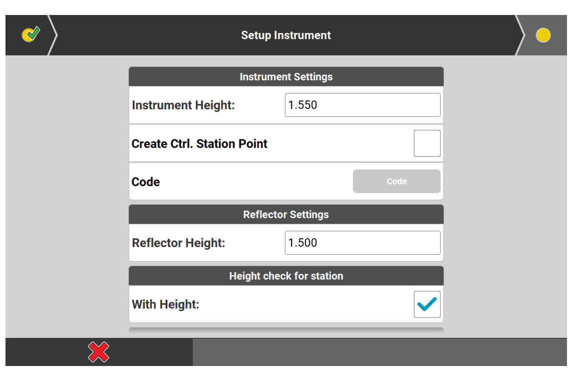
2. Select **Setup Pilot**.
For an overview of available setup methods refer to Setup Methods.

3. Level instrument, then tap the next Wizard step  to proceed.

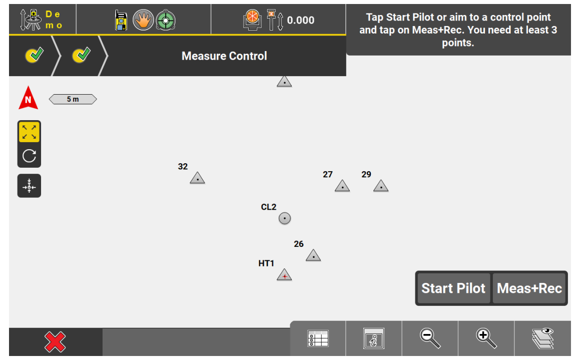


4. Enter a **Station Name** (iCON site/iCON build Plus only).
Enter **Instrument Height**.
The **Create Ctrl. Station Point** tick box allows to define the station as control station point. In that case it's also possible to assign a code to that station point.

☞ If you want to check the Total Station setup periodically activate the option using the **Prompt for Setup Checks** tick box and set the **Check time (Hours):** as required. According to the time set you will be reminded repeatedly to check the setup.

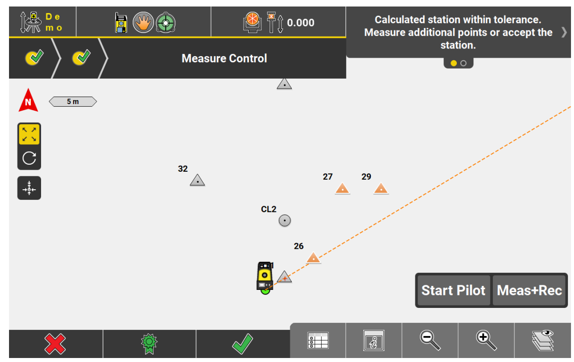


5. Proceed to the next Wizard step.

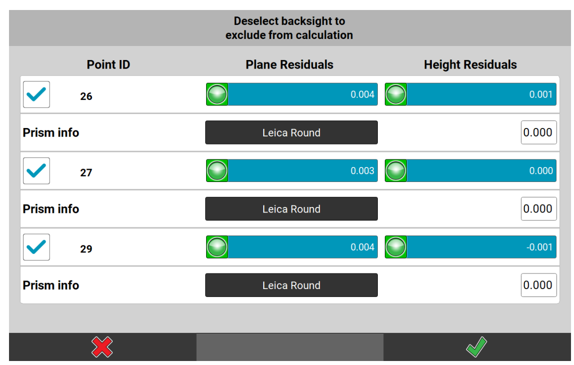


- For the automated Setup Pilot with a robotic total station, tap **Start Pilot**. The instrument starts a PowerSearch. It is possible to **Pause** the search at any stage.
- For the manual use with manual or robotic total stations, press **Meas+Rec** after aiming the first point.

6. When the calculated station is within tolerance a corresponding information is displayed. Tap ✓ to accept station position.

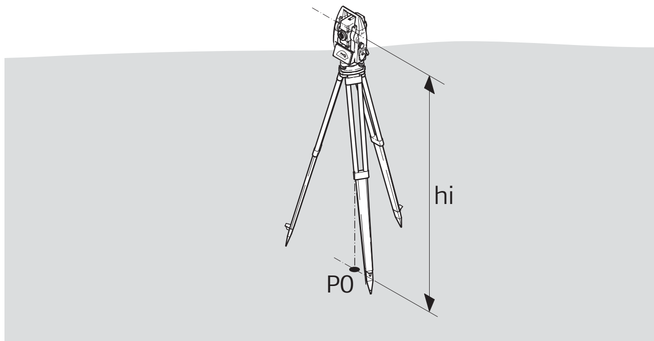


☞ When at least three points have been measured and calculated, the **Residuals** screen can be accessed by tapping the residuals button, where inaccurate measurements can be removed. Tap ✓ to accept.



4.7 Transfer Elevation to Instrument Placed over Height Benchmark TPS

General description



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hi	Instrument height
P0	Benchmark

Given:

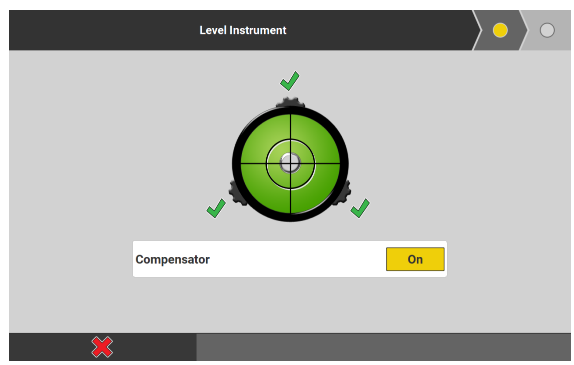
- Instrument placed over benchmark with given elevation.

Transfer elevation to instrument placed over height benchmark step-by-step

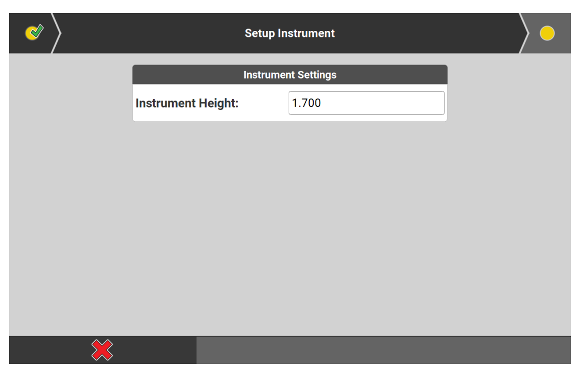
1. Select **Setup** from the Home Menu.

2. Select **Heights** - **Over reference point**.
For an overview of available setup methods refer to Setup Methods.

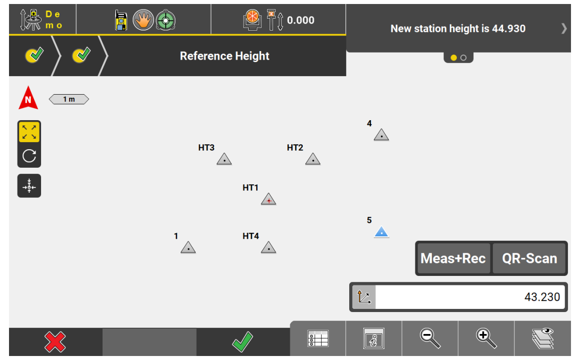
3. Level instrument, then tap the next Wizard step  to proceed.



4. Enter **Instrument Height**.
Tap  to confirm.



5. In the next Wizard step, either select the relevant point from the map, or directly enter the height of the bench-mark.



☞ Alternatively, tap **QR-Scan** to scan point information.
To be able to use the QR-Scan function your entitlement needs to include the QR-Code Reader licence.
For further information refer to: Importing data using QR-Scan step-by-step

6. Tap to confirm. The new station height is set.

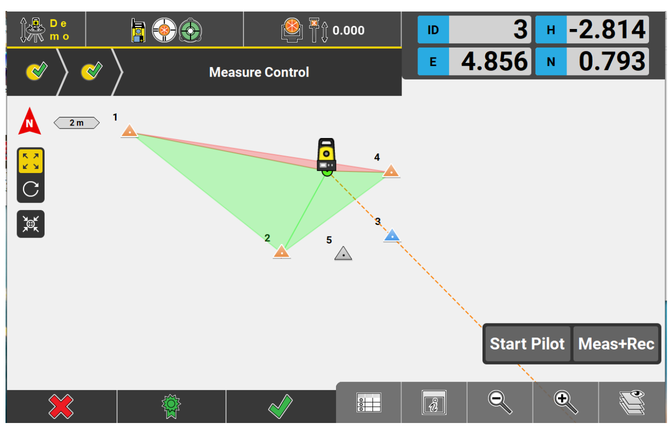
4.8 Setup Graphics

Setup Graphics

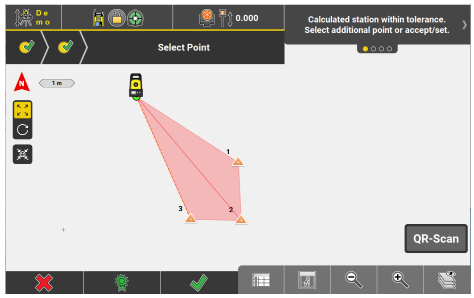
☞ Available for setup methods:
- Anywhere
- Setup Pilot
- Control Line

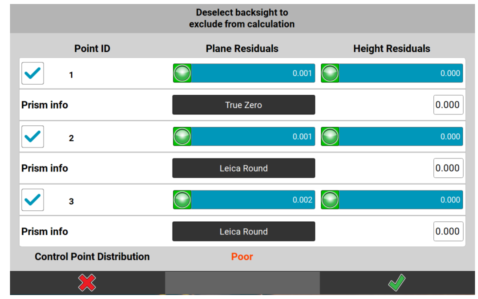
See also: Setup Methods

As a means of quality control for setup constellations, the angles measured between points used to create a station and the station itself are checked during setup and graphically indicated as good, if they are between 35° and 145°, or poor if they are outside of this range.

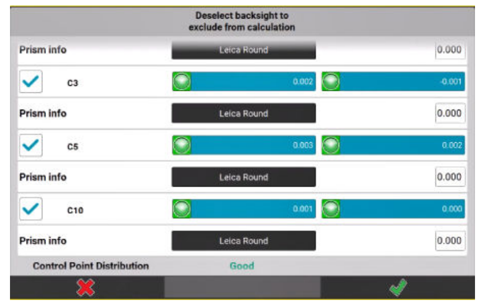


In the **Residuals** screen the **Control Point Distribution** is indicated as **Poor** if more then 50% of the angles are identified as poor.

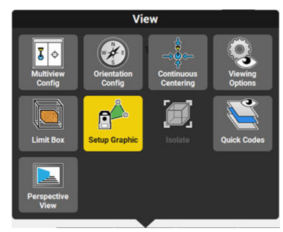




To improve the constellation the station should be in the center of the control points. You can also try and use different control points to improve the quality of the station setup.



☞ Setup graphics are also stored to the report and can be turned on or off persistently via the View Settings.



5 How to Setup a GPS Base Station GPS

5.1 Control Points

Adding control points to a job

For some setup procedures, control points need to be available in the current job. There are different ways to add control points to a job.

Importing control points	You can import a list of control points. Refer to Importing data to the project step-by-step. ☞ When importing TPS control points, information on prism type and height is only imported for file types *.geo and *.xml. After importing the control points, add missing information using the toolbox function **Edit** in the point list. Refer to 2.5 Point List, Searching for a Point.
Defining new points as control points	When creating new points in the point list, you can define them as control points. Refer to 2.5 Point List, Searching for a Point (Toolbox function **New**). ☞ After creating a TPS control point, add the information about prism type and height using the toolbox function **Edit**.
Turning existing measured points into control points	• Open the point list and select an existing measured point. • Use the toolbox function **Edit** to turn the point into a control point. • For TPS points define prism type and height and the coordinates of the new control point. Refer to 2.5 Point List, Searching for a Point (Toolbox function **Edit**).
Defining measured points as control points	In the **Measure** application, activate the toolbox function **Control Point** to define measured points as control points. • To measure and store a control point, press **Start**. All measured points are stored as control points. • For TPS points select the correct prism type and height (refer to 1.3.1 Prism Types and Prism Heights). ☞ The information about the currently selected prism type and height is stored together with the measured control point.

Creating control points in the Draw/ Sketching application

Create a single control point

- Select the toolbox function **New Point**.
- Enter the coordinates for the new point.
- Tap to activate the **Control Point** function or select **Control Point** in the toolbox.
- Tap to create the control point.

Create several control points along a line

- Select the toolbox function **Start Point**.
- Define direction of the line, distance from the start point and height.
- Select **Control Point** in the toolbox.
- Tap x1 and enter the desired number to create several control points along a line.
- Tap to create the control points.

Information about prism type and prism height for TPS points

The information about prism type and height of a control point only needs to be defined once. There are two possibilities to define this information:

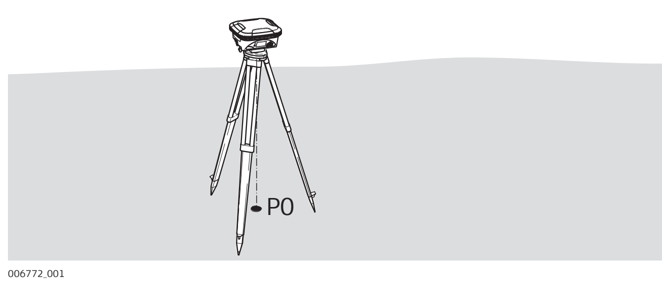
- Define this information directly after adding control points to a job by using one of the previously described methods.
- Define this information when using a setup procedure with coordinates for the first time:
  Before measuring an existing control point, select the correct prism type and height. The information about the currently selected prism type and height is stored together with the measured control point.

☞ The next time you start a setup procedure, this information is automatically set for each control point. You can directly select and measure the control points for setup.

5.2 GPS Base Station Setup over Known Point GPS

General description

☞ iCON iCG60 and iCON iCG70 require a licence to use this application.



P0 Known point

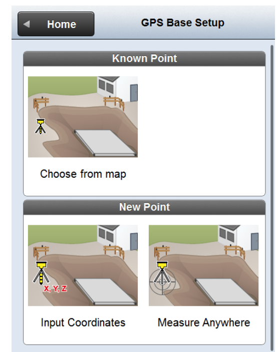
Given:

- Control points in the chosen coordinate system are active within the current job. Refer to 5.1 Control Points.
- Instrument is set up with a Base profile. Refer to 1.5.2 Setting up a GPS Profile for iCON iCG30/iCON iCG70 or 1.5.5 GPS Profile Setup for iCON iCG60 and Other Antenna Models .
- A coordinate system is loaded to the project. Refer to Importing data to the project step-by-step.
- Coordinates must be available in WGS84.

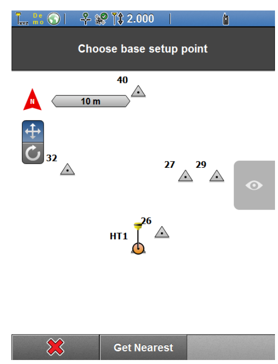
GPS Base Station setup over known point step-by-step

1. Select **Base Setup** from the Home Menu.

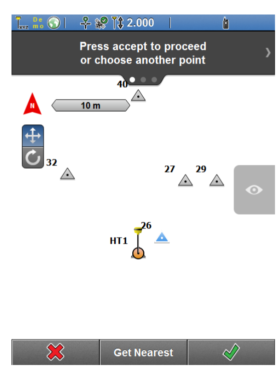
2. Select **Known Point** - **Choose from map**.



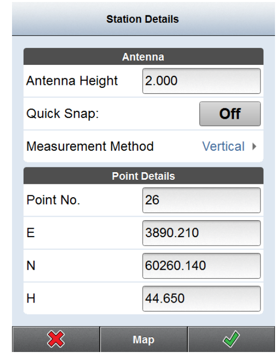
3. Tap a point in the Map screen. Alternatively, tap **Get Nearest** to display the closest points to the current antenna position. If there is only one point available, it is automatically selected.



4. When the required point is selected, tap ✓ to accept.



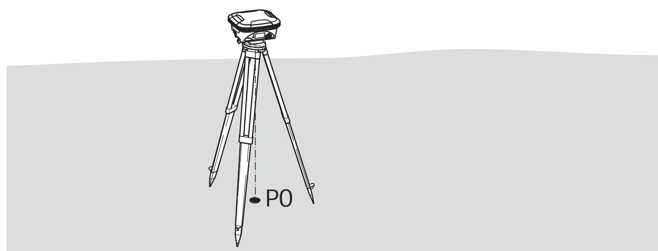
5. The **Station Details** can then be reviewed and edited. Once ✓ is pressed, the GPS Base Station starts transmitting corrections.



5.3 GPS Base Station Setup over New Point GPS

General description

☞ iCON iCG60 and iCON iCG70 require a licence to use this application.



006772_001

P0 Station (sought)

Given:

- Instrument is set up with a Base profile. Refer to 1.5.2 Setting up a GPS Profile for iCON iCG30/iCON iCG70 or 1.5.5 GPS Profile Setup for iCON iCG60 and Other Antenna Models .
- A coordinate system is loaded to the project. Refer to Importing data to the project step-by-step.

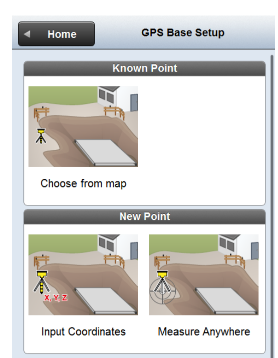
☞ Two possibilities available: **Input Coordinates** or **Measure Anywhere**.

GPS Base Station setup over new point

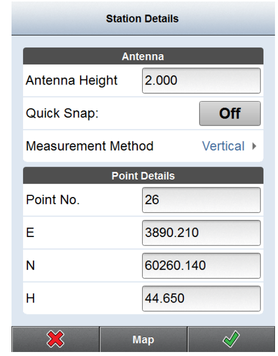
Input Coordinates:

1. Select **Base Setup** from the Home Menu.

2. Select **New Point - Input Coordinates**.



3. Enter the antenna and point information in the **Station Details** screen, tap ✓ to accept.

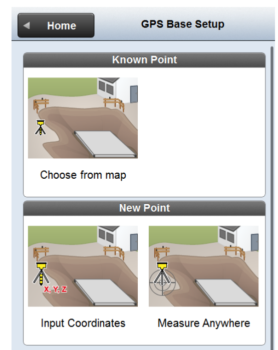


☞ Once ✓ is pressed, the GPS Base starts transmitting corrections.

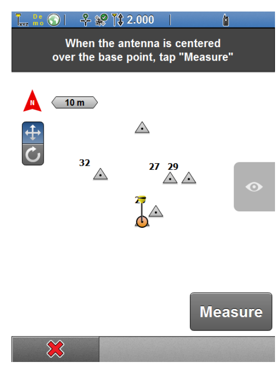
Or alternatively, Measure Anywhere:

1. Select **Base Setup** from the Home Menu.

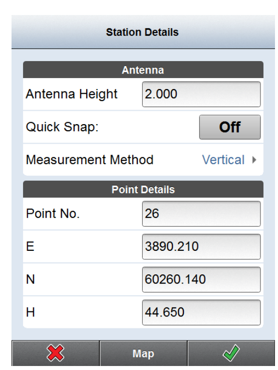
2. From the **GPS Base Setup** Menu, select **New Point - Measure Anywhere**.



3. Centre the antenna over the base point, and tap **Measure**.



4. The **Station Details** screen is displayed. Check the information, and tap ✓ to accept.



☞ Once ✓ is pressed, the GPS Base starts transmitting corrections.

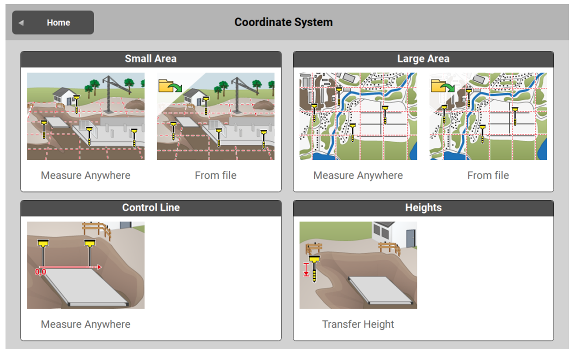
6 How to Create a New Coordinate System GPS

6.1 Coordinate Systems GPS

General description

Measure points with known coordinates to create a coordinate system for use in either a **Small Area** (< 10 km^2) or a **Large Area**.

Measure Anywhere



Preconditions:

- Control coordinates are available within the current job. Refer to Importing data to the project step-by-step.
- Instrument is set up with a Rover profile and has a GNSS-fixed position. Refer to 1.5.2 Setting up a GPS Profile for iCON iCG30/iCON iCG70 or 1.5.5 GPS Profile Setup for iCON iCG60 and Other Antenna Models .

For **iCON site**, **iCON site Plus**, **iCON build Plus** you can, instead of measuring points, import control points **From file**.

GNSS coordinates will be imported together with control coordinates for a given set of points.

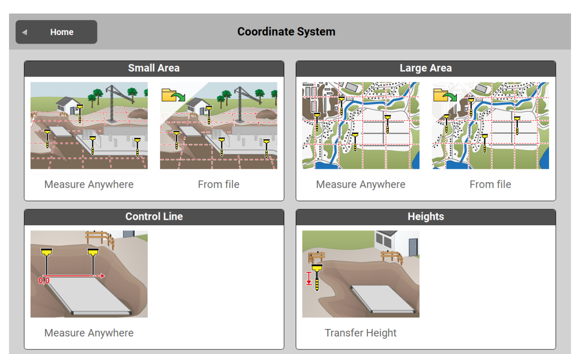
Precondition is that **Localization from File** is set to be active in the User Permissions. See also: User Permissions

6.1.1 Create Coordinate System by measuring points

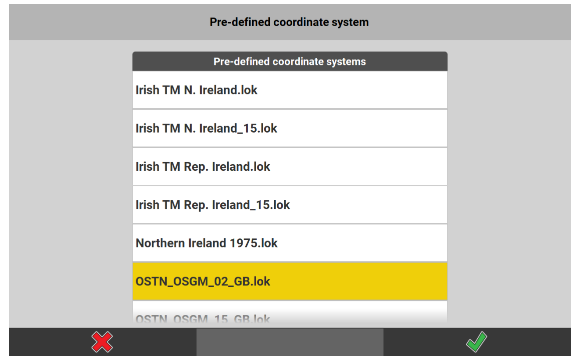
Create a new Coordinate System step-by-step

1. Select **Coordinate System** from the Home Menu.

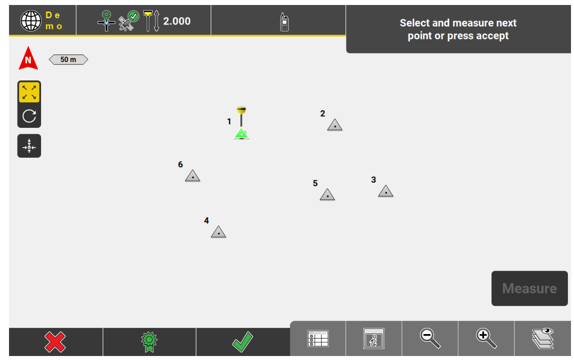
2. From the **Coordinate System** Menu, go to **Small Area** and tap on **Measure Anywhere**.



☞ For **Large Area** the workflow is the same, except that for **Large Area** a predefined coordinate system must be selected.

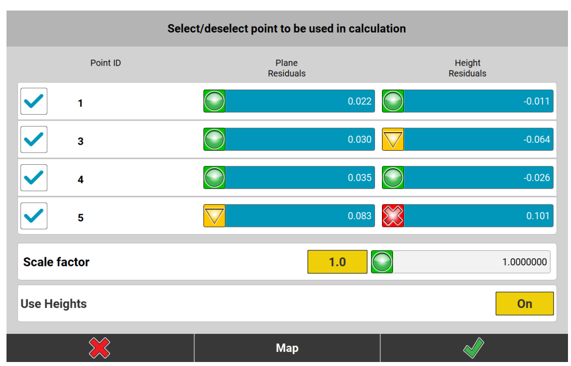


3. Select the first point, then press **Measure**. Repeat for further points.



☞ Define **Measure Mode** in the Status 1 menu. According to the setting selected, the measure key may differ from the description within this guide.

4. Tap in the Map screen to view residuals for each measured point.



- Tap to deselect a point.
- Heights can be turned **On** and **Off** altogether.
- Tap on individual Plane Residuals or Height Residuals to deselect single values.
- For a **Small Area** the scale can be set/locked to 1.000.

5. Tap **Map** at the bottom of the screen to return to the Map screen.

6. In the Map screen tap ✓ to save changes and create the Coordinate System.

☞ It is possible to cancel and store an unfinished localisation. In this case the unfinished localisation can be resumed the next time the **Coordinate System** application is started.

7. Confirm or enter a new name for the *.lok file and tap ✓ to save the file.

6.1.2 Create Coordinate System from imported Control File

General description

☞ The Control file needs to be of format *.txt or *.csv.

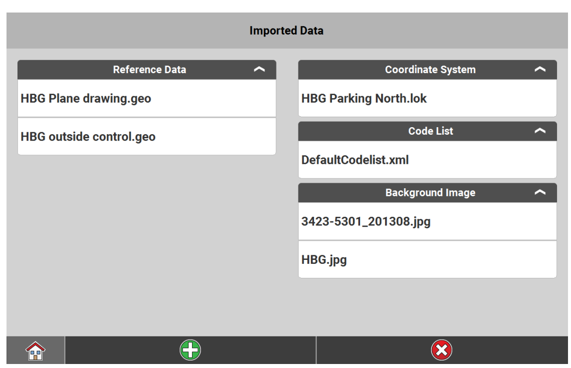
☞ Precondition is that the file contains coordinate information for each point on Easting, Northing, Height (Control Coordinates in local system) as well as Latitude, Longitude, Ellipsoidal Height (WGS84). Points without WGS84 information are imported but cannot be used for *.lok file creation.

Example of *.csv file:

	A	B	C	D	E	F	G
1	Point ID	Easting	Northing	Height	Latitude	Longitude	Ell.H
2	1	2764562.866	1253174.252	404.405	47.24316926	9.370915781	451.129
3	2	2764593.575	1253155.138	404.464	47.24310464	9.371059658	451.188
4	3	2764611.953	1253154.016	404.394	47.24309935	9.371147132	451.118
5	4	2764640.082	1253168.945	404.581	47.24314514	9.37128323	451.306
6	5	2764641.509	1253161.247	404.59	47.24312009	9.371289009	451.314
7							

Import Control file step-by-step

1. Select **Import & Delete** from the Home Menu.

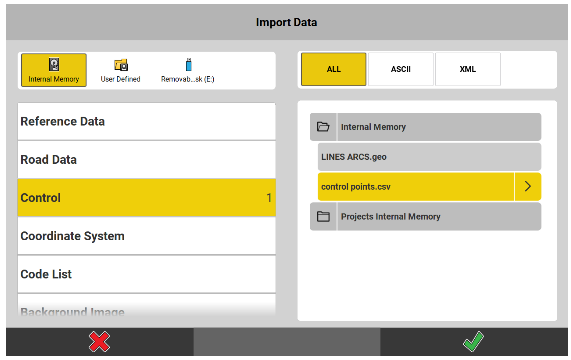


All data that is already loaded to the active project is displayed.

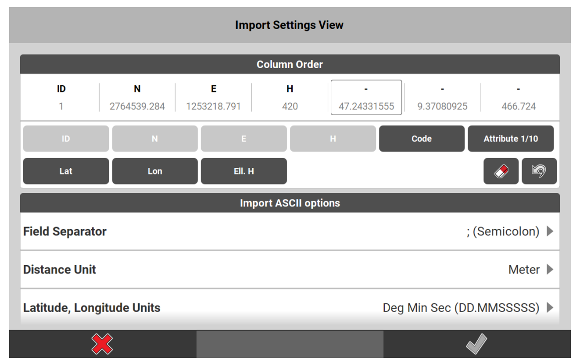
2. Tap ⊕ to import more data.

☞ For general information on how to import data step-by-step see: Importing data to the project step-by-step

3. Select the type of data to import. Tap **Control**.

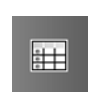


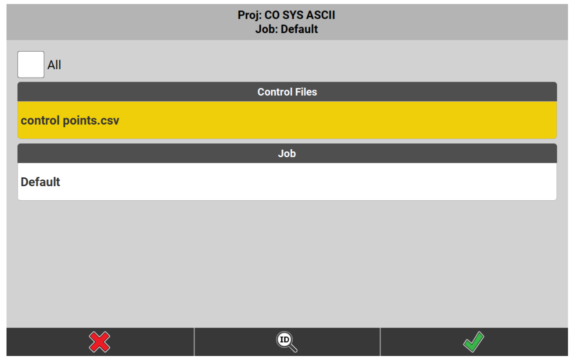
All files that are available for import are displayed on the right side.

4.	Tap  next to the file to be imported.
	The Import Settings View is displayed.
5.	Define the content of each column by tapping the buttons. Ensure that Easting, Northing and Height as well as Latitude, Longitude and Ellipsoidal Height are assigned correctly to the relevant columns. 
☞	The display jumps from one column to the next. The buttons turn grey and cannot be used a second time.
☞	Tap  to erase your selection. Tap  to undo your last action.
6.	Adapt the unit setting for latitude and longitude to the unit used in the file. ☞ Only 'Degrees Minutes Seconds' (DD.MMSSSSSS) or Decimal Degrees are supported.
7.	When all columns are defined tap  .
8.	Back in the Import Data page tap  again to complete the data import.

Inspect imported file

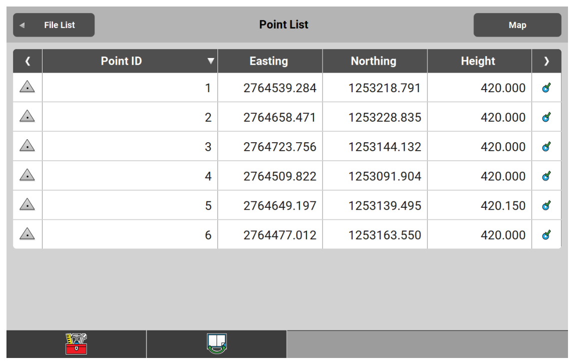
The imported file can be inspected before using it for coordinate system creation.

1. Select **Point List** from the **Map handler**. 



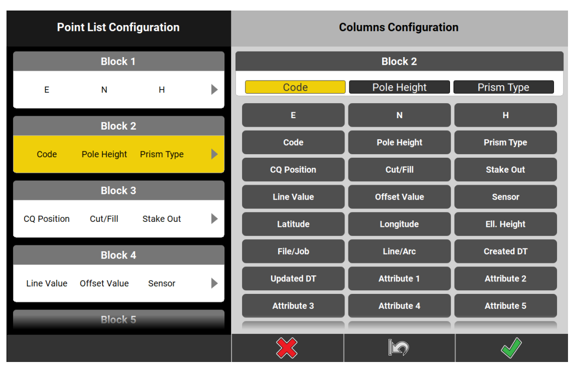
A list of available files is opened.

2. Tap the imported file in order to select it. The tap ✔.



The Point List is displayed for the selected file.

3. Tap and hold one of the column headers, for example Northing.



The Point List Configuration page is displayed.

4. Define one block to show Latitude and Longitude. Select None for the third column.
Define the Ellipsoidal Height in an extra block to prevent the Latitude/Longitude values from being cut off.

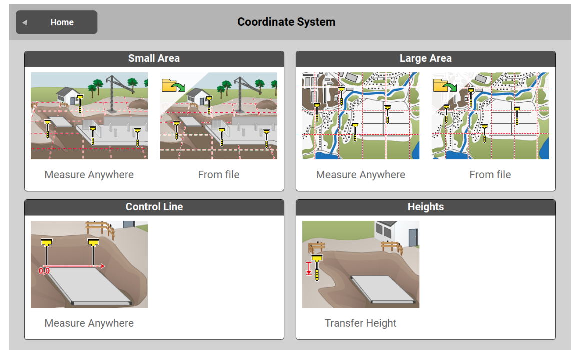
5. When all blocks are defined tap ✔.

☞ For further information on how to use and configure point lists see: How to use Point List step-by-step

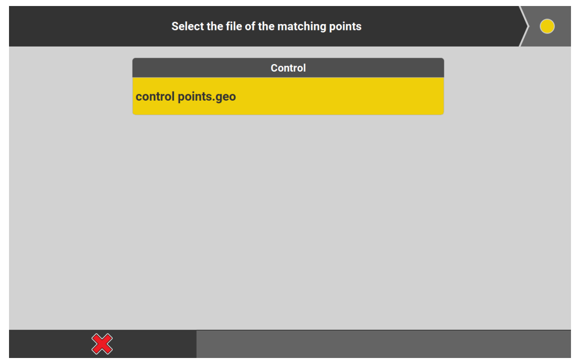
Create Coordinate System from File

1. Select **Coordinate System** from the Home Menu.

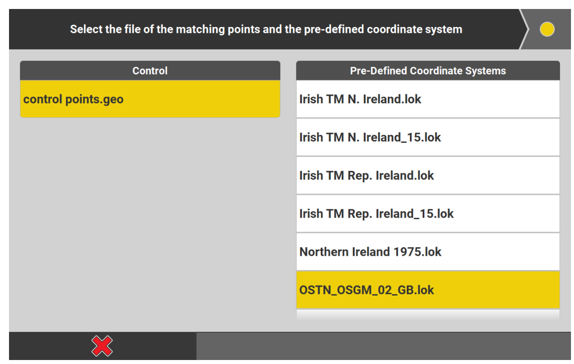
2. From the **Coordinate System** Menu, go to **Small Area** and tap on **From file**.

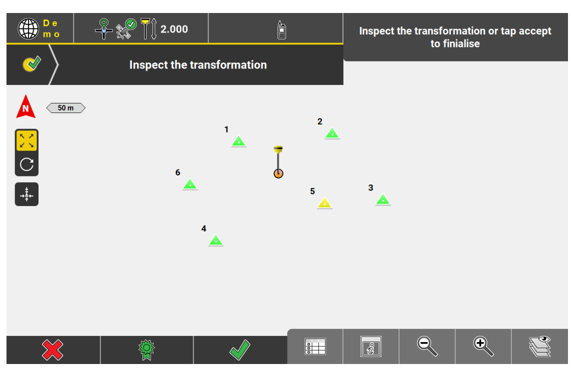


3. Select the Control file and tap the yellow button in the top right corner.



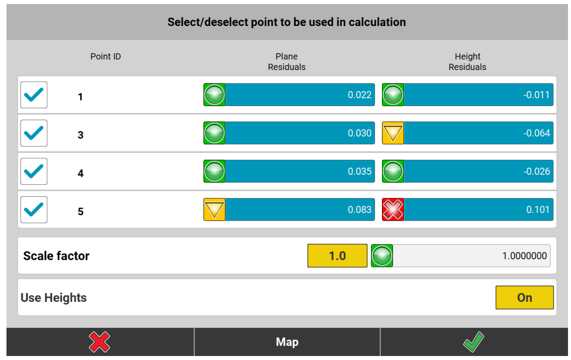
☞ For **Large Area** the workflow is the same, except that for **Large Area** a predefined coordinate system must be selected.





The Map screen is then displayed showing the points that shall be used for the transformation.

4. Tap  to view residuals for each measured point.



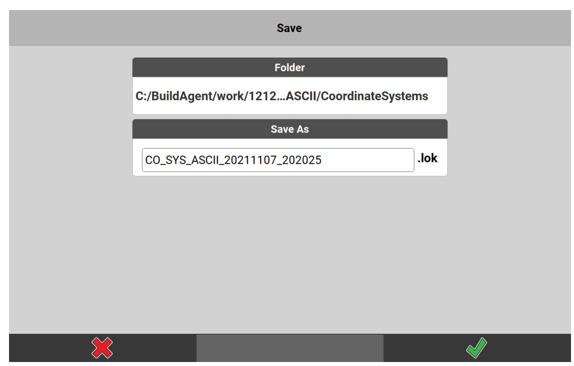
- Tap to deselect a point.
- Heights can be turned **On** and **Off** altogether.
- Tap on individual Plane Residuals or Height Residuals to deselect single values.
- For a **Small Area** the scale can be set/locked to 1.000.

5. Tap **Map** at the bottom of the screen to return to the Map screen.

6. In the Map screen tap to save changes and create the Coordinate System.

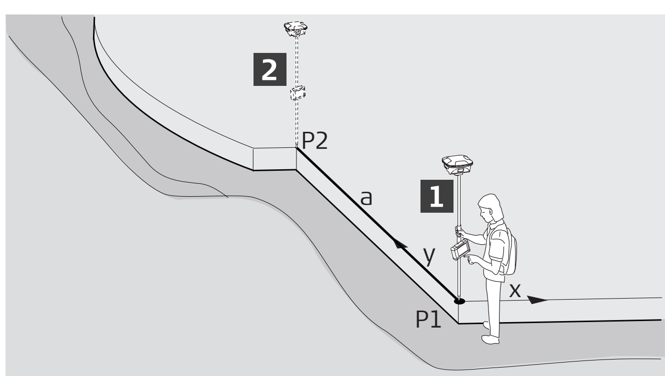
☞ It is possible to cancel and store an unfinished localisation. In this case the unfinished localisation can be resumed the next time the **Coordinate System** application is started.

7. Confirm or enter a new name for the *.lok file and tap to save the file.



6.2 How To Define a Control Line using GPS GPS

General description



006791_001

P1	Start point
P2	Direction point
a	Control line (sought)

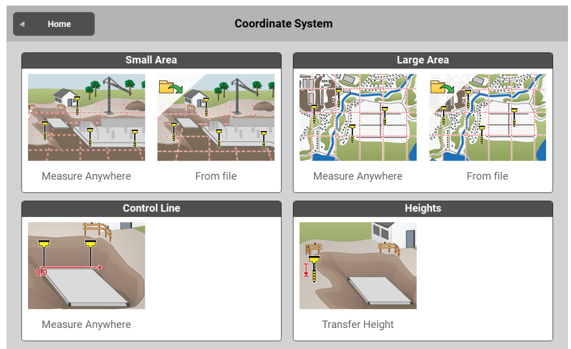
Given:

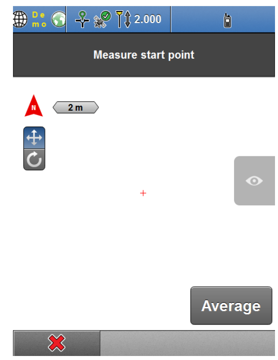
- Instrument is set up with a Rover profile and has a Fixed position. Refer to 1.5.2 Setting up a GPS Profile for iCON iCG30/iCON iCG70 or 1.5.5 GPS Profile Setup for iCON iCG60 and Other Antenna Models .

How to define a control line using GPS step-by-step

1. Select **Coordinate System** from the Home Menu.

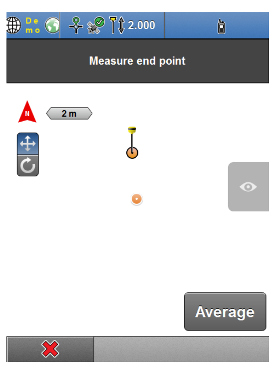
2.
- From the **Coordinate System** Menu, select **Control Line**.
- Position the antenna, and press **Average** to record the first point.

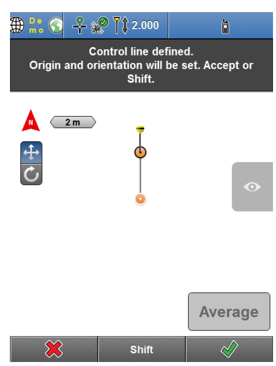




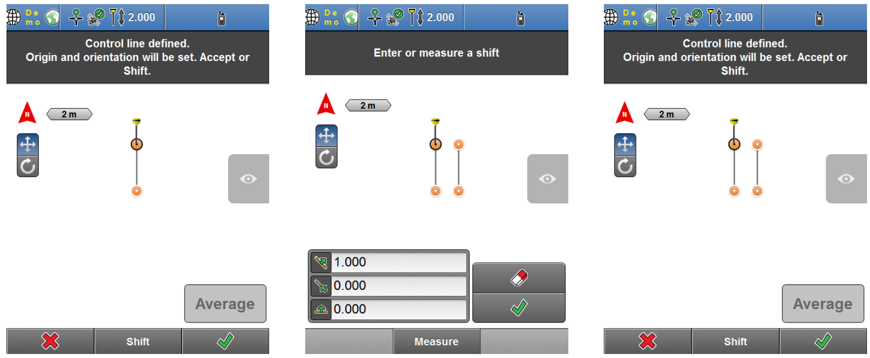
☞ Define **Measure Mode** in the Status 1 menu. According to the setting selected, the measure key may differ from the description within this guide.

3.
- Move antenna to second point of the control line. Press **Average**.
- The control line is now defined. Tap ✓ to confirm.





4.
- To Shift the origin of the control line, press **Shift**.
- Enter shift values in the Toolbar. To measure a Shift, press **Measure**.
- Position the antenna, and press **Average**. The origin of the control line is shifted to the new point. Tap ✓ to confirm the shift.



6.3 How To use GPS Height Transfer GPS

General description

Given:

- Instrument is set up with a Rover profile and has a Fixed position. Refer to 1.5.2 Setting up a GPS Profile for iCON iCG30/iCON iCG70 or 1.5.5 GPS Profile Setup for iCON iCG60 and Other Antenna Models .

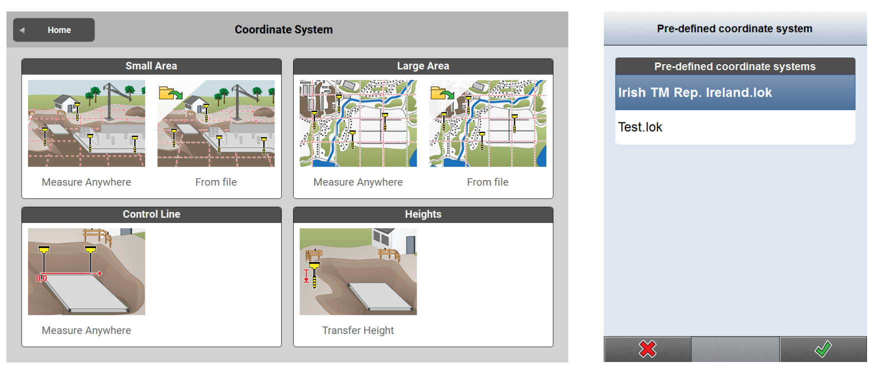
☞ **Height Transfer** enables to simply define a **local height system** and consider the local height to all points measured afterwards.

GPS height transfer step-by-step

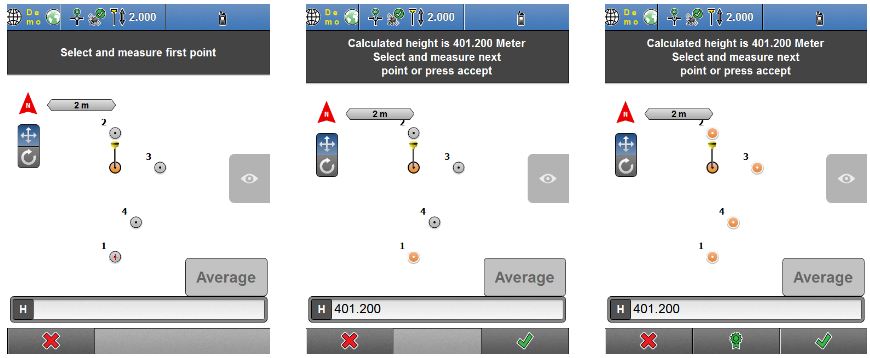
1. Select **Coordinate System** from the Home Menu.

2. - From the **Coordinate System** Menu, select **Height Transfer**.
   - Select a coordinate system, either from the project or a pre-defined one. Tap ✓ to accept.

   ☞ If a coordinate system is already present in the current project, that step is skipped.



3. - Select an existing point, either from the map or the Point List, to get the height from or input height value directly.
   - Tap ✓ to accept the local reference height or measure further points.



☞ Define **Measure Mode** in the Status 1 menu. According to the setting selected, the measure key may differ from the description within this guide.

4. - When at least two points have been measured, the **Residuals** screen can be accessed by tapping , where inaccurate measurements can be removed.
   - To finish the localisation tap **OK** in the **Confirmation** screen. Then save the new Coordinate System, either with the proposed name or a user defined one, by tapping ✓ .
   - Confirm the next information screen. From now on all points measured will have the reference height applied.

☞ When more than one point has been measured to define the local reference height, a **best fit** solution will be applied and used as the height difference. This means that the local reference height is balanced from the measured heights and the height difference equals the height of the newly measured point minus the local balanced reference height.

7 How to Measure and Record Data TPS + GPS

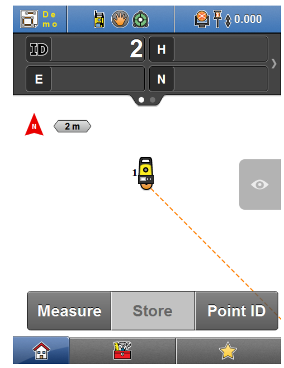
7.1 General Information TPS + GPS

General description

Measure is an application that records and displays point and line information obtained using the connected Total Station or GPS instrument.

Points, lines and arcs can be measured, recorded and displayed within the Map screen. Descriptions, codes, and IDs can be assigned to each element. All element information can later be exported to office software.

All measurements are performed using the **Measure bar**, which can be configured to display the commands you require. Refer to Measure bar for more information.



Commands can also be placed in the Favourites key. Refer to Measure bar (Information about Favourites menu configuration) for more information.

Information preview for points

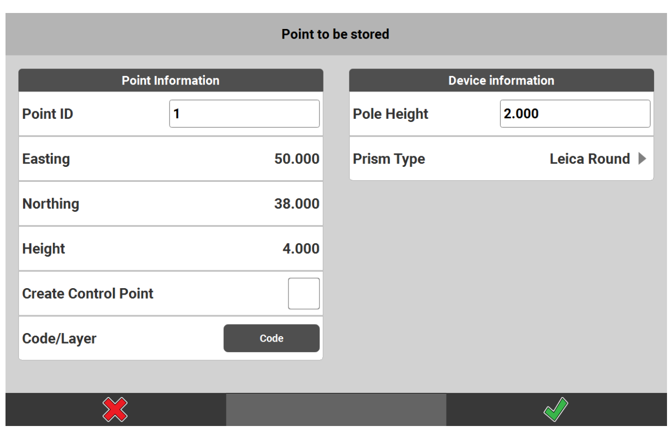
When you measure single points, a preview window pops up showing the values to be stored for the measured point, for example Point ID, coordinates, assigned code and attributes.

☞ By default, the preview window for measured points is disabled. To enable the preview, tap **System** in the Home screen, select **Display** and set the option **Information preview for points** to **On**.

Depending on the connected device and the currently used application, more values are given on the right side of the preview window.

☞ The preview window is not available in Sketch (Draw) application.

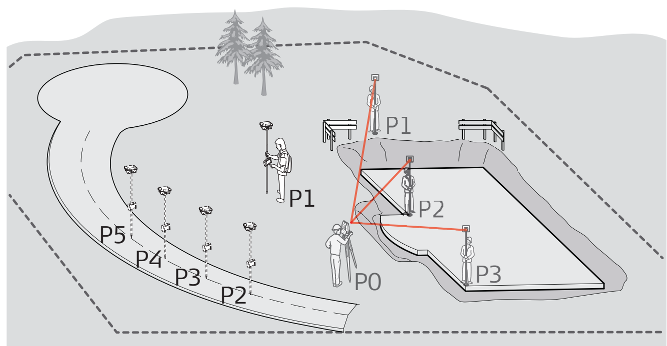
Example for a point measured with TPS



- If necessary, you can edit the point values in the preview window before storing the point.
  For example, change the point ID or assign a code.
- To store the point and return to map view, tap ✓ .
- To return to map view without storing the point, tap ✗.

7.2 Measuring and Recording Points, Lines and Curves TPS + GPS

General description



006773_002

P0	Known station
P1...	Target

Given:

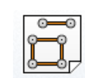
- Instrument is connected and set up.

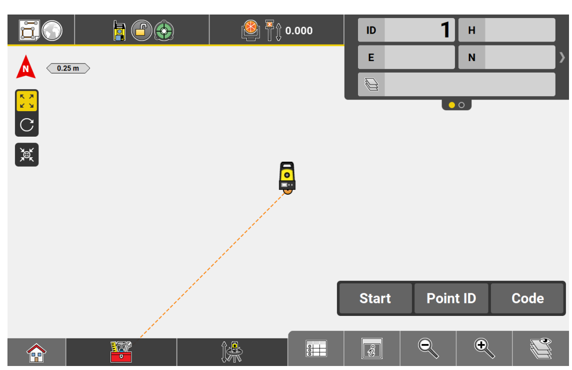
☞ Note that main workflow refers to Total Station. For GPS press **Measure** to record a point.

Measuring and recording points, lines and curves step-by-step

Measuring and recording points

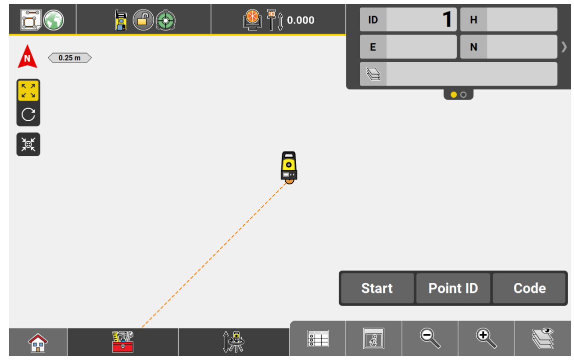
1. Select **Measure** from the Home Menu.





Map screen is displayed.

2. Sight target and press **Start**.

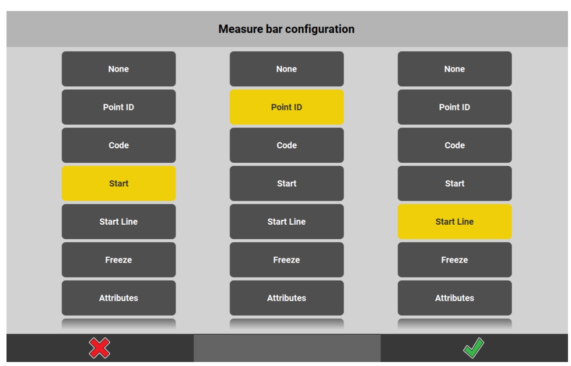


3. After measuring, press **Store** to store the point.

Measure and store as many points as required.

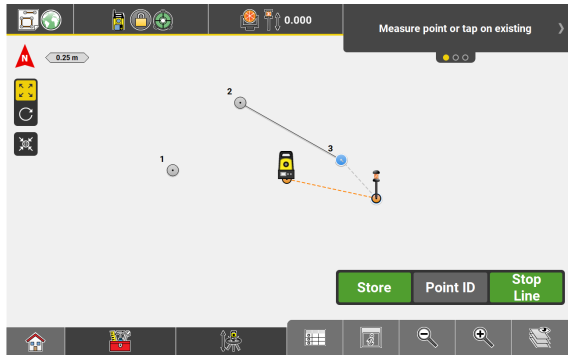
Measuring and recording lines

1. To create lines between points, **tap and hold** the Measure bar. Configure to display the **Start Line** function. Tap ✓ to accept.



2. Press **Start Line**.

3. Measure and store points.



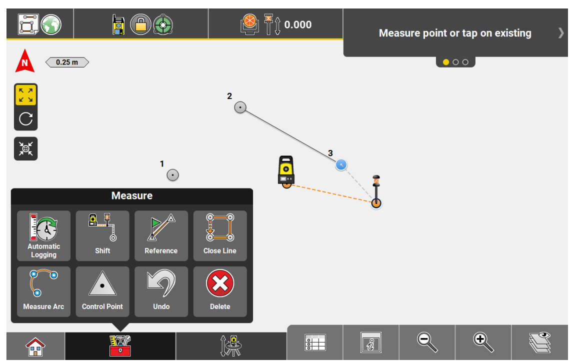
A line is drawn between the points.

4. To disable the line function, tap **Stop Line** in the Measure bar.

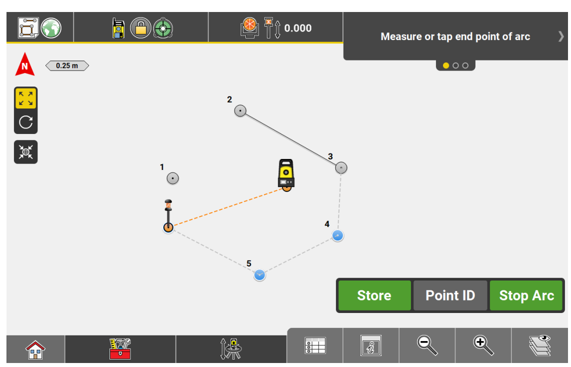
☞ It is also possible to measure points and/or use existing points to create lines.

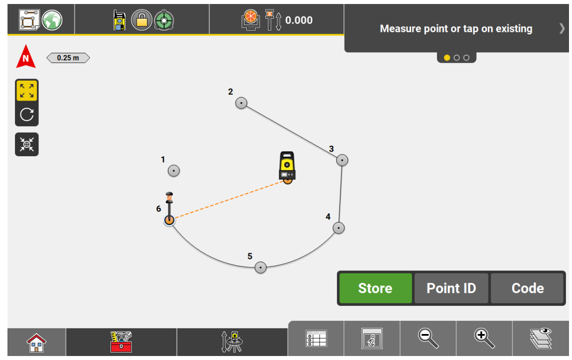
Measuring and recording arcs

1. To create arcs from three points, select **Measure Arc** from the Toolbox.



2. Measure and store three points.





When the third point is stored, the arc is created.

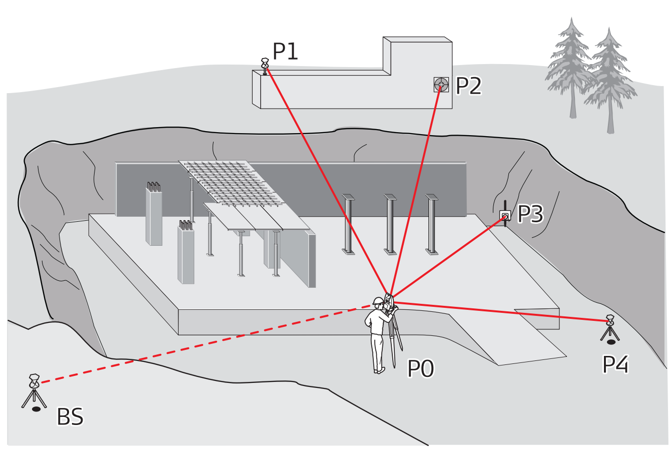
☞	It is also possible to measure points and/or use existing points to create arcs.
☞	It is possible to combine line and arc elements in a single polyline. If you want to start a combined polyline with arc elements first start the line, then invoke the Measure Arc tool. When the arc is done, continue the line if desired or stop it. See above.
☞	It is possible to join existing lines/polylines and arcs. See also: How to draw a plan step-by-step

7.3 Measuring Sets of Angles TPS

General description

The Sets of Angles tool allows you to measure up to ten sets of points; within each set, you can measure several foresight points using one of the following measurement methods.

Measurement method	Measuring sequence
B1-F1-F2-B2	All points are measured in face I, then measured in face II in reverse sequential order.
B1-F1-B2-F2	All points are measured in face I, then measured in face II.
B1-B2-F2-F1	Backsight point is measured in face I immediately followed by face II. Other points are measured in alternating face order.
B1-B2-F1-F2	Backsight point is measured in face I immediately followed by face II. Other points are measured in face I, face II order.



16238_001

P0 Known station
P1 Foresight point
P2 Foresight point
P3 Foresight point
P4 Foresight point
BS Backsight point

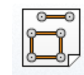
Given:

- Instrument is connected and set up.

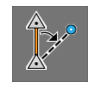
☞ iCON site requires an additional license to use this application.

Measuring sets of angles step-by-step

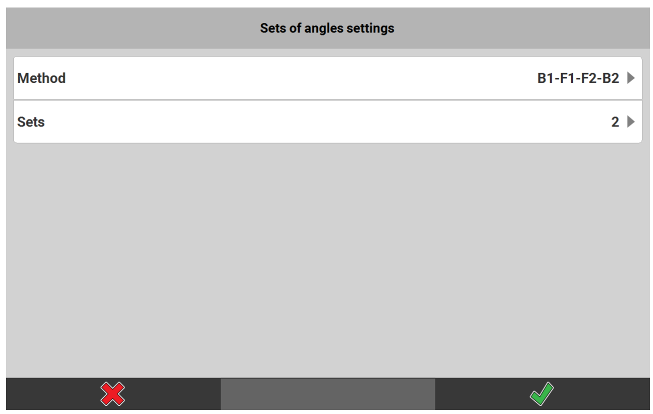
1. Select **Measure** from the Home Menu.
Map screen is displayed.



2. Select **Sets of Angles** from the toolbox.



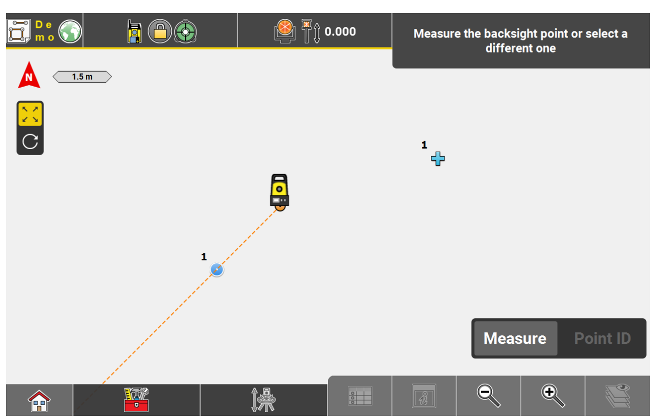
The Sets of angles settings screen is displayed.



