FIXTURLASER XA GEOMETRY

USER´S MANUAL

FLATNESS STRAIGHTNESS BORE MEASUREMENTS

CONTENT

INTRODUCTION

Congratulations on your choice of the Fixturlaser XA Geometry!

We are convinced that you have made the right decision and we hope the system will meet, and even exceed, your expectations.

This manual is a complement to the Fixturlaser XA manual.

It is important that you read the sections about safety and care in the Fixturlaser XA manual before you proceed with your first measurement.

The purpose of this manual is to guide you through the different procedures and operations of the hardware and software. Since machine installations and setups are often different from each other, we have focused this manual on measurement principles and how to handle the system.

The manual describes applications, functions and equipment that may be available in a Fixturlaser XA system, the ones that are available in your specific system depend upon which application packages and accessories you have selected.

We wish you many successful measurements!

DECLARATION OF CONFORMITY

In accordance with the EMC Directive 2004/108/EC, the Low Voltage Directive 73/23/EEC, including amendments by the CE-marking Directive 93/68/EEC & EC directives RoHS, 2002/95.

Type of equipment

Alignment System

Brand name or trade mark

Fixturlaser XA Geometry

Type designation(s)/Model no(s)

1-0832 Fixturlaser RM

1-0833 Fixturlaser RS

1-0835 Fixturlaser BT2

1-0390 Fixturlaser T110

1-0285 Fixturlaser T111

1-0897 Fixturlaser T21

1-0289 Fixturlaser T220

1-0836 Fixturlaser TM

1-0837 Fixturlaser TS

Manufacturer's name, address, telephone & fax no

Elos Fixturlaser AB
Box 7
SE-431 21 Mölndal
Sweden

Tel: +46 31 7062800
Fax: +46 31 7062850

The following standards and/or technical specifications, which comply with good engineering practice in safety matters in force within the EEA, have been applied:

Standard/Test report/Technical construction file/Normative document

Emission: EN 61000-6-3:2007.
Immunity: EN 61000-6-2:2005, EN 61000-4-2, -3.
ISO9001:2008 Ref. No/ Issued by:DNV Certification AB Certification No. 2009-SKM-AQ-2704/2009-SKM-AE-1419.

The laser is classified in accordance with the International Standard IEC-60825-1:2007,
USA FDA Standard 21 CFR, Ch 1, Part 1040.10 and 1040.11 except for deviations pursuant to laser notice No. 50, dated June 24, 2007.

The wireless 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 interference received, including interference that may cause undesired operation.

Additional information

The product was CE-marked in 2009.

As manufacturer, we declare under our sole responsibility that the equipment follows the provisions of the Directives stated above.

Date and place of issue

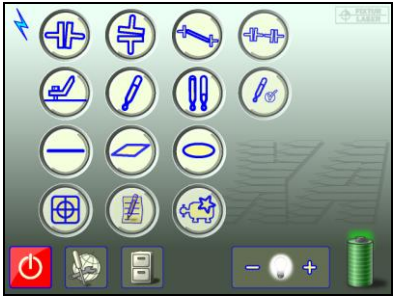
Mölndal 2009-09-30

Signature of authorized person

Hans Svensson, Managing Director

MAIN MENU

The Fixturlaser XA is available with different programs for specific purposes. The programs included depend upon which application packages and accessories you have selected.



Press the red button to start the system and the Main Menu appears. Here you can select the program that you want to use.

In the Main Menu you will also find the Memory Manager and Global Settings.

APPLICATION PROGRAMS


Shaft Alignment Horizontal Machines


Shaft Alignment Vertical Machines


Shaft Alignment Offset Machines


Machine Train Alignment


Softcheck


Target Values


OL2R


Hot Check


Straightness Measurement


Rectangular Flatness Measurement


Circular Flatness Measurement


Sensor Display


Text Editor


Machine Defined Data

MEMORY MANAGER

Memory Manager

SYSTEM FUNCTIONS

Global Settings

Battery indicator

Wireless indicator

Lit when wireless communication is activated.

Backlight

Off

OFF options

When touching the OFF icon, you will see a dialog box where you can choose whether to turn the unit off, put it to sleep, or return to the main menu.

Off

Sleep

Return

STRAIGHTNESS MEASUREMENT

INTRODUCTION

In the Straightness Measurement program, straightness can be measured in two axes. The laser beam is used as reference and the deviation in distance between the laser beam and the measurement object is measured in two or more positions, with the use of the receiver.

MEASUREMENT METHODS

In the Straightness Measurement program, there are different measurement methods. Measurement method is selected in the measurement point window.

Standard Straightness

The laser beam is set roughly parallel to a surface or an object. Two points are used as references.

Straightness with the Clock method as reference

The laser beam is set roughly parallel to a centre line. Two points are used as references. The receiver is rotated 180 degrees in each measurement point to find the centre of the measurement object.

Straightness with the Arc Angle Method

The laser beam is set roughly parallel to a centre line. Two points are used as references. The receiver is placed in 3 to 9 positions at each measurement point to find the centre of the measurement object.

Different measurement methods can be used in the same measurement.

MOUNTING

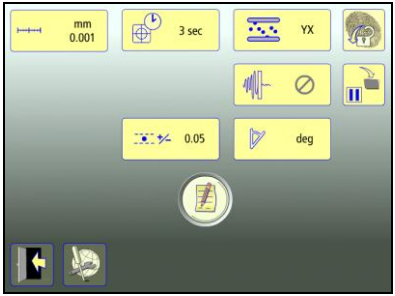
See chapters about receivers and laser transmitters.

STARTING THE PROGRAM

Start the program by touching the Straightness Measurement icon in the Main Menu.

