







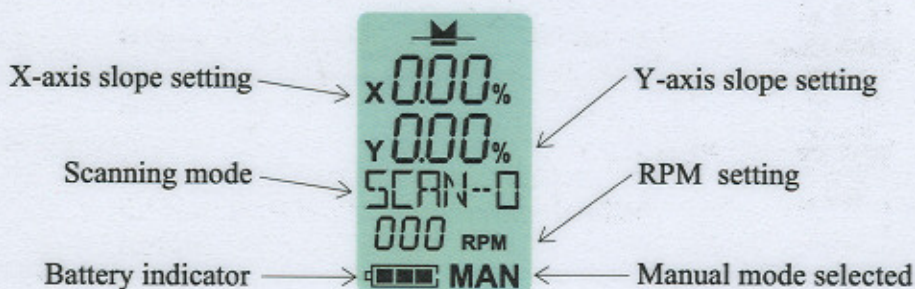




## Control Panel - ML 14



-  Selects the X-axis slope setting
-  Power button
-  Selects the Y-axis slope setting
-  Increases the slope setting
-  Selects and toggles scanning mode
-  Decreases the slope setting
-  Selects and toggles the rotation speed (RPM)
-  Manual/Auto mode selection  
(See warning on previous page)



To be able to change the value of a setting, that setting must be selected and its name flashing in the display.

For example, to change rotation speed, press the  button once to select the RPM setting. RPM begins flashing in the display. The RPM can now be changed by pressing the  button to toggle through the RPM values until the required RPM is selected.

## Battery

The laser is powered by a rechargeable 7.2V Ni-Cd "Makita" type battery. A complete recharge of the battery in the supplied charger takes about one hour. The red LED on the charger will light during charging. When the LED goes out, the battery is fully recharged.

A fully recharged battery has a capacity of approx. 20 hours of operation.

## Inserting the battery

Open the battery compartment by pushing in the ribbed button. The battery hatch will swing open, as shown. Insert the battery into the laser with the contact end first and the ridge facing upwards. Push the battery until it clicks into place. Close the hatch - it will also click into place.



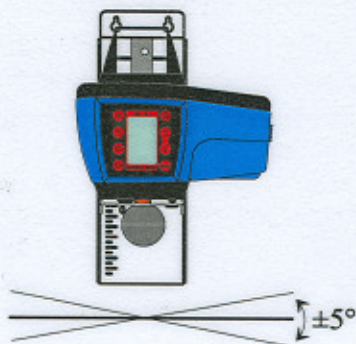
## Laser Set Up

### Horizontal Rotation

The laser can be placed on any surface which is within  $\pm 5^\circ$  of horizontal. If the laser is outside of this working range, it will not be able to level and the LIMIT alarm will be shown (see page 7).

**Important:** When working with slope, the laser must be placed on a plane levelled surface.

For best results, use the supplied wall bracket or a tripod.




### Vertical Rotation (ML 14 only)

For vertical rotation, mount the wall bracket horizontally on a tripod using the oversized washer provided. This set up allows the alignment of the ML-14 *i* in the cross-axis direction to be adjusted.

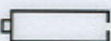



# Operating Instructions

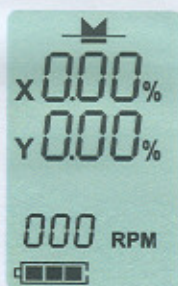
## Horizontal Rotation

Turn the laser on by pushing the  button.

The battery indicator in the bottom left corner of the display shows the battery level:

 = flat battery     = full battery

If the battery indicator is empty and flashing, then there is only a very short working time remaining.



Whenever the laser is turned on, it always starts in full automatic mode.

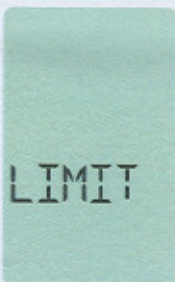
**ML 14 i only:** First the laser spins briefly, so that the rotor head sensor can locate the position of the laser beam - this position is used in scanning mode.

The laser will automatically self-level. During self-levelling, the laser stops rotating and the beam flashes to indicate that the laser is not yet level. This will also occur if the laser is disturbed at any time while running in full automatic mode.