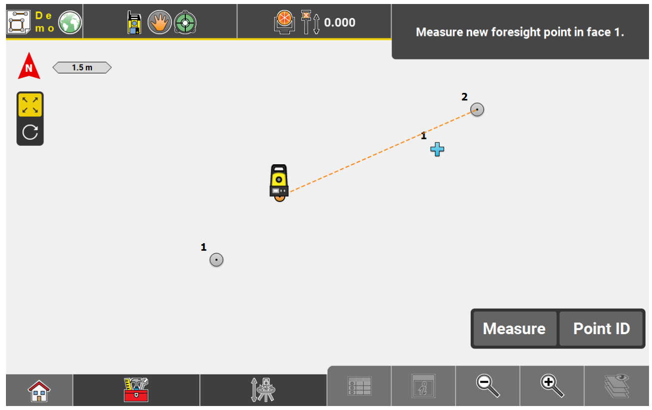
3.
- To define another method, tap **Method**.
- To define the number of sets, tap **Sets**.

Tap ✓ to accept.

4. *Map screen is displayed.*
Select a backsight point and measure it. Follow the instructions on this screen.



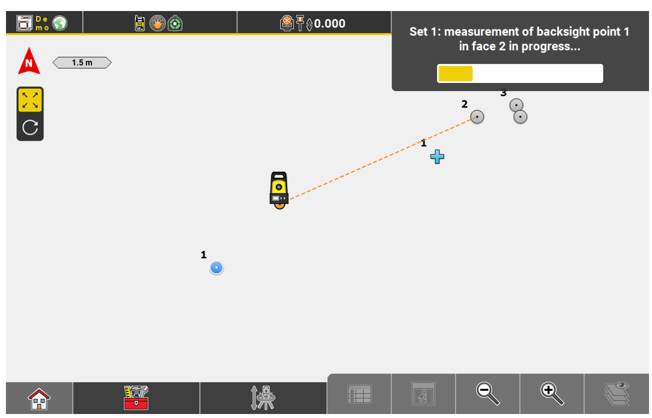
5. Measure a foresight point.



6. *An information message is displayed, allowing you to add more foresight points to the set.*
   - To add another foresight point, tap **OK**.
   - To start the measurement process, tap **Define Set**.

7. **Working with a manual total station:**
   Turn the instrument to sight the defined points in the desired face and trigger the measurement manually. Follow the instructions on this screen.
   Working with a robotic total station:
   The instrument automatically turns to the defined points and measures them. A progress bar is displayed during the measurement process.

   ☞ If **Prism Type** is set to "reflectorless" or "tape", or if **Measure Mode** is set to "Single Manual", you must fine aim and trigger the measurement manually.

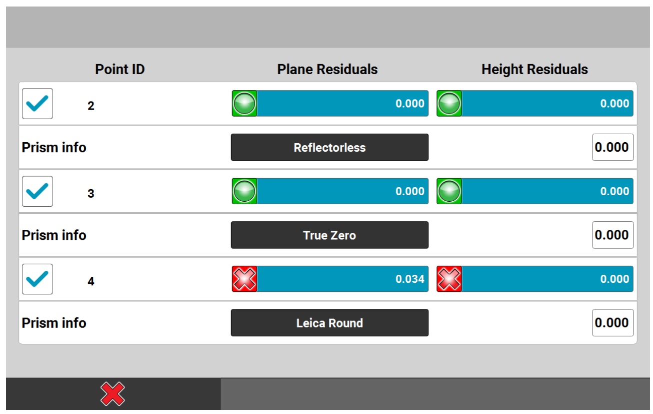


8. *As soon as the measurement process is finished, the residuals for each measured point are displayed.*

☞ Inaccurate measurements cannot be stored. Remove points with inaccurate measurements.

☞ If necessary, you can change the prism type and height for each point.

- Deactivate a checkbox to remove a point with inaccurate measurements.
- To return to map screen without saving any measurements, tap ✖.
- Tap ✔ to store the measurements and return to the map screen.

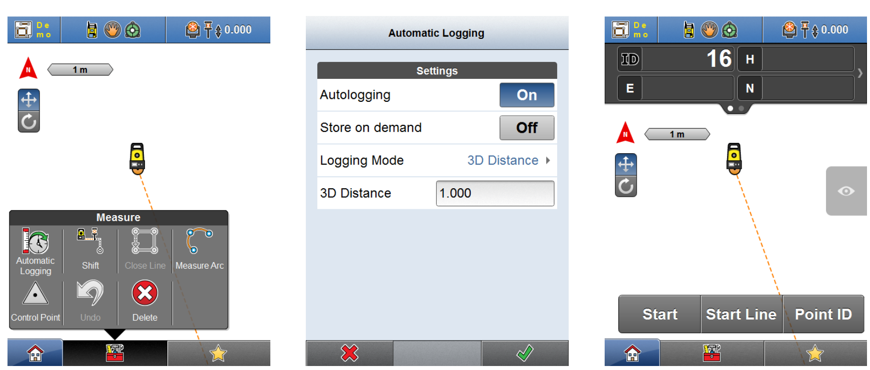


7.4 How to Store Points Automatically TPS + GPS

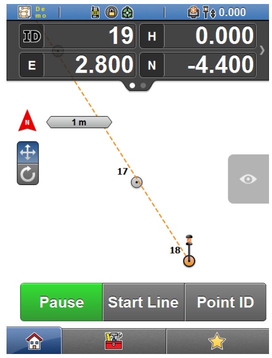
☞ This feature is available when using a Robotic Total Station or GPS instrument.

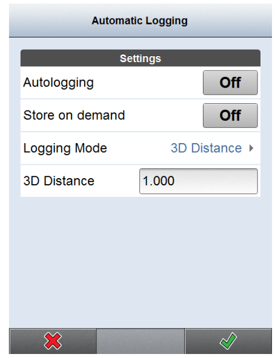
How to store points automatically step-by-step

1.
- In **Measure**, select **Automatic Logging** from the Toolbox.
- In the **Automatic Logging** screen, set **Autologging** to **On**. Select the **Logging Mode** from **3D Distance**, **Distance and/or Height**, **Time**, or **Time over a point** and define the Interval. **Store on demand** allows to record measurements anywhere in between, if enabled. Tap ✔ to accept.
- Press **Start** in the Measure bar.



2. - As the target position moves, points are automatically stored at the defined time/distance interval. Press **Pause** to temporarily stop storing points.
   - To turn off automatic logging, set the mode to **Off** in the **Automatic Logging** screen.

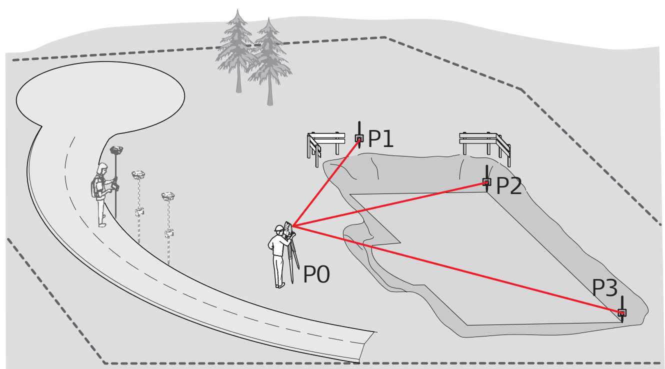




7.5 Point IDs and Codes TPS + GPS

7.5.1 Applying Point IDs to Measurements TPS + GPS

General description



006774_001

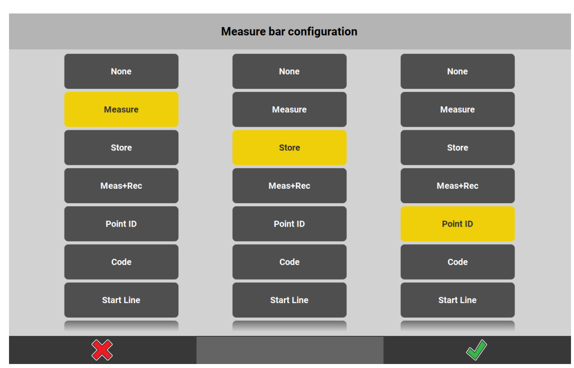
P0	Known station
P1...	Target

Given:

- Instrument is connected and set up.

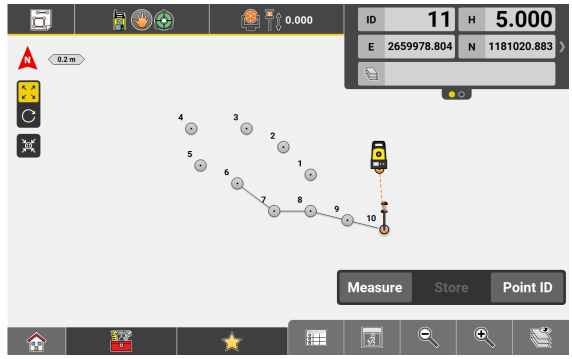
Apply point IDs to measurements step-by-step

☞ If not yet configured, **tap and hold** the Measure bar and select to display **Point ID**. Tap to accept.

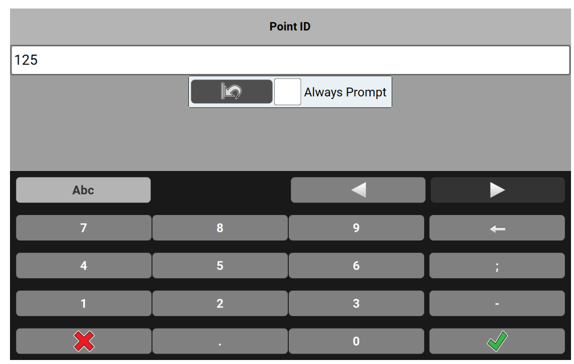


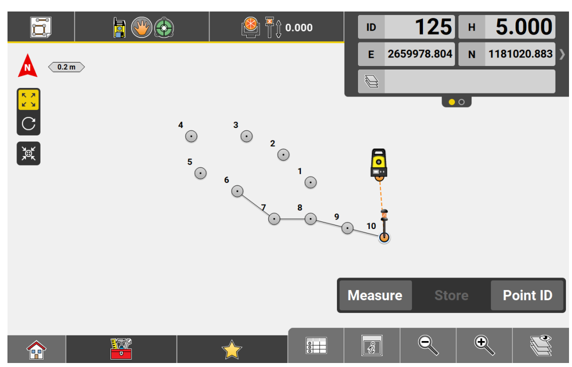
☞ It is possible to add **Point ID** and other commands to the Favourites menu in the function bar. Tap and hold the specific key while in the **Measure bar configuration** screen.

1. Tap **Point ID** to edit the ID for the next point.



2. Enter the desired Point ID. When finished, tap to accept.





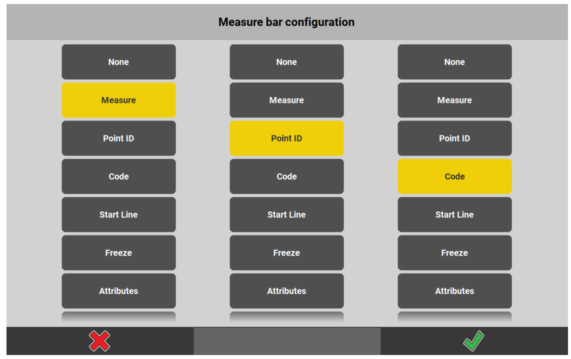
The next stored point takes the defined Point ID. Further Point IDs will follow-on numerically, incremented by 1.

To recall this function automatically for every measured/stored point, tap the **Always Prompt** checkbox.

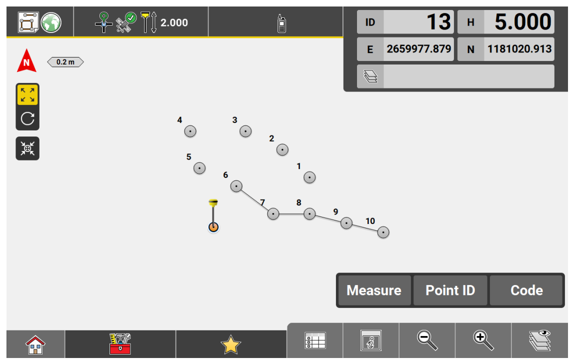
7.5.2 Defining Code for Each Stored Point TPS + GPS

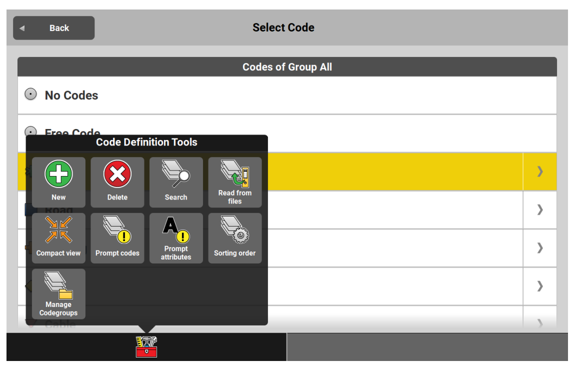
Defining a code for each stored point using the code list

1. To define a code for specific points, configure the Measure bar to display **Code**. **Tap and hold** the Measure bar.
Select **Code** from the **Measure bar configuration** screen, and tap to accept.



2.	Tap **Code** in the Measure bar.





Use Compact view from the Toolbox to toggle between the full and the compact code list view.

3.	Select a predefined code from the list. OR:

Define a new code.	Select **New** from the Toolbox. Define a new code in the text entry field. Tap when finished. New codes are stored in the code list. Now select the code.
Edit an existing code.	Tap › to edit a code. When in Compact view select **Edit** from the Toolbox. Select the code to edit and tap to accept. Edit the code as desired and tap to accept. Now select the code.

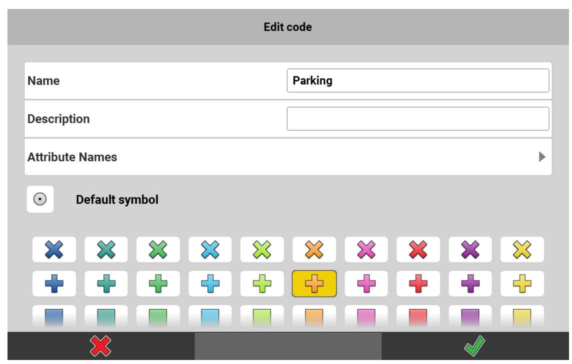
	Search for an existing code.	Select **Search** from the Toolbox. Enter the code to search for or a part of it in the text entry field and tap ✓ to accept. Now select the code.
	Search for an existing code description.	Select **Search** from the Toolbox and tap on the **Description** button in the top left corner. In the text entry field, enter the code description or a part of the code description and tap ✓ to accept. Now select the code.

4. Define or change a code symbol.
You can choose between nine different shapes, each available in ten colours.

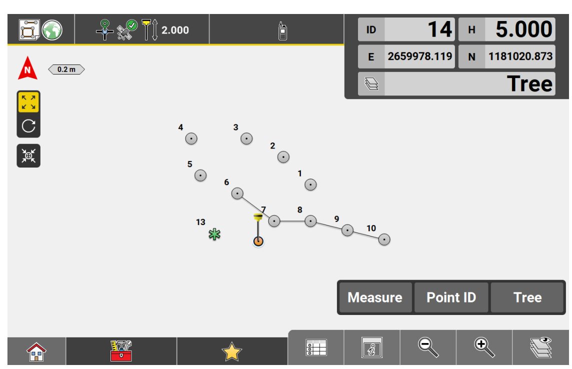
☞ Defining or changing a code symbol is only possible in the full codelist view. If necessary, deactivate **Compact view** in the Toolbox.

5. In the Edit code page tap the desired point symbol.

In the codelist view, the point symbol of the code is updated according to the selected symbol.



6. Tap ✓ to accept.



Back in the Map view the code key in the Measure bar displays the selected code. The selected code is assigned to any points that are stored.

☞ To change the active code, tap the **Code** key, and select another code.

☞ To automatically recall this function for every measured/stored point, select **Always Prompt** from the Toolbox.

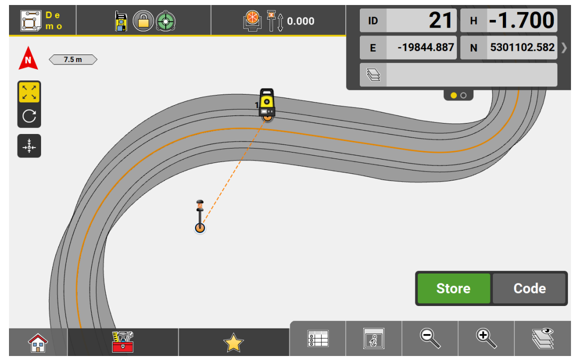
☞ To delete an existing code select **Delete** from the Toolbox. Select the code to delete and tap ✓ to accept.

☞ The code assigned to points stored allows layer management. For example it's possible to turn a code layer on or off in the Map View manager for the active job, so that only points with a specific code applied are displayed.

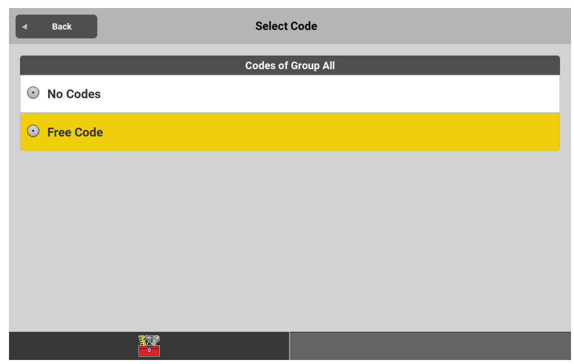
☞ Refer to Importing data to the project step-by-step for information about loading pre-defined Code Lists.

Defining a code for each stored point using Free Codes

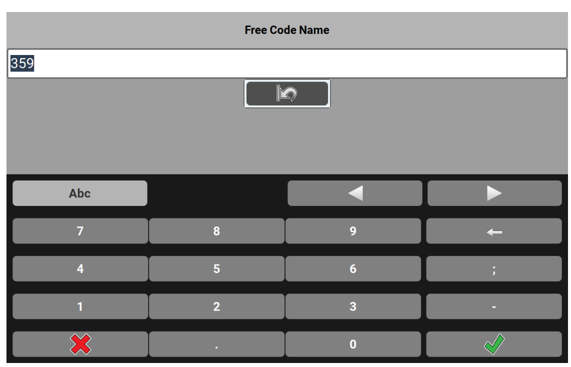
1. Tap **Start** in the Measure bar. Then, before storing the point, tap **Code**.



2. Select **Free Code**.

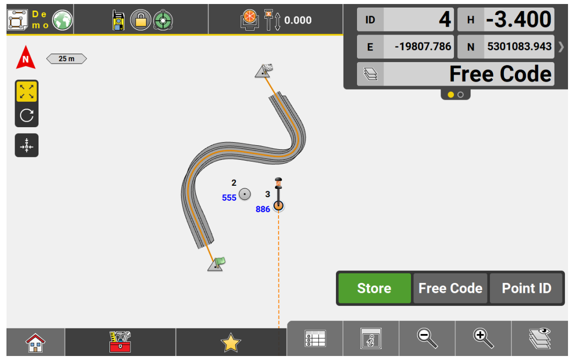


3. Back in the Map View tap **Store**.



Free Code Name page is displayed and a keyboard is shown.

4. Enter the desired code name and tap ✓.



The point will be stored with the entered code.

When you tap **Store** to measure the next point you can again enter a code name, confirm, and the point will be stored with the given code name.

☞ Free Codes will also be added to the code list.

Adding codes to the code list

If imported files contain points with codes that differ from the codes in the currently used code list, it is possible to add these codes to the code list.

1. To display the code list view, tap **Code** in the Measure bar. If necessary, configure the Measure bar to display **Code**. Refer to Defining a code for each stored point using the code list.

☞ Use **Compact view** from the Toolbox to toggle between the full and the compact code list view.

2. Select **Add Codes** from the toolbox.

The codes from all imported files are added to the code list.

Sort order in the code list view

1. To display the code list view, tap **Code** in the Measure bar. If necessary, configure the Measure bar to display **Code**. Refer to Defining a code for each stored point using the code list.

☞ Use **Compact view** from the Toolbox to toggle between the full and the compact code list view.

2. Select **Sorting order** from the toolbox.

3. Define the sort order of the existing codes:
   - **As imported/created**:
     Codes are sorted according to the order they were imported or created.
   - **Last used on top**:
     Codes are sorted according to their frequency of use. The code used last is displayed first.
   - **Alphabetical**:
     Codes are sorted alphabetically.

4. Tap ✔ to accept.
The codes are displayed according to the selected sort order.

7.5.3 Defining Attributes for a Code TPS + GPS

User-defined code attributes

For each code, you can add up to ten user-defined attributes in one of the following formats:

- **Text**
  Input is treated as plain text.
- **Value**
  Input is restricted to numerical values.
- **List**
  Allows you to define a pick list with as many list items as necessary.

Example

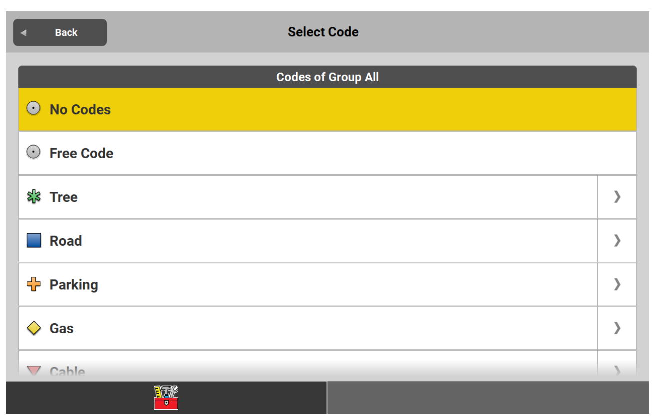
To enhance the code "Tree" in a feature survey, you could define the attribute "Species" as pick list, the attributes "Height", "Spread" and "Trunk diameter" in numerical format and the attribute "Tree tags" in text format.

How to edit code attributes step-by-step

☞ You can edit the code attributes by editing an existing code or when defining a new code.
Configure the Measure bar to display **Code** or **Attributes**. Refer to Measure bar.

1. To display the codelist view, tap **Code** in the Measure bar.

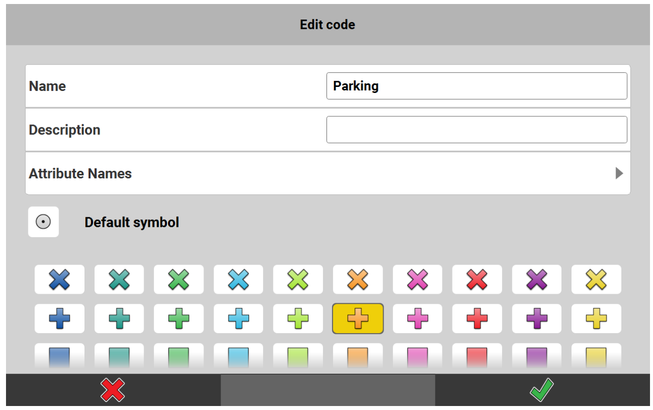
   ☞ Alternatively, tap **Attributes** in the Measure bar and tap the code name to display the following screen:



☞ Defining or changing the code attributes is only possible in the full codelist view. If necessary, deactivate **Compact view** in the Toolbox.

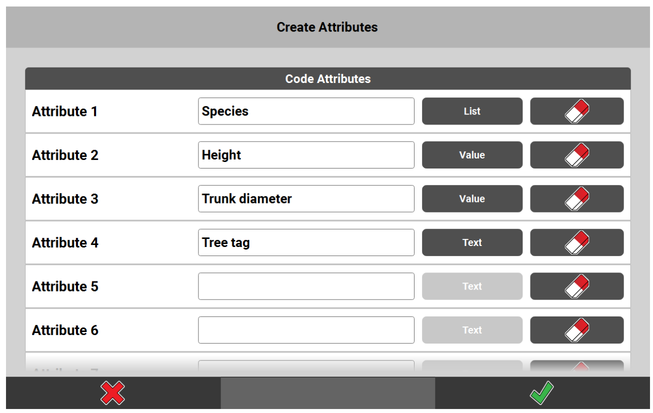
2. To change the code attributes, define a new code or edit an existing code:
   - To define a new code, select **New** from the Toolbox.
   - To edit an existing code, tap ❯ .

The "Edit code" screen is displayed.



3.	To edit the code attributes, tap **Attribute Names**.

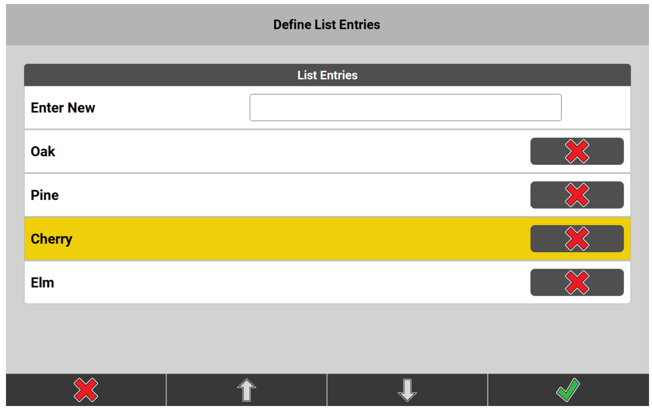
The "Create Attributes" screen is displayed.



4.
- Enter the name of an attribute and tap ✓ to accept.
- By default, the attribute is in text format. Tap **Text** to change the attribute format.

☞ To clear the content of an attribute, tap .

☞ If you tap **List**, the "Define List Entries" screen is displayed.



- To add a list entry, enter a name and tap .
- To delete a list entry, tap .
- To sort list entries select an entry and tap the arrows or to shift the list entry further up or further down.

To save the list entries and return to the "Create Attributes" screen, tap .

5. To save the code attributes, tap .

6. To save the code, tap .

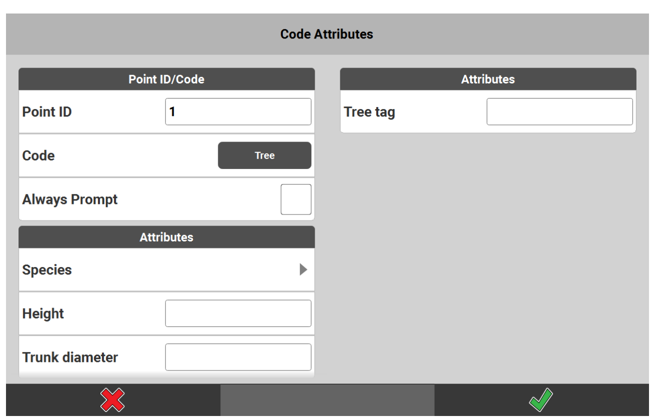
☞ For information on how to assign attributes to measured points, refer to How to assign code attributes step-by-step.

How to assign code attributes step-by-step

Assigning code attributes to points while measuring

☞ Configure the Measure bar to display **Attributes**. Refer to Measure bar.

1. Measure a point.
Before you store the point, tap **Attributes** in the Measure bar to display the "Code Attributes" screen.



☞	The attributes of the currently selected code are displayed within the **Attributes** container. If no code is selected, the **Attributes** container is not displayed. Tap **Code** to select a code with different attributes or to define a new code.
2.	• To change an attribute in list format, tap the attribute name and select an item from the list. • For attributes in text or numerical format, enter the desired value.
☞	If you activate the checkbox **Always Prompt**, the "Code Attributes" screen is displayed each time a point is stored. Activate the checkbox if you need to measure many detail points with attributes.
3.	To save the code attributes, tap ✔.

Assigning code attributes to points using the point list

1.	Select **Point List** from the **Map handler**.
2.	*A list of available files is opened.* Select the files you want the Point List to be created for. Multiple file selection is possible.
3.	Tap ✔ to accept the selection and proceed to the Point List.
4.	To select a point for editing, tap the respective row in the point list.
5.	Tap and select **Edit**. *The Edit Point screen is displayed.*
☞	The attributes of the currently selected code are displayed. If no code is selected, no attributes are displayed. Tap **Code** to select a code with different attributes or to define a new code.
6.	• To change an attribute in list format, tap the attribute name and select an item from the list. • For attributes in text or numerical format, enter the desired value.
7.	To save the code attributes, tap ✔.

7.5.4 Codes and Lines TPS + GPS

Line colouring depending on code symbols

In map view, lines or arcs can be displayed in different colours corresponding to the colours of the used code symbols. Line colouring helps you to distinguish between different lines in the map view.

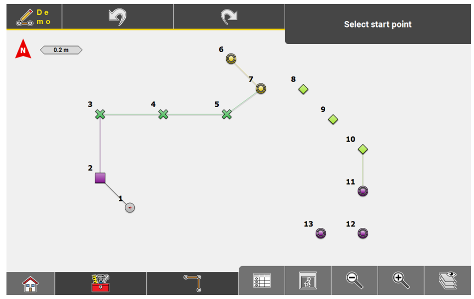


Fig. 1: Colouring of straight lines

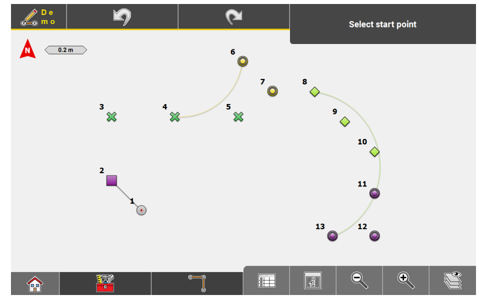


Fig. 2: Colouring of arcs

Application Draw

In following cases a line gets coloured:

- Several points are created while the **draw line** function is enabled and a code is applied. The colour of the created line corresponds to the colour of the applied code symbol.
- Two or more points are being connected by a line. Each line segment is coloured according to the colour of the first segment point.
  For polylines, the colour of the start point symbol is kept throughout the whole line, even if the code symbol changes in between.
- Two or three points are selected to create an arc. The arc line is coloured according to the colour of the first selected point.

Application Measure

In following cases a line gets coloured:

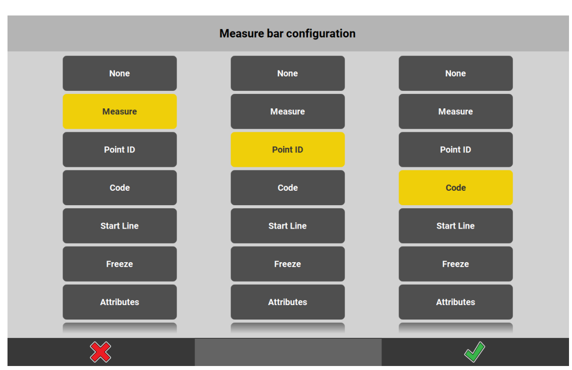
- Several points are measured while the function **Start Line** is enabled and a code is applied. The colour of the measured line corresponds to the colour of the applied code symbol.
  If the applied code is changed in between, the line colour changes accordingly.

☞ For polylines, the colour of the start point symbol is kept throughout the whole line, even if the code symbol changes in between.

7.5.5 Code Grouping TPS + GPS

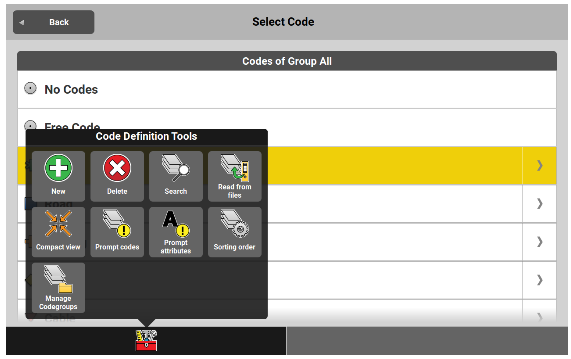
Grouping Codes

1. To manage code groups, configure the Measure bar to display **Code**.
   Tap and hold the Measure bar.
   Select **Code** from the **Measure bar configuration** screen, and tap ✓ to accept.

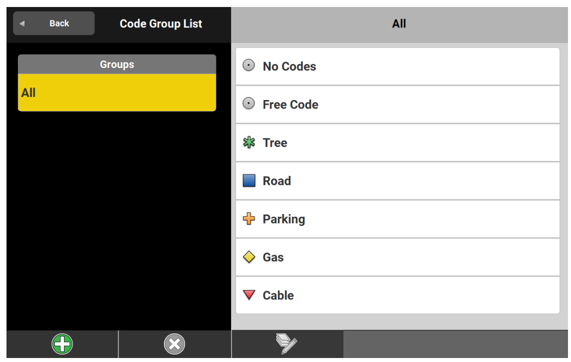


2. Back in the Map View tap **Code** in the Measure bar.

3. In the **Select Code** page open the Toolbox and tap **Manage Code-groups**.

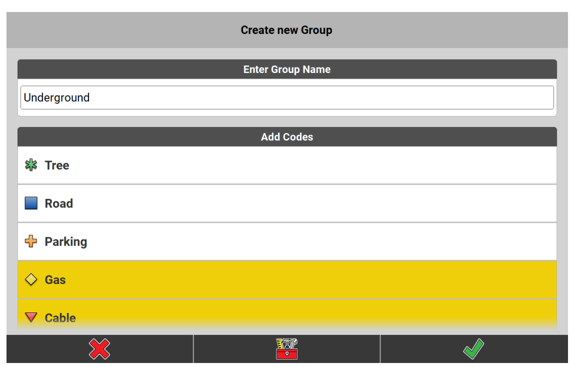


On the left all Groups are listed, on the right the codes belonging to the selected group are shown.



Group "All" exists by default and cannot be edited. Group "All" always contains all existing codes. "No Codes" and "Free Code" are always available in all groups by default.

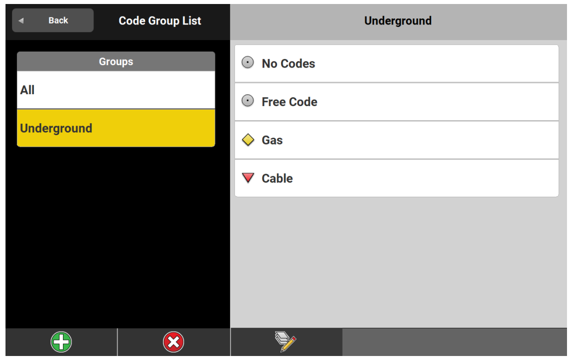
4. Tap to create a new code group and enter a code group name.



Below all available codes are listed. Tap single codes to select them.

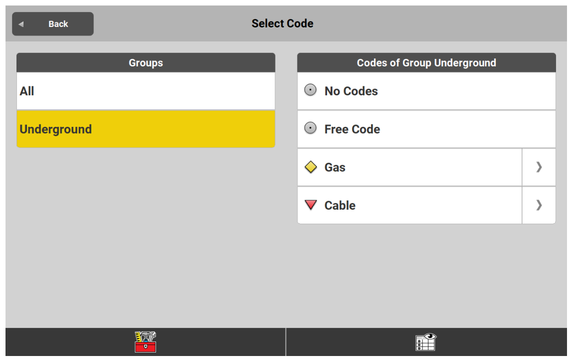
☞ The Toolbox offers functionality to switch to Compact view to Search for single codes and to change the Sorting order.

5. Tap to add the selected codes to the new code group.



To make changes to an existing code group select the group and tap .

6. Tap **Back** to be returned to the **Select Code** page.



The newly created code groups are added on the left-hand side.

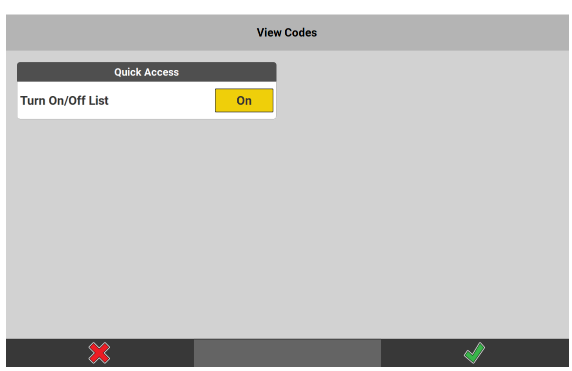
☞ Tap / to toggle between a split screen showing the list of code groups on the left and a screen showing only the codes belonging to the selected code group.

☞ To delete a code group open the Toolbox and go to **Manage Code-groups**. Tap to access the **Delete Code Group(s)** page. Select the group(s) to be deleted and tap .

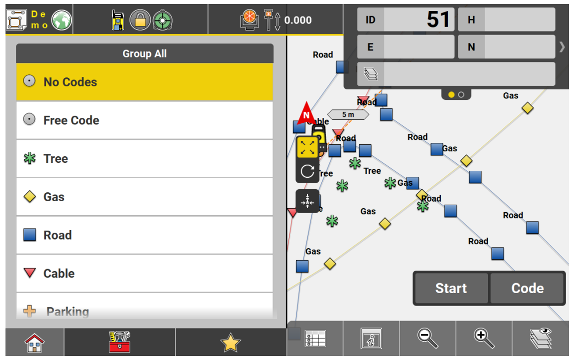
7.5.6 Quick Access to Codes TPS + GPS

Turning on quick access to codes

1. Tap to access **View** in the Map handler.
2. Tap to turn on quick access to codes.



3. Tap to accept the settings and return to the map.



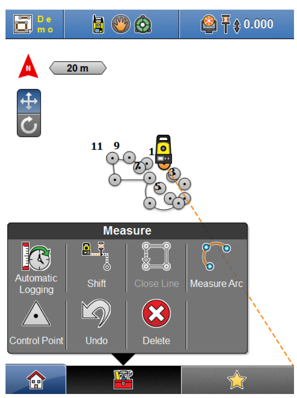
7.6 How to Shift Points TPS

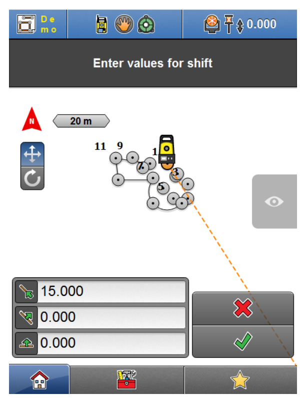
7.6.1 Shift Point TPS

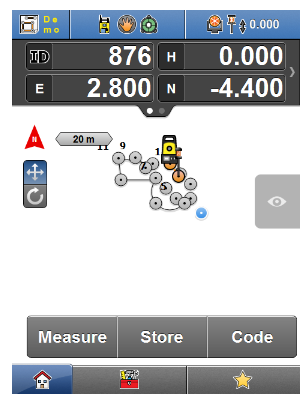
Description

It is possible to shift the position of a measured point in all three dimensions.

- Select **Shift** from the Toolbox.
- Enter the Shift values in the displayed Toolbar. Tap to accept.
- The next measured point has the defined shift applied to it.





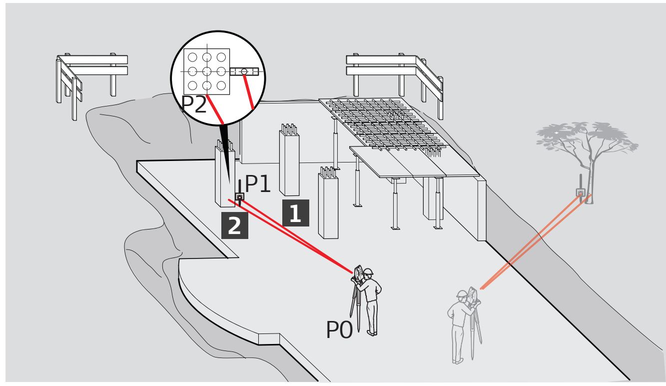


These shift values will not be applied to further measured points.

Shift applies offsets in relation to the current Total Station orientation.

7.6.2 Measuring the Centre of Trees or Columns TPS

General description



006775_001

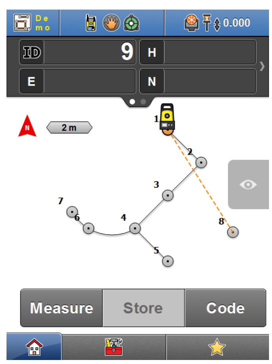
P0	Known station
P1	Target
P2	Centre point

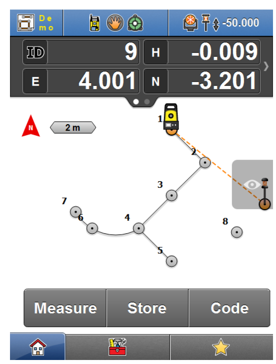
Given:

- Instrument is connected and set up.
- Map handler displays separate **Measure** and **Store** keys. **Tap and hold** Measure bar to configure accordingly.

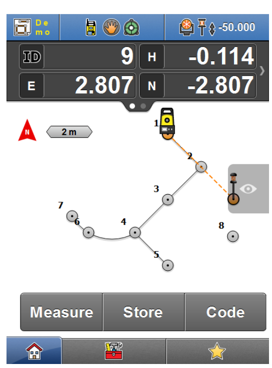
Measuring the centre of trees or columns step-by-step

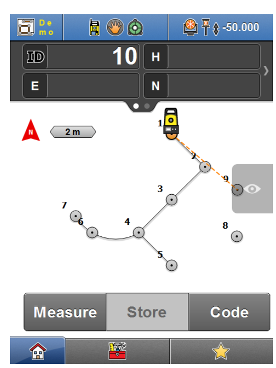
1.
   - Place prism next to tree or column, at the same distance as the centre, as shown in the illustration before.
   - Sight prism and press **Measure**.





2.
   - Turn instrument and sight the centre of the tree or column.
   - Press **Store** to store the point with the new angle.





7.7 How to Capture Images and Link Them to Points TPS + GPS

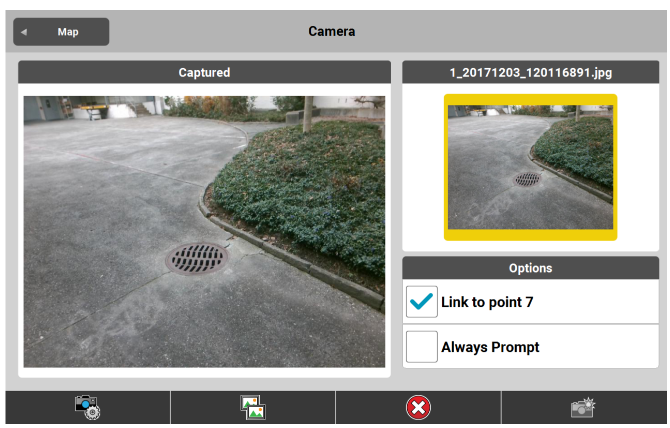
General description

The Camera function allows you to capture images using the integrated camera of the controller. For documentation and reporting purposes, you can link captured images to points.

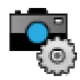
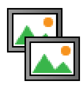
How to access the Camera screen

☞	The Camera function is accessible from any measuring application using the Measure bar. It is not available in TPS Setup, GNSS Base Setup or when creating a Coordinate System.
☞	You need to configure the Measure bar to display the **Camera** button.
☞	When using iCON site, the **Camera** button is available in the Favourites menu by default.
1.	To enable the **Camera** function, **tap and hold** the Measure bar.
2.	Configure the Measure bar to display **Camera**. For a detailed instruction, refer to Measure bar. Tap ✓ to accept the settings and return to the map.
3.	Tap **Camera** to access the Camera screen.
☞	For a detailed description of the Camera screen, refer to The Camera screen.

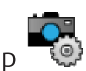
The Camera screen



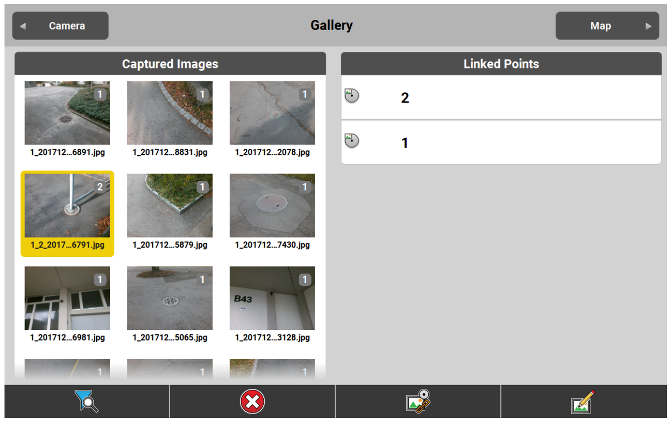
Screen element	Description
Back button	Tap to return to the Map view.
Live container	Live image of the camera.
Image container at the right	Preview of the last captured image. ☞ If there are no captured images the preview is empty. ☞ To get an enlarged preview image, tap the preview image. *The live image of the camera is replaced by the enlarged preview image.* To return to the live image, tap either the enlarged or the small preview image.

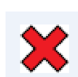
Screen element	Description
Options container with checkboxes	**Link to point %1** *(Point number of last stored point is displayed.)* Activate the checkbox to link the captured image to the last stored point. You can link several images to the same point. If there are no measurements in the active job, the checkbox is not available.
	Always Prompt Activate the checkbox to display the Camera screen automatically each time a point is stored.
	Tap to adjust the camera settings. Refer to Adjusting the camera settings.
	Tap to view and manage all captured images. Refer to The Gallery screen.
	Tap to delete the last captured image.
	Tap to capture an image.

Adjusting the camera settings

1.	To display the Camera Settings screen, tap  in the Camera screen.
2.	• Tap **Device Name** to toggle between front and back camera. • Tap **Resolution** to set the image resolution. • To activate geotagging, set **Geotagging** to **On**. Geotagging requires a connection to a GPS sensor or the internal GPS of the controller. When geotagging is enabled, the GPS coordinates are stored to the captured image. • To add drawings or text to an image directly after capturing, activate the option **Always edit the image after capture**. By default, this option is disabled.
3.	Tap  to accept the settings and return to the Camera screen.

The Gallery screen



Screen element	Description
Camera button	Tap to return to the Camera screen.
Captured Images container	List of captured images, displayed as thumbnails. • Tap a thumbnail to select it and to display the points linked to it. • Tap a second time to enlarge the image preview.
Linked Points container	List of points which are linked to the selected image.
	Tap to define and apply a filter to the list of images or linked points. Refer to Filtering the list of images/points.
	Tap to delete the selected image.
	Tap to link one or several points to the selected image. Refer to Linking images to points.
	Tap to edit the selected image. Refer to Edit images.

Filtering the list of images/points

The Gallery Filter tool helps you to quickly find relevant images or points by using different filter options. For example, you can sort or reduce the list of images displayed in the Gallery.

1. To display the Gallery Filter screen, tap  in the Gallery screen.

2. Define the necessary filter options:
   - Select the job that contains the relevant points for linking.
   - Define the sort order of the images based on the creation date: ascending or descending.
   - Define the sort order of points available for linking: ascending or descending.
   - To show a maximum of 50 images, activate the checkbox.
   - To show only images which are not linked to any points, activate the checkbox.

3. Tap to accept the settings and return to the Gallery screen.

☞ When you exit the Camera application, the filter options are reset back to default values.

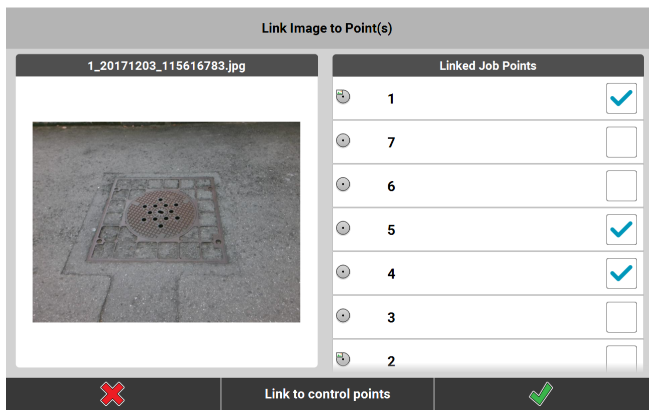
Linking images to points

☞ The images displayed in the Gallery screen can be linked to points of the currently selected job. If necessary, change the filter options. Refer to Filtering the list of images/points.

1. In the Gallery screen, tap the image.

   The selected image is highlighted in yellow. If the image is already linked to points, these points are listed in the Linked Points container.

2. Tap to edit the links.
   In the Linked Points container, all available points for linking are displayed. For already linked points, the respective checkbox is activated.



3. Activate the checkbox of a point to link it to the image.
   Deactivate the checkbox of a point to unlink it from the image.

☞ Linking an image to points from reference files is not possible.

4. Tap to save the changes for the image.

   Tap to discard any changes.

☞ Images linked to points can be included in a report.
To include images, set **Captured Images** to **On** when configuring the template of the respective report type. Refer to How to configure the template of a report type.

Edit images

☞ You can add text and free-hand drawings to a captured image.
To edit images directly after capturing, activate the respective option in the camera settings. Refer to Adjusting the camera settings.

1. In the Gallery screen, tap the image you want to edit.
   The selected image is highlighted in yellow.

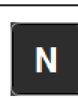
2. Tap to edit the selected image.

Following screen is displayed:

3.	To add free-hand drawing to the image, select **Pen** from the toolbox. To add text to the image, select **Text** from the toolbox.	 
	Example of edited image: 	
4.	To discard all changes, tap . To discard all changes and return to the Gallery screen, tap . To save the changes for the image, tap .	

7.8 Information Bar Values TPS + GPS

Description

Type/Icon		Description
Id		Point ID of the current point to record.
E		East value at the current target position.
N		North value at the current target position.

Type/Icon	Description
H	Height at the current target position.
Hz	TPS only: Horizontal angle to the current target position.
V	TPS only: Vertical/zenith angle to the current target position.
Code	Code/layer for the next point to record.
sD	TPS only: Slope distance to the last point measured.
hD	TPS only: Horizontal distance to the last point measured.
CQ 1D	GPS only: Coordinate quality value for the height information at the current position.
CQ 2D	GPS only: Coordinate quality values for the plain information at the current position.
CQ 3D	GPS only: Coordinate quality values for a combination of the height and the plain information at the current position.
GDOP	GPS only: Geometric dilution of precision quality value at the current position.
Chainage	Chainage at the measured point along the selected reference line.
Proj.Lin	Line value at measured point along the selected reference line.
Proj.Off	Offset value at measured point to the selected reference line.
Proj. H. Diff	Height difference at measured point to the selected reference line.

8 How to Collect Data Using Scanning TPS

8.1 General information

Scanning functionality

The **Grid & Scan** tool is available in the following applications:

- As-Built/Measure
- Layout Points/Layout Lines/Stakeout
- Slopes
- Checks
- Volumes
- Cut/Fill Grid
- Verification
- Roading

The Grid & Scan tool offers two scanning methods for creating point clouds.

Scan

This scanning method allows you to create large point clouds that can be used for verification and inspection of as-built objects (refer to 13 How to Use Verification). Connect the iCON software to the MS60 to use it as a scanner.

Precise Grid Scan/Quick Grid Scan

These scanning methods allow you to create small point clouds that can be used especially for verification and inspection of surfaces, such as floors or walls (refer to 13 How to Use Verification).

Connect the iCON software to an iCR or iCT. Define an area and a scan grid. The software calculates the points to be measured.

☞ When connected to an iCR or iCT, the software automatically lays out the grid points, and measures and stores them after reaching the tolerances.

Requirements

- The Grid & Scan licence must be active.
- An MS60 scanner or an iCR/iCT device is connected to iCON.

Availability of scanning methods

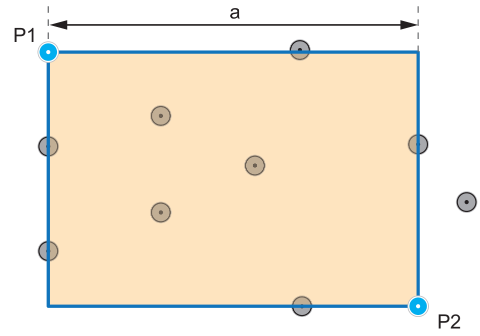
Depending on which device is connected to the software, the availability of scanning methods differs.

Scanning method	iCR/iCT	MS60	MS60+
Rectangular Precise Grid	●	●	●
Polygonal Precise Grid	●	●	●
Polygonal Quick Grid	●	●	●
Rectangular area		●	●
Polygonal area		●	●

Definition of scan area depending on scan method

Rectangular scan area

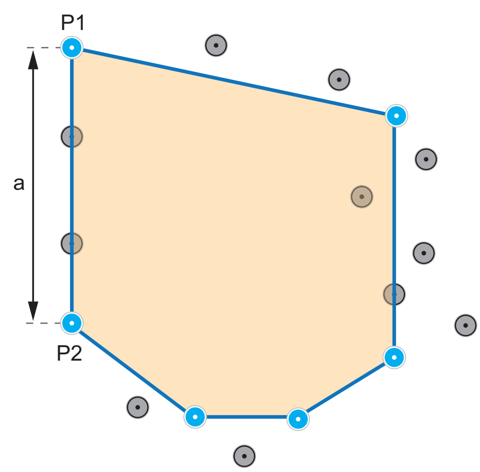
When using a scanning method based on a rectangular area, it is necessary to define two points. The first point defines the start point of the baseline and the second point defines the width of the scan area.



a Baseline

Polygonal scan area

When using a scanning method based on a polygonal area, it is necessary to define at least three points. The first and second points define the baseline of the polygonal scan area. The polygon is closed from the third point on, and every new point creates another corner of the polygon.



a Baseline

8.2 How to Use the Grid Scan Functionality

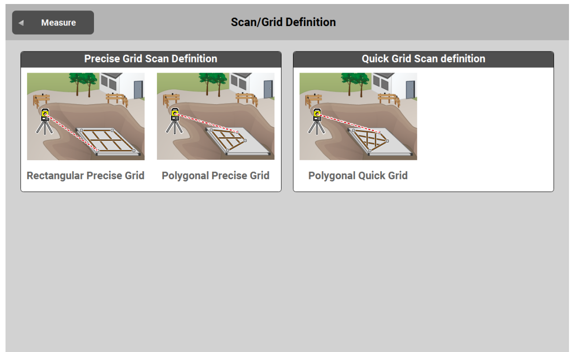
Using Rectangular Precise Grid and Polygonal Precise Gridstep-by-step

Preparation

1. Connect the instrument to the iCON field software.
2. Set up the instrument.
3. Go to the desired application in iCON.

Scanning process

1. In the current application, select **Grid & Scan** from the toolbox.



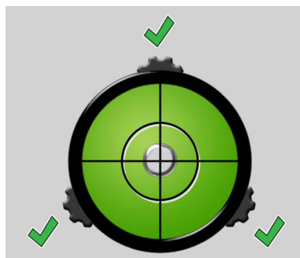
The screen "Scan/ Grid Definition" is displayed.

---

2. Tap the desired method to start the wizard for this method.

---

3. Level the instrument.



Tap next wizard step to proceed.
Map view is displayed.

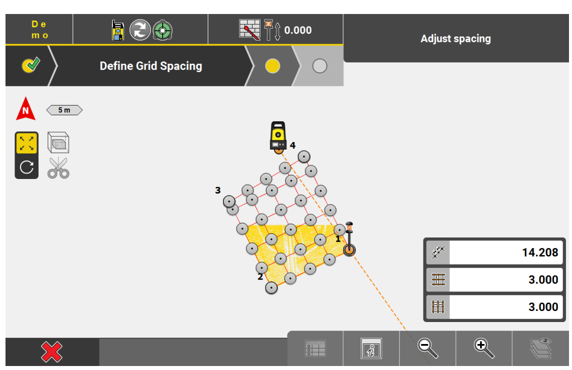
---

4. Define the scan area depending on the selected method. Follow the instructions on this screen.

- **Rectangular Precise Grid**
  Select or measure two points to define the upper left and lower right corner of the rectangular area.

  To swap the orientation of the rectangular area, tap .
- **Polygonal Precise Grid**
  Select or measure at least three points to define a polygonal area.

To clear the defined scan area, tap .
Tap next wizard step to proceed.



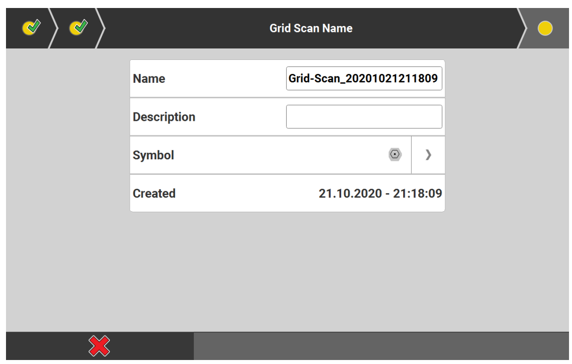
The toolbar for grid definition is displayed in Map View.

5. Use the toolbar to define the scan grid and the spacing of scan points on this grid.
   - To define the distance between scan points on the grid lines, tap and enter the desired value.
   - To define the distance between grid rows, tap and enter the desired value.
   - To define the distance between grid columns, tap and enter the desired value.

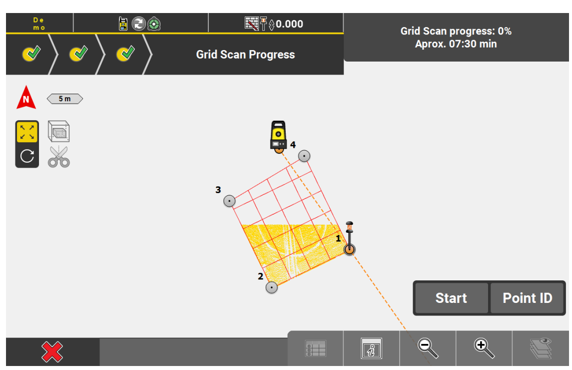
   The grid preview is updated according to the entered values. The software calculates the number of points to be scanned and the estimated scanning time and displays them in the info panel.

   To cancel the process, tap

   To accept the defined grid and continue with the next wizard step, tap

6. 