Go to Settings for selecting settings.

SETTINGS

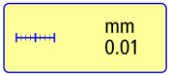


These settings are unique for this application.

For most of the settings, the current selection is shown in the icon.

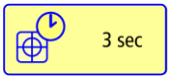
The functions that are available depend upon which application packages and accessories you have selected.

Measurement unit and resolution shown



Opens window for selection of measurement unit and resolution shown.

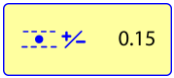
Sampling time



Opens window for selection of sampling time.

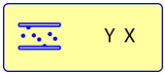
A repeatability test can also be made here. See chapter “Repeatability test”.

Tolerance



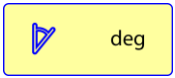
Opens window for selection of tolerance.

Best fit



Opens window for selection of best fit type; Y axis only or Y and X axis.

Angle format



Opens window for selection of angle format.

Notes

Opens Notes, where notes can be entered.

Screen lock

Locks the screen.

Resume function

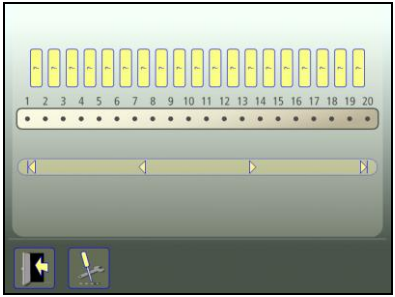
Stores system data to allow a resume of these data to be performed after OFF.

Global settings

Opens Global settings. See chapter “Global settings”.

Exit

Exits the Settings and returns to the application.



Up to 99 points can be measured.

Number of points is selected by entering distances between them, starting from point 1.

Equal distances can be entered by entering them at the last point (the furthest from point 1). The same distance will then be filled in in all empty boxes towards point 1.

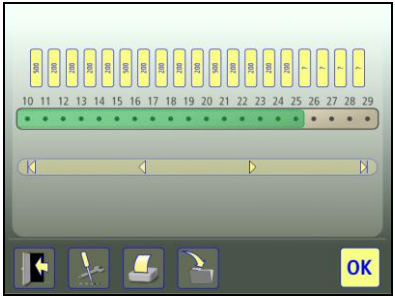
Enter distances

Touch and release the icon to enter distances.

Measure and enter distances between measurement points.

If most of the distances are unequal they can be entered one by one without exiting the input window, by changing the distance input to “next”.

Touch the icon to change distance input to “next”.



The selected area is marked in green.

Confirm configuration

Confirm the configuration and continue to summary screen.

Touch the OK icon to confirm the configuration.

Save configuration

The configuration (distances and tolerance) can be saved separately, to be opened up later.

Touch the save icon to save the configuration.

Change configuration

Distances can be changed.

Touch and release the icon to change a distance.

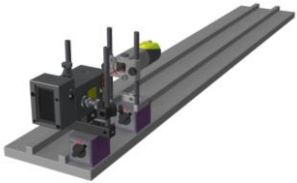
The last distance can be deleted if there are no measured points beyond it.

Touch the delete icon to remove a distance.

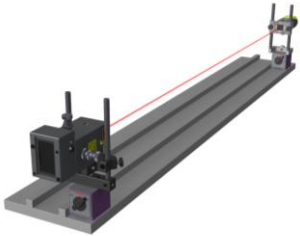
COARSE ADJUSTMENT

Standard Straightness

1. Position the laser transmitter at one end of the measurement object, on the object or on a tripod.
2. Position the receiver as close as possible to the laser transmitter. Adjust the height of the laser transmitter and the receiver until the laser beam hits the centre of the target.



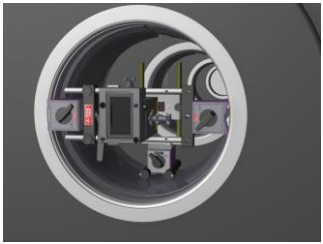
3. Move the receiver as far from the laser transmitter as possible but still on the measurement object. Adjust the laser beam with the adjustment screws on the laser transmitter until it hits the centre of the target. Repeat until the laser beam hits the target at both ends of the measurement object.



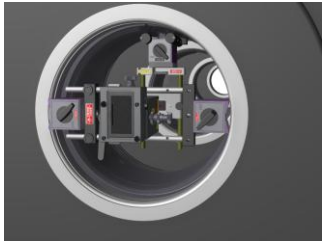
Straightness with the Clock method

1. Locate the approximate centre of the bore with a tape measure and place the receiver at this centre.

2. Position the laser transmitter as close as possible to the first bore so that the laser beam hits the centre of the target.



3. Rotate the receiver 180° and slide it to correct half of the difference between the laser spot and the centre.



4. Adjust the laser transmitter so that the laser beam hits the centre of the target.

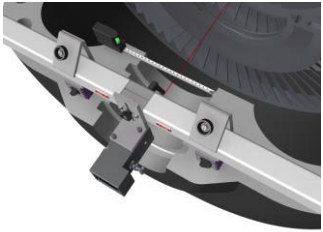
5. Move the receiver to the last bore. Adjust the angle of the laser beam with the adjustment screws until it hits the centre of the target.

6. Move the receiver to the first measurement point.

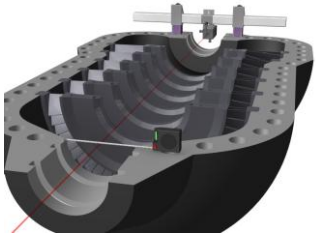
   If the laser beam does not hit the centre of the target, adjust the laser transmitter and then move the receiver to the last measurement point and adjust the angle of the beam.

Straightness with the Arc Angle method

1. Place the laser transmitter as close as possible to the first bore. Make sure that the transmitter and its fixture is firmly attached to the casing.



