Leica iCON excavate iCP41

User Manual

Version 1.3
English

- when it has to be **right**

Leica Geosystems

Introduction

Purchase

Congratulations on your purchase of the iCON excavate iCP41.
The iCON excavate iCP41 is an ideal tool for increasing productivity in all aspects of the construction earthmoving industry.

This manual contains important safety directions as well as instructions for setting up the system and operating it. Refer to "8 Safety Directions" for further information.
Read carefully through the User Manual before you switch on the product.

To ensure safety when using the system, please also observe the directions and instructions contained in the User Manual and Safety Handbook issued by the:

- Machine manufacturer and
- System manufacturer.

Product identification

The type and serial number of your products are indicated on the label on the base of the unit.
Enter the model and serial number in your manual and always refer to this information when you need to contact your agency or Leica Geosystems authorised service workshop.

Type: iCON excavate iCP41 Serial No.: _____

Symbols

The symbols used in this manual have the following meanings:

Type	Description
⚠ **Danger**	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ **Warning**	Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury.
⚠ **Caution**	Indicates a potentially hazardous situation or an unintended use which, if not avoided, may result in minor or moderate injury and/or appreciable material, financial and environmental damage.
☞	Important paragraphs which must be adhered to in practice as they enable the product to be used in a technically correct and efficient manner.

Trademarks

- GSM is a trademark owned by the GSM Association.

All other trademarks are the property of their respective owners.

Validity of this manual

This manual applies to the iCON excavate iCP41.

☞ To use the iCON excavate iCP41 efficiently it's inalienable to refer to the manual provided together with the software running on the iCON excavate iCP41.

Table of Contents

In this manual

1 Product Overview

1.1 Product Description and Features

General

The iCON excavate iCP41 has a key pad and touch screen for user input. The display is a 7" wide screen and has state of the art brightness, making it possible to use in sunny environments.

The rugged IP56 enclosure is designed for harsh environments.

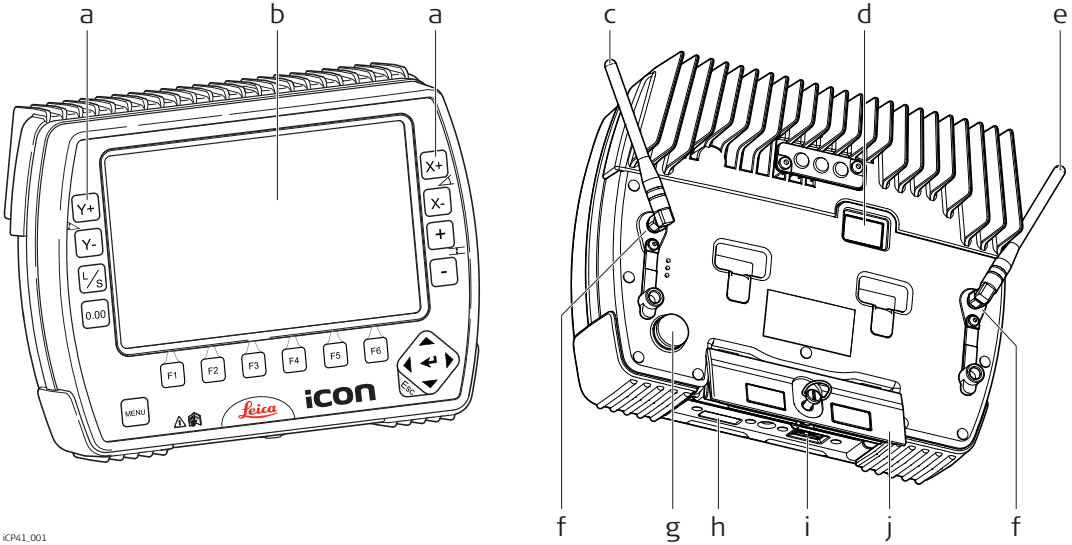
Power Supply and Communication

For utmost reliability in harsh and dusty environment, no connecting cables or power supply plugs are used at the iCON excavate iCP41.

☞ "Cradle" will be used as a short form for MMB1300 cradle throughout this manual.

- The iCON excavate iCP41 is wirelessly powered over the cradle via induction.
- Data are transferred wirelessly via IR between the MMB1300 cradle and the iCON excavate iCP41.
- The iCON excavate iCP41 has WLAN hardware support (for future use).
- On the bottom of the iCON excavate iCP41 are connectors for SIM card and USB.

iCON excavate iCP41



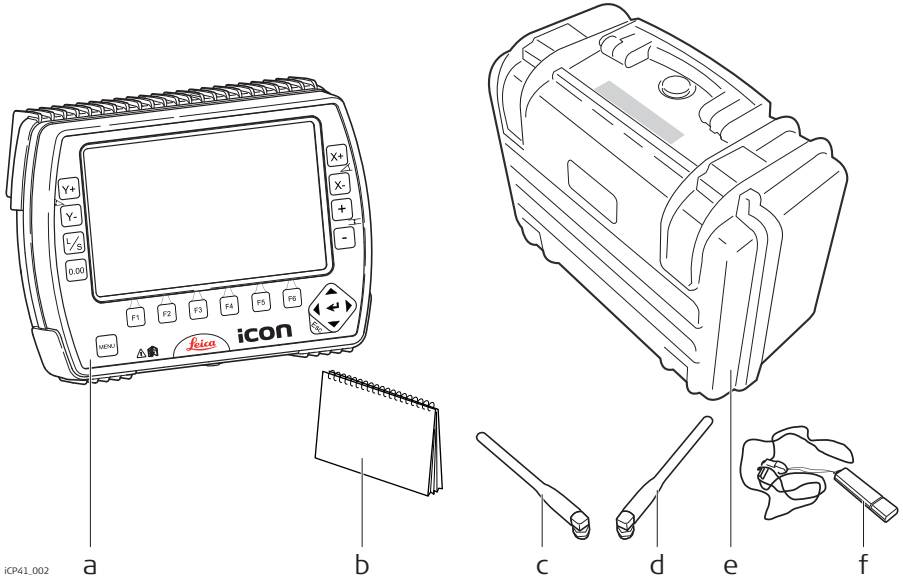
iCP41_001

a) Keypad
b) 7" LCD wide screen display
c) WiFi antenna
d) IR-Port for data transfer
e) HSPA antenna
f) Reverse SMA Connectors
g) Ventilation cap
h) SIM card connector
i) USB 2.0 connector
j) Cover for communication ports

- Do not cover the IR-Port for data transfer as this can lead to a transfer interruption.
- Both, the HSPA and the WiFi antenna are not attached to the iCON excavate iCP41 when delivered.
- To store the iCON excavate iCP41 inside the transport case both antennas must be detached.

1.2 Container Contents

Container for instrument and delivered accessories



a) iCON excavate iCP41
b) UserManual
c) WiFi antenna
d) HSPA antenna
e) Transport case
f) USB memory stick

2 Commissioning

2.1 Installation

Warning

This product may be installed on building machinery only by an appropriately trained and qualified specialist.

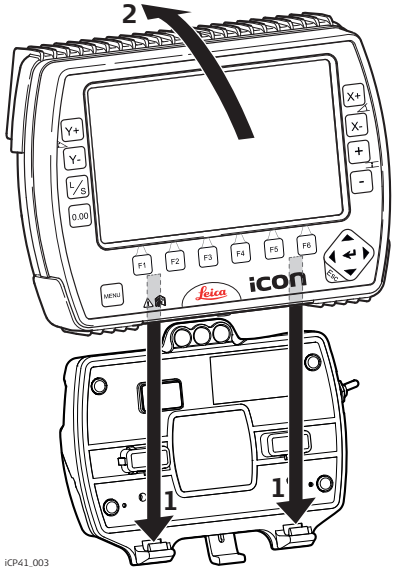
Warning

Unauthorised modification of machines by mounting the product may alter the function and safety of the machine.
Precautions:
Follow the instructions of the machine manufacturer. If no appropriate instruction is available, ask machine manufacturer for instructions before mounting the product.

Installation information

The iCON excavate iCP41 is ready to use when delivered from factory, no installation procedure is needed.
To get the iCON excavate iCP41 started complete the following steps:

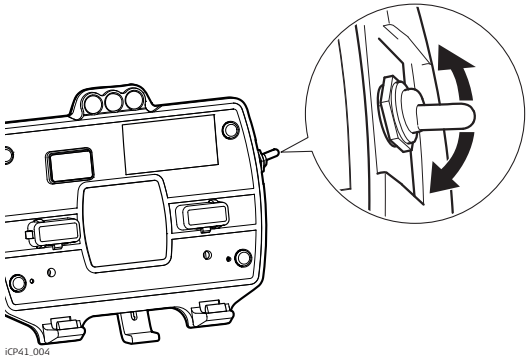
1. Snap iCON excavate iCP41 onto cradle.



To connect the iCON excavate iCP41 to the cradle:

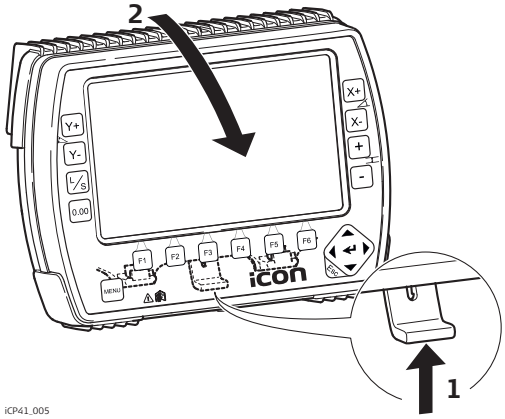
1. Put the iCON excavate iCP41 on the holding hooks in the bottom of the cradle.
2. Then snap the iCON excavate iCP41 onto the cradle by pressing it towards the cradle.

2. Turn iCON excavate iCP41 on.



To turn the iCON excavate iCP41 on and off, use the power switch on the right side of the cradle. This is the master switch for the entire system.

Removing the iCON excavate iCP41 will also turn off the power.



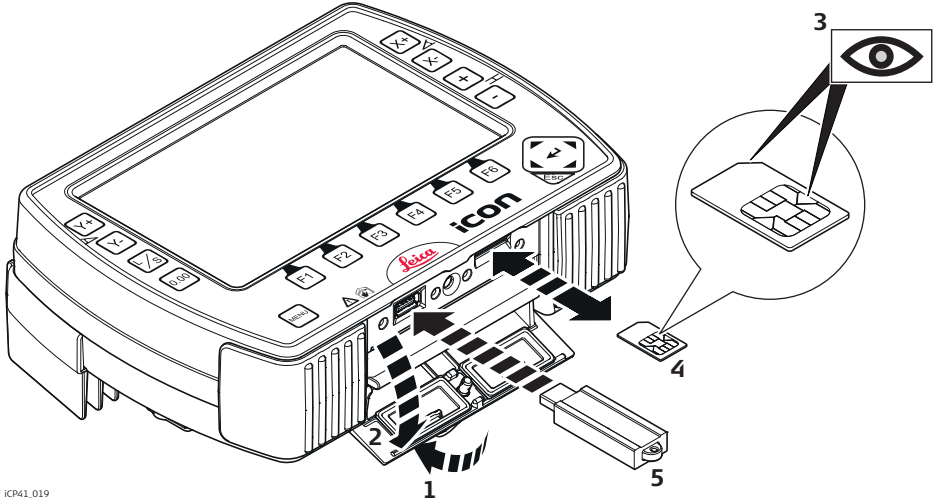
To release the iCON excavate iCP41 simply press the release key at the bottom of the cradle and pull the iCON excavate iCP41 towards you and then lift it up.

2.2 Installation a SIM Card/USB-Stick

Insert and remove a SIM card/USB-Stick step-by-step

Follow the step-by-step instructions to install a SIM card/USB-Stick.

To remove the SIM card/USB-Stick place the instrument on a stable surface first. Then follow the following instructions in reverse order.



Place the instrument onto a stable surface. (Not illustrated)

Step	Description
1.	Rotate the ring to the left.
2.	Pull the ring to open the protection cap.

Step	Description
3.	Orientate the SIM card as illustrated.
4.	Insert the SIM card into the card slot and push it in until it locks in place.
5.	Insert the USB-Stick into the USB slot and push it in until it locks in place.

2.3 Inspection Prior to Commissioning

Inspection

1. Check that the **cradle on/off switch** is put into **off** position.
2. Check that the iCON excavate iCP41 is **readily snapped into the cradle**.
3. Check that the cradle LEDs are operating normally.
   - The top led should blink to show that messages are being transmitted from the CANbus over the IR link.
   - The middle LED should blink to show that messages are being received from the CANbus over the IR link.
   - The bottom LED should remain on to show that the cradle has sufficient power.

2.4 Commissioning

Power supply

The iCON excavate iCP41 is powered in the following way:
- Induction based power through the backside of the iCON excavate iCP41 facing the cradle.

3 Setting the Direction of X

Description

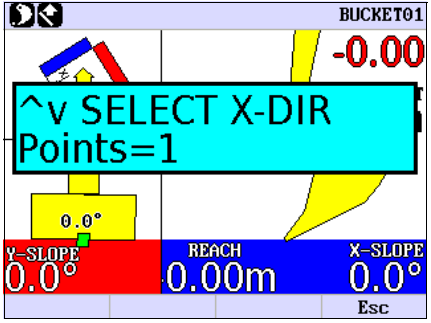
The Direction of X is the main direction of the excavator boom.
It is very important to set the Direction of X when working in Dual Slope Mode.

There are two ways to set the Direction of X.
The traditional way is to use the one-point method where the correct Direction of X is already known.
The more advanced way is to use the two-point method. You can use this method when working with a string line for example.

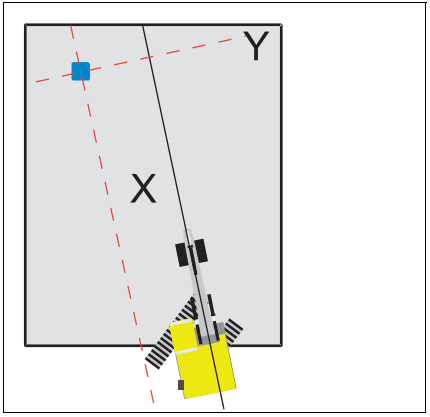
One-point method

This is how you set the Direction of X using the One-point method:

1. Press the F2 button, which will open the Direction of X menu.
2. Select **One-point method** by pressing the up/down arrows ⬍.



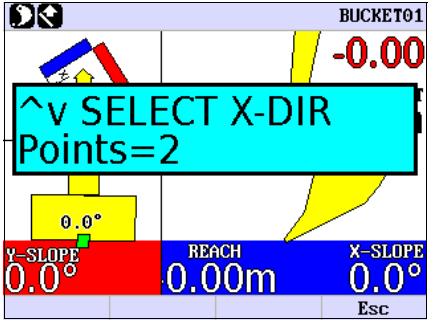
3. Turn the machine so that the boom points towards the Direction of X.
4. Press the Enter button ↵ to save the Direction of X.

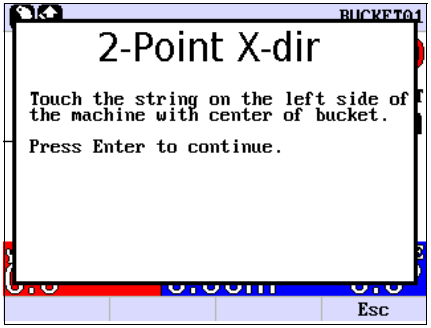


Two-point method

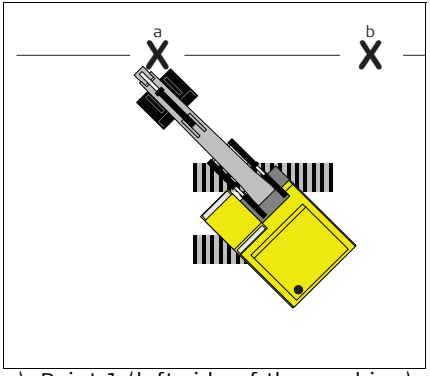
This is how you set the X direction using the Two-point method:

1. Press the F2 button, which will open the Direction of X menu.
2. Select **Two-point method** by pressing the up arrow ▲.
3. Press the Enter button ↵ to enter the Two-point method.



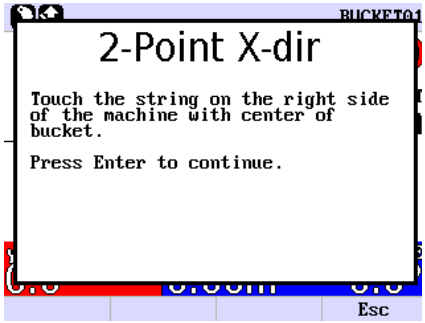


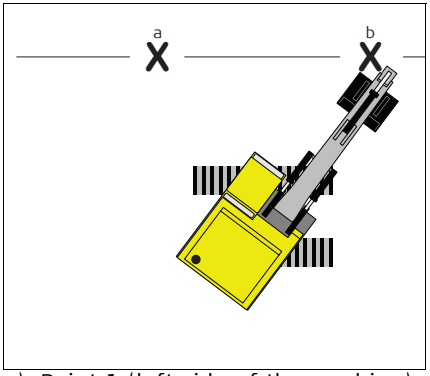
4. Place the centre of the bucket on point 1 (left side of the machine).
5. Press the Enter button ↵ to save point 1.



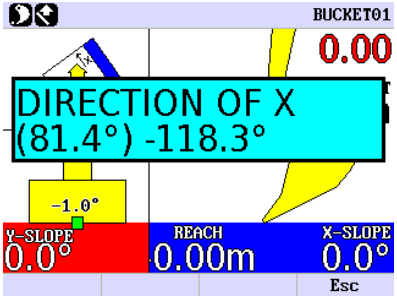
a) Point 1 (left side of the machine)
b) Point 2 (right side of the machine)

6. Place the centre of the bucket on point 2 (right side of the machine).
7. Press the Enter button ↵ to save point 2.
   The Direction of X has now been set to be exactly between the two points that were touched.





a) Point 1 (left side of the machine)
b) Point 2 (right side of the machine)

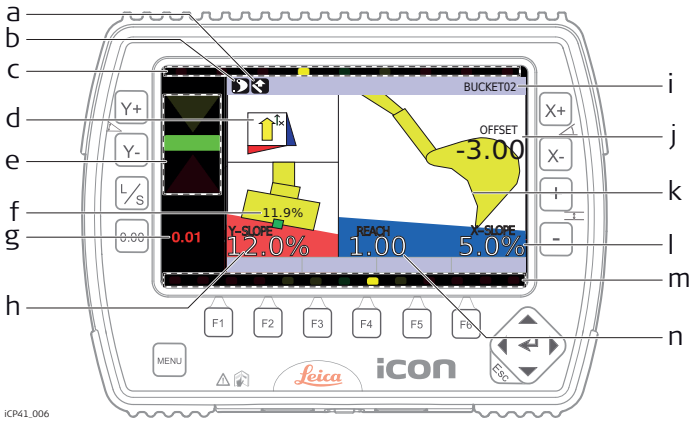

BUCKET01
0.00
DIRECTION OF X
(81.4°) -118.3°
-1.0°
Y-SLOPE
0.0°
REACH
0.00m
X-SLOPE
0.0°
Esc

4 2D Run Mode

4.1 Control Box 2D Mode

Control Box

Description of display



a) Height measurement direction: NORMAL / VERTICAL
b) Reference Method: LASER / BUCKET / 3D
c) Bucket / Tilt angle indicator.
d) Direction of X.
e) Shows the position of the bucket: Background is yellow for HIGH, green for ON GRADE and red for LOW.
f) Tilt slope display. Active when tilt sensor is connected.
g) Remaining depth (in red), until ON GRADE.
h) Y-slope.
i) Selected bucket.
j) Desired offset above/below reference height.
k) Bucket's position.
l) X-slope.
m) Bucket angle indicator.
n) Reach measurement.