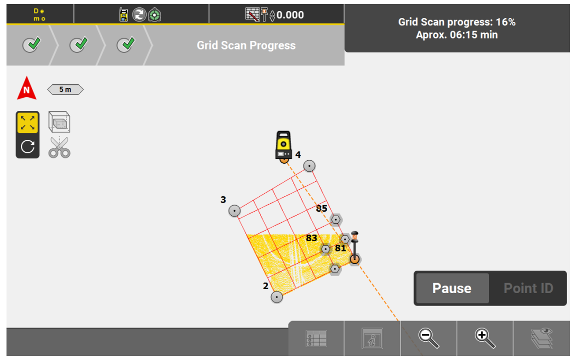
   If desired, you can edit the file name of the scan data, enter a description and define the symbol for the scan points.
   Tap next wizard step to proceed.



Map view is displayed. The info panel displays the estimated scanning time.

☞ To assign a code to the scan points, tap **Code**. If necessary, adapt the Measure bar to display **Code**.

7. To start the scanning process, tap **Start**.



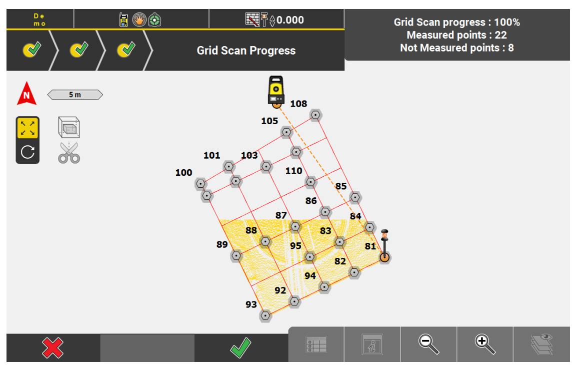
The info panel displays the progress and the estimated remaining time for scanning.

☞ To pause the scanning process, tap **Pause**.

To cancel the scanning process, tap **Pause**, then tap ✖.

☞ *If the connected instrument becomes unlevelled during scanning, an error message is displayed.*

Level the instrument and tap ✔ to restart the scanning process, beginning at the first defined scan point.



When the scanning process is finished, the info panel displays the scan result. All measured points are displayed on the map.

8. Tap ✔ to finish the scanning process.

☞ The generated point grid can be used to verify data in the Verification application. Refer to 13 How to Use Verification .

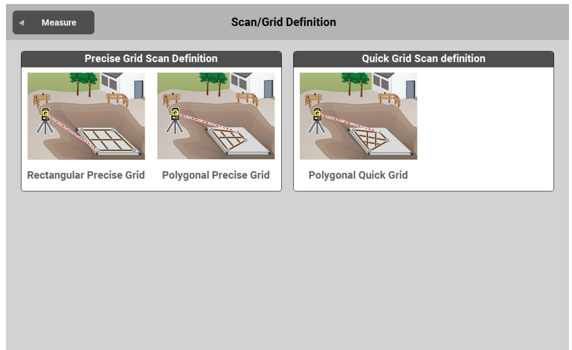
Using Polygonal Quick Gridstep-by-step

Preparation

1. Connect the instrument to the iCON field software.
2. Set up the instrument.
3. Go to the desired application in iCON.

Scanning process

1. In the current application, select **Grid & Scan** from the toolbox.



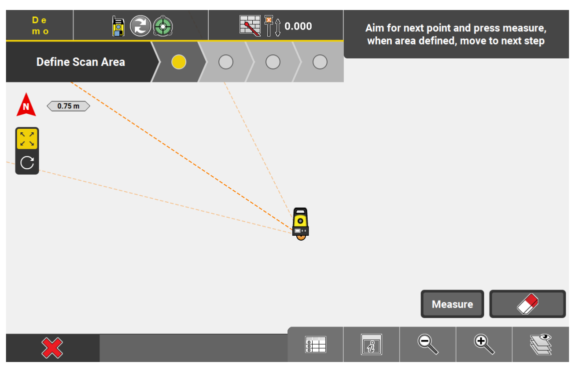
The screen "Scan/ Grid Definition" is displayed.

2. Tap the desired method to start the wizard for this method.

3. Level the instrument.

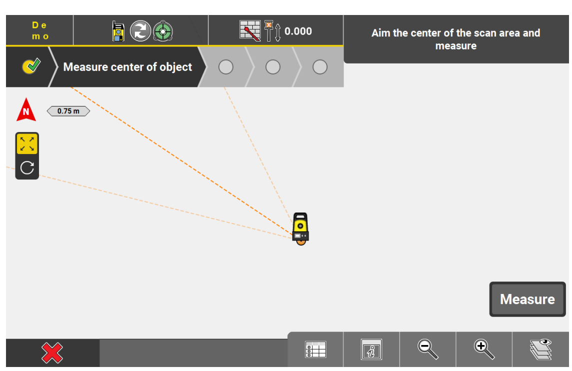
Tap next wizard step to proceed.
Map view is displayed.

4. Follow the instructions on this screen to define the polygonal scan area. Measure at least three points to define a polygonal area.
Only the angles are measured and stored.



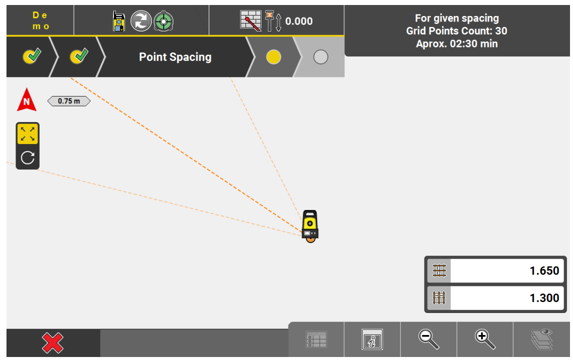
Tap next wizard step to proceed.

5. Measure the centre of the scan area.



6. Use the toolbar to define the scan grid.

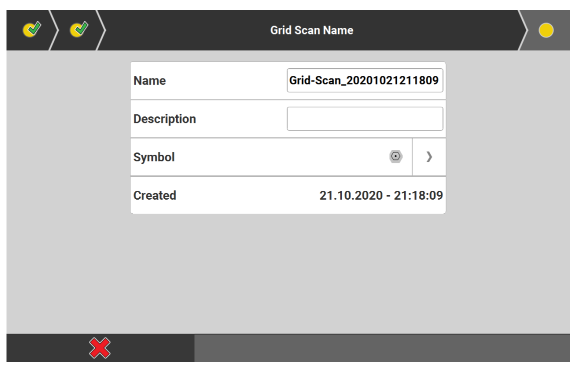
- To define the distance between grid rows, tap and enter the desired value.
- To define the distance between grid columns, tap and enter the desired value.



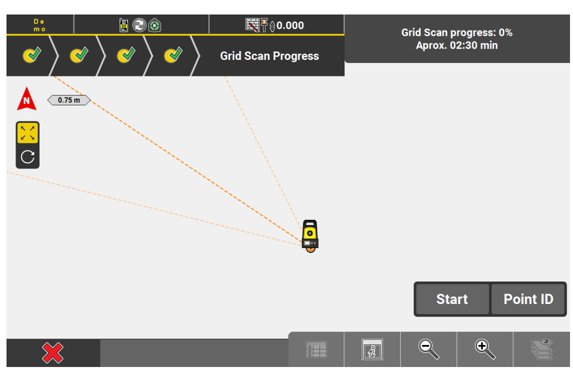
To cancel the process, tap

Tap next wizard step to proceed.

7. If desired, you can edit the file name of the scan data, enter a description and define the symbol for the scan points.



Tap next wizard step to proceed.



Map view is displayed. The info panel displays the estimated scanning time.

☞ To assign a code to the scan points, tap **Code**. If necessary, adapt the Measure bar to display **Code**.

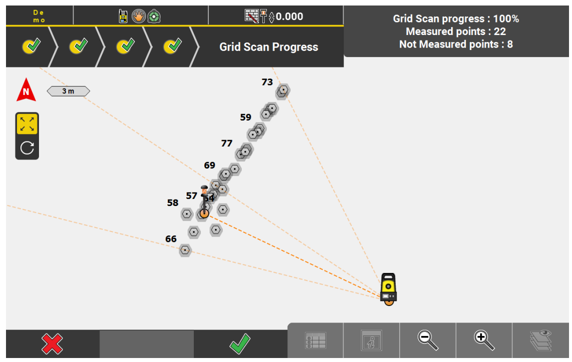
8. To start the scanning process, tap **Start**.
The info panel displays the progress and the estimated remaining time for scanning.

☞ To pause the scanning process, tap **Pause**.

To cancel the scanning process, tap **Pause**, then tap ✖.

☞ *If the connected instrument becomes unlevelled during scanning, an error message is displayed.*

Level the instrument and tap ✔ to restart the scanning process, beginning at the first defined scan point.



When the scanning process is finished, the info panel displays the scan result. All measured points are displayed on the map.

9. Tap ✔ to finish the scanning process.

☞ The generated point grid can be used to verify data in the Verification application. Refer to 13 How to Use Verification .

8.3 How to Use the Scan Data Functionality

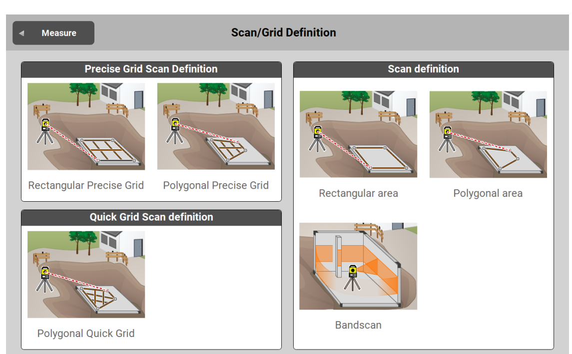
Using Rectangular area and Polygonal area step-by-step

Preparation

1. Create a new project and import the necessary control points.
2. Connect the MS60 to the iCON field software.
3. Set up the instrument.
4. Go to the desired application in iCON.

Scanning process

1. In the current application, select **Grid & Scan** from the toolbox.



The screen "Scan/Grid Definition" is displayed.

2. Tap the desired method to start the wizard for this method.

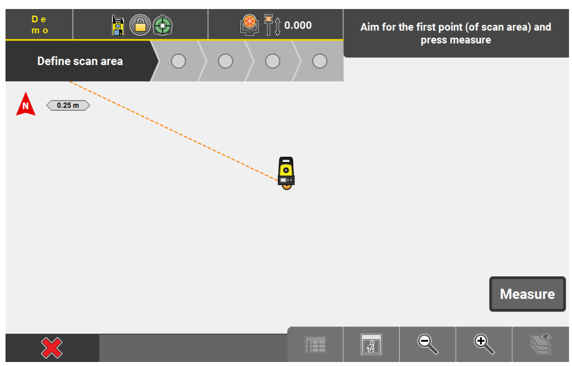
☞ **Bandscan** is only available for MS60+.

3. Level the instrument.

Tap next wizard step to proceed.

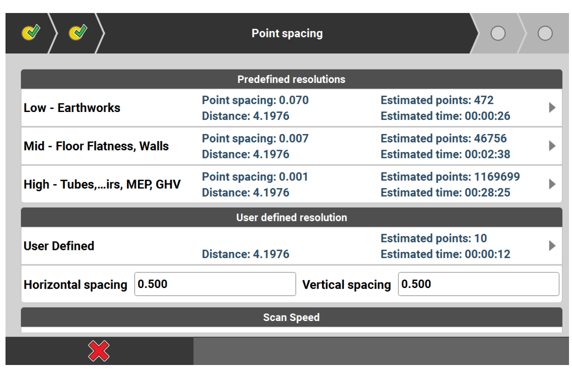
4. Define the scan area depending on the selected method. Follow the instructions on the screen.
   - **Rectangular area**
     Measure two points to define the upper left and lower right corner of a rectangular area.
   - **Polygonal area**
     Measure at least three points to define a polygonal area.

   Tap next wizard step to proceed.



Map view is displayed.

5. Measure the centre point of the object to be scanned.
   Tap next wizard step to proceed.

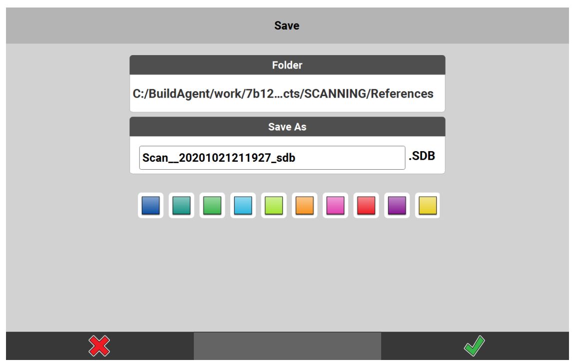


The point spacing defines the resolution of the scan data. Depending on the selected point spacing, the software calculates the estimated number of scan points and the estimated scanning time.

6. By default, the recommended point spacing is active. If desired, choose another resolution:
   - **Low - Earthworks**
   - **Mid - Floor Flatness, Walls**
   - **High - Tubes, Stairs, MEP, GHV[High]**
   - **User defined resolution:**
     Enter the desired values for the horizontal and vertical point spacing.
   - **Only for MS60+:**
     By default, the recommended scan speed is selected. If desired, choose another scan speed to reduce the scanning time.
     - 1000 points per second
     - 2000 points per second
     - 4000 points per second
     - 8000 points per second

     Changing the scan speed manually might influence the quality of the scan result.

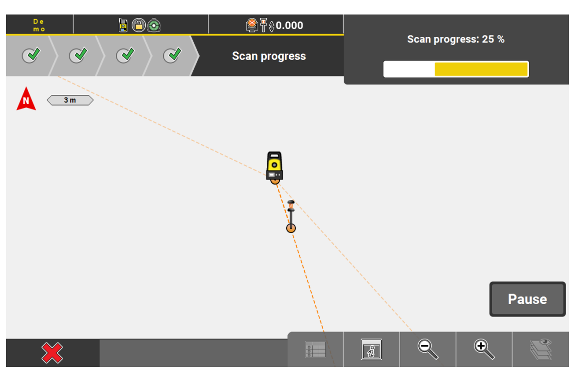
   Tap next wizard step to proceed.



7. - If desired, edit the name of the scan data, enter a description and define a colour for the scan points.
   - Select the storing location.
     If the estimated scan data is bigger than the available storage place, an error message is displayed. To continue, select a different storage location with enough space.

   Tap to continue.
   Map view is displayed.

8. To start the scanning process, tap **Start**.



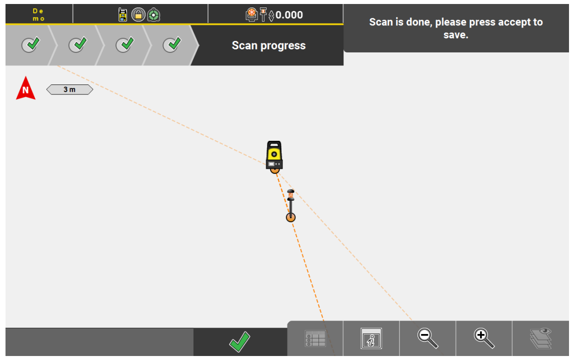
The info panel displays the scanning progress.

☞ To pause the scanning process, tap **Pause**.

To cancel the scanning process, tap .

☞ *If the connected instrument becomes unlevelled during scanning, an error message is displayed.*

Level the instrument and tap ✓ to restart the scanning process, beginning at the first defined scan point.



When the scanning process is finished, the info panel displays the scan result. All measured points are displayed on the map.

9. Tap ✓ to finish the scanning process.

☞ The generated point grid can be used to verify data in the Verification application. Refer to 13 How to Use Verification .

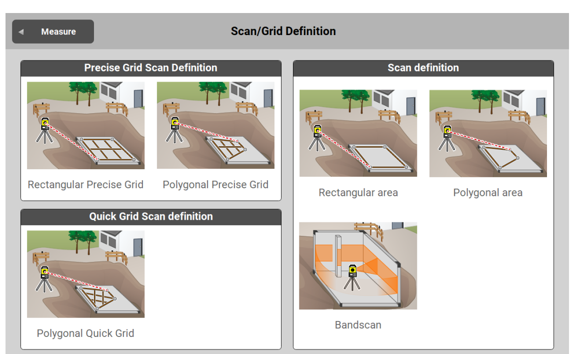
Using Bandscan step-by-step

Preparation

1. Import the necessary control points to the project.
2. Connect the MS60+ to the iCON field software.
3. Set up the instrument.
4. Go to the desired application in iCON.

Scanning process

1. In the current application, select **Grid & Scan** from the toolbox.



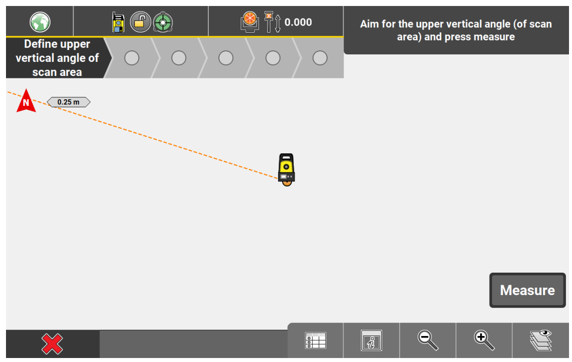
The screen "Scan/Grid Definition" is displayed.

2. Tap **Bandscan** to start the wizard for this method.

3. Level the instrument.

Tap next wizard step to proceed.

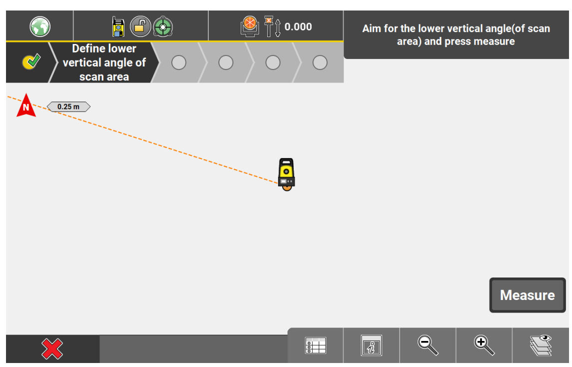
4. Measure two points to define a vertical stripe.
Tap next wizard step to proceed.



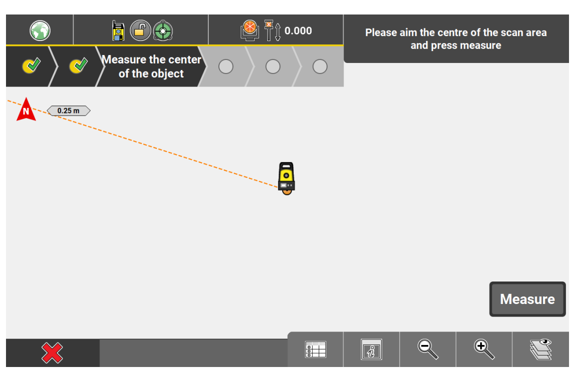
Map view is displayed.

5. Follow the instructions on the screen and measure the upper vertical angle of the scan area.

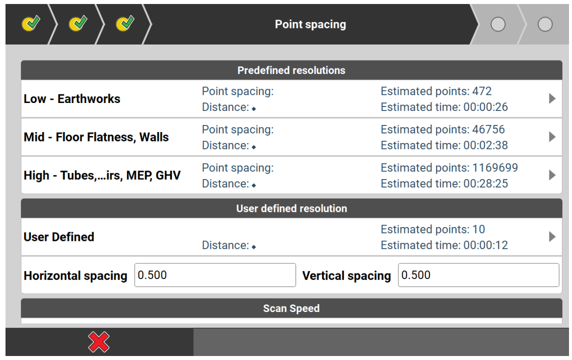
6. Aim the instrument at the lower vertical angel of the scan area and tap Meausre again.



7. Measure the centre point of the object to be scanned.



The Point spacing page is displayed.



The point spacing defines the resolution of the scan data. Depending on the selected point spacing, the software calculates the estimated number of scan points and the estimated scanning time.

8. By default, the recommended point spacing is active. If desired, choose another resolution:
   - **Low - Earthworks**
   - **Mid - Floor Flatness, Walls**
   - **High - Tubes, Stairs, MEP, GHV[High]**
   - **User defined resolution:**
     Enter the desired values for the horizontal and vertical point spacing.
   - By default, the recommended scan speed is selected. If desired, choose another scan speed to reduce the scanning time.
     - 1000 points per second
     - 2000 points per second
     - 4000 points per second
     - 8000 points per second

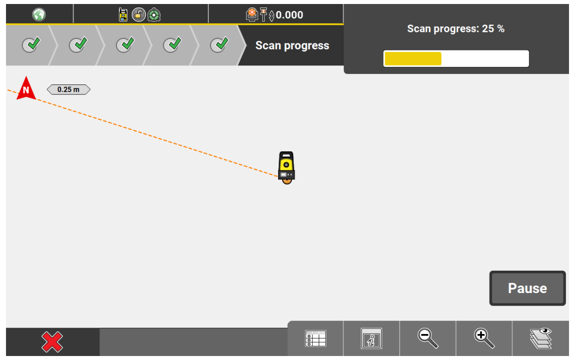
     Changing the scan speed manually might influence the quality of the scan result.

   Tap next wizard step to proceed.

9. - If desired, edit the name of the scan data, enter a description and define a colour for the scan points.
   - Select the storing location.
     If the estimated scan data is bigger than the available storage place, an error message is displayed. To continue, select a different storage location with enough space.

   Tap to continue.
   Map view is displayed.

10. To start the scanning process, tap **Start**.



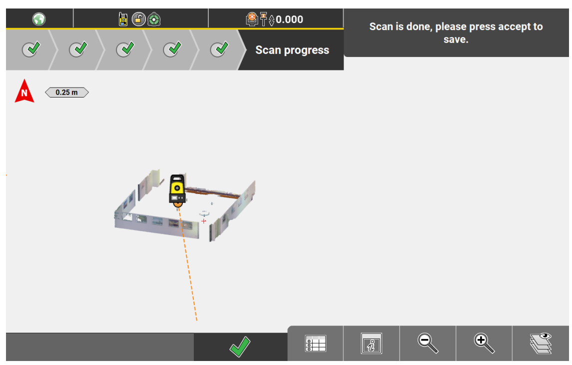
The info panel displays the scanning progress.

☞ To pause the scanning process, tap **Pause**.

To cancel the scanning process, tap .

☞ *If the connected instrument becomes unlevelled during scanning, an error message is displayed.*

Level the instrument and tap to restart the scanning process, beginning at the first defined scan point.



When the scanning process is finished, the info panel displays the scan result. All measured points are displayed on the map.

11. Tap to finish the scanning process.

☞ The generated point grid can be used to verify data in the Verification application. Refer to 13 How to Use Verification .

9 How to Do Checks

General description

Checks is an application that can be used to check geometries by selecting or measuring points and lines.

You can make use of reference data and/or measured and sketched data as well as the geometry from IFC objects.

☞ In order to make use of IFC geometry a license for **Layout Objects** or **Verification** is required.

Results are shown in the Information bar within the application.

☞ If necessary, you can save the results to include them in a Checks report later. For information on how to create a report, refer to 19 How to Create a Report .

Calculated values are tie distance results, angles, areas and block volumes:

- Horizontal distance, sloped distance, height difference, slope
- Sum horizontal, sum sloped, azimuth, last included angle
- Area and perimeter in plane and tilted
- Block volume, plane and tilted

☞ Tilted area and perimeter allow also to calculate vertical geometries, for example the size of a window.

How to do checks step-by-step

☞ Available as a separate licence or included in iCON site Plus.

1. Select **Checks** from the Home Menu.

2. Select or measure points and lines to check geometries.

   ☞ The points and lines have to be selected or measured ordered, either in clockwise or anticlockwise direction.

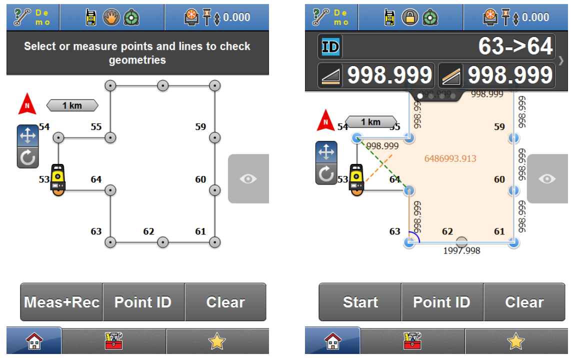
   You have got the option to select points/objects be **reading a QR-Code**.

   ☞ Tap and hold the Measure bar and configure it such that it shows the **QR-Scan** button. Tap ✔ when finished.

   Back in the Map View tap **QR-Scan**.
   See also: IFC object selection using QR-code

   ☞ To be able to use the QR-Scan function your entitlement needs to include the QR-Code Reader licence.

   Current results are updated and shown in the Information bar according to the points and lines selected or measured.



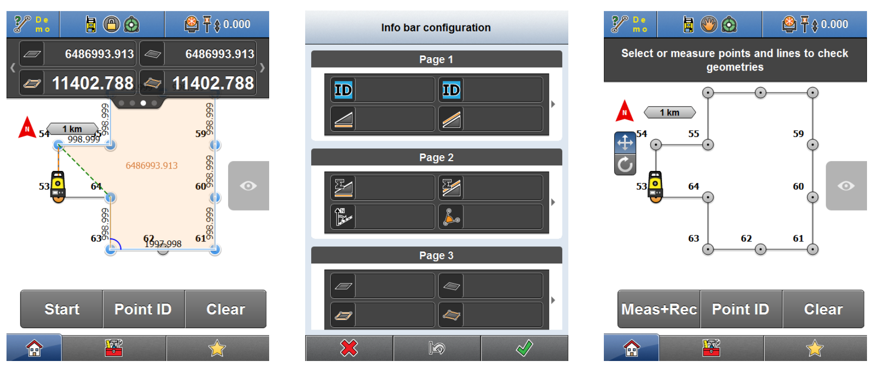
☞ All values are shown according to the current settings, in the chosen unit and the number of decimals set.

☞ To save a result, select **Save for Report** from the toolbox.

- If necessary, change the default file name.
- To save the results, tap ✓.

Results are stored separately depending on the applied method (Radial, Polygonal, Point to line).

3.
- To display further results tap the arrow in the Information bar.
- **Tap and hold** the Information bar to see which results are displayed or to configure the Information bar. Tap ✓ when finished.
- Tap **Clear** in the Measure bar to deselect the measured or selected points and lines.

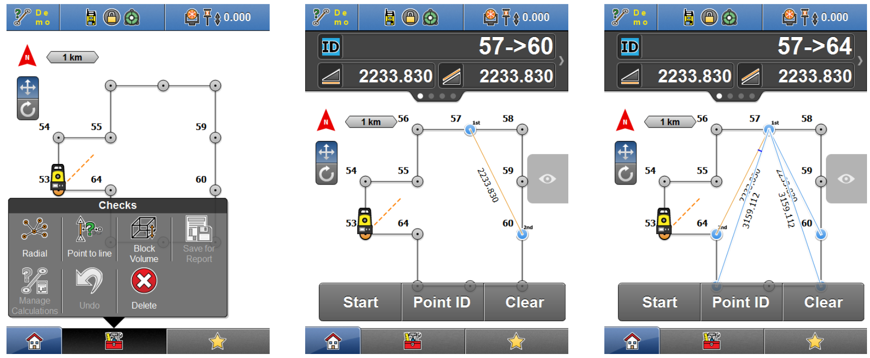


4.
- To switch to a radial calculation method select **Radial** from the **Toolbox**.

☞ Radial method means, the first point selected or measured is always kept and is always the first point for the next tie distance.

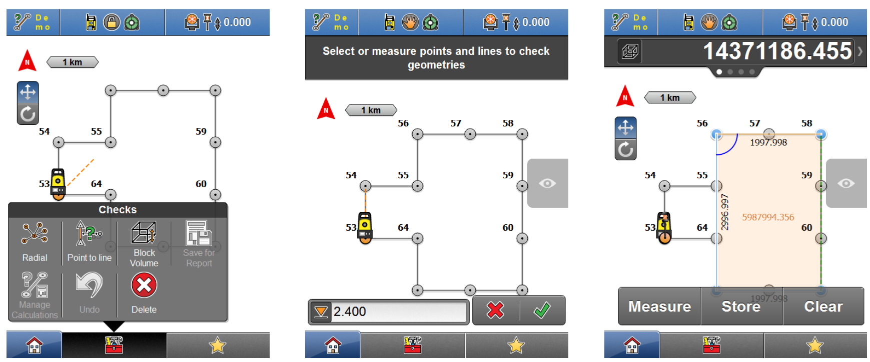
- To switch back to the polygonal calculation method select **Polygonal** from the **Toolbox**.

☞ When switching between radial and polygonal method, the current result is adapted immediately.



5. - For calculating block volumes select **Block Volume** from the **Toolbox**.
   - Enter the needed height value, then tap ✓.
   - Now select or measure points and lines. As soon as an area can be calculated, the block volume is also calculated and the result displayed in the Information bar, if configured accordingly.

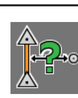
☞ It is also possible to select or measure points and lines first and then select **Block Volume** from the **Toolbox**.



☞ The **Point to line** function allows to define a reference line by selecting a line or two points. Then measure or select one or more points. This results in a line and an offset value from the reference line to each measured or selected point.

☞ The **Delete** and **Undo** functions are also available in the **Toolbox**.

Toolbox functions

Function		Description
Radial		Tap to check geometries using the radial method.
Polygonal		Tap to check geometries using the polygonal method.
Point to line		Allows you to check points with reference to a line or a polyline.
Block Volume		Tap to calculate block volumes.

Function	Description
Save for Report	Tap to save the currently displayed result.
Manage Calculations	Allows you to view and delete already created Checks calculations. • To view details of a calculated result, tap the arrow button to the right. • To delete a calculated result, tap its name to select it and tap to confirm deletion.

Information bar values

Type/Icon	Description
Id	Point ID of the last point measured or selected.
E	East value of the last point measured or selected.
N	North value of the last point measured or selected.
H	Height of the last point measured or selected.
Ref_Id	Reference ID of the last two points measured or selected, in the corresponding order.
Az	Horizontal angle to the last point measured or selected.
sD	Slope distance between the last two points measured or selected.
hD	Horizontal distance between the last two points measured or selected.
Thd	Sum of horizontal distances between the points measured or selected.
Tsd	Sum of sloped distances between the points measured or selected.
Inc Angle	Included horizontal angle between the last two lines measured or selected. ☞ When selecting points, the last line always ends with the last point measured or selected.

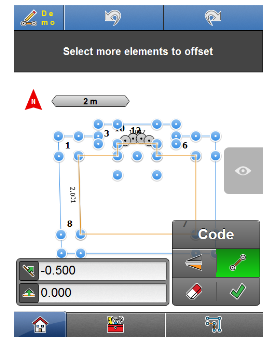
Type/Icon	Description
A_2D	Horizontal area, covered by all points measured or selected.
A_sl	Sloped area, covered by all points measured or selected.
Slope	Slope angle, between a virtual horizontal line through the second to last point and the current line to last point measured or selected.
HeightD	Height difference between the last two points measured or selected.
Code	Code/layer for the next point to record.
Pr	Horizontal perimeter, available with at least three points measured or selected. The value is always calculated from the closed figure of the measured/selected points.
Pr_3D	Sloped perimeter, available with at least three points measured or selected. The value is always calculated from the closed figure of the measured/selected points.
BlkVol_H	Calculated horizontal block volume. Available as soon as the needed height value is entered and an area can be calculated.
BlkVol_SL	Calculated sloped block volume. Available as soon as the needed height value is entered and an area can be calculated.
dN	Difference in the north value between the last two points measured or selected.
dE	Difference in the east value between the last two points measured or selected.
CQ 1D	**GPS** only: Coordinate quality value for the height information at the current position.
CQ 2D	**GPS** only: Coordinate quality values for the plain information at the current position.
CQ 3D	**GPS** only: Coordinate quality values for a combination of the height and the plain information at the current position.
GDOP	**GPS** only: Geometric dilution of precision quality value at the current position.

10 How to Sketch a Plan

10.1 Points, Lines and Arcs

General description

Draw is an application that can be used without a connected instrument. Layout plans consisting of **points**, **lines** and **arcs** can be created, and these plans can then be used in another application to be directly staked out.
The following is a step-by-step guide to using some of the key functions in **Draw** to create a layout plan.



Example of a layout plan

☞ No instrument connection is required.

How to draw a plan step-by-step

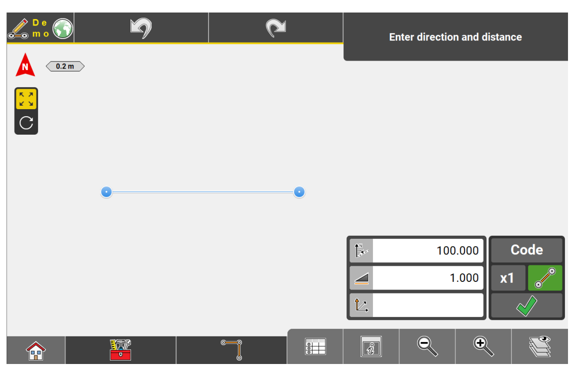
Access application

Select **Draw** from the Home Menu.

Draw points and lines

☞ If point data is present, tap a point to begin.

1. Use the Toolbar to enter information for the position of the next point.
   - The Toolbar contains options to edit **angle**, **distance**, **height**, and to **draw a line** between points.
   - To create several points easily in one step tap **multiple points** x1 and enter the desired number of points.



The entred angle is always drawn with reference to the north direction.

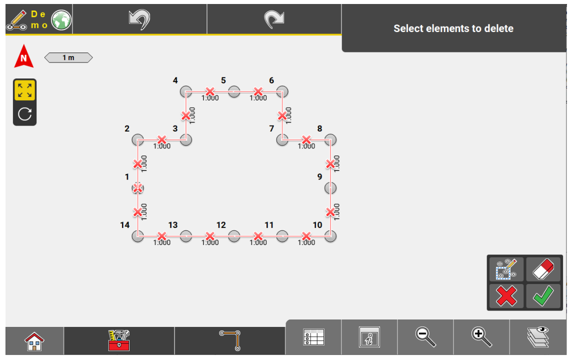
2. Tap ✓ to confirm point position and repeat the process to create another point.

☞ Use **CODE** to define and apply a code for every point recorded.

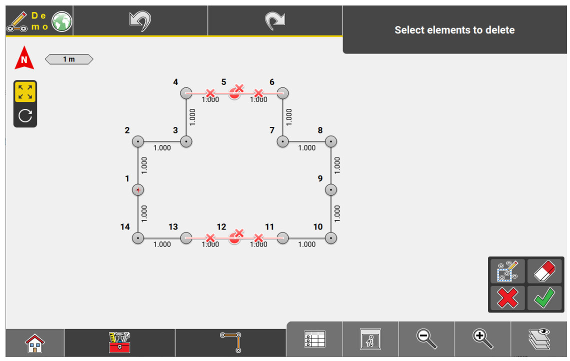
☞ In the map view tap the button for rotation mode (3D) to enable rotation.
See also: Applications

☞ The **Delete** function is available from within the **Toolbox**.

Select the elements to be deleted, then tap ✓.

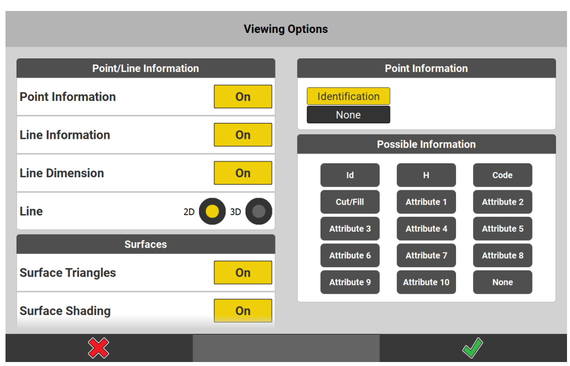


Tap on a polyline to select the whole line for deletion. Its constituting points will not be deleted.
To select all elements (lines and points) in a specific area for deletion tap .



Tap on single point(s) to just delete the point(s) and their adjacent line segments.

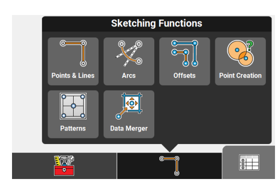
☞ In the **Viewing Options** you can toggle between 2D and 3D line values to be shown in the map view. **Line Dimension** needs to be switched **On**.



2D shows the horizontal line length as entered for distance.
3D shows the slope distance.

Draw an arc

1. To draw an arc, select **Arcs** from the **Sketching Functions** menu.

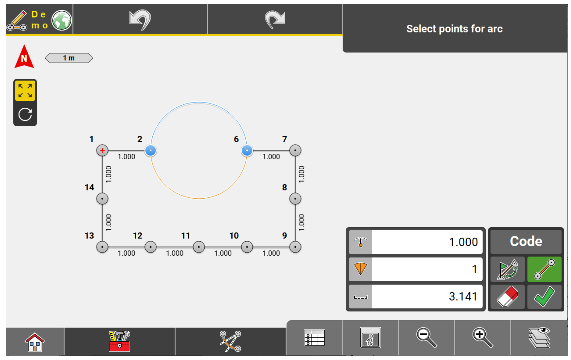


2. Tap the points for the arc.

☞ Arcs can be drawn by tapping **two points** and inputting **radius** information into the Toolbar, or tapping **three points**. When tapping three points, the radius of the arc is calculated automatically and the field for entering the radius is read-only.

3. *Potential arcs are displayed, the light blue part is the selected one.* To select the other possible arc simply tap on it.

4. Tap ✓ to store the arc.

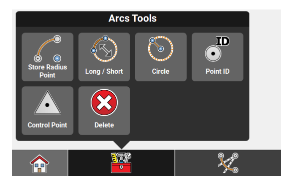


Draw a circle

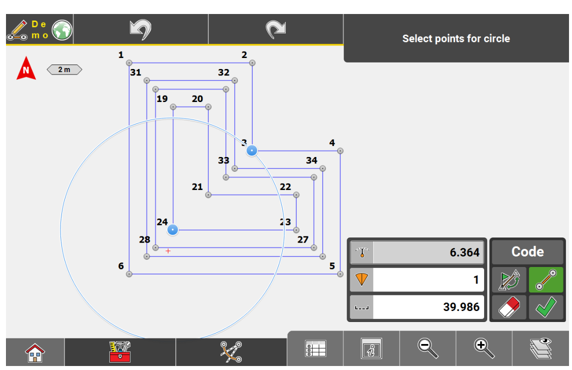
☞ Only available for iCON site Plus.

1. To draw a circle, select **Arcs** from the **Sketching Functions** menu.

2. Select **Circle** from the Toolbox.



3. To create a circle, use one of the following options:
   - Select a centre point and enter a radius.
   - Select a centre point and a start point.
     The radius is calculated automatically.
   - Select 3 points which should be on the circle line.
     The radius is calculated automatically and the centre point is stored.

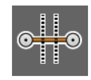


☞ *Potential circles are displayed in light blue colour.*
When selecting two or three points, the field for entering the radius is read-only.
The height of the circle is defined by the start point. If no height is defined for the start point, the height of the circle is set to zero.

4. Tap to store the circle.

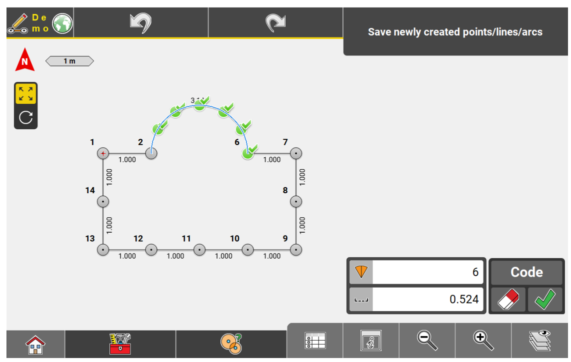
Divide a line or arc into equal segments

1. To distribute a number of points evenly along an arc/line, select **Point Creation** from the **Sketching Functions** menu. 

2. Select **Divide Line** from the Toolbox. 

3. Select the line/arc you need to divide, then tap  and enter the **Number of Segments**.

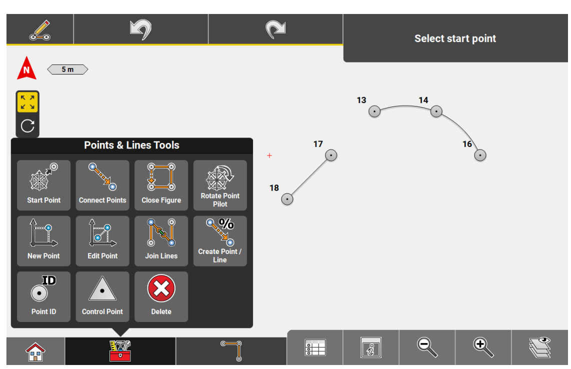
   Alternatively, tap  and enter the **Interval length**.



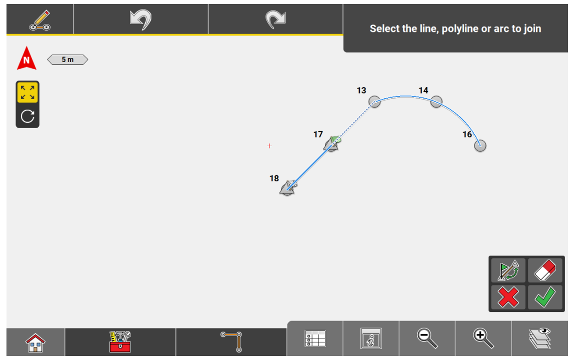
4. Tap to confirm.

Create a polyline from lines and arcs

1. To create a polyline from lines and arcs, select **Join Lines** from the Points & Lines Tools.



2. Tap on the lines/arcs that shall be joined.



The selected lines/ arcs are connected with a dotted line.

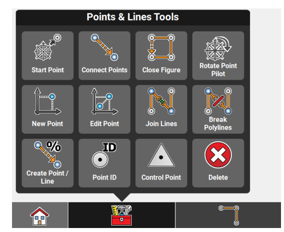
3. Tap  to create the polyline.

☞
- Tap  to change the start-end direction of the selected line/ arc.
- Selected lines/arcs can be deselected in the order of selection. To clear the whole selection, tap .

Break polylines

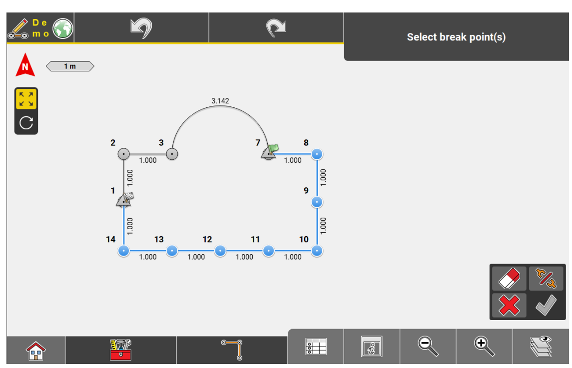
1. To break a polyline into several lines select **Break Polylines** from the **Points & Lines** toolbox.

   ☞ This function is only available for polylines. Arcs or circles cannot be selected for breaking.

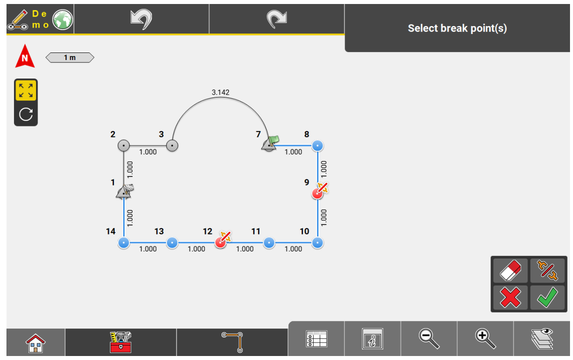


There are two options to break a polyline. You can either select single break points, i.e. points at which a polyline shall be broken, or you can select a whole line to be broken into single segments.

2. In order to break a line at specific points, first select the polyline that shall be broken.

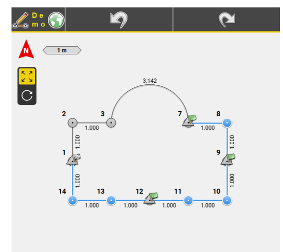


3. Then select the break point(s).

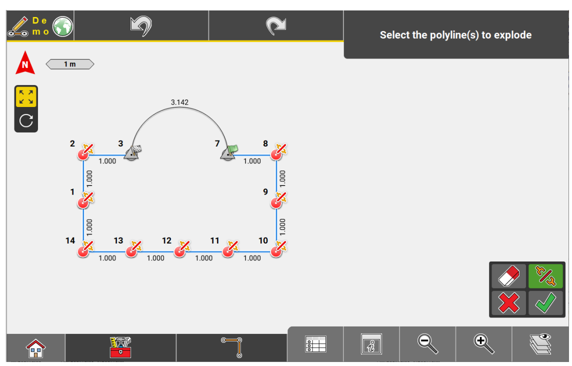


4. Tap ✓ to confirm your selection.

With reference to the example shown above the existing polyline will be broken into three lines that can be selected separately for further operations.



5. To explode whole polylines into segments, select the line to be broken and tap .

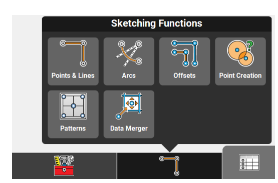


All points of the polyline will be selected as break points.

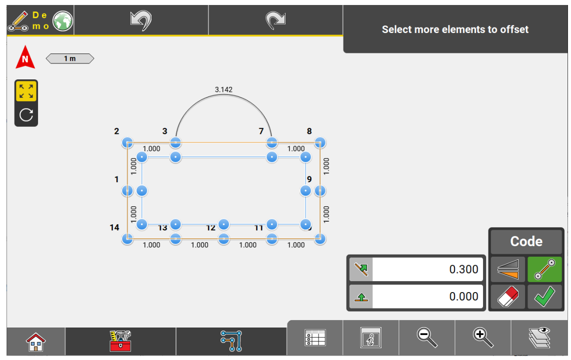
6. Tap ✓ to confirm your selection and break the line at each point.

Create offset points

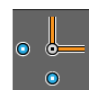
1. To create offset points for the drawing, select **Offsets** from the **Sketching Functions** menu.

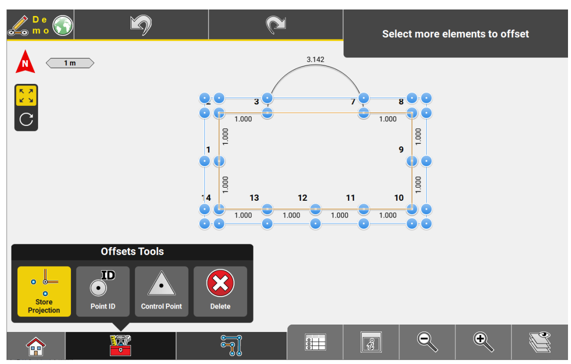


2.
- Select the points required for offset, then tap and enter an **Offset** value.
- Tap and enter a **Height Offset** value, if needed.
- Enable or disable **draw line** as required.
- Use **flip** to switch the offset value from positive to negative.



☞ To store projection points at perpendicular offsets in the corners select **Store Projection** from the Toolbox.



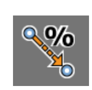


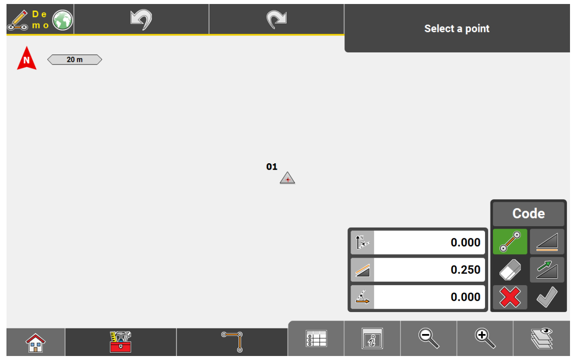
To switch the projection points off before storing, tap the toolbox button again.

3. Tap to accept and store the offset points.

Create points or lines by defining direction and slope

1. Select **Points & Lines** from the **Sketching Functions** menu.
2. Select **Create Point / Line** from the Toolbox.

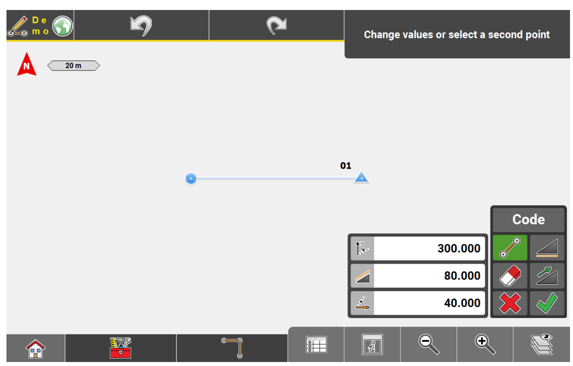




3. Select a point.

4. Make the necessary settings in the toolbar:
   - Enter or change the horizontal angle.
   - Enter or change the distance value.
     Tap the respective button to switch between sloped distance and horizontal distance.
   - Enter or change the slope value.
     Tap the respective button to switch between positive slope and negative slope.
   - Enable or disable **draw line** as required.

☞ To set the values for horizontal angle, distance and slope automatically, select a second point. It is possible to modify the values as desired.



☞ Use **CODE** to define and apply a code to the created point.

5. Tap ✓ to store the projected point or line.

How to create points with Snap Points tool

☞ Available for iCON build and iCON site Plus.

Creating points with the Snap Points tool

1. Select **Draw/Sketching** from the Home Menu.

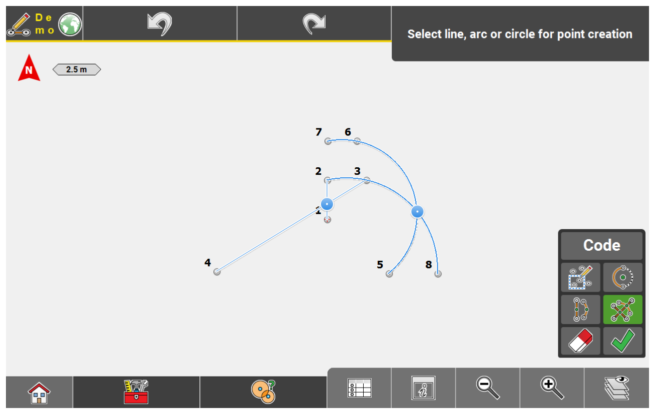
2. Select **Point Creation** from the **Sketching Functions** menu.

3. Select **Snap Points** from the toolbox.

Toolbar for Snap Points is displayed. Refer to the following table for a description of the toolbar buttons.

4. Select all lines, arcs or circles for which you want to create points. For quick selection or deselection, use the **Window Selection** mode.

5. Activate the corresponding toolbar button to create mid-points, centre points or intersection points for the selected elements.



When you activate a button, a preview of the resulting points is displayed in map view. An active button is highlighted in green.

6. Tap ✓ to confirm the preview and create the points.

Toolbar for Snap Points

Toolbar button	Description
	Tap this button to start the **Window Selection** mode. This mode allows you to select or deselect several elements at once instead of tapping each of them separately. All elements located within the defined selection area can be selected or deselected. • Define a rectangular selection area by tapping two points for the area corners. • Tap ✓ to add the elements within the selection area to the selection. • Activate  and tap ✓ to deselect the elements within the selection area.
	Activate this button to create centre points for the selected elements. ☞ This button is activated by default.
	Activate this button to create mid-points for the selected elements.

Toolbar button	Description
	Activate this button to create intersection points for the selected elements.
	Tap this button to deselect all selected elements.
	Tap this button to create the corresponding points.

10.2 How to Merge Models (Drawings, PDF Files)

Import models

It is possible to import several models to a job, such as floor plans or installation plans. After import, you can scale, rotate and align these models to each other using the **Data Merger** tool.

Allowed file formats:

- 2D PDF: Vector type of PDF, typically created from a CAD program.
- DXF
- DWG

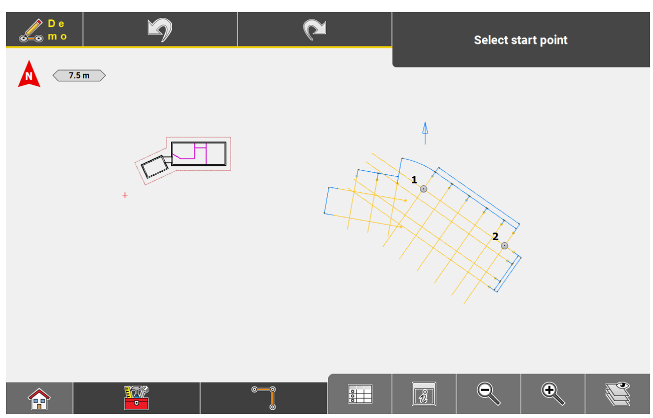
☞ For information on how to import reference data, refer to Importing data to the project step-by-step (within 2.2 Import, Export, or Delete Data).

Merge models step-by-step

☞ Ensure that the necessary models are loaded to the active project.

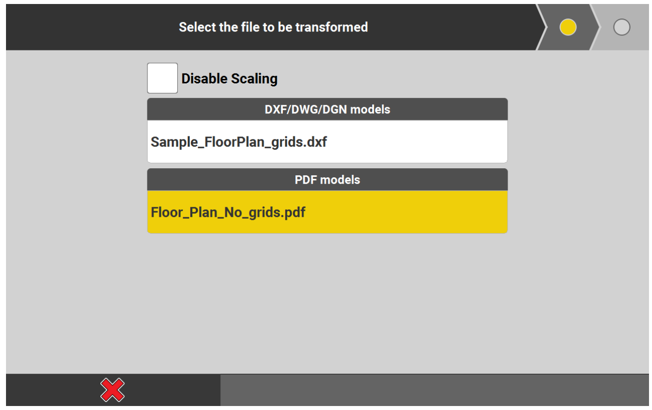
1. Select **Sketching** from the Home Menu. 

Map view is displayed.



☞ Each model must include two points which can serve as reference points for scaling, rotating and aligning the vector data.
If necessary, create these points for each model before merging the models.

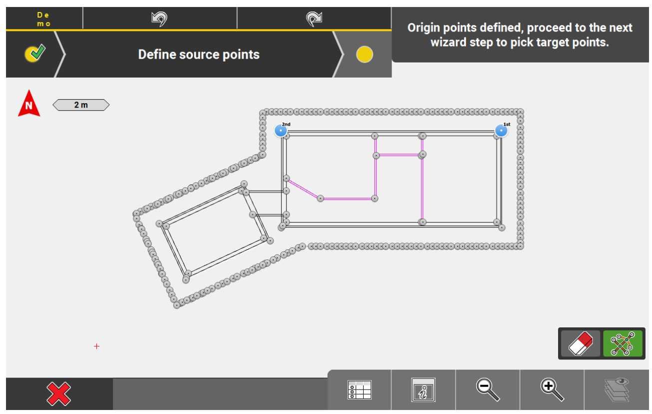
2. To merge the models, select **Data Merger** from the **Sketching Functions** menu. 

3. 

Select the model to be scaled, rotated and aligned.

Tap to proceed to the next Wizard step.

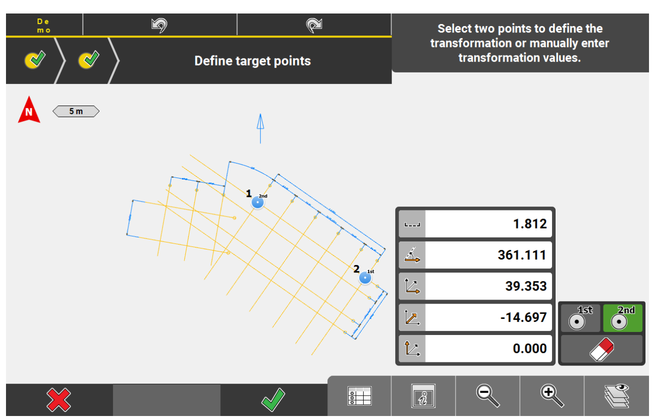
All available points of the selected model are displayed in map view.



4. Select two points to be used as source points.
To cancel point selection, tap .

Tap to proceed to the next Wizard step.

5. *The model serving as target for the alignment is displayed in map view.*



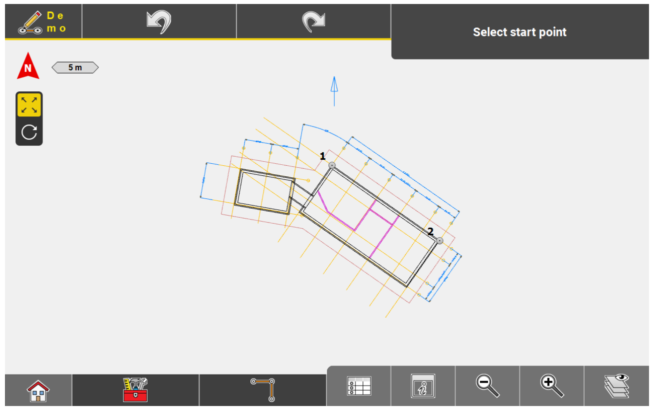
Select two points to be used as target points.
To cancel point selection, tap .

☞ If necessary, enable the option **Show Points** in the Layer Manager.

6. To merge the models, tap ✓.

7. If necessary, edit the file name of the merged models.
Tap ✓ to save.

Map view is displayed. The models are now aligned to each other.



10.3 How to Create Drill Patterns

General description

The **Drill Patterns** creation functionality allows to define drilling or piling patterns for drill rigs.

Once the pattern is created, transfer it to iCON Rig machines running MC1 or VisualMachine.

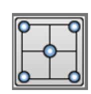
☞ The software requires an additional license to use this application.

How to create drill patterns step-by-step

1. Import the data you want to apply. For example: Points, lines, polylines, road lines, and so on. Refer to 2.2 Import, Export, or Delete Data.