2. Adjust the position of the laser, sideways and in height, until the laser beam is within 1-2 mm from the centre of the first reference bore, by using the tape measure.



3. Adjust the angle of the laser beam, horizontally and vertically, by using the micrometer screws on the laser transmitter to position it in the centre of the second reference bore. Use a tape measure to position the beam into the centre within 1-2 mm.

4. If necessary, repeat the procedure for coarse adjustment until the beam is centred in both reference bores.

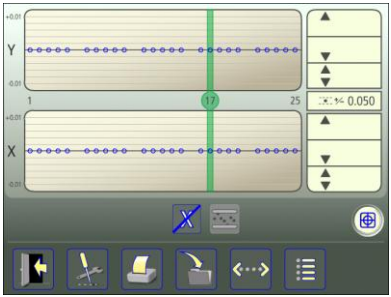
REPEATABILITY TEST

Before starting the straightness measurement, we recommend that you perform a repeatability test. See chapter “Repeatability Test” in Fixturlaser XA manual.

Do the repeatability test at a position far from the laser transmitter.

MEASUREMENT

Summary screen



The summary screen shows all the measurement points.

The measurement point registration is done in the measurement point screen.

Touch and release a point to open the measurement point screen.

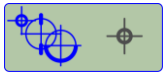
The touched point is marked in green.

If you want to change configuration, it is possible to return to the configuration.

Touch and release the configuration icon to go to configuration.

Measurement method

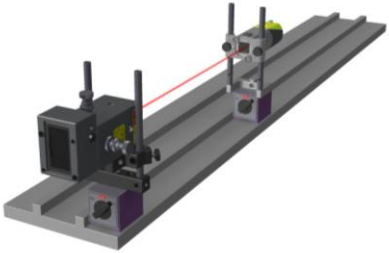
Measurement method is selected in the measurement point window.

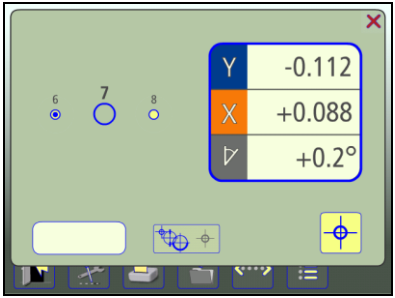


Opens window for selection of measurement method. Standard Straightness, Straightness with the Clock method, or Straightness with the Arc Angle method.

Measurement point registration - Standard Straightness

Place the receiver on the point to be measured. Make sure that the laser beam hits the target.





Live values are indicated with a blue flashing frame around the values.

Touch the register icon to register the measurement point.

The colour indicates the status of the Y and X values in relation to the selected tolerance.

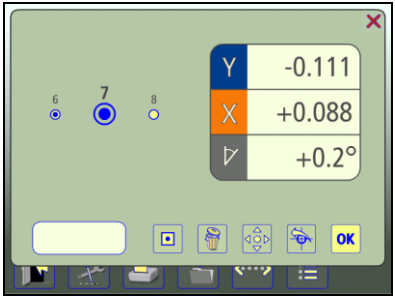
Within tolerance.

Positive values within double tolerance.

Negative values within double tolerance.

Positive values out of double tolerance.

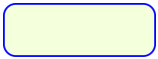
Negative values out of double tolerance.



When a measurement point is registered, fixed values are indicated without a blue flashing frame around the values.

Note

A note with up to 20 characters can be entered at each point.



Touch the icon for entering a note.

Neighbor points

It is possible to continue directly to a neighbor point direct in the measurement point screen. In other words, it is not necessary to return to the summary screen between each point.

Touch a neighbor point to go to it.

Unmeasured neighbor point.

Measured neighbor point.

Remeasure a point

Touch the remeasure icon.

Delete a point

Touch the delete icon.

Return to summary screen

Touch the OK icon to return to summary screen.

Measurement point registration - Straightness with the Clock method

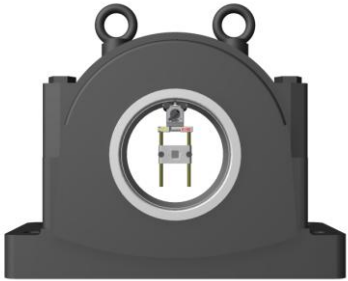
Using this method, the procedure at every measurement point is made in two steps.

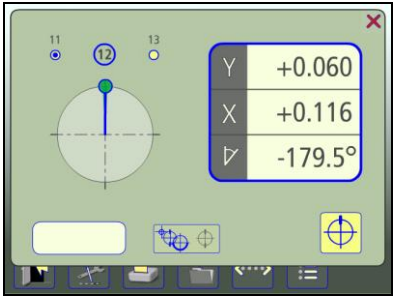
For each measurement point, measurement values have to be taken in 2 positions.

Important: Make sure that the entire laser beam falls inside the detector area of the receiver at both positions, before starting the registration.

Note: The clock method with measurements only at 12 and 6 o'clock are not recommended for larger diameter bores (i.e. diameter over approximately 250 mm), or when there are worn surfaces in bottom of bores and/or errors in roundness.

Place the receiver upside-down and in level.

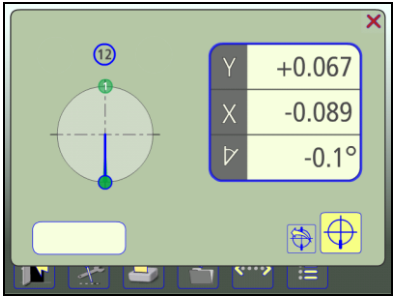


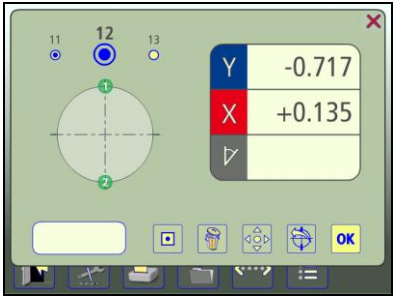


Live values are indicated with a blue flashing frame around the values.