Description of buttons

Button	Description
Y+ Y-	Increases/decreases slope in Y-direction.
X+ X-	Increases/decreases slope in X-direction.
+ -	Increases/decreases offset.
L/S	Read and save setup height.
0.00	Reset button. Used for setting the reference level and resetting earlier values in the menu.
MENU	Selecting a bucket.
	Navigation button. Allows you to navigate through the menus. Press left/right arrows to move between bucket items. **Naming convention within this manual:** • ↵: Enter button • ◆: Left / Right arrow buttons • ▲ : Up / Down arrow buttons • Esc: Escape button
F1	Quick settings. Up to 10 user settings can be stored.
F2	X-direction. Used for setting the X-direction.
F6	Return to 3D main menu.

4.2 Single Slope Mode without Laser

Setting the desired offset

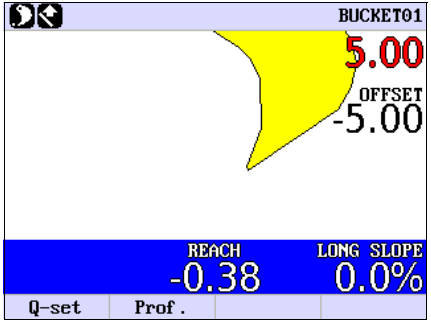
1. Make sure that **LASER MODE** is set to **OFF** (Bucket is selected as reference) in the menu option **SETUP HEIGHT -> LASER MODE**.
2. Press the [+] or [-] button until the display shows the desired offset value.

Example

If you want to enter a offset of 5.0 m, press the [-] button until the display shows the value -5.00.

The display to the right indicates:

1. The bucket selected is No. 1.
2. The value in red 5.00 indicates the distance to ONGRADE.
3. The desired offset is set to -5.00.
4. The X-slope is 0.0% (no slope).
5. The bucket tip is used as reference.
6. The distance is measured vertically .
7. REACH=-0.38 means that the bucket has been moved 38 cm closer to the machine since the [0.00] button was pressed.

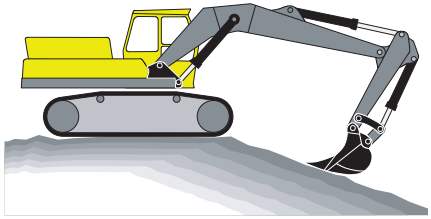


Digging with slope in X-direction

Press the X+ or X- button until the display shows the slope desired.

Example:

If you want a slope where the excavation is getting shallower as the bucket comes nearer the excavator, press the right X+ button until the display shows the desired slope.



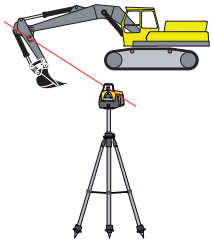
Positive slope

Moving the excavator

1. Make sure that OFF is selected in the menu option **SETUP HEIGHT -> LASER MODE**
2. Put the bucket at a place that can be reached again after moving the excavator.
3. Press the L/S button to store the position.
   The red display will flash to indicate that the position is stored.
4. Move the excavator and put the bucket at **exactly** the same place where the position above was stored.
5. Press the L/S button again to load the position.

4.3 Single Slope Mode with Laser

Basic operation instructions



1. Make sure that INTEGRATED is selected in the menu option **SETUP HEIGHT -> LASER MODE**.
2. Make sure that the rotation laser is activated.
3. Move the laser sensor, so that it can detect the laser beam.
   When the sensor detects the beam, the message

   NEW REF. @ 0.00
   PRESS L/S KEY

   is shown in the display.

When the sensor approaches the beam, the indicators to the left side of the control box indicate the direction in which the sensor is to be moved in order to detect the laser beam.

4. Press the L/S button to set the reference point.
   When the display flashes the message **LASER**, the reference point has been accepted. The values of actual Offset and desired Offset depend on the actual position of stick and bucket.

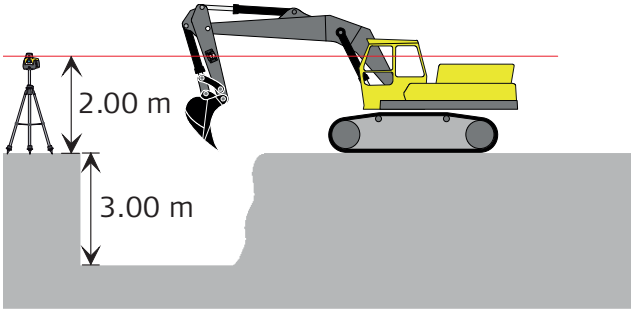
Setting the desired offset

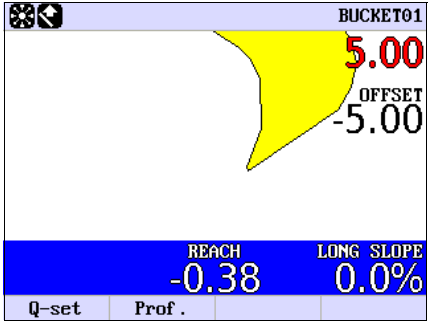
Press the [+] or [-] button until the display shows the desired value.

☞ The reference point is the laser beam.

Example:

If you want to enter a offset of 5.0 m below the laser beam, press the [-] button until the display shows the value -5.00.

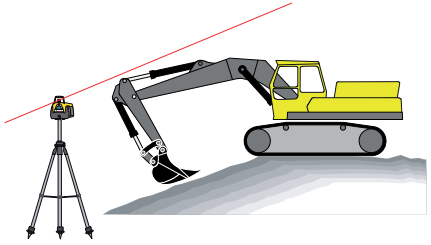




Digging with slope in X-direction

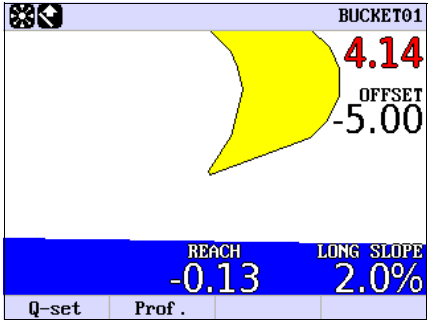
Press the X+ or X- button until the display shows the slope desired.

The slope you enter on the display must always be the same as the slope of the rotation laser.



Example:

If you want a slope of 2%, where the excavation is getting shallower as the bucket comes nearer the excavator, press the X+ button until the display shows the value 2.0%.



Moving the excavator

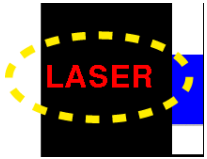
1. Make sure that INTEGRATED is selected in the menu option **SETUP HEIGHT -> LASER MODE**.
2. Move the excavator to the desired location.
3. Move the laser sensor, so that it can detect the laser beam.
   When the sensor detects the beam, the message

   NEW REF. @. 0.00
   PRESS L/S KEY

   is shown in the display.

When the sensor approaches the beam, the indicators to the left side of the control box indicate the direction in which the sensor is to be moved in order to detect the laser beam.

4. Press the L/S button to set the reference point.
   When the display flashes the message **LASER**, the reference point has been accepted. The values of actual Offset and desired Offset depend on the actual position of stick and bucket.



4.4 Dual Slope Mode

Description

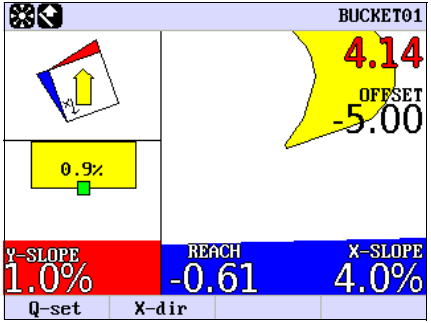
1. Turn on the display.
2. Press the Enter button ↵. You will now enter the User Menu.
3. Press the right arrow ▶ to select the option **DUAL SLOPE**.
4. Press the up arrow ▲ to turn **DUAL SLOPE ON** or **OFF**.
5. Leave the User Menu by pressing the [F4] button.
6. **Adjustment of Y slope**.
   Press the [Y+] or [Y-] button until the display shows the desired value.
7. **Setting the Direction of X.**
   Turn the machine so that the bucket points towards the Direction of X.
   Press the [F2] button, which sets the Direction of X .

☞ It is very important to set the Direction of X in Dual Slope Mode.

8. **Adjustment of X slope**.
   Press the [X+] or [X-] button until the display shows the desired value.
9. Adjust the offset underneath the laser beam by pressing the [+] or [-] button until the display shows the desired value.

The display to the right indicates:

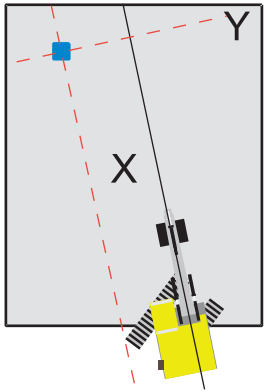
1. The bucket selected is No. 1.
2. The value in red 4.14 indicates the distance to ONGRADE.
3. The desired offset is set to -5.00.
4. The X-slope is 4.0%.
5. REACH=-0.61 means that the bucket has been moved 61 cm closer to the machine since the 0.00 button was pressed.
6. The Y-slope is 1.0%.
7. A laser beam is used as reference .
8. The distance is measured vertically .



Example

The laser (blue) is adjusted to the following slopes 4.0% in the X direction and 1.0 % in the Y direction.

1. Turn on the display.
2. Press the Enter button ↵. You will now enter the User Menu.
3. Select **DUAL SLOPE** by pressing the right arrow ▶.
4. Select **ON** by pressing the up arrow ▲.



5. Leave the Menu by pressing the F4 button.
6. Set the desired **Y Slope** by pressing the Y+ or Y- button. (1.0%)

☞ Positive slope if the excavation gets deeper from the machine and to the right.

7. Turn the machine so that the bucket points to the direction of X.

   Press the F2 button.
8. Press the X+ or X- button until the display shows the desired value for X Slope. (4.0%)

☞ Positive slope if the excavation gets deeper from the machine and towards the bucket.

9. Adjust the offset underneath the laser beam by pressing the + or - button until the display shows the desired value.
10. Move the laser sensor so that it can detect the laser beam.
    When the display reads

    NEW REF. @. 0.00
    PRESS L/S BUTTON

    you must press the L/S button and you can start digging with **Dual Slope**.
11. iCON excavate iCP41 remembers the X direction, so you do not have to change the setting for X direction until you have a task for which the direction of X differs from the present setting.

4.5 2D User Menu Tree

User Menu tree

|—— **SETUP SYSTEM**
| |—— UNITS LENGTH
| |—— UNITS ANGLE
| |—— BEEP VOLUME
| |—— LIGHT INTENSITY
| |—— ALARM HEIGHT
| |—— REVERSED VIEW
|
|—— **SETUP HEIGHT**
| |—— GREENBAND MODE
| |—— GREENBAND
| |—— YELLOWBAND
| |—— YELLOW BEEP
| |—— REFERENCE OFFSET
| |—— HEIGHT DIRECTION
| |—— LASER MODE
|
|—— **SETUP BUCKET**
| |—— CALIBRATE BUCKET
| | |—— ^v SELECT BUCKET
| | |—— TOOL TYPE
| | |—— BUCKET LEFT/RIGHT
| | |—— TILT
| | |—— BUCKET LEN
| | |—— BUCKET ANGLE
| | |—— BUCKET FLAT ANGLE
| | |—— BUCKET WIDTH
| | |—— TILT ZERO
| | |—— AUGER LENGTH
| | |—— DOG BONE L4
| | |—— BUCKET NAME
| |