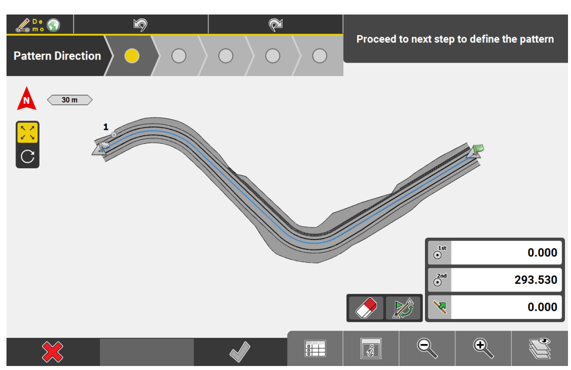
2. Select **Draw** from the Home Menu.

3. Select **Patterns** from the **Sketching Functions** menu.



4. Select **Drill Patterns** to start the Wizard.

5. Define the direction of the pattern.



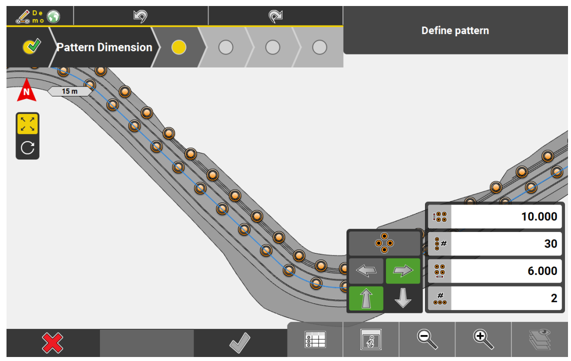
Select two points, a line or a polyline to define the forward direction of the pattern.

- Tap to flip the start and end point of the line.
- To offset the line, enter a value at .
- If necessary, define the start and end chainage of the line in the toolbar.

Tap the next Wizard step to proceed.

---

6. Define and dimension the pattern. The pattern points are the bottom points of the drill holes.



For a description of the icons, refer to **Toolbar buttons and editable fields for defining the pattern (step 6.)**.

Tap the next Wizard step to proceed.

☞ If any combination of the forward holes spacing with the number of forward holes exceeds the end point of the line, a message appears with options to retract or overshoot the pattern.

- **Retract**: The pattern stops before the endpoint of the line.
- **Overshoot**: The pattern extends by one set of forward points.

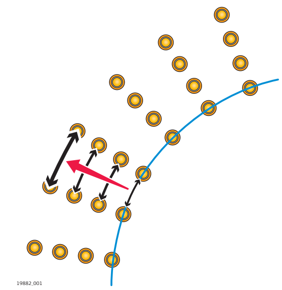
---

7. Define the height of the pattern points.
By default, all pattern points have the height of the start point.
There are several options to change the height of the pattern points:

- Manually enter the desired height into the editable field.
- Select a surface to transfer the heights of the surface to the pattern points. Pattern points outside the surface are not created.
- Select the line of a road model to transfer the heights of the model to the pattern points. Pattern points outside the road model are not created.
- Select a line and tap to transfer the height of the selected line.

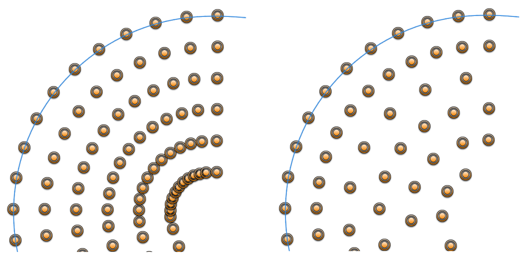
Tap the next Wizard step to proceed.

8. When you apply a pattern to a curved line, the forward hole spacing is influenced by the distance of the points to the selected line. Depending on which side the pattern is created, the forward hole spacing is increasing or decreasing.

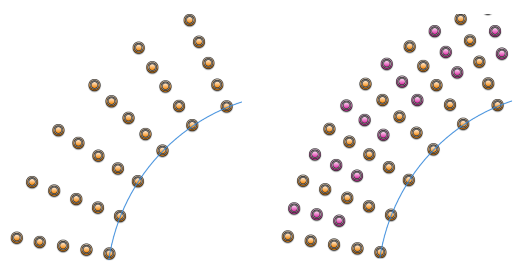


This step is optional and available when a line has been selected in the wizard step 1.
For a description of the icons, refer to **Editable fields for defining the minimum/maximum hole spacing (step 8.)**.

Define the minimum hole spacing to remove holes.



Define the maximum hole spacing to add extra holes. The added holes are shown in purple colour.

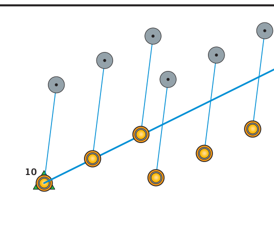


To reset the values, ensure that the editable fields are empty.

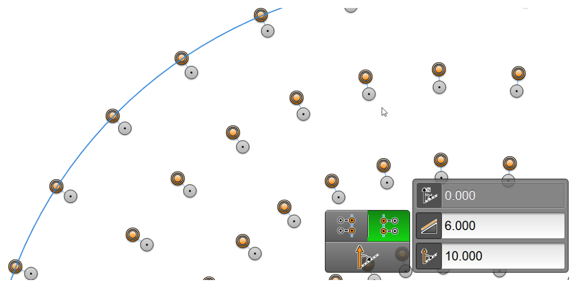
Tap the next Wizard step  to proceed.

---

9. Define the heading and the inclination of the holes. The top points are the grey points on the map.



Example: The heading of the holes is set to be perpendicular to the line at the right side.

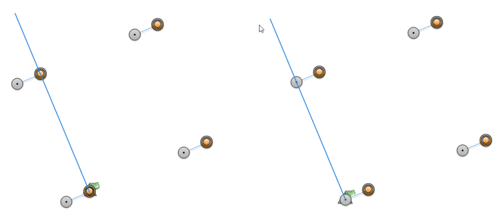


For a description of the icons, refer to **Toolbar buttons and editable fields for defining the heading and the inclination of the holes (step 9.)**.

Change the vertical angle/slope definition (zero vertical angle) from bottom to top. This setting avoids drilling at a wrong position, for example too close to a free face.
By default, the vertical angle is applied at the daylight point/top point (kick angle from bottom).

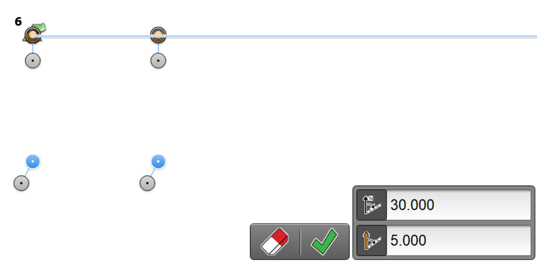
When is enabled, the vertical angle is applied from the top points to the bottom points (kick angle from top).

Example: Pattern when the vertical angle is applied to top points (left) and bottom point (right)



Tap the next Wizard step to proceed.

10. If necessary, select one or more holes and change the heading and/or the vertical angle/slope. This step is optional.



Tap to accept the changes or tap to cancel any changes made in this step.

11. Tap to finish the wizard.

12. Enter the name for the pattern.
Tap to accept.
The pattern is stored as a *.geo file. It is visible on the map for further checking. Turn off the file from the layer manager or delete if not longer needed.

13. Select **Export** from the Home Menu.
Select **Drill Patterns** option for exporting.
Export in XML format (IREDES standard) for MC1 or Kof for VisualMachine (kof contains the bottom points of the holes).
The file is exported to the Data folder of the internal memory or USB stick.
It is also possible to export the drill pattern to ConX.

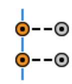
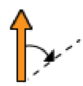
Toolbar buttons and editable fields for defining the pattern (step 6.)

Toolbar button	Description
	Tap this button to rearrange the pattern into a diamond formation.
	Tap this button to create the pattern on the left side of the line.
	Tap this button to create the pattern on the right side of the line.
	Tap this button to create the pattern at forward direction.
	Tap this button to create the pattern as backward direction. ☞ This button is only active, if two points have been selected in the previous step.
	Enter forward holes spacing.
	Enter number of forward holes.
	Enter side holes spacing.
	Enter number of side holes.

Editable fields for defining the minimum/maximum hole spacing (step 8.)

Toolbar button	Description
	Enter the minimum hole spacing to remove holes.
	Enter the maximum hole spacing to add extra holes.

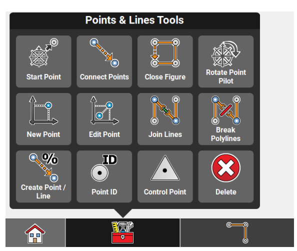
Toolbar buttons and editable fields for defining the heading and the inclination of the holes (step 9.)

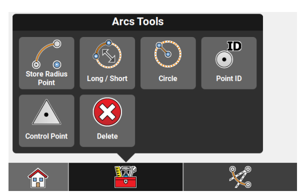
Toolbar button	Description
	Tap this button to set the hole heading perpendicular to the line on the left direction.
	Tap this button to set the hole heading perpendicular to the line on the right direction.
	Tap this button to kick the vertical angle/slope from top. By default the vertical angle/slope is applied from the bottom.
	Enter the holes heading.
	Enter the distance to the top points.
	Enter the vertical angle/slope of the holes.

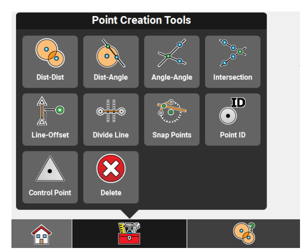
10.4 Sketching Toolbox Functions

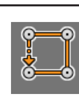
Toolbox functions

Depending on the **Sketching Functions** selected, the toolbox contains some additional functions.

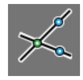
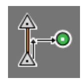
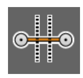






Function		Description
Start Point		Allows the selection of a point as the new start point.
Connect Points		Tap points to create a line between these points.
Close Figure		Tap to complete the shape.

Function	Description
Rotate Point Pilot	Rotate the point pilot relevant to presettings, for example a reference line or a constructional drawing, to use this helpful tool in a rotated position. ☞ Only available for iCON build and iCON site Plus.
New Point	Insert a point into the map by entering the required coordinates or by scanning a QR-code, or select a point and adapt the coordinates for the new point. The new point can also be defined as Control Point. ☞ To start the QR-code scan tap . See also: Importing data using QR-Scan step-by-step
Edit Point	After selecting a point from the map, permitted values can be edited.
Join Lines	Tap and select lines/arcs to join them. ☞ Only available for iCON site and iCON build Plus.
Break Polylines	Tap and select polylines and break points. ☞ Only available for iCON site and iCON build Plus.
Create Point / Line	Allows you to create a point or line by defining direction and slope.
Point ID	Tap Point ID to edit ID for the next point.
Control Point	Tap to activate the **Control Point** function. When active, new points are stored as control points.
Store Radius Point	Allows you to store the radius point along with the arc.
Long / Short	Allows you to toggle between the short and the long segment of a circle, when creating an arc. By default, short is selected.
Circle	Allows you to create circles. ☞ Only available for iCON build and iCON site Plus.
Dist-Dist	Select two points and the required distances for intersection. When the theoretical circles inter-sect select the intersection point to store.

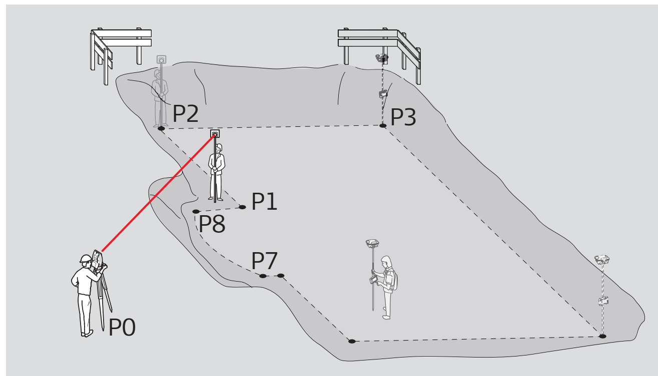
Function		Description
Dist-Angle		Select a point and the required distance. Then select a second point and the angle for theoretical line through that point. When the theoretical circle intersects the line select the intersection point to store.
Angle-Angle		Select two points and the angles for the theoretical lines through these points. When the theoretical lines intersect, select the intersection point to store.
Intersection		Select a first line or two points for it. Select a second line or two points for it. When the theoretical lines intersect store the intersection point.
Line-Offset		Select a line to offset or two points for it. Then enter the line and offset information and store the new point.
Divide Line		Select a line, or two points for it, or an arc, to divide into segments.
Snap Points		Select lines, arcs or circles and create their mid-points, intersection points or centre points. ☞ Only available for iCON build and iCON site Plus.

11 How to Stake Out TPS + GPS

11.1 Staking Out TPS + GPS

General description

☞ The **Stakeout** application is used to place marks in the field at pre-determined points. These predetermined points are the points to be staked.



006790_001

P0	Known station
P1...	Point to be staked

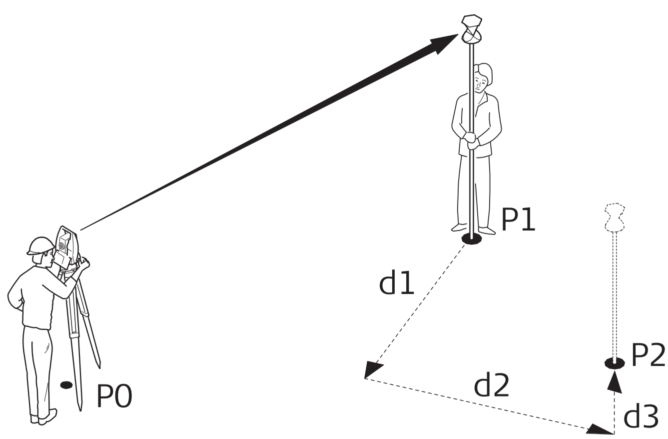
The points to be staked can:

- Be uploaded as a file to a project. Refer to Importing data to the project step-by-step for more information.
- Be created within the **Draw** application, and accessed directly. Refer to 10 How to Sketch a Plan.

This chapter explains how to stake out points, lines, and arcs, using **GPS** and **Total Station**.

☞ For information about staking out Surfaces refer to 12 How to Stake Out Surfaces .

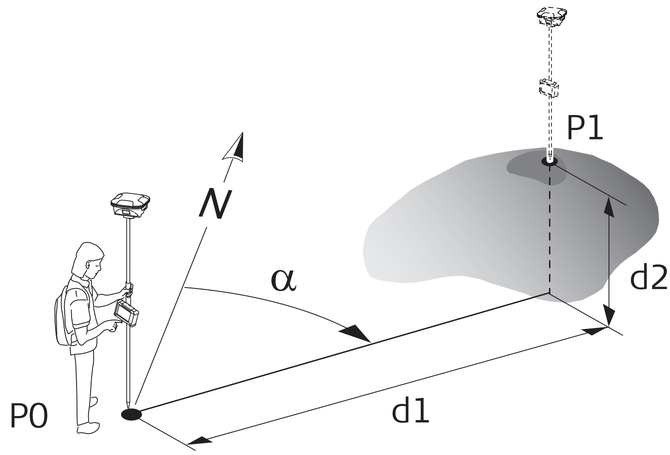
Stake Out elements, TPS



006776_001

P0	Station
P1	Current position
P2	Point to be staked
d1	Stake out element
d2	Stake out element
d3	Stake out element

Stake Out elements, GPS



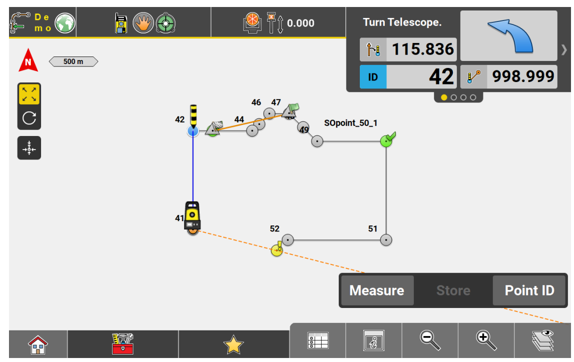
006777_001

P0	Current position
P1	Point to be staked
d1	Stake out distance
d2	Height difference between current position and point to be staked
α	Stake out direction

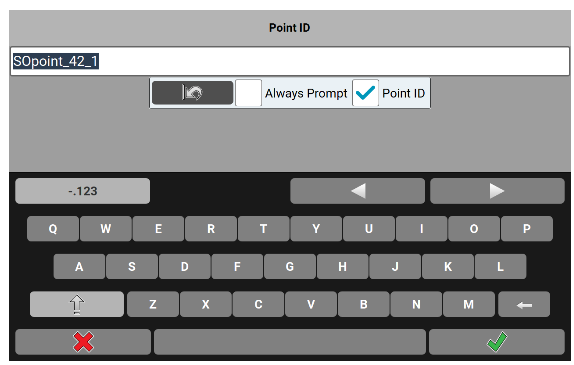
Associate Point ID to Stakeout point

iCON site allows to associate a Point ID to a Stakeout point:

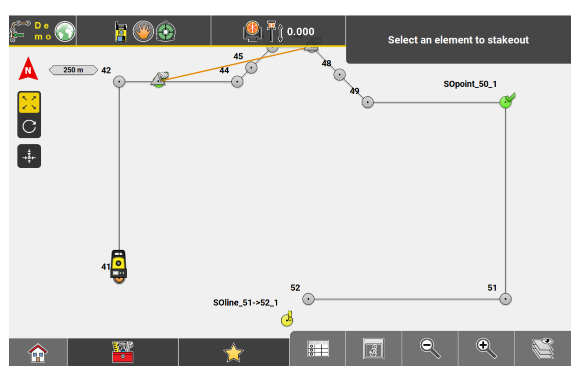
1. Select **Stakeout** from the Home Menu. Map screen is displayed. Select an element to stake.



2. Configure the Measure bar to display **Point ID**, then tap **Point ID**. Tap on the **Point ID** tick box and tap to accept.



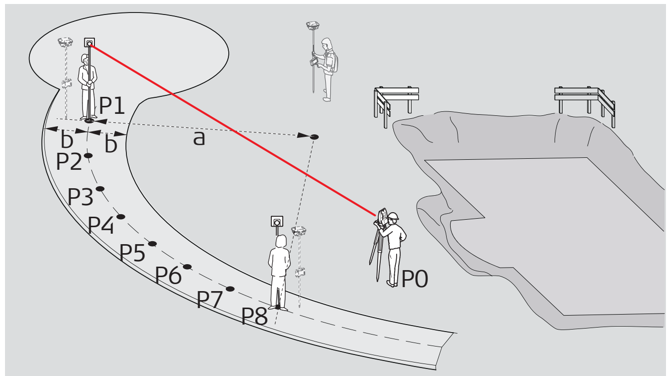
3. Measure and store a new point. This point will be recorded with the associated Point ID.



☞ When a line is selected as stakeout element the associated name will follow this convention: start point ID minus end point ID underscore additional number. For example for a line from point ID 10 to point ID 17 it will be 10-17_1, 10-17_2 and so on.

11.2 Stake Out Points TPS + GPS

General description



006778_001

P0	Known station
P1 ...	Layout points
a	Radius
b	Offset

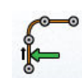
Given:

- Instrument is connected and set up with known station and height.
- Points are active within the current job. Refer to Importing data to the project step-by-step.

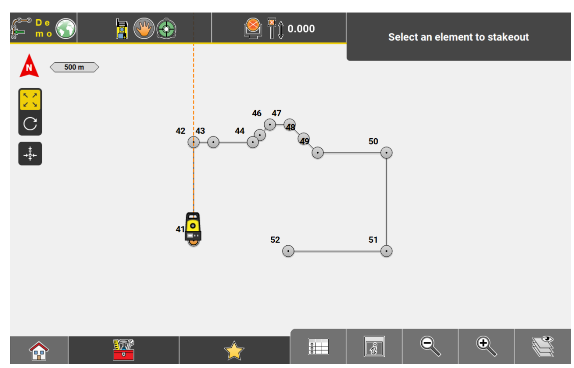
☞ Note that main workflow refers to Total Station. For GPS press **Measure** to record a point.

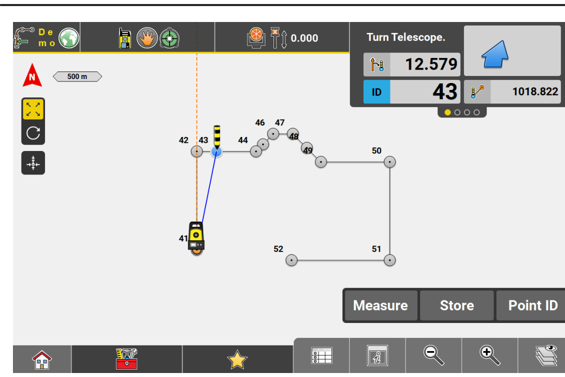
Stake out points step-by-step

1. Select **Stakeout** from the Home Menu.

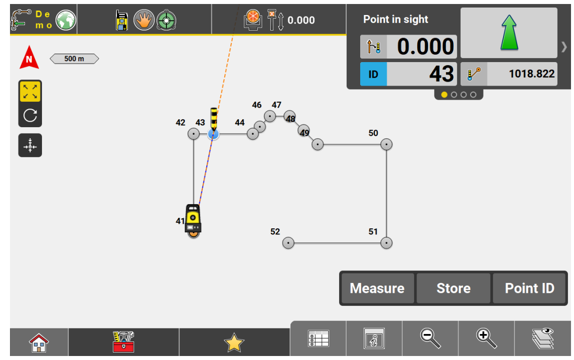


2. Select the point to stake, then follow the guidance to navigate the target to the point.

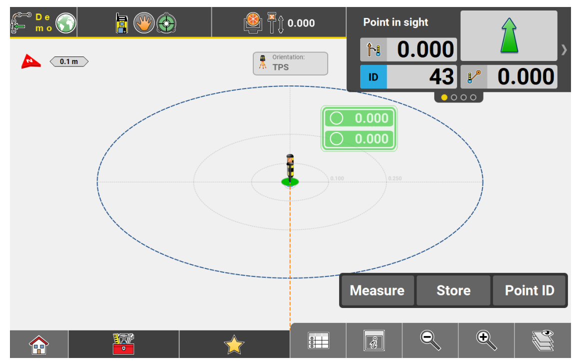




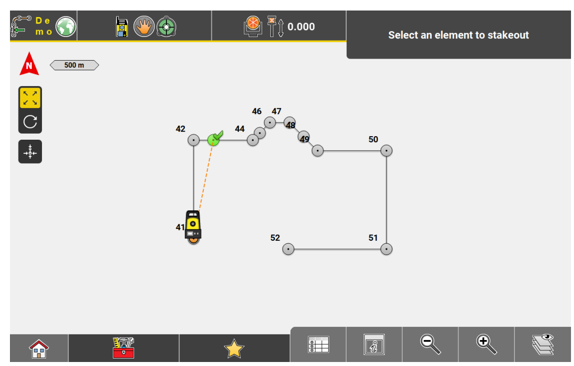
3. Once telescope is aimed to target point, press **Measure**. The difference between the measured point and the point to be staked is displayed. The colour of the measured point indicates whether it is within tolerance.



4. Record the point by tapping **Store**, or measure again, using **Measure**.



5. Once the location is marked, the next point can then be selected, and the process can repeat.



☞ In 5" or 7" display mode, with Multiview active, use **Stakeout Point List** to get the points to be staked displayed. It is possible to select the points for staking out in the list.

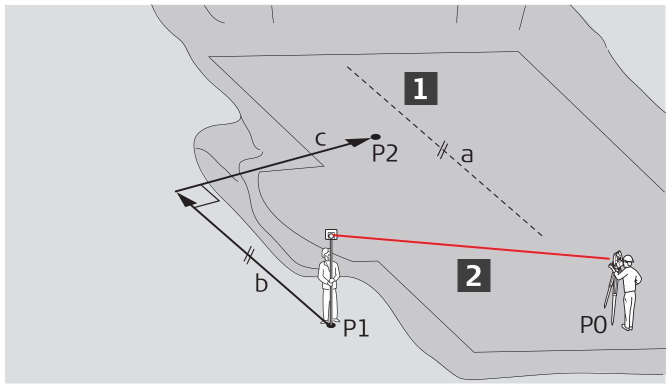
☞ Define **Measure Mode** in the Status 1 menu.

☞ Tolerances can be set in **Units** m/ft, which is found in the Home Menu.

☞ **GPS and Robotic Total Station approach:**
As the target moves around, real-time measurement data and guidance information is constantly displayed in the **Information bar**. Once the point in the screen turns green, the point is staked within tolerance. To record points using the Total Station, press **Store**. If using GPS, press **Measure**.

11.3 Stake Out Points with Reference to a Line TPS + GPS

General description



006780_001

P0	Known station
P1	Measured point
P2	Point to be staked
a	Reference line
b	Line
c	Offset

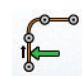
Given:

- Instrument is connected and set up with known station and height.
- Points are active within the current job. Refer to Importing data to the project step-by-step.

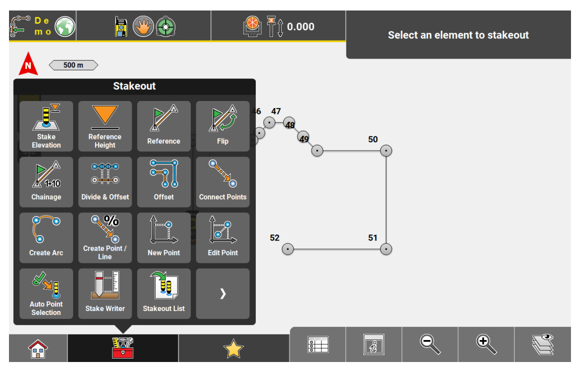
☞ Note that main workflow refers to Total Station. For GPS press **Measure** to record a point.

Stake out points with reference to a line step-by-step

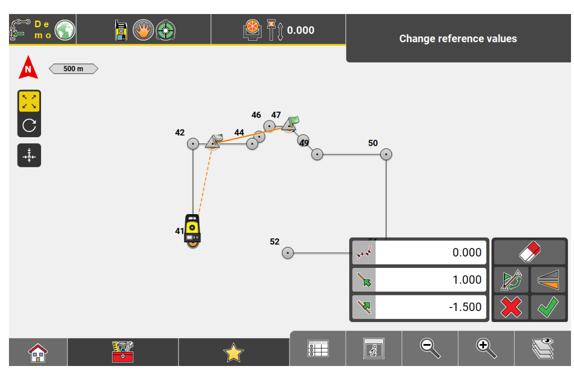
1. Select **Stakeout** from the Home Menu.



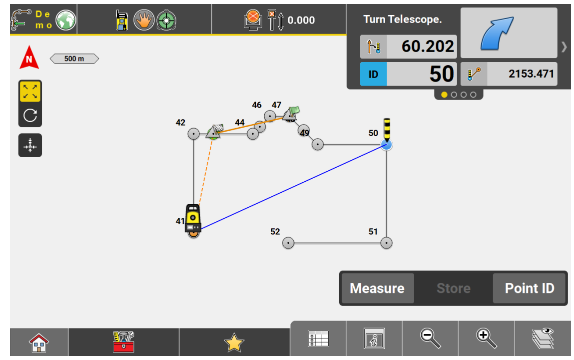
2. Select **Reference** from the Toolbox.



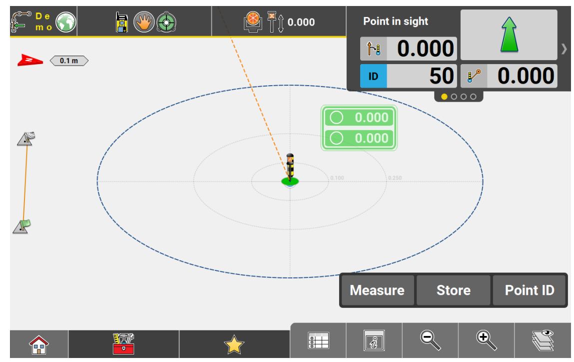
3. Define the reference line, then use the Toolbar to define any offset for the line. Tap ✓ to accept.



4. Select a point to stake, and then press **Measure**. The difference between the measured point and the point to be staked is displayed, with reference to the line that was defined.



5. Once the location is marked (in the field) and stored, the next point can then be selected, and the process can repeat.

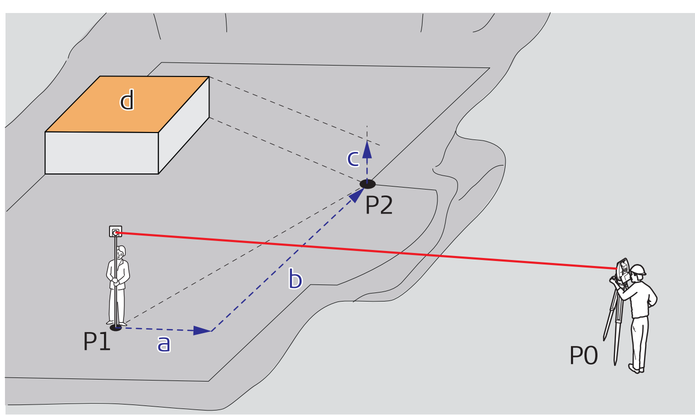


☞ **GPS and Robotic Total Station approach:**
As the target moves around, real-time measurement data and guidance information is constantly displayed in the **Information bar**. Once the point in the screen turns green, the point is staked within tolerance. To record points using the Total Station, press **Store**. If using GPS, press **Measure**.

11.4 Stake Out Points, Lines, Arcs with Reference to a Height

TPS + **GPS**

General description



19084_001

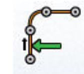
P0	Known station	a, b	Distance offsets
P1	Measured point	c	Height offset
P2	Point to be staked	d	Reference height

Given:

- Instrument is connected and set up with known station and height.
- Data is active within the current job. Refer to Importing data to the project step-by-step.

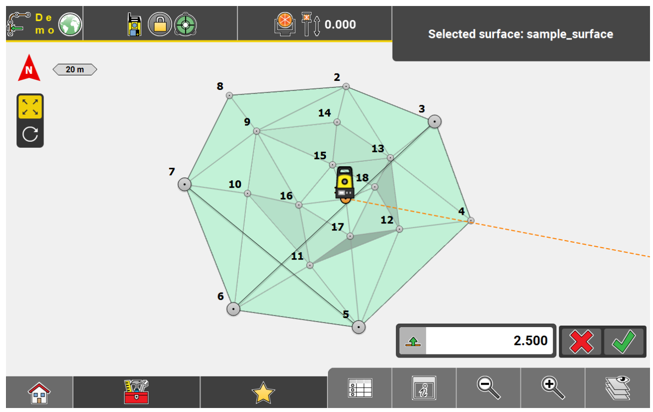
Stake out points with reference to a height step-by-step

1. Select **Stakeout** from the Home Menu.



2. Select **Reference Height** from the Toolbox.

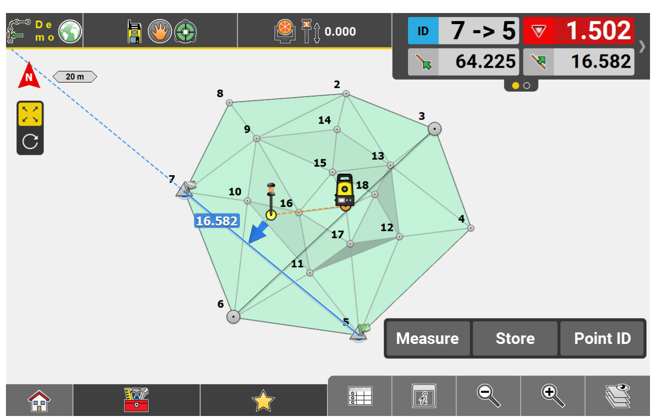
The Toolbar for reference height is displayed.



3. Define the reference height by one of the following options:
   - Select a point with the desired height.
   - Select a surface. If necessary, use the Toolbar to define an offset to the surface. 
   - Directly enter a reference height in the Toolbar. 

   Tap ✓ to accept.

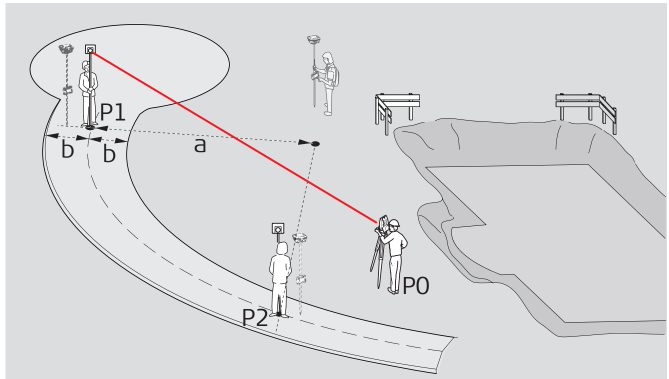
4. Select a point, line or arc to stake. Press **Measure**.
   The Cut & Fill value from the defined reference height to the measuring position is calculated.
   To store the point, tap **Store**.



☞ Once the location is marked (in the field) and the point is stored, the next element can then be selected, and the storing process can repeat.

11.5 Stake Out Lines and Arcs TPS + GPS

General description



006781_001

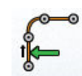
P0	Known station
P1 ...	Layout points
a	Radius
b	Offset

Given:

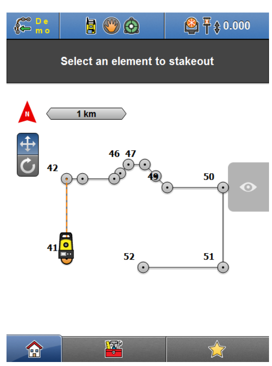
- Instrument is connected and set up with known station and height.
- Points/lines/arcs are available in the current job. Refer to Importing data to the project step-by-step.

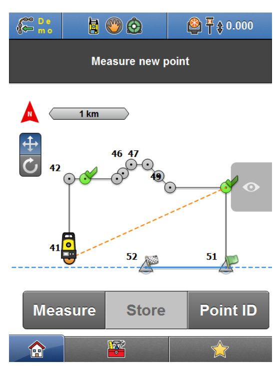
☞ Note that main workflow refers to Total Station. For GPS press **Measure** to record a point.

Stake out lines and arcs step-by-step

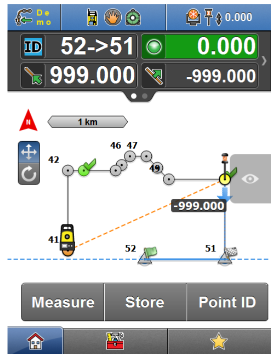
1. Select **Stakeout** from the Home Menu. 

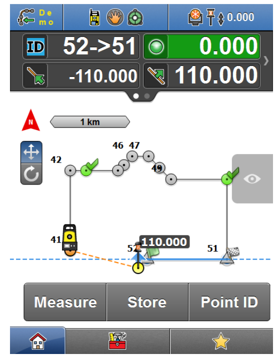
2. - Define or select the line/arc to stake by tapping the relevant elements.
   - To change the direction of the line, select **flip**  from the Toolbox. Once the line is defined, press **Measure**.





3. - Once the target is within tolerance, it changes colour to green. Press **Store**. Mark the staked position (in the field).
   - This process can repeat along the same line. To stake another line, tap the preferred line, and continue the process.





Define **Measure Mode** in the Status 1 menu.

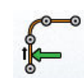
GPS and Robotic Total Station approach:
As the target moves around, real-time measurement data and guidance information is constantly displayed in the **Information bar**. Once the point in the screen turns green, the point is staked within tolerance. To record points using the Total Station, press **Store**. If using GPS, press **Measure**.

Use Divide & Offset step-by-step

The toolbox function **Divide & Offset** allows you to divide a line or arc into segments. Based on a defined interval or number of segments, the function automatically creates segment points that can be staked out. These segment points can also be offset in one step.

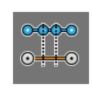
If desired, you can add the created segment points to an existing or a new stakeout list.

1. Select **Stakeout** from the Home Menu.

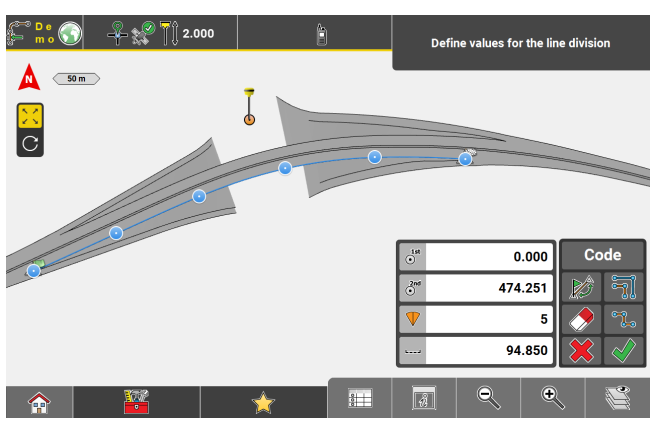


Divide & Offset is also available in the **Roading** application.

2. Select **Divide & Offset** from the **Toolbox**.



3. Select the line/arc for dividing and offsetting by tapping the relevant element.
The Divide & Offset toolbar is displayed.



4. Use the toolbar to define the values for line division and if necessary, the values for offsetting the segment points. The map view is updated accordingly to show a preview of the points to be created.

Start/End point
Start and end point define whether the whole line/arc or only a part of it is divided into segments. If necessary, change the values of the start and end point.

Tap **Flip** to switch the start and end point of the line/arc.

Values for line division
The fields for defining the necessary number of segments and the length of a single segment are interdependent. Enter a value for one of the fields and the value of the other is updated accordingly.

Offset values
Tap this button to define the offset values for the segment points.

☞ The button and the toolbar change their appearance accordingly. Tap the button again to define the values for line division.

Enter values for the horizontal and vertical offset to the selected line/arc.

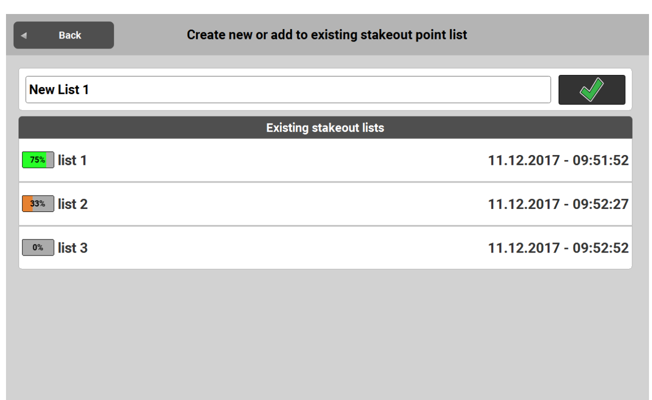
Tap **Flip** to switch the vertical offset value from positive to negative.

Codes
Tap the **Code** button to assign a code to the created segment points. For information on codes, refer to 7.5 Point IDs and Codes .

Break Points
Activate this button to create so called "break points", in addition to the segment points. Using break points is especially helpful for polylines that have many changes in direction or slope. A break point is created at each change of direction.

5. Tap ✓ to store the created segment and break points.

6. *Following screen is displayed:*



☞ To return to map view without creating a stakeout list for the created points, tap **Back**.

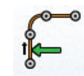
- To add the created points to a new stakeout list, enter a name and tap ✓.
- To add the created points to an existing stakeout list, tap the respective row in the list.

A message is displayed, informing about the number of points added to a new or existing stakeout list.
Tap OK to return to map view.

11.6 Stake Out Contour Lines TPS + GPS

Stake out contour lines step-by-step

1. Select **Stakeout** from the Home Menu.

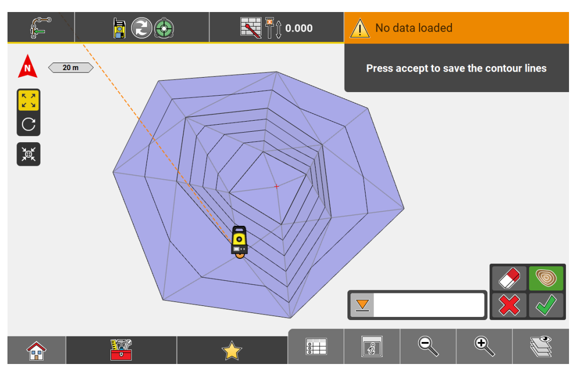


2. From the Toolbox select **Contour Lines**.

3. In the Map View select the surface on which contour lines shall be staked out and tap the contour lines icon to take over existing contour lines.
See also: Viewing options for Elevation Map

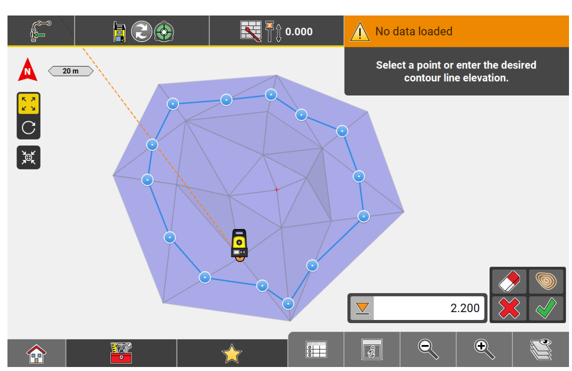
☞ Alternatively, create a contour line at a desired elevation. See below.

4. Tap ✓ to save the contour lines.



The contour lines are saved to an XML file and available for stakeout.

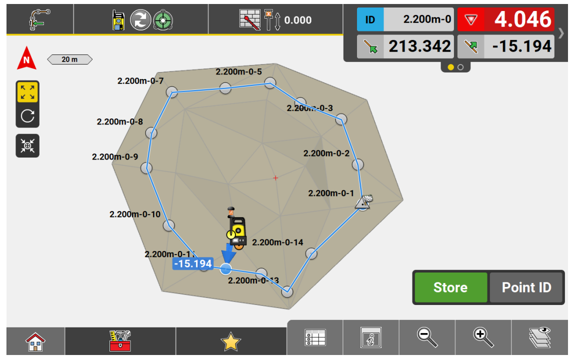
5. To create a contour line at a specific elevation enter a value and tap ✓ to save the contour line.



The contour line is stored in the database and available for stakeout.

6. Select the contour line(s) and start with staking out.

   ☞ On how to stake out lines see: Stake out lines and arcs step-by-step



11.7 Stake Writer TPS + GPS

General description

Stake Writer allows for user-friendly marking of cut/fill values on the stakes.

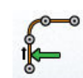
The function is available in the applications:

- Stakeout
  See also: General Stake Out Toolbox Functions
- Cut & Fill
  See also: General Cut/Fill Toolbox Functions
- Roading
  See also: General Roading Toolbox Functions
- Slopes
  See also: Toolbox functions

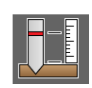
When you have loaded the project data and connected to the sensor you can access the relevant application.

Using Stake Writer step-by-step

1. Select **Stakeout** from the Home Menu.

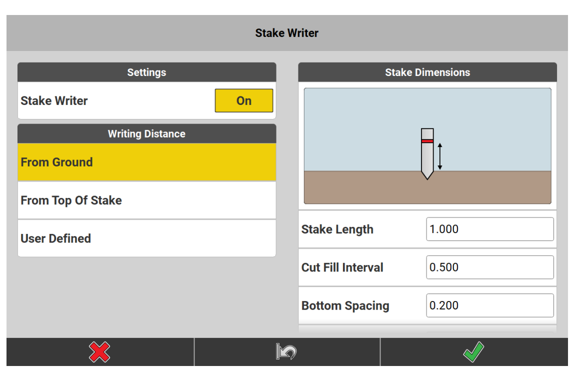


2. Select **Stake Writer** from the Toolbox.

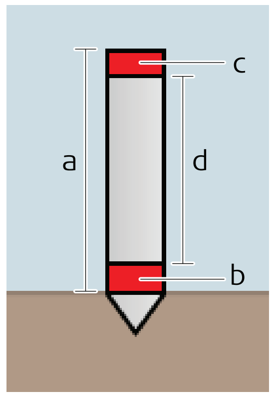


A configuration screen appears to select the desired stake-writing method and configure the stake dimensions.

3. Under **Settings** tap the button to turn Stake Writer **On**.



4.	Under **Writing Distance** select between: • From Ground • From Top Of Stake • User Defined With **User Defined** being the usual method not using any stake marking assistance.
5.	Under **Stake Dimensions** define the parameters as required.



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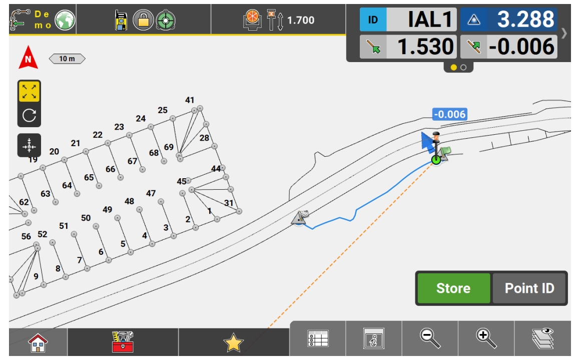
a Stake Length
b Bottom Spacing
c Top Spacing
d Range for applying the mark in accordance with the defined Cut Fill Interval.

- Enter the length of the stake used for stakeout, only available for method **From Ground**.
- Enter an interval by which an easy-to-use Cut & Fill value shall be calculated for the marking on the stake.
  For example, a **Cut Fill Interval** of 0.5m implies that the software calculates the mark to be at 0.5m intervals, that is either at 0.0m or 0.5m or 1.0m or 1.5m etc. cut or fill.
  The interval value can as well be set to 0.
- Enter values for **Bottom Spacing** and **Top Spacing** in order to define a margin at the top and/or the bottom of the stake that shall not be available for marking.
  If the calculated Cut & Fill mark lies outside the given range, the system issues a notification.
  The bottom/top spacing can be set to 0, which implies that the whole length of the stake will be available for applying the mark.

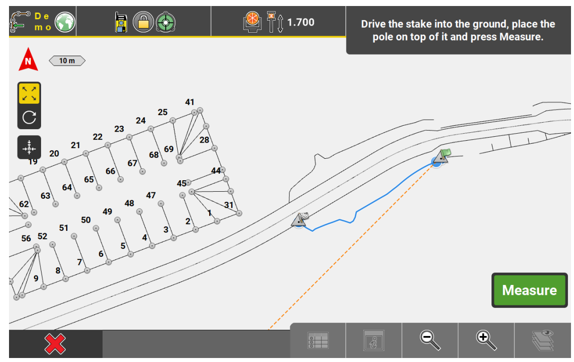
6.	Tap ✔ in order to accept all settings and proceed with using Stake Writer.
☞	Tap to reset any configurations to default. The Stake Writing Method will be reset to **From Ground**.
7.	In the Map View select the element to be staked out.

8. **Start** measuring. When the pole position is inside tolerance tap **Store**.

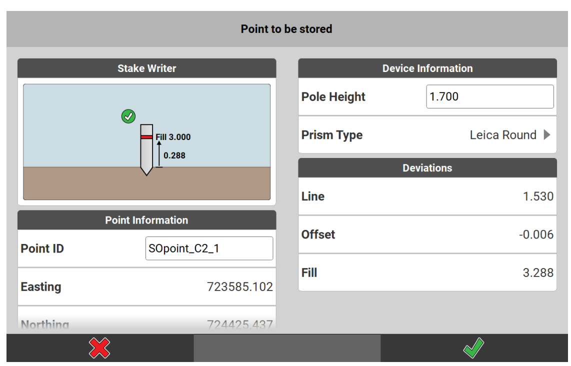


☞ For method **From Top Of Stake** a second measurement on top of the stake is needed.

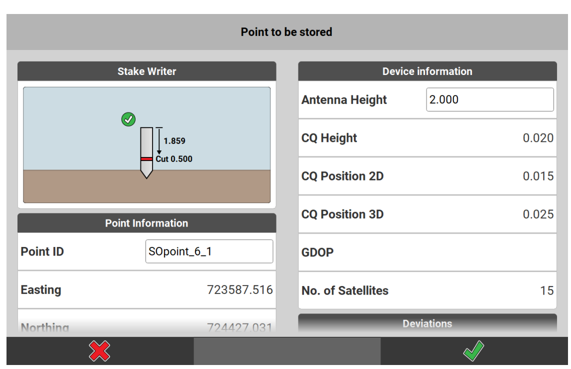
- Measure and store the ground point.
- Drive the stake into the ground.
- Place the pole on top of the stake and tap Measure.



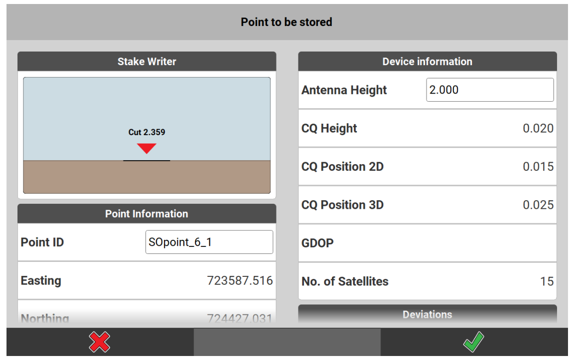
The **Point to be stored** page is displayed:



For Writing Distance From Ground



For Writing Distance From Top Of Stake



For Writing Distance User Defined

9. Tap ✓ to store the point.

☞ If the measurement fits to the defined Stake Dimensions the indicator in the diagram shows ✓.
If the calculated stake mark position lies outside the defined Stake Dimensions (for example, beyond the range for applying the Cut & Fill mark or beyond the defined Stake Length) then a warning ⚠ is indicated in the diagram.

☞ Stake Writer information is also displayed in the Point Information screen.
On how to view detailed information on stored points refer to: Display point information

11.8 Staking Out Points Automatically TPS

General description

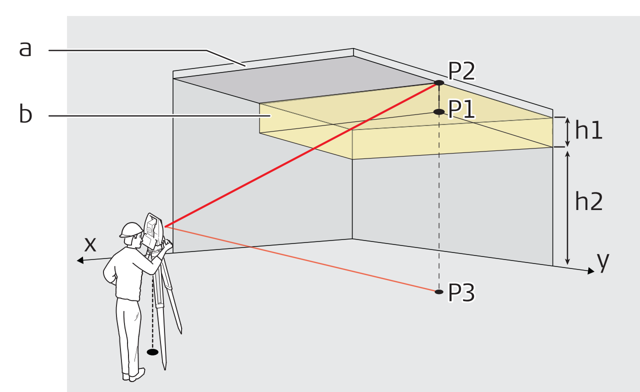
☞ This feature is available when using a Robotic Total Station. Available for iCON build and iCON site Plus.

☞ Auto Staking can be activated separately for each **Layout** application (Points/Lines/Objects).

☞ Once activated in an application, Auto Staking will stay activated in that application even after restart.

The **Auto Staking** tool allows you to stake out points automatically, such as points on a ceiling, floor, wall or penetration points on walls. The tool is especially intended for situations where the coordinates of the point to be staked out do not fit to the already built area.

Stake out a point on ceiling, floor or wall

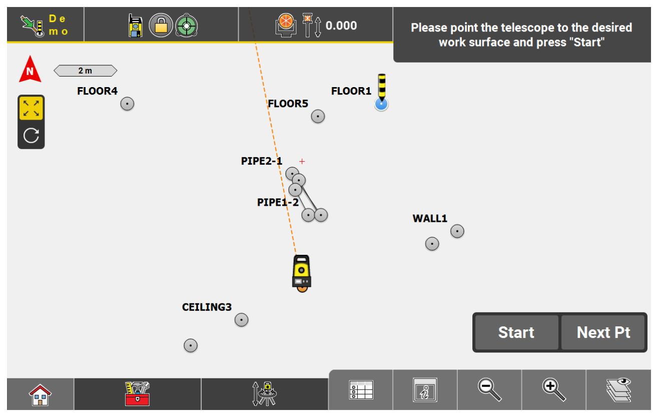


a Existing ceiling
b Designed ceiling (not yet built)
P1 Designed point to be staked out
P2 Auxiliary point on ceiling
P3 Auxiliary point on floor
h1 Height difference between existing and designed ceiling
h2 Height difference between designed ceiling and floor

1. Select **Layout Points** from the Home Menu.
Map screen is displayed.

2. Select **Auto Staking** from the toolbox.

3. Turn the telescope either to the ceiling, the floor or the wall where the point should be staked out or marked.
Select the point and tap **Start**.



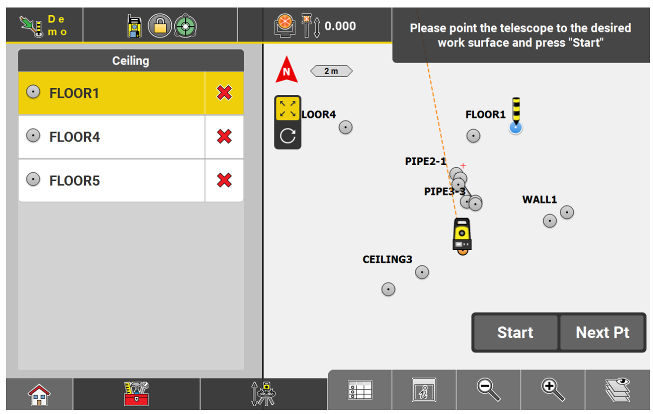
4. *The instrument starts measuring and turns automatically to the desired coordinates (X, Y) on the existing ceiling or floor.*

5. *If the point is in tolerance, the solid laser pointer is switched on to show the point position.*

☞ If the point is out of tolerance, a warning message is displayed.
- Tap Continue to continue the measurement.
  If necessary, change the orientation of the telescope. For example, it may not be possible to stake out a ceiling point due to some objects being in the line of sight. In this case, point the telescope to the floor instead.
- Tap **Accept** to accept the displayed deviation. The solid laser pointer is switched on to show the point position.

6. Tap **Store** to store the measured point.

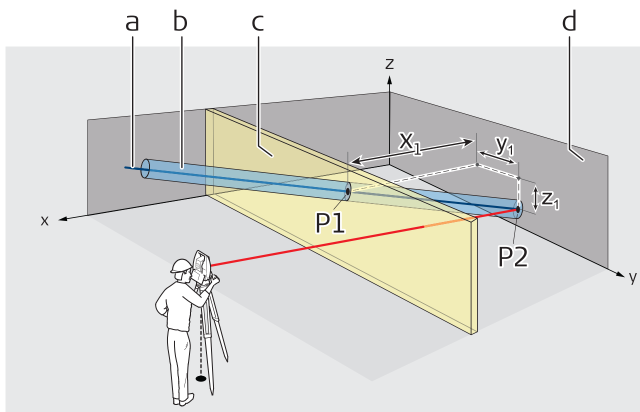
☞ You can stake out several points automatically, using the Stakeout List function:
- Create a Stakeout List or activate an existing list. Refer to 2.6 Managing Stakeout Lists.
- In 5" or 7" display mode, activate Multiview and **Stakeout Point List** to display the point list and the map side by side.
- Select **Auto Staking** from the toolbox.
- Select the first point in the list and tap **Start**.



☞ **For points on wall:**
You can stake out several points on a wall automatically, using the Stake to Wall function:
- Configure the Measure bar to show **Stake to Wall**.
  If **Stake to Wall** is active, all points are staked out on a wall. If inactive, all points are staked out on the ceiling/floor.
- Select a point, turn the telescope to the desired wall and start the measurement. The selected point is projected to the existing wall.
- Select **Stake to Wall** in the Measure bar. The wall is defined by the first two measurements and iterated with every new measurement.
- To finish staking to a wall, select **Stake to Wall** in the Measure bar again.

☞ Once activated, Stake to Wall will stay activated even after restart.

Stake out a wall penetration point



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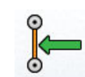
a	Centreline of designed pipe
b	Designed pipe (not yet built)
c	Designed wall (not yet built)
d	Existing wall parallel to designed wall
P1	Penetration point on designed wall
P2	Penetration point on existing wall
x_1	Horizontal offset in X direction between existing and designed wall
y_1	Horizontal offset in Y direction between P1 and P2
z_1	Vertical offset in Z direction between P1 and P2

☞ This procedure does not work for strongly curved walls or rough surfaces!

1. Select **Layout Lines** from the Home Menu.
   Map screen is displayed.

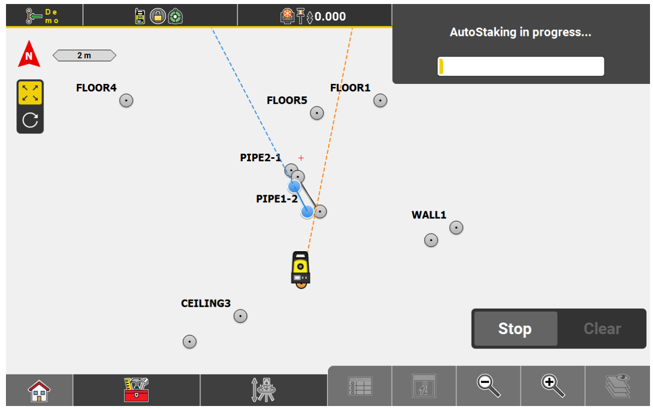


☞ To stake out penetration points, the current job should contain a line representing the centreline of the designed pipe or duct.
If necessary, measure a line or create a line using the "Connect Points" tool.

2. Select **Auto Staking** from the toolbox.

3. Turn the telescope to the existing wall where the penetration point should be staked out or marked.
   Select the line and tap **Start**.

4. *The instrument starts measuring and turns automatically to the desired penetration point on the existing wall.*



5. *If the point is in tolerance, the solid laser pointer is switched on to show the point position.*

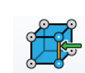
☞ If the point is out of tolerance, a warning message is displayed.
- Tap Continue to continue the measurement.
- Tap **Accept** to accept the displayed deviation. The solid laser pointer is switched on to show the point position.

6. Tap **Store** to store the measured point.

Stake out points on ceiling, wall or floor

With the Layout Objects application, it is possible to either stake out points on ceilings, floors, walls or penetration points on walls. See also Stake out a point on ceiling, floor or wall or Stake out a wall penetration point.