Register the values in the position before rotation. The Y and X values will be zeroed.

Rotate the receiver 180° (in level).





Register the values in the position after rotation. The Y and X values will be halfed.

When a measurement point is registered, fixed values are indicated without a blue flashing frame around the values. The colour indicates the status of the Y and X values in relation to the selected tolerance.

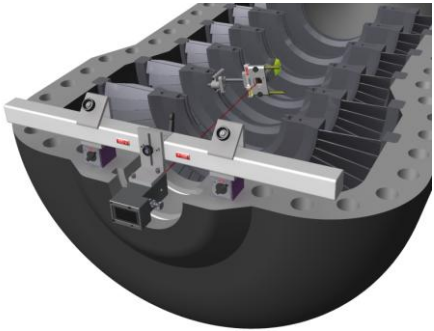
Measurement point registration - Straightness with the Arc Angle method

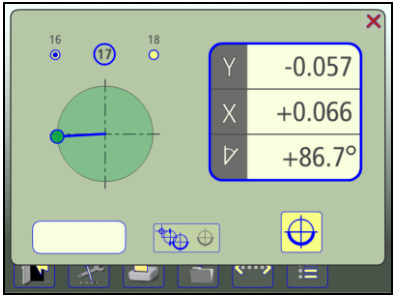
Using the Arc Angle method, the procedure at every measurement point is made in several steps.

For each measurement point, measurement values have to be taken in 3 positions and can be taken in up to 9 positions.

Important: Make sure that the entire laser beam falls inside the detector area of the receiver at all positions, before starting the registration.

Place the receiver at the first position and make sure that it is properly attached to the surface.

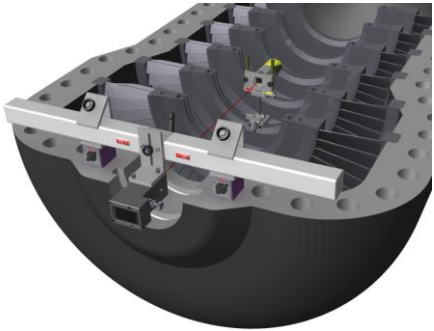




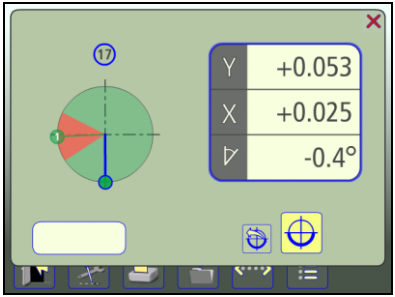
Live values are indicated with a blue flashing frame around the values.

Register the values at the 1st position, by touching the icon for registration of positions in the Arc Angle method.

Rotate the receiver to a 2nd appropriate position.

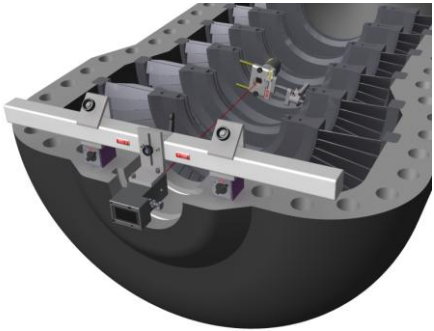


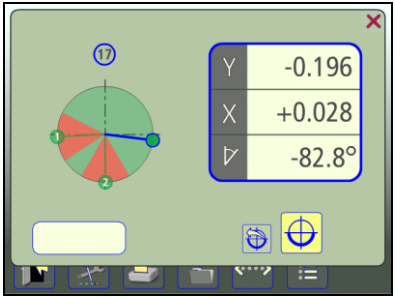
Minimum angle between positions is 30 degrees. Green sector show permitted positions. Red sector show forbidden positions.



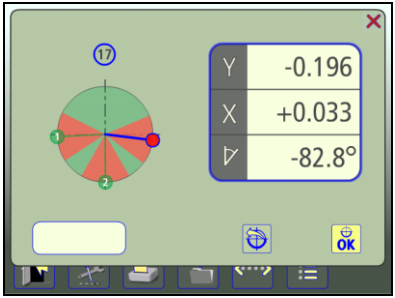
Register the values at the 2nd position.

Rotate the receiver to the 3rd appropriate position.



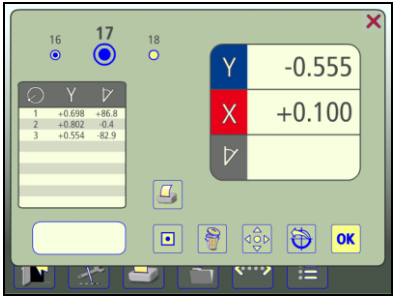


Register the values at the 3rd position.



Rotate the receiver to another position or confirm Arc Angle measurement and show result for the point.

Finish Arc Angle measurement and show result for the point.



When the Arc Angle measurement is finished, a list of the values at each position is shown together with the result. This list will not be saved but it is possible to take a screen dump of it.

Fixed result values are indicated without a blue flashing frame around the values. The colour indicates the status of the Y and X values in relation to selected tolerance.

REFERENCES

There are different ways to select references.

Manually selected reference points

One or two points that can be selected in the measurement point screen.

Select point as reference.