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|       |—— BUCKET POINT
|       |—— BUCKET INDICATOR
|       |—— BUCKET GREENBAND
|       |—— TILT GREENBAND
|
|—— DUAL SLOPE
|
|
|—— MEASURE
|
|
|—— PROFILE
|
|
|—— CABLE DETECTION
|       |—— MODE
|       |—— RANGE MIN
|       |—— RANGE MAX
|       |—— RESPONSE
|       |—— ALARM
|       |—— VOLUME
|
|—— SERVICE MENU*
```

* Password protected menu for support personnel only.

4.6 2D User Menu

Enter the User Menu

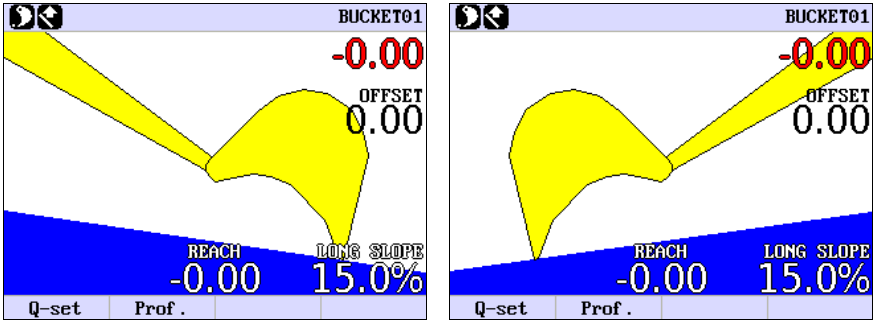
To enter the User Menu, press the Enter button ↵.
Select a menu option by pressing the left/right arrows ◆▶.
Press the Enter button ↵ to enter the sub-menus.
Change a value by pressing the up/down arrows ▲▼.

4.6.1 SETUP SYSTEM

UNITS LENGTH	This menu option is used to set in which unit the length is measured. You can choose between meters, inches or feet.
UNITS ANGLE	This menu option is used to set in which unit the angle is measured. You can choose between per cent, per thousand, gon, degrees or relative.
BEEP VOLUME	This menu option is used to set how loud the iCON excavate iCP41 Control Box is to beep. You can choose between off, low, normal and loud.
LIGHT INTENSITY	This menu option is used to set the light intensity in the display. You can choose between the values from 0 to 15.
ALARM HEIGHT	This menu option is used to set how high up the pivot points are allowed to get. The value is the distance from the lowest pivot point. You can save the value by moving the bucket to a desired alarm height and pressing the 0.00 button.

REVERSED VIEW

This menu option is used to reverse the view.
You can choose between **OFF** or **ON**.



4.6.2 SETUP HEIGHT

GREENBAND MODE	This menu option is used to set the position of the greenband **centred**, **above** or **below**, the **defined on grade level**. Greenband is the interval in which the green light flashes.
GREENBAND	This menu option is used to set when the green diode/diodes in the middle of the remote display and on the Control Box respectively start to light. The value is the distance from when the green diodes start to light until when the red arrow and diode start to light.
YELLOWBAND	This menu option is used to set when the yellow diodes on the remote display and on the Control Box respectively start to light. The value is the distance from when the yellow diodes start to light until when the green diodes start to light.
YELLOW BEEP	This menu option is used to enable or disable the audible indication of being in the yellow band.
REFERENCE OFFSET	This menu option is used to set the reference height when the 0.00 button is pressed.
HEIGHT DIRECTION	The iCON excavate iCP41 is capable of measuring the height of the bucket point over the defined on grade plane either strictly vertical or normal to the defined on grade plane. Use this option to set the desired height direction. You can choose between **NORMAL** and **VERTICAL**.

LASER MODE

This menu option is used to choose the nulling method.
You can choose between **OFF** and **INTEGRATED**.

- For **OFF**, the method is as described in the section **"4.2 Single Slope Mode without Laser"**.
- For **INTEGRATED**, the method is as described in the section **"4.3 Single Slope Mode with Laser"**.

4.6.3 SETUP BUCKET

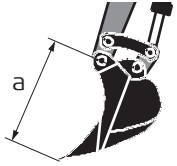
CALIBRATE BUCKET

In order to calibrate the bucket sensor, you must input some information about the length and angles of the bucket to the iCON excavate iCP41 System.

Follow the instructions below to do so:

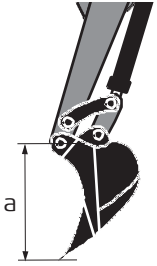
1. Press the Enter button ↵. You will now enter the User Menu.
2. Select the menu option **SETUP BUCKET**. You select a menu option by pressing the left/right arrows ◀▶.
3. Press the Enter button ↵ to enter the menu option **CALIBRATE BUCKET**.
4. Press the Enter button ↵ to enter the menu option **^v SELECT BUCKET**.
5. Select the bucket you want to calibrate ▲▼. It is possible to select between 30 buckets.
6. Press the right arrow ▶ to enter the menu option **TOOL TYPE**.
   Select which tool type you want to calibrate, Bucket or Auger.
7. Press the right arrow ▶ to enter the menu option **BUCKET LEFT/RIGHT**.
8. Select whether the bucket sensor is placed left or right. ▲▼.
   When making your choice, you must look on the lid of the sensor. If the lid is turned against the left side, then you must choose LEFT and vice versa.
   Note: if you choose the wrong side, the bucket and the graphics will work upside down.
9. Press the right arrow ▶ until the display shows **TILT**.
10. Select “NO” if the bucket is not a tilt bucket. Otherwise, select which tilt unit to use with the bucket. The system allows you to associate any one out of 5 tilt units to each bucket. Tilt units can be used with several buckets which is relevant when using a tilt coupling.
11. Press the right arrow ▶ until the display shows option **BUCKET LEN**.

12. Measure the distance between the pivot point of the bucket and the edge of the bucket.



a) BUCKET LEN

13. Press the up/down arrows ⬍ until the display shows the distance between the pivot point and the edge of the bucket (BUCKET LEN) that you have measured in step 12.
14. Press the right arrow ▶ until the display shows **BUCKET ANGLE**.
15. Move the bucket of the excavator to a position where the line between the pivot point of the bucket and the edge of the bucket is in a straight vertical plane. To make sure that the line is in a straight vertical plane, we recommend that you use a spirit level. In calm weather, it is also possible to hold a plumb line to the pivot point and let it hang straight down. Then move the bucket until the leading edge touches the string.



a) BUCKET ANGLE

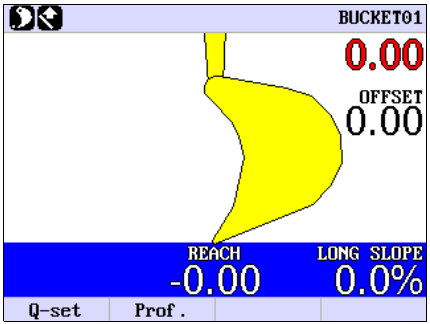
16. Press the [0.00] button when the bucket is in the position described before in step 15.
17. Press the right arrow ▶ until the display shows **BUCKET FLAT ANGLE**.

18. Move the bucket of the excavator to a position where the bucket can be used to level the surface evenly. (This part of the calibration is used to set how the movements of the bucket are shown on the Control Box. The position you put the bucket into will correspond to the middle diode of the Bucket Angle Indicator on the Control Box. See section LED Display in the Chapter System Overview.)

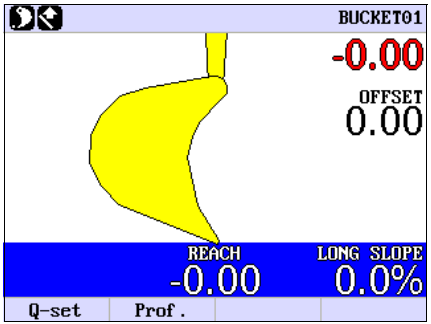
a) BUCKET FLAT ANGLE

19. Press the [0.00] button when the bucket is in the position described before in step 18.

☞ You can mount a reversed Bucket.
Calibrate the reversed Bucket as normal and the graphic will reverse the Bucket on the screen.



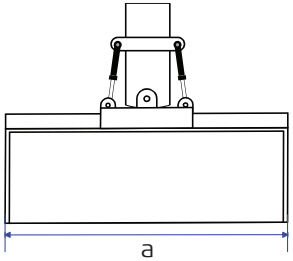
"Standard" bucket view



"Reversed" bucket view

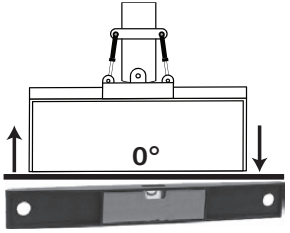
20. Press the right arrow ▶ until the display shows **BUCKET WIDTH**.

21. **BUCKET WIDTH**
    Measure the bucket width and press the up/down arrows ◆ until the display reads the width.
    The bucket sensor has now been calibrated.



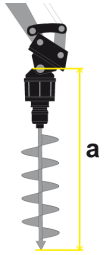
a) BUCKET WIDTH

22. Press the right arrow ▶ until the display shows **TILT ZERO**.
23. **TILT ZERO**
    This sub-menu is used to calibrate the tilt bucket this way:
    Move the bucket to a position where the bucket is level 0°.
    Use a spirit level to check that the bucket is level and press the [0.00] button.



24. Press the right arrow ▶ until the display shows **AUGER LENGTH**.
    This menu option is only used when an Auger is attached to the machine.
    If an Auger is not attached, then Auger Length should be set to 0.000

25. Measure the length of the auger from the swivel joint to the tip of the drill bit and press the up/down arrows ⬍ until the display reads the length.
    The Auger has now been calibrated.



a) AUGER LENGTH

26. Press the right arrow ▶ until the display shows **DOG BONE L*4***.
27. **DOG BONE L*4***
    This sub-menu is only used when bucket sensor is mounted on the dog bone.

28. Press the right arrow ▶ until the display shows **BUCKET NAME.**
29. **BUCKET NAME**
    This sub-menu is used to give the various buckets a name after they have been calibrated. If you state @ as the first letter in the name, the iCON excavate iCP41 will generate the names BUCKET 1, BUCKET 2 etc. according to the number of buckets you have calibrated to the system.
    By pressing the left/right arrows ◀▶, you can move the position of the cursor.
    By pressing the up/down arrows ⬍, you can change the letter.
30. Press the F4 button three times to leave the User Menu.

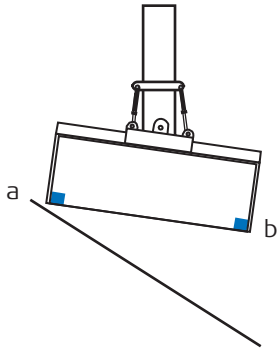
BUCKET POINT

At this option you choose which bucket point is used for height measurements.
You can choose between 5 settings:

- **MIDDLE**, **LEFT** or **RIGHT** side of the bucket as reference point.
  The chosen bucket point is shown with a green indication.

There are 2 other possibilities where the bucket point automatically changes between:

- **Closest**: the bucket point that is closest to the surface, or
- **Lowest**: the bucket point that is lowest without regard to the surface.
  The chosen bucket point is shown with a blue indication.



a) Closest b) Lowest

BUCKET INDICATOR

Enables or disables the bucket and tilt angle indicators.

BUCKET GREENBAND

Sets the sensitivity of the bucket angle indicator.

TILT GREENBAND

Sets the sensitivity of the tilt angle indicator. This means how fast you want the lamps in the Tilt Slope display to react. 0.5% corresponds to an accuracy of about ± 2 cm working with a bucket of 1 m.

4.6.4 DUAL SLOPE

Description	Turns the dual slope mode of the iCON excavate iCP41 on or off. Dual slope operation is described in the section "4.4 Dual Slope Mode".

4.6.5 MEASURE

Description

With this menu option you can let the iCON excavate iCP41 calculate slope, height, and length in relation to 2 reference points.
You can choose which of the values is to be shown in the upper display.
Press the up/down arrows ▲▼ to select the value.
To let the iCON excavate iCP41 calculate slope, height and length, follow this procedure:

1. Place the tip of the bucket on the first reference point.
2. Press the [0.00] button to save the first reference point.
3. Place the tip of the bucket on the second reference point.

The upper blue box shows the slope, height or length according to which value you have selected.

If you want to work with the calculated slope, height and length, press the [L/S] button to save the second reference point.
After saving the second reference point, iCON excavate iCP41 automatically leaves the User Menu and returns to working mode.
There is no timeout at this menu option.

4.6.6 PROFILE

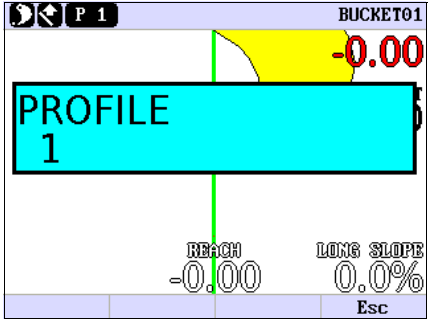
General information

The basic idea of making profiles is either to **copy/save** a job that is already carried out or to pre-define various distances with a slope to match.
After defining the distances or copying a job you can then dig the job at a stretch.

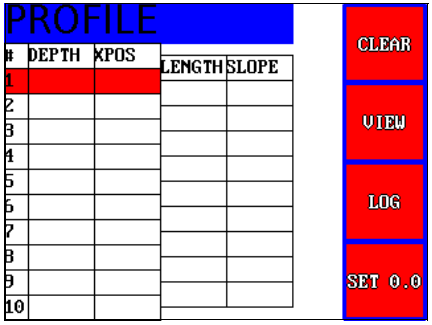
When you work in profile mode, you will only be able to work with slope in one direction and a laser as reference line cannot be used. So before you start, make sure that Dual Slope mode is disabled.

How to copy/save a job that already exists

1. Turn on the iCON excavate iCP41 Control Box.
2. Enter the User Menu by pressing the Enter button ↵.
3. Select the menu option **PROFILES** by pressing the left/right arrows ◆▶.
4. At the menu option **PROFILES** you can select a profile number by pressing the up/down arrows ▲▼.
   A small icon will indicate which profile is activated, for example **P 1**.
   Profile number 0 indicates that iCON excavate iCP41 is not running in profile mode.
   Profile number 11 is a Demo profile that cannot be changed.

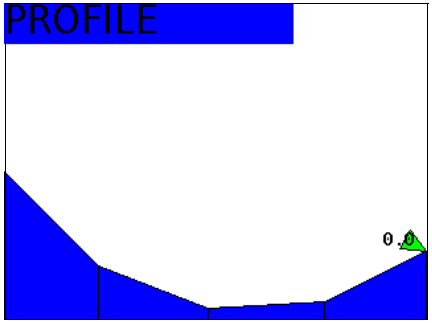


5. When you have selected a profile from 1 – 10, press the Enter button ↵ to activate the selected profile.

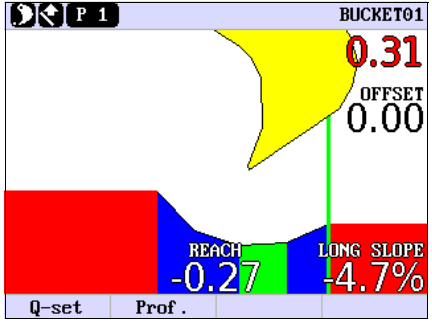


6. Place the bucket at the farthest point of the profile you want to copy/save.
7. Press the + button to LOG/Save this point as the first point of the profile.
8. Place the bucket at the second farthest point of the profile.
9. Press the + button to save this point as the second point. The slope and distance between the points is shown in the display.
10. Place the bucket at the third farthest point of the profile.
11. Press the + button to save this point as the third point. The slope and distance between the points is shown in the display.
12. Place the bucket at the fourth farthest point of the profile.
13. Press the + button to save this point as the fourth point. The slope and distance between the points is shown in the display. Continue this operation until you have saved all points in your profile. You can save up to 10 points in a profile.

You can get a graphic view of your profile by pressing the X- button.

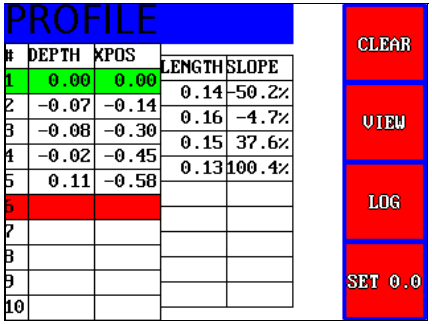


14. Press the Enter button ↵ two times to save and leave the profile.

