

# Leica iCONgrade iCP32 User Manual



Version 1.0  
English

- when it has to be **right**

**Leica**  
Geosystems

HITCHDOC HE1596\_R0; OWNERS MANUAL, LEICA iCP32

## Introduction

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### Purchase

Congratulations on your purchase of iCONgrade machine control system. iCONgrade System is an ideal tool for increasing productivity in all aspects of the construction earthmoving industry.

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This manual contains important safety directions as well as instructions for setting up the system and operating it. Refer to the chapter "4 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.
- 

### 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:      iCP32 Control Box      Serial No.:      \_\_\_\_\_

Type:      MMB1300 Cradle      Serial No.:      \_\_\_\_\_

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## Symbols

The symbols used in this manual have the following meanings:

Type	Description
 <b>Danger</b>	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
 <b>Warning</b>	Indicates a potentially hazardous situation or an unintended use which, if not avoided, could result in death or serious injury.
 <b>Caution</b>	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.

## Validity of this manual

This manual applies to the Control Box iCP32 and the 2D part of the Control Box iCP42.

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# 1

## Product Overview

### 1.1

#### Product Description and Features

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##### General

The control panel has keys surrounding the screen for user input. The 3.5" colour display, incorporates a state of the art LCD colour screen, making it easy to use, even in bright, sunny conditions.

The rugged IP56 enclosure is designed for harsh environments.

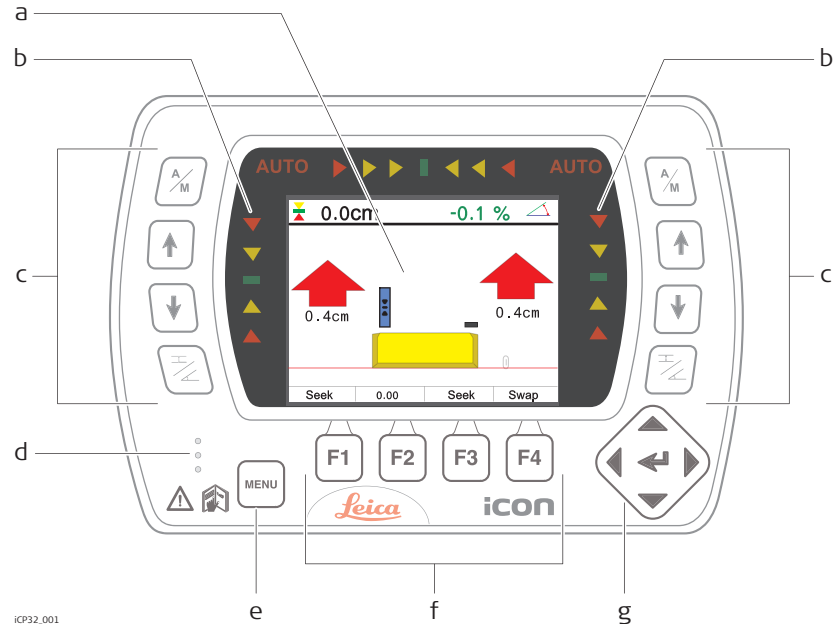
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##### Power supply, communication

The control panel is powered from a cradle based on a sophisticated induction solution, while data is transferred wirelessly via infrared between the MMB1300 cradle and the iCP32 control panel. The MMB1300 will be called the "Cradle" throughout this manual.

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## iCP32 control panel



- ICP32\_001
- a) Graphical display
  - b) Grade indication LEDs
  - c) Left/Right side sensor setup
  - d) Speaker

- e) Menu key
- f) Function keys
- g) Enter key

### Warning

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

**Warning**

Unauthorized 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 the machine manufacturer for instructions before mounting the product.

**Keys**

Up key



Down key



Enter key



Auto/Manual key



Menu key



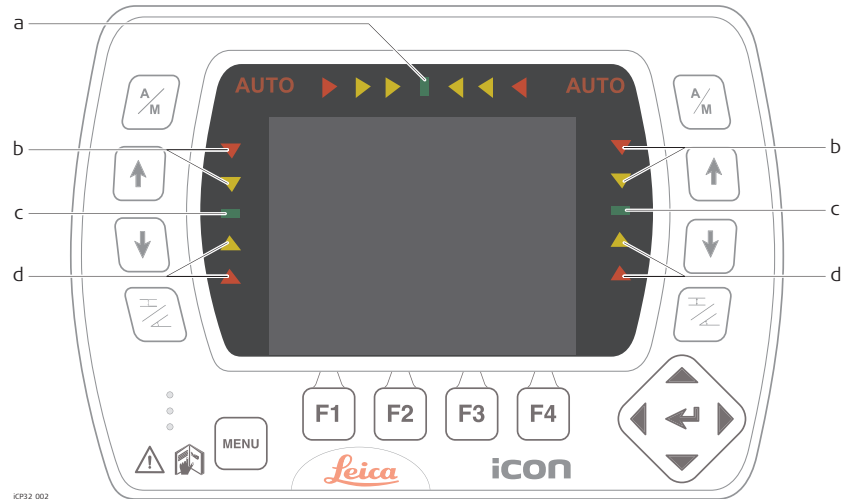
Sensor select key



Fuction keys

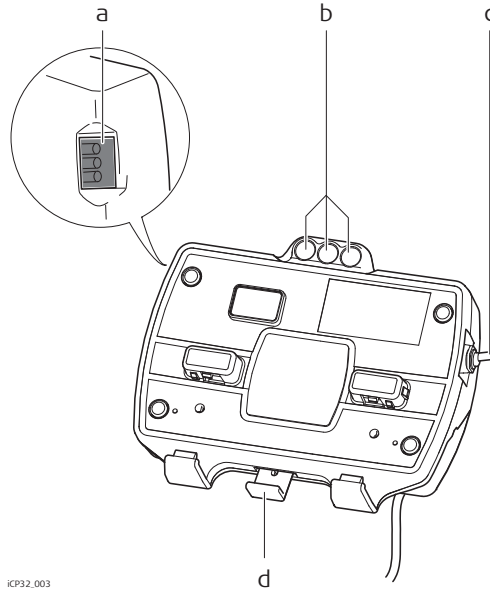


## Display



- a) Side shift alignment indication
- b) Above grade
- c) Left/Right on-grade indication
- d) Below grade

MMB1300 Cradle



ICP32\_003

- a) Power and data transfer LED indicators
- b) Holding magnets
- c) On/off switch
- d) Release key for control panel

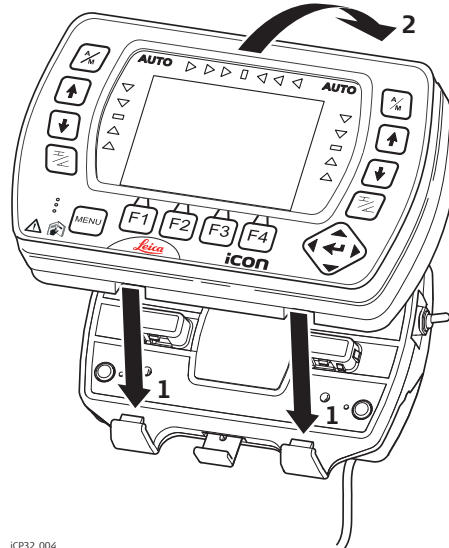
## 1.2

## Getting Started

### System start

To get the system started complete the following steps:

#### 1. Snap control panel onto cradle.

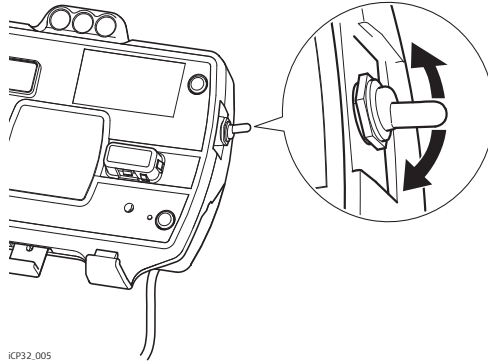


ICP32\_004

To connect the control panel to the cradle:

1. Put the control panel on the holding hooks in the bottom of the cradle.
2. Then snap the control panel onto the cradle by pressing it towards the cradle.