Best fit

Contrary to the selection of reference points, best fit is a function that can be enabled or disabled. The function calculates a reference line that minimizes the deviation from measured points. In straightness, a minimum of two measured points is required for the function to be accessible. When the function is enabled, it will continuously recalculate a reference line or plane whenever the input parameters to the function are changed. These parameters are changed if a new point is measured, a point is remeasured, a measured point is removed or if a user given distance is changed. The best fit reference line will however not be recalculated if the user aligns a measured point.

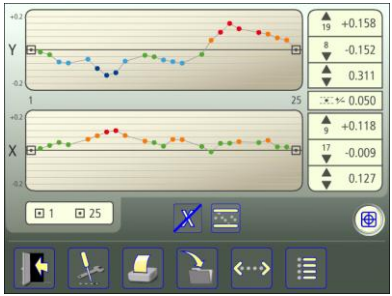
Enable the best fit function.

Update best fit calculations.

Disable the best fit function.

MEASUREMENT RESULT

Summary screen



The summary screen shows all the measurement points.

The diagram scale is automatically adjusted according to the highest or lowest Y or X value.

The symbols indicate status of the measurement point.

- Values within tolerance.
- Positive values within double tolerance.
- Negative values within double tolerance.
- Positive values out of double tolerance.
- Negative values out of double tolerance.
- Unmeasured point.
- Reference point.

Tolerance, maximum and minimum values and the difference between the maximum and minimum values are also shown.

Measurement values for each point can be seen in the measurement point screen or in the list screen.

Touch and release a point to open the measurement point screen.

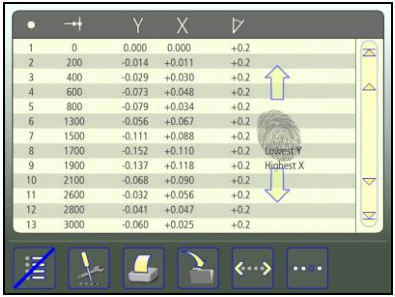
Touch the list icon to go to list.

Save measurement

The measurement can be saved anytime and be opened later.

Touch the save icon to save the measurement.

List screen



Go back to summary screen.

The list screen shows all the measurement points in a list with distances, values and notes if any.

The list can be scrolled up and down with a finger or by using the arrows at the right.

Evaluating the result

The result is presented in relation to the selected references. The direction is depending on how the receiver is placed. If the receiver is placed according to the mounting instructions, Y values are showing the vertical direction and X values the horizontal direction. In the vertical direction (Y), positive values mean that the measurement object at this point is higher than the reference line and negative values that the measurement object is lower than the reference line.

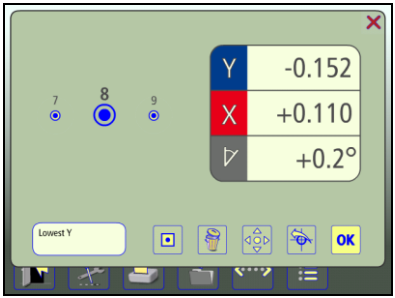
In the horizontal direction (X, looking at the receiver from the laser transmitter), positive values mean that the measurement object at this point is to the left and negative values that the measurement object is to the right.

These values are compared with the tolerance to determine whether correction is necessary. When a tolerance is selected, the symbols indicate if the values are within tolerance or not.

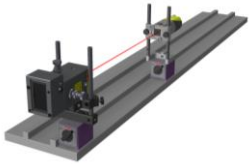
In the diagrams, upwards correspond to positive values.

ALIGNMENT

Select the point to be aligned in the summary screen.

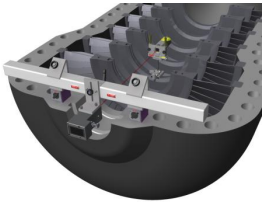


Place the receiver on the point. Make sure that the laser beam hits the target.



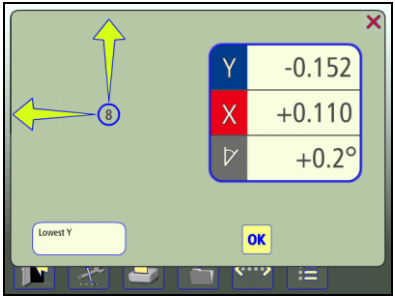
Standard Straightness

Straightness with the Clock method



Straightness with the Arc Angle method

Touch the alignment icon.



The actual values for the selected point go live and alignment can be made towards zero. Zero will be in accordance to selected references.

Adjust vertically and horizontally until the Y and X values for the selected measurement point are within tolerance.

The arrows show in which direction to adjust.

Touch the OK icon.

Note: Depending on your application, alignment at one point might affect other measurement points. It is therefore recommended to remeasure all points when all adjustments are made.

OTHER FEATURES

Turn off X diagram

When measuring in the Y axis only, the X diagram can be turned off. The diagram scale will then be automatically adjusted according to the highest or lowest Y value only.

Turns off X diagram.

Sensor display

Sensor Display can be reached directly in the summary screen.

Starts Sensor Display.

See chapter ”Sensor Display” in the XA manual.

Reference Receiver

A reference receiver, a second receiver, is used in applications where you want to check that the reference, the laser beam, has not moved during the measurement sequence.

The reference receiver is normally mounted at far distance from the laser transmitter to more easily detect any movements of the laser.

When the laser beam is adjusted to its final position and the reference is established, the values from the reference receiver are set to zero in the Sensor Display. It is possible, at any time during the measurement, to enter the Sensor Display and check that the values are still zero.

RECTANGULAR FLATNESS MEASUREMENT

INTRODUCTION

In the Rectangular Flatness Measurement program a laser plane is used as reference. The deviation in distance between the laser plane and the measurement object is measured in one or more positions with the use of the receiver.