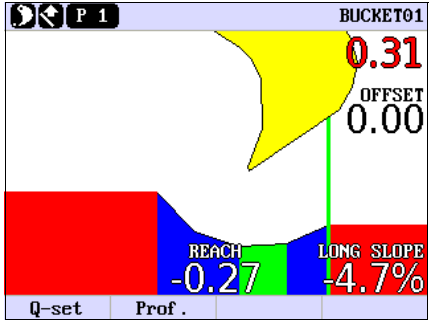


The green vertical line indicates your 0-point, the farthest point of the profile.

The 0-point can be moved the following way:
Enter the profile. Use the up/down arrows ⬍ to move the red bar to the point that you want to be your new 0-point. Press the [-] button (SET 0.0).



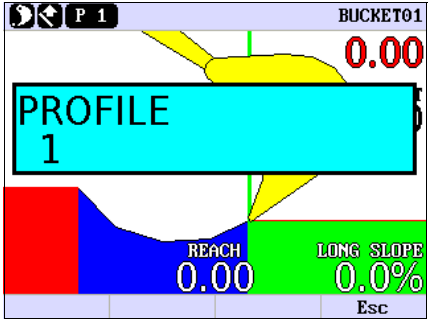
- The **green area** indicates that this area is included in the profile, and your bucket is working in this area right now.
- The **blue area** indicates that this area is included in the profile, but your bucket is not working in this area right now.
- The **red area** indicates that this area is NOT included in the profile.



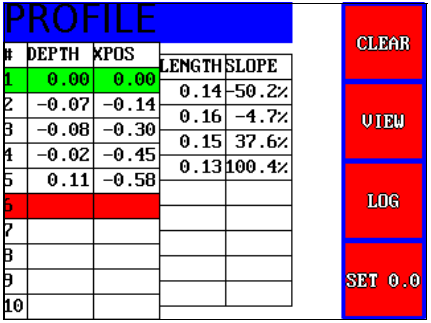
When you are at the Main Screen, you can press the [F2] button to enter the settings of the selected profile.

How to set up/change a profile by stating the length and slope

1. Turn on the iCON excavate iCP41 Control Box.
2. Enter the User Menu by pressing the Enter button ↵.
3. Select the menu option **PROFILES** by pressing the left/right arrows ◆▶.
4. At the menu option **PROFILES** you can select a profile number by pressing the up/down arrows ◆.
   A small icon will indicate which profile is activated, for example **P 1**.
   Profile number 0 indicates that iCON excavate iCP41 is not running in profile mode.
   Profile number 11 is a Demo profile that cannot be changed.



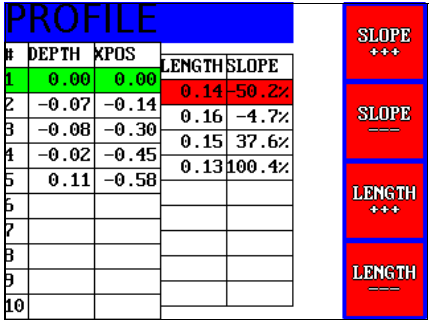
5. When you have selected a profile from 1 – 10, press the Enter button ↵ to activate the selected profile.



6. Press the right arrow ▶ to set up/change the selected profile.

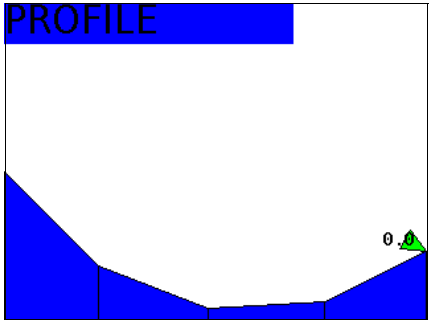
7. Press the [+] or [-] button to state the length of the first stretch of the profile.

8. Press the [X+] or [X-] button to state the slope of the first stretch of the profile.



9. Press the down arrow ▼ to get to the next stretch of the profile.
10. Press the [+] or [-] button to state the length of the next stretch of the profile.
11. Press the [X+] or [X-] button to state the slope of the next stretch of the profile.
    The length and slope between the points are shown in the display.
    Repeat the procedures 10. and 11. until you have stated all the stretches you want to include in the profile.
    You can state up to 10 stretches in the profile.

You can get a graphic view of your profile by pressing the left arrow ◀ and subsequently the [X-] button.



12. Press the Enter button ↵ two times to save and leave the profile.

4.6.7 CABLE DETECTION

Description

Please refer to the Cable Detection EZiDIG User Manual regarding the settings for CABLE DETECTION.

4.6.8 SERVICE MENU

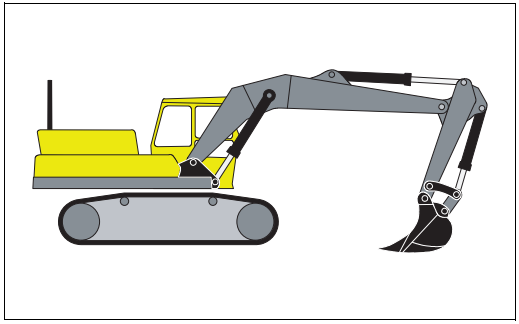
Description	Password protected menu for support personnel only.

4.7 Reversed Bucket

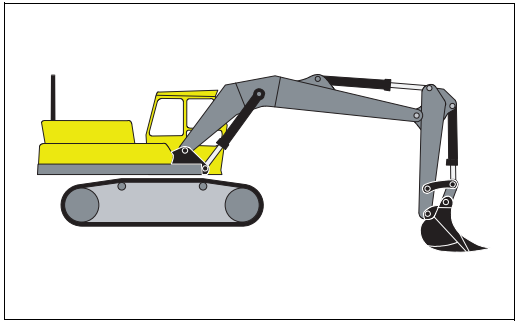
Description

You can mount a reversed bucket.

Calibrate the reversed Bucket as standard bucket and the graphic will reverse the bucket on the screen.



"Standard" bucket view



"Reversed" bucket view

4.8 Quick Settings

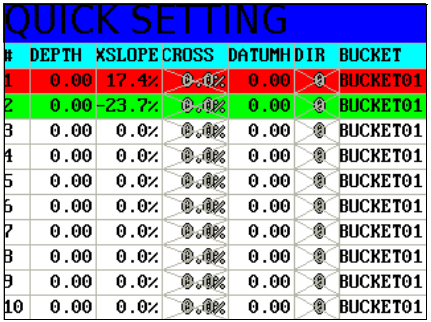
General

The basic idea of Quick Settings is to make it possible for the user to change between 10 different settings.
Each setting includes values for: Offset, Slope in X-direction, Tilt Slope, Datum Height, Direction of X and the bucket selected.

How to make a Quick Setting

1. Turn on the iCON excavate iCP41 Control Box.
2. Enter Quick Setting by pressing the F1 button.
3. Select the Quick Setting number you want to make by pressing the up/down arrows.

The green bar indicates which Quick Setting will be active when you return to working mode.



#	DEPTH	XSLOPE	CROSS	DATUMH	DIR	BUCKET
1	0.00	17.4%	0.0%	0.00	@	BUCKET01
2	0.00	-23.7%	0.0%	0.00	@	BUCKET01
3	0.00	0.0%	0.0%	0.00	@	BUCKET01
4	0.00	0.0%	0.0%	0.00	@	BUCKET01
5	0.00	0.0%	0.0%	0.00	@	BUCKET01
6	0.00	0.0%	0.0%	0.00	@	BUCKET01
7	0.00	0.0%	0.0%	0.00	@	BUCKET01
8	0.00	0.0%	0.0%	0.00	@	BUCKET01
9	0.00	0.0%	0.0%	0.00	@	BUCKET01
10	0.00	0.0%	0.0%	0.00	@	BUCKET01

4. Press the Enter button ↵ to enter the values for the selected Quick Setting. You will return to working mode.
5. Enter the values by using the normal buttons for Offset, Slope, Bucket etc. The values will be stored as a Quick Setting and you can start to dig.

How to change between Quick Settings

1. Enter Quick Setting by pressing the F1 button. You will see a green and a red bar.
2. The red bar indicates the settings you had before entering Quick Setting.
3. The green bar indicates the settings that you will have when leaving Quick Setting and return to working mode by pressing the F1 button.
4. To select a Quick Setting move the green bar up or down by pressing the up/down arrows ▲▼.

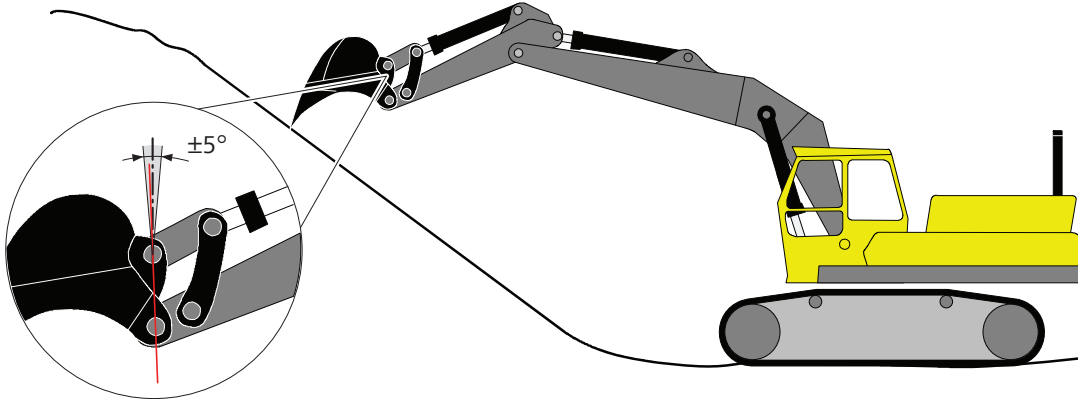
4.9 Special Working Situations

4.9.1 Tilt Sensor

Description

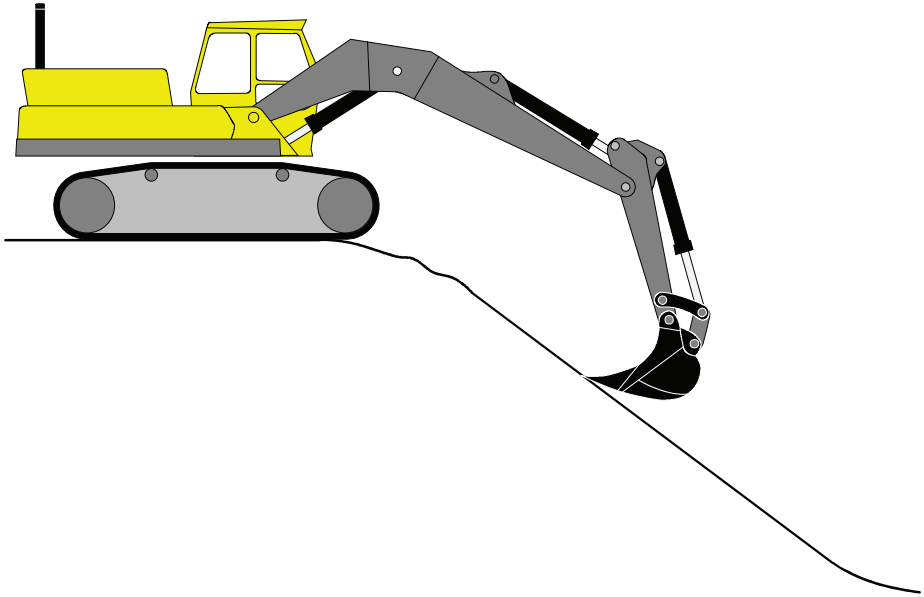
Under special circumstances, you may experience that the option **Tilt sensor** cannot follow the right measure/height. This will affect the height value that is shown in the upper red display. The value will "jump". This can happen during a pull – please just ignore it and continue, the system will then settle back and show the right height.

The above mentioned situation will appear when the Delta Angle is in vertical position ±5° like shown in the drawing below.



Solution

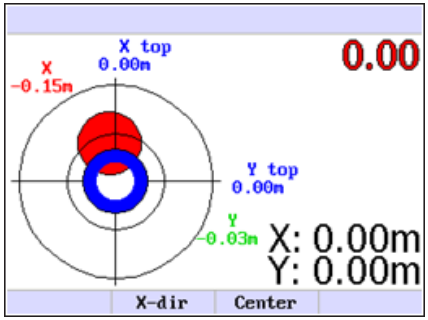
- Move the machine closer to the profile, so that you do not have to open the bucket fully, or
- Move the machine on top of the profile, and work from the bottom to the top.

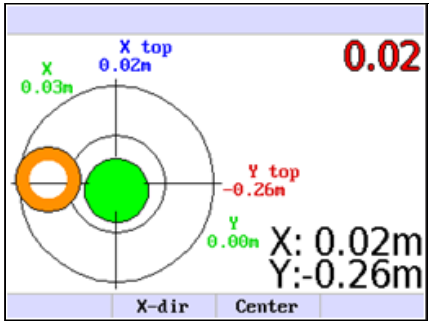


4.9.2 Using an Auger

Explanation of the work screen

- The drill bit tip will be shown as a circle and have the colour Green (0-5 cm) or Red (+5 cm)
- The top point of the auger will be shown as a ring and have the colour Blue (0-5cm) or Orange (+5 cm)
- The inner part of the cross hairs will be highlighted when the drill bit and top of the drill is within the specified tolerance.
- The X and Y **top** tell you how far the top of the auger is from zero.
- The X and Y tell you how far the auger is from center.
- In the right top corner is the high shown relative to zero.
- In the lowest right corner you can see X and Y, this indicate how much you have moved the auger away from the first hole.
- If you move the auger 2 meters in the X direction and will drill a new hole the place the Auger 2-3 cm above the ground and press the F3 button. (Center)
- The circle and the ring will now be on top of each other and you can start drill.

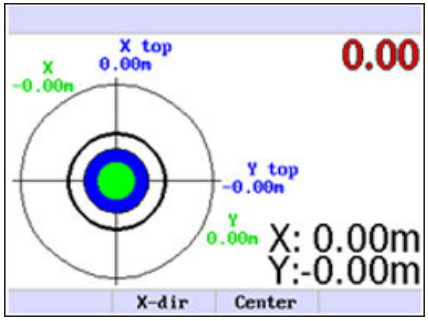




How to use the Auger

To use a Auger on your excavator, please follow the procedure below:

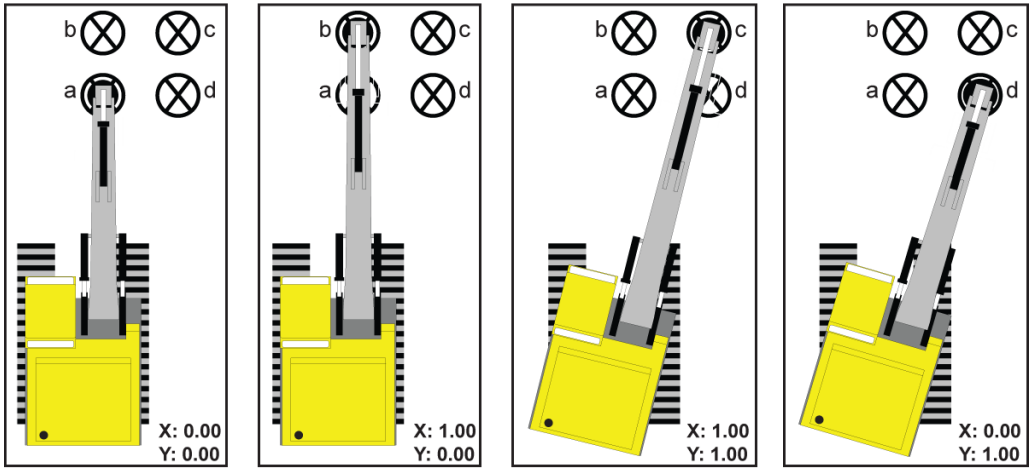
1. Place the auger over the first point you want to drill.
2. Press the X-dir button and set the direction. (Select 1 or 2 points option with the up or down arrows and press Enter).
3. Press the 0.00 button when the auger and direction are placed and set correct.
4. Start drilling.



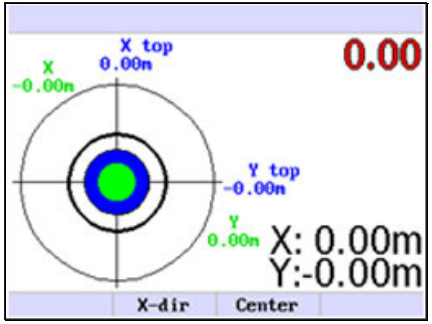
When drilling the next hole, just move the upper part of the excavator (not the tracks) and use the X and Y for placing the next hole. Press Center (F3) when the auger is placed correct, and then start drilling.

The X and Y direction can be affected by iron objects around the machine.

Example:
You want to drill 4 holes; a, b, c and d.
Hole b is to be drilled 1 m in the X axis from hole a.
Hole c is to be drilled 1 m in the X axis and 1 m in the Y axis from hole a.
Hole d is to be drilled 1 m in the Y axis from hole a.



1. Place the auger over hole a.
2. Press the X-dir button and set the direction. (Select 1 or 2 points option with the up or down arrows and press Enter).
3. Press the 0.00 button when the auger and direction are placed and set correct.
4. Start drilling.
5. Move the auger without moving the tracks of the machine until the display reads X: 1.00m and Y: 0.00m.
6. Press Center (F3).
7. Start drilling.
8. Move the auger without moving the tracks of the machine until the display reads X: 1.00m Y: 1.00m.
9. Press Center (F3).
10. Start drilling.
11. Move the auger without moving the tracks of the machine until the display reads X: 0.00m Y: 1.00m.
12. Press Center (F3).
13. Start drilling.



4.10 Diagnose Screen

Description

This is a diagnose tool to view the status of sensors and error messages. If a cable breaks or a sensor is dead, it is easily possible to verify where the problem is.

To activate this screen, you must push the left/right arrows ◀▶ at the same time.

Example of a diagnose screen

SENSOR		VALUE	VERSION	ENAB	STAT
ROLL		-0.05	RS10A200	YES	ON
PITCH		2.20	RS10A200	YES	ON
BOOM1		45.91	XIS1 202	YES	ON
BOOM2		0.00		NO	OFF
STICK		2.77	XIS1L203	YES	ON
BUCKET	*	-131.48	IS3 3.01	YES	ON
TILT	!	-0.16	IS2 3.01	YES	ON
XIS1LASER		0x00			OFF
RS10 FLUX		210.78	RS10A200	YES	ON
EXTENSION		0.00		NO	OFF
CABLE DET.		0		NO	OFF

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On the diagnosis screen you can see a detailed system status information.

The most important columns are the last two: ENAB and STAT.
They will show if there is a deviation.

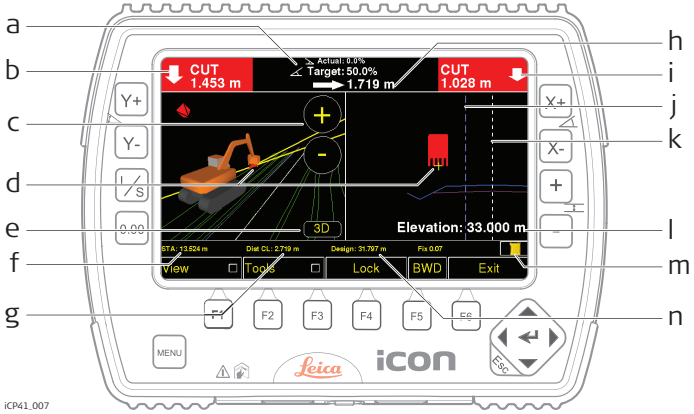
- **ENAB** tells the setting for the sensor that has been made in the technical menu. When the sensor is activated, YES will be shown.
- **STAT** tells if the sensor is working.
  ON shows that the sensor is working, OFF shows a failure either in the sensor or in the cable connection from the previous sensor - this is meant from the cabin and out towards the bucket.
- ***** tells that the Bucket Sensor needs to be recalibrated. Please contact your local dealer.
- **!** tells that the Tilt Sensor is not working correctly. Please contact your local dealer.

5 3D Run Mode

5.1 Control Box 3D

Control Box

Description of display



a) Bucket's current cross-slope and model's slope. Symbol on the left shows direction of slope.
b) CUT/FILL value for left bucket edge. Background is blue for fill, green for inside tolerance and red for CUT.
c) Zoom keys, touch screen to view keys.
d) Bucket's reference point, toggle right / left arrows on the navigation key.
e) Switch between 2D/3D in plane view.
f) Reference point's stationing in the centre line.
g) Reference point's side distance to centre line.
h) Distance to guide line. Line selection depends on the active reference.
i) CUT/FILL value for right bucket edge. Background is blue for fill, green inside tolerance and red for CUT.

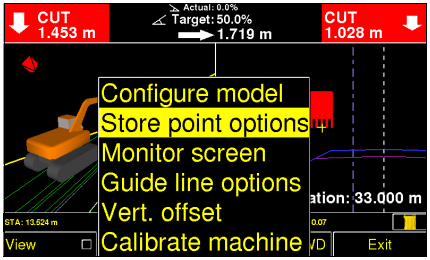
j) Guide line, viewed as a dashed blue line in the cross-section view.
k) Centre line, viewed as a black & white line in the cross-section view.
l) Elevation of bucket reference point.
m) GPS-status, on the right:
   - CQ (precision) for PowerBox, iCON gps 60 and iCON gps 80
   - DOP for other receivers
n) Reference model's height in bucket reference point's position.

Description of buttons

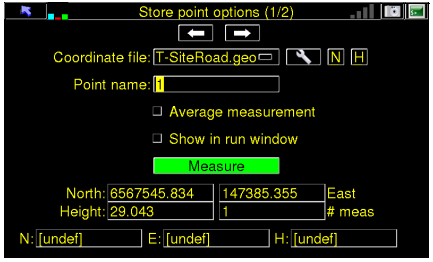
Button	Description
	These buttons offset the reference model vertically up or down. One push of the button equals 1 cm.
	Opens the excavator's internal system with the "select bucket" menu open.
	Opens a display window for the excavator's internal system. It is not possible to adjust the excavator's system settings in this mode. Press the button again to close the window.
	Opens the excavator's internal system. The system is still in 3D mode (GPS). The excavator's system settings can be changed.
	Navigation button. Allows you to navigate through the menus. Press left/right arrows to change the bucket's reference point. **Naming convention within this manual:** • ↵: Enter button • ◆◆: Left / Right arrow buttons • ◆◆ : Up / Down arrow buttons • Esc: Escape button

Storing points

1. Press **Tools**.
2. Select **Store point options**.



3. Select the **Coordinate file** you wish to store the measured points in.
4. Enter a **Point name**. Point numbers automatically increase by one when a point has been stored.
5. Press **Measure** to store the bucket reference point.
   The colour of this key corresponds to the position quality. The key is green when the position quality is good and red when it is low. In the latter case the function can't be used.
6. Check the **Show in run window** box to use the **Measure** key directly in run mode.



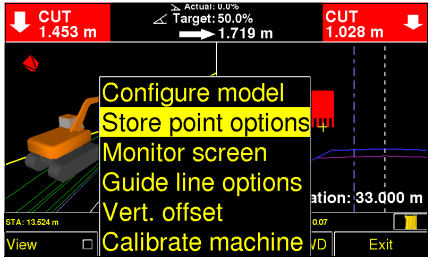
H Pressing this key will bring up the selected coordinate file in the plan view as a help model. Measured points are displayed in plan view.

N Press this key to create a new coordinate file.

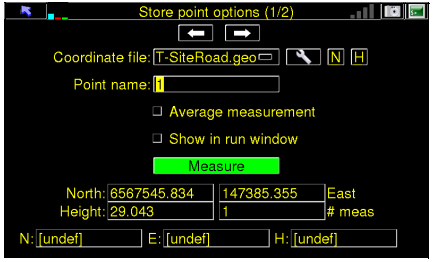
5.3 Auto logging function

Using Auto logging

1. To use the auto logging function you must be in run screen and have a fix position.
1. Press **Tools**.
2. Select **Store point options**.

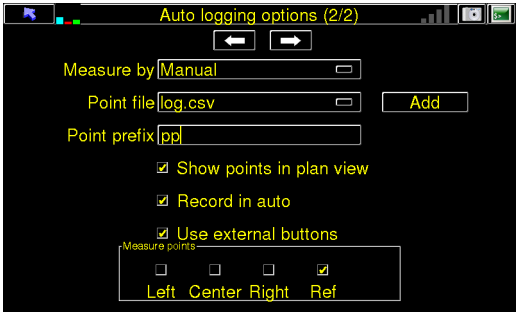


3. Go to the second page (2/2) by pressing the right arrow on the top of the screen.



Options in Auto logging