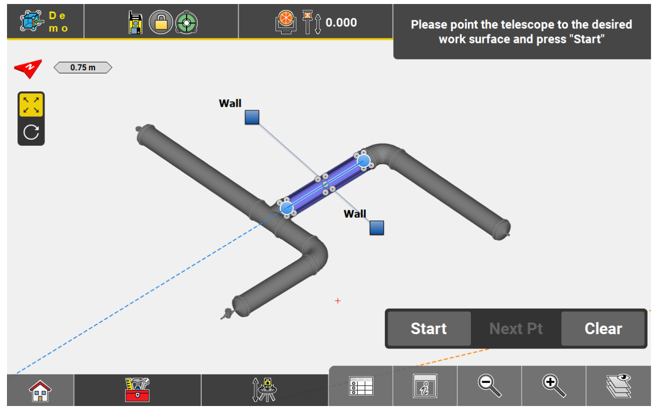
1. Select **Layout Objects** from the Home Menu.
Map screen is displayed.



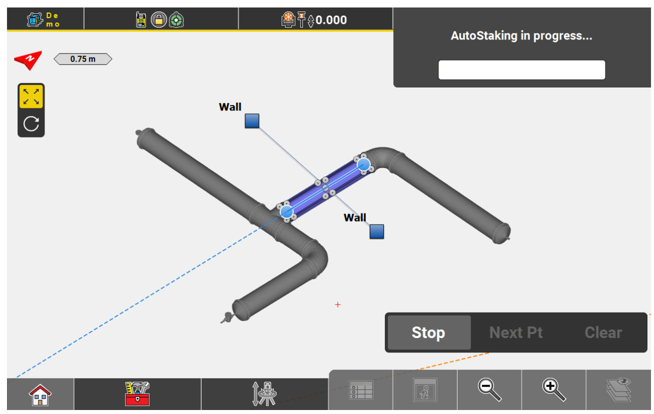
2. Select **Auto Staking** from the toolbox.

3. Turn the telescope to the desired surface.
   - For a penetration point, select a line or the edge of an object.
   The penetration point is laid out automatically.
   - For a point on a ceiling, floor or wall, select a normal point, endpoint of a line or point of an object.

   Tap **Start**.



4.	*The instrument starts measuring and turns automatically to the desired point on the existing surface.*	



5. *If the point is in tolerance, the solid laser pointer is switched on to show the point position.*

☞ If the point is out of tolerance, a warning message is displayed.

- Tap Continue to continue the measurement.
  If necessary, change the orientation of the telescope. For example, it may not be possible to stake out a ceiling point due to some objects being in the line of sight. In this case, point the telescope to the floor instead.
- Tap **Accept** to accept the displayed deviation. The solid laser pointer is switched on to show the point position.

6. Tap **Store** to store the measured point.

☞ **For points on ceiling/floor/wall:**
You can stake out several points automatically, using the Stakeout List function:

- Create a Stakeout List or activate an existing list. Refer to 2.6 Managing Stakeout Lists.
- To display the **Stakeout List** toolbar, select **Stakeout List** from the toolbox.
- In 5" or 7" display mode, activate Multiview and **Stakeout Point List** to display the point list and the map side by side.
- Select **Auto Staking** from the toolbox.
- Select the first point in the list and tap **Start**.

☞ **For points on wall:**
You can stake out several points on a wall automatically, using the **Stake to Wall** function:

- Configure the Measure bar to show **Stake to Wall**.
  If **Stake to Wall** is active, all points are staked out on a wall. If inactive, all points are staked out on the ceiling/floor.
- Select a point, turn the telescope to the desired wall and start the measurement. The selected point is projected to the existing wall.
- Select **Stake to Wall** in the Measure bar. The wall is defined by the first two measurements and iterated with every new measurement.
- To finish staking to a wall, select **Stake to Wall** in the Measure bar again.

☞ Once activated, Stake to Wall will stay activated even after restart.

11.9 Layout Objects

General description

☞ iCON site requires an additional license to use this application.

The **Layout Objects** application allows you to import IFC files, including the IFC attributes of the contained objects.

Based on the imported object models, the application allows you to lay out corner points or edges of an object.

Given:

- Sensor is connected and setup with known station and height.
- IFC file with objects is available within the current job. Refer to Importing data to the project step-by-step.

Layout objects step-by-step

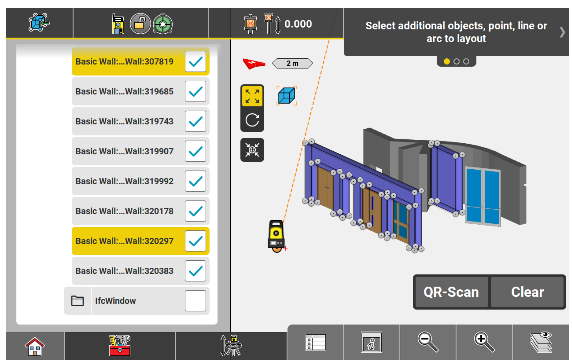
1. Select **Layout Objects** from the Home Menu.
   Map screen is displayed.
   ☞ The **Layout Objects** application is not available when using the iCON software on the iCON iCR80 or on an iCB.

2. Tap an object in the map view to select it. It is possible to select multiple objects.
   Tap **Clear** to deselect all selected objects.

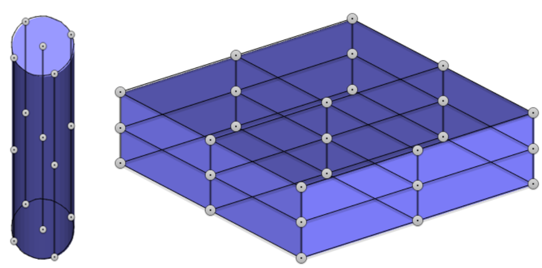
   You have got the option to select points/objects be reading a QR-Code. Tap **QR-Scan**.
   See also: IFC object selection using QR-code
   ☞ To be able to use the QR-Scan function your entitlement needs to include the QR Code Reader licence.

☞ Alternatively, use the **IFC Tree View** for object selection. Refer to Using IFC Tree View step-by-step (1.4.7 Special Options for IFC Files).

Selected objects are highlighted in blue in the map view and in yellow in the tree view. The displayed corner points and edges of the objects are simulated and serve only as reference for layout.



☞



For cylindrical objects such as pipes or columns, the following points and lines are displayed to simplify the layout process:

- Centreline of the object
- Four lines representing the outer edges of the object.
- Start, end and centre point of each line

For rectangular objects such as walls, slabs or windows, the following points and lines are displayed to simplify the layout process:

- Lines at the edges and centrelines of each surface
- Centre points of each line
- Centre points of each rectangular surface
- Centre point of the 3D shape

☞ If the shape of a rectangular object is for example interrupted by holes or windows, only the corner points and lines at the edges are displayed.

---

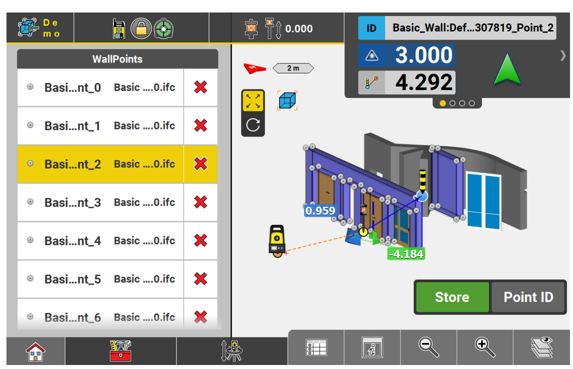
3. Select a corner point, centre point or edge of an object to be laid out.
To lay out several points in sequence, select **Stakeout List** from the toolbox. Refer to **Stakeout List** function.

☞ Attributes of the object to be laid out can be transferred to the point information. Tap Attribute Info Config from within the **Map Handler>View** panel and configure the attribute information. See also: Displaying IFC attributes in the information bar. When you layout the point the attribute information will be copied to the point information as configured.

☞ Activate Multiview and **Stakeout Point List** to display the point list and the map side by side. It is possible to select the points for laying out.

---

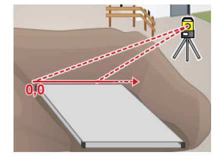
4. Follow the guidance to navigate the target to the selected point. Once the target is within tolerance, it changes colour to green.
To store the selected point, press **Store**. Mark the laid out position (in the field).

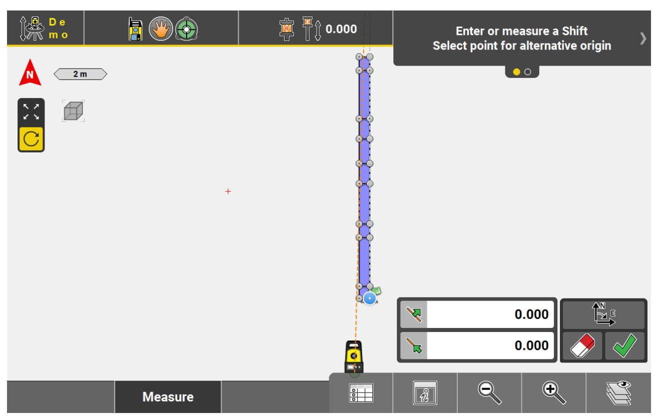


☞ Define **Measure Mode** in the Status bar.

☞ **GPS and Robotic Total Station approach:**
As the target moves around, real-time measurement data and guidance information is constantly displayed in the **Information bar**. Once the point in the screen turns green, the point is set out within tolerance. To record points using the Total Station, press **Store**. If using GPS, press **Measure**.

Shift a control line onto an IFC object

1. Select **Layout Objects** from the Home Menu.
   Map screen is displayed.
   ☞ The **Layout Objects** application is not available when using the iCON software on the iCON iCR80.
   
2. iCON site: Tap the **Favourites** key and select **Setup**.
   iCON build: Tap the **Setup** key.
   
3. In the section **Control Line** select **Anywhere**.
   
4. Level instrument, then tap the next Wizard step  to proceed.
   Map screen is displayed.
5. Follow the guidance to measure start and end point of the control line.
   A preview of the control line is displayed.
6. To shift the control line onto an IFC object, tap **Shift**.
7.
   - Select an IFC object and select a point of the object to define it as alternative origin of the control line.
   - Select another point of the same or a different object to define the direction of the control line.
   - Enter shift values in the Toolbar. To measure a Shift, press **Measure**.



8. Tap  to toggle the orientation of the control line between north and east.
   Tap  to cancel the shift of the control line.
   Tap  to confirm the shift.
9. Tap  to accept station position.

Stakeout List function

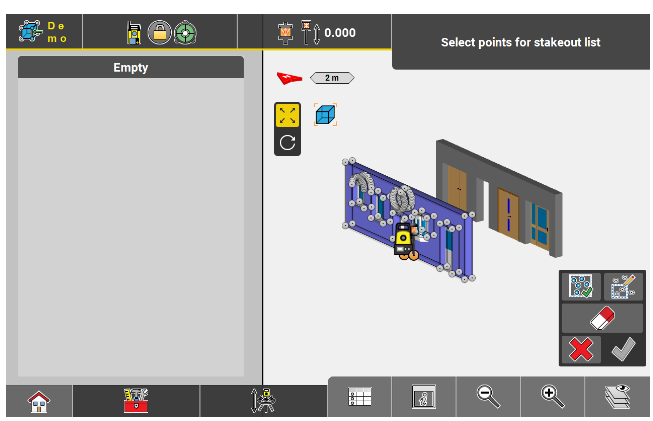
Within the **Layout Objects** application, the **Stakeout List** function allows you to add points of the selected objects to the Stakeout Point List.

Stakeout List toolbar

Toolbar button	Description
	Tap this button to select all available points of the selected objects. ☞ The number of points available for selection is defined by the number of selected IFC objects.
	Tap this button to start the **Window Selection** mode. This mode allows you to select or deselect several points at once instead of tapping each of them separately. All object points and other points located within the defined selection area can be selected or deselected. • Define a selection area by tapping as many points as desired for the area corners. • Tap ✓ to add the points within the selection area to the point selection. • Activate and tap ✓ to deselect the points within the selection area.
	Tap this button to deselect all selected points.
	Tap this button to cancel.
	Tap this button to add the selected points to the Stakeout Point List.

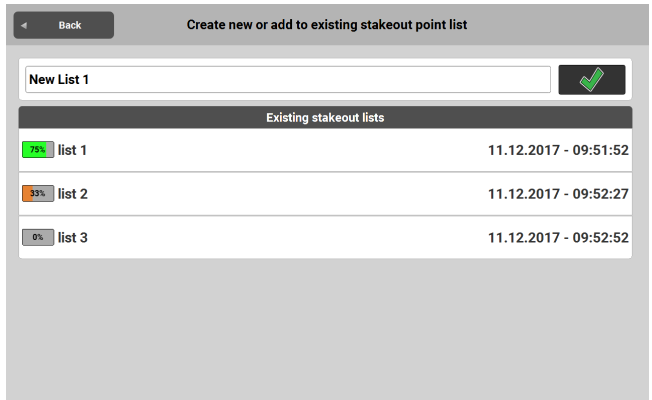
☞ In 7" display mode, activate Multiview and **Stakeout Point List** to display the point list and the map side by side.

1. Tap an object in the map view to select it.
2. To display the Stakeout List toolbar, select **Stakeout List** from the toolbox.



3. Use the Stakeout List toolbar to select points. Tap ✓ to add the selected points to a new or existing Stakeout Point List.

Following screen is displayed:



4. ☞ To return to map view without creating a stakeout list for the created points, tap **Back**.
   - To add the points to a new stakeout list, enter a name and tap ✓.
   - To add the points to an existing stakeout list, tap the respective row in the list.

   A message is displayed, informing about the number of points added to a new or existing stakeout list.
   Tap OK to return to map view.

11.10 General Stake Out Toolbox Functions TPS + GPS

Description

General

Function	Description
Stake Elevation	Stake out with reference to a height, which is defined: • by selecting an existing point, • by entering the height directly, • by selecting an area. The reference height is automatically calculated to the **balanced height** of the area. **Cut/Fill** values in the Information bar are altered according to the reference height applied. **Side View** is a kind of cross-section view and only available when using **Stake Elevation**.

Function	Description
Reference Height	Stake out elements (points, lines, arcs) with reference to a height, which is defined: • by selecting an existing point, • by entering the height directly, • by selecting a surface. The selected stake out element is projected to the surface and the reference height is set to the height value of the surface. **Cut/Fill** values in the Information bar are altered according to the reference height applied. Refer to Stake Out Points, Lines, Arcs with Reference to a Height .
Reference	Stake elements with reference to a line.
Flip	Switch the start point and end point of the active line.
Chainage	Activates the use of chainage.
Divide & Offset	Divide a line or arc into segments. When using this function the Offset feature is available as well. Therefore a line or arc can be divided into segments and the segment points be offset in one step. Refer to Use **Divide & Offset** step-by-step.
Offset	Offset an element to be staked.
Connect Points	Tap points to create a line between these points.
Create Arc	Tap points to create an arc to be staked.
Create Point / Line	Allows you to create a point or line by defining direction and slope.
New Point	Insert a point into the map by entering the required coordinates or by scanning a QR-code. This point can then be staked. The new point can also be defined as Control Point. ☞ To start the QR-code scan tap . See also: Importing data using QR-Scan step-by-step
Edit Point	After selecting a point from the map, permitted values can be edited.

Function	Description
Auto Element Selection	Set this option to **On** to make the next point/ line to stake be selected automatically according to the settings. • **Next Point from list**: the next point from the Stakeout Point List is selected automatically. • **Nearest Point (or line)**: the point or line in the Map view that is closest to the current position is selected automatically after the previous point/line was staked out. • **Nearest Point from list**: the point from the Stakeout Point List that is closest to the current position is selected automatically after the previous point was staked out. • **Nearest Line in direction**: only works for vehicle/dozer/scraper and tractor configurations. The line closest to the current position is selected automatically. Lines on the left or the right-hand side in direction of driving can be excluded by setting the Blade Ref. Point to either "Left" or "Right" in the Foreman Settings. See also: Vehicle/Machine mode • **Dynamic Point selection**: the point closest to the current or last known pole/rover position is selected automatically. ☞ To use the **Next Point from list** or the **Nearest Point from list** function, it is necessary to define the list of points first. ☞ Calculation of the nearest point or line is based on 3D coordinates. ☞ Lines at a 3D distance larger than 10 m are not selected automatically. ☞ Auto Element Selection can be activated separately for each Stakeout/ Layout application and will stay active even after restart. The chosen method will stay selected in the Stakeout/Layout application after restart, too.
Stake Writer	Enable this option to get guidance on marking of the stake. For further details refer to: Using Stake Writer step-by-step
Contour Lines	Tap this button in order to create contour lines.

Function		Description
Stakeout List		Tap this button in order to add points via graphical selection to a **Stakeout List**. To be able to see the list next to the Map view switch on the **Stakeout Point List** from within the Map Handler > Viewing options . It is possible to select points for staking out from the list or to use the list for **Auto Element Selection** (see above).
Undo		Undo previous action.
Delete		Remove points/lines/arcs.

Layout Objects

Function		Description
Object Info		Display the IFC attributes of a selected object. ☞ If multiple objects are selected, this function is not available.
Parallel Offset		Offset a line to be set out.
Perpendicular Line		Create a perpendicular line to be set out.
Stake Elevation		When using a Robotic Total Station, a defined height can be set out automatically by tapping the **Auto Staking** button in the Measure bar. Height and autostake function stay active so that the same height can be autostaked on different walls. See also: Stake out a point on ceiling, floor or wall.

11.11 Information Bar Values TPS + GPS

Description

Type/Icon		Description
Id	ID	Point ID of the stakeout element.
E	E	East value of the last point measured.
N	N	North value of the last point measured.
H	H	Height of the last point measured.

Type/Icon	Description
Cut/Fill	Cut/Fill value of the last point measured, compared to the stakeout element.
Chainage	Chainage at the measured point along the selected reference line. With no reference line, the value shows the chainage at the measured point along the selected line.
dL	Horizontal distance from the last point measured to the stakeout point.
dLin	Perpendicular distance from the last point measured to the north heading at the stakeout point.
dOff	Perpendicular distance from the last point measured to the east heading at the stakeout point.
Lin	Horizontal line value (2D) from the measured point along the selected line.
Lin3D	3D line value from the measured point along the selected line.
Off	Offset value at measured point to the selected line.
Proj.Lin	Line value at measured point along the selected reference line.
Proj.Off	Offset value at measured point to the selected reference line.
Proj. H. Diff	Height difference at measured point to the selected reference line.
Reference-Height	Reference height for staking out, that is defined by entering a value or selecting a point or surface.
VOff	Vertical offset value of the defined reference surface.
Ref_Id	Reference ID of the stakeout element.
Ref_E	East value of the stakeout point.
Ref_N	North value of the stakeout point.

Type/Icon	Description
Ref_H	Height of the stakeout point.
Ref_Lin	Line value of the stakeout point, along the selected reference line.
Ref_Off	Offset value of the stakeout point, to the selected reference line.
Cod_Ref	Code of the reference point.
Att1_Ref	Attribute 1 of the reference point.
Att10_Ref	Attribute 10 of the reference point.
dHz	TPS only: Horizontal angle between the current line of sight and the stakeout point.
Hz	TPS only: Horizontal angle to the current target position.
V	TPS only: Vertical/zenith angle to the current target position.
sD	TPS only: Slope distance from the instrument to the last point measured.
hD	TPS only: Horizontal distance from the instrument to the last point measured.
CQ 1D	GPS only: Coordinate quality value for the height information at the current position.
CQ 2D	GPS only: Coordinate quality values for the plain information at the current position.
CQ 3D	GPS only: Coordinate quality values for a combination of the height and the plain information at the current position.
GDOP	GPS only: Geometric dilution of precision quality value at the current position.
lSlp	Indicates the long slope at the measured point. Negative means down sloping in the line direction.

Type/Icon	Description
sSlp sSlp	Indicates the side slope (cross slope) at the measured point to the selected line. A negative value means downward sloping from the measured point to the selected line.

12 How to Stake Out Surfaces TPS + GPS

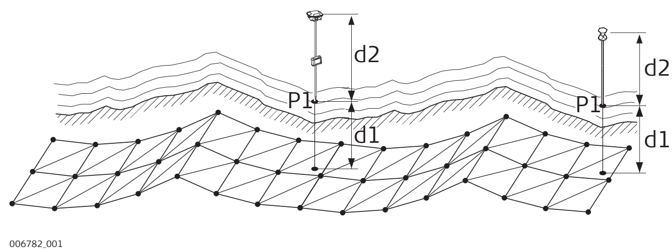
12.1 General Information TPS + GPS

General description

A Digital Terrain Model (**DTM**) can be staked for height values. The heights of the measured positions are compared with the heights of the Terrain Model at the same position. The height differences are displayed in the Information bar in a **Cut/Fill** format.

Staking a Terrain Model can be used for:

- Staking out where the Terrain Model represents the surface to be staked.
- Quality control purposes, where the Terrain Model represents the final project surface.



P1 Point to be staked
d1 Cut/Fill
d2 Antenna / target height

Given:

- Instrument is connected and set up with known station and height.
- Terrain Model active within the current job. Refer to Importing data to the project step-by-step.

☞ The **Cut & Fill** procedure is the same as in the **Stakeout** application, except the heights to be staked are taken from the selected Terrain Model.

☞ Note that main workflow refers to GPS. For Total Station press **Measure**, then **Store**.

Cut/Fill can be carried out in three ways:

- Manual Total Station
- Robotic Total Station
- GPS

If using **Manual Total Station**, the Information bar is updated after each point is measured.

If using Total Station in **Continuous Mode**, or if using **GPS**, real time measurement data is displayed automatically in the Information bar.

How to stake out surfaces step-by-step

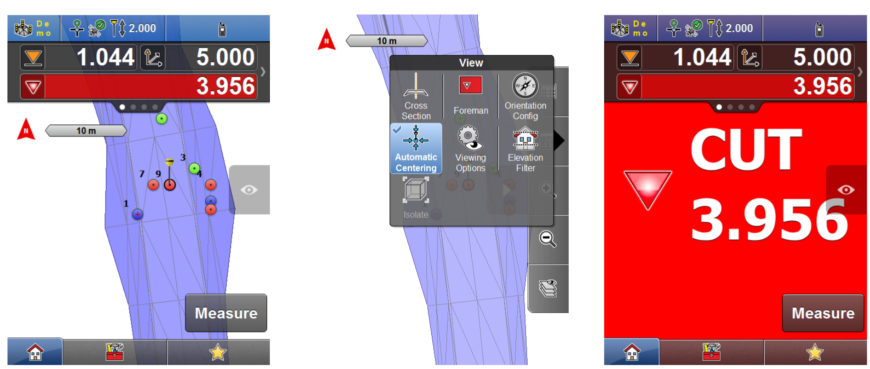
1. Select **Cut & Fill** from the Home Menu.

2. - Tap the required Terrain Model.
   - As the pole moves across the surface, real-time measurement data is displayed in the Information bar.

   ☞ The **Cut/Fill** value is colour coded, depending on whether the height is above-grade, below-grade, or on-grade, when compared with the Terrain Model. Refer to Cut/Fill colour indicators for details.

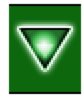
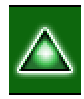
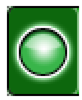
3. - Record points by tapping **Measure**. The colour of the stored point indicates whether the point is **in** or **out** of **height tolerance**.
   - The process can repeat.

4. - **Cut & Fill** offers a **Foreman View**, which displays the **Cut/Fill** value in large letters and digits on a colour coded background.
   - To activate, access **View** in the Map handler and tap **Foreman**.
   - To return to standard view deactivate **Foreman** the same way.



☞ The Cut/Fill tolerance level can be selected in **Tolerances**, which is found in **Units** .

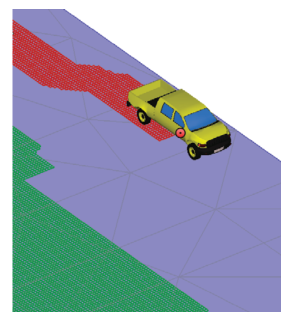
Cut/Fill colour indicators

Indicator		Description
Cut	 	Indicates that the height measurement is above the surface design. When colour changes to green the measured position is within the defined tolerance but still above the surface design.
Fill	 	Indicates that the height measurement is below the surface design. When colour changes to green the measured position is within the defined tolerance but still below the surface design.
On Grade		Indicates that the height measurement exactly matches the surface design.

12.2 Cut & Fill Grid Logging

General description

The grid logging function in Cut & Fill generates a real-time coloured grid while moving along the surface. The coloured grid gives an overview of the current surface state.



16626_001

Grid colour	State of the existing surface
Red	Above the design surface.
Blue	Below the design surface.
Green	Matching the design surface.
Grey	Outside the design surface.

Requirements:

- Cut/Fill Grid can only be used with a field controller and requires a Surface Pilot licence.

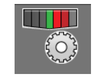
Given:

- Instrument is connected and set up with known station and height.
- Terrain Model active within the current job. Refer to Importing data to the project step-by-step.

Grid logging step-by-step

1. Select **Cut & Fill** from the Home Menu. 

2. Access View in the Map handler and tap Foreman Settings.

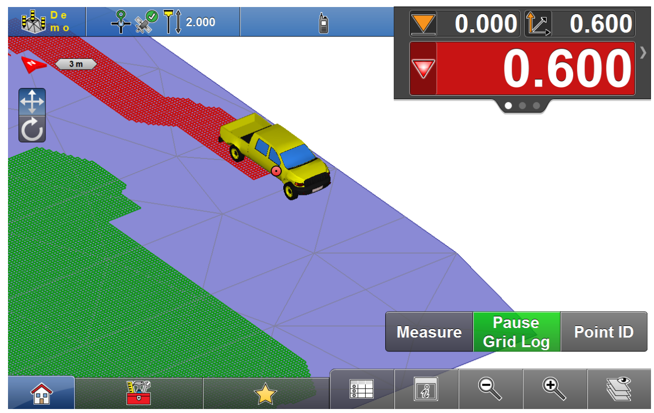


- Set **Generate Cut/Fill Grid** to **On**.
- Enable vehicle or pole mode.

Refer to 1.4.8 Foreman Settings.

3. To start the grid logging process, tap **Start Grid Log**.
Move the vehicle with the mounted antenna/prism along the surface.

☞ It is not necessary to store points, the grid is logged automatically.

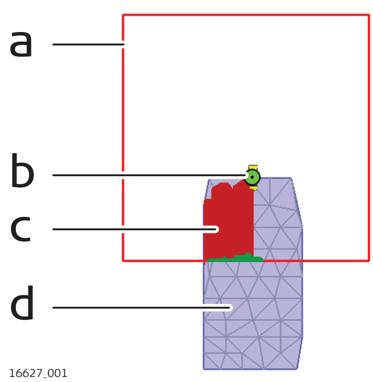


☞ You can pause grid logging at any time. Tap **Pause Grid Log**. To resume grid logging, tap **Start Grid Log** again.

☞ When moving over surface for which a grid is already logged, the grid refreshes dynamically based on the new values of cut and fill.

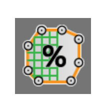
Grid preview

To allow a smooth real-time update of the logged grid, the currently visible grid is limited. To display the full grid along the whole surface, enable **Grid Preview**.

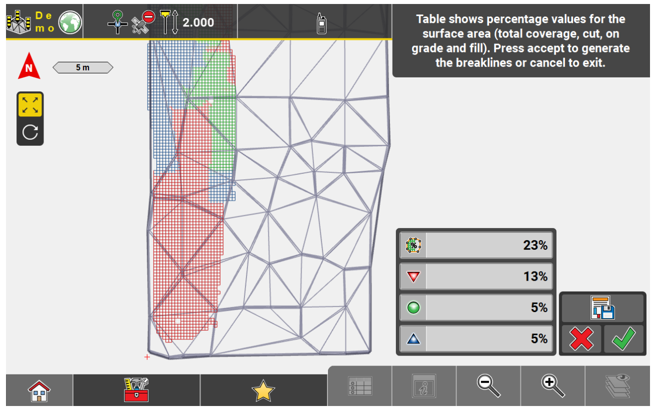


- a Visible grid area (90 m by 90 m) around the current position
- b Current position
- c Surface within the visible grid area
- d Surface outside the visible grid area

1. Select **Grid Preview** from the toolbox.

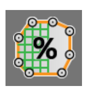
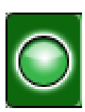


The full grid is displayed.



2.	• To exit the preview and continue with grid logging, tap . • To save the current percentage values of the grid for the Grid Logging report, tap . Refer to Save data for Grid Logging report . • To create break lines, tap  .

☞ Break lines are the lines along the surface where the grid changes colour. The created break lines are stored as *.geo file and are available for staking out.

Icon	Description
	Percentage value of the design surface covered by the Cut/Fill Grid.
	Percentage value of the grid where the existing surface is above the design surface.
	Percentage value of the grid where the existing surface is matching the design surface.
	Percentage value of the grid where the existing surface is below the design surface.

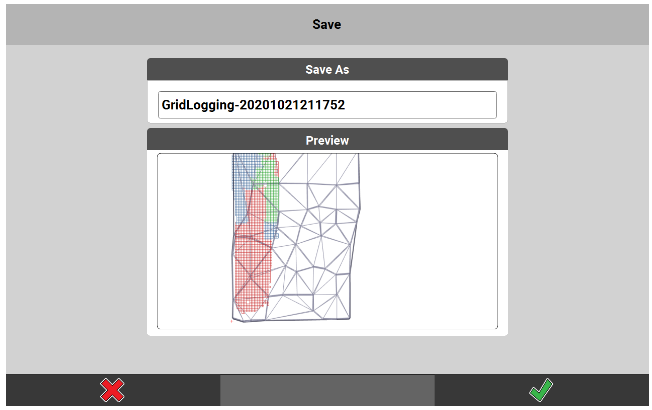
Save data for Grid Logging report

The **Save for Report** function allows saving the current percentage values of the logged grid along with a screenshot of the grid preview. The data and screenshot are saved in a package. Multiple packages can be saved to document the progress of the grid logging process. These packages can then be included in a Grid Logging report.

☞ For information on how to create a Grid Logging report, refer to 19 How to Create a Report .

1.	To save a package for reporting, tap the **Save for Report** button in the Grid preview.	

2. *Following screen is displayed.*



3. • If necessary, edit the file name of the package to be saved.
   • To change the screenshot to be saved, tap ✖ to return to Grid preview. Pan, rotate or zoom the map view as required, then tap the **Save for Report** button again.

4. To save the package, tap ✔ .

12.3 General Cut/Fill Toolbox Functions TPS + GPS

Toolbox functions

Function	Description
Automatic Logging	Set **Autologging** to **On**/**Off**. Select the **Logging Mode** from **3D Distance**, **Distance and/or Height**, **Time**, or **Time over a point** and define the Interval. **Store on demand** allows you to record measurements anywhere in between, if enabled.
Reference	Stake out with reference to a line, which is defined by tapping elements on the screen. **Line and Offset** values are displayed in the Information bar. These values are derived from the North and East values of the line. The height value is derived from the height of the Terrain Model.
Fix Heading	A cross section can be defined perpendicular to the current heading based on the walking path. To fix the calculation of cross sections based on the last heading tap **Fix Heading**.
Start long section	Activates a long-section view. A long-section view is similar to a cross section view but along the current direction of movement. ☞ Start long section is an optional feature. For enabling, Surface Pilot licence is needed.
Offset	Vertically offset the whole Terrain Model. **Cut/Fill** values in the Information bar are altered according to the offset applied.

Function	Description
Stake Elevation	Stake out with reference to a height, which is defined: • by selecting an existing point, • by entering the height directly, or • or by selecting an area. The reference height is automatically calculated to the **balanced height** of the area. **Cut/Fill** values in the Information bar are altered according to the reference height applied. **Side View** is a kind of cross section view and only available when using **Stake Elevation**.
Stake Writer	Enable this option to get guidance on marking of the stake. For further details refer to: Using Stake Writer step-by-step
Grid Preview	Displays the full Cut/Fill Grid of the whole surface.
Manage Grid Calculations	Allows you to view and delete already created Grid Logging calculations. • To view details of a calculated result, tap the arrow button to the right. • To delete a calculated result, tap its name to select it, tap ✓ to accept and confirm the deletion.

12.4 Information Bar Values TPS + GPS

Description

Type/Icon	Description
Id	Point ID of the stakeout element.
E	East value of the last point measured.
N	North value of the last point measured.
H	Height of the last point measured.
Hz	TPS only: Horizontal angle to the current target position.
Design	Design height at the measurement position.
Actual	Current height at the measurement position.

Type/Icon	Description
Surface	Identifier of the design surface.
V	TPS only: Vertical/zenith angle to the last point measured.
Lin	TPS only: Distance along the control line. Or with a reference line selected, distance along the reference line.
Off	TPS only: Offset to the control line. Or with a reference line selected, offset to the reference line.
H. Diff	Height difference, from the measurement position to the projection point on the control line. Or with reference line selected, from the measurement position to the projection point on the reference line.
Code	Code/layer for the next point to record.
sD	TPS only: Slope distance to the last point measured.
hD	TPS only: Horizontal distance to the last point measured.
Cut/Fill	Cut/Fill value of the last point measured.
Chainage	Chainage at the measured point along the selected reference line.
Proj.Lin	Line value at measured point along the selected reference line.
Proj.Off	Offset value at measured point to the selected reference line.
Proj. H. Diff	Height difference at measured point to the selected reference line.
V. Offset	Vertical offset to the design surface.
CQ 1D	GPS only: Coordinate quality value for the height information at the current position.

Type/Icon		Description
CQ 2D		**GPS** only: Coordinate quality values for the plain information at the current position.
CQ 3D		**GPS** only: Coordinate quality values for a combination of the height and the plain information at the current position.
GDOP		**GPS** only: Geometric dilution of precision quality value at the current position.

13 How to Use Verification TPS

13.1 General information

Necessary licence

To use this application, the **Verification** licence must be active.

Verification

The Verification application allows you to use surfaces, objects, point clouds or patterns as a reference and compare them to measured (as-built) surfaces, objects, point clouds or patterns.

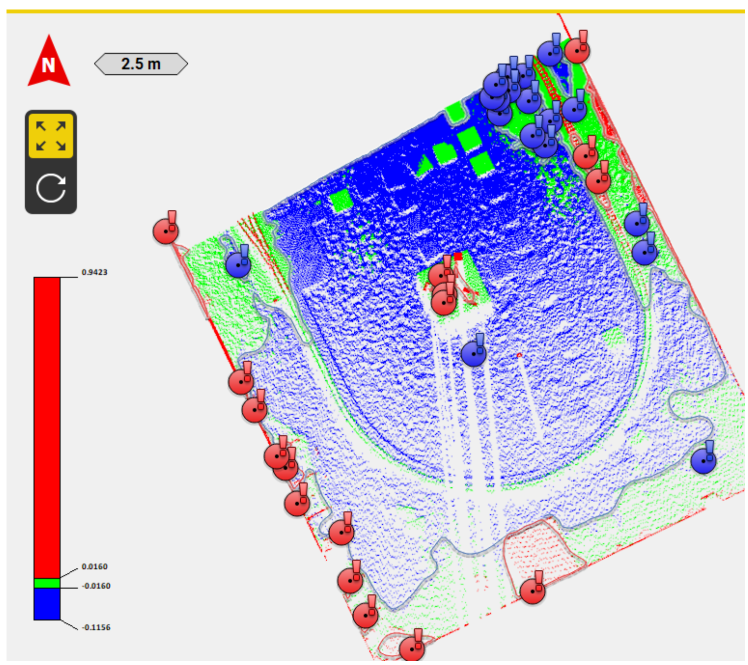
For example, you can scan a floor and compare the measured surface against the design surface of the floor.

☞ To create point clouds for verification, you can use the Leica MS60 as a scanner together with iCON or import point clouds from other sources. To create grid scan point clouds or surfaces based on a point grid, you can use an iCB/iCR or iCT together with iCON. Refer to How to Collect Data Using Scanning .

The verification result is a graphical map, indicating by colour the points where the as-built data corresponds with or deviates from the design data. The colour coding is according to the defined tolerance and colour settings.

For information on changing the settings, see: Tolerance settings and 13.3 Scale Options

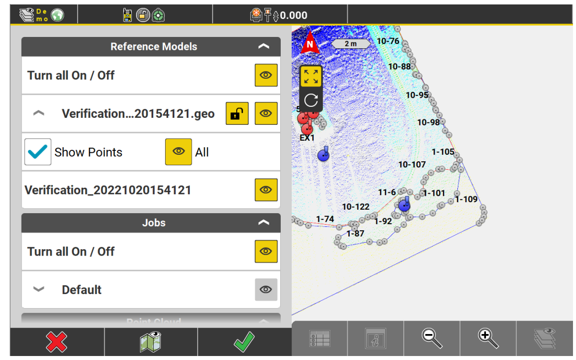
The verification result can be saved to the project and/or exported as a report.



The software creates extrema points for out-of-tolerance areas, and contour lines to delimit the areas within and outside the tolerance. Contour lines for areas above the tolerance are coloured red, contour lines for areas below the tolerance are coloured blue.

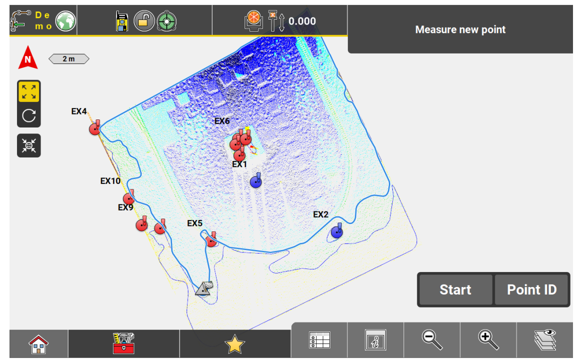
When saving the verification result, you can select to store extrema points and contour lines to the database, in order to stake out the points and areas which need to be reworked.

Contour lines are saved to a *.geo file of their own with the break points being switched off by default.
To make the break points become visible in the map view, select **Show Points** in the Map View Manager.



Contour lines can be selected for stakeout as polylines in the applications:

- Stakeout (iCON site)
- Layout Lines (iCON build)



13.2 Verification Methods

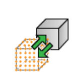
Verification methods

There are three different methods to verify data:

1. **Verify already measured data without a reference**
   Select the measured data to be verified. The software automatically creates a verification plane using the average of the selected data, and compares it to the selected data.
   Refer to Verify data without a reference step-by-step.
2. **Verify already measured data using a reference**
   Select the measured data to be verified, then select the reference data. The software compares the selected data to the reference data.
   Refer to Verify data using a reference step-by-step.
3. **Define a reference and start measuring to verify data**
   Select the reference data, then start to measure points. The measured points are directly compared to the defined reference data.
   Refer to Verify data while measuring step-by-step.

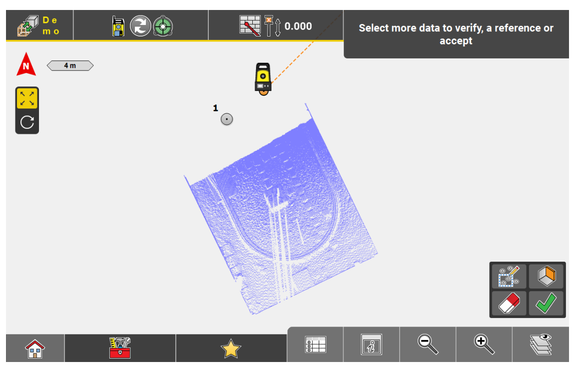
Verify data without a reference step-by-step

☞ Make sure that the data to be verified is active within the current job.
To reduce the amount of visible data, use the layer manager or visibility filters.
See also: Reducing the Number of Visible Elements/Objects in Map View

1.	Select **Verification** from Home Menu.	

The toolbar for Verification is displayed.

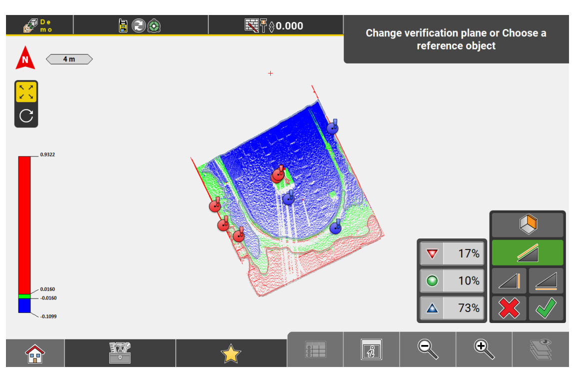
2. To select the data to be verified, tap at least three single points, a point cloud or a grid-scan point cloud.
   - To select multiple points quickly using the **Window Selection** mode, tap the window selection icon.
   - To add more data to the already selected data, tap the respective elements in the map. To deselect data, tap the selected elements again.
   - To deselect all selected data at once, tap the eraser icon.



Selected data are highlighted in blue colour.

3. When all data to be verified are selected, tap the check mark icon.

The software automatically creates a verification plane using the average of the selected data.
A preview of the verification result is displayed, with the selected data being compared to the verification plane.



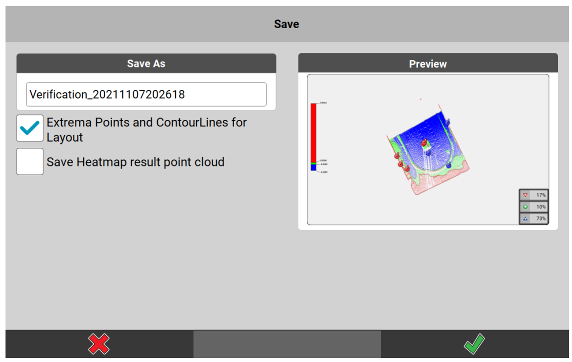
The heatmap shows the verification plane with the result overlaid.
A quantity indicator shows the percentage of the points in tolerance and out of tolerance, above and below the verification plane.

☞ To define another reference than the verification plane, tap the reference icon. For information on how to define a reference, refer to Verify data using a reference step-by-step.

☞ To change the settings of the colour scale or the tolerance settings, tap and hold the scale. Refer to 13.3 Scale Options.

4.
- To define the orientation of the reference plane, tap the respective toolbar button:
  - Vertical
  - Horizontal
  - Tilted

  The preview is updated accordingly.
- To return to the previous step, tap ✖.
- To store the verification result, tap **Store**.



The Save screen is displayed.

5.
- If necessary, edit the file name.
- To store extrema points and contour lines, activate the respective checkbox.
- To store the heatmap result as a coloured point cloud, activate the respective checkbox.
- To return to the previous step, tap ✖.
- To accept and store the verification result, tap ✔.

☞ To export the verification result in a report, return to Home Menu and select **Reports**. Refer to: 19 How to Create a Report .

Verify data using a reference step-by-step

☞ Make sure that the data to be verified is active within the current job.
To reduce the amount of visible data, use the layer manager or visibility filters.
See also: Reducing the Number of Visible Elements/Objects in Map View

1. Select **Verification** from Home Menu.

The toolbar for Verification is displayed.

---

2. To select the data to be verified, tap at least three single points, a point cloud or a data base.
   - To select multiple points and point clouds quickly using the **Window Selection** mode, tap .
   - To add more data to the already selected data, tap the respective elements in the map. To deselect data, tap the selected elements again.
   - To deselect all selected data at once, tap .

Selected data are highlighted in blue colour.

---

3. To define a reference for verification, tap .

The toolbar changes to display the options for reference selection.
Reference data is highlighted in orange colour.

4. There are several options to define a reference:

- Tap a **surface**, **object** or **point cloud** to define it as reference.
- To define **horizontal reference planes**, select or measure a single point or enter a height value.
- To define a **vertical reference plane**, select or measure two points. The orientation of the plane is defined by the line through these points.
- To define a **tilted reference plane**, select or measure three points. The points can be measured points, surface points, points on IFC objects or points from any imported point file.

You have got the option to select points/objects be reading a QR-Code. Tap .

See also: IFC object selection using QR-code

☞ To be able to use the QR-Scan function your entitlement needs to include the QR Code Reader licence.

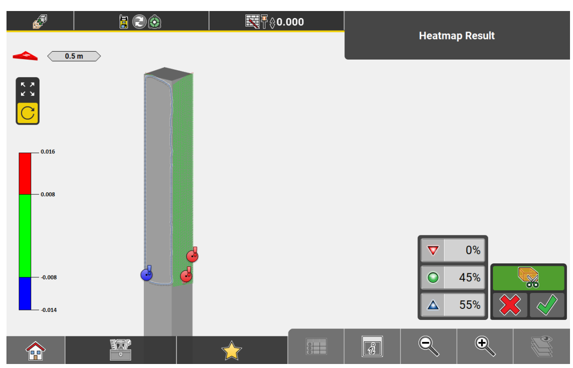
More options:

- To shift a vertical or tilted reference plane, tap and enter the shift parameters.
- To clear the defined reference, tap .
- To return to the previous step and select more or different data to be verified, tap .

---

5. To accept the defined reference and continue, tap .

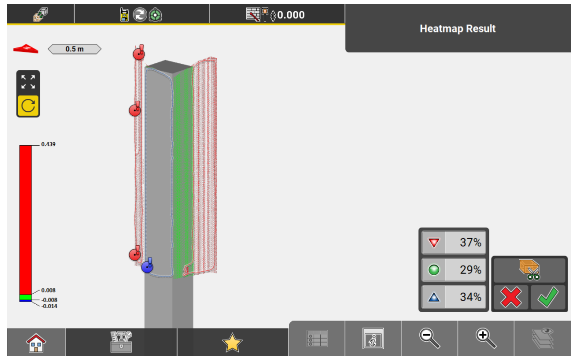
The verification result is displayed, with the selected data being compared to the reference data.



The heatmap shows the reference object with the result overlaid.
A percentage indicator shows the percentage of the points in tolerance and out of tolerance, above and below the reference data.

Only results close to the referenced IFC object will be displayed.
By default, the cut-off values above and below the surface of the reference object are double the tolerance as defined and selected in the Scale Options dialogue.

☞ Tap to see unfiltered results.



☞ To change the settings of the colour scale or the tolerance settings, or to change the cut-off value for the **Reference Filter Projection**, tap and hold the scale. Refer to 13.3 Scale Options.

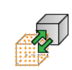
6.
- If necessary, edit the file name.
- To store extrema points and contour lines, activate the respective checkbox below the preview.
- To store the coloured heatmap result as point cloud, activate the respective checkbox below the preview.
- To return to the previous step, tap ✖.
- To accept and store the verification result, tap ✔.

☞ To export the verification result in a report, return to Home Menu and select **Reports**. Refer to 19 How to Create a Report .

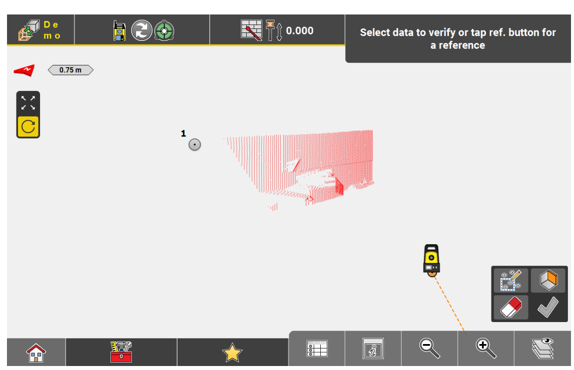
Verify data while measuring step-by-step

☞ Make sure that the data to be verified is active within the current job.
To reduce the amount of visible data, use the layer manager or visibility filters.
See also: Reducing the Number of Visible Elements/Objects in Map View

1. Select **Verification** from Home Menu.
The toolbar for Verification is displayed.



2. To define a reference for verification, tap .

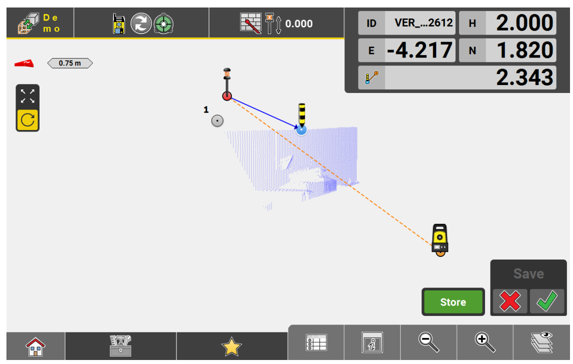


The toolbar changes to display the options for reference selection.

3. There are several options to define a reference:
   - Tap a **surface**, **object** or **point cloud** to define it as reference.
   - To define **horizontal reference planes**, select or measure a single point or enter a height value.
   - To define a **vertical reference plane**, select or measure two points. The orientation of the plane is defined by the line through these points.
   - To define a **tilted reference plane**, select or measure three points. The points can be measured points, surface points, points on IFC objects or points from any imported point file.

   More options:
   - To shift a vertical or tilted reference plane, tap and enter the shift parameters.
   - To clear the defined reference, tap .

4. To accept the defined reference and continue, tap .



Map view changes to measure mode. Configure the measure bar as needed.

5. Measure and store as many points as desired.
   The colour of the measured points indicates the deviation from the defined reference. The info panel displays the point coordinates and the perpendicular distance to the reference.

   To select a different reference, tap .

   To close the measure mode, tap .

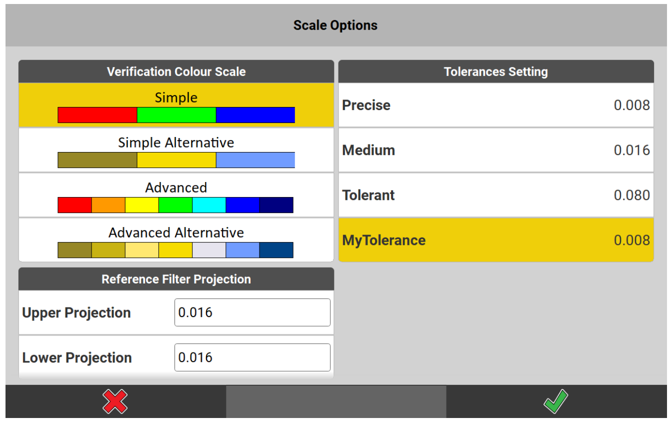
☞ To export the verification result in a report, return to Home Menu and select **Reports**. Refer to 19 How to Create a Report .

13.3 Scale Options

Define scale options

☞ To access the scale options, tap and hold the colour scale in the result screen within the Verification app.

Define the scale options to be used for verification in the screen **Scale Options**.



Verification Colour Scale

- **Simple**
  This scale has three colours according to three value ranges, with green representing the values within the desired tolerance range.
- **Simple Alternative**
  Same as the simple scale, but with alternative colours for colour-blind people.
- **Advanced**
  This scale has seven colours according to seven value ranges, with green representing the values within the desired tolerance range.
- **Advanced Alternative**
  Same as the advanced scale, but with alternative colours for colour-blind people.

☞ The default setting for colour scale is **Simple**.

Tolerances Setting

Select from the four pre-defined tolerance sets: **Tolerant**, **Medium** or **Precise**. If available, select a user-defined tolerance set.
To change the tolerance settings, refer to Tolerance settings.

Reference Filter Projection

Define the cut-off values for the reference filter.
Upper Projection defines the value above the surface of the referenced IFC object.
Lower Projection defines the value below the surface of the referenced IFC object.

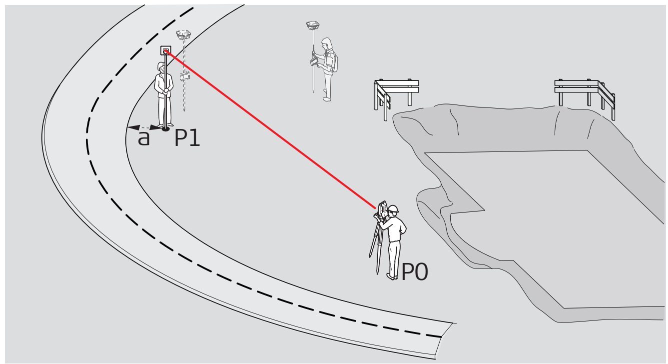
☞ By default, the cut-off values are double the selected tolerance value.

14 How to Stake Out Roads TPS + GPS

14.1 Stake Out Road Lines TPS + GPS

General description

☞ The **Roading** application is used to place marks in the field along predetermined road lines or cross-sections. These predetermined road lines are the lines to be staked.



006792_001

P0	Known station
P1 ...	Layout line
a	Offset

The road lines to be staked can be uploaded as a file to a project. Refer to Importing data to the project step-by-step for more information.

This chapter explains how to stake out road lines using **GPS** and **Total Station**.

Given:

- Instrument is connected and set up with known station and height.
- Road model active within the current job. Refer to Importing data to the project step-by-step.

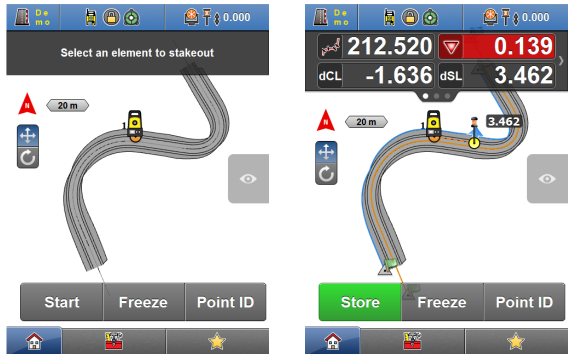
☞ Note that main workflow refers to Total Station. For GPS press **Measure** to record a point.

☞ **Roading** is an optional application. Ask your agency or your Leica Geosystems representative for information about licensing.

Stake out road lines

1. Select **Roading** from the Home Menu.

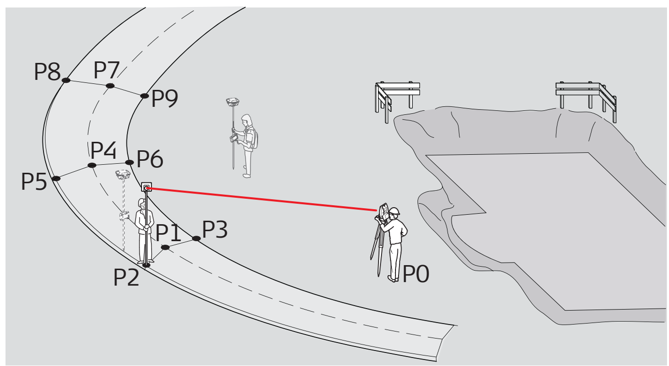
2. - Map screen is displayed. Select the road line to stake, then follow the guidance to navigate the target to the road line. Once the line is defined, press **Start**.
   - Once the target is within tolerance, it changes colour to green. Press **Store**.



3.	Mark the staked position (in the field).
☞	This process can be repeated along the same line. To stake another line, tap the preferred line, and continue the process.

14.2 Stake Out Cross-Sections TPS + GPS

General description



006793_001

P0	Known station
P1 .. P9	Point to be staked

Given:

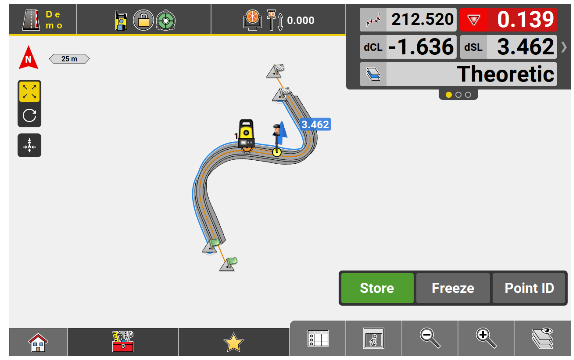
- Instrument is connected and set up with known station and height.
- Road model active within the current job. Refer to Importing data to the project step-by-step.

☞ Note that main workflow refers to Total Station. For GPS press **Measure** to record a point.

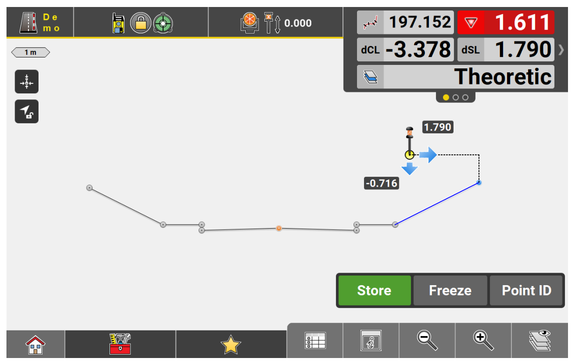
Stake out cross-sections step-by-step

1.	Select **Roading** from the Home Menu.	
	Map screen is displayed.	

2. Select the road line to stake, then follow the guidance to navigate the target to the road line.



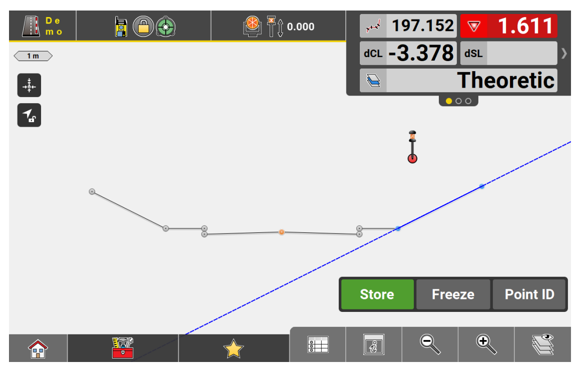
3. Once a measurement is available, select **Cross Section** view from the Map Handler.



The view mode changes into cross-section. The target is shown against the current cross-section of the selected road model.

To change view mode back to map view, deselect **Cross Section** view from the **Map Handler**.

☞ If a cross-slope element is selected the pole icon shows the Cut/Fill colours. If a point is stored it is colour coded based on Cut/Fill colour and tolerance settings.



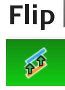
☞ To fix the heading in the cross-section view, tap 

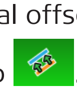
☞ To select cross slopes directly from the map, enable **Road Shading** in **Viewing Options**.