The laser plane can either be created by three reference points or by levelling, with the laser plane put in level and with one measurement point as reference.

MOUNTING

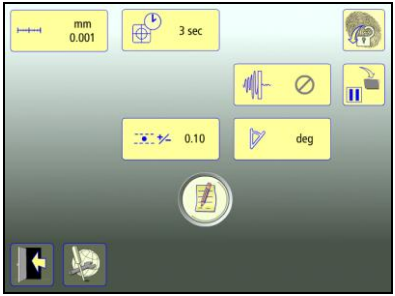
See chapters about the receiver and laser transmitters.

STARTING THE PROGRAM

Start the program by touching the Rectangular Flatness Measurement icon in the Main Menu.

Go to Settings for selecting settings.

SETTINGS

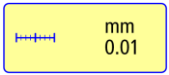


These settings are unique for this application.

For most of the settings, the current selection is shown in the icon.

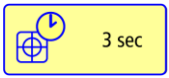
The functions that are available depend upon which application packages and accessories you have selected.

Measurement unit and resolution shown



Opens window for selection of measurement unit and resolution shown.

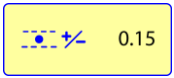
Sampling time



Opens window for selection of sampling time.

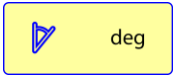
A repeatability test can also be made here. See chapter “Repeatability test”.

Tolerance



Opens window for selection of tolerance.

Angle format



Opens window for selection of angle format.

Notes

Opens Notes, where notes can be entered.

Screen lock

Locks the screen.

Resume function

Stores system data to allow a resume of these data to be performed after OFF.

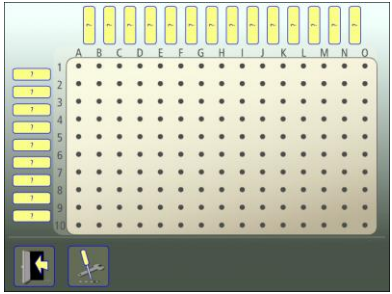
Global settings

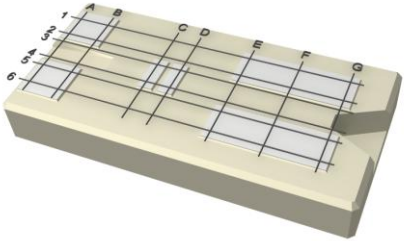
Opens Global settings. See chapter “Global settings”.

Exit

Exits the Settings and returns to the application.

CONFIGURATION





Up to 15 x 10 points can be measured.

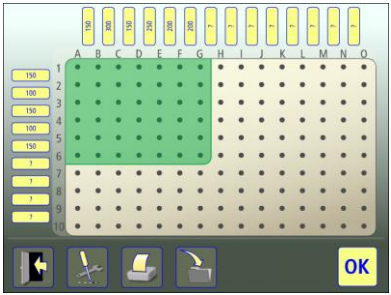
Number of points is selected by entering distances between them, starting from point A1.

Equal distances can be entered by enter them at the last point (the farthest from point A1). The same distance will then be filled in in all empty boxes towards point A1.

Enter distances

Touch and release the icon to enter distances.

Measure and enter distances between measurement points.



The selected area is marked in green.

Confirm configuration

Confirm the configuration and continue to summary screen.

Touch the OK icon to confirm the configuration.

Save configuration

The configuration (distances and tolerance) can be saved separately, to be opened up later.

Touch the save icon to save the configuration.

Change configuration

Distances can be changed.

Touch and release the icon to change a distance.

The last distance in the row or column can be deleted if there are no measured points beyond them.

Touch the delete icon to remove a distance.

COARSE ADJUSTMENT

Three reference points

1. Position the laser transmitter at one end of the measurement object, on the object or on a tripod.
2. Mark the measurement points and name them as they will be shown in the flatness software (A1, A2 etc).
3. Position the receiver as close as possible to the laser transmitter. Adjust the height of the laser transmitter and the receiver until the laser beam hits the centre of the target.
4. Move the receiver to a second point on the measurement object far from the transmitter. Adjust the angle of the laser beam, with one of the adjustment screws, until it hits the centre of the target.
5. Move the receiver to a third point on the measurement object in a direction perpendicular to the other two points far from the transmitter. Adjust the angle of the laser beam, with the second adjustment screw, until it hits the centre of the target.
6. Repeat the procedure until the laser beam hits the centre of the target at all three points. Check that the beam falls into the target centre at all measurement points before starting the flatness measurement.

One reference point – Levelling

To check how a surface is positioned according to level, it is necessary to set the laser plane in level. This is done by zeroing the levels with the micrometer screws.

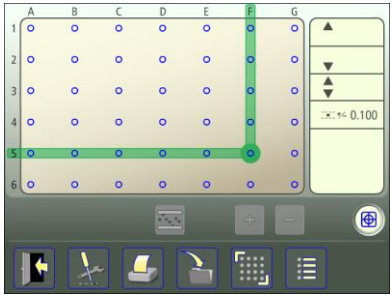
REPEATABILITY TEST

Before starting the flatness measurement, we recommend that you perform a repeatability test. See chapter “Repeatability Test” in Fixturlaser XA manual.

Do the repeatability test at a position far from the laser transmitter.

MEASUREMENT

Summary screen



The summary screen shows all the measurement points.

The measurement point registration is done in the measurement point screen.

Touch and release a point to open the measurement point screen.

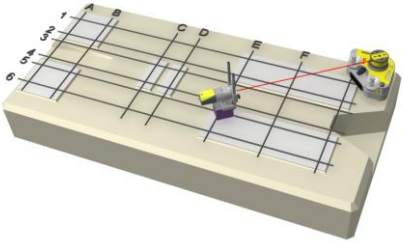
The touched point is marked in green.