**ML 14 i only:** When the laser is level, it starts rotating with the RPM value set when it was last used.

**ML 11 x only:** When the laser is level, it starts rotating with the fixed RPM of 600.

If the laser is positioned beyond its levelling range of  $\pm 5^\circ$ , it won't be able to self-level and the display will show the message LIMIT until the laser is repositioned within this range.



## Operating Instructions, cont.

### The Slope System

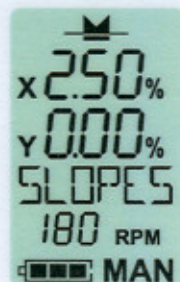
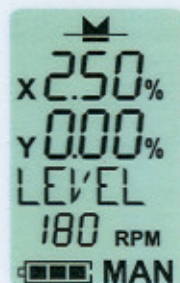
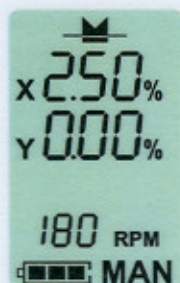
The rotor laser uses a semi-automatic slope system. This means that, initially, all the user has to do is input the required slope, and the laser will do the rest. However, if the laser is subsequently disturbed or knocked, it doesn't automatically level with the set slope again, but instead alerts the user of the disturbance (see Level Alarm, page 9).

The ML 11 x is a single grade laser allowing positive slopes from 0 to 10% to be set in the X axis as marked on the top of the laser.

The ML 14 i is a dual grade laser allowing positive slopes from 0 to 10% to be set in the X and Y axes as marked on the top of the laser. Slopes are only available with horizontal rotation.

### Setting Slope

1. To set slope, the laser must be in manual mode.  
To enter manual mode push the **MAN** button.  
MAN will appear in the bottom right corner of the display.
2. ML 14 i only: Select the axis in which slope is to be set by pushing the **X** or **Y** button, e.g. X-axis. The X in the display will start flashing.
3. Use the arrow buttons to set the required value for slope, e.g. 2.50%. Pushing an arrow button once changes the value by 0.01%. Holding an arrow button down changes the value faster.
4. Approx. 15 seconds after the slope has been set, the laser starts self-levelling. The message **LEVEL** appears in the middle line of the display.
5. Once the laser has self-levelled, it moves up to the selected slope. At the same time, the value of slope in the display counts up to the input value and **SLOPES** is shown.



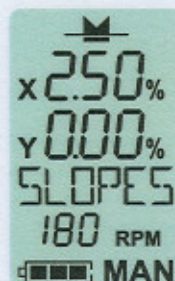
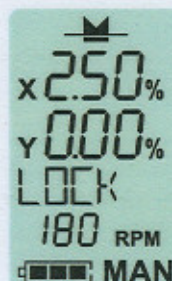


## Setting Slope, cont.

6. When the laser reaches the set slope, it locks the slope, and LOCK and SLOPES alternate in the display.

While the laser moved up to the set slope, it would have stopped rotoating and the beam begun to flash.

The laser now begins to rotate again, the beam stops flashing and the display returns to normal.




ML 14 i only: Slope in the Y-axis is set in exactly the same way as above. For dual slopes, just set both the X and Y slopes at the beginning.


To cancel slope settings, use the  button to turn the laser off, then on again. The rotor laser returns to automatic self-levelling mode.

## Level Alarm

If the laser is disturbed or knocked after it has locked the slope, the level alarm will be triggered. The laser stops operating, the beam starts flashing, and LEVEL ALARM will flash in the display.




To turn off the alarm and restart the laser with the same slope, but without checking if it has been moved from its original position, simply press the  button. The laser will then self-level before moving up to the set slope again.

To check the position of the laser, turn the laser off, then on again using the  button. The laser will start as normal, self-levelling without slope, allowing any checks to be made. However, the slope will have to be set again as described in the previous section.



## Operating Instructions, cont.

### Vertical Rotation (ML 14 *i* only)

Turn the laser on by pushing the  button.

With vertical rotation, the top line of the display becomes an electronic spirit level, showing the laser's position in the cross-axis direction.