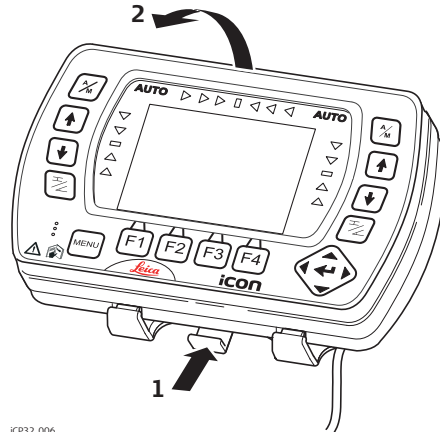
## 2. Turn on the control panel.



iCP32\_005

To turn the system 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 panel will also turn off the power.



iCP32\_006

➔ To release the control panel simply press the release key at the bottom of the cradle and pull the control panel towards you and then lift it up.

## 1.3





### Sensor Setup Keys

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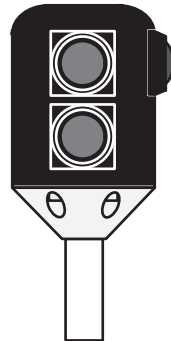
#### Sensor setup keys

The sensor setup keys are used to choose the type of sensor that the system should run with, and to find and set the reference point for that sensor.

The left and right hydraulic channel has four sensor setup keys each:

-  Auto/Manual key,
-  up key,
-  down key,
-  sensor select key.

#### External Multi Switch for Grader



The system can also be fitted with an External Multi Switch. This switch has three keys on it. One Auto/Manual key (Red) and a set of up and down keys (green). These keys have the same function as the corresponding keys on the control panel.

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**External switch for  
Dozer**

Toggle the master switch to **AUTO** to enable automatic control on all channels selected on the control panel. Toggling the master switch to **MAN** places all channels in manual control regardless of selection on the control panel.

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## 2

## Operation

### 2.1

### Pre-power up checks

#### State of the machine

Before the system is powered up, please check the state of the machine to make sure that it is configured to function correctly.

Check and set	When?	To learn how, see ...
Mast perpendicular to wheelbase.	For Graders without mast slope sensor, and for Dozers, every time the blade changes attack angle (pitch).	"2.1.2 Mast orientation"
No articulation and circle side shift on Grader.	Every time a job is to be made with a single elevation sensor + cross slope sensor on a Grader.	"2.1.3 No Articulation, circle center shift, or wheel lean on Grader"
Turn Grader blade cushioning off.	Every time you want to use automatic controls on a Grader.	"2.1.4 Grader blade cushioning off"
Dozer blade square.	Every time you begin a job with a single elevation sensor + cross slope sensor on a Dozer	"2.1.5 No blade rotation on Dozer"



### 2.1.1

#### **Hint for best performance**

#### **Best operation practice for Grader Systems**

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Below you will find a list of things that will help achieve the best results when operating a Grader system.

- Ensure that mast is perpendicular to the wheelbase, or use a mast slope sensor.
  - Keep the circle centered under the gooseneck.
  - Do not lean the wheels.
  - Do not articulate the machine.
  - Where possible, move the machine in one direction only; do not turn around.
  - Where possible, set the blade rotation and leave it in the same position.
  - Where possible, run with the slope sensor trailing, not leading.
-

---

**2.1.2****Mast orientation****Mast orientation**

For Dozers and Graders without mast slope sensor, you must make sure that the mast is at the "as measured" position (that is, the position the mast or masts were in during the mast measure up).

On a Dozer this means that the mast should not be mechanically sloped. If for some reason the mast is actually mechanically sloped, a new mast measure up must be done.

On a Grader the blade should be tipped back towards its end stop, if that was the original measure position.

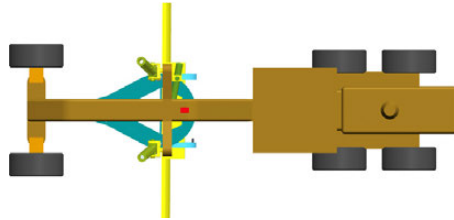
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### 2.1.3

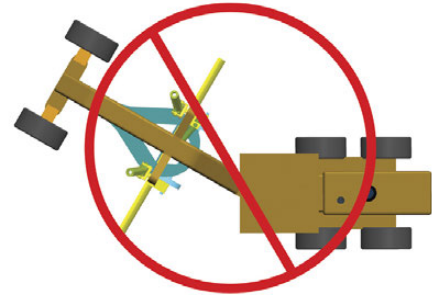
#### Articulation, circle Centershift, and wheel lean

#### No Articulation, circle center shift, or wheel lean on Grader

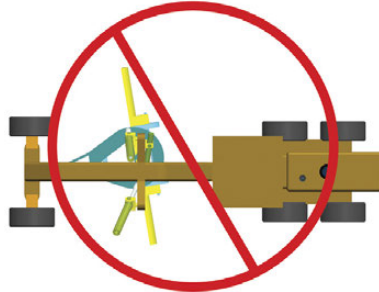
For Grader systems that rely on the cross slope sensor, and a single elevation sensor, you must make sure that the machine is not articulated and that there is no side shift applied to the circle. The front wheels must be upright (not leaned).



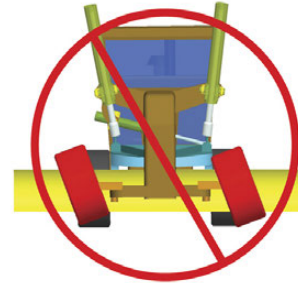
Okay



Articulated



Circle center shifted



Wheel leaned

Wheel lean introduces an error in the reading from the mainfall sensor. Articulation and circle Centershift introduce unmeasured blade rotation. Operating with wheel lean, circle centershift or articulation can cause inaccuracy in the cross slope being cut.

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## 2.1.4

### Grader blade cushioning off

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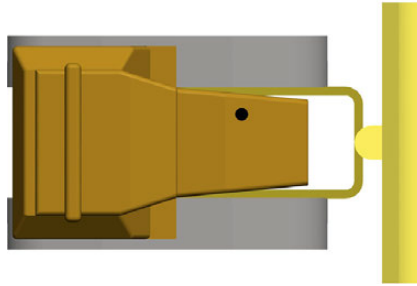
#### Blade cushioning off

Using a Grader's blade cushioning device at the same time as the blade is being automatically controlled by the system results in poor automatic control performance. Make sure that blade cushioning, if installed, is turned off before working with automatic controls.

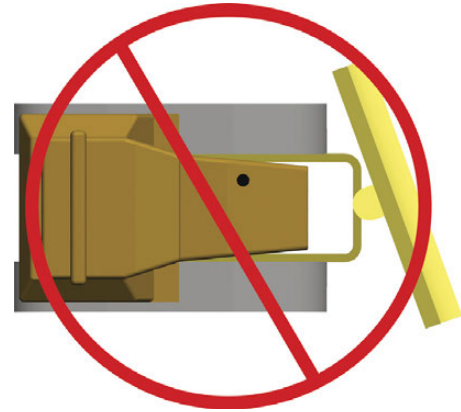
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**2.1.5****No blade rotation on Dozer****Dozer blade rotation**

For Dozer systems that use a cross slope sensor you must make sure that the blade is square to the machine (not rotated).



Dozer blade square



Dozer blade rotated

Operating with a rotated blade can cause inaccuracy in the cross slope being cut.

When driving on a surface that has 0% cross slope and 0% long slope, the blade can be rotated freely.


The bigger cross slope and long slope you are working with, the bigger the error on a rotated blade will be.