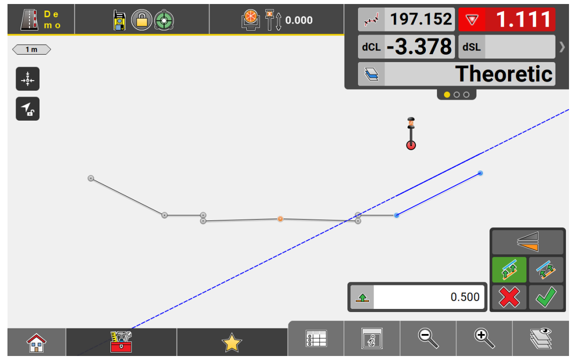
4. To offset an individual string line or a cross-slope select **Offset Element**.

5. Select the element required for offset, then enter an **Offset** value.

Use **Flip**  to switch the offset value from positive to negative.

Tap  in order to define a vertical offset for the element.

To define a perpendicular offset tap .



6. Tap to accept.

14.3 General Roading Toolbox Functions TPS + GPS

Description

Function	Description
Divide & Offset	Divide a line or arc into segments. When using this function the Offset feature is available as well. Therefore a line or arc can be divided into segments and the segment points be offset in one step. Refer to Use **Divide & Offset** step-by-step.
Active Layer	Select the active layer of the current active road line model.
Centerline	Allows the user to change the centreline of the road model. The result is a new XML road model based on the new centreline. You can switch between both road models by selecting one or the other *.xml file via the Map View Manager.
Offset	Offsets the whole model by entered value.
Create cross section	Create cross-sections using different methods.
Offset Element	Offsets the selected element, for example cross-slopes or individual string lines, by entered value in map and cross-section view.
Fixed Slope	Hold and extend the slope of a selected cross-slope element.
Define Corridor	Corridor function for cross-sections. Define the limiting values of the corridor. ☞ Cross-section calculation is restrained by the defined corridor. ☞ Useful for curvy roads.

Function	Description
Create Road	Convert exisiting reference data into a roading file. Resulting file format: *.xml Refer to Convert reference data into a roading file step-by-step.
Auto Element Selection	Set this option to **On** to make the next point/line to stake be selected automatically according to the settings. • **Next Point from list**: the next point from the Stakeout Point List is selected automatically. • **Nearest Point (or line)**: the point or line in the Map view that is closest to the current position is selected automatically after the previous point/line was staked out. • **Nearest Point from list**: the point from the Stakeout Point List that is closest to the current position is selected automatically after the previous point was staked out. • **Nearest Line in direction**: only works for vehicle/dozer/scraper and tractor configurations. The line closest to the current position is selected automatically. Lines on the left or the right-hand side in direction of driving can be excluded by setting the Blade Ref. Point to either "Left" or "Right" in the Foreman Settings. See also: Vehicle/Machine mode • **Dynamic Point selection**: the point closest to the current or last known pole/rover position is selected automatically. ☞ To use the **Next Point from list** or the **Nearest Point from list** function, it is necessary to define the list of points first. ☞ Calculation of the nearest point or line is based on 3D coordinates. ☞ Lines at a 3D distance larger than 10m are not selected automatically. ☞ Auto Element Selection can be activated separately for each Stakeout/Layout application and will stay active even after restart. The chosen method will stay selected in the Stakeout/Layout application after restart, too.
Stake Writer	Enable this option to get guidance on marking of the stake. For further details refer to: Using Stake Writer step-by-step
Undo	Undo previous action.

Function	Description
Delete 	Remove points/lines.

Convert reference data into a roading file step-by-step

Road alignments in DXF format cannot be used by the Roading application or by Leica machine control software platforms.

The **Create Road** tool allows you to convert existing reference data into a roading model.

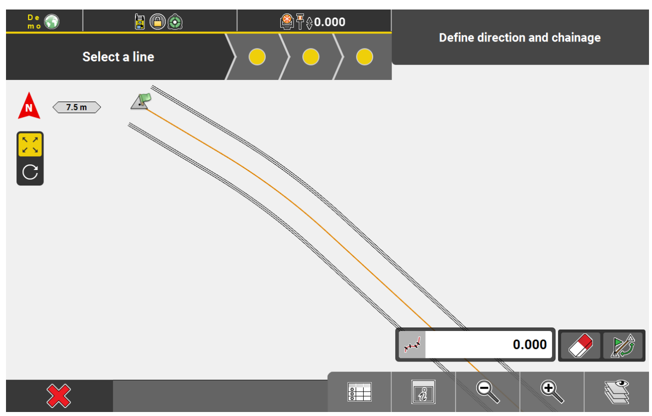
The created road file can be exported to a USB stick or to Leica ConX for transferring to other field controllers or to Leica machine control systems. (Refer to 2.2 Import, Export, or Delete Data.)

☞ **Given:**
Reference model is active within the current job.

1. Select **Roading** from the Home Menu.
   Map screen is displayed. 

2. Select **Create Road** from the toolbox. 

3. Follow the Wizard steps.

   Select a line to be used as road line. If necessary, define direction and chainage of the road line in the toolbar.

   Tap the next Wizard step to proceed.

4. Select a reference file to convert the lines into road stringlines.
   *If no reference file is selected, the software creates a road line in *.xml format. If a reference file is selected, the software creates a road model in *.xml format.*

   Tap the next Wizard step to proceed.

5. Select individual lines for the road creation. To ensure that all selected lines have the same start-end point direction, tap .

6. Select a surface to perform a vertical transformation.
Vertical transformation is optional; it allows shifting the model to an existing surface when the reference file has zero or no height information. If vertical transformation is not required, proceed without selecting a surface.
Tap ✓ to proceed.

7. If necessary, change the file name.
Tap ✓ to convert and save the roading file.

14.4 Information Bar Values TPS + GPS

Description

Type/Icon	Description
Id	Point ID of the last point measured.
E	East value of the last point measured.
N	North value of the last point measured.
H	Height of the last point measured.
Cut/Fill	Cut/Fill value of the last point measured.
Chainage	Indicates the chainage of the measured point on the centreline.
Hz	TPS only: Horizontal angle to the last point measured.
V	TPS only: Vertical/zenith angle to the last point measured.
sD	TPS only: Slope distance to the last point measured.
hD	TPS only: Horizontal distance to the last point measured.
iCh	Indicates the chainage of the measured point on the selected stringline.
dCL	Indicates the perpendicular distance from the centreline to the measured point. A negative value means that the point is to the left of the line.

Type/Icon	Description
dSL	Indicates the perpendicular distance from the stringline to the measured point. A negative value means that the point is to the left of the line.
sSlp	Indicates the cross section slope at the measured point. Negative means sloping down from the road centreline.
lSlp	Indicates the long slope at the measured point. Negative means down sloping in the line direction.
Din	Inner distance. Indicates the distance from the measured point to the inner edge of the current element (the edge closest to the centreline).
Dout	Outer distance. Indicates the distance from the measured point to the outer edge of the element (the edge most far away from the centreline).
SdI	Indicates the sloped distance from the measured point to the inner edge of the element.
SdO	Indicates the sloped distance from the measured point to the outer edge of the element.
dHix	Side distance to the point in the current chainage where current height intersects the theoretic road profile. For example, useful when building up a road bank.
Layer	Indicates the layer of the stringline model that is used as a reference.
dHSL	Indicates the height difference at the measured position to the selected stringline. Negative means above, positive below the stringline.
Offset Model	Indicates the applied vertical offset value.
Offset Element	Indicates the applied vertical offset value.
dHPO	Perpendicular height difference from the measured position to the slope. A negative value means that the measured position is above the design.
CQ 1D	GPS only: Coordinate quality value for the height information at the current position.
CQ 2D	GPS only: Coordinate quality values for the plain information at the current position.

Type/Icon		Description
CQ 3D		**GPS** only: Coordinate quality values for a combination of the height and the plain information at the current position.
GDOP		**GPS** only: Geometric dilution of precision quality value at the current position.

15 How to Use Differential Milling GPS

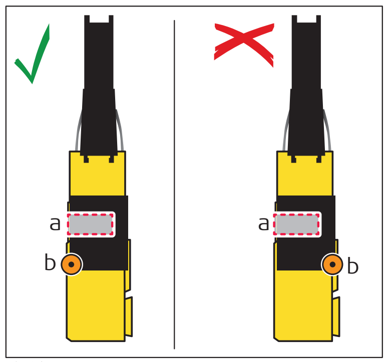
General description

Differential Milling allows you to carry out milling tasks by using a GPS/GNSS antenna and a field controller in the following way:

- Mount the antenna on the milling machine.
- Connect the iCON software to the antenna and configure the milling machine.
- Load the design surface or road.
- Load the existing surface (as-built).

The software calculates the left and right cut values and the cross slope of the design model at the current GPS/GNSS position as well as ahead of the milling machine.

☞ If the drum width is shorter than the machine width, mount the GPS/GNSS antenna within the drum width.



18396_001

a Drum position
b GPS/GNSS antenna position

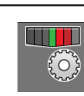
Requirements:

- Differential Milling can only be used with a field controller running iCON site software and requires a Milling Pilot licence.

Given:

- GPS/GNSS antenna is connected to the iCON site software.
- A coordinate system is loaded to the project.
- For Roading: A road model and a surface are loaded in the project.
  For Cut & Fill: Two surfaces are loaded in the project.

Milling step-by-step

1.	Select **Cut & Fill** or **Roading** from the Home Menu.	 
2.	Access **View** in the Map handler and tap **Foreman Settings**.	

☞ For information on the available settings, refer to section Milling machine mode.

- For the icon type, select **Milling Machine**.
- The maximum cutting depth value is empty by default. If no value is entered, the height deviation is not checked.
  If necessary, enter the maximum cutting depth of the milling machine.
  If the height deviation is greater than the defined cutting depth, a warning is displayed in milling view.
- Define the **Vehicle Configuration** settings. Make sure to enter the correct dimensions of the milling drum.

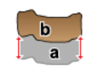
Tap ✓ to accept the settings and return to the map.

☞ When using the Cut & Fill application, import two surface files (*.trm, *.dxf or *.xml), one for the existing surface and one as design information.

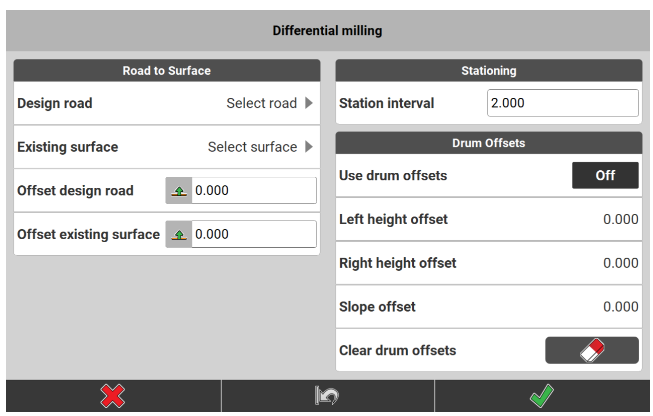
☞ When using the Roading application, import a surface file (*.trm, *.dxf or *.xml) for the existing surface and a road model (*.lmd or *.xml) as design information.

---

3. To activate the existing surface and the design surface or design road, select **Differential Milling** from the toolbox.



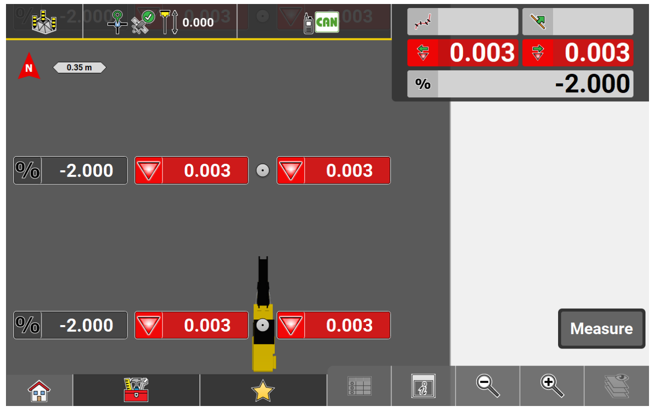
The "Differential milling" screen is displayed.



4.
- Tap **Design surface** to load the terrain model of the design road surface.
- Tap **Existing surface** to load the terrain model of the existing road surface.
- If necessary, enter a vertical offset for the loaded terrain models.
- Define the **Station interval**. This value defines the distance interval for which the software calculates the next cut and cross slope values. The map scale is adapted to the entered value.
- **Drum Offsets** can be defined and used. For further information see: Using Drum Offsets step-by-step

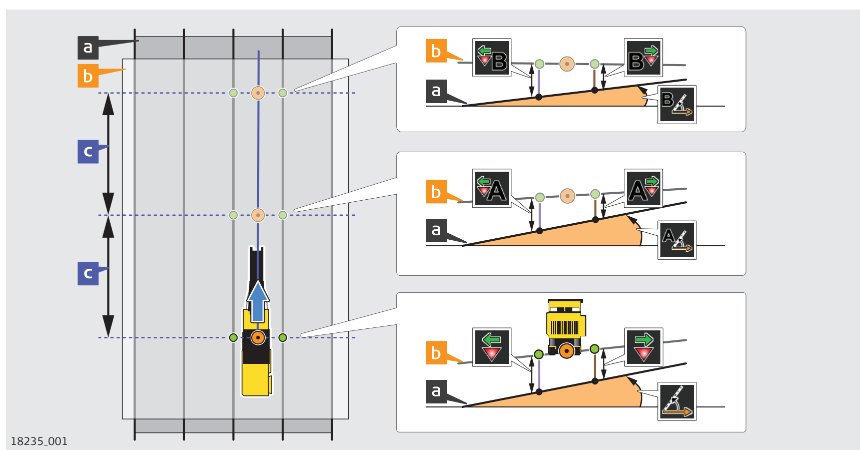
Tap ✓ to accept the settings and return to the map.

The map is displayed in Milling view.



In Milling view, the map is not interactive. To allow for interaction, activate Multiview.
Refer to section Multiview.

5. Drive the milling machine along the surface.
The software constantly calculates the left and right cut values and the cross slope value of the design road surface at the current machine position. In addition, the software calculates the values at two further positions ahead of the machine, each at the distance of the defined station interval.
These predicted points are fixed in position, as if they were spray marks from a surveyor. However, you can configure the information bar to show real-time values ahead of the machine that update as you drive. Refer to the next section Information bar values.
For instructions on how to configure the information bar, refer to the section Information bar.



a Model of design surface
b Model of existing surface
c Station interval

6. To exit Milling view, select **Differential Milling** from the toolbox. Tap reset and tap ✓ to accept.

Cut value indication in map view:

Cut down the existing surface by the displayed cut value.

The cut value is greater than the defined maximum cutting depth. The area has to be milled again.

Existing surface matches the design surface.

Milling is not possible, as existing surface is below the design surface. A warning is displayed in the information bar.

If the cut value cannot be calculated, the field for cut value is left empty.

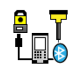
Automated Differential Milling

Using automated differential milling, iCON site sends the Cut and Cross Slope information directly to the Machine Controller.

Automatic Milling is available for the following Wirtgen machines:

- Large Milling machines with LevelPro II controller 2011-2019y, W200-W250 models
- Large Milling machines with LevelPro Active controller 2019>, W200-W250Fi models
- Compact Milling machines with LevelPro Plus controller 2018>, W100-W150 models

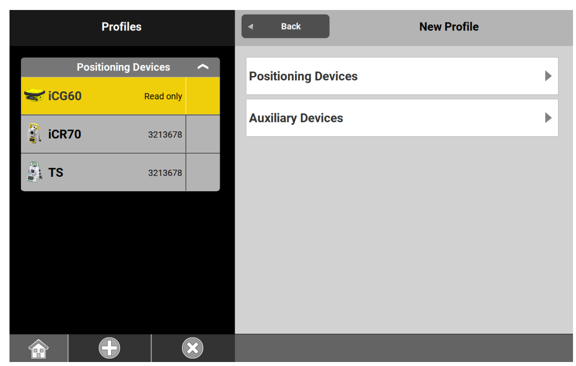
1. In order to configure the connection to the Milling machine select **Devices** from the Home Menu.

   ☞ Assumption is that the controller is already connected to the positioning sensor.

---

2. Tap ⊕ and select Auxiliary Devices.



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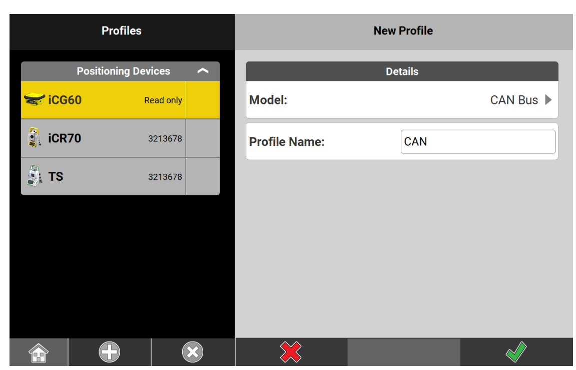
3. Select **CAN Bus** and tap ✓ to establish connection to the device.



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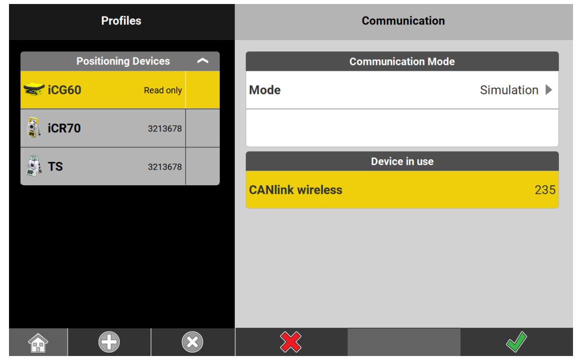
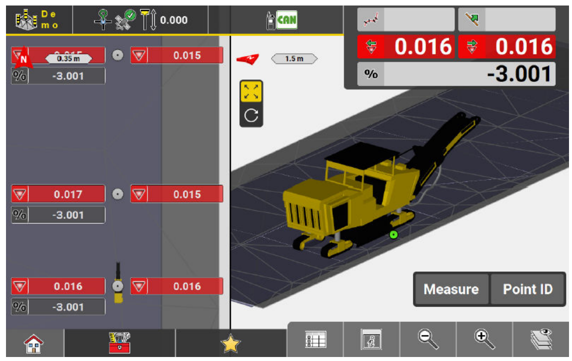
4. Tap to add the device to the list of active profiles.



Connection is established via Bluetooth.



The status bar shows the icon when connected.

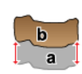
When there is an error in the connection the icon turns to .

The activation of the Automatic Milling mode is done on the Wirtgen Machine Controller.

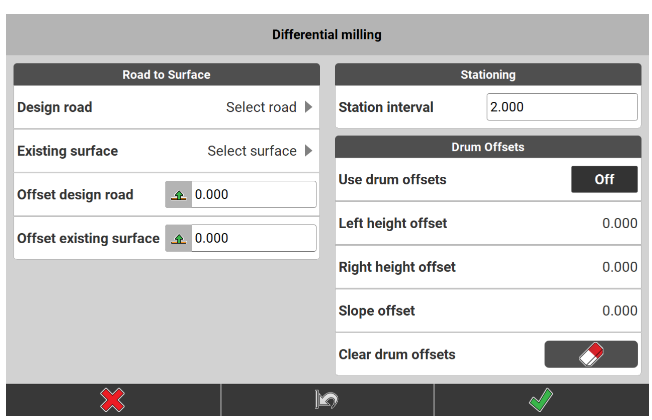
Using Drum Offsets step-by-step

1. Select **Cut & Fill** or **Roading** from the Home Menu.

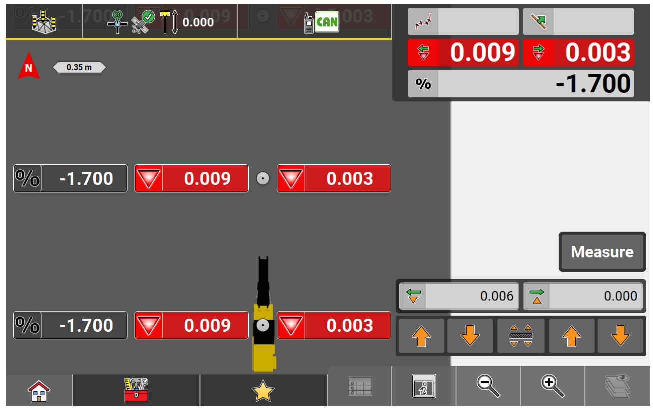
2. To activate the existing surface and the design surface or design road, select **Differential Milling** from the toolbox.



The "Differential milling" screen is displayed.



3. To use **Drum Offsets** switch the function on by tapping the **Off** button. Tap to clear the currently defined offset values.
Tap to accept the settings and return to the map.



The map is displayed in Milling view. Adjust the left and right cut values by tapping the arrow buttons .

4. If the machine controller is configured to control the left side with height and the right side with slope, tap .
The toolbar changes so that on the left the height offset for the whole drum can be adjusted, and on the right the slope/angle offset.

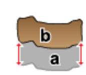
5. Tap to adjust the slope/angle offset value.

☞ If the machine controller is configured such that slope is on the left side, go to the Foreman Settings and set the **Drum Ref. Point** to be on the right side.

☞ Incrementation of the offset values depends on the **Display Accuracy** and can be changed under **Home** > **System** > **Display**. See also: Display settings
Units used for distance and angle can be changed under **Home** > **Units**. See also: Units settings
For details on incrementation steps see tables below.

6. Drive the milling machine along the surface.

7. To exit Milling view, select **Differential Milling** from the toolbox. Tap reset and tap to accept.



Incrementation of Height offset values:

Height Accuracy	Meter	Feet	Feet Fractional
Simple	0.01	0.1	1 "
Standard	0.001	0.01	1/8 "
Precise	0.001	0.005	1/16 "

Incrementation of Slope offset values:

Slope - decimal degrees/gons	Slope - degrees minutes seconds	%	H:V, V:H
0.1	1 minute	0.1	n/a

Information bar values

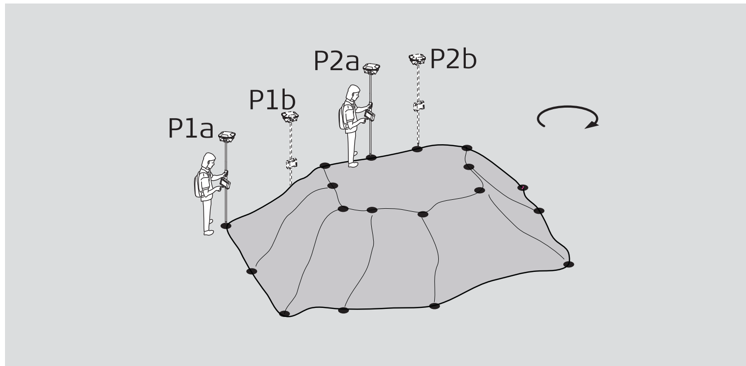
Type/Icon	Description
Cross Slope	Cross slope angle of the design model at the current position. ☞ Depending on the current active setting for slope display, this value may also be displayed as H:V, V:H or %.
Left Cut/Fill	Left Cut/Fill value over the current position. The value is calculated from the difference of the existing model to the design model.
Right Cut/Fill	Right Cut/Fill value over the current position. The value is calculated from the difference of the existing model to the design model.
Next Cross Slope	Calculated cross slope angle of the design model ahead of the machine at the distance of the defined station interval.
Next Left Cut/Fill	Calculated left Cut/Fill value ahead of the machine at the distance of the defined station interval.
Next Right Cut/Fill	Calculated right Cut/Fill value ahead of the machine at the distance of the defined station interval.
Next* Cross Slope	Calculated cross slope angle of the design model ahead of the machine at twice the distance of the defined station interval.
Next* Left Cut/Fill	Calculated left Cut/Fill value ahead of the machine at twice the distance of the defined station interval.
Next* Right Cut/Fill	Calculated right Cut/Fill value ahead of the machine at twice the distance of the defined station interval.

16 How to Handle Volumes TPS + GPS

16.1 Create a Surface TPS + GPS

General description

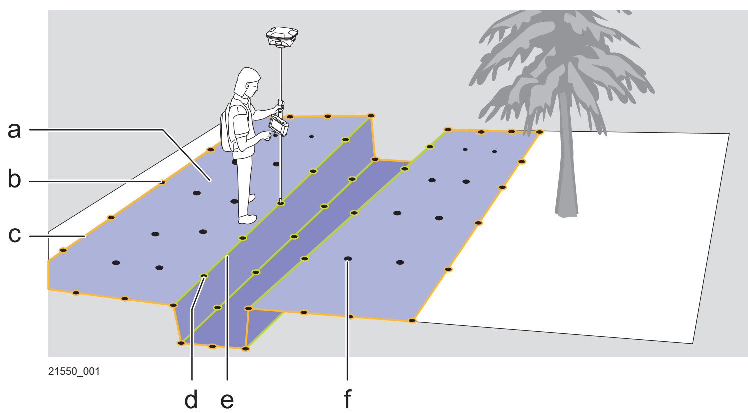
Measuring a stockpile surface for volume calculation



006783_001

P1a, P1b, ...	Boundary points
P2a, P2b, ...	Surface points

Measuring a surface with the use of breaklines



21550_001

a Surface
b Boundary point
c Boundary
d Breakline point
e Breakline
f Surface point

Create a surface step-by-step

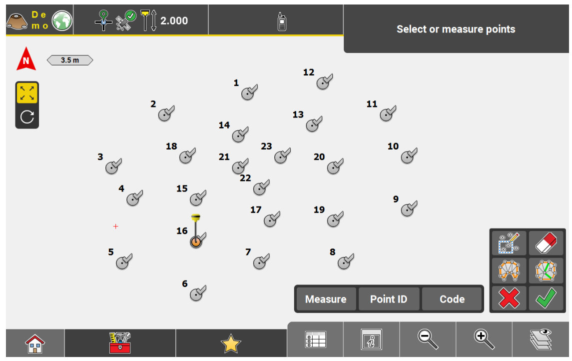
☞ **Requirements for creating a surface by measuring points:**
- Instrument is connected and set up.

☞ **Requirements for creating a surface with existing points:**
- Map contains the points for the surface creation.
- Only points with an elevation can be used for the creation of surfaces.

☞ The main workflow refers to GPS. For Total Station press **Measure**, then **Store**.

1. Select **Volumes** from the Home Menu.

2. Select **New Surface** from the **Toolbox**.



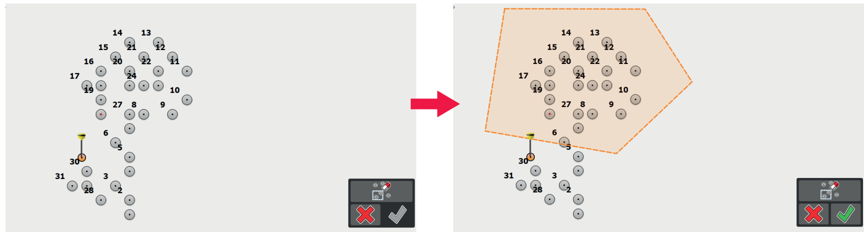
The toolbar for surface creation is displayed in map view.

	Tap to activate **Window Selection** mode.
	Tap to deselect all points.
	Tap to create a boundary.
	Tap to create breaklines.
	Tap to cancel surface creation.
	Tap to finish surface creation.

3. **To define the new surface**, measure as many points as required or tap existing points in the map to be included in the surface.

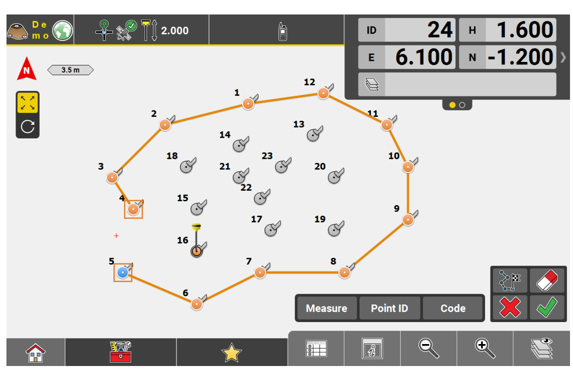
☞ **TPS** only: To setup the instrument in another location, for example in order to measure further points behind a stockpile, tap the **Setup** key  from favourites container . The Station Setup screen opens. Refer to 4 How to Setup a Total Station for information about station setup. After the station setup is complete, the software returns to the Volumes application and measurements can be continued.

4. **To select several existing points at once** instead of tapping each one of them, tap .
The toolbar for Window Selection is displayed.

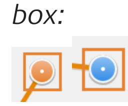


- Define the selection area by tapping as many points as desired for the area corners.
- To deselect several points, activate and tap the map to define the area for deselection.
- To cancel Window Selection, tap .
- To accept the selection, tap .
All points inside the defined area are selected automatically.

5. **To define a boundary**, tap .
The toolbar for boundary creation is displayed.
- Measure points or tap existing points on the screen to connect all boundary points.
- To close the boundary, tap the start point again.
- Alternatively, measure lines or tap existing lines to define the boundary.
If available, you can also select arcs to include them for a boundary.
- To stop boundary definition and start it on another point, tap .
- To clear all boundary definitions, tap .
- To finish the boundary and return to surface creation screen, tap .
- To leave the boundary definition mode without any changes, tap .



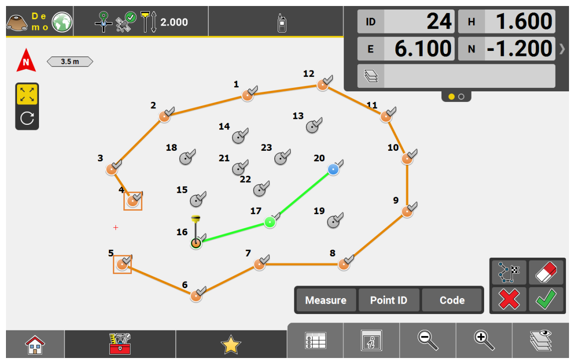
The boundary is displayed in orange colour.
Open boundary points are highlighted by an orange box:



6. **To define a breakline**, tap .

The toolbar for breakline creation is displayed.

- Measure points or tap relevant points on the screen to connect all breakline points.
- To clear all breakline points, tap .
- To discard any changes of the breaklines, tap .
- To stop the breakline and create a new one, tap .
- To finish the breakline and return to surface creation screen, tap .



A breakline is displayed in green colour.

☞ During surface creation, you can also use the following tools from the Toolbox, if needed:

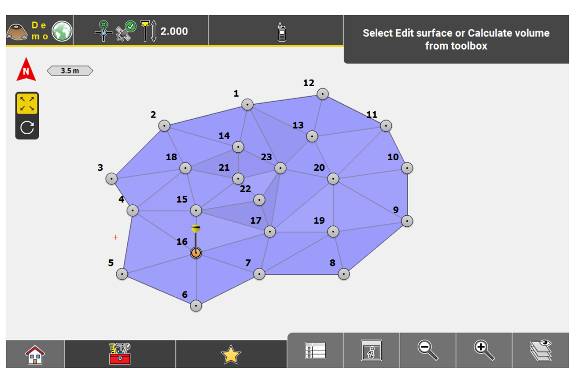
- **Automatic Logging**
  This tool allows you to densify the surface by automatically measuring surface points. Refer to 7.4 How to Store Points Automatically .
- **Intersection**
  This tool allows you to create an intersection point where a breakline crosses the surface boundary or another breakline.
- **Shift Point**
  This tool allows you to shift a surface point.

Refer to 16.6 Volumes Toolbox Functions .

7. To finish surface creation, tap .

The "Save" screen is displayed.

8. To save the surface, enter the desired name and tap .



The surface is created and displayed on the map.

16.2 Measure Volume and Make a Stockpile Calculation TPS + GPS

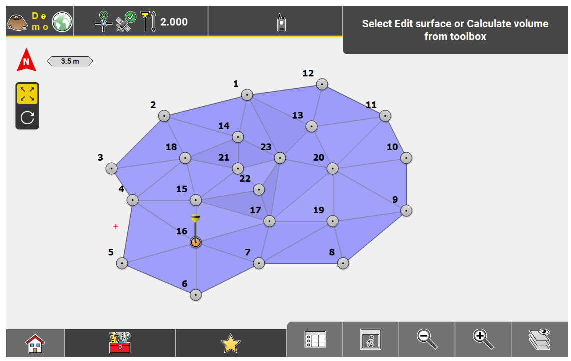
Measure volume and make a stockpile calculation step-by-step

☞ **Requirements:**

- Surface file available in active job. It can be either previously created in the Volumes application (refer to Create a surface step-by-step), or imported as a reference (refer to Importing data to the project step-by-step).
- To display different surfaces use **Map view manager**, refer to Map View manager.

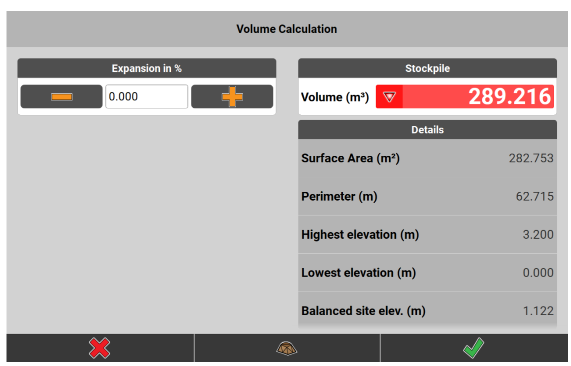
1. Select **Volumes** from the Home Menu.

2. Select a surface for measurement.



3. Select **Calculate Volume** from the Toolbox.

4. For the calculation method, select **Stockpile**.



The calculated volume of the selected surface along with measurement data is displayed.

5. If needed, adapt the **Expansion** value: enter a positive (= swell) or negative (= shrink) percentage value of the calculated volume.
The calculated volume is adapted immediately.

☞ Tap  at the bottom of the screen to turn on the Cut/Fill map.

The icon changes to , in order to indicate that a Cut/Fill map is available.
For further information refer to: Calculate volumes to an elevation step-by-step

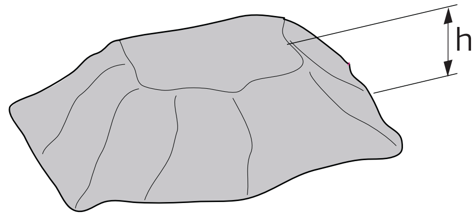
☞ The Cut/Fill map is calculated from the **Balanced site elevation** of the Stockpile.

6. To accept the result, tap ✓. *The "Save" screen is displayed.*

7. To save, enter the desired name and tap ✓.

16.3 Calculate Volumes to an Elevation TPS + GPS

General description



006784_001

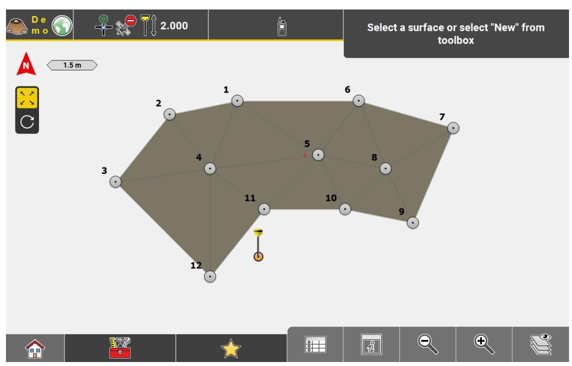
h Elevation

Given:

- Surface file available in active job. It can be either previously created in the **Volumes** application (refer to 16.1 Create a Surface , steps 1 & 2), or imported as a reference (refer to Importing data to the project step-by-step).

Calculate volumes to an elevation step-by-step

1. Select **Volumes** from the Home Menu.

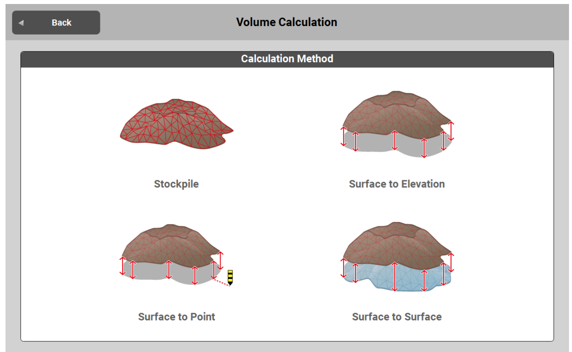
2. 

Tap the displayed surface to select it.

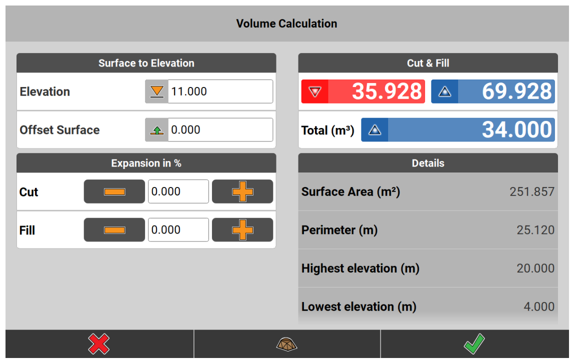
☞ To display different surfaces use **Map view manager**, refer to Map View manager.

3. Select **Calculate Volume** from the **Toolbox**.

4.



Select **Surface to Elevation** in the Calculation Method screen.



Screen for volume calculation is displayed.

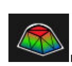
---

5. Enter the desired elevation.

- If needed, enter the desired offset value for the selected surface. To return back to the calculation screen, tap  .
  The volume is recalculated according to the new elevation and displayed along with measurement data.
- If needed adapt the **Expansion** for Cut, Fill or both values: enter a positive (= swell) or negative (= shrink) percentage value of the calculated volume.
  The calculated volume is adapted immediately.

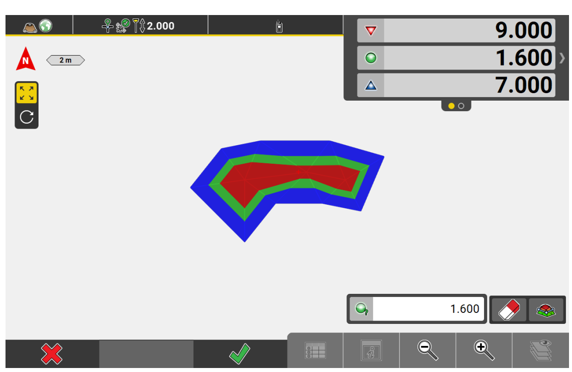
---

6. Tap  at the bottom of the screen to turn on the Cut/Fill map.

The icon changes to , in order to indicate that a Cut/Fill map is available.

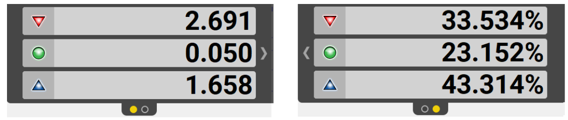
---

7. Tap  to accept the result.

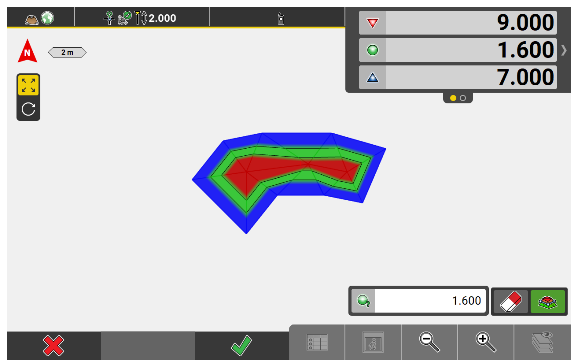


A colour-coded surface is shown providing information on the areas where material needs to be removed or added. The Cut/Fill Map View information including the graphic is also part of the Volumes report.

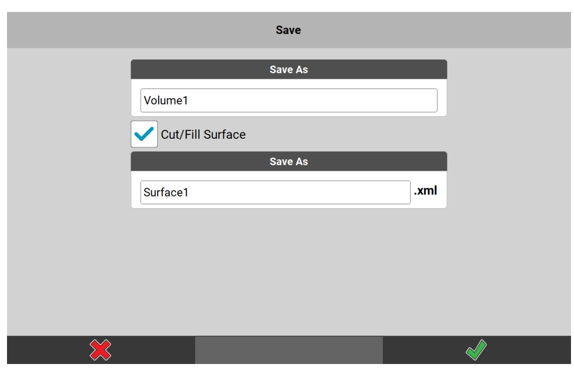
The information bar provides the relative maximum Cut/Fill values as well as the coverage for Cut/Fill and on-grade areas in %.



8.
- In the toolbar enter a height tolerance value  for the "on-grade" green areas.
  All parts within the tolerance band are displayed in green, cut or fill segments are shown matching the Cut/Fill colour indicators. By default, the tolerance value is set to 10% of the difference between the maximum Cut and the maximum Fill value.
- Tap  to create the Cut/Fill lines.



9. Tap  . The "Save" screen is displayed.



Tap to select Cut/Fill Surface if you want to store the colour-coded surface and the Cut/Fill lines as an XML file for further usage.

10. To save, tap  .

☞ Select **Surface to Point** as a volume calculation method to calculate the volume according to the height value of a specific point.

☞ Select **Surface to Surface** as a volume calculation method to calculate the volume between two separate surfaces. The calculated volume is based on where the two surfaces overlap.

16.4 Shift a Surface TPS + GPS

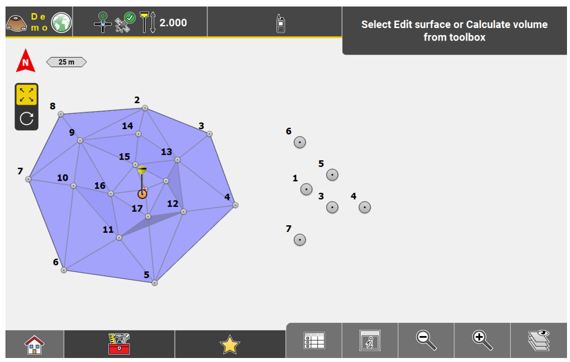
Shift a surface step-by-step

☞ **Requirement:**
Surface file available in active job. It can be either previously created in the Volumes application (refer to 16.1 Create a Surface), or imported as a reference (refer to Importing data to the project step-by-step).

☞ To display different surfaces, use **Map view manager**. Refer to Map View manager.

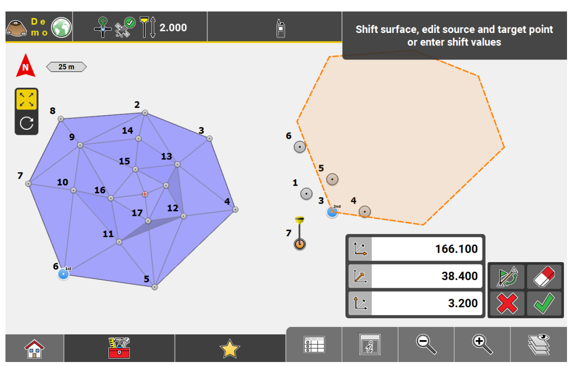
1. Select **Volumes** from the Home Menu. 

2. Select an existing surface or create a surface.



3. Select **Shift Surface** from the **Toolbox**. 
The toolbar for shifting surfaces is displayed in map view.

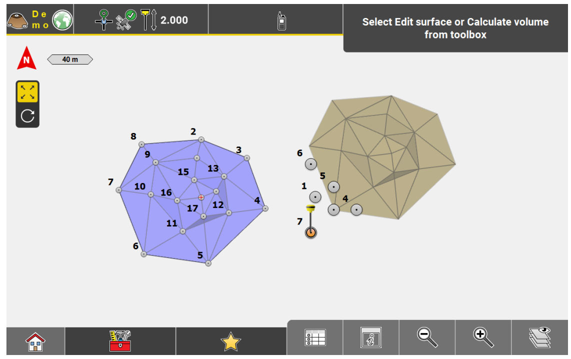
4. To define the shift, either select a source point and a target point in the map, or enter shift values to define the east, north and height shift.



A preview of the shifted surface is displayed.

- To switch source and target point or to invert the shift values, tap .
- To clear the selected points or the entered shift values, tap .
- To cancel surface shift, tap .
- To accept and shift, tap . *The "Save" screen is displayed.*

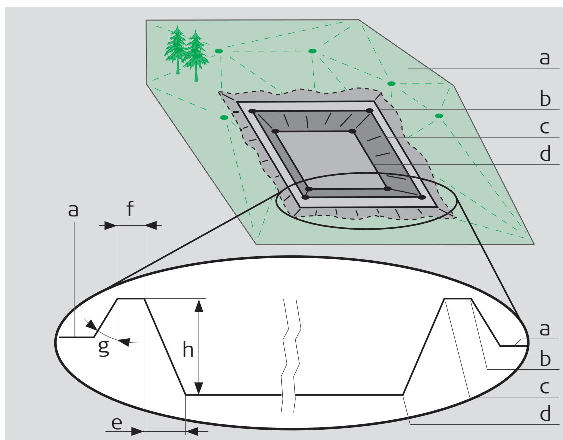
5. To save the surface, enter the desired name and tap ✓.



The shifted surface is created and displayed in the map view.

16.5 Define a Pond Fitting in an Existing Surface TPS + GPS

General description



012236_001

a Existing surface
b Pond outer edge*
c Pond inner edge*
d Pond floor*
e Offset to floor lines*
f Berm width*
g Outer berm slope angle*
h Relative height difference

* Values to enter during **Dimensioning** process. For pond inner edge and pond outer edge only the height is entered.

Given:

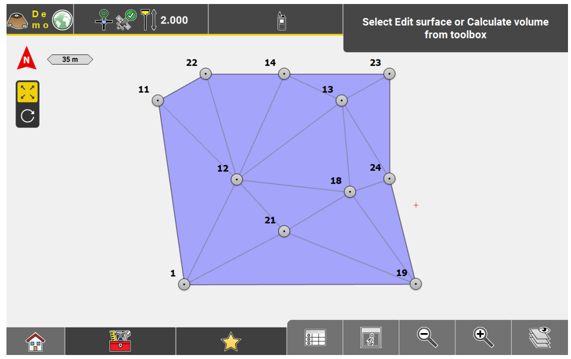
- Instrument is connected and set up.
- Surface file available in active job.
- Known dimensions of the pond to be established.

☞ Note that main workflow refers to GPS. For Total Station press **Measure**, then **Store**.

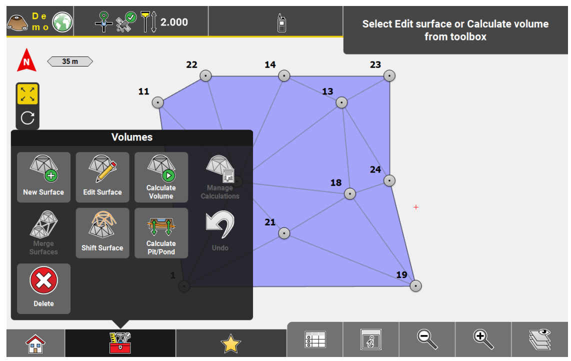
Define a Pond fitting in an existing surface step-by-step

1. Select **Volumes** from the Home Menu.

2. Tap the displayed surface to select it.

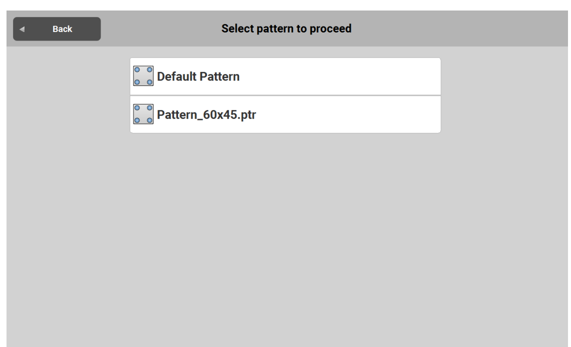


3. Select **Calculate Pit/Pond** from the **Toolbox**.



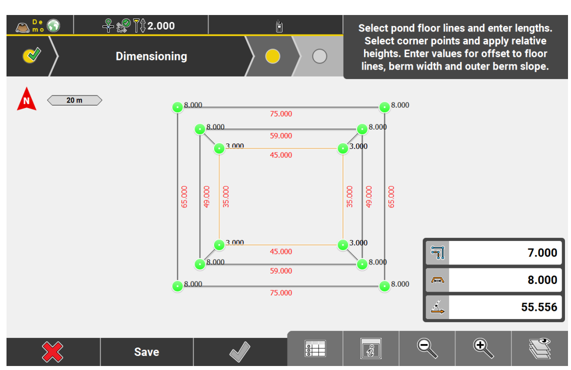
☞ To display different surfaces use **Map view manager**.

4.



Select the pattern according to your needs. During first-time use, only the **Default Pattern** is available.

5.



Now dimension all necessary elements, as shown in the illustration before:

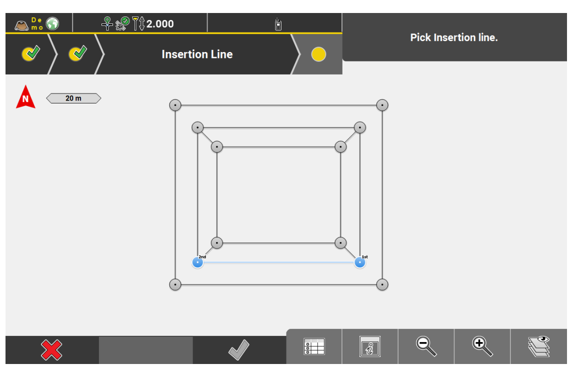
- Define length and width of the pond floor.
  Enter a relative height value for each of the four floor corner points separately. These heights can vary.
- Enter offset value to the floor lines at .
  This value is the distance from the floor lines to the pond inner edge.
- Enter a relative height value for the pond inner or pond outer edge. The same height is applied to all eight corner points.
- Define the berm width at .
- Define the outer berm slope angle at .

6.

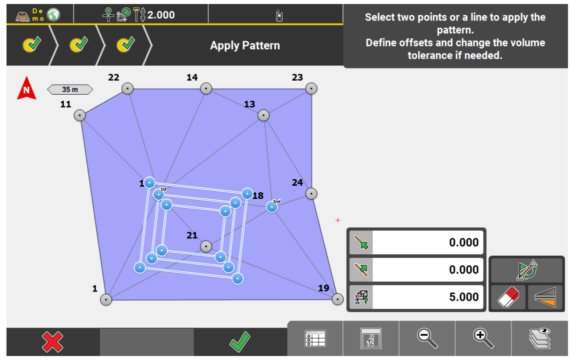
After defining all these values, you can save this pond as a user-defined pattern. Tap **Save**, enter a name and tap . In this case, the software automatically proceeds to the next step.

Otherwise tap the next Wizard step to proceed.

7. Define where to place the pattern at.
Pick the line that is used as insertion line.



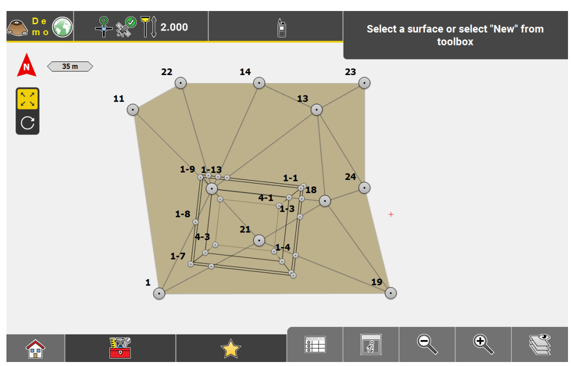
8. Proceed to the next step to apply the pattern:



- Select two points or a line as the reference line. If needed, use [icon] to switch the start point and end point of the active line.
- Use [icon] to flip the pattern across the reference line.
- Enter an offset value along the line at [icon] and offset value to the line at [icon], if needed.
- Define the volume calculation tolerance at [icon]. The smaller this value is, the longer the calculation needs.
- When finished, tap ✓ to accept.

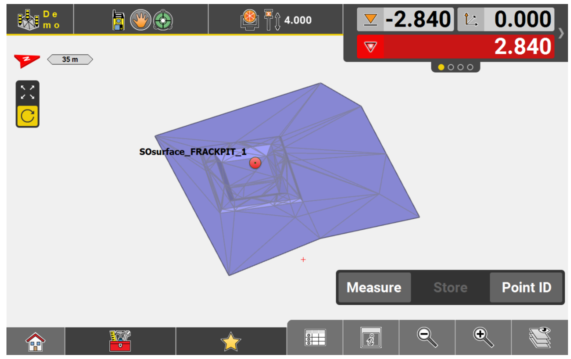
9. Enter a name for the surface in the next screen, and tap ✓ to save. Then enter a name for the pond geometry and tap ✓ to save.

10. In the final screen, the newly created pond is shown applied to the selected surface.



☞ The newly created surface, including the pond, can now be used for staking out, but the data can also be exported for machine use .

☞ Example of the surface with pond, used in **Cut & Fill**.



16.6 Volumes Toolbox Functions TPS + GPS

Toolbox functions

Function	Description
New Surface	Measure as many points as required to create a surface.
Edit Surface	Tap to edit a selected surface. "Edit Surface" contains the same tools and functions as "New Surface".
Calculate Volume	Allows you to calculate the volume based on a surface.
Manage Calculations	Allows you to view and delete already created Volume calculations. • To view details of a calculated result, tap the arrow button to the right. • To delete a calculated result, tap its name to select it and tap ✓ to confirm deletion.
Merge Surfaces	Allows you to create a surface out of two or more existing surfaces. • Select **Merge Surfaces** from the Toolbox. • Select at least two existing surfaces to be merged. • To merge the surfaces, tap ✓.
Shift Surface	Allows you to create a surface by shifting an existing surface.
Calculate Pit/ Pond	Allows you to define a pond fitting in an existing surface.

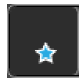
Toolbox Functions in Surface Creation Mode

Function	Description
Automatic Logging	Set **Autologging** to **On**/**Off**. Select the **Logging Mode** from **3D Distance**, **Distance and/or Height**, **Time**, or **Time over a point** and define the Interval. **Store on demand** allows you to record measurements anywhere in between, if enabled.
Intersection	Select a first line or two points for it. Select a second line or two points for it. At the position where the two lines are crossing, store the upper or lower intersection point.
Shift Point	Allows you to shift the position of a point in all three dimensions by entering shift values.

16.7 Information Bar Values TPS + GPS

Description

Type/Icon	Description
Id	Point ID of the current point to record.
E	East value at the current target position.
N	North value at the current target position.
H	Height at the current target position.
Code	Code/layer for the next point to record.
Hz	TPS only: Horizontal angle to the current target position.
V	TPS only: Vertical/zenith angle to the current target position.
sD	TPS only: Slope distance to the last point measured.
hD	TPS only: Horizontal distance to the last point measured.
Surface	Name of the selected surface.

Type/Icon		Description
CQ 1D		GPS only: Coordinate quality value for the height information at the current position.
CQ 2D		GPS only: Coordinate quality values for the plain information at the current position.
CQ 3D		GPS only: Coordinate quality values for a combination of the height and the plain information at the current position.
GDOP		GPS only: Geometric dilution of precision quality value at the current position.

17 How to Handle Slopes TPS + GPS

General description

Slopes is an application that allows to stake out regular slopes and batter boards.

In general, the user defines a sloped reference plane. Afterwards positions can be measured on the site and these measured positions are compared with the sloped reference plane.

The application can be used for:

- **Checks on a defined slope**: The operator moves around the sloped area and takes measurements to check if the current status is ok, below or above the designed surface.
- **Staking and mounting the batter board**: To mark the design slope by installing a board onto two pegs, that has the same slope as the design and is exactly in the sloped designed plane.
- **Finding the Daylight line**: The intersection of the current real surface and the designed surface is called Daylight line. This line is exactly the place where the excavator needs to start digging off the ground to build the designed slope.
- **Finding the Daylight point**: In this case a sloped line is used instead of a sloped plane. The daylight point and how to get to this position are the values of interest and can be used for inclined pile ramming or drilling.

The following is a step-by-step guide to using some of the key functions in Slopes: a single line as reference together with a regular slope definition. Afterwards the Daylight line can be marked and a batter board built up, starting at that location.

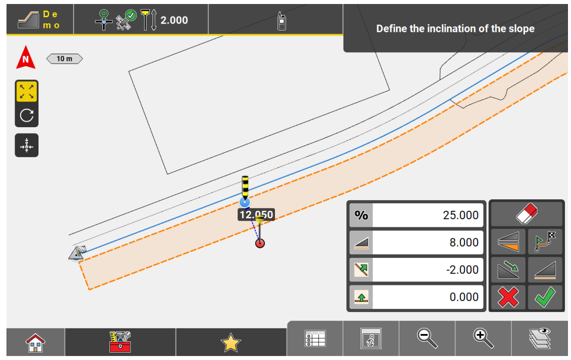
Given:

- Instrument is connected and setup with known station and height.

☞ Note that main workflow refers to Total Station. For GPS press **Measure** to record a point.

How to handle slopes step-by-step

1.	Select **Slopes** from the Home Menu.
2.	Select the reference element. The reference element can be a point, a line segment, an arc or a polyline.
3.	Define the slope. - Define the inclination of the slope . Inclination can be **%**, **V:H**, **H:V** or **Elev. Angle**, depending on the current active setting for slope display. - Set the horizontal length or the height of the slope. The input can be toggled via the button. - If needed, set a horizontal and/or vertical offset / for the slope.



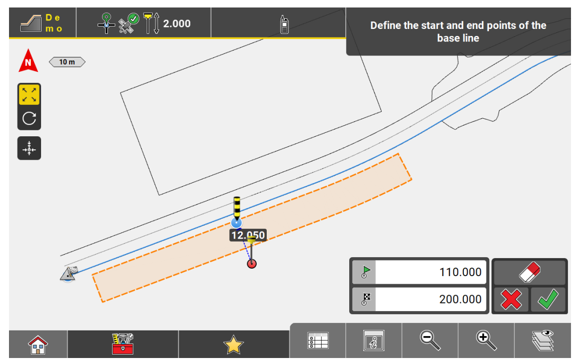
☞ Tap to erase all entered values.