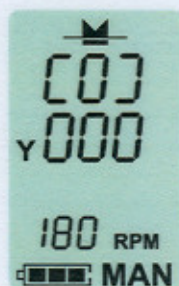
To increase the accuracy of measurement, the "bubble" should be in the middle or as close to the middle as possible.




Raise the right  
side of the laser

The laser  
is level

Raise the left  
side of the laser



Fine adjustment of the beam alignment can be made using the two arrow buttons when Y is selected and flashing in the display.



Push the  button to select Y. During adjustment, the Y line of the display acts as a counter. The number has no significance and is just a guide as to how much the beam has been moved.

### Scanning Mode (ML 14 *i* only)

In scanning mode, the laser beam scans rapidly back and forth over a fixed angle chosen by the user. Scanning mode increases beam visibility up to 20 times compared with normal rotation, and is available instead of both horizontal and vertical rotation.

Scanning mode has four settings: 0, 1, 2, and 3. The larger the number, the wider the angle scanned, i.e. SCAN-0 scans a very narrow angle, SCAN-3 scans a very wide angle.

SCAN-1 and SCAN-2 have a power consumption comparable to normal rotation, while SCAN-0 and SCAN-3 have a much higher power consumption.

To enter scanning mode, push the  button once to select the SCAN setting. SCAN starts to flash in the display, and the laser begins scanning with the current setting. To change the setting, push  repeatedly to toggle through the values until the required setting is reached.

## Scanning Mode (ML 14 i only), cont.


To adjust the direction of the beam during scanning, use the arrow buttons:



- moves the beam direction clockwise.





- moves the beam direction anti-clockwise.

To leave scanning mode and return to rotation, press the  button once.

## Changing Rotation Speed, RPM (ML 14 i only)

There are six possible settings for RPM: 0, 30, 60, 180, 360 and 600.

To change the rotation speed, press the  button once to select the RPM setting. RPM starts flashing in the display. The RPM can now be changed by pressing the  button to toggle through the RPM values until the required RPM is selected.

When the RPM is set to zero, it is possible to adjust the beam direction by using the arrow buttons:




- moves the beam direction clockwise.



- moves the beam direction anti-clockwise.

When an arrow button is held down, the beam will move slowly at first to allow fine adjustments, before speeding up for large adjustments.

## Manual Mode

To enter manual mode, push the  button.

**MAN** will appear in the bottom right corner of the display.

### WARNING:

In Manual mode, the rotor laser does **NOT** automatically self-level. This means there is **NEITHER** horizontal **NOR** vertical levelling in Manual mode.



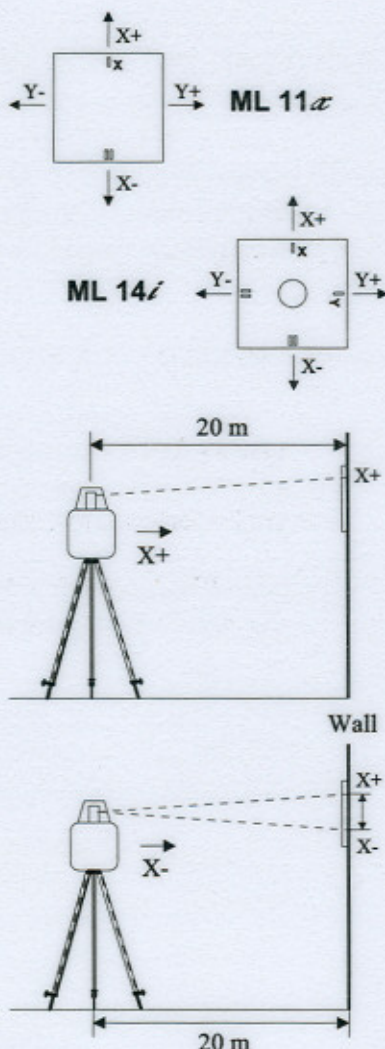
## Checking and Adjusting the Rotor Laser

It is important that the precision of the rotor laser's horizontal calibration and vertical calibration (ML 14 *i* only) are checked periodically, particularly when the laser has been transported over long distances or, for example, been sent by post. In most cases, any adjustment necessary can be made by the user. The methods of checking and adjusting described below make use of scanning mode to increase beam visibility. As this function is only available on the ML 14 *i*, users of the ML 11 *x* should use normal rotation and the laser sensor instead.