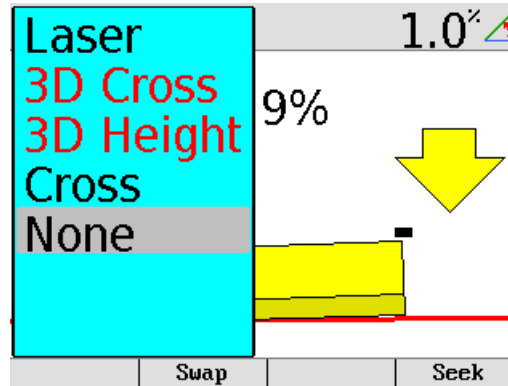
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## 2.2

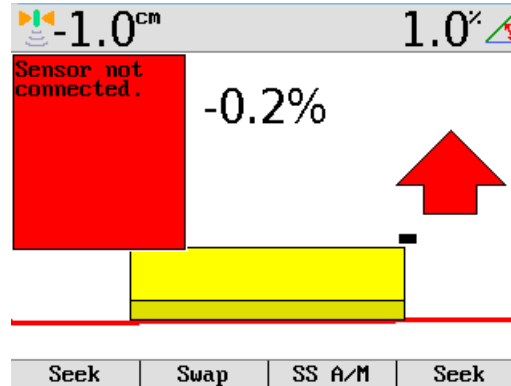
### Select the Input Source



#### Sensor selection

1. Push the left or right  key to open the sensor selection menu. Following screen appears:



2. Use the  /  keys to scroll through the available sensors.
  - a) If the sensor is connected and active it will show up in black.
  - b) If it's not connected or inactive it will show in red.

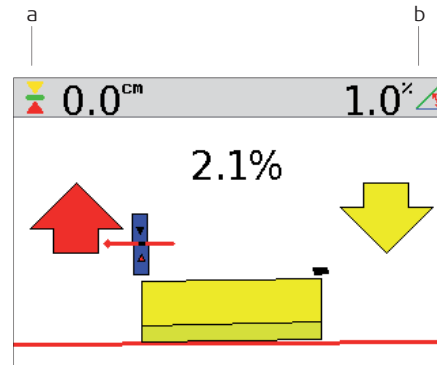


3. Highlight the sensor that is going to be used and exit the sensor selection menu by pressing  or .



4. The chosen sensor is indicated by a small icon in the upper corner of the display, and by an icon shown on the blade in relation to the actual placement of the sensor.

**Example:**



- a) Laser indication  
b) Cross Slope

A cross slope is selected in the right side and in the left side a Laser Sensor is selected.

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## 2.3 Setting a Reference Height



### Inspection

When a sensor is selected the control panel automatically uses the last set reference height for that sensor.



There are two ways to change the reference:

- Manual mode
- Seek mode

### Manual mode

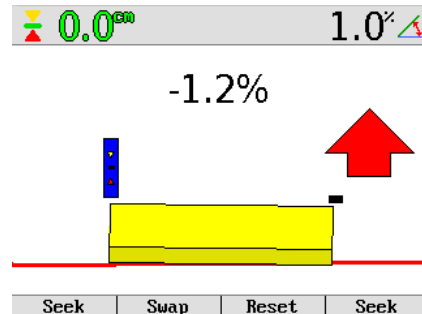
Use the  /  keys to change the reference height up or down.

### Seek mode


Press the  and  keys simultaneously to enter the seek mode. In seek mode the screen shows the current sensor value of the selected sensor.


Pressing both keys simultaneously again exits the seek mode.

Or press  or  for seek mode.





While in Seek Mode, the height values at the top of the screen will be green.

 If both keys are pressed, and held for more than three seconds, the control panel will take the current sensor value and store as the new reference height.

While holding these buttons, the  key will change from **Seek** to **0.0**. Once the new reference height has been set, the height values at the top of the screen will change back to black.

## **Automatic detection of the laser beam**

For systems with a MPM700 Electric Mast, entering seek mode will start an automatic search for the laser beam.

If the laser sensor is out of beam the operator can select in which direction the mast should start moving to look for the laser beam using the  and  keys. The mast will then start moving in that direction until the laser sensor has the beam centered.

If the mast, during a seek reaches its top or bottom limit it will automatically switch moving direction, and continue to seek for the laser beam until it is found or it hits the next end point.

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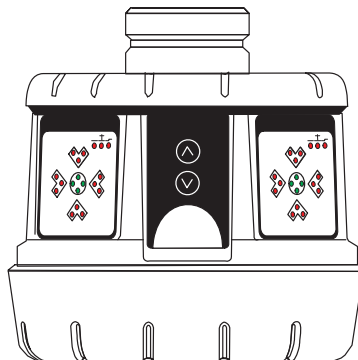
## 2.4 Using the MUS1300 Tri-Sonic Sensor

### Using Tri-Sonics

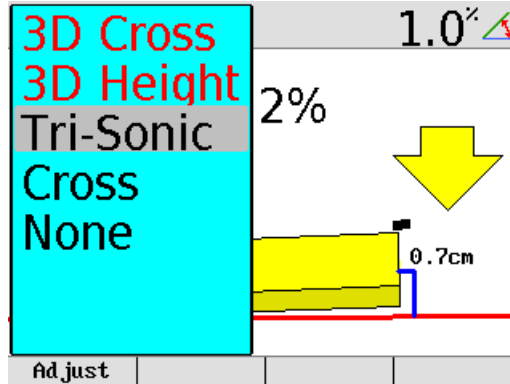
The Tri-Sonic can also measure the horizontal distance to a stringline and therefore it can be used to control the sideshift on a grader.

To do that, complete the following steps:

1. Place the machine so that the Tri-Sonic is above ground, the edge or stringline. The sensor needs an edge or string to follow before it can control the sideshift.
2. Move the blade to the working position.
3. Move the Tri-Sonic to a good working height. This is approximately 60 cm above the reference.
4. Select the Tri-Sonic on the same side as where it is placed on the machine.








5. Enter the Tri-Sonic menu. First press the  key, then press the **Adjust** function key.



Select between the different modes:

- Ground Mode
- Edge Mode
- Stringline






Press the  or  key to toggle between the modes. Once selected press the  key.

Following screens will appear by pressing the up () or down () Enter key to toggle between the screens.

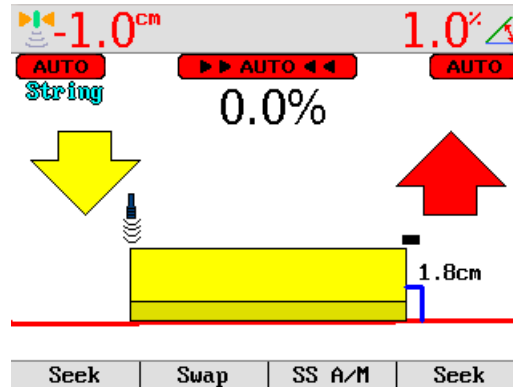


Stringline describes the window where the Tri-Sonic will work within certain range. All readings outside of this range will be ignored.

Sideshift works only with the Edge and Stringline modes.

6. Go to the **Sideshift** menu option and set it to **Yes**.
7. Press both  and  keys simultaneously to set the control panel in seek mode.
8. Check that the height is approximately 60 cm.
9. Press both  and  keys simultaneously, or press seek function key, and keep them pressed for three seconds to set the reference height.
10. Press the right  key to set the machine in Auto-Mode.

11. Press the **Side A/M** function key to enable the automatic sideshift control.



## 2.4.1

## Installation and Set Up Tri-Sonic Sensor

**Mounting the Tri-Sonic Sensor**

The Tri-Sonic can be installed quickly and easily with the simplest of tools. Mount a support in a suitable location that is adjustable for height and lateral motion. This will enable setting up of the Tri-Sonic over any reference. The support may differ according to the machine and reference.

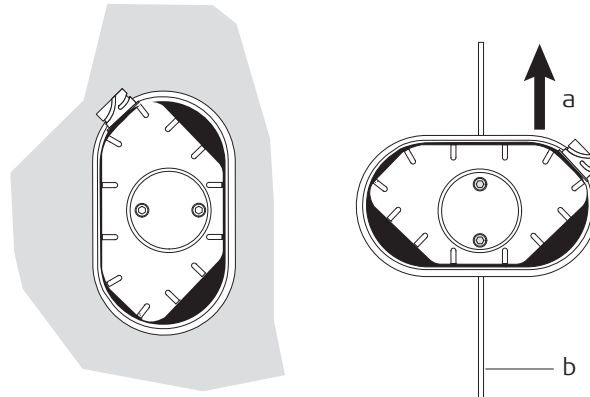


In case of large differences in temperature between the storage and working environments, allow 30 minutes for the sensor to adapt to the working environment prior to operation.