In the auto logging menu you will find various options. You will have to make selections according to how you want to use auto logging.
Below you will find a description of the options that can be set in auto logging:



Options that can be set in auto logging

Measure by

1. Select between the four options in the drop down list.
   - **Distance** - point(s) are logged by distance
   - **Manual**
   - **None**
   - **Time** - point(s) are logged by time interval

Point file

1. Create a new point file by pressing the **Add** button or
2. Select an already created file in the drop down list.

Point prefix

1. Enter the prefix for the points you will log. The prefix will be shown in the file when it is opened.

Show points in plan view

1. Mark the check box if you want to see the logged points in the plan view.

Record in auto

1. Mark the check box if you want to have logging started when auto is enabled. (Only Dozer / Grader)

Use external buttons

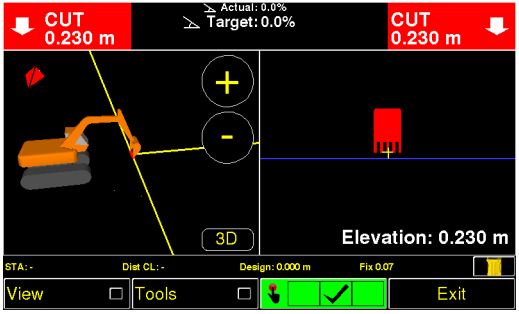
1. Mark the check box if you want to use external buttons.
   - The external zero button can be used to log single points in Manual mode. You can also press directly on the icon on the screen to log a single point.
   - If you choose **Distance** or **Time** you can also enable/disable auto logging by pressing the external zero button once. You can also press directly on the icon on the screen to enable and disable the auto logging
   - It is also possible to use two other external buttons Toggle and Switch (see in the installations manual how to install external buttons).

Measure points

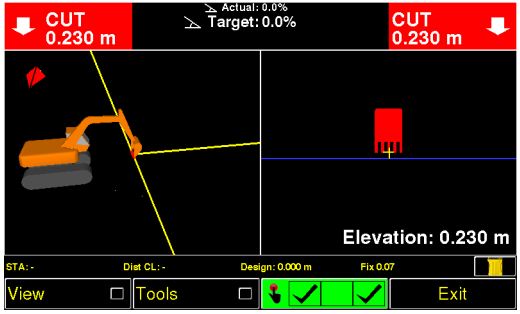
1. Select how you want to measure points.
   - **Left**
   - **Center**
   - **Right**
   - Combination of all above
   - **Ref.** (reference point on bucket) - cannot be used in combination

Examples of settings

Below you will find screens that show examples of how the auto logging can be setup:

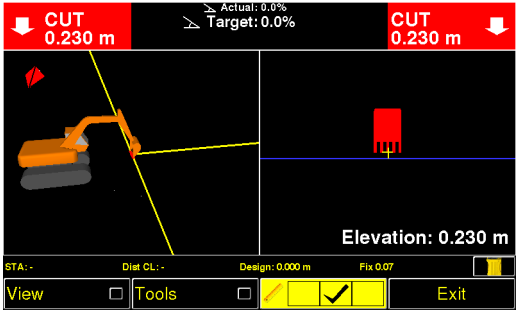


Manual mode ref point in center

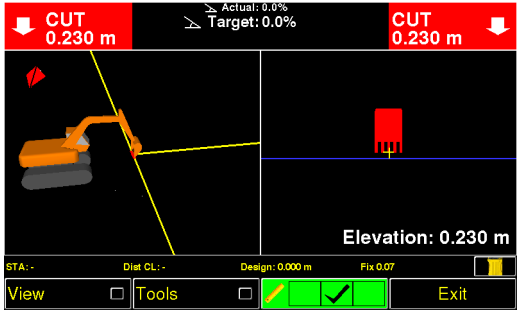


Combination of Left and Right

Distance mode ref point in center

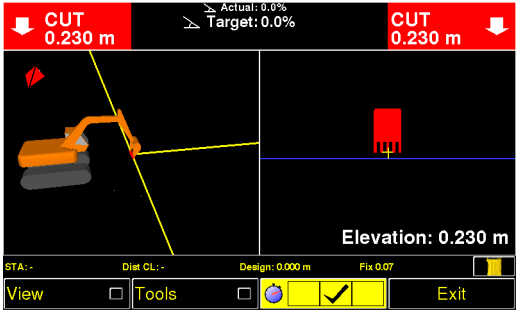


Distance mode ref point in center - Auto logging OFF

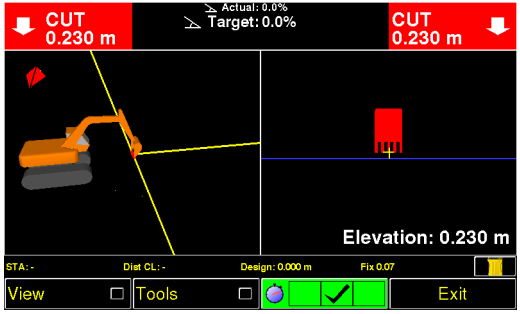


Distance mode ref point in center - Auto logging ON

Time mode ref point in center

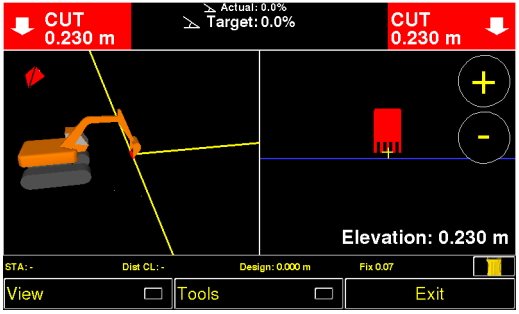


Time mode ref point in center -
Auto logging OFF



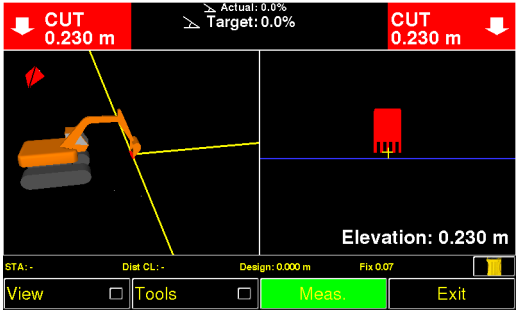
Time mode ref point in center -
Auto logging ON

None mode



None mode
Auto logging is disabled

You can now use store point options. Refer to "5.2 Storing Points" for further information.



5.4 Avoidance zones

Description of avoidance zones

Avoidance zones are areas you can specify to give a visual alarm when entered.
In an avoidance zone no guidance nor automatic control is possible.
For avoidance zones, the following characteristics apply:

- An avoidance zone is a geo file that is created in iCON office.
- The avoidance zone must be a closed polygon.
- The avoidance zone geo file must be placed in the project.

☞ The avoidance zone geo file must not contain points, lines that are not closed, lines with radius or lines that intersect.

Options in avoidance zones

In the avoidance zone menu you will find various options. You will have to make selections according to how you want to use avoidance zones.

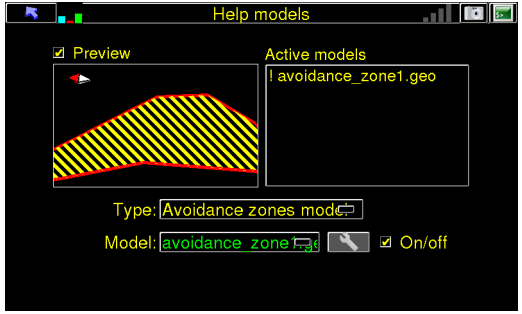
Below you will find a description of the options in avoidance zones:

Type

1. Select **Avoidance zones model** on the drop down list.

Model

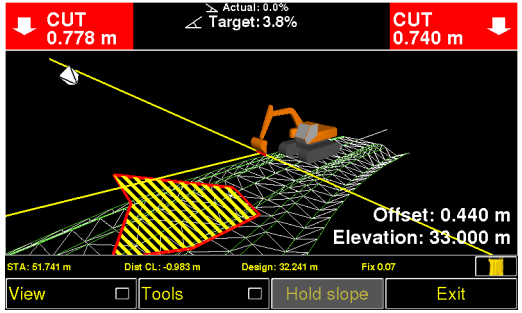
1. Select the avoidance zone in the drop down list you want to use, and mark the check box **On/Off**. You will now see the selected model in **Active models**.



Selected model is shown in **Active models**

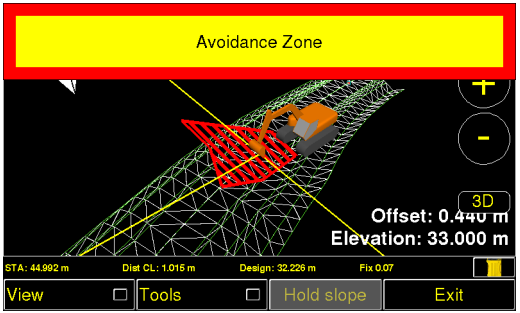
Examples

Below you will find screens that show examples of how the avoidance zone can look in the panel:



Avoidance zone in front of the machine

The next screen shows that the machine has entered the avoidance zone and a warning will pop up on the screen and an alarm will sound.
When the machine is out of the avoidance zone, the warning and sound will stop.



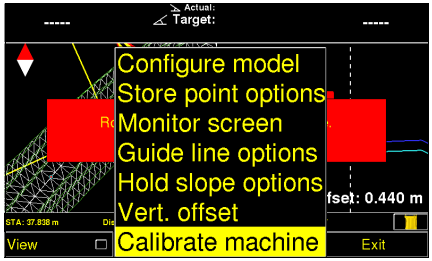
The machine has entered the avoidance zone

5.5 Resetting the Rotation Calibration, Single GPS Only

Sometimes the rotation calibration becomes unusable as the machines moves. This occurs when the machine body's rotation centre is moved, resulting in that the system can't correctly calculate the bucket position until another rotation calibration is performed. Pushing the 'Calibrate Excavator' button forces the system to prompt a new rotation calibration.

Resetting the rotation calibration

1. Press **Tools**.
2. Select **Calibrate excavator**.
3. The machine needs to be rotated before resuming work.

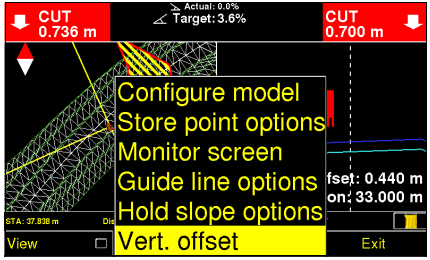


5.6 Vertical Offset

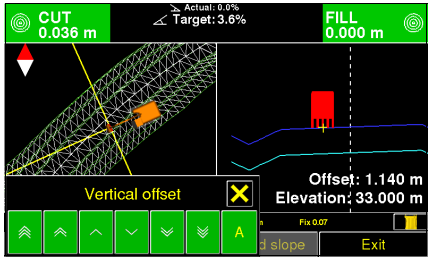
This function moves the reference model vertically up or down.

Setting the vertical offset

1. Press **Tools**.
2. Select **Vert. offset**.
3. A window opens on the screen where you can adjust the vertical offset.



4. The CUT/FILL values in the upper corners refer to the offset surface. In the cross-section view it is illustrated by a blue line.
5. The green line represents the original surface level.



Vertical offset keys

Key	Description
	Equals an offset of 10 cm (.3').
	Equals an offset of 1 cm (.03').
	Equals an offset of 1 mm (.003').
	The vertical offset is set so that the current CUT/FILL values for the bucket reference point is zero, therefore the reference model "moves" to the bucket.
	On the panel, you can adjust the vertical offset using the + / - buttons. Each button press equals an offset of 1 cm (.03').

5.7 Changing the bucket reference point

Changing the bucket reference point

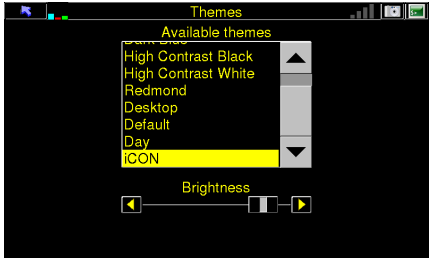
You can change the bucket reference point by pressing the left/right arrows ◀▶ while in run mode.

5.8 Screen Settings

Background lighting and theme

Background brightness and theme, like colours of the keys, can be adjusted in **Tools** › **Themes** in the main menu.

1. Select a **Theme** from the list.
2. Adjust the screen's background lighting using the **Brightness slider**.

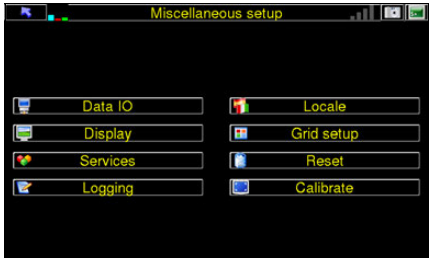


When the brightness is set to max, the backlight on the on-panel buttons is turned off.

5.9 Other Settings

Other settings

Other settings such as language, length units etc. can be found in **Settings** › **Other** in the main menu.



Option	Description
Data IO	Modem settings and viewing data on ports.
Locale	Settings for languages, units, etc.
Display	Advanced run mode settings such as background colour in run mode, point size, cross hair size, hide machine view in run mode, etc.
Grid setup	Settings for handling grid models (modification models).
Services	Advanced iCON telematics settings.
Reset	Reset the configurations: machine settings, instrument settings, etc. are removed. Projects are left intact.
Logging	Activate logging for trouble-shooting. ☞ This is not a function for logging of points.
Calibrate	Calibrate the touch screen. Consult support personnel before calibrating the screen.

5.10 Working with Terrain Models

5.10.1 Guide Line

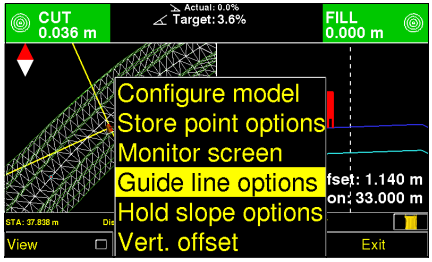
How to select a Guide line

There are two ways to select a Guide line when working with a terrain model:

- from a file, in LIN format
- graphically by touching the screen, from a file in GEO format.

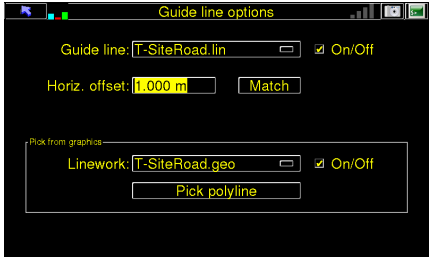
Selecting a Guide line

1. Press **Tools**.
2. Select **Guide line options**.



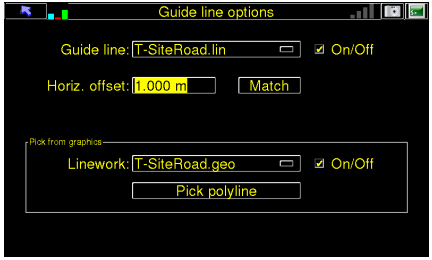
Select Guide line from file

1. Check the box to the right of **Guide line**.
2. In the drop down list, select the file with the relevant guide line.
3. By entering a value for **Horiz. offset**, the line will be moved horizontally at the given value.
4. Press **Match** to set the horizontal offset at the same distance as the bucket's perpendicular distance to the Guide line.

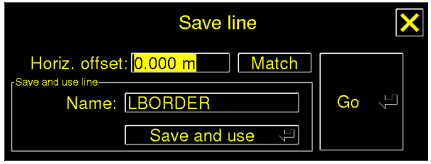


Select Guide line by touching the screen

1. Check the box to the right of **Linework**.
2. In the drop down list, select the file containing the Linework.
3. Press **Pick polyline**.



4. On the touch screen, select the line that is to be used as a Guide line.
5. Press **Go** to activate the selected Guide line and return to run mode.



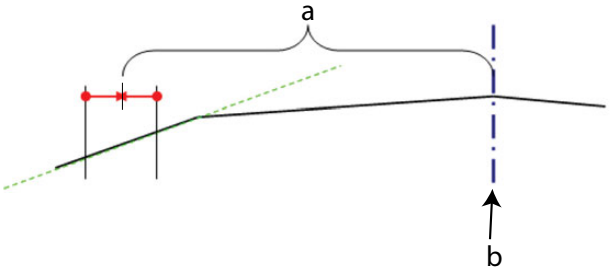
5.10.2 Locking Cross Slope

To use this function a centre line needs to be selected in the reference model settings.

Possibilities to hold a slope

In a terrain model, there are two ways to hold a cross slope:

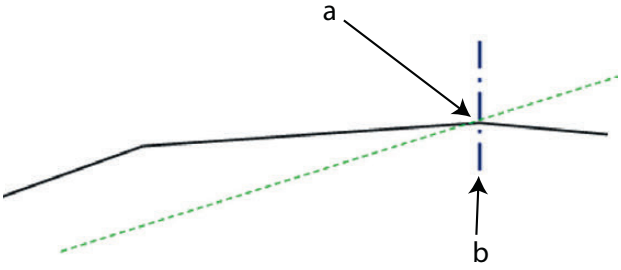
- **From centre line**



a) Hold slope distance from centre line
b) Centre line

The slope is calculated between two points at a distance of 25 cm on each side of the distance to centre line in the current cross-section.

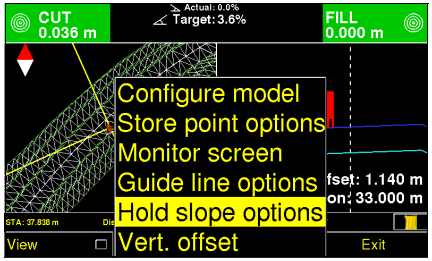
- **User-defined**



a) The slope is constant along the centre line and intersects the centre line at the same level as the reference surface intersects it.
b) Centre line

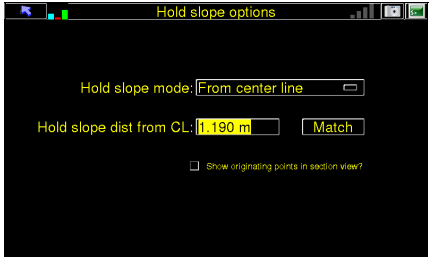
Enter Hold slope options

1. Press **Tools**.
2. Select **Hold slope options**.



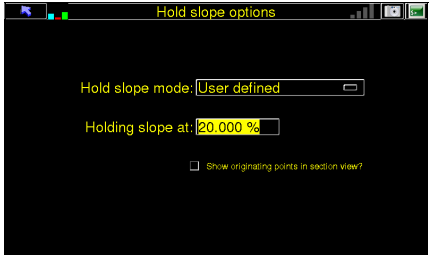
From centre line:

1. Select **From centre line** in **Hold slope mode**.
2. Enter the distance from the centre line where the slope is to be locked. Refer to "From centre line", page 84, for more information.
3. Press **Match** to automatically set the distance to the bucket's current position.
4. Use the Back key to go back.



User-defined:

1. Select **User defined** in **Hold slope mode**.
2. Enter a constant slope setting. Refer to "User-defined", page 84, for more information.
3. Use the Back key to go back.



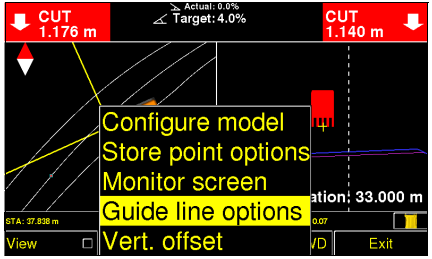
4. In run mode, press **Hold slope** to hold the cross slope according to the settings specified above.

5.11 Working with MBS (Volume Calculation Model)

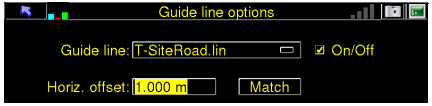
5.11.1 Selecting a Guide Line

Selecting a guide line

1. Press **Tools**.
2. Select **Guide line options**.



3. Check the box to the right of **Guide line**.
4. Select guide line as: **Centre line**, **Closest element** or **Horizontal intersection**.
5. By entering a value for **Horiz. offset**, the line will move horizontally.
6. Press **Match** to set the horizontal offset to the bucket reference point's current distance from the Guide line.
7. Use the Back key to return to run mode.



5.11.2 Holding Slopes

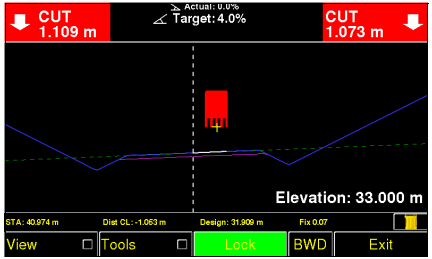
Hold the slope

There are two ways to hold the slope when working with an MBS:

- Above the element that the bucket is currently positioned over.
- Hold the slope for a specific element by choosing the element's code. Remember that the element must be coded when the MBS was created in order for this function to be available.

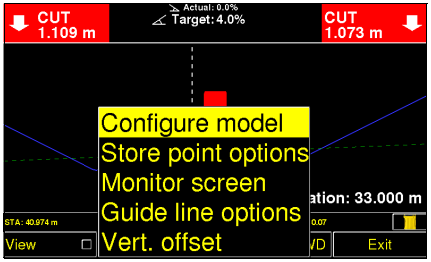
In run mode, press **Lock** to hold the slope. The key turns green when the function is activated.

- The slope above the current element will automatically be held if none of the settings below are adjusted.
- The slope setting for the selected code will be held if the function is activated in the settings. Refer to "Holding slope for an element using a code", page 89, for more information.

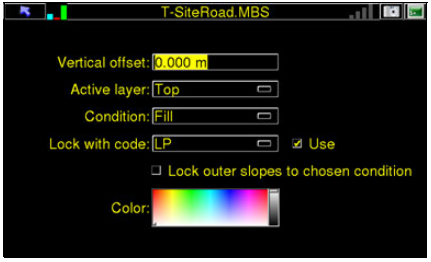


Holding slope for an element using a code

1. Press **Tools**.
2. Select **Configure model**.

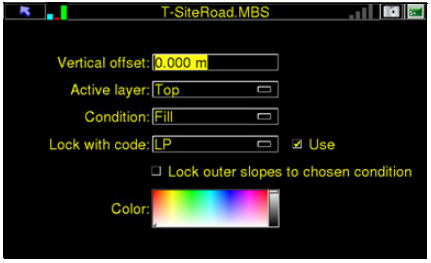


3. Check the **Use** box. If the box is left unchecked the slope setting for the element above the bucket's current positioned will be locked.
4. Select a code for the element to be locked in **Lock with code**.
5. Use the Back key to go back.



Selecting a layer

1. Press **Tools**.
2. Select **Configure model**.
3. Select **Top layer** or **Bed** in **Active layer**. CUT/FILL values will point towards an active layer.
4. Use the Back key to go back.

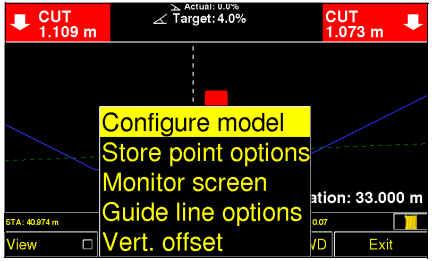


Selecting conditions for outer slope and level of bed

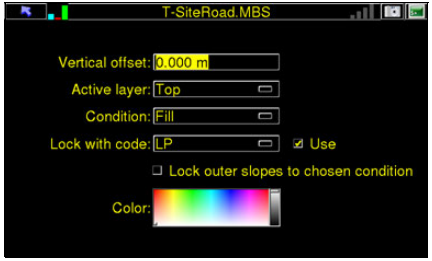
The angle of the outer slopes and levels of the bed will vary depending on the terrain the machine is working in. The steepness of the slope and other design elements are determined when creating the MBS.

If the bucket is positioned above the MBS reference surface, the outer slopes will be calculated under a CUT condition: sloping upwards. If the bucket is under the reference surface, the outer slopes will be calculated for the FILL condition: sloping downwards.

1. Press **Tools**.
2. Select **Configure model**.

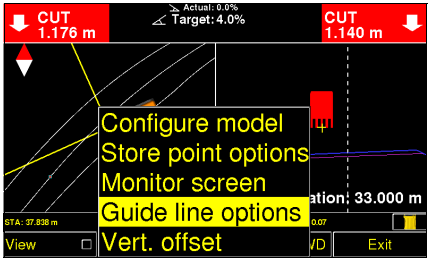


3. For **Condition**, choose between: **Fill**, **Soil**, **Rock**, **User1** or **User2**. The angle of the outer slopes and the level of the bed will vary depending on the selected option.