### Horizontal Calibration

#### Checking calibration

1. Set up a level tripod 20m from a wall. Mount the laser on the tripod, facing the X+ direction towards the wall.
2. Turn the laser on and wait for self-levelling to complete.
3. Enter scanning mode and use the arrow buttons to move the beam direction until it is aimed directly at the wall. Use the sight on top of the laser as an aid.
4. Tape a piece of paper onto the wall, where the laser is scanning and mark the beam's position (X+).
5. Turn the laser through 180°, so that X- is now facing the wall. Be careful not to alter the height of the laser while turning.
6. In scanning mode, move the beam round until it is scanning across the paper again. Mark this new beam position (X-).





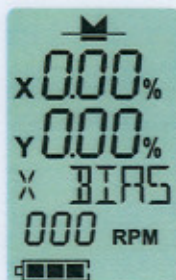
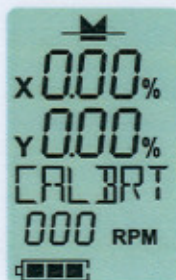
## Horizontal Calibration, cont

7. Measure the difference between the two marked positions, X+ and X-.  
If the difference is 4 mm or less, then no calibration is necessary.
8. Repeat the above procedure for the Y-axis.

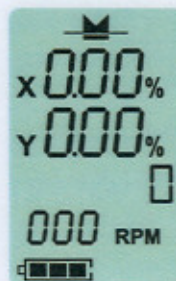
### Adjusting calibration

If the difference between the set of marks for either the X-axis or Y-axis is more than 4 mm, then follow the procedure below to adjust the calibration of that axis. If the difference between a set of marks is more than can be adjusted in calibration mode, then please contact your Mikrofyn dealer.

1. Hold down the **MAN** button to enter calibration mode. CALBRT appears in the middle line of the display.



2. Continue to hold down **MAN** and push the up arrow button to select the axis to be calibrated. Push once to select the X-axis (X BIAS) or twice for the Y-axis (Y BIAS).
3. Release the **MAN** button and a number will appear in the middle line of the display. This number corresponds to the correction made to the laser beam in mm per 100 m. i.e. every time the number is changed by 1, the beam moves 1 mm when measured at a distance of 100 m from the laser. The maximum correction possible is  $\pm 30$  mm at 100 m.





4. Now, use the arrow buttons to alter the correction. Move the laser beam up or down, as required, until it is centered between the two marks made when the calibration was checked.

## Horizontal Calibration, cont

When calibrating in the X+ or Y+ direction, increasing the correction raises the beam, while decreasing the correction lowers the beam. The opposite is true when calibrating in the X- or Y- direction.

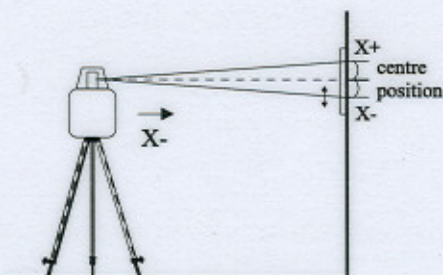
As soon as the adjustment has been made, the laser will self-level at the new position, allowing any further adjustment to be made.

5. When the beam has been centered, leave calibration mode by holding down the  button, X BIAS or Y BIAS will appear in the display. Push the down arrow button until CALBRT appears, then release the  button.
6. Repeat the **Checking calibration** procedure on page 12 to confirm that the calibration has been adjusted correctly.

### Example:

The calibration in the X direction has been checked, and the difference between the two marks, X+ and X-, was 8 mm (see diagram).

In calibration mode, select X BIAS. In this example, the laser beam is too low in the X- direction. To raise the beam, reduce the X BIAS correction.



Moving the beam 1 mm at a distance of 20 m from the laser is the same as moving the beam 5 mm at a distance of 100 m. Since the correction has units of mm per 100 m, it must be altered by 5 to move the beam 1 mm at 20 m.