**The direction of movement of the Tri-Sonic sensor**

While ground and curb scanning, the Tri-Sonic should move longitudinally for the averaging of the scanned values.

For Stringline and Edge the Tri-Sonic should be placed at an angle of 90° to the reference with the face plate orientated to back of the machine.



- a) Working direction
- b) stringline



## Stringline and Edge sensing

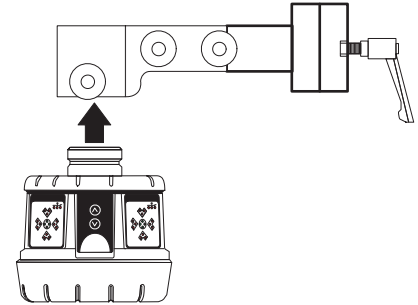
For stringline sensing, the Tri-Sonic must be positioned across the reference wire. The Automatic Side Shift control of the Tri-Sonic will keep the sensor always over the reference using the hydraulics of the third valve section to regulate the Blade in and out.

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## Mounting the Tri-Sonic on the support

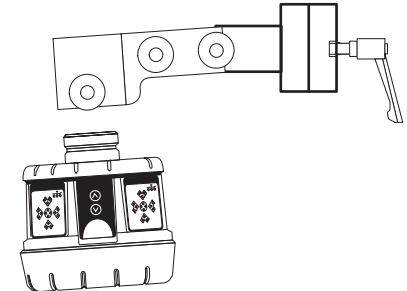
### Normal operation


1. Release the clamping screw on the support.
2. Insert the round centering pivot on the top of the sensor housing vertically into the support.
3. Rotate the sensor to the required sensing mode (refer to previous page).
4. Lock the centering pivot of the sensor with the clamping screw.



### Edge operation

For sensing Edges it is required to tilt the sensor toward the Edge, as shown on the picture. Slacken the knob on the bracket, tilt the bracket and tighten the knob again.



 **Caution** System Components can protrude from the machine, which could lead to bodily injury and/or product damage.  
**Precautions:**  
 Exercise caution in operation to avoid striking any objects or persons near the working area.

### 2.4.2 Operation with the Tri-Sonic Sensor

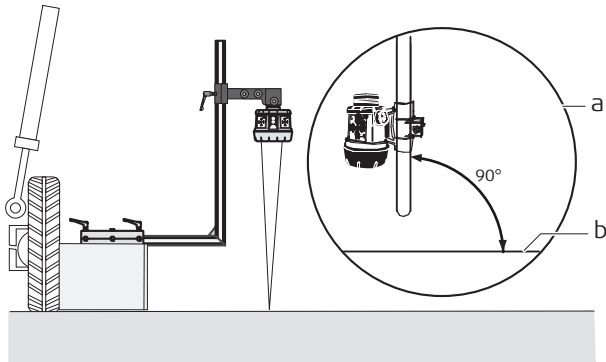
**iCP32 system flexibility** Multifunctional and multitask - iCP32 system can be operated in various combinations for the most demanding job requirements.

**Mount the Tri-Sonic** Mount the Tri-Sonic to the appropriate height for its maximum performance according to the reference used. The sensing range shows the minimum and maximum values possible, wherever it can be achieved to obtain the range of best performance.

#### Sensing range

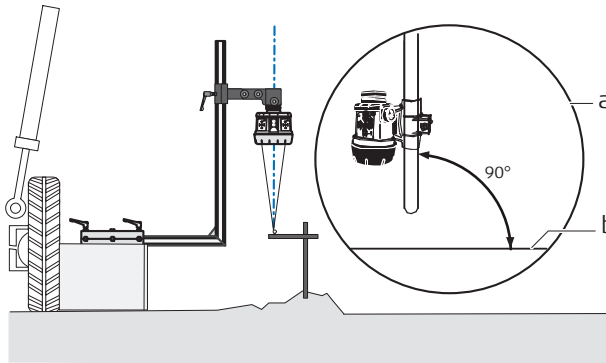
Reference	Sensing Range	Best Performance
String	15-36 inch (38-91 cm)	24 inch (60 cm)
Edge	15-36 inch (38-91 cm)	24 inch (60 cm)
Flat Ground	15-99 inch (38-250 cm)	24 inch (60 cm)

## Reference ground



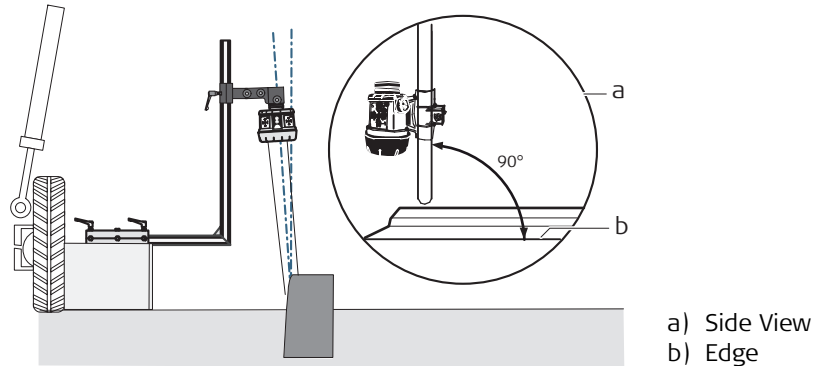
- a) Side View
- b) Ground

## Reference stringline



- a) Side View
- b) String

## Reference edge



## Setting up the Tri-Sonic

When setting the Tri-Sonic sensor over a reference (string, curb, or previous pass), the best performance will be achieved when the sensor is positioned square to the reference (not turned or leaning).

### Setup over a curb

When setting the Tri-Sonic sensor over a curb, it is generally recommended to use the GROUND mode and use the flat surface of the gutter as the reference as shown here.

### Setup over an EDGE

Use of the curb edge as a reference requires extra care be taken to ensure a proper distance and control of iCP32 system. Unlike a string or a flat surface, a curb edge can present some special problems. It is best that this mode be used only by experienced operators.

### Over any reference

It is important to rotate and roll the blade of the Grader to its approximate working position before setting and adjusting the Tri-Sonic sensor, the blade edge, and the reference.

### 2.4.3

## Swap Function

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### Set up and operation

The swap function allows the operator to quickly and easily swap sensors, turn the machine around, and grade in the opposite direction by following the previously pass.

There are two levels to the swap function available:

- **Level 1:** Swap the cross slope by inverting the actual target cross slope. For example: +2,3% -> -2,3%.
  - **Level 2:** Swap the cross slope by inverting the actual target cross slope and swap the side of the Grader that is controlled by ultrasonic.
- 

### Level 1

By pressing  / **SWAP** the actual target slope will be inverted.






The SWAP function can also be activated by pressing the up key on both external multi switches simultaneously.

---

### Level 2

Requirements: Two Tri-Sonic sensors must be connected and the system must be in Grader mode.

1. Move the Grader to a flat level ground.
  2. Set the moldboard level with the machine.
  3. Select slope on left side and sonic on right side. Choose ground mode for the Tri-Sonic.
  4. Manually set the cross slope of the blade to level.
  5. Set the height for the right sonic by pressing and holding  / **SEEK** for 2 sec.
  6. Press  / **SWAP** and the sensors will switch sides.
  7. Set the height for the left sonic by pressing and holding  / **SEEK** for 2 sec.
- The machine is now ready for the final grade following the previously pass.



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It is possible to have different heights and mode settings for the two Tri-Sonic sensors.

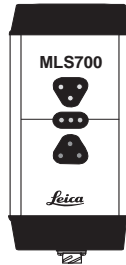
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## 2.5

## Using the Laser Sensor

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### Laser Sensor



The Laser Sensor is used to measure the elevation of the blade. This is done by measuring the distance from where the laser beam is hitting the laser and the centerline on the Laser Sensor.


When the Laser Sensor detects a laser beam this is indicated on the display by a red line through the laser icon.

If at some point the laser beam is lost while the control panel is set in auto mode, it will give a beep and a red cross will appear with a text message saying **laser beam lost**.