4. If the **Shaft** box is checked, the outer slopes will be calculated under the FILL condition, even when the bucket is above the MBS's reference surface. This is useful when building up a road bank and you want to fix the outer slopes to point downwards.
5. Use the Back key to return to run mode.

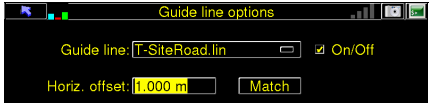


Selecting a guide line

1. Press **Tools**.
2. Select **Guide line options**.



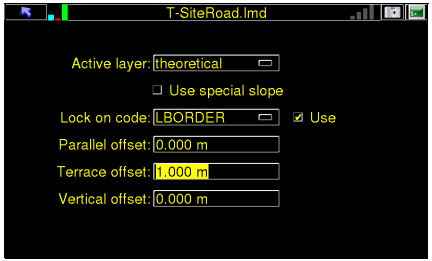
3. Check the box to the right of **Guide line**.
4. Select guide line as: **Centre line**, **Closest element** or **Horizontal intersection**.
5. By entering a value for **Horiz. offset**, the line will move horizontally.
6. Press **Match** to set the horizontal offset to the bucket reference point's current distance from the Guide line.
7. Use the Back key to return to run mode.



Terrace offset

You can move the terrace vertically but not the whole reference surface as is the case with vertical offset. This is practical when building up a road bank with fixed levels.

1. Press **Tools**.
2. Select **Configure model**.
3. Enter the distance the terrace is to be moved. When moving the terrace downward the entered value must be negative (-).
4. Use the Back key to return to run mode.



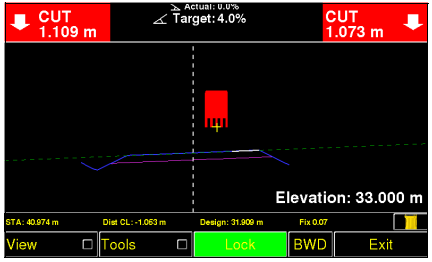
Locking the slope

There are two ways to lock a slope setting when working with a String line model:

- Above the element over which the bucket's reference point is currently positioned.
- Lock the slope for a specific element by choosing the element's code. Remember that the element must be coded when creating the string line model in order for this function to be available.

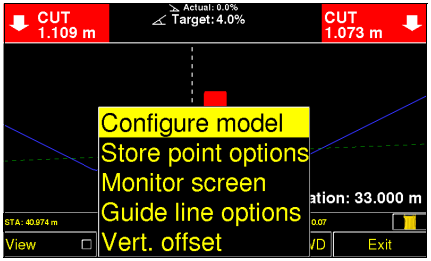
In run mode, press **Lock** to lock the slope. The key turns green when the function is activated.

- The slope above the current element will automatically be locked if none of the settings below are adjusted.
- The slope setting for the selected code will be locked if the function is activated in the settings. Refer to "Locking slope for an element using a code", page 93, for more information.

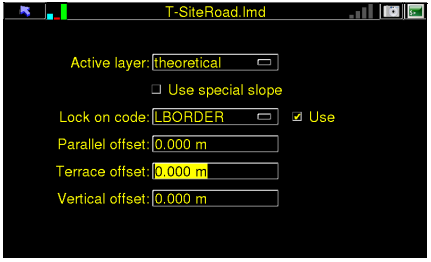


Locking slope for an element using a code

1. Press **Tools**.
2. Select **Configure model**.

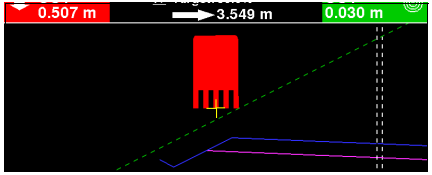


3. Check the **Use** box. If the box is left unchecked the slope setting for the element above or below the bucket reference point will be locked.
4. Select a code for the element to be locked at **Lock on code**.
5. Use the Back key to return to run mode.

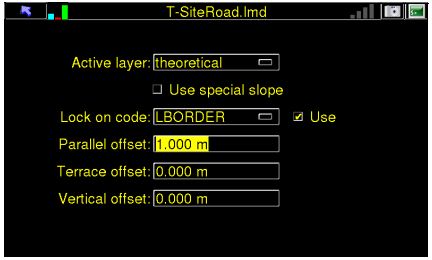


Parallel offset when locking an element

An element can be moved in parallel from the locked element. Observe that this is not the same as vertical offset where the reference surface is moved vertically up or down.



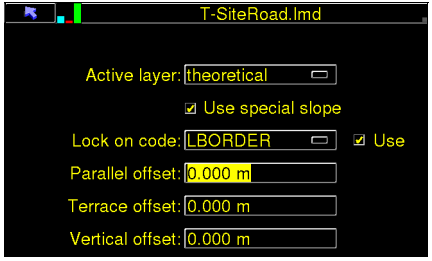
1. Press **Tools**.
2. Select **Configure model**.
3. At **Parallel offset**, enter the distance the locked element is to be moved in parallel.
4. Use the Back key to return to run mode.



Selecting a layer

When creating a line model it is possible to add information about which build-up layers are available for the model and their thicknesses. If this information is available it is possible to choose which layer the calculations will be based on.

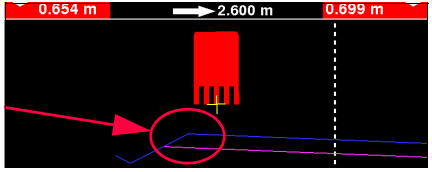
1. Press **Tools**.
2. Select **Configure model**.
3. In **Active layer**, select which capping layer you wish to work with. CUT/FILL values refer to the selected layer.
4. Use the Back key to return to run mode.



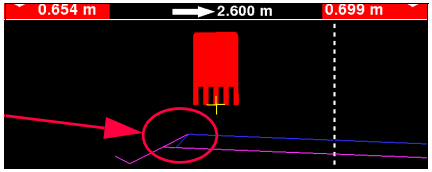
Using special slopes

Special slopes are used for minimising the consumption of expensive material. You can use a cheaper material. The slope of the special slope is set when you create the string line model. In the example below, the surface layer is in blue and the bed is in pink.

Special slope is not activated.

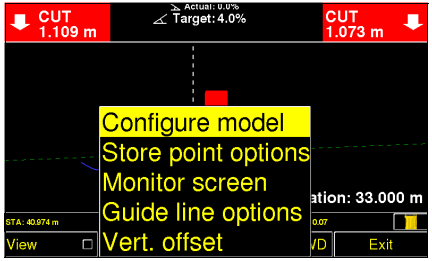


Special slope is activated, cheaper material can be used outside the taper.

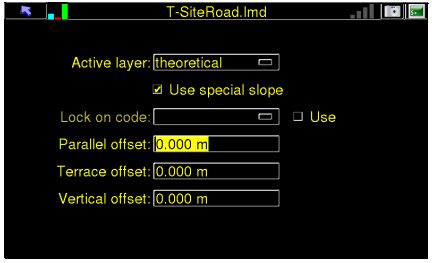


Activating the special slope

1. Press **Tools**.
2. Select **Configure model**.



3. Check the **Use special slope** box.
   Observe that the information about the tapered slope must be added when you create the line model in order for the function to work properly.
4. Use the Back key to go back.



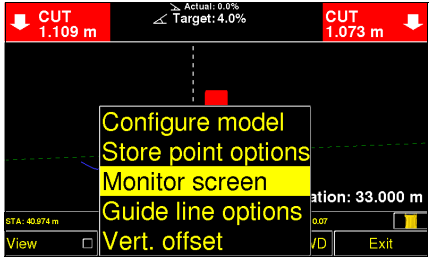
5.13 Monitor Screen

General information

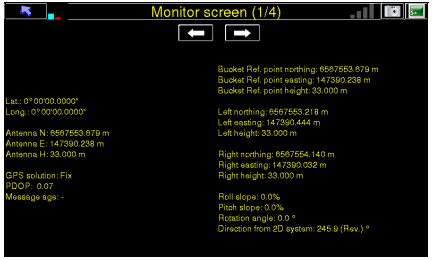
In the monitor screen you can see useful information for controlling the system and for trouble shooting. This information includes GPS status, skyplot (map with satellite coverage), bucket coordinates, system information etc.

Selecting Monitor screen

1. Press **Tools**.
2. Select **Monitor screen**.



3. There are several pages in the monitor screen. Use the ◄ and ► arrows to toggle between them.
4. Use the Back key ↖ to return to run mode.



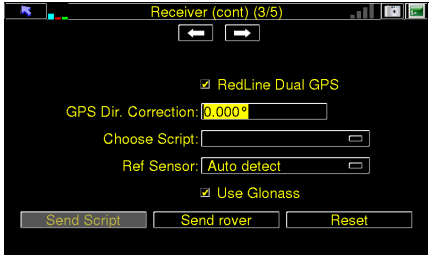
5.14 Switching Between Single and Dual GPS (PowerBox)

Switching between single and dual GPS

You can switch between single and dual GPS (one or two GPS antennas) in **Settings** › **Instruments**.

1. Press the settings key to the right of **Sensor** in the upper part of the screen.
2. Go to page 3 of this screen using the ← or → arrows.
3. To activate dual GPS, check the **RedLine Dual GPS** box. **GPS Dir. Correction** must be given a value when you are using dual GPS.
   If the PowerAntenna is positioned at the back on the right side it normally has a value of about 90 degrees. If it is at the back on the left side it is around -90 degrees.

   When using single GPS (one antenna) the box must be empty.
4. Press **Send rover**.
5. Use the Back key to go back.

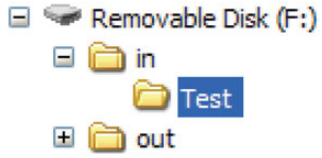


5.15 Transferring Files via USB

Transferring data to Test Project

You can transfer the Example.trm reference model from a personal computer, for example desktop PC or notebook, to a test project using an USB stick.

1. The USB stick must have a **folder** named **in** and one named **out** under the USB stick root.
2. Insert the USB stick into the PC.
3. Create a folder in the **in** folder of the USB stick and name it **Test**.



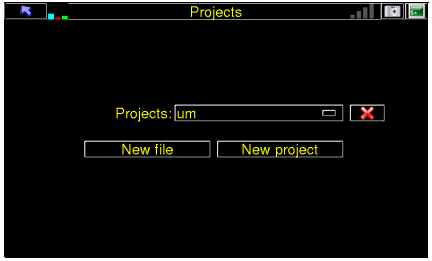
4. Copy the Example.trm file from the PC and paste it into the Test folder on the USB stick.
5. Remove the stick from the PC.
6. Insert the USB stick into the panel. It can take up to 10 seconds for the USB stick to work.
7. Go to **Tools** › **Data transfer** in the main menu.
8. Press **USB Sync**.
9. Press **OK** when the transfer is complete.
10. You can now work with the Example.trm reference model.

5.16 Selecting Projects and Reference Models

Reference models, localisations (coordinate systems) etc. are stored in a project.

Selecting a project

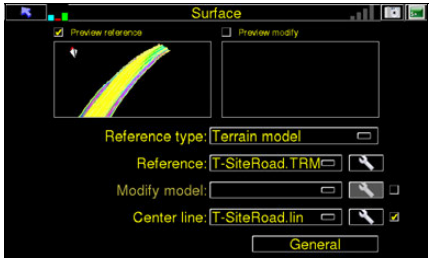
To select a project, go to **Settings** › **Projects**.
Select a **Project** from the list.
Or:
As the Settings menu can be password protected, you can also select a project in **Projects** in the **main menu**. Preselected reference models and localisations will automatically be activated.
Select a **Project** from the list.



Selecting a reference model

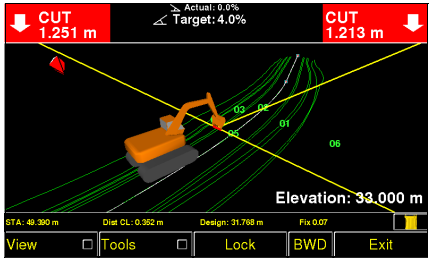
You can select a reference model in **Settings** › **Surface**.

1. Select **Reference type**.
2. Select **Reference**.
3. If you are working with a terrain model you can activate and select a **Centre line**. Locked slopes with terrain models will relate to this line.



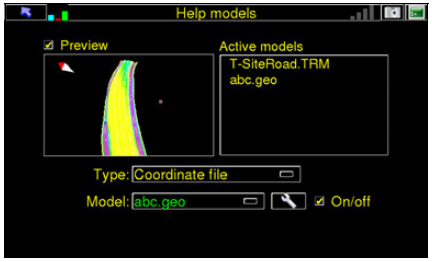
Viewing help models in the graphics window

Background images (help models) can be shown in plan view. Help models are a visual tool only and cannot be used for calculations. Several help models can be viewed at the same time. Examples of help models include road shoulders, power cables, etc.

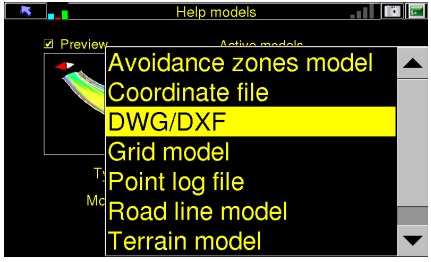


To select a help model, go to **Settings** › **Help models**.

1. Select the **Type** of file.
2. Select the **Model** you wish to view.
3. Check the **On/Off** box to activate the help model.



Dwg/dxf models can also be used as an ordinary help model. Select the dwg/dxf model like an ordinary help model.
All models in **Active models** can be viewed in the plan view in run mode.



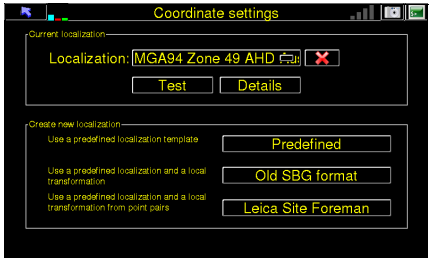
☞ Avoidance zones are set here. Refer to "5.4 Avoidance zones" for further information.

5.17 Localisation Settings (Coordinate Systems)

A localisation is the transformation from global to a local coordinate system and is carried out in iCON 3D. When using the PowerBox the localisation can be done directly in the PowerBox. When using iCON gps 80, localisation must be done in iCON 3D.

Using localisation in SBG LOK format

1. Transfer the LOK file to the current project for example via USB.
2. Go to **Settings** › **Localisation**.
3. Select the appropriate **Localisation** from the list.

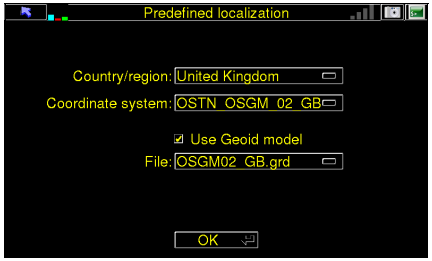


If a geoid model is used by the LOK file, it should be saved in the global folder.
Refer to "Transferring a geoid model to the system", page 106, for more information.

Using predefined coordinate systems

Several national/regional coordinate systems are preinstalled.

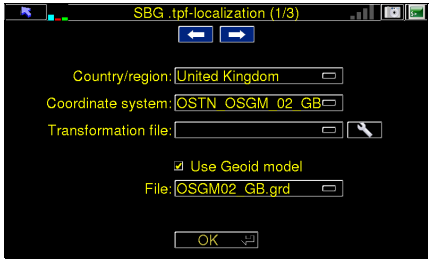
1. Go to **Settings** › **Localisation** › **Predefined**.
2. Select **Country/region** and **Coordinate system**.
3. To use a geoid model, check the **Use Geoid model** box and select the appropriate file.



The geoid model must be stored in the global folder.
Refer to "Transferring a geoid model to the system", page 106, for more information.

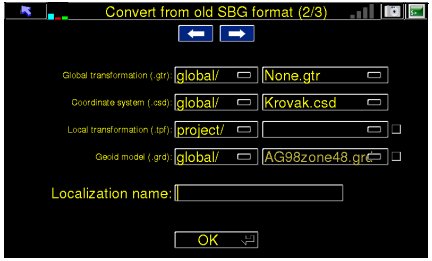
Local transformation in SBG TPF format

1. Transfer the TPF file to the current project for example via USB.
2. Go to **Settings** › **Localisation** › **Old SBG formats** (first page).
3. Select **Country/region** and **Coordinate system** that the TPF file was created in.
4. Select the correct **Transformation file** (TPF).
5. If a geoid model was being used when the TPF file was created, check the **Use Geoid model** box and select the correct file.



The geoid model must be stored in the global folder. Refer to "Transferring a geoid model to the system", page 106, for more information.

Coordinate systems in the old SBG formats (GTR, CSD, GRD, TPF)



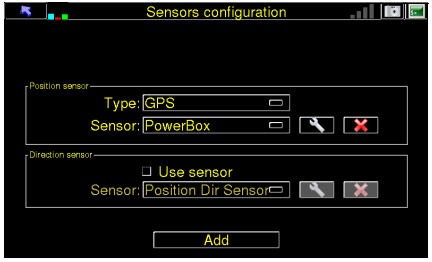
1. Transfer coordinate system files to the current project, for example with USB.
2. Go to **Settings** › **Localisation** › **Old SBG formats** (first page).
3. Go to page 2 of this screen using the ← or → arrows.
4. Specify whether the **GTR file** is stored in the global folder or project folder in the list on the left. Select GTR file from the list on the right.
5. Specify whether the **CSD file** is stored in the global or project folder in the list on the left. Select the CSD file from the list on the right.
6. For **local transformations**, check the box on the right, specify if the **TPF file** is stored in the global or project folder in the list on the left. Select the TPF file from the list on the right.
7. If a geoid model is used by the TPF file, check the box on the right, specify if the **Geoid file** is stored in the global or project folder in the list on the left. Select the geoid file from the list on the right. Observe that the geoid file must be stored in the global folder. Refer to "Transferring a geoid model to the system", page 106, for more information.

PowerBox: Localisation in the receiver using TRFSET.DAT

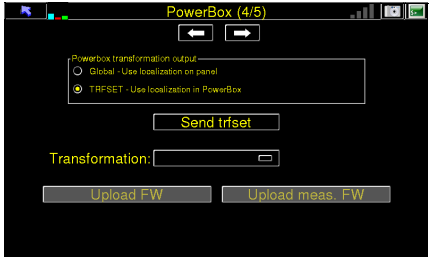
It is possible to transfer a Leica localisation file (transformation set, trfset.dat) and its accompanying geoid models (.gem) and correction grids (.csc) to the Leica PowerBox. The localisation must then be selected in the machine control software as per the instructions below. The PowerBox must be connected and plugged in to the power supply.

No localisation in iCON 3D is used when using the PowerBox to transform the coordinates!

1. Transfer the TRFSET.DAT file to the current project for example via USB.
2. Go to **Settings** › **Instruments**.
3. Press the settings key to the right of Sensor in the upper box.



4. Go to page 4 of this screen using the or arrows.
5. Select **TRFSET - Use localization in PowerBox**.
6. Press **Send trfset** to upload the TRFSET file to the PowerBox.



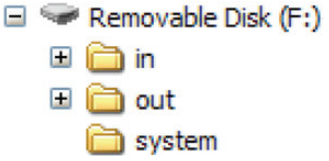
7. Select the appropriate localisation from the Transformation list. Observe that available options in the list are read from trfset.dat, stored in the PowerBox.

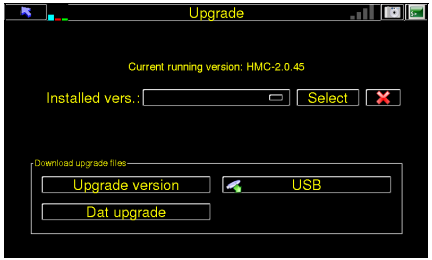
If the localisation is performed in the machine control software, **Transformation** must be set to **WGS84**.

Transferring a geoid model to the system

Geoid models must be stored in the global folder.
Upgrade files with geoid models and coordinate systems can be found on the USB memory supplied with the system, downloaded via iCON telematics.