In this case, the beam must be raised by approx. 4 mm to centre it between the two marks, and the X BIAS correction must be reduced by approx. 20 to do this. Once the adjustment has been made, the laser will self-level with the new setting, and any further adjustments to X BIAS can be made.



## Horizontal Calibration, cont

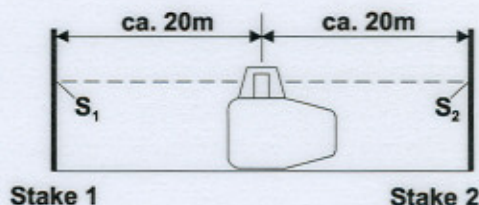
When the beam position is satisfactory, leave calibration mode and repeat the **Checking calibration** procedure on pages 12-13, to confirm that the calibration has been adjusted correctly.

## Vertical Calibration (ML 14 i only)

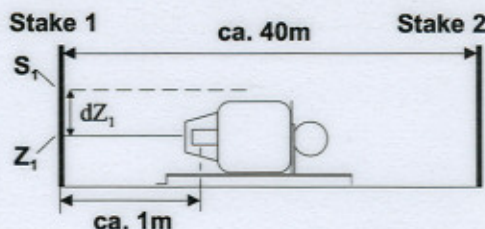
### Checking calibration

This check should be performed after completing the **Horizontal Calibration** procedure on pages 12 - 15. Since the split beam is always perpendicular to the plane of rotation, adjusting the calibration of the split beam horizontally will simultaneously adjust the vertical plane of rotation.

1. Set up the ML 14 i for horizontal rotation half way between two stakes set up a minimum of 40 m apart. (The laser can be facing in either the X or Y direction. No tripod is used.)



2. Turn the laser on, and wait for self-levelling to complete.
3. Tape a piece of paper on each stake. Use either scanning mode, or normal rotation and a laser sensor, to mark the horizontal laser beam positions on each stake ( $S_1$  and  $S_2$ ).
4. Turn the laser off and mount it in the wall bracket at position 0. In this position, the rotating laser beam shines through the slot in the wall bracket, giving a zero reference for the laser. Set up the laser for vertical rotation approx. 1 m from Stake 1.
5. With the rotor head of the laser facing Stake 1 directly, turn the laser on. Make sure that the laser is level in the cross-axis direction, as described at the top of page 10.

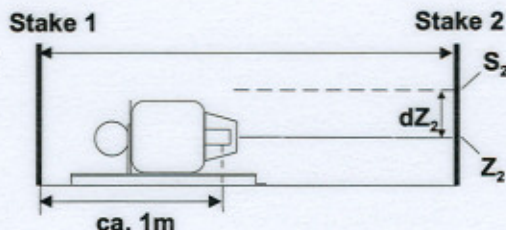


## Vertical Calibration (ML 14 i only), cont.

- On the ground, mark where the laser beam shines through the slot in the wall bracket. This will be used as a reference when the laser is turned round.
- Mark the position ( $Z_1$ ) where the split beam strikes Stake 1. Measure the distance ( $dZ_1$ ) between the two marks  $S_1$  and  $Z_1$ .
- Turn the laser and wall bracket round, so that the rotor head is now facing directly towards Stake 2, and the beam shining through the slot in the wall bracket still strikes the reference mark on the ground.

Once again, make sure the laser is level in the cross-axis direction.

- Mark the position ( $Z_2$ ) where the split beam strikes Stake 2. Measure the distance ( $dZ_2$ ) between the two marks  $S_2$  and  $Z_2$ .



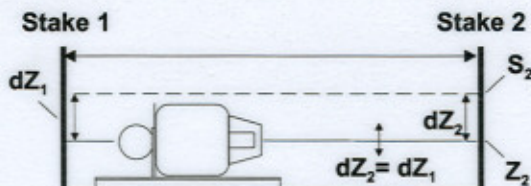
Compare the two measurements  $dZ_1$  and  $dZ_2$ . If the difference is less than 4 mm, then no adjustment is necessary. If it is more than 4 mm, then follow the calibration procedure below.