---






### Laser Sensor and manual mast

To use the Laser Sensor with a manual mast for controlling the elevation of the blade complete the following steps:

1. Select the Laser Sensor on one of the sides.
  2. Place the cutting edge of the blade at the desired height.
  3. Move the mast up or down until the Laser Sensor detects the laser beam. Continue to move the mast until the indication led's on the Laser Sensor is showing a green line.
  4. Press the left  key to set the machine in Auto-Mode.
  5. When the control panel is in Auto-Mode the machine will start to move the raise/lower hydraulic cylinders so that the laser beam always is in the center of the Laser Sensor.
-

**Laser Sensor and  
MPM700 Electric Mast**

To use the Laser Sensor with a power mast for controlling the elevation of the blade complete the following steps:

1. Select the Laser Sensor in one of the sides.
  2. Place the cutting edge of the blade at the wanted height.
  3. Enter **SEEK** mode.
  4. Press the  or  key to tell the mast in which direction it should start to seek. The mast will now move in the given direction until the Laser Sensor detects the laser beam, and has it in the center of the sensor.
  5. Press the left  key to set the machine in Auto-Mode.
  6. The  and  keys can now be used to move the mast up or down, and thereby changing the elevation reference.
-



## 2.6

## SP14 Sensor

### Introduction

The SP sensor is a new technology in machine automation. It improves smoothness obtained with GPS, PowerTracker and laser reference sensors. In addition, the dozer can be operated with increased speed compared to a system without SP technology.



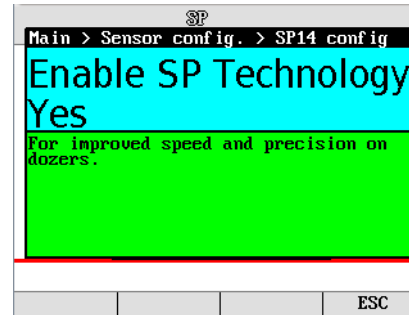
The SP Technology can only be used on Dozers with the Control Box iCP42, together with PowerBox or PowerTracker.



The SP Technology **MUST** be turned off when using the SP14 sensor together with a laser or sonic sensor.

### Enabling the SP14 Sensor

If the system is equipped with a SP sensor it is recommended to have it enabled at all times. SP functionality can be enabled or disabled in the tech-mode.



---

**Benefits from using the  
SP14 Sensor**

For a system with GPS, SP technology results in greater smoothness, increased operation speed and a system that is more robust against poor GPS coverage.

For a system with PowerTracker, SP technology results in greater smoothness, increased operation speed and a system that is more robust against losing the prism in case of the beam being interrupted.

---

## 2.7

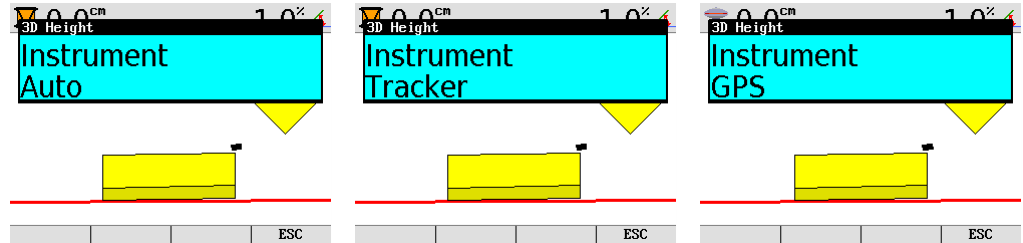
### How to set 3D sensor type

## 3D Sensors

Select 3D Height (press the **left or right (sensor) key** once), and then press the **Adjust** function key to enter the adjust menu.

**Note that it's only the current selected sensor in either left or right side that is adjusted.**

If the 3D system is configured to indicate which sensor is currently in use, select **AUTO**. If not, then select either **TRACKER** or **GPS** from the menu.



Once **Auto / GPS / Tracker** is selected, it is required to **EXIT** from this menu for the change to take effect and then re-enter the menu to adjust gains.

Gains need to be set for both GPS or Tracker depending on which sensor is used. If AUTO is selected, the iCP32 will use the gains set in the Tracker and GPS settings.

Use the right arrow key to enter the gains settings.

Refer to chapter "2.8 Setting the Value for Gain and Deadband" for configuring Gains.

---

To select 3D Slope, Press the **left or right (sensor) key** once, and then press the **Adjust** function key to enter the adjust menu.

**Note that it's only the current selected sensor in either left or right side that is adjusted.**

Set gains for 3D Slope as explained in chapter "2.8 Setting the Value for Gain and Dead-band".


---

## 2.8





## Setting the Value for Gain and Deadband

### Adjust the gain and deadband

To adjust the gain and deadband of each of the sensors complete the following steps:

1. Press the left or right  key once, and then press the **Adjust** function key to enter the adjust menu.

**Note that it's only the current selected sensor in either left or right side that is adjusted.**

2. Use the  or  key to scroll through the settings.
3. Use the  or  key to change the value.
4. To exit the adjust menu press the menu key.

### Deadband

The deadband controls the precise motion of machine hydraulics. These values do not correspond to accuracy but only to hydraulic speeds. These values should not be confused with overall machine performance and/or precision.



The automatic hydraulic calibration will set the dead band values, and these should NOT be changed.

#### Default values:

Sensor	Dozer	Grader
GPS	1.0 cm	1.0 cm
Laser	0.7 cm	0.7 cm
Cross slope	0.6 %	0.3 %
Tracker	0.5 cm	0.5 cm
Sideshift	---	2.0 cm

**Gain** This is the scaling of hydraulic speeds for each of the sensors.

To enter **Gains** select the **Lower Left** or **Lower Right** buttons to open up the available sensors. Select appropriate sensor and then the **F1** or **F4** key (depending on left or right side) to enter the **Adjust** Menu.

The automatic hydraulic calibration will calculate the optimal gain values. It is recommended not to change these values.

**Elevation:**

Press the Test button to adjust the value so that it corresponds to the below distances. For example, during 2 seconds of movement, the blade should move 13 cm for GPS.

Sensor	Dozer	Grader
Laser/Sonics/Tri-Sonics/GPS	13 cm	13 cm
Tracker	7 cm	7 cm

**Second laser for cross slope:**

This should be measured 1.5 meters from the centre of the blade. Press the Test button to adjust the value so that it corresponds to the below distances. For example, during 2 seconds of movement, the blade should move 8 cm for a laser sensor controlling tilt.

Laser: 8 cm.

**2D and 3D cross slope sensor:**

This should be measured 1,5 meters from the centre of the blade. Press the Test button to adjust the value so that it corresponds to the below distances. For example, during 2 seconds of movement, the blade should move 8 cm for 3D cross-slope on Dozer.

Sensor	Dozer	Grader
2D and 3D cross-slope	8 cm	14 cm

**Sideshift (Grader only):**

Enter the Tri-Sonic or 3D height adjust menu. Press the Test button to adjust the value so that it corresponds to the below distances.

2D and 3D sideshift: 13 cm.

---

## 2.9

## Sensor Calibration Wizard

### Enter the Sensor Calibration Wizard

In order to maintain the correct calibration of the sensors, the Sensor Calibration Wizard should be run periodically due to blade wear. This should also be done when changing the blade wear edges or changing tires on a grader, as this will change the mainfall slope.

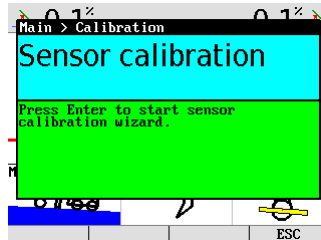
This is done by entering the calibration wizard:

**Menu -> Calibration -> Sensor Calibration**

and following the on-screen instructions.

### Sensor Calibration 1. step

Select the Sensor Calibration. Follow the on-screen instructions to calibrate each sensor. The following example is for graders, but the dozer sensor calibration is similar.





## Warning Screen

If any sensors are not installed or not connected a warning screen will appear.

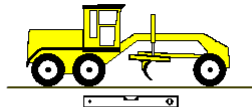
### Warning

- Rotation sensor not present!