1. Create a folder on a USB stick and name it **system**. You can use any USB stick.
2. Copy the DAT file and paste it into the system folder.
3. In the machine control software, go to **Tools** › **About** › **Upgrade**.
4. Press **USB**.
5. Select the appropriate DAT file from the list.
6. Press **OK**.
7. Follow the instructions on the screen.





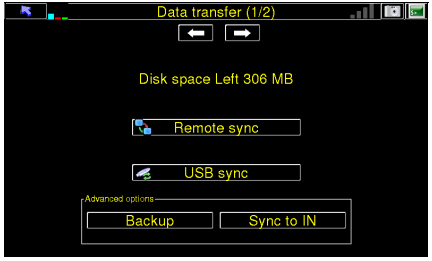
5.18 iCON telematics

iCON telematics allows for remote version upgrading, remote file transfer, remote screen sharing/controlling and live monitoring of the machine's position for fleet tracking.
This functionality requires an iCON telematics license.

For more detailed information on how to setup iCON telematics, visit the iCON telematics homepage.

Remote file transfer, iCON sync

iCON sync synchronizes the files on the machine with those on the iCON telematics server, meaning that new design files are synchronized to the machine control software and survey files from the machine control software are synchronized to the server.

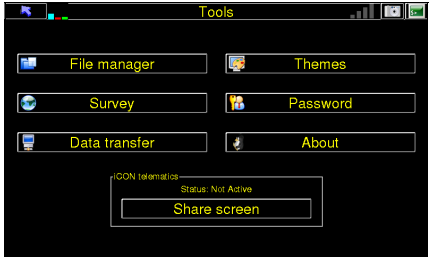


1. In the machine control software, go to **Tools** › **Remote sync**.
2. When done, press **OK**.

Remote Support, iCON view

iCON view activates remote viewing/controlling of the screen from the iCON telematics server meaning that support personnel can share the same screen as the operator.

1. In the machine control software, go to **Tools** from the main menu.
2. Press **Share screen**.
3. When screen is shared, a pop-up will inform of this. Press **OK**.
4. When done, press the same button again to exit iCON view.



6 iCON gps 80

6.1 The iCON gps 80 GNSS receiver

Description

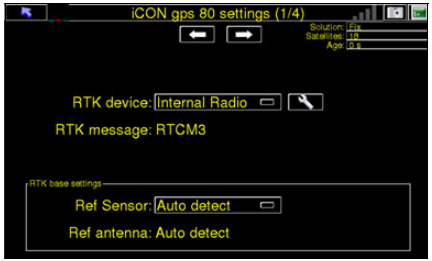
The iCON gps 80 receiver is a high performance on-machine GNSS receiver and must be connected via CAN to work. Refer to the installation manual for how to properly install it. iCON 3D automatically detects if an iCON gps 80 unit is connected.

The first time an iCON gps 80 units is detected by iCON 3D it will prompt you to name it and configure it.

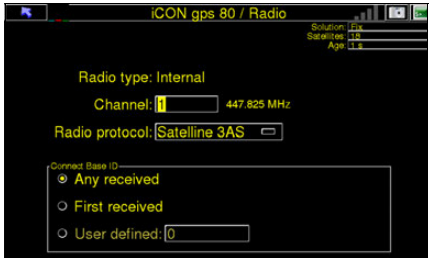
☞ All coordinate systems are handled by localisation files (.lok) in iCON 3D.

Operating the iCON gps 80 receiver with the internal radio

The settings for the selected iCON gps 80 profile can be found at:
Main menu > Settings > Instruments



1. Select “Internal Radio” as RTK device.
   The RTK message is automatically detected.
2. Select the brand of the RTK base sensor.
   If it is a Leica Base you can select “Auto detect”.
3. Enter the settings by pressing the button.



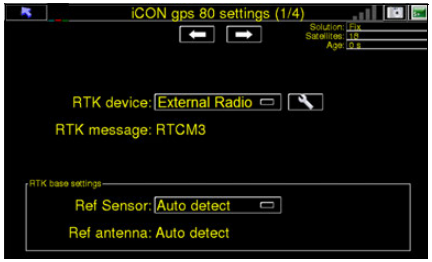
4. Set the correct radio channel.
5. Enter the radio protocol used.
6. Enter which mode for the connection base ID is used.
7. Exit the settings page by pressing the button. You will be asked to save the settings.
   Press “Yes” if the settings are correct.
   Pressing “No” will undo the settings.

All settings that are done, are immediately applied onto the receiver.

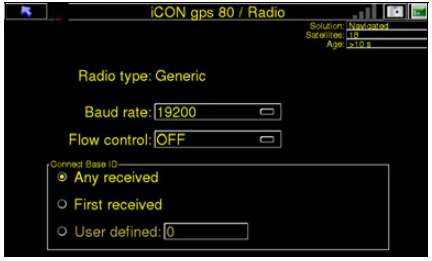
Ask the site supervisor about the radio connection details used.

Operating the iCON gps 80 receiver with external radio

The settings for the selected iCON gps 80 profile can be found at:
Main menu > Settings > Instruments



1. Select “External Radio (P2)” as RTK device.
   The RTK message is automatically detected.
2. Select the brand of the RTK base sensor. If it is a Leica Base you can select “Auto detect”.
3. Enter the settings by pressing the button.

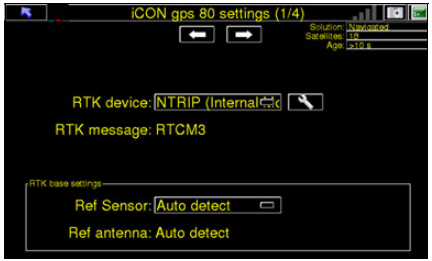


4. Set the correct baud rate of the external radio.
5. Enter flow control ON/OFF.
6. Enter which mode for the connection base ID is used.
7. Exit the settings page by pressing the button. You will be asked to save the settings.
   Press “Yes” if the settings are correct.
   Pressing “No” will undo the settings.

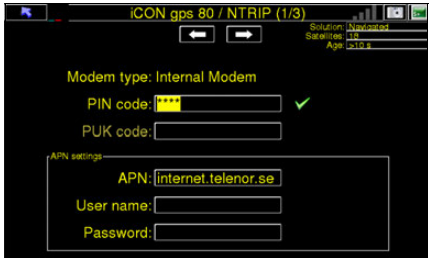
Ask the site supervisor about the radio connection details used.

Operating the iCON gps 80 receiver using NTRIP

The settings for the selected iCON gps 80 profile can be found at:
Main menu > Settings > Instruments

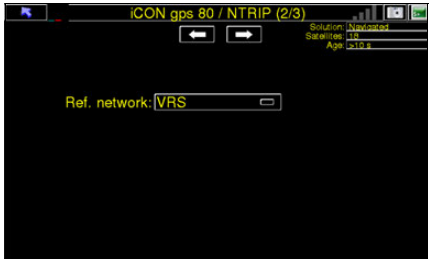


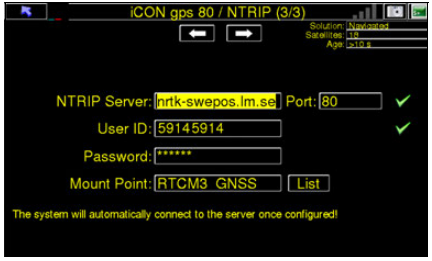
1. Select “NTRIP” as RTK device.
   The RTK message is automatically detected.
2. Select the brand of the RTK base sensor.
   If it is a Leica Base you can select “Auto detect”.
3. Enter the settings by pressing the button.



4. Enter the PIN code of the SIM card.
   The symbol indicates a correct PIN code and the symbol indicates an incorrect PIN code. You have three attempts before the SIM card must be unlocked by the PUK code.
5. Enter the APN settings provided by the SIM card provider:
   - APN
   - User name
   - Password

6. Press the ← and → arrows to change pages.
7. Select the reference network used by the RTK service.
8. Enter the NTRIP server details:
   - Server
   - Port
   - User name
   - Password
9. Select the mount point used. The mount point list can be retrieved by pressing “List”.
10. Exit the settings page by pressing the ↖ button. You will be asked to save the settings. Press “Yes” if the settings are correct. Pressing “No” will undo the settings.

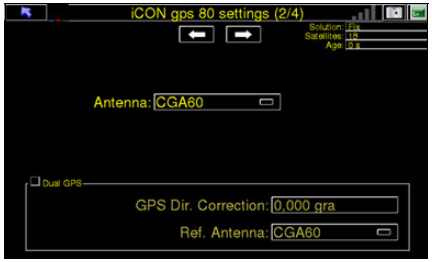




Ask the SIM card provider for data connection details and the person in charge of NTRIP account for details on the RTK connection.

Changing the GNSS antenna

The settings for the selected iCON gps 80 profile can be found at:
Main menu > Settings > Instruments



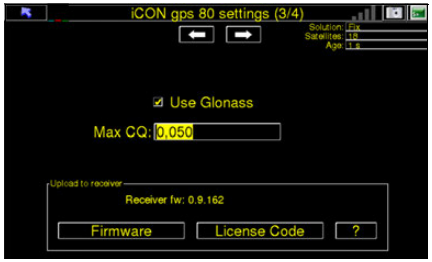
1. Press the ← and → arrows to change pages.
2. In the antenna list, select the GNSS antenna connected to the receiver.
3. Exit the settings page by pressing the button. You will be asked to save the settings. Press “Yes” if the settings are correct. Pressing “No” will undo the settings.

If the system is used on an Excavator or Wheel Loader, please follow the procedure below:

1. Check the “Dual GPS” check box.
2. Enter the GPS Dir. Correction.
   This value is calculated when calibrating the machine.
3. Select the Ref. antenna.
   This is the dual GNSS antenna connected to the receiver.

Selecting GLONASS and changing CQ value

The settings for the selected iCON gps 80 profile can be found at:
Main menu > Settings > Instruments



1. Press the ← and → arrows to change pages.
2. To select/deselect using GLONASS for the position calculations on this machine, use the “Use GLONASS” check box.
3. To decrease/increase the Coordinate Quality (CQ) value, enter the new value into the “Max CQ” field. A higher value means that iCON 3D will accept a lower coordinate quality before warning about too high CQ value in run mode.
4. Exit the settings page by pressing the button. You will be asked to save the settings. Press “Yes” if the settings are correct. Pressing “No” will undo the settings.

7 Care and Transport

7.1 General Notices

General information	Servicing the system only requires a minimum of time. All electronic components are enclosed in robust housings to safeguard them against mechanical damage.
Periodic checks	If any iCON excavate iCP41 components are subjected to severe impact, be sure to check for proper operation prior to performing any work with the system.

7.2 Transport

Transport in the field	When transporting the equipment in the field, always make sure that you carry the product in its original transport container.
Transport in a road vehicle	Never carry the product loose in a road vehicle, as it can be affected by shock and vibration. Always carry the product in its transport container and secure it.
Shipping	When transporting the product by rail, air or sea, always use the complete original Leica Geosystems packaging, transport container and cardboard box, or its equivalent, to protect against shock and vibration.

7.3 Storage

Product	Respect the temperature limits when storing the equipment, particularly in summer if the equipment is inside a vehicle. Refer to "9 Technical Data" for information about temperature limits.

7.4 Cleaning and Drying

Product	• Blow off dust. • Use a clean, soft, lint-free cloth for cleaning. If necessary, moisten the cloth with water or pure alcohol. Do not use other liquids; these may attack the polymer components.
Cables and Plugs	Keep plugs clean and dry. Blow away any dirt lodged in the plugs of the connecting cables.
Damp products	Dry the product, the transport container, the foam inserts and the accessories at a temperature not greater than +40°C / +104°F and clean them. Always close the transport container when using in the field.
Connectors with dust caps	Wet connectors must be dry before attaching the dust cap.

8 Safety Directions

8.1 General

Description

The following directions should enable the person responsible for the product, and the person who actually uses the equipment, to anticipate and avoid operational hazards.

The person responsible for the product must ensure that all users understand these directions and adhere to them.

8.2 Intended Use

Permitted use

- Determine the position of a dozer/grader blade or excavator bucket.
- Calculate the distance between the blade/bucket and a reference model (surface, line or point).
- Automatic adjustment of a dozer/grader hydraulic system in order to match the blade to the reference model.

Reasonably foreseeable misuse

- Use of the product without instruction.
- Use outside of the intended limits.
- Disabling safety systems.
- Removal of hazard notices.
- Opening the product using tools, for example screwdriver, unless this is specifically permitted for certain functions.
- Modification or conversion of the product.
- Use after misappropriation.
- Use of products with obviously recognizable damages or defects.
- Use with accessories from other manufacturers without the prior explicit approval of Leica Geosystems.

- Inadequate safeguards at the work site, for example working on roads.
- Controlling of machines, moving objects or similar monitoring application without additional control- and safety installations.

8.3 Limits of Use

Environment

Suitable for use in an atmosphere appropriate for permanent human habitation: not suitable for use in aggressive or explosive environments.

Danger

Local safety authorities and safety experts must be contacted before working in hazardous areas, or in close proximity to electrical installations or similar situations by the person in charge of the product.

8.4 Responsibilities

Manufacturer of the product

Leica Geosystems AG, hereinafter referred to as Leica Geosystems, is responsible for supplying the product, including the user manual and original accessories, in a completely safe condition.

Person responsible for the product

The person responsible for the product has the following duties:
- To understand the safety instructions on the product and the instructions in the user manual.
- To ensure that it is used in accordance with the instructions.
- To be familiar with local regulations relating to safety and accident prevention.
- To inform Leica Geosystems immediately if the product and the application becomes unsafe.
- To ensure that the national laws, regulations and conditions for the operation of e.g. radio transmitters are respected.

Warning This product may be installed on building machinery only by an appropriately trained and qualified specialist.

8.5 Hazards of Use

Warning Only Leica Geosystems authorised service workshops are entitled to repair these products.

Warning Unauthorised modification of building and constructions machines by mounting or installing the product may alter the function and safety of the machine.
Precautions:
Follow the instructions of the machine manufacturer. If no appropriate instruction is available, ask machine manufacturer for instructions before mounting or installing the product.

Caution Installing near mechanically moving machine components may damage the product.
Precautions:
Deflect the mechanically moving machine components as far as possible and define a safe installation zone.

Warning Beware of inadequate steering if machine is defective like after a crash or other damaging events or alterations to the machine.
Precautions:
Periodically perform control measurements and field adjustments on the machine as specified in the User Manual. While working, construction and grading should be checked by appropriate means, for example spirit level, tachymeter, before and after important measuring tasks.

⚠ Warning

While steering or navigating the machine accidents may occur due to a) the operator not paying attention to the surroundings (persons, ditches, traffic, etc.), or b) malfunctions (...of a system component, interference, etc).

Precautions:

The operator assures that the machine is operated, guided and monitored by a qualified user (e.g. driver). The user has to be able to take emergency measures, for example an emergency stop.

⚠ Warning