### Adjusting calibration

- Without moving the laser, enter calibration mode. Instead of X BIAS and Y BIAS, it is now possible to select Z BIAS. This can be adjusted in exactly the same way as for horizontal rotation, using the arrow buttons.

Increasing Z BIAS correction lowers the beam, while decreasing the correction raises the beam.

- Move the split beam up or down on Stake 2 until the new measurement for  $dZ_2$  is equal to the measurement made for  $dZ_1$ .





## **Vertical Calibration (ML 14 *i* only), cont.**


3. Once the two measurements are equal, the adjustment is complete.  
Leave calibration mode, and repeat the **Checking calibration** procedure on pages 15 - 16 to confirm that the calibration has been adjusted correctly.

## User Menu

To enter the User Menu: Push the  button and hold it down for about 2 seconds.

You select a menu option by holding the  button down at the same time as you push the UP/DOWN button.



Once you have found the menu option you want to change, you must let go of the  button.

You will now be at a selected menu option.

Each menu option has various values.

You can change these values by pushing the UP/DOWN button.

Once you have changed the value at a menu option, you save the setting by turning off the laser.



In the User Menu you will find the following menu options:

The names of the menu options may vary, if the language has been changed.

**CALBRT**

**X BIAS**

**Y BIAS**

**SLOPE ALERT**

**LEVEL ALERT**

**RC ID**

**RCMODE**

**LANGUA**

**CALBRT**

This menu option just indicates that you have entered the User Menu.

**X BIAS**

This menu option is used to calibrate the X Bias.

The calibration of the X Bias is described at page 12.

**Y BIAS**

This menu option is used to calibrate the Y Bias.

The calibration of the Y Bias is described at page 12.



## User Menu, continued

### SLOPE ALERT

This menu option is used to alert the user if the laser is disturbed while operating in slope mode. This allows the position of the laser to be checked before work is continued.

You can choose between **FINE**, **COARSE** and **OFF**.

The default setting is **COARSE**.

As the display only has six characters, the name "SLOPE ALERT" is displayed as rolling text.

### LEVEL ALERT

This menu option is used to alert the user if the laser is disturbed while operating in self-levelling mode. This allows the position of the laser to be checked before work is continued.

You can choose between **ON** and **OFF**.

The default setting is **OFF**.

As the display only has six characters, the name "LEVEL ALERT" is displayed as rolling text.

### RC ID

This menu option is used to state the ID number of the Remote Controller that you want to control the laser.

You can choose a figure between **0** and **7**.

The default setting is **0**.

For changing the RC ID number of the Remote Controller, see the User Menu in the Manual for the Remote Controller.

### RCMODE

This menu option is used to state in which mode you want the Remote Control to control the laser.

You can choose between **BASIC** and **FULL**.

The default setting is **BASIC**.

### LANGUA

This menu option is used to choose between various languages.

For the moment, you can choose between **ENGLISH**, **FRENCH** and **DANISH**.

## **Non-Standard Factory Options**

The following options can be set by your dealer, either at the time of purchase or at a later date:

### **Fully manual slope setting**

With this setting, the semi-automatic slope system is turned off, allowing all slopes to be set manually, without any automatic levelling by the laser.

### **Units of slope**

The slope can be displayed in either per cent or per thousand.



## Technical Specifications

Working range (with laser sensor):		150 m
Accuracy:		5mm/100m
Levelling range:		±5°
Working range (interior, visible):	ML 11α ML 14λ	No 30 m
Grade adjustment range:	ML 11α ML 14λ	0 - 10%, single 0 - 10%, dual
Rotational speed, rpm:	ML 11α ML 14λ	600 0/30/60/180/360/600
Scanning:	ML 11α ML 14λ	No Yes
Split beam:	ML 11α ML 14λ	No Yes
Laser/Optics:		
Diode:		635 nm
Maximum output:		2.5 mW
Laser class:		Class 3A
Battery:		
	7.2V, 1.4Ah, "Makita" type	
	Battery life, approx:	20 hours
Water Resistant:		Yes (IP67)
Dimensions (L×W×H), mm:		195×110×180
Weight:		1800 g