Exit | Skip | Next

## Sensor Calibration 2. step

Park the machine on a flat, hard and level surface, preferably a paved road or similar. This will facilitate turning the machine around and proper machine alignment. If the machine is already aligned properly and is ready for calibration, skip ahead by pressing "Skip" (F2). To start, select "Next".

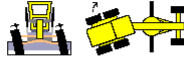


Park machine on a flat, hard and level surface.

Back | Skip | Next

**Sensor Calibration****3. step**

Straighten the machine's front wheels and articulation. This ensures correct values for calibrating the mainfall sensor.  
Select "Next" when complete.

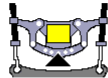


Align wheels vertically and  
straighten articulation.

Back | Skip | Next

**Sensor Calibration****4. step**

Centre the machine link bar. It must then be set in its centred position for proper Cross Slope calibration.  
Select "Next" when complete.



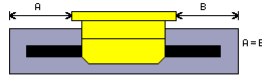
Set link bar in center hole.

Back | Skip | Next

## Sensor Calibration

### 5. step

Centre the Blade Sideshift, ensuring the distance from the machine base to the blade tip is the same on both sides. This is important for the measurements in the next step. Select "Next" when complete.



Move sideshift to center the blade.

Back Skip Next

## Sensor Calibration

### 6. step

Rotate the blade so that the distance from the swivel to each blade tip is the same. This ensures that the blade is perfectly perpendicular to the axis along the machine. This is important for the correct calibration of the rotation sensor. Select "Next" when complete.

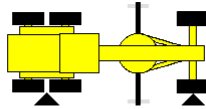


Rotate blade to perpendicular to machine.

Back Skip Next

**Sensor Calibration****7. step**

Mark the positions of the wheels on the ground and place the blade gently on solid blocks or other solid reference, ensure the blade has not rotated or sideshift has been altered. Select "Next" when complete.



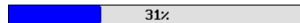
Mark wheel positions on the ground and place the blade gently on fixed points (large rocks, blocks of concrete etc). Do not rotate or sideshift blade.

Back Skip Next

**Sensor Calibration****8. step**

The rotation sensor will automatically calibrate, while at the same time collecting Mainfall and Cross Slope data. Select "Next" when complete.

Calibrating Rotation Sensor.

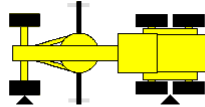


Back Skip Next

## Sensor Calibration

### 9. step

Turn the machine around and place the blade gently on the same blocks or reference as before, ensuring that the blade is not rotated or sideshift has altered. Align the wheels using the markings from the previous step. This is important for the correct measurement of the Mainfall and Cross Slope values. Select "Next" when complete.



Turn machine around and place the blade gently on fixed points. Do not rotate or sideshift blade.

Back Skip Next

## Sensor Calibration

### 10. step

The Mainfall and Cross Slope sensors will now be automatically calibrated. Select "Next" when complete.

Calibrating Mainfall & Slope Sensors.



Save Exit

**Sensor Calibration****11. step**

The calibration routine is complete.

Save the calibrated values and exit the wizard by pressing "Save".

To exiting the wizard without saving, press "Exit".

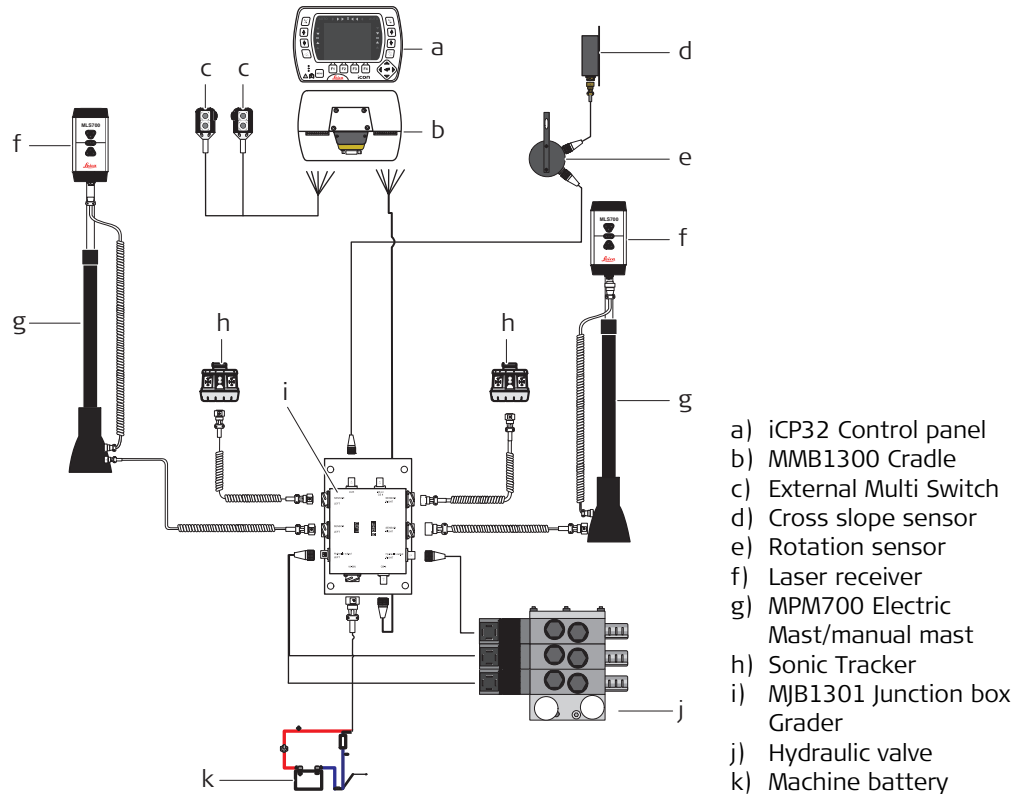
Calibration complete.

		Save	Exit
--	--	------	------

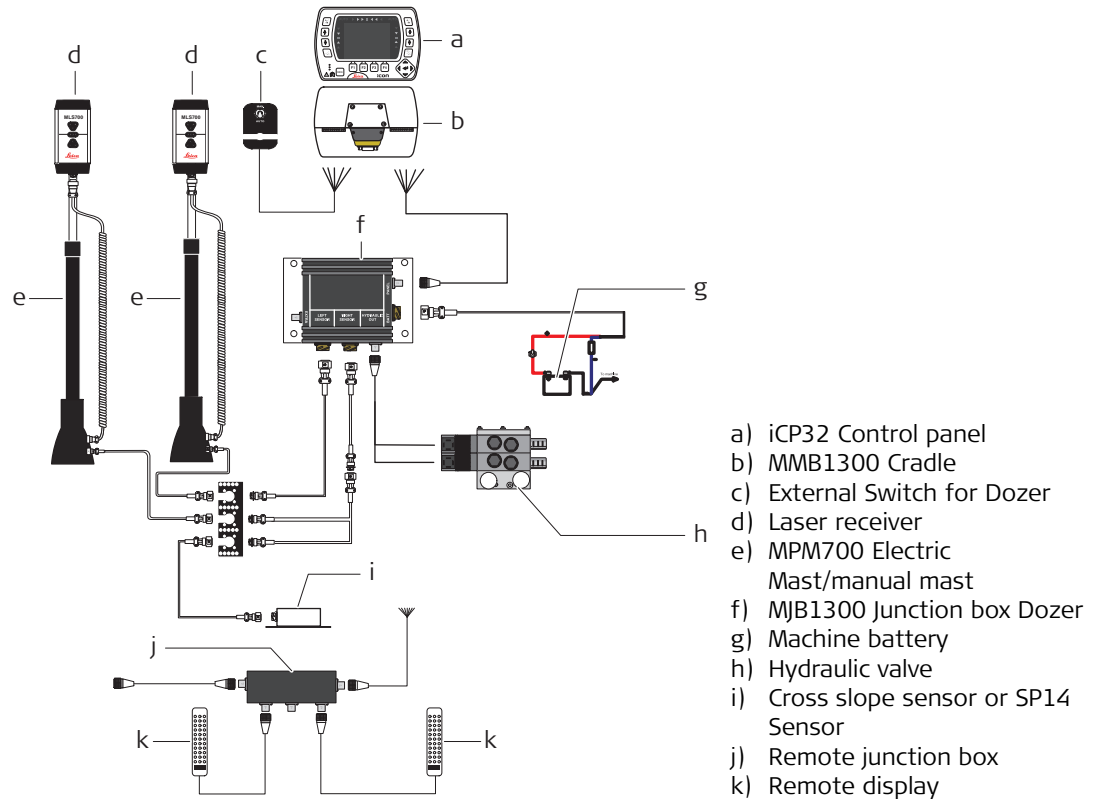
## 2.10

## Machine Setups

### Grader Setup



## Dozer Setup







---

## 3 Care and Transport

### 3.1 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 iCP32 components are subjected to severe impact, be sure to check for proper operation prior to performing any work with the system.