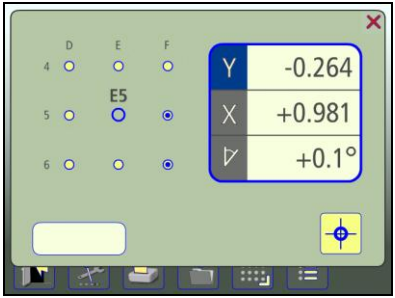
If you want to change configuration it is possible to return to the configuration.

Touch and release the configuration icon to go to configuration.

Measurement point registration

Place the receiver on the point to be measured. Make sure that the laser beam hits the target.





Live values are indicated with a blue flashing frame around the values.

Touch the register icon to register the measurement point.

The colour indicates the status of the Y value in relation to the selected tolerance.

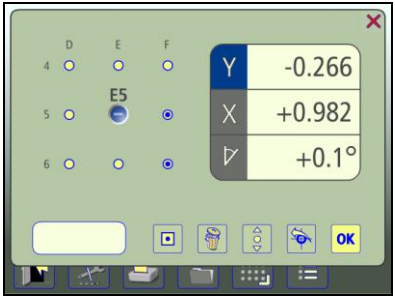
Within tolerance.

Positive values within double tolerance.

Negative values within double tolerance.

Positive values out of double tolerance.

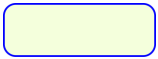
Negative values out of double tolerance.



When a measurement point is registered, fixed values are indicated without a blue flashing frame around the values.

Note

A note with up to 20 characters can be entered at each point.



Touch the icon for entering a note.

Neighbor points

It is possible to continue directly to a neighbor point in the measurement point screen. In other words, it is not necessary to return to the summary screen between each point.

Touch a neighbor point to go to it.

Unmeasured neighbor point.

Measured neighbor point.

Remeasure a point

Touch the remeasure icon.

Delete a point

Touch the delete icon.

Return to summary screen

Touch the OK icon to return to summary screen.

REFERENCES

There are different ways to select references.

Manually selected reference points

One or three points can be selected in the measurement point screen.

Select point as reference.

Reference points for positive values only

Selects reference points for positive values only. When selecting positive values only, suitable reference points are automatically selected. Can be selected in the summary screen. Use only after points have been measured.

Select reference points for positive values only.

Reference points for negative values only

Selects reference points for negative values only. When selecting negative values only, suitable reference points are automatically selected. Can be selected in the summary screen. Use only after points have been measured.

Select reference points for negative values only.

Best fit

Contrary to the selection of reference points, best fit is a function that can be enabled or disabled. The function calculates a reference plane that minimizes the deviation from measured points. In flatness, a minimum of three measured points is required in order for the function to be accessible. It is also required that not all the measured points lie on a straight line in order for the function to be accessible. When the

function is enabled, it will continuously recalculate a reference plane whenever the input parameters to the function are changed. These parameters are changed if a new point is measured, a point is remeasured, a measured point is removed or if a user given distance is changed. The best fit reference plane will however not be recalculated if the user aligns a measured point.

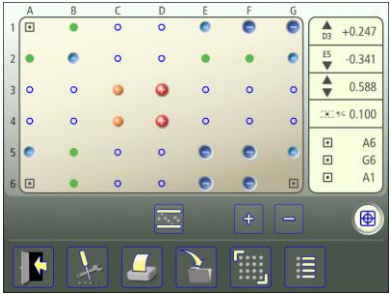
Enable the best fit function.

Update best fit calculations.

Disable the best fit function.

MEASUREMENT RESULT

Summary screen



The summary screen shows all the measurement points.

The symbols indicate status of the measurement point.

- Values within tolerance.
- Positive values within double tolerance.
- Negative values within double tolerance.
- Positive values out of double tolerance.
- Negative values out of double tolerance.
- Unmeasured point.
- Reference point.
- Inactive reference point.

Tolerance, maximum and minimum values and the difference between the maximum and the minimum values are also shown.

Measurement values for each point can be seen in the measurement point screen or in the list screen.

Touch and release a point to open the measurement point screen.

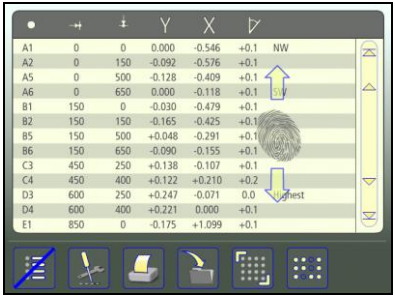
Touch the list icon to go to list.

Save measurement

The measurement can be saved anytime and be opened later.

Touch the save icon to save the measurement.

List screen



			Y	X		
A1	0	0	0.000	-0.546	+0.1	NW
A2	0	150	-0.092	-0.576	+0.1	
A5	0	500	-0.128	-0.409	+0.1	
A6	0	650	0.000	-0.118	+0.1	
B1	150	0	-0.030	-0.479	+0.1	
B2	150	150	-0.165	-0.425	+0.1	
B5	150	500	+0.048	-0.291	+0.1	
B6	150	650	-0.090	-0.155	+0.1	
C3	450	250	+0.138	-0.107	+0.1	
C4	450	400	+0.122	+0.210	+0.2	
D3	600	250	+0.247	-0.071	0.0	highest
D4	600	400	+0.221	0.000	+0.1	
E1	850	0	-0.175	+1.099	+0.1	

The list screen shows all the measurement points in a list with distances, values and notes if any.

The list can be scrolled up and down with a finger or by using the arrows at the right.

Touch the summary screen icon to go back to summary screen.