When working near magnetic fields or objects which might influence the magnetic field, check results for plausibility.

⚠ Warning

The absence of instruction, or the inadequate imparting of instruction, can lead to incorrect or adverse use, and can give rise to accidents with far-reaching human, material, financial and environmental consequences.

Precautions:

All users must follow the safety directions given by the manufacturer and the directions of the person responsible for the product.

⚠ Caution

Watch out for erroneous measurement results if the product has been dropped or has been misused, modified, stored for long periods or transported.

Precautions:

Periodically carry out test measurements and perform the field adjustments indicated in the user manual, particularly after the product has been subjected to abnormal use and before and after important operations.

⚠ Danger

Because of the risk of electrocution, it is very dangerous to use poles and extensions in the vicinity of electrical installations such as power cables or electrical railways.

Precautions:

Keep at a safe distance from electrical installations. If it is essential to work in this environment, first contact the safety authorities responsible for the electrical installations and follow their instructions.

⚠ Warning

During dynamic applications, there is a danger of accidents occurring if the user does not pay attention to the environmental conditions around, for example obstacles, excavations or traffic.

Precautions:

The person responsible for the product must make all users fully aware of the existing dangers.

⚠ Warning

Inadequate securing of the work site can lead to dangerous situations, for example in traffic, on building sites, and at industrial installations.

Precautions:

Always ensure that the work site is adequately secured. Adhere to the regulations governing safety and accident prevention and road traffic.

⚠ Caution

If the accessories used with the product are not properly secured and the product is subjected to mechanical shock, for example blows or falling, the product may be damaged or people may sustain injury.

Precautions:

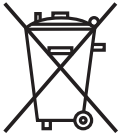
When setting-up the product, make sure that the accessories, for example tripod, tribrach, connecting cables, are correctly adapted, fitted, secured, and locked in position.
Avoid subjecting the product to mechanical stress.

⚠ Warning

If the product is improperly disposed of, the following can happen:

- If polymer parts are burnt, poisonous gas are produced which may impair health.
- If batteries are damaged or are heated strongly, they can explode and cause poisoning, burning, corrosion or environmental contamination.
- By disposing of the product irresponsibly you may enable unauthorised persons to use it in contravention of the regulations, exposing themselves and third parties to the risk of severe injury and rendering the environment liable to contamination.

Precautions:



The product must not be disposed with household waste. Dispose of the product appropriately in accordance with the national regulations in force in your country. Always prevent access to the product by unauthorised personnel.

Product specific treatment and waste management information can be downloaded from the Leica Geosystems home page at http://www.leica-geosystems.com/treatment or received from your Leica Geosystems dealer.

8.6 Electromagnetic Compatibility EMC

Description

The term Electromagnetic Compatibility is taken to mean the capability of the product to function smoothly in an environment where electromagnetic radiation and electrostatic discharges are present, and without causing electromagnetic disturbances to other equipment.

Warning

Electromagnetic radiation can cause disturbances in other equipment.
Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment may be disturbed.

Caution

There is a risk that disturbances may be caused in other equipment if the product is used in conjunction with accessories from other manufacturers, for example field computers, personal computers, two-way radios, non-standard cables or external batteries.
Precautions:
Use only the equipment and accessories recommended by Leica Geosystems.
When combined with the product, they meet the strict requirements stipulated by the guidelines and standards. When using computers and two-way radios, pay attention to the information about electromagnetic compatibility provided by the manufacturer.

Caution

Disturbances caused by electromagnetic radiation can result in erroneous measurements.
Although the product meets the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that the product may be disturbed by very intense electromagnetic radiation, for example, near radio transmitters, two-way radios or diesel generators.
Precautions:
Check the plausibility of results obtained under these conditions.

Warning

If the product is operated with connecting cables attached at only one of their two ends, for example external supply cables, interface cables, the permitted level of electromagnetic radiation may be exceeded and the correct functioning of other products may be impaired.
Precautions:
While the product is in use, connecting cables, for example product to external battery, product to computer, must be connected at both ends.

Radios

Use of product with radio devices:

Warning

Electromagnetic fields can cause disturbances in other equipment, in installations, in medical devices, for example pacemakers or hearing aids and in aircraft. It can also affect humans and animals.
Precautions:
Although the product meets in combination with radio devices recommended by Leica Geosystems the strict regulations and standards which are in force in this respect, Leica Geosystems cannot completely exclude the possibility that other equipment may be disturbed or that humans or animals may be affected.

- Do not operate the product with radio devices in the vicinity of filling stations or chemical installations, or in other areas where an explosion hazard exists.
- Do not operate the product with radio devices near medical equipment.
- Do not operate the product with radio devices in aircraft.

8.7 ICES-003 Statement, Applicable in Canada

Warning

This Class (A) digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe (A) est conforme à la norme NMB-003 du Canada.

8.8 FCC Statement, Applicable in U.S.

Applicability

The grayed paragraph below is only applicable for products without radio.

Warning

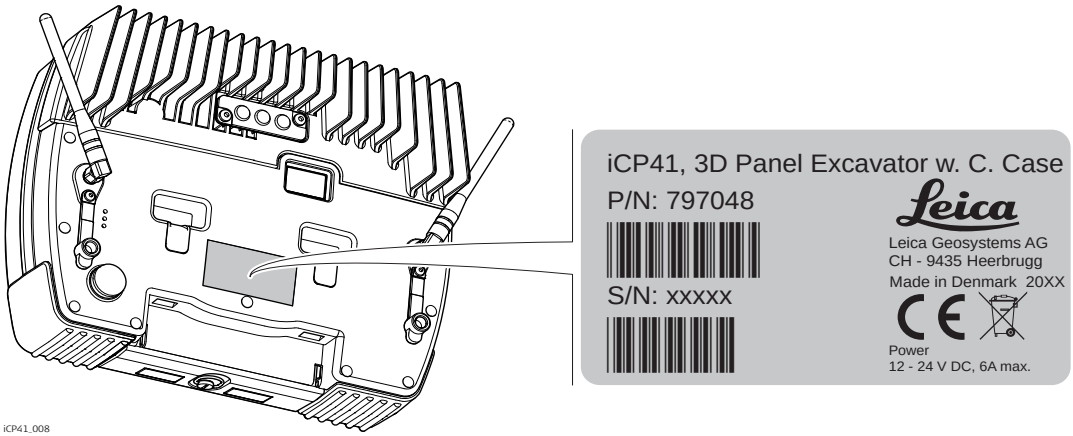
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules.
These limits are designed to provide reasonable protection against harmful interference in a residential installation.
This equipment generates, uses and can radiate frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communication.
However, there is no guarantee that interference will not occur in a particular installation.
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

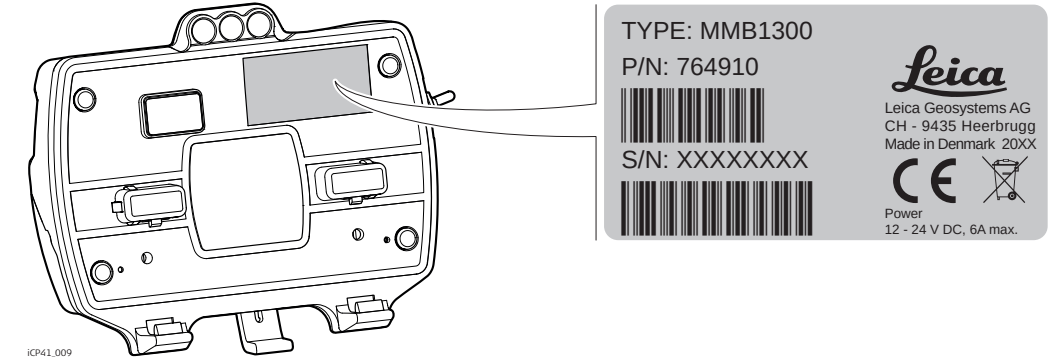
Warning

Changes or modifications not expressly approved by Leica Geosystems for compliance could void the user's authority to operate the equipment.

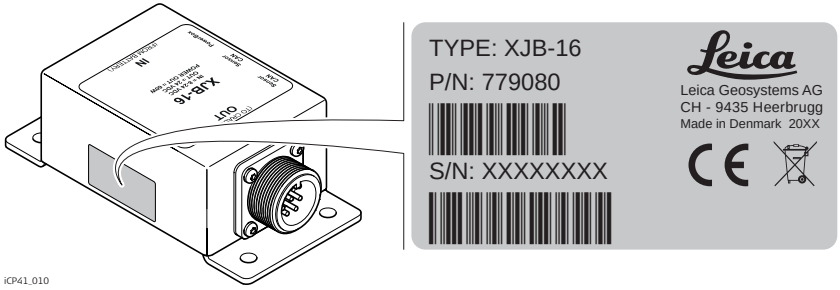
Labelling Control Box



Labelling Cradle

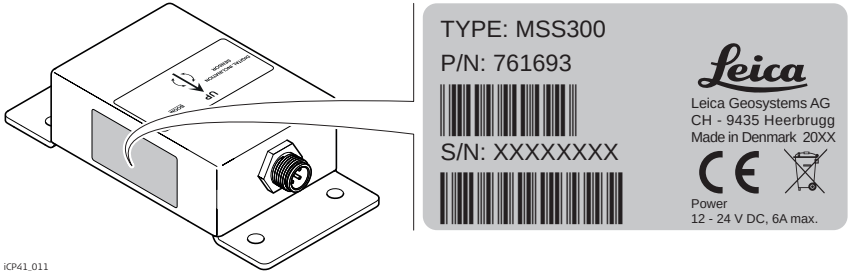


Labelling Junction Box



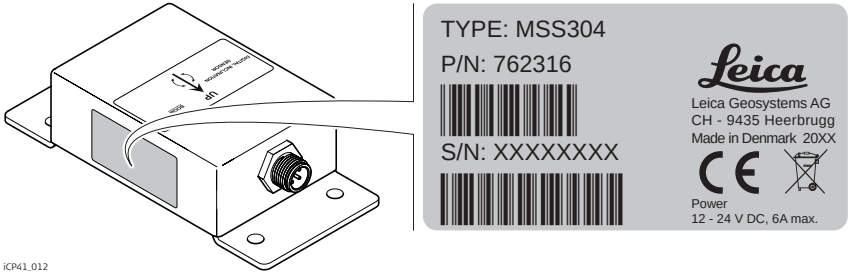
iCP41_010

Labelling Boom 1 Sensor



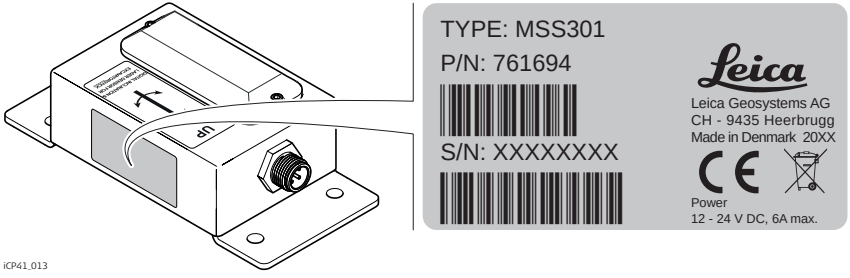
iCP41_011

Labelling Boom 2 Sensor



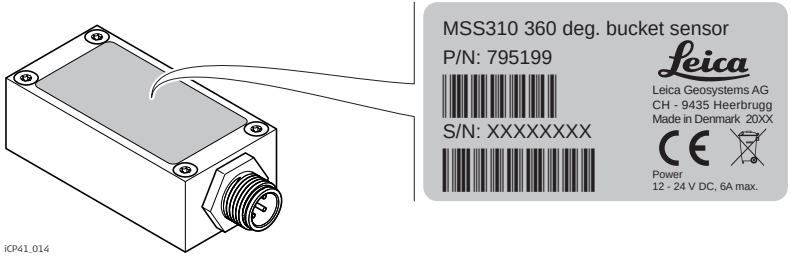
iCP41_012

Labelling Stick/Laser Sensor



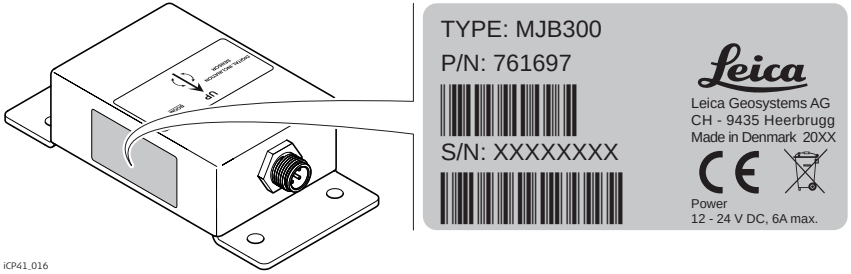
iCP41_013

Labelling Bucket Sensor

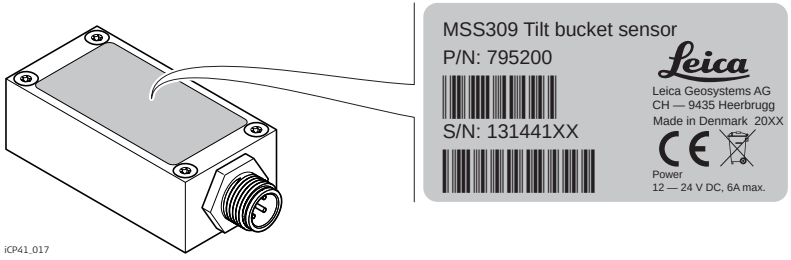


Labelling Compass and Pitch/Roll Sensor

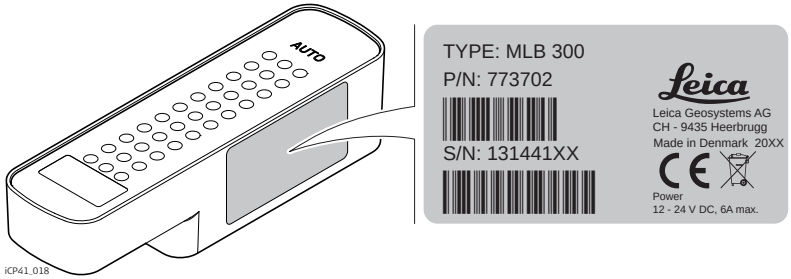
Labelling Can Junction Box



Labelling Tilt Bucket Sensor



Labelling
Remote Display



9 Technical Data

9.1 iCON excavate iCP41 Technical Data

The iCON excavate iCP41 is designed to operate from standard vehicle power systems at 12V / 24V DC - check to ensure proper connection and polarity.

Instrument ports

Name	Description
SIM card port	• 1 x SIM card support • This port is located at the base of the instrument.
USB port	• 1 x USB 2.0 port • This port is located at the base of the instrument.
HSPA Modem	• HSPA modem for GPRS/GSM/EDGE/HSPA/UMTS communication. • This port is housed within the instrument.
WLAN	• WiFi IEEE 802.1 a/g controller • This port is housed within the instrument.

Instrument dimensions

Length [mm]	Height [mm]	Thickness [mm]
222	170	88

Weight

1.8 kg

Power

External supply voltage (cradle): Nominal voltage 24 V DC, Range 20 V-28 V
Power consumption: 1.1 A @ 24 V cradle and iCON excavate iCP41

Antennas

- 1 x WiFi antenna reverse SMA connector
- 1 x HSPA antenna reverse SMA connector

Environmental specifications

Temperature

Type	Operating temperature [°C]	Storage temperature [°C]
Instrument	-25 to +55	-40 to +85

Protection against water, dust and sand

Type	Protection
Instrument	IP56 (IEC 60529)

Humidity

Type	Protection
Instrument	Max 95 % non condensing The effects of condensation are to be effectively counteracted by periodically drying out the instrument.

Miscellaneous

Input and buttons*

- 4 buttons on each side of the display
- 6 function buttons under the display
- Navigation, Menu, Enter and ESC buttons

* The assignment of these buttons can vary depending on the software running on the iCON excavate iCP41.

CPU, Chipset, VGA and Audio

- ADLink ETX667-423
- Intel Celeron M 1Ghz 1Mb L2
- NXP lpc2300 microcontroller

Memory

- SDRAM SO-DIMM

IDE port

- Compact FLASH

9.2 General Technical Data

Protection class

Unit	Protection class
All Sensors	IP68
Cradle	IP54
Junction Box	IP68
Can Junction Box	IP68

Temperature

Unit	Operating temperature [°C]	Storage temperature [°C]
All Sensors	-20 to +70	-40 to +80

Cradle

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	< 2.5A with control box connected and no load at 12 V
Output	2 x RS232, RX, TX, 12V/2Amp, GND, 2 x CAN and J1939
Communication (Infrared)	1 Mbit
Dimensions	12.4 x 15.2 x 4.4 cm
Weight	0.320 kg

Bucket Sensor

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	0,2A @ 24VDC
Interfaces	1x CAN M12
Dimensions	2.5 x 2.5 x 5 cm
Weight	0.100 kg

Stick/Laser Sensor

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	0,2A @ 24VDC
Interfaces	2 x CAN M12
Range	19 cm to 150 m (depended on laser)
Laser requirement	All Rotating Lasers (visible HeNe, invisible Infrared diodes Laser)
Operating range	55 mm
Dimensions	8 x 12 x 3 cm
Weight	0.750 kg

Tilt Bucket Sensor

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	0,2A @ 24VDC
Interfaces	1 x CAN M12
Dimensions	2.5 x 2.5 x 5 cm
Weight	0.100 kg

Rotation Sensor

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	0,2A @ 24VDC
Interfaces	2 x CAN M12
Dimensions	ø 7 cm, hight incl. Mast: 80 cm
Weight	0.500 kg

Can Junction Box

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	0,2A @ 24VDC
Interfaces	2 x CAN M12
Dimensions	8 x 12 x 3 cm
Weight	0.750 kg

Angle sensor

Parameter	Specification
Voltage range	12/24 Volts dc (nom)
Current consumption	0,2A @ 24VDC
Interfaces	2 x CAN M12
Dimensions	8 x 12 x 3 cm
Weight	0.750 kg

9.3 Conformity to National Regulations

Conformity to national regulations

- FCC Part 15, 22 and 24 (applicable in US)
- Hereby, Leica Geosystems AG, declares that the iCON excavate iCP41 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC and other applicable European Directives. For the declaration of conformity please contact your Leica Geosystems distributor.

Class 1 equipment according European Directive 1999/5/EC (R&TTE) can be placed on the market and be put into service without restrictions in any EEA member state.

- The conformity for countries with other national regulations not covered by the FCC part 15, 22 and 24 or European directive 1999/5/EC has to be approved prior to use and operation.

Frequency band

Type	Frequency band [MHz]
WLAN	2412 - 2483.5
HSPA	**GSM, GPRS, EDGE** 850 MHz, 900 MHz, 1800 MHz, 1900 MHz
	UMTS WCDMA, HSDPA, HSUPA 800 MHz, 850 MHz, 900 MHz, 1900 MHz, 2100 MHz
	Receive diversity: Optimised for diversity on 800, 850, 900, 1900 and 2100 MHz

Output power

Type	Output power [dBm]
WLAN	15 @ 54 Mbps
EGSM 900/GSM 850 Power Class 4	2 W / 33 dBm
GSM 1800/1900 Power Class 1	1 W / 30 dBm
EDGE Power Class E2 for 850/900	0.5 W / 27 dBm
EDGE Power Class E2 for 1800/1900	0.4 W / 26 dBm

Antenna

WLAN: Gain: 2dBi at 2.4GHz
HSPA: Gain: 2dBi at 2.4GHz

10 International Limited Warranty, Software License Agreement

International Limited Warranty

This product is subject to the terms and conditions set out in the International Limited Warranty which you can download from the Leica Geosystems home page at http://www.leica-geosystems.com/internationalwarranty or collect from your Leica Geosystems distributor.

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- when it has to be **right**

Leica Geosystems