### 3.2 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.

### 3.3 Storage

#### Product

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

---

## 3.4

### 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 products at a temperature not greater than 40°C/108°F and clean them. Do not repack until everything is completely dry.

---

---

## 4 Safety Directions

### 4.1 General

#### Description

The following Instructions 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 instructions and adhere to them.

---

### 4.2 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.
- 

#### Adverse use

- 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.

 **Warning**

Adverse use can lead to injury, malfunction and damage.  
It is the task of the person responsible for the equipment to inform the user about hazards and how to counteract them.  
The product is not to be operated until the user has been instructed on how to work with it.

 **Warning**

Unauthorized 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.

## 4.3

### 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.

## 4.4

### 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.

**Manufacturers of non Leica Geosystems accessories**

The manufacturers of non Leica Geosystems accessories for the product are responsible for developing, implementing and communicating safety concepts for their products, and are also responsible for the effectiveness of those safety concepts in combination with the Leica Geosystems product.

**Person in charge of the product**

The person in charge of the product has the following duties:

- To understand the safety instructions on the product and the instructions in the user manual.
- 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.

 **Warning**

The person responsible for the product must ensure that it is used in accordance with the instructions. This person is also accountable for the training and the deployment of personnel who use the product and for the safety of the equipment in use.

 **Warning**

Unauthorized 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.

 **Warning**

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

**4.5****Hazards of Use** **Warning**

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

 **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**

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 Instructions given by the manufacturer and the Instructions 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 unauthorized 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 received from your Leica Geosystems dealer.

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## 4.6

## Electromagnetic Compatibility EMC

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### 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:**

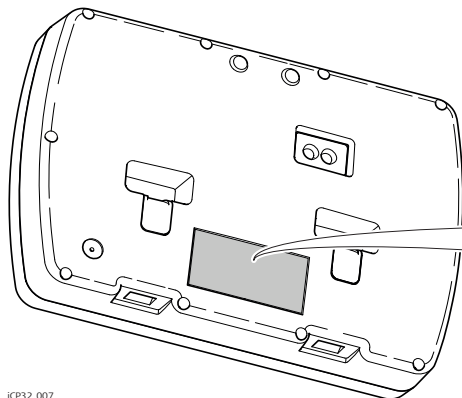
While the product is in use, connecting cables, for example product to external battery, product to computer, must be connected at both ends.

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4.7

Labelling

Labelling iCP32 Control Panel



iCP32\_007

iCP32 Grading 2D Panel

P/N: 798669



S/N: xxxxxxxx



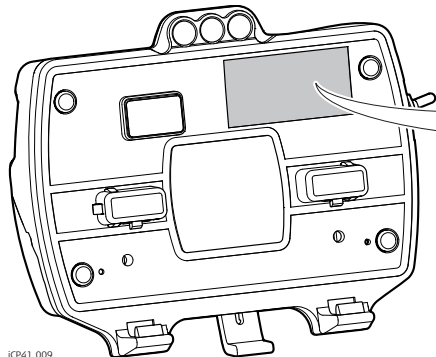
**Leica**

Leica Geosystems AG  
CH - 9435 Heerbrugg  
Made in Denmark 20XX



Power  
12 - 24 V DC, 6A max.

Labelling MMB1300 Cradle



iCP41\_009

TYPE: MMB1300

P/N: 764910



S/N: XXXXXXXX



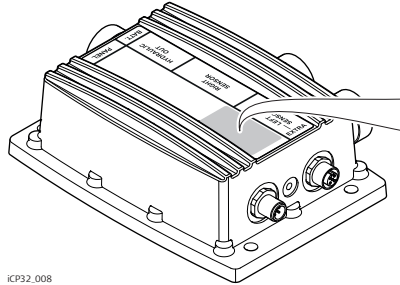
**Leica**

Leica Geosystems AG  
CH - 9435 Heerbrugg  
Made in Denmark 20XX



Power  
12 - 24 V DC, 6A max.

## Labelling MJB1300 Junction Box



iCP32\_008

TYPE: MJB1300

P/N: 764838



S/N: XXXXXXXX



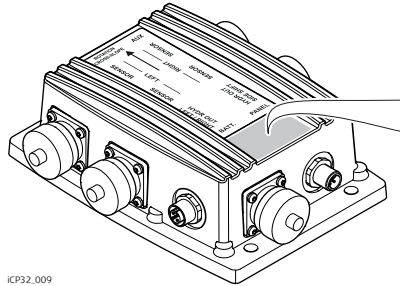
**Leica**

Leica Geosystems AG  
CH - 9435 Heerbrugg  
Made in Denmark 20XX



Power  
12 - 24 V DC, 6A max.

## Labelling MJB1301 Junction Box



iCP32\_009

TYPE: MJB1301

P/N: 764839



S/N: XXXXXXXX



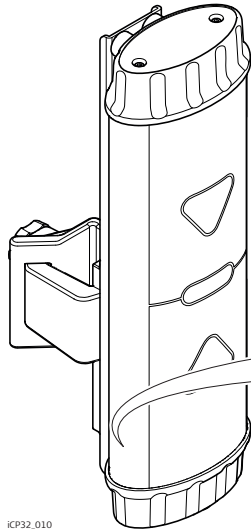
**Leica**

Leica Geosystems AG  
CH - 9435 Heerbrugg  
Made in Denmark 20XX



Power  
12 - 24 V DC, 6A max.

Labelling MLS700 Laser Receiver



ICP32\_010

TYPE: MLS700

P/N: 760862



S/N: XXXXXXXXX



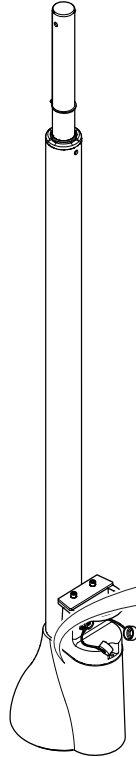
*Leica*

Leica Geosystems AG  
CH - 9435 Heerbrugg  
Made in Denmark 20XX



Power  
12 - 24 V DC, 6A max.

## Labelling MPM700 Power Mast



ICP92.011

TYPE: MPM700

P/N: 760863



S/N: XXXXXXXXX



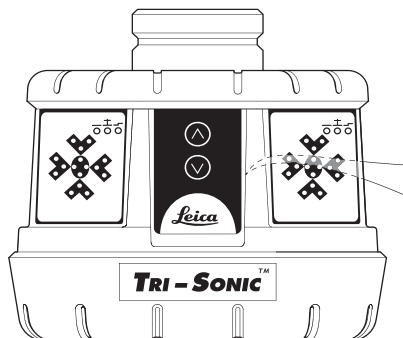
*Leica*

Leica Geosystems AG  
CH - 9435 Heerbrugg  
Made in Denmark 20XX



Power  
12 - 24 V DC, 6A max.

**Labelling MUS1300  
Tri-Sonic**



ICP32\_012

**Type: MUS1300**

Art.No.  
**764031**

Power: 11-30V $\overline{\text{=}}$ , 0.5A max

S.No.  
.....

Leica Geosystems AG

CH-9435 Heerbrugg

Manufactured: 2010

Made in Switzerland

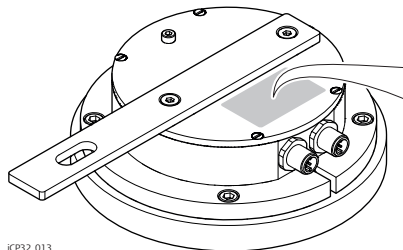
Patents: U.S.