☞ To change the direction of the slope (seen from start point to end point of the selected line), tap **Flip**.

☞ To change between increasing and decreasing slope tap the corresponding key.

☞ Tap to refine the start and/or end point of the baseline.

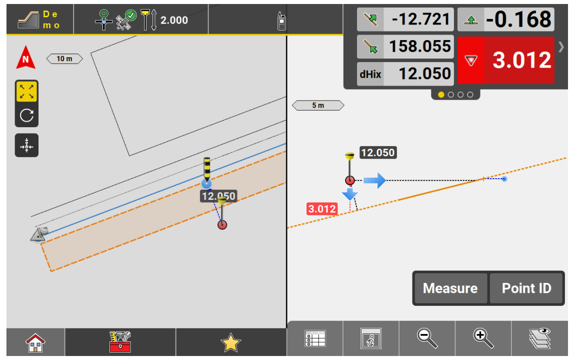
Tap to accept.



4. Once the slope is defined, tap to accept.

☞ The slope definition is stored within the application. When the next element is selected, for example an arc or a line, the start and/or end point of the baseline are reset while the slope is kept.

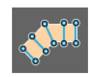
5. After defining the slope measurements can be started.
   - Once a measurement is available, calculated values are displayed. The most important values are **Cut**/**Fill** as the height difference between the measured point and the defined slope, and the **dHix** value for the distance to the daylight line at the height of the measured point.
   - To change to cross-section view mode select **Cross Section** from the Map Handler. The target is shown against the current cross-section of the defined slope.

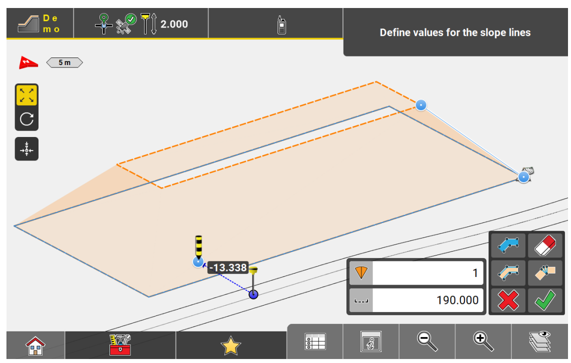


How to define Slope Lines & Model

1. Select **Slopes** from the Home Menu. 

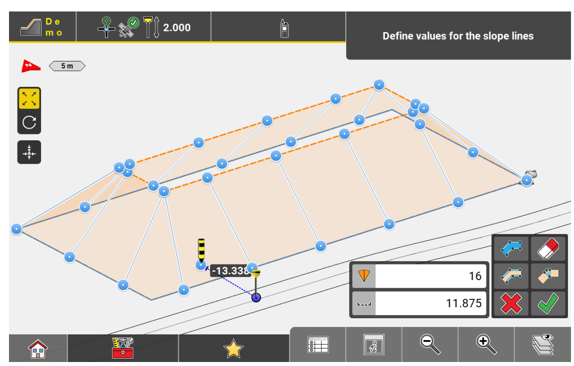
2. Select a line and define the slope. See also: How to handle slopes step-by-step

3. From the Toolbox select **Slope Lines & Model**. 



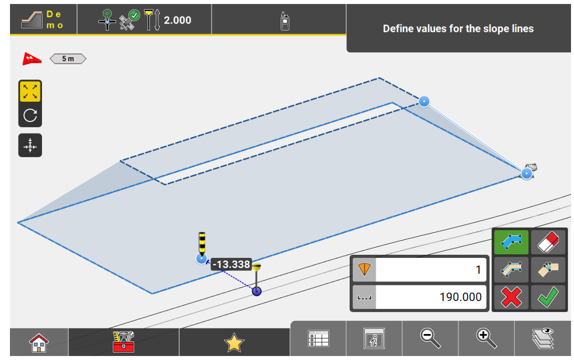
The Map screen is then displayed showing the proposed sloping lines.

4. Enter the number of segments  or an interval value  to create slope lines.

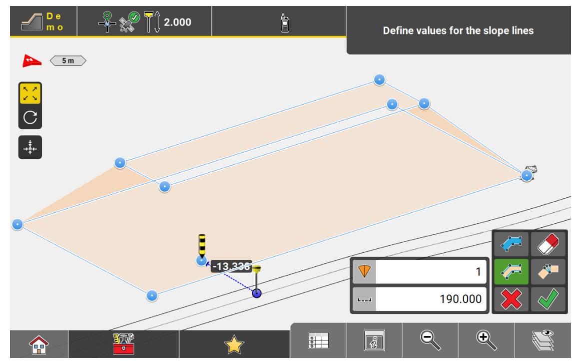


☞ Tap  to erase all entered values.

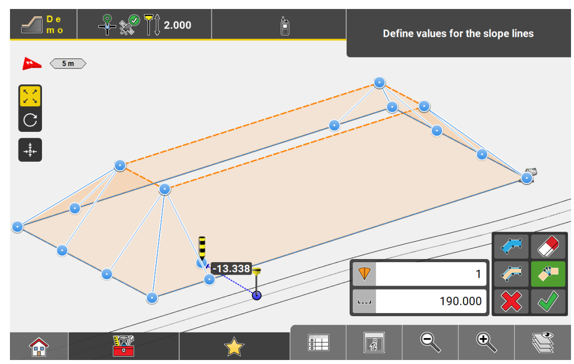
☞ Tap to create a surface from the defined slope.



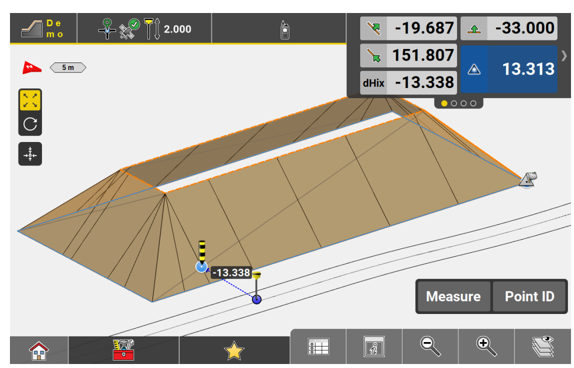
☞ Tap to calculate the baseline of the slope and the offset line of the baseline.



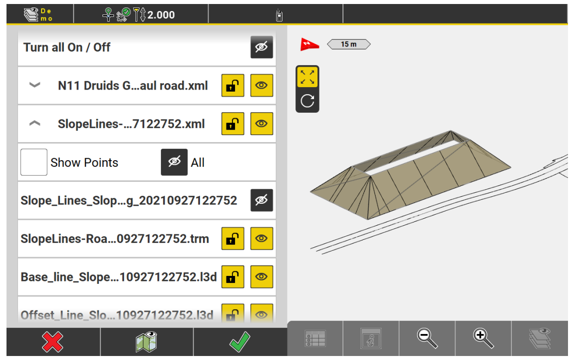
☞ Tap to create articulation lines in the corners.



5. Tap ✓ to save the slope lines and surface model.



The model will be stored as an *.xml file.



Surface, baselines and slope lines are stored on separate layers.

☞ The created file can be further used in other applications such as **Stakeout** or **Cut & Fill**.

Toolbox functions

Function	Description
Reference	Allows the user to select a reference line (for example the centreline of a road model). The information bar can be configured to show chainage and offset values to the defined reference line.
Battered Pile	Allows the settings for tilted pile ramming and delivers information for the Daylight point and the referenced angle.
Edit Slope	Edit values of the defined slope, including horizontal and vertical offset.
Slope Lines & Model	Allows the user to create: - 3D lines at desired intervals along the defined slope mode - the baseline and the offset line of the slope model - the surface defined by the slope model
Connect Points	Tap points to create a line or a polyline.
Stake Writer	Enable this option to get guidance on marking of the stake. For further details refer to: Using Stake Writer step-by-step
Undo	Undo previous action.
Delete	Remove points/lines/arcs.

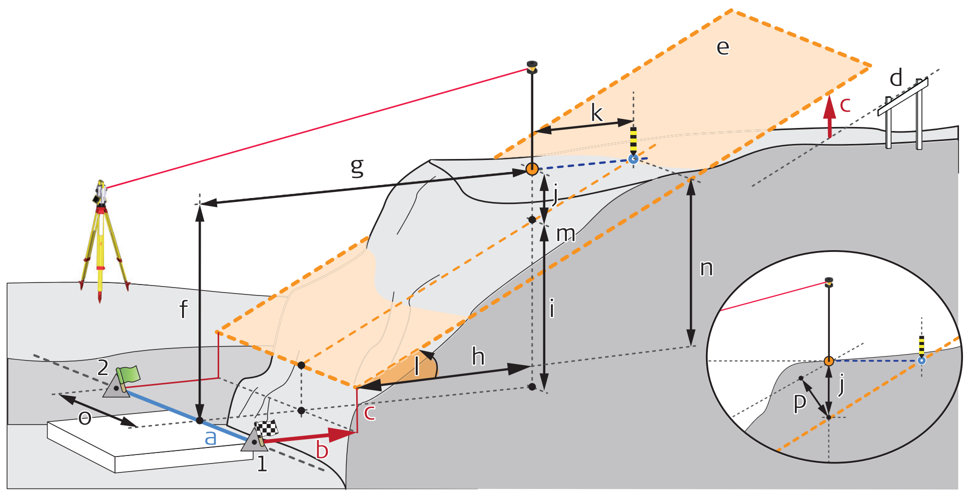
Information bar values

Type/Icon	Description	Pos.
☞	Pos. stands for the position in the following illustration.	

Type/Icon	Description	Pos.
Id	Name of the selected reference line.	-
E	East value at the current target position.	-
N	North value at the current target position.	-
H	Height at the current target position.	-
Cut/Fill	Cut/Fill value and colour indicator of the last point measured, compared to the design slope.	j
Design	Design height at the measurement position.	m
Lin	Horizontal line value, from measurement position to the beginning of the sloped reference plane.	
H. Diff	Height difference, from the measurement position to the beginning of the sloped reference plane.	f
Off	Horizontal offset, from the measurement position to the beginning of the sloped reference plane.	g
dHix	Horizontal distance to the design slope.	k
dHPO	Perpendicular height difference from the measured position to the slope.	j/p
Max	Maximum height for the defined slope.	n
Slope	Slope angle of the reference slope. ☞ Depending on the current active setting for slope display, this value can also be symbolised as **h:v**, **v:h**, or **%**.	l

Type/Icon	Description	Pos.
VOff	Vertical offset, as set in the slope definition.	c
HOff	Horizontal offset, as set in the slope definition.	b
Ref_Off	Horizontal distance from the baseline of the slope to the current target position.	b+g
Ref_Lin	Line value at current target position, along the baseline of the slope.	o
dH_Ref	Height difference from the baseline of the slope to the current target position.	c+f
Ref_Id	ID of the selected baseline of the slope.	a
Chainage	Chainage at the measured point along the selected reference line.	
Proj.Lin	Line value at measured point along the selected reference line.	
Proj.Off	Offset value at measured point to the selected reference line.	
Proj. H. Diff	Height difference at measured point to the selected reference line.	
Code	Define a code/layer for the next point to record.	-
Hz	**TPS** only: Horizontal angle to the current target position.	-
V	**TPS** only: Vertical/zenith angle to the current target position.	-
sD	**TPS** only: Slope distance to the last point measured.	-
hD	**TPS** only: Horizontal distance to the last point measured.	-

Type/Icon		Description	Pos.
CQ 1D		GPS only: Coordinate quality value for the height information at the current position.	-
CQ 2D		GPS only: Coordinate quality values for the plain information at the current position.	-
CQ 3D		GPS only: Coordinate quality values for a combination of the height and the plain information at the current position.	-
GDOP		GPS only: Geometric dilution of precision quality value at the current position.	-



a	Baseline (1 -> 2)
b	Horizontal offset
c	Vertical offset
d	Reference slope
e	Sloped reference plane
f	Reference height offset
g	Reference offset
h	Horizontal design value
i	Vertical design value
j	Cut/Fill value
k	dHix value: horizontal distance to the design slope
l	Elevation angle
m	Design height at current position
n	Maximum height for the defined slope
o	Line value at current target position, along the baseline
p	Height difference, with calculation perpendicular method chosen

18 How to Use Machine Calibration TPS

Machine calibration workflow

The iCON site software offers a simple workflow for a Machine calibration.

Calibration results are automatically stored in the internal memory of the controller. Additionally, the results can be saved to a USB stick. Transferring the results to the machine control system using a USB stick helps to decrease installation time.

The **MC Calibration** application is available for:
- **Single-Boom Excavator**
- **Dual-Boom Excavator**
- **Wheel Loader**
- **Snow Groomer**
- **On-Cab Dozer**
- **Tower Mounted Driller/Body Mounted Driller**
- **Tower Mounted Piler/Body Mounted Piler**

The different workflows are described in the following chapters.

☞ Before starting the machine calibration, ensure that the machine is placed on a flat solid surface where it cannot move or sway.

☞ Take care to use correct settings for **Prism Type** and **Prism Height** when measuring the machine.

☞ Always adhere to the instructions in the display.

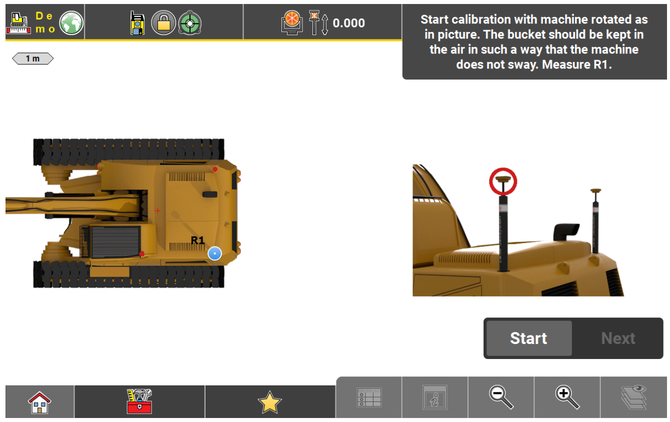
☞ When the calibration is done, enter or load the calibration results to the machine. Do not move the machine before the values are entered in the machine control system.

☞ For excavators, more calibration options are available. Refer to 18.3 Additional Calibration Options for Excavators .

The calibration screen

The calibration screen is intended to guide you through the calibration process. The screen consists of two sections:
- **Map screen (left section):** This section displays a photorealistic picture of the machine and the position of the points to be measured. You can zoom and pan the picture if necessary.
- **Instructions and navigation (right section):** This section displays instructions as well as a detailed picture of the current point to be measured. Once all points in the current step are measured, tap **Next** to proceed to the next step.

Example:



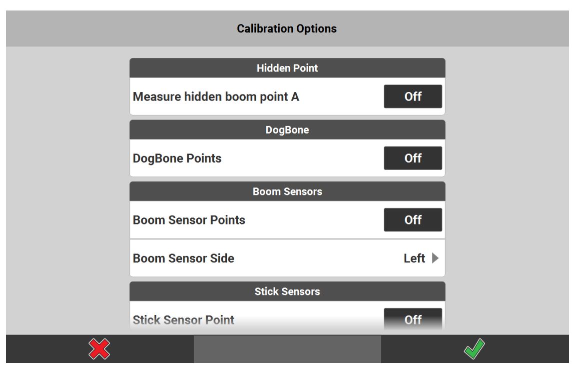
18.1 Machine Calibration for Single Boom Excavators TPS

Machine calibration for single boom excavators step-by-step

☞ Make sure to set up the total station at a position that allows measuring all points. Ideally, this position is at the front right side of the excavator about 10-15 m away from the machine.

1. Select **MC Calibration** from the Home Menu.

2. Select **Single-Boom Excavator**.

3. 

The Calibration Options screen is displayed.

If you want to calibrate the excavator including the additional options, set the desired option to **On**.
For more information, refer to 18.3 Additional Calibration Options for Excavators .

To accept, tap .

☞ Always adhere to the instructions in the display.

4. *The calibration screen is displayed.*

5. Aim telescope to target point. Measure and store the target point using the measure bar buttons.

☞ To remeasure points, tap the relevant point in the map screen and confirm the warning message.

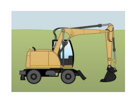
6.	Tap **Next** to proceed to the next calibration step. Follow the instructions on the screen. Aim telescope to target point. Measure and store the target point using the measure bar buttons.	
☞	Repeat until all points have been measured successfully. You can go back to a previous step to remeasure points or to measure missing optional points. Select **Back** from the toolbox.	
7.	*When all points have been measured successfully, the Machine calibration results screen is displayed.* To accept, tap ✓.	
8.	Before saving the calibration results, you can set the file location and change the default file name. To store the results onto a connected USB stick, tap Save to and choose **USB**. • To save the results, tap ✓. • To cancel the saving process and remeasure points, tap ✗. After successfully measuring points again, execute a recalculation using **Calculate** from the Toolbox. The new results are displayed.	
☞	To display the calibration results again, select **MC Calibration** from the Home Menu and tap **Calibration Results**.	

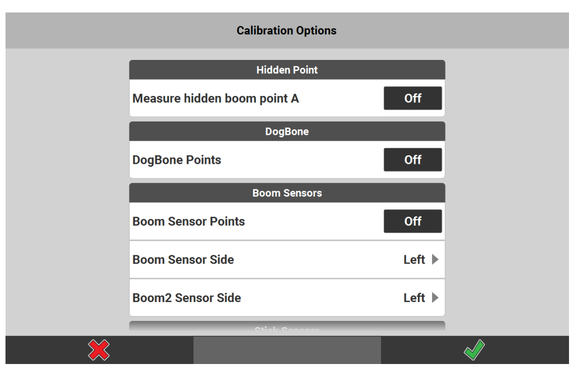
18.2 Machine Calibration for Dual Boom Excavators TPS

Machine calibration for dual boom excavators step-by-step

1. Select **MC Calibration** from the Home Menu.

2. Select **Dual-Boom Excavator**.



3. 

The Calibration Options screen is displayed.

If you want to calibrate the excavator including the additional options, set the desired option to **On**.
For more information, refer to 18.3 Additional Calibration Options for Excavators .

To accept, tap ✓.

☞ Always adhere to the instructions in the display.

4. *The calibration screen is displayed.*

5.	Aim telescope to target point. Measure and store the target point using the measure bar buttons.
☞	To remeasure points, tap the relevant point in the map screen and confirm the warning message.
6.	Tap **Next** to proceed to the next calibration step. Follow the instructions on the screen. Aim telescope to target point. Measure and store the target point using the measure bar buttons.
☞	Repeat until all points have been measured successfully. You can go back to a previous step to remeasure points or to measure missing optional points. Select **Back** from the toolbox.
7.	*When all points have been measured successfully, the Machine calibration results screen is displayed.* To accept, tap ✔.
8.	Before saving the calibration results, you can set the file location and change the default file name. To store the results onto a connected USB stick, tap **Save to** and choose **USB**. • To save the results, tap ✔. • To cancel the saving process and remeasure points, tap ✖. After successfully measuring points again, execute a recalculation using **Calculate** from the Toolbox. The new results are displayed.
☞	To display the calibration results again, select **MC Calibration** from the Home Menu and tap **Calibration Results**.

18.3 Additional Calibration Options for Excavators TPS

Excavator calibration options

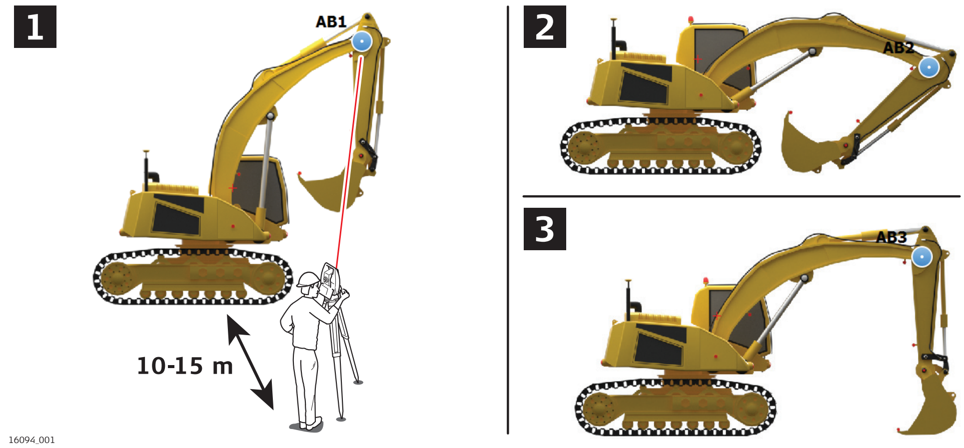
For excavators, the following extra calibration options can be included into the full calibration procedure:

- Hidden Point
- DogBone
- Boom Sensors
- Measure Swing Boom Rotation Point
- Stick Sensors (for example laser catcher)

☞ DogBone and laser catcher can also be calibrated in a separate calibration procedure.

Hidden Point calibration

Whenever possible, calibrate the excavator by measuring point A. If point A is not accessible, use the Hidden Point function.



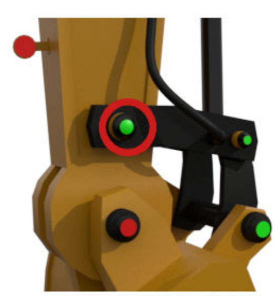
☞ Before starting the calibration procedure, make sure to set up the total station at the correct distance. A correct setup allows you to measure point AB1 which can be quite high. To obtain good results, ensure that the points AB1, AB2 and AB3 are not measured close to each other.

1.	Fold the stick gently and lift the boom as high as possible. Measure point AB1.
2.	Lower the boom as low as possible. Ensure that the stick is folded. Measure point AB2.
3.	Lift the boom, position the stick vertically and put the bucket gently on the ground. Measure point AB3.

☞ When calibrating a dual-boom excavator, ensure to keep the angle between first and second boom the same while measuring AB1, AB2 and AB3.

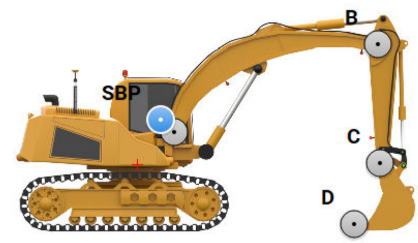
DogBone calibration

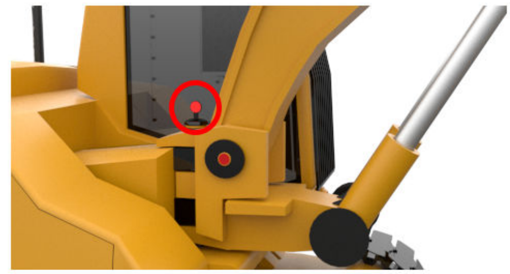
When DogBone calibration is enabled, an extra step to measure the relevant DogBone Points is added to the calibration procedure.



Measure Swing Boom Rotation Point

When the **Measure Swing Boom Rotation Point** calibration option is enabled, an extra step is added to the calibration procedure, in order to measure the boom rotation point in addition to the usual calibration points.



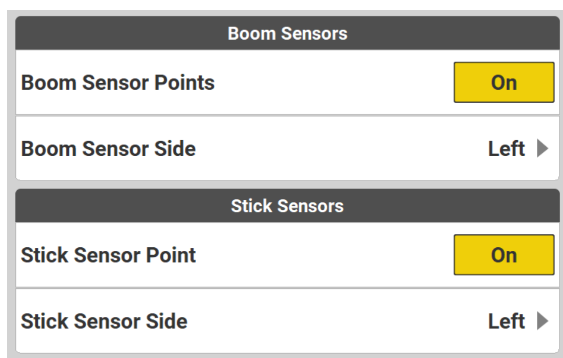


☞ Before starting the calibration, ensure that the boom is aligned with the machine body so that no swing is applied.

Calibration of Boom Sensors and Stick Sensors

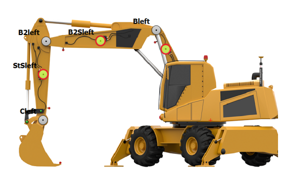
☞ The stick sensor can be for example a laser catcher.

1. To include the Boom Sensors and Stick Sensors in the calibration procedure, set the options to **On**.

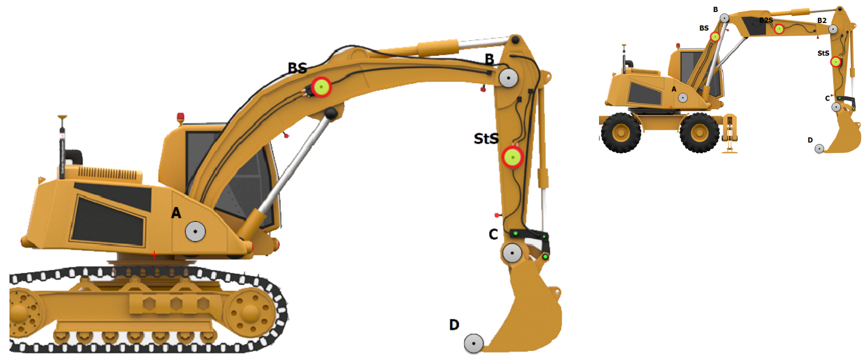


☞ To calibrate the sensors correctly, make sure to set the side of the Boom Sensor Points/Stick Sensor Point to **Left** or **Right**.

☞ **Left side:**



☞ **Right side:**



18.4 Machine Calibration for Wheel Loaders TPS

Machine calibration for wheel loaders step-by-step

1. Select **MC Calibration** from the Home Menu.

2. Select **Wheel Loader**.
The calibration screen is displayed.

3. Enter pitch angle and roll angle.

To start calibration, tap .

☞ Always adhere to the instructions in the display.

4. Aim telescope to target point. Measure and store the target point using the measure bar buttons.

☞ To remeasure points, tap the relevant point in the map screen and confirm the warning message.

5. Tap **Next** to proceed to the next calibration step. Follow the on-screen instructions.
Aim telescope to target point. Measure and store the target point using the measure bar buttons.

☞ Repeat until all points have been measured successfully.
You can go back to a previous step to remeasure points or to measure missing optional points. Select **Back** from the toolbox.

6. *When all points have been measured successfully, the Machine calibration results screen is displayed.*

To accept, tap .

7. Before saving the calibration results, you can set the file location and change the default file name.
To store the results onto a connected USB stick, tap **Save to** and choose **USB**.

- To save the results, tap .
- To cancel the saving process and remeasure points, tap .
After successfully measuring points again, execute a recalculation using **Calculate** from the Toolbox. The new results will be displayed.

☞ To display the calibration results again later, select **MC Calibration** from the Home Menu and tap **Calibration Results**.

18.5 Machine Calibration for Snow Groomers TPS

Important notes

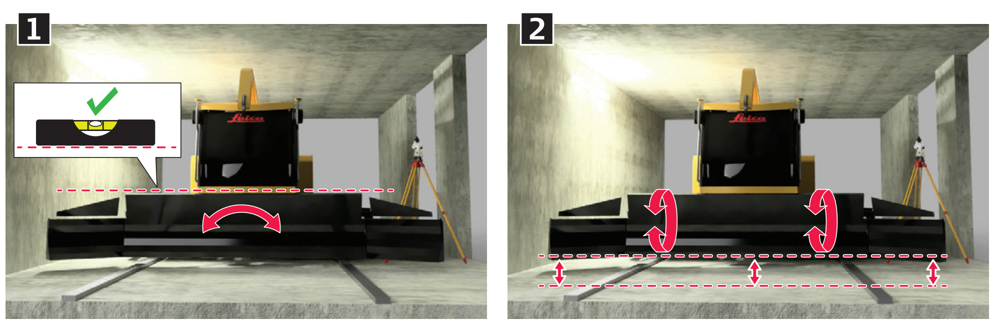
Calibration setup

☞ Before starting the calibration procedure, make sure to set up the total station at a location from which you can measure all necessary points. Fully extend the blade wings.

18151_001

☞ It is recommended to use the Leica CPR111 TrueZero prism (761712) for the calibration process.

Setting the cutting angle of the blade



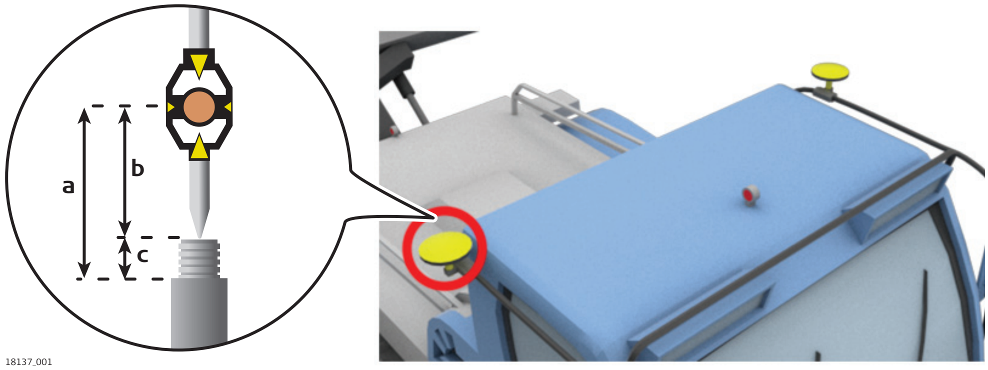
18148_001

1.	Fully extend the blade wings and level the blade.
2.	To set the cutting angle, pitch the blade until the main blade and the blade wings are all at the same height and parallel to the ground.

☞ Make sure that the blade is set to the correct cutting angle, as this angle has a significant influence on the quality of the calibration results.

Measuring the GNSS positions

GNSS positions must be measured correctly. Before measuring the GNSS positions, make sure that you have entered the correct prism height. Take into account the height of the thread.



18137_001

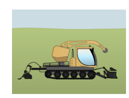
a Value of prism height to be entered in the software
b True prism height
c Height of the thread

Machine calibration for snow groomers step-by-step

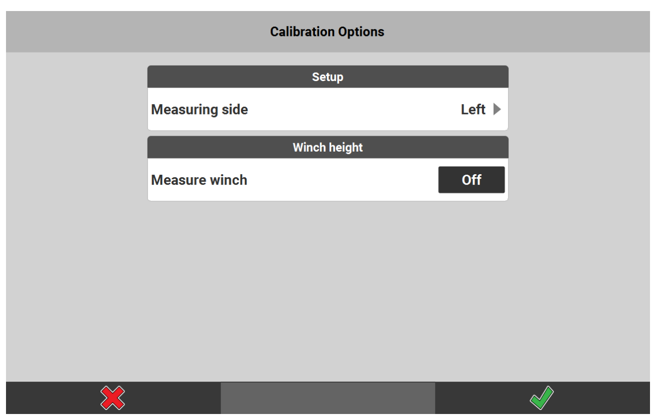
☞ Make sure the snow groomer is correctly set up for calibration. Refer to section Important notes (Page 335).

1. Select **MC Calibration** from the Home Menu.

2. Select **Snow Groomer**.



3. *The Calibration Options screen is displayed.*



- Define the measuring side.
- If you want to calibrate the snow groomer including the winch, set **Measure winch** to **On**.

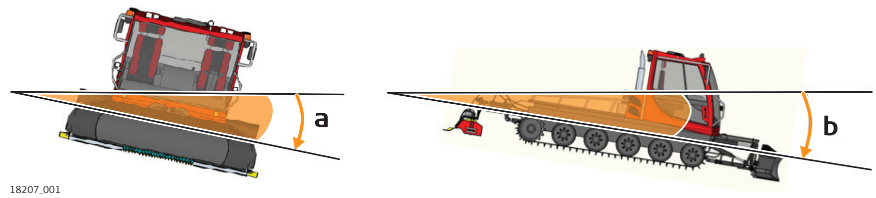
To accept, tap ✓.

The calibration screen is displayed. Refer to section The calibration screen(Page 328).

☞ Always adhere to the instructions in the display.

4. Enter pitch angle and roll angle.

To start calibration, tap .



a Roll angle (negative)
b Pitch angle (negative)

5. Aim telescope to target point. Measure and store the target point using the measure bar buttons.

☞ To remeasure points, tap the relevant point in the map screen and confirm the warning message.

6. Tap **Next** to proceed to the next calibration step. Follow the instructions on the screen.
Aim telescope to target point. Measure and store the target point using the measure bar buttons.

☞ Repeat until all points have been measured successfully.
You can go back to a previous step to remeasure points or to measure missing optional points. Select **Back** from the toolbox.

7. *When all points have been measured successfully, the Machine calibration results screen is displayed.*

To accept, tap .

8. Before saving the calibration results, you can set the file location and change the default file name.
To store the results onto a connected USB stick, tap Save to and choose **USB**.

- To save the results, tap .
- To cancel the saving process and remeasure points, tap .
After successfully measuring points again, execute a recalculation using **Calculate** from the Toolbox. The new results are displayed.

☞ To display the calibration results again, select **MC Calibration** from the Home Menu and tap **Calibration Results**.

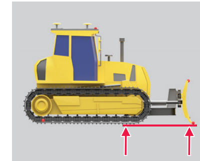
18.6 Machine Calibration for On-Cab Dozers TPS

Setting up the dozer

1. Place the Machine on a flat surface.
Do not move the tracks of the machine during calibration.

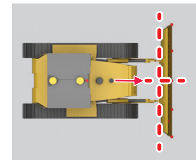
2. Set the total station at a distance of 25-30 m away from the machine in order to measure all the necessary points, especially the rear GNSS position. Make sure to measure all the machine points in one setup. Do not move the total station during calibration.

3. Make sure that the blade is levelled and aligned with the tracks.



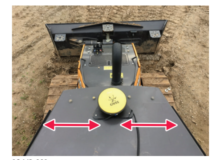
19444-001

4. Make sure that the blade is perpendicular to the machine direction.



19445-001

5. Mount the GNSS antennas as close as possible to the centre axis of the machine and at least 1 m apart from each other.



19442-001

19443-001

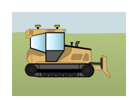
6. Mount a prism or a tape at the centre of the blade to measure the ARP points (arm rotation point). Make sure you measure always the same spot with 0 m prism height.

7. When measuring the TP point, make sure to add the track thickness to the prism height offset.

Machine calibration for dozers step-by-step

1. Select **MC Calibration** from the Home Menu.

2. Select **On-Cab Dozer**.
The calibration screen is displayed. Refer to section The calibration screen.



☞ Always adhere to the instructions in the display.

3. Aim telescope to target point. Measure and store the target point using the measure bar buttons.

☞ To remeasure points, tap the relevant point in the map screen and confirm the warning message.

4. Tap **Next** to proceed to the next calibration step. Follow the on-screen instructions.
Aim telescope to target point. Measure and store the target point using the measure bar buttons.

☞ Repeat until all points have been measured successfully.
You can go back to a previous step to remeasure points. Select **Back** from the toolbox.

5. *When all points have been measured successfully, the Machine calibration results screen is displayed.*

To accept, tap ✓.

6. Before saving the calibration results, you can set the file location and change the default file name.
To store the results onto a connected USB stick, tap Save to and choose **USB**.
   - To save the results, tap ✓.
   - To cancel the saving process and remeasure points, tap ✗. After successfully measuring points again, execute a recalculation using **Calculate** from the Toolbox. The new results are displayed.

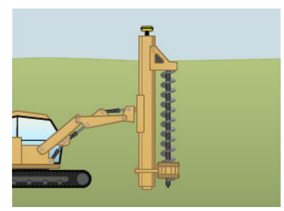
☞ To display the calibration results again, select **MC Calibration** from the Home Menu and tap **Calibration Results**.

18.7 Machine Calibration for Pilers and Drillers GPS

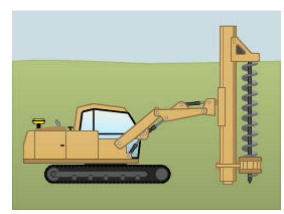
Important notes

☞ Depending on where the prisms/GNSS are located on the machine, different parts of the machine must be measured.

Tower mounted machines
The prisms/GNSS are located on top of the tower.



Body mounted machines
The prisms/GNSS are located on the main body of the machine.

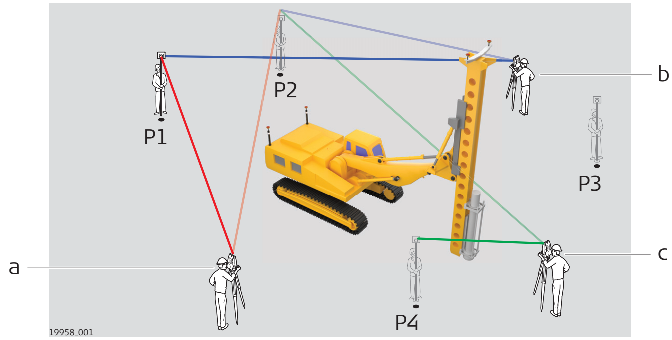


☞ Before starting the machine calibration, ensure that the machine is placed on a flat solid surface where it cannot move or sway. Ensure that the tower is plumbed.

As it is not possible to measure all the required points using one instrument setup, it is required to move the total station to another location during the calibration process.

Before starting any piler or driller calibration

a) Connect to a total station and ensure that it is levelled.
b) Set the tolerances to **Precise**.
c) Measure at least three to four control points around the machine. Ensure the points are visible from the left, from the right and from the front side of the machine.



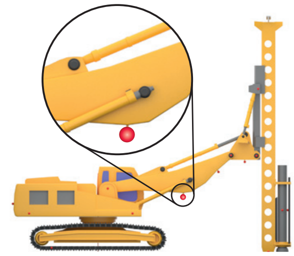
a Setup 1, right side of machine
b Setup 2, left side of machine
c Setup 3, front side of machine

Setting up a tower-mounted piler

☞ Place the machine on a solid and flat surface.
Do not move the tracks of the machine during calibration.

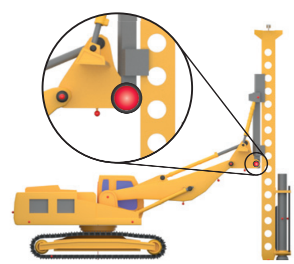
1. Extend the machine (boom and stick) to the maximum horizontal reach if you measure the machine length (ML point).
2. Ensure that the tower is plumbed.
3. To measure the points visible from the right side of the machine:
Set up the total station at the right-hand side of the machine at a distance so that it is possible to measure all the required points (approximatelly 10 - 15 m away).
4. Place prisms/tapes at the following points on the machine.

Point C3 located along the center axis of the boom.



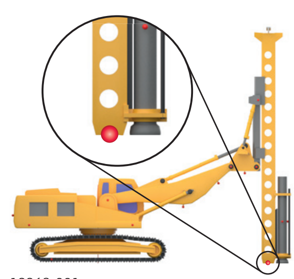
19853_001

Point A located on the hinge joint.



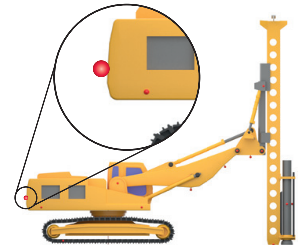
19854_001

Point TD located at the bottom of the tower.



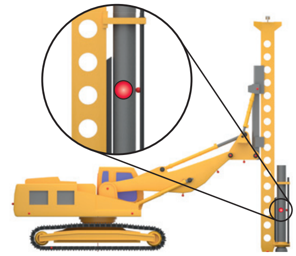
19968_001

Optionally:
Point ML at the back of the machine.
Ensure the machine (boom and stick) is extended to the maximum horizontal reach if this point needs to be measured.



19969_001

Optionally:
Point TC1 at the center of the tool.
Use a reflective tape or a mark on the tool.

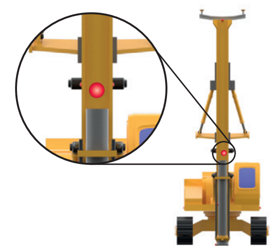


19970_001

5. To measure the points visible from the front side of the machine: Setup the total station at the front side of the machine at a distance so that it is possible to measure all the required points, especially the point at the top of the tower.

6. Place prisms/tapes at the following points on the machine.

Point C1 along the central vertical axis of the tower. Use a reflective tape or a mark on the tower to measure.
Ensure that point C1 is aligned with C3.

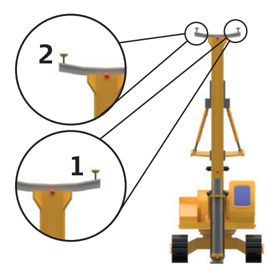


19851_001

Point C2 along the central vertical axis of the tower. The point must be located at the top of the tower.
Use a reflective tape or a mark on the tower to measure.
Ensure that point C2 is aligned with C1 and C3.

19852_001

Two prisms on the top of the tower. Pos1 is the left prism (from drivers perspective) and Pos2 is the right prism.
Ensure that the correct prism type is applied to the measurements.
Ensure that the correct prism height is applied if the the machine is to be used with GNSS sensors.



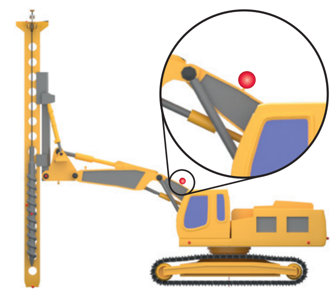
19971_001

Setting up a tower-mounted driller

☞ Place the machine on a solid and flat surface.
During the calibration, do not move the tracks on the left-hand side of the machine (where the tool is visible).

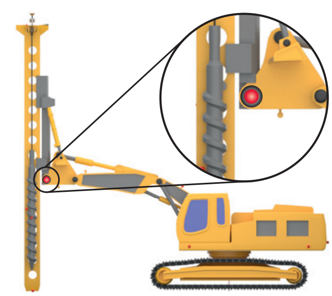
1.	Extend the machine (boom and stick) to the maximum horizontal reach if you measure the machine length (ML point).
2.	Ensure the tower is plumbed.
3.	To measure the points visible from the side of the machine: Setup the total station at the side of the machine where the tool is visible, at a distance so that it is possible to measure all the required points (approximatelly 10 - 15 m away).
☞	If the tool is visible from the left side of the machine, setup the total station on the left-hand side of the machine. Otherwise setup the total station on the right-hand side of the machine.
4.	Place prisms/tapes at the following points on the machine:

Point C3 located along the center axis of the boom.



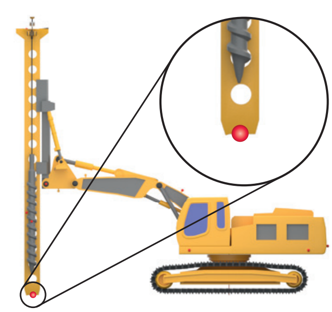
19974_001

Point A located on the hinge joint.

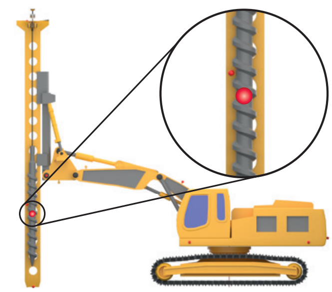
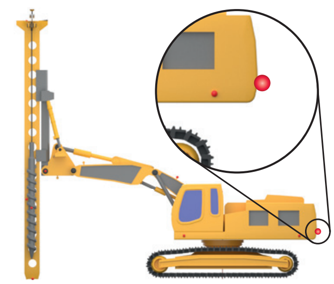
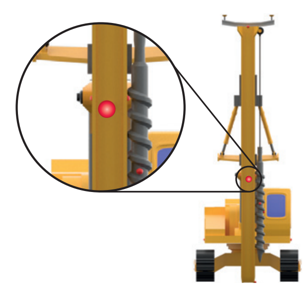
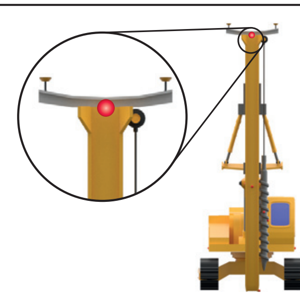


19975_001

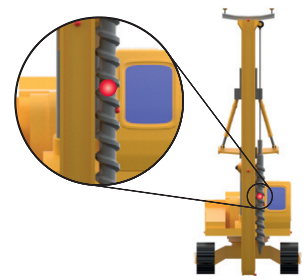
Point TD located at the bottom of the tower.



19976_001

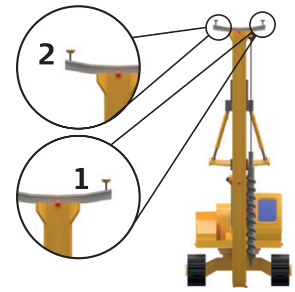
	Point TC1 at the center of the tool. Use a reflective tape or a mark on the tool.	 19978_001
	Optionally: Point ML at the back of the machine. Ensure the machine (boom and stick) is extended to the maximum horizontal reach if this point needs to be measured.	 19977_001
5.	To measure the points visible from the front side of the machine: Setup the total station at the the front side of the machine at a distance so that it is possible to measure all the required points (especially the point at the top of the tower).	
6.	Place prisms/tapes at the following points on the machine.	
	Point C1 along the central vertical axis of the tower. Use a reflective tape or a mark on the tower to measure. Ensure that point C1 is aligned with C3.	 19972_001
	Point C2 along the central vertical axis of the tower. The point must be located at the top of the tower. Use a reflective tape or a mark on the tower to measure. Ensure that point C2 is aligned with C1 and C3. Ensure that point C2 is aligned with C1 and C3.	 19973_001

Point TC2 at the center of the tool. Use a reflective tape or a mark on the tool.



19979_001

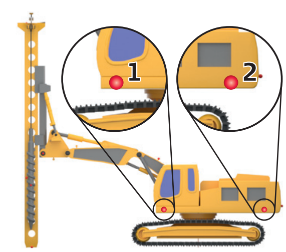
Two prisms on the top of the tower.
Pos1 is the left prism (from drivers perspective) and Pos2 is the right prism.
Ensure that the correct prism type is applied to the measurements.
Ensure that the correct prism height is applied if the the machine is to be used with GNSS sensors.



19980_001

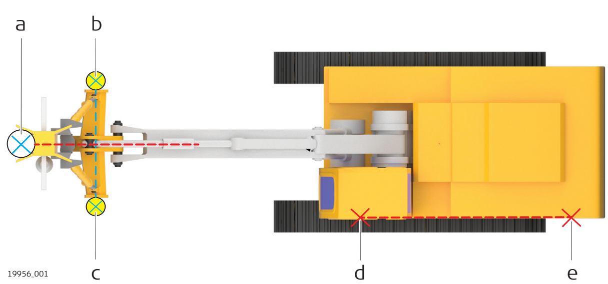
Tower-mounted piler/ driller with short boom

If the boom is too short and C3 cannot be measured, enable the short boom option and measure the points Ref1 and Ref2 located on the side of the machine.
Ref1 is the front point and Ref2 the rear point.



19981_001

☞ It is important to have the boom and tower aligned with the machine body.
The points Ref1 and Ref2 must be also aligned with the boom.

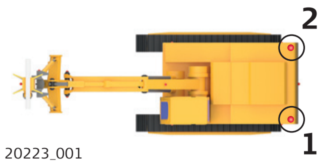


a	Tool
b	GNSS antenna 2
c	GNSS antenna 1
d	Reference point 1
e	Reference point 2

Setting up the piler/ driller - Body mounted

1. Place the machine on a solid and flat surface.
   Do not move the tracks of the machine during calibration.
2. Ensure that the tower is plumbed.
3. To measure the points visible from the right side of the machine:
   Set up the total station at the right-hand side of the machine at a distance so that it is possible to measure all the required points.
4. Place prisms/tapes at the following points on the machine:

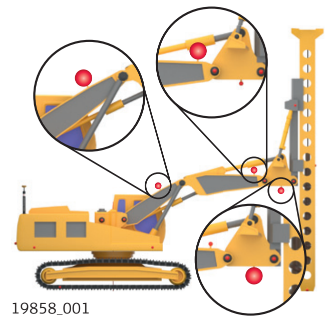
Two prisms on the machine body. Pos1 is the left or rear prism and Pos2 is the right or front prism.
Ensure that the correct prism type is applied to the measurements.
Ensure that the correct prism height is applied if the the machine is to be used with GNSS sensors.
If an MPR122 is used, apply 5 cm for the prism height.



20223_001

Point C1 along the central axis of the boom.
Point C2, along the central axis of the boom.
Point C3, along the central axis of the stick.

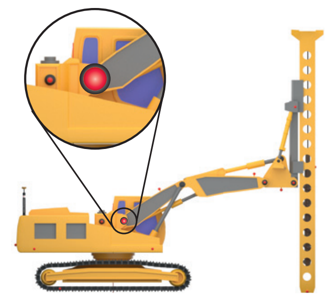
☞ Ensure that C1, C2 and C3 are aligned.



19858_001

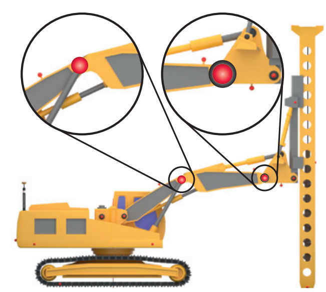
Point A at the boom joint.

☞ If point A cannot be measured directly, enable **Hidden Boom Joint** option and measure the stick joint at five different position. Refer to 18.3 Additional Calibration Options for Excavators .



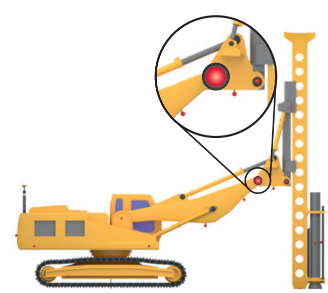
19859_001

Points B and B2 located at the boom and stick joints.

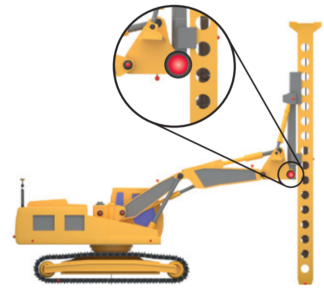
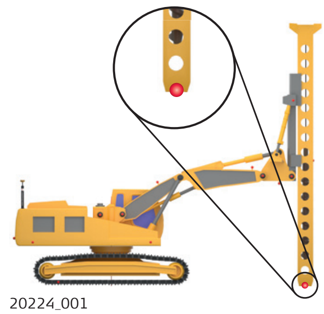
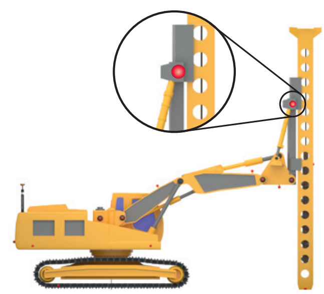
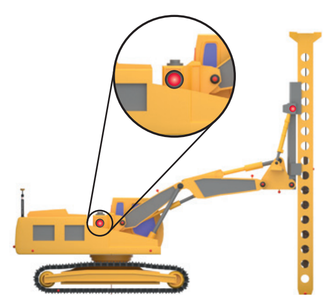
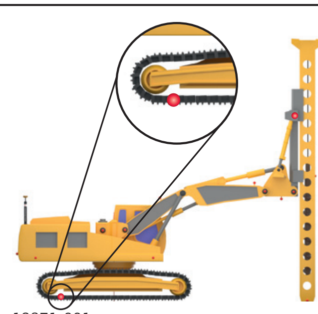


19862_001

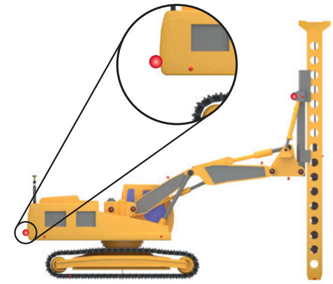
Point B2 is optional, but must be measured when the driller has dual boom.



19863_001

Point C located at the hinge joint. If a piler has no stick, this measurement can be skipped.	 19866_001
Point TD located at the bottom of the tower.	 20224_001
Optionally: Point TU located at the rotation point of the tower.	 20264_001
For drillers only: Optionally: Point SL located at the swing rotation center. Ensure that the correct prism type and prism height are applied to the measurement. ☞ When the machine supports swing rotation, ensure that the boom is aligned with the tracks before starting the calibration.	 19872_001
Optionally: Point GH at the machine tracks. Ensure to add the track thickness to the prism height value.	 19871_001

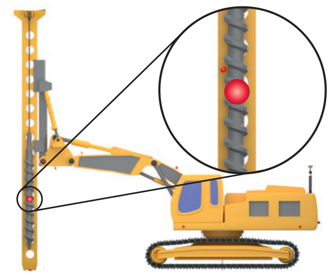
Optionally:
Point ML at the back of the machine.



19870_001

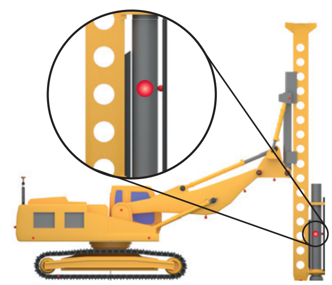
Point TC1 at the center of the tool. Use a reflective tape or a mark on the tool.

☞ For drillers: Point TC1 is mandatory to be measured. If the tool is not visible from the right-hand side, perform a new setup at the side that can be measured.



19864_001

For pilers: Point TC1 is optional.

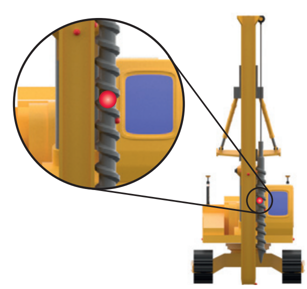


20265_001

5. To measure the points visible from the front side of the machine: Setup the total station at the the front side of the machine at a distance so that it is possible to measure all the required points.

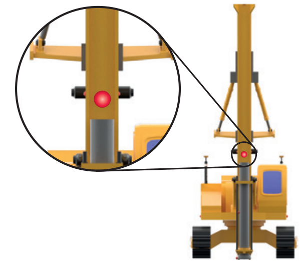
6. Place prisms/tapes at the following points on the machine.

For drillers only:
Point TC2 at the center of the tool. Use a reflective tape or a mark on the tool.



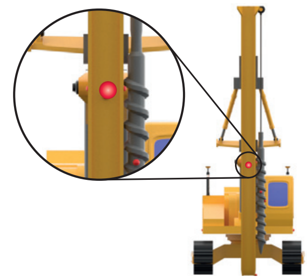
20266_001

For pilers only:
Point TF along the central axis of the tower. Use a reflective tape or a mark on the tower.



19868_001

Optional for drillers only:
Point HR located along the central axis of the tower. If the towers central axis is aligned with the booms central axis, this measurement can be skipped.

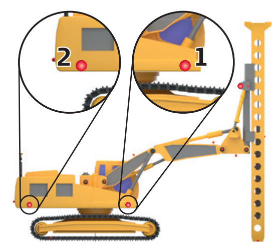


19867_001

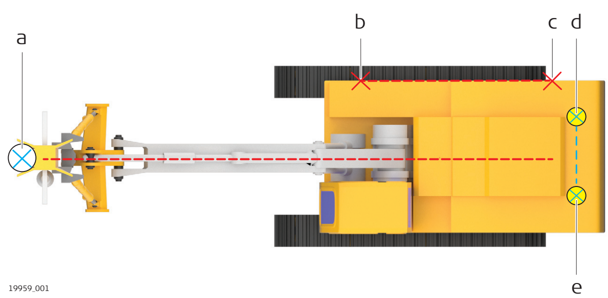
Short boom

If the boom is too short and C1, C2, C3 cannot be measured, enable the short boom option. Measure the points Ref1 and Ref2 on the side of the machine.
Ref1 is the front point and Ref2 the rear point.

☞ Boom and tower must be aligned with the machine body.
Points Ref1 and Ref2 must be aligned with the boom.



20267_001



19959_001

a Tool
b Reference point 1
c Reference point 2
d GNSS antenna 2
e GNSS antenna 1

Non-rotating machines

If the machine cannot rotate 360°, enable the relevant option in the configuration screen.

☞ Place the machine on a solid and flat surface.
The machine must be levelled and the tower be plumbed.

Machine calibration for pilers/drillers step-by-step

☞ By default, the tolerance setting for a setup is 1.2 cm in position and 1.6 cm in height. For an accurate calibration, stricter tolerances are recommended. Set the tolerances to **Precise**. Refer to Tolerance settings.

1.	Measure the control points around the machine. Refer to 4.3 Setup Anywhere with Given Coordinates .

2.	Select **MC Calibration** from the Home Menu.
3.	Select the calibration method. The calibration screen is displayed. Refer to section The calibration screen.
☞	Always adhere to the instructions in the display.
4.	Aim the telescope to the target point. Measure and store the target point using the measure bar buttons.
☞	To remeasure points, tap the relevant point in the map screen and confirm the warning message.
5.	Tap **Next** to proceed to the next calibration step. Follow the on-screen instructions. Aim telescope to target point. Measure and store the target point using the measure bar buttons.
☞	Repeat until all points for the first setup have been measured successfully. You can go back to a previous step to remeasure points. Select **Back** from the toolbox.
☞	**To setup the total station at another location, follow the instructions of the next step carefully. Otherwise the calibration has to be repeated from the beginning.**
6.	Before moving the total station, tap the **Favourites** key and access Setup screen. Move the total station to the second setup point and perform a **Coordinates - Anywhere setup** by measuring the control points. Refer to 4.3 Setup Anywhere with Given Coordinates . Repeat measuring all other calibration points.
7.	*When all points have been measured successfully, the Machine calibration results screen is displayed.* To accept, tap .
8.	Before saving the calibration results, you can set the file location and change the default file name. To store the results onto a connected USB stick, tap Save to and choose **USB**. • To save the results, tap . • To cancel the saving process and remeasure points, tap . After successfully measuring points again, execute a recalculation using **Calculate** from the Toolbox. The new results are displayed.
☞	To display the calibration results again, select **MC Calibration** from the Home Menu and tap **Calibration Results**.

19 How to Create a Report TPS + GPS

19.1 General Information TPS + GPS

Available report types

Following report types are available:

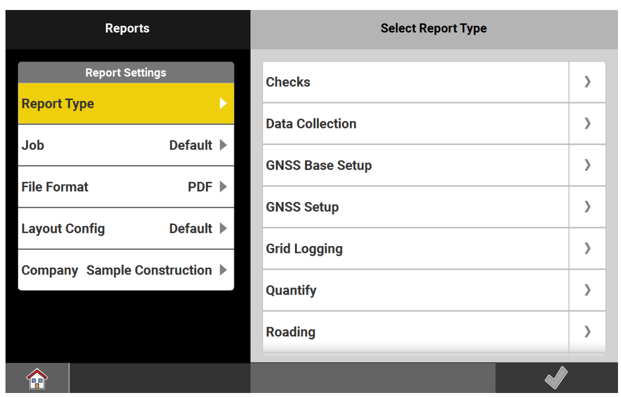
- Checks
- Verification
- Data Collection
- GNSS Base Setup
- GNSS Setup
- GridLogging
- Quantify
- Roading
- Stakeout
- TPS Setup
- Volume

☞ You can configure the template of a report type according to your needs. Refer to How to configure the template of a report type.

☞ GridLogging is only available with the Surface Pilot licence. Verification is only available with the Point Cloud licence.

How to configure the template of a report type

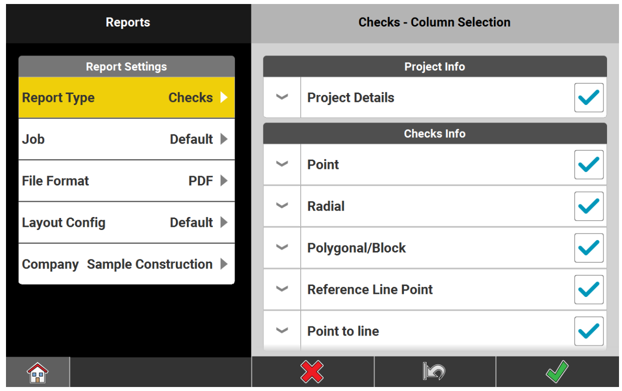
1. Select **Reports** from the Home Menu.



2. To configure the template of a report type, tap the arrow button ❯ beside the name of the report type.

The column selection screen for the respective report type is displayed.

☞ The screenshot shows an example for Checks. Other applications have different values to select/show.

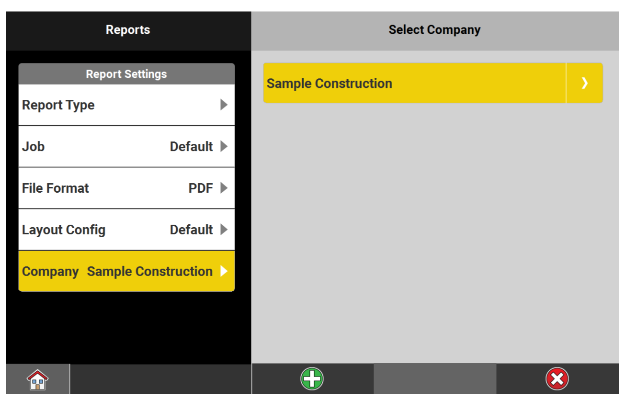


3.	• To display or hide the available columns of an information type, tap the down/up arrow. • To select or deselect the desired columns to be displayed, tap the check box of the respective column names. • Tap ✖.
4.	To save the changes of the report template, tap ✔.

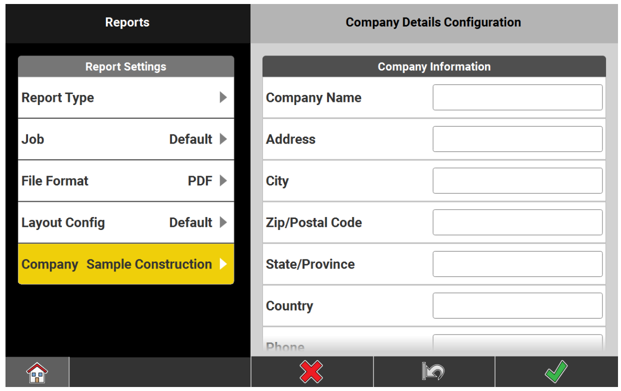
How to configure the company information

It is possible to configure the report to include a specific logo, address, contact details and footer. You can create several company profiles and apply them to the report as needed.

1.	Select **Reports** from the Home Menu.
2.	To create, edit or delete a company profile, tap **Company**. *The Select Company screen is displayed.*



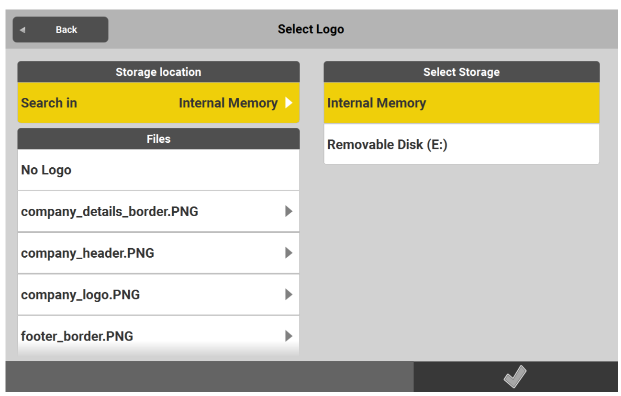
3.	• To edit an existing company profile, tap the arrow button ❯ beside the company name. *The Company Details Configuration screen is displayed.* • To create a company profile, tap ⊕. *The Company Details Configuration screen is displayed.*
4.	Enter the necessary information below **Company Information**. ☞ Enter at least a company name. To clear all entries, tap ↶.

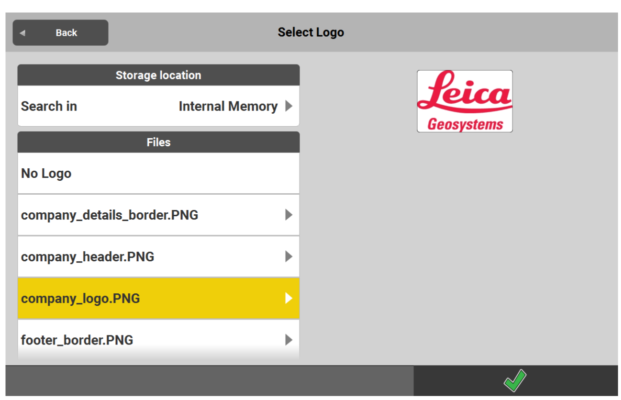


- To delete the selected company profile, tap .

☞ You can add a company logo as .jpeg or .png file. Save such files in the internal memory or in the root directory of a removable data storage device.
Logo size:
- Minimum: 10 x 10 pixels
- Maximum: 102 x 1024 pixels

5. To add a company logo, scroll down to **Company Logo**.
- To display the available files, tap **Company Logo**.
- To set the source of the logo file, tap **Search in**.
- To display the preview of a logo file, tap the file name.
- To select the displayed logo file, tap .



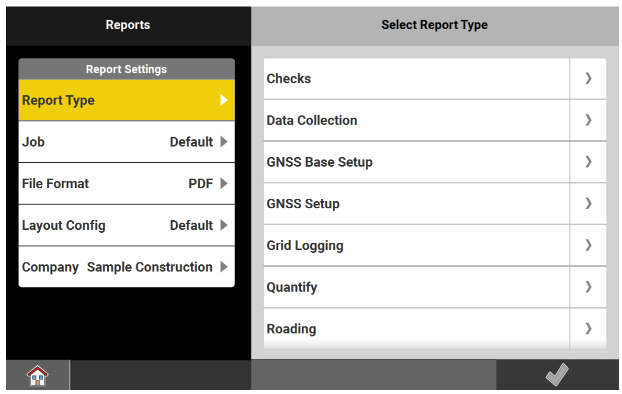


☞ You can add a footer as .jpeg or .png file. Save such files in the internal memory or in the root directory of a removable memory device.
The procedure is the same as for a company logo.
Footer size:
- Minimum: 300 x 1500 pixels
- Maximum: 10% of the height of the text or width size

6. To save the company profile, tap .
The company profile is automatically selected for use in the next report.

How to create a report step-by-step

1. Select **Reports** from the Home Menu.



The currently active report settings are displayed.

2. To start creating a report, tap the desired report type.
   ☞ **TPS Setup** respectively **GNSS Setup** and **GNSS Base Setup** can only be used onboard a TPS with display, or on the controller with the appropriate instrument being connected.
3. *The current active job is selected by default.*
   Tap **Job** to select another job containing the data for the report.
4. To define the desired file format of the report, tap **File Format**.
   Available file formats:
   - TXT, CSV, PDF and HTML
   - For TPS onboard: TXT, CSV and HTML
5. To define the layout of a report in PDF or HTML format, tap **Layout Config**.

☞ For information on configuring the layout for PDF data, refer to 19.2 How to Create a PDF Report.

6. To select the desired company profile, tap **Company**.
7. To create the report, tap .

☞ *Depending on the report type, more settings are displayed.*

- For **Data Collection**, **GNSS Base Setup**, **GNSS Setup**, **Quantify**, **Roading**, **Stakeout** or **TPS Setup** no additional settings are required. Proceed to the next step.
- For **Checks**, **GridLogging**, **Volume** and **Verification**, a list with all available data is shown. Select the packages to be included in the report.
  - For **Volume**: If it is sufficient to get an idea of the coordinates and to have short report in the end select **Five Points** instead of **All Points**.
  - For **Verification**: If it is not necessary to show all extrema points in the report, select **Ten Points** instead of **All Points**.

Tap ✓ to accept.

8. Select the storing location.
   - The data storage device can be the internal memory or a removable data storage device.
   - The location can be either the global Reports folder or the Reports folder within a project.

☞ In the **Save** screen, you may change the default name to a user-entered one.

9. To accept and save the report, tap ✓

☞ *Depending on the file format selected, a preview is shown of what is stored as Report file.*
Tap ✓ to accept.
The file is created at the chosen location.

☞ *If the report template is configured to include images, the report file and the images linked to the points are exported together into the same directory. The images are in the subdirectory "CapturedImages".*

19.2 How to Create a PDF Report

General description

PDF is a special type of report that allows you to export selected information in a nice layout.

The PDF report is printable but not editable.

For Checks and Volumes, the tables are shortened. Any information about prism/antenna height, codes, satellites, quality and similar is not shown. If this information is needed, create a report in another file format or create a Data Collection report.

Necessary driver

For controllers delivered with v5.0 or higher, the necessary driver is already installed.

For controllers upgraded to v5.0 or higher, download and install the necessary driver (Component_PDFReports.exe) from **myWorld** under the relevant section for your controller.

☞ Before installing the driver, make sure that iCON is not running.

Generating a PDF report

1. Select **Reports** from the Home Menu.

   The currently active report type is displayed.

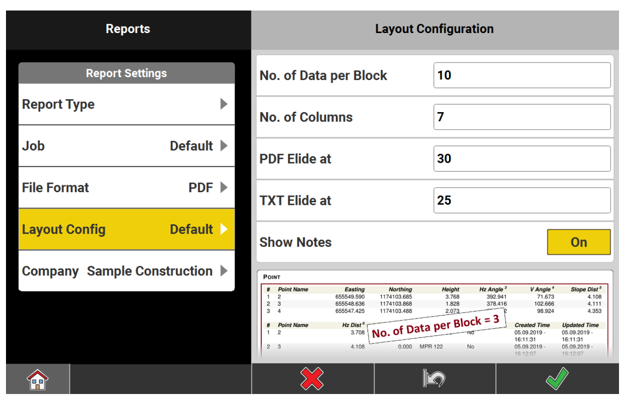
2. Tap **Job** to select another job containing the data for the report.

   ☞ The current active job is selected by default.

3. Select PDF as file format.

4. Configure the layout:
   Tap **Layout Config**.
   - **No. of Data per Block**: In the report, the information for a point is broken up into several lines. Define the number of points for which all information is shown before a new block of points begins.
     Example: When using 10, all information of the first 10 points shown in one block
   - **No. of Columns**: Define the number of columns. Up to 9 columns can be configured.
   - **PDF Elide at** and **TXT Elide at**: Define the maximum number of characters shown per column.
     Default for PDF: 30, default for TXT Elide: 25
     If an entry exceeds the defined number of characters, "..." is added.
   - To cancel the configuring process, tap ✖.
   - To reset to default settings, tap ↺.

   To accept, tap ✔.



5. To select the desired company profile, tap **Company**.

6. Tap ✔.

7. A preview is shown of what is stored as report file. Tap ✔.

8. Select the storing location.
   You may change the default name to a user-entered one.
   Tap ✔.

19.3 How to Create a Quantifier Report

General description

Quantify is a special type of report that allows you to attribute costs to surveyed points, lines, areas and volumes. Based on an imported cost file, the software calculates the job costs according to the quantity of surveyed features and the accordingly defined prices.

Cost file

A cost file contains the following information:

- **Code**
  Name of the code. The name stands for the survey feature to which the code is applied.
- **Description**
  Further description of the code.
- **Cost**
  Cost rate for the survey feature. Such rates are normally defined by contract.
- **Entity Code**
  Type of entity to be used for quantifying. See code explanation in the header of the cost file.
  Example: If a line is measured using a code specified for the entity "point", the line is not taken into account in the Quantifier report.
- **Attribute**
  Up to ten attributes can be defined for a code.

Basic steps for generating a Quantifier report

- Start a new job.
- Import a cost file containing the necessary codes for quantification.
- Survey the applicable features to be included into the Quantifier report by assigning the respective codes.
- Generate and export a Quantifier report based on the contents of the job.

Importing a cost file as codelist

☞ A sample cost file (sample pricelist_comma.csv) is included in the system folder: "...\Documents\Leica Geosystems\iCON\Codes".

1.	Save a copy and edit the cost file (*.csv) to your needs.
2.	Import the cost file as a codelist.
☞	For information on importing data, refer to 2.2 Import, Export, or Delete Data.
3.	After import, edit the currency settings according to your needs. Select **Units** from the Home Menu.
4.	Tap **Currency** and enter the currency name. Tap ✓ to save changes.

Measuring features for quantification

There are two options to include measured features in the quantification process:

- **Automatic quantification**
  Measured features are automatically included by assigning a code to the measured feature.
  This option applies to points, lines, polylines measured with a line code, and closed polylines measured with an area code.
- **User-defined quantification**
  Measured features are added manually when generating the Quantifier report.
  This option applies to areas and volumes.
  Refer to Generating a quantifier report.

Automatic quantification

1. Create a new job.
   In the "Create new job" wizard, activate the imported code list for quantification.

2. In the Home Menu, select the desired application for measuring points, lines, polylines or areas.
   Map screen is displayed

☞ Configure the Measure bar to display **Code**. Refer to Measure bar.

3. Before measuring a feature, assign the respective code from the cost file to include the feature in the quantification process. Tap **Code** in the Measure bar and select a code from the list.
   For detailed information, refer to Defining Code for Each Stored Point .

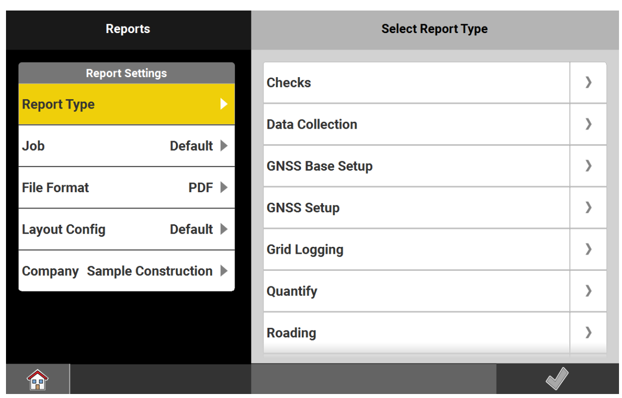
☞ When all applicable items are measured, you can generate a Quantifier report. Refer to Generating a quantifier report.

Generating a quantifier report

☞ Ensure that the active job contains the imported cost file.

1. Select **Reports** from the Home Menu.

Following screen is displayed:

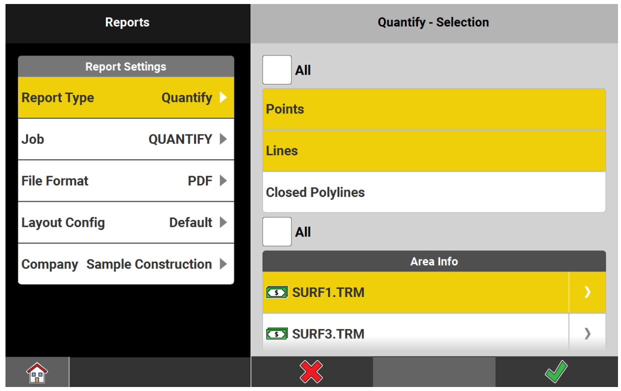


☞ Ensure that the selected job contains Quantify data.
If the selected job does not contain the required data, tap **Job** to select another job containing the data for the report.

2. Select the desired file format.

3. To start creating the report, select **Quantify** and tap ✓ to accept.

The screen for data selection is displayed.

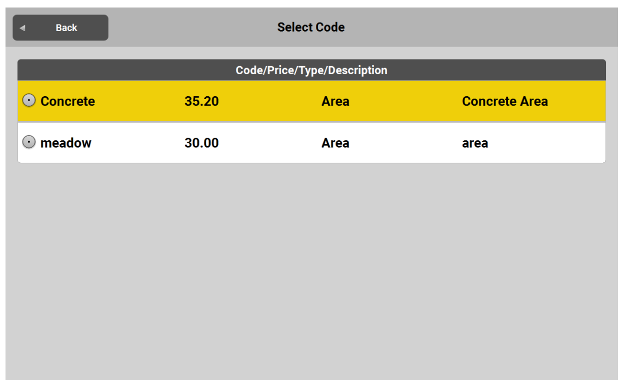


4. Select a line to add the information to the report.
To select or deselect all list items, tap **All**.

To enable correct quantification of areas and volumes, assign a code from the cost file:

Tap the arrow button beside the name of the respective area or volume.

Following screen is displayed:



Tap the desired code.

The screen for data selection is displayed again.
A symbol beside the name of the area or volume indicates that a code is assigned.

5. Tap ✓ when finished with data selection.

6. Select the storing location.
You may change the default name to a user-entered one.
Tap ✓.

☞ The data storage device can be the internal memory or a removable data storage device.
The location can be either the global Reports folder or the Reports folder within a project.

7. *The report is created at the chosen location.*

20 How to Use Cloud Services

20.1 How to Use Leica ConX

20.1.1 General Introduction

Description

With a connection between the controller and the Leica ConX web page, **Leica ConX** offers:

- **View**: Enables a remote user to access the controller to view or control iCON site.
- **Sync**: To exchange data between the controller and a remote web page.
- **Track**: Enables a remote user to track the current position of the sensor.

☞ To use this functionality an account is needed for the Leica ConX web page. The license is handled on the controller. Ask your agency or your Leica Geosystems representative for information about licensing and how to get an account.

☞ An Internet connection on the controller is needed, either using a LAN cable, a wireless local area network connection (WLAN/WiFi), or a 3G/4G modem.

20.1.2 Installing a SIM Card

☞ For information about how to insert a SIM card to the controller, please refer to the documentation provided with the controller.

☞

- Keep the card dry.
- Use it only within the specified temperature range.
- Do not bend the card.
- Protect the card from direct impacts.

☞ Failure to follow these instructions could result in data loss and/or permanent damage to the card.

20.1.3 Operation

Leica ConX setup step-by-step

To use the **Leica ConX** functionality, perform following setup works in the given order:

1. **Establish an Internet connection on the controller**
   OR
   Establish an Internet connection on the total station
2. **Pair the controller/total station to the Leica ConX web page**
3. **Connect the controller/total station to Leica ConX**

Establish an Internet connection on the controller

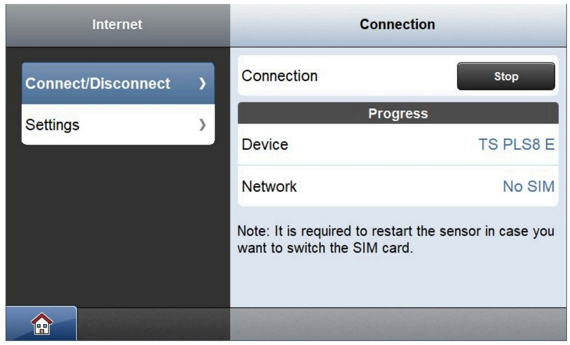
1.	Establish an Internet connection, using one of the following options: • LAN cable • Wireless local area network connection (WLAN/WiFi) • 3G/4G modem
☞	The Internet connection on the controller must be set up from Windows, not from iCON site.
☞	WLAN/WiFi connection cannot be used, when a sensor is already connected with WLAN.

☞	When using the 3G/4G modem, open the **Computer Settings > Networks** dialog and select the modem connection to be used.
2.	If the iCON site software was exited, select **iCON** from the Start menu within Windows to reenter.
☞	Ensure a correct Internet connection, by checking the wireless connections icon in the Windows task bar.

Establish an Internet connection on the total station

☞	Ensure that a SIM card is inserted.
1.	Select **Internet** from the Home Menu.
2.	Tap **Connect/Disconnect** and set either **Mobile Data** or **WiFi** to **On**.
☞	Before starting to connect to the Internet, ensure that the settings are correct. Tap **Settings**.
	Connection using Internal modem • Enter the PIN. • Tap **Provider List**, select a provider from the list and tap ✓. ☞ If **Autoselection** is set to **On**, the provider is selected automatically. ☞ If **Auto-Connect** is set to **On**, the Internet connection is established automatically after every restart. ☞ If **APN** is set to **On**, enter the APN ID and the password.
	Connection using WiFi • Minimise or exit iCON site software. • Within Windows desktop, select **Start\Settings\Network and Dial-Up Connections** to open the **Network Connections** dialogue. • Hold the stylus on the **TIWLNAPI1** icon. Select **Enable** from the context menu. Close the dialogue. • In the Windows taskbar, double-click the network icon. Switch to the **Wireless Information** tab. Select a network from the list and enter the network key. • To connect, click ok. Once the connection is established, the network icon in the taskbar turns blue. • Select **iCON** from the Start menu within Windows to reenter.
3.	To start the Internet connection, select **Connect/Disconnect** again and tap **Start**.

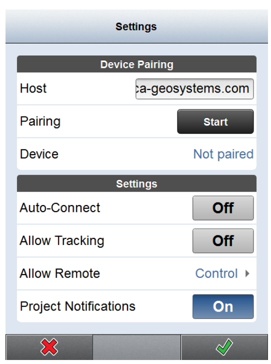
☞ The section "Progress" displays the status of the device and the Internet connection.

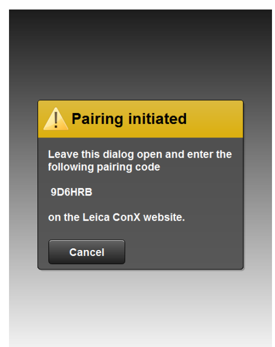


Pair the controller/total station to the Leica ConX web page

☞ This is only necessary for the first time the device is connected to the Leica ConX web page.
For the first-time connection, continue with 1. to 3., otherwise proceed to **Connect the controller/total station to Leica ConX**

1. On the controller/total station:
   - Select **Clouds**  from the Home Menu.
   - Tap **Leica ConX Settings**. Set **Host** to **conx.leica-geosystems.com**. Tap **Start** to start the pairing process.
   - An information screen is displayed, showing the pairing code. Be sure to leave this screen open.

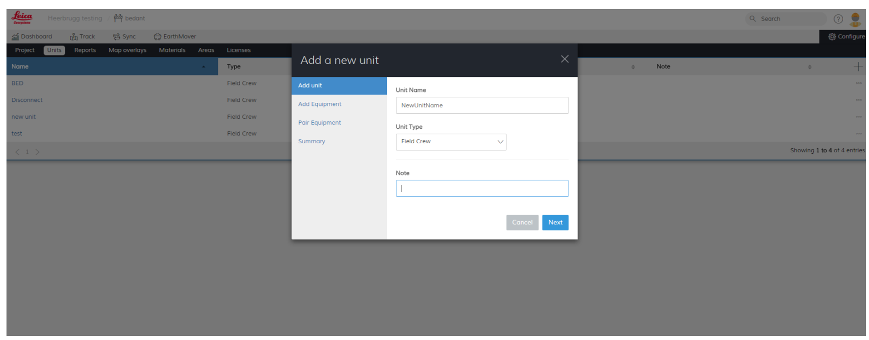




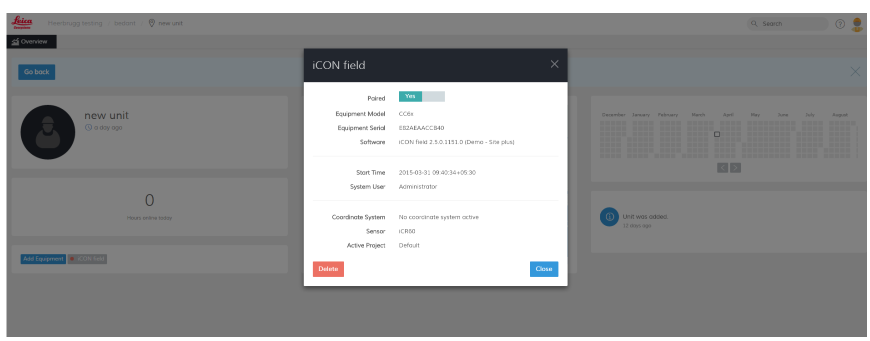
2. On the remote computer:
   - Start a web browser. Google Chrome is recommended for best performance.
   - Go to the Leica ConX web page: **conx.leica-geosystems.com**.
   - Use your **User name** and **Password** to log in.

☞ To use this functionality an account is needed for the Leica ConX web page. The licence is handled on the controller. Ask your agency or your Leica Geosystems representative for information about licencing and how to get an account.

   - Now create a **Unit**:
     - Select the **Company** or create a new one.
     - Select the **Project**, that the Unit should be assigned to. If no project is available, create a project first.
     - Tap **Configure**, and select **Units**.
     - Tap the **+** icon.
     - Enter the desired **Unit Name** and set the **Unit Type** to Field Crew. If desired, use **Note** to enter additional information. Tap **Next**.
     - Set **Equipment Type** to **iCON field**. Tap **Add Equipment** to create a Unit with the current settings.



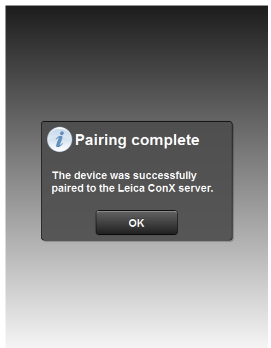
   - To pair the instrument and the created (Web) Unit, enter the pairing code displayed on the controller and tap **Pair**.
   - Tap **Finish** to accept.

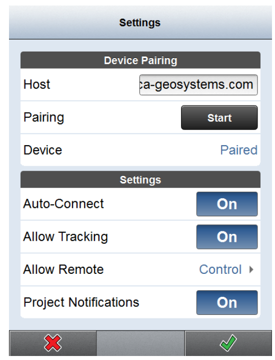


3. On the controller/total station:
   - The pairing screen should have been replaced by a confirmation that the pairing was successful. The device is now paired/registered on the web page, and ready to connect.
   - Tap **OK** to confirm the information.
   - The **Leica ConXSettings** screen is displayed. Ensure to set **Auto-Connect**, **Allow Tracking**, **Allow Remote** (only controller) and **Project Notifications** (only controller) according to the intended use.

   ☞ Refer to **Leica ConX** settings for more information.

   - Tap ✓ to accept.

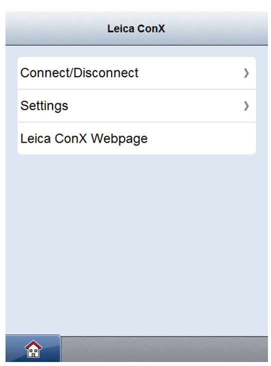


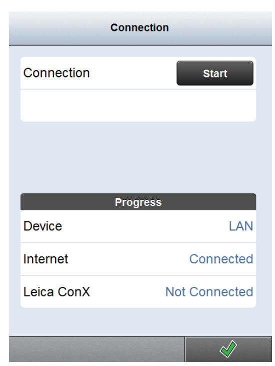


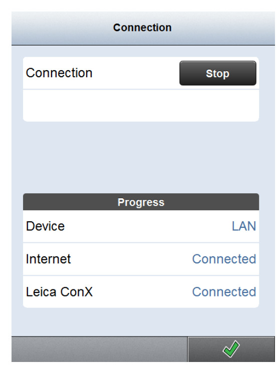
Connect the controller/total station to Leica ConX

1. Select **Clouds** from the Home Menu.

2. Tap **Leica ConX Connect/Disconnect**.
3. Tap **Start**.
4. After a successful connection, tap ✓ to accept.







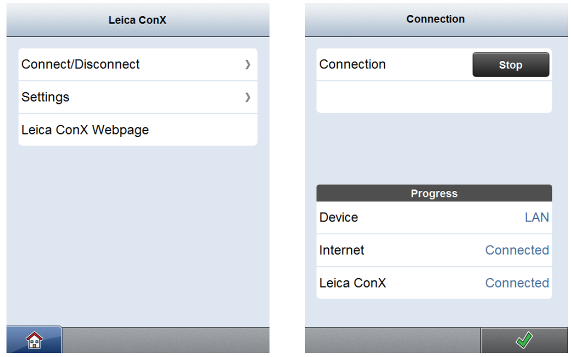
☞ The device is connected to the Leica ConX web page now and ready for **View**, **Sync** and **Track**.

☞ **Sync**, which provides file transfer to/from the Leica ConX web page, is done using the normal Import and Export functions in iCON site. Once connected to the Leica ConX web page, there will be a **Leica ConX** entry in the list of Sources/Targets.

Connect/Disconnect

1. Select **Clouds** from the Home Menu.

2.
- Tap **Leica ConX Connect/Disconnect**.
- To connect the paired controller to the Leica ConX web page, tap **Start**. To disconnect when already connected, tap **Stop**. Tap ✓ to accept.



Leica ConX settings

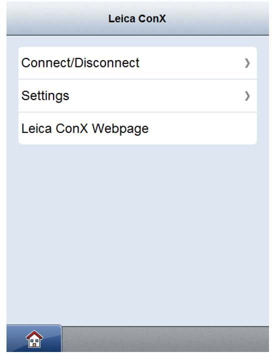
1. Select **Clouds** from the Home Menu.

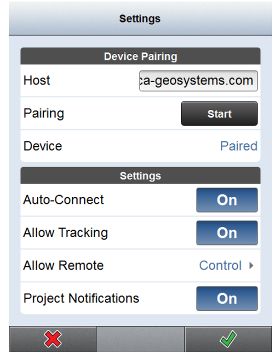
2. Tap **Leica ConX Settings**.

☞ Tap **Leica ConX Webpage** to open the Leica ConX web page automatically in a web-browser.

3.
- Set **Auto-Connect** to **On**, to connect the controller automatically to the Leica ConX web page after every startup of iCON site.
- To allow the software to send the position of the paired controller to the Leica ConX web page, set **Allow Tracking** to **On**.
- Set **Allow Remote** to:
  - **View**, to allow a remote user to connect and view the iCON site software on the controller.
  - **Control**, to allow a remote user to connect and control the iCON site software on the controller.
  - **No**, to block any remote user from connecting to the controller.
- Set **Project Notifications** to **On**, to receive a message every time a new file is uploaded to the Leica ConX web page.
- Set **Sync data** to **On**, to transfer the measured data to the Leica ConX web page. The synchronisation of the measured data takes place once every minute. To ensure correct transfer of data, activate a valid coordinate system in the project on the Leica ConX web page.

☞ When using a TPS, also assign a valid coordinate system to the unit on the Leica ConX server. When using GPS, this step is not required.





4. Tap to accept.

☞ If the settings for **Allow Remote** have been changed, **Leica ConX** will automatically reconnect to the paired computer after tapping

☞ Depending on the settings, different Status icons are displayed. Refer to Cloud Services - status icons for more information.

☞ Refer to the Help function available on conx.leica-geosystems.com for information about using the different functions on the Leica ConX web page.

20.2 How to Use Autodesk BIM 360 Docs

How to connect to BIM 360 Docs

BIM 360 Docs is an online file storage and sharing platform from Autodesk. This service allows you to download or upload standard files, such as PDF, DXF, DWG or IFC.

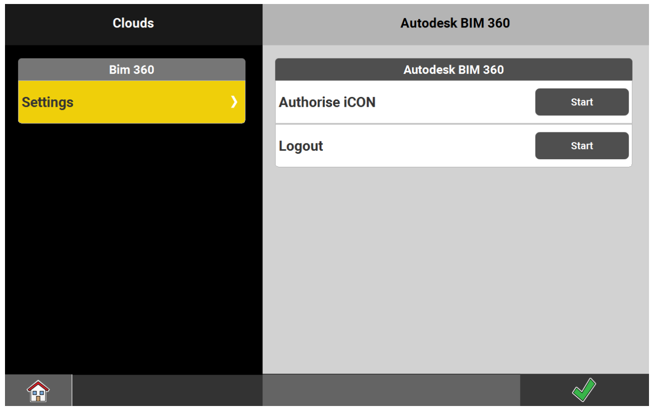
☞ BIM 360 Docs require a BIM 360 licence on the controller.

☞ In order to connect to BIM 360 Docs, the account administrator must add the Leica iCON app from the Autodesk App Store to the Autodesk account. iCON recognises the permissions granted to a user within BIM 360 Docs for downloading or uploading files.
Refer to the Autodesk user guide for further nformation.

☞ For further details refer to the following website:
https://leica-geosystems.com/products/construction-tps-and-gnss/software/software-partners/autodesk/bim360docs

1. Select **Clouds** from the Home Menu.

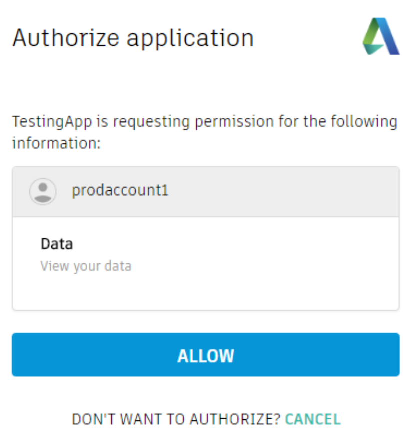
2. Tap **BIM 360 Settings**.
Following screen is displayed:



3. To connect to the **BIM 360** service, tap **Start**.
The Autodesk authorisation screen is opened in the default web browser.

4. Log in to Autodesk with your credentials.
If necessary, create an account.

5. *After login, following screen is displayed:*



To establish a connection, tap **Allow**.

6. *Once the connection has been established, you can go back to iCON and import or export data to the BIM 360 server.*

☞ Once logged in, you can repeatedly access your documents online without having to log in each time.
In the background, the iCON software receives an authentication token which is given to the BIM 360 server to get a refresh token.
The refresh token is saved in the Projects folder in iCON.
You can choose to save your login details using cookies on the default web browser on your device.

7. When a connection to BIM 360 is established, then BIM 360 is available as a data source for import and export.
   - For instructions on how to import data, refer to Importing data to the project step-by-step.
   - For instructions on how to export data, refer to Exporting data step-by-step.

☞ **Specifically for importing BIM 360 data:**

- As data source for import, select **BIM 360**. The iCON software detects the companies on your account.
- Select a company and a project at the same time from the list. The folders within the selected project become available.
- Select the file to import.

☞ **Specifically for exporting BIM 360 data:**

- For Destination, select **BIM 360**.
- Select a folder on the BIM 360 server where the data is exported to.
- Select a project from the list.
- Select the format.
- Tap ✓.
- Define a file name.
- Tap ✓.

20.3 How to Use Procore

How to connect to Procore

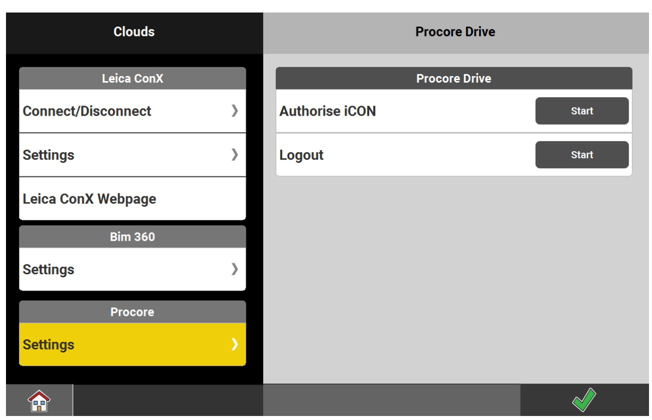
Procore is a construction project management software which allows larger teams of construction companies, project managers, contractors, and so on, to collaborate on projects and share access to documents, planning systems and data. It is designed to support input from many sources including forwarded e-mails and PDFs. The customer is charged for this service on a per project basis instead of a per user basis.

All file types which iCON supports can be downloaded or uploaded.

☞ Procore requires the **Procore** licence.

1. Select **Clouds** from the Home Menu.

2. Tap **Procore Settings**.
   Following screen is displayed:



3. To connect to the **Procore** service, tap **Start**.
   The Procore authorisation screen is opened in the default web browser.
4. Log in to Procore with your credentials.
   If necessary, create an account.
5. Once the connection has been established, you can go back to iCON and import or export data to the **Procore** server.

☞ Once logged in, you can repeatedly access your documents online without having to log in each time.
In the background, the iCON software receives an authentication token which is given to the Bricsys 24/7 server to get a refresh token. The refresh token is saved in the Projects folder in iCON.
You can choose to save your login details using cookies on the default web browser on your device.

6. When a connection to Procore is established, then Procore is available as a data source for import and export.
   - For instructions on how to import data, refer to **Importing data to the project step-by-step**.
   - For instructions on how to export data, refer to **Exporting data step-by-step**.

☞ **Specifically for importing Procore data:**
- As data source for import, select **Procore**. The iCON software detects the companies on your account.
- Select a company and a project at the same time from the list. The folders within the selected project become available.
- Select the file to import.

☞ **Specifically for exporting Procore data:**
- For Destination, select **Procore**.
- Select a folder on the Procore server where the data is exported to.
- Select a project from the list.
- Select the format.
- Tap .
- Define a file name.
- Tap .

20.4 How to Use Bricsys 24/7

How to connect to Bricsys 24/7

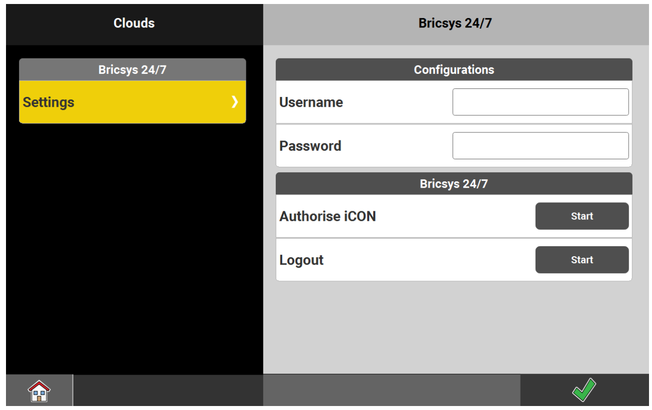
Bricsys 24/7 is a construction project management software which allows larger teams of construction companies, project managers, contractors, and so on, to collaborate on projects and share access to documents, planning systems and data. It is designed to support input from many sources including forwarded e-mails and PDFs. The customer is charged for this service on a per project basis instead of a per user basis.

All file types which are supported by iCON can be downloaded or uploaded.

☞ Bricsys 24/7 requires the **Bricsys 24/7** licence.

1. Select **Clouds** from the Home Menu.

2. Tap **Bricsys 24/7 Settings**.
Following screen is displayed:



3. Enter your login data.
If necessary, create an account.

4. To connect to the **Bricsys 24/7** service, tap **Start**.
The Bricsys 24/7 authorisation screen is opened in the default web browser.

5. Once the connection has been established, you can go back to iCON and import or export data to the **Bricsys 24/7** server.

☞ Once logged in, you can repeatedly access your documents online without having to log in each time.
You can choose to save your login details using cookies on the default web browser on your device.

6. When a connection to Bricsys 24/7 is established, then Bricsys 24/7 is available as a data source for import and export.
   - For instructions on how to import data, refer to **Importing data to the project step-by-step**.
   - For instructions on how to export data, refer to **Exporting data step-by-step**.

☞ **Specifically for importing Bricsys 24/7 data:**
- As data source for import, select **Bricsys 24/7**. The iCON software detects the companies on your account.
- Select a company and a project at the same time from the list. The folders within the selected project become available.
- Select the file to import.

☞ **Specifically for exporting Bricsys 24/7 data:**
- For Destination, select **Bricsys 24/7**.
- Select a folder on the Bricsys 24/7 server where the data is exported to.
- Select a project from the list.
- Select the format.
- Tap ✓.
- Define a file name.
- Tap ✓.

20.5 How to Use Bluebeam Studio

How to connect to Bluebeam Studio

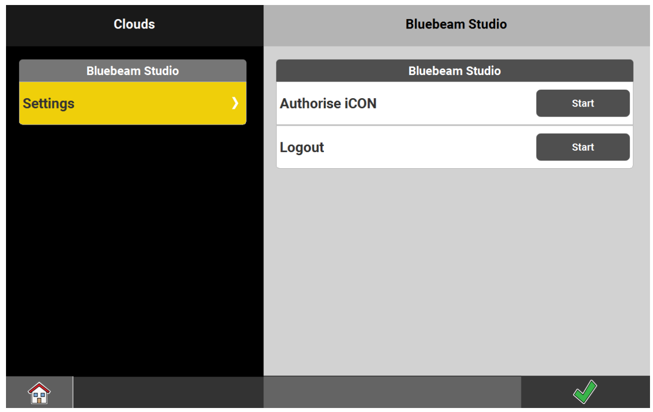
Bluebeam Studio is a construction project management software which allows larger teams of construction companies, project managers, contractors, and so on, to collaborate on projects and share access to documents, planning systems and data. It is designed to support input from many sources including forwarded e-mails and PDFs. The customer is charged for this service on a per project basis instead of a per user basis.

All file types which are supported by iCON can be downloaded or uploaded.

☞ Bluebeam Studio requires the **Bluebeam Studio** licence.

1. Select **Clouds** from the Home Menu.

2. Tap **Bluebeam Studio Settings**.
Following screen is displayed:



3. To connect to the **Bluebeam Studio** service, tap **Start**.
The Bluebeam Studio authorisation screen is opened in the default web browser.

4. Log in to Bluebeam Studio with your credentials.
If necessary, create an account.

5. Once the connection has been established, you can go back to iCON and import or export data to the **Bluebeam Studio** server.

☞ Once logged in, you can repeatedly access your documents online without having to log in each time.
In the background, the iCON software receives an authentication token which is given to the Bluebeam Studio server to get a refresh token. The refresh token is saved in the Projects folder in iCON.
You can choose to save your login details using cookies on the default web browser on your device.

6. When a connection to Bluebeam Studio is established, then Bluebeam Studio is available as a data source for import and export.
   - For instructions on how to import data, refer to **Importing data to the project step-by-step**.
   - For instructions on how to export data, refer to **Exporting data step-by-step**.

☞ **Specifically for importing Bluebeam Studio data:**
- As data source for import, select **Bluebeam Studio**. The iCON software detects the companies on your account.
- Select a company and a project at the same time from the list. The folders within the selected project become available.
- Select the file to import.

☞ **Specifically for exporting Bluebeam Studio data:**

- For Destination, select **Bluebeam Studio**.
- Select a folder on the Bluebeam Studio server where the data is exported to.
- Select a project from the list.
- Select the format.
- Tap .
- Define a file name.
- Tap .

20.6 How to Use BIMPLUS

How to connect to BIMPLUS

BIMPLUS is collaboration platform designed by Allplan to coordinate and exchange project data.

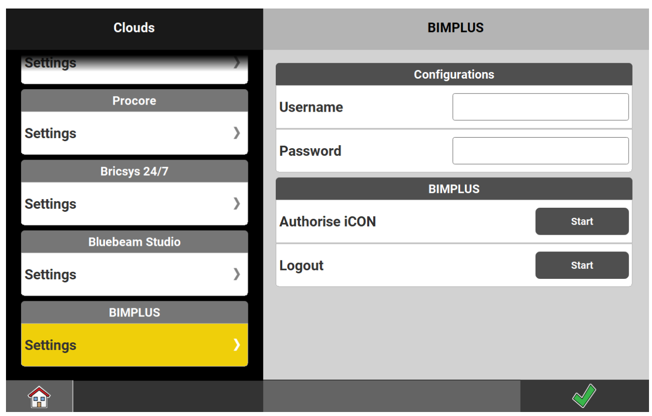
All file types which are supported by iCON can be downloaded or uploaded.

☞ BIMPLUS requires the BIMPLUS licence.

1. Select **Clouds** from the Home Menu.

2. Tap **BIMPLUS Settings**.

Following screen is displayed:



3. Enter your login data.
If necessary, create an account.

☞ To save your credentials tap .

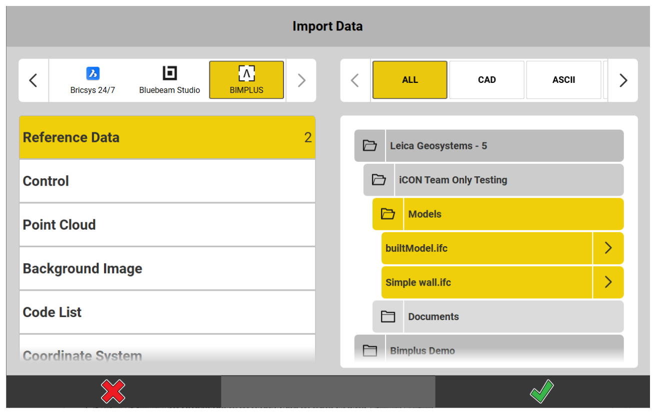
4. Tap **Authorise iCON** > **Start**, in order to connect to the BIMPLUS service.

☞ To log out tap **Logout** > **Start**.

5. When a connection to the BIMPLUS server is established, then BIMPLUS is available as a data source for import and export.
   - For instructions on how to import data, refer to Importing data to the project step-by-step.
   - For instructions on how to export data, refer to Exporting data step-by-step.

Specifically for importing BIMPLUS data:

- BIMPLUS automatically creates a 'Name' column when data is uploaded to the server.
  Make sure that you delete all entries from the name column in BIMPLUS before import is started
  Else files and models will not be visible for import in iCON.
- In iCON select **BIMPLUS** as data source for import.
  The iCON software detects the teams and project folders on your BIMPLUS account.
- Open a team/project folder and select file(s) and/or model(s) from one or more sub-folders.
- Tap to start download from BIMPLUS and import the selected files to iCON.



Specifically for exporting BIMPLUS data:

- As Destination, select **BIMPLUS**.
- Select a folder on the BIMPLUS server where the data shall be exported to.
- Select a project from the list.
- Select the format.
- Tap .
- Define a file name.
- Tap .

21 Check & Adjust

21.1 Overview

Description

Leica Geosystems instruments are manufactured, assembled and adjusted to the best possible quality. Quick temperature changes, shock or stress can cause deviations and decrease the instrument accuracy. It is therefore recommended to check and adjust the instrument from time to time. This check and adjust can be done in the field by running through specific measurement procedures. The procedures are guided and must be followed carefully and precisely as described in the following chapters. Some other instrument errors and mechanical parts can be adjusted mechanically.

Electronic adjustment

The following instrument errors can be checked and adjusted electronically:

l, t	Compensator longitudinal and transversal index errors
i	Vertical index error, related to the standing axis
c	Horizontal collimation error, also called line of sight error
a	Tilting axis error
ATR	ATR zero point error for Hz and V - option

If the compensator and the horizontal corrections are activated in the instrument configuration, every angle measured in the daily work is corrected automatically.

Mechanical adjustment

The following instrument parts can be adjusted mechanically:

- Circular level on instrument and tribrach
- Optical plummet - option on tribrach
- Allen screws on tripod

Precise measurements

To get precise measurements in the daily work, it is important:

- To check and adjust the instrument from time to time.
- To take high precision measurements during the check and adjust procedures.
- To measure targets in two faces. Some of the instrument errors are eliminated by averaging the angles from both faces.

☞

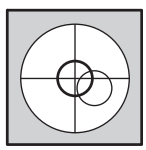
During the manufacturing process, the instrument errors are carefully determined and set to zero. As mentioned above, these errors can change and it is highly recommended to redetermine them in the following situations:

- Before the first use
- Before every high precision survey
- After rough or long transportation
- After long working periods
- After long storage periods
- If the temperature difference between current environment and the temperature at the last calibration is more than 20 °C

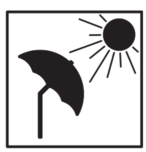
Summary of errors to be adjusted electronically

Instrument error	Effects Hz	Effects V	Elimination with two face measurement	Automatically corrected with proper adjustment
c - Line of sight error	✓	-	✓	✓
a - Tilting axis error	✓	-	✓	✓
l - Compensator index error	-	✓	✓	✓
t - Compensator index error	✓	-	✓	✓
i - Vertical index error	-	✓	✓	✓
ATR Collimation error	✓	✓	-	✓

21.2 Preparation



Before determining the instrument errors, the instrument has to be levelled using the electronic level.
The tribrach, the tripod and the underground should be stable and secure from vibrations or other disturbances.



The instrument should be protected from direct sunlight to avoid thermal warming.
It is also recommended to avoid strong heat shimmer and air turbulence. The best conditions are early in the morning or with overcast sky.

Before starting to work, the instrument has to become acclimatised to the ambient temperature. Take at least 15 minutes into account or approximately 2 minutes per °C of temperature difference from storage to working environment.

Even after adjustment of the ATR, the crosshairs may not be positioned exactly on the centre of the prism after an ATR measurement has been completed. This outcome is a normal effect. To speed up the ATR measurement, the telescope is normally not positioned exactly on the centre of the prism. These small deviations/ATR offsets, are calculated individually for each measurement and corrected electronically. This means that the horizontal and vertical angles are corrected twice: first by the determined ATR errors for Hz and V, and then by the individual small deviations of the current aiming.

21.3 Combined Adjustment (l, t, i, c and ATR)

Description

The combined adjustment procedure determines the following instrument errors in one process:

l, t	Compensator longitudinal and transversal index errors
i	Vertical index error, related to the standing axis
c	Horizontal collimation error, also called line of sight error

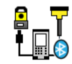
ATR Hz	ATR zero point error for horizontal angle option
ATR V	ATR zero point error for vertical angle option

Combined adjustment procedure step-by-step

The following description explains the most common settings:

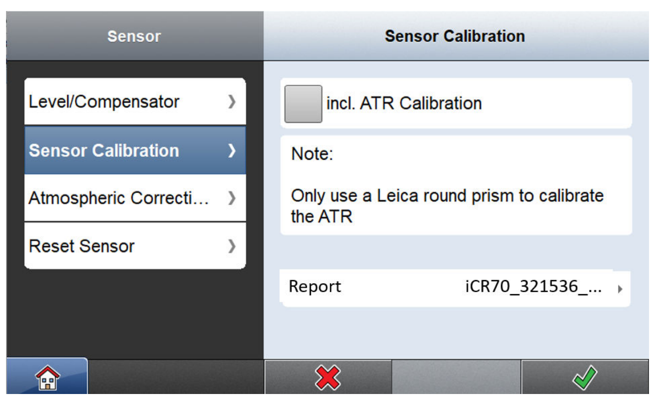
☞ It is recommended to use a clean Leica circular prism as target. Do not use a 360° prism.

1.
- For ATR calibration connect the device with the Instrument.
- Select **Devices** from the Home Menu.
- Select your instrument and tap the arrow.



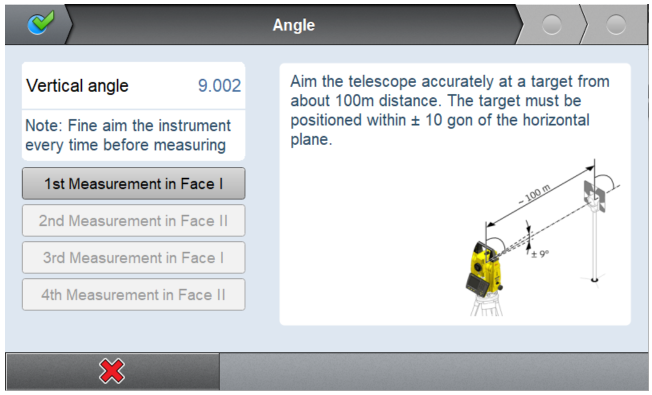
☞ When being connected to an iCON iCR50, iCON iCR70 or iCON iCR80S or to an iCON iCT30 via the controller, or when using the onboard software of any iCON driven TPS, the TPS calibration report function is available. For information on the calibration report, refer to Calibration report .
The calibration report can also be exported. Refer to Exporting data step-by-step.

2. Select **Sensor Calibration**.
- Select the **incl. ATR Calibration** option if you like to calibrate the ATR. For ATR callibration a Leica round prism is needed. For Angle callibration no prism is required.
- If applicable, tap **Report** to view a list of all calibration reports. Tap the name of a report to show the respective calibration results.
If no calibration reports are available yet, the button is greyed out.
- To start calibration, tap ✓ .
Follow the wizard which guides through the calibration.



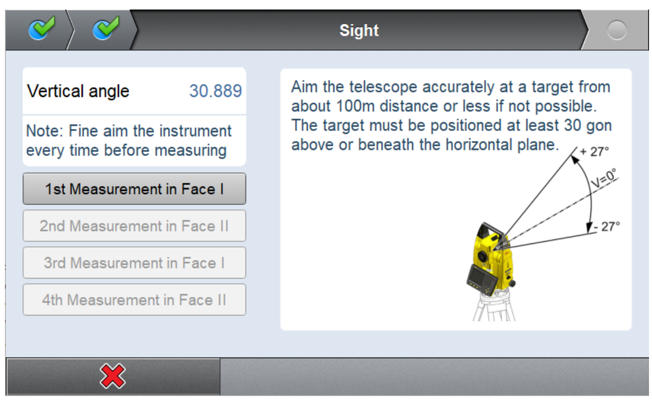
3.
- Aim the telescope accurately at a target at about 100 m distance. The target must be positioned within ± 9°/± 10 gon of the horizontal plane. Start the procedure in telescope face one.
- Press the measurement keys to measure and to continue to the next step.
- Motorised instruments change automatically to face one after tapping on the next measurement.
- For ATR calibration the target must be a Leica round prism.

☞ The fine pointing has to be performed manually in both faces.



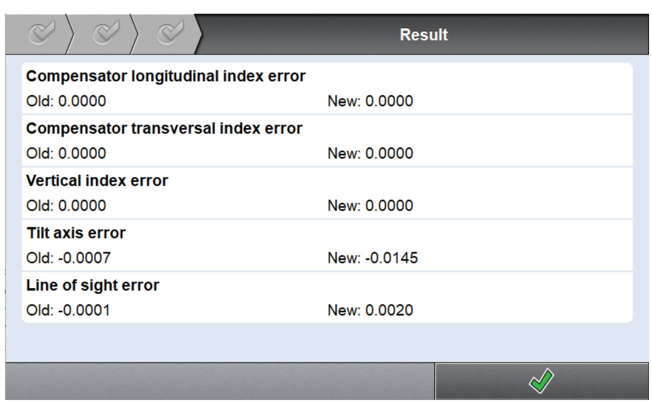
4.
- Tap in the wizard to get to the next page.
- Aim the telescope accurately at a target at about 100 m distant or less if not possible. The target must be positioned at least 27°/30 gon above or beneath the horizontal plane.
- Press the measurement keys to measure and to continue to the next step.
  Motorised instruments change automatically to the other face.

☞ The fine pointing has to be performed manually in both faces.



5. **Adjustment Accuracy**

After pressing the last in the wizard, the results are shown and stored to the instrument.



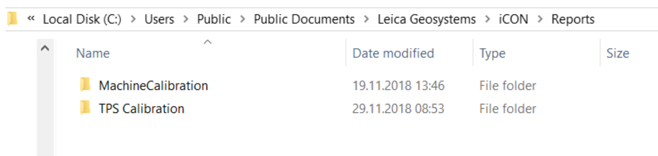
6. Tap ✓ to get back to the **Devices** page.

Calibration report

The purpose of the calibration report is a documentation of the results of the field calibration. The report proofs the quality of the equipment for quality insurance.

At the end of the sensor calibration, a report (*.calibration) is created automatically. The report contains all calibration values.

The report is stored on the hard drive of the controller (for instruments with keyboard unit only):



The reports and results of past calibrations can also be exported.

Select **Export** from the Home Menu. Tap within the section **Details** and select **TPS Calibration**.

22 Software Licence Agreement/Warranty

Software Licence Agreement

This product contains software that is preinstalled on the product, or that is supplied to you on a data carrier medium, or that can be downloaded by you online according to prior authorisation from Leica Geosystems. Such software is protected by copyright and other laws and its use is defined and regulated by the Leica Geosystems Software Licence Agreement, which covers aspects such as, but not limited to, Scope of the Licence, Warranty, Intellectual Property Rights, Limitation of Liability, Exclusion of other Assurances, Governing Law and Place of Jurisdiction. Please make sure, that at any time you fully comply with the terms and conditions of the Leica Geosystems Software Licence Agreement.

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Open source information

The software on the product may contain copyright-protected software that is licensed under various open source licences.

Copies of the corresponding licences

- are provided together with the product (for example in the About panel of the software)
- can be downloaded on http://opensource.leica-geosystems.com/icon

If foreseen in the corresponding open source licence, you may obtain the corresponding source code and other related data on http://opensource.leica-geosystems.com/icon.

Contact opensource@leica-geosystems.com in case you need additional information.

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