5.327.345 4.733.355



*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interferences received, including interference that may cause undesired operation.*

**Labelling MRS1300  
Rotation Sensor**



ICP32\_013

TYPE: MRS1300

P/N: 767435



S/N: XXXXXXXX



**Leica**

Leica Geosystems AG

CH - 9435 Heerbrugg

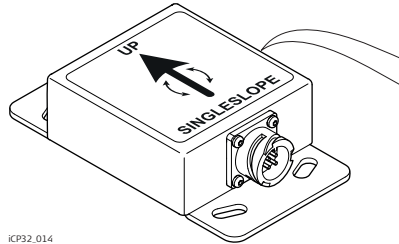
Made in Denmark 20XX



Power  
12 - 24 V DC, 6A max.



## Labelling MSS1300 Cross Slope Sensor



iCP32\_014

TYPE: MSS1300

P/N: 764842



S/N: XXXXXXXXX



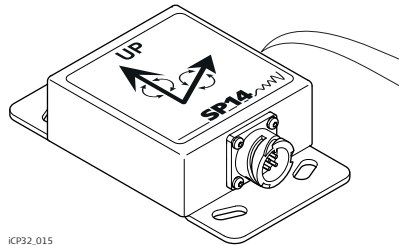
*Leica*

Leica Geosystems AG  
CH - 9435 Heerbrugg  
Made in Denmark 20XX



Power  
12 - 24 V DC, 6A max.

## Labelling SP14 SP Sensor



iCP32\_015

TYPE: SP 14

P/N: 782749



S/N: XXXXXXXXX



*Leica*

Leica Geosystems AG  
CH - 9435 Heerbrugg  
Made in Denmark 20XX



Power  
12 - 24 V DC, 6A max.

## 5 Technical Data

### 5.1 iCP32 Technical Data



The iCP32 system is designed to operate from standard vehicle power systems at 24V DC - check to ensure proper connection and polarity.

#### iCP32 Control Panel

Parameter	Specification
Power Supply	The iCP32 is supplied from the cradle MMB1300
Power consumption	< 200 mA
Graphic display	4" LCD colour screen
Keypad	18 keys, with backlight
Interfaces	Infrared
Dimensions	12.5 x 18.0 x 3.7 cm
Weight	0.5 kg

#### MMB1300 Cradle

Parameter	Specification
Voltage range	24 V DC (nom.)
Dimensions	12.4 x 15.2 x 4.4 cm
Weight	0.320 kg
Communication (Infrared)	1 Mbit
Output	2 x RS232, RX, TX, 12V/2Amp, GND, 2 x CAN and J1939

## MJB1300 and MJB1301 Junction Box

Parameter	Specification
Voltage range	24 V DC (nom.) Nominal voltage 24 V DC, Range 10 V-30 V
Power consumption	< 0.5 A with no sensors and valve connected
Dimensions	MJB1300: 13.8 x 18.3 x 6.4cm MJB1301: 14.5 x 18.3 x 6.4cm
Weight	2 kg
Hydraulic Output Settings	Proportional valves, On/Off and Danfoss
Interfaces MJB1300	Battery MIL Cradle M12 Valves M12 CAN A MIL CAN B MIL CAN A M12
Interfaces MJB1301	Battery MIL Cradle M12 Valves 2x M12 CAN A 2x MIL CAN B 2x MIL CAN A M12 Aux M12
Special feature for MJB1301	Integrated main fall sensor

**MUS1300 Tri-Sonic**

Parameter	Specification
Dimensions	17.2 x 18.3 x 14 cm
Weight	2.5 kg
Accuracy	within $\pm 0.125$ cm @ 30.5 cm
Input voltage	11 to 30 V DC
Power Consumption	0.5 A max.

**MPM700 Electric Mast**

Parameter	Specification
Voltage range	24 V DC (nom.) Nominal voltage 24 V DC, Range 10 V-30 V
Power consumption	< 2.5 A
Mast height (extended)	2.9 m
Mast height (retracted)	1.7 m
Mast travel	1.2 m
Mast travel speed	85 mm per second
Positions repeatability	$\pm 1$ mm
Weight	30 kg

**MM4 Manual Mast**

Parameter	Specification
Height (extended)	3.257 m
Height (retracted)	1.857 m

Parameter	Specification
Travel	1.4 m
Scale	Metric/Inch
Weight	14 kg

### MLS700 Laser Receiver

Parameter	Specification
Voltage range	24 V DC (nom.) Nominal voltage 24 V DC, Range 11 V-30 V
Power consumption	< 500 mA
Dimensions	28 x 12 x 7.2 cm (without mounting bracket)
Weight	2.5 kg (incl. clamp)
Detection angle	360°
Linear detection height	190 mm
Operating range	300 m radius
Sensor pick-up range	18.5 cm
Laser requirement	All Rotating Lasers (visible HeNe, invisible Infrared diodes Laser)
Pulsed display	5 pulses per second

**MSS1300 Cross Slope Sensor**

Parameter	Specification
Voltage range	24 V DC (nom.) Nominal voltage 24 V DC, Range 10 V-30 V
Power consumption	< 0.25 A
Dimensions	15.3 x 8.7 x 3.9 cm
Weight	0.855 kg
Accuracy cross slope	±0.1 % slope at ±25°
Working range	±80°
Interfaces	CAN MIL

**SP14 Sensor**

Parameter	Specification
Voltage range	24 V DC (nom.) Nominal voltage 24 V DC, Range 10 V-30 V
Power consumption	< 0.25 A
Dimensions	15.3 x 8.7 x 3.9 cm
Weight	0.855 kg
Accuracy cross slope	±0.1 % slope at ±25°
Working range	±80°
Interfaces	CAN MIL

## MRS1300 Rotation Sensor

Parameter	Specification
Voltage range	24 V DC (nom.) Nominal voltage 24 V DC, Range 10 V-30 V
Power consumption	< 0.25 A
Dimensions	Ø16.0 x 22.6 x 5.9 cm
Weight	1.56 kg
Working range	0-360°

## Environmental specifications

### Temperature

Type	Operating temperature [°C]	Storage temperature [°C]
iCP32 Control Panel	-20 to +60	-30 to +70
MMB1300 Cradle	-20 to +60	-30 to +70
MJB1301 Junction Box	-20 to +60	-30 to +70
MJB1300 Junction Box	-20 to +60	-30 to +70
MPM700 Electric Mast	-20 to +60	-30 to +70
MLS700 Laser Receiver	-20 to +60	-30 to +70
MUS1300 Tri-Sonic	-20 to +65	-40 to +85
SP14 SP Sensor	-20 to +60	-40 to +80
MSS1300 Cross Slope Sensor	-20 to +60	-40 to +80
MRS1300 Rotation Sensor	-20 to +60	-40 to +80

**Protection against water, dust and sand**

Type	Protection
iCP32 Control Panel	IP67
MMB1300 Cradle	IP54
MJB1301 Junction Box	IP67
MJB1300 Junction Box	IP67
MPM700 Electric Mast	IP45
MLS700 Laser Receiver	IP68
MUS1300 Tri-Sonic	IP54
SP14 SP Sensor	IP68
MSS1300 Cross Slope Sensor	IP68
MRS1300 Rotation Sensor	IP67

**Humidity**

Type	Protection
iCP32 Control Panel	Max 95 % non condensing The effects of condensation are to be effectively counter-acted by periodically drying out the instrument.



## 5.2

## Conformity to National Regulations

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### Conformity to national regulations



Hereby, Leica Geosystems AG, declares that the iCP32 control panel is in compliance with the essential requirements and other relevant provisions of the applicable European Directives. For the declaration of conformity please contact your Leica Geosystems distributor.

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## 6 International Limited Warranty, Software License Agreement

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**Total Quality Management: Our commitment to total customer satisfaction.**



Leica Geosystems AG, Heerbrugg, Switzerland, has been certified as being equipped with a quality system which meets the International Standards of Quality Management and Quality Systems (ISO standard 9001) and Environmental Management Systems (ISO standard 14001).

**Ask your local Leica Geosystems dealer for more information about our TQM program.**

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