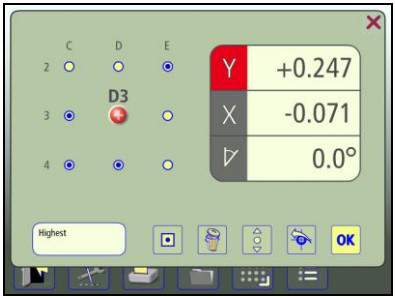
Evaluating the result

The result is presented in relation to the selected references. The direction is depending on how the receiver is placed. If the receiver is placed according to the mounting instructions, Y values are showing the vertical direction. In the vertical direction (Y), positive values mean that the measurement object at this point is higher than the reference plane, and negative values that the measurement object is lower than the reference plane.

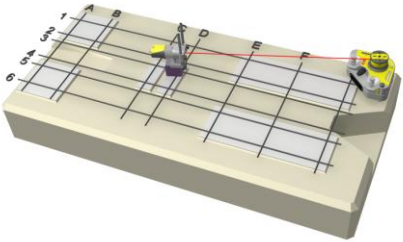
These values are compared with the tolerance to determine whether correction is necessary. When a tolerance is selected, the symbols indicate if the values are within tolerance or not.

ALIGNMENT

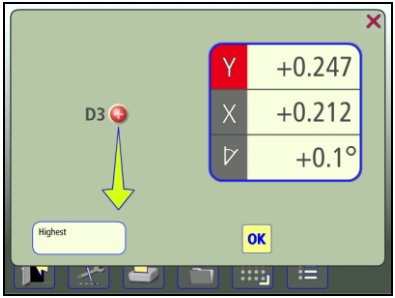
Select the point to be aligned in the summary screen.



Place the receiver on the point. Make sure that the laser beam hits the target.



Touch the alignment icon.



The actual Y value for the selected point goes live and alignment can be made towards zero. Zero will be in accordance to selected references.

Adjust vertically until the Y value for the selected measurement point is within tolerance.

The arrow show in which direction to adjust.

Touch the OK icon.

Note: Depending on your application, alignment at one point might affect other measurement points. It is therefore recommended to remeasure all points when all adjustments are made.

OTHER FEATURES

Sensor display

Sensor Display can be reached directly in the summary screen.

Starts Sensor Display.

See chapter ”Sensor Display” in the Fixturlaser XA manual.

Reference Receiver

A reference receiver, a second receiver, is used in applications where you want to check that the reference, the laser beam, has not moved during the measurement sequence.

The reference receiver is normally mounted at far distance from the laser transmitter to more easily detect any movements of the laser.

When the laser beam is adjusted to its final position and the reference is established, the values from the reference receiver are set to zero in the Sensor Display. It is possible, at any time during the measurement, to enter the Sensor Display and check that the values are still zero.

CIRCULAR FLATNESS MEASUREMENT

INTRODUCTION

In the Circular Flatness Measurement program, a laser plane is used as reference. The deviation in distance between the laser plane and the measurement object is measured in one or more positions with the use of the receiver.

The laser plane can either be created by three reference points or by levelling, with the laser plane put in level and with one measurement point as reference.

MOUNTING

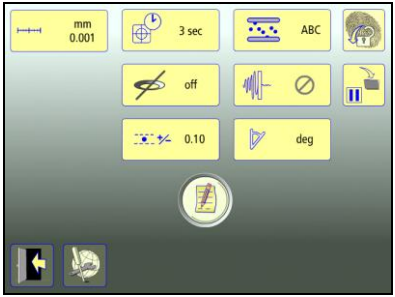
See chapters about the receiver and laser transmitters.

STARTING THE PROGRAM

Start the program by touching the Circular Flatness Measurement icon in the Main Menu.

Go to Settings for selecting settings.

SETTINGS

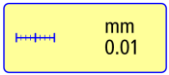


The settings are unique for this application.

For most of the settings, the current selection is shown in the icon.

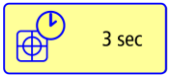
The functions that are available depend upon which application packages and accessories you have selected.

Measurement unit and resolution shown



Opens window for selection of measurement unit and resolution shown.

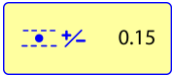
Sampling time



Opens window for selection of sampling time.

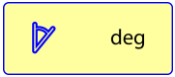
A repeatability test can also be made here. See chapter “Repeatability test”.

Tolerance



Opens window for selection of tolerance.

Angle format

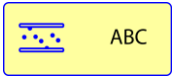


Opens window for selection of angle format.

Flange measurement

Opens window for activating or de-activating Flange measurement.

Best fit type



Opens window for selection of Best fit type.

Best fit based on all circles (ABC) or one circle (A, B or C).

Notes

Opens Notes, where notes can be entered.

Screen lock

Locks the screen.

Resume function

Stores system data to allow a resume of these data to be performed after OFF.

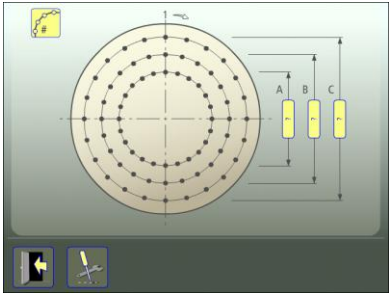
Global settings

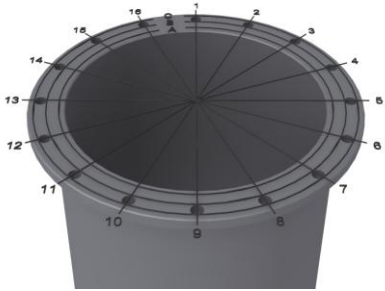
Opens Global settings. See chapter “Global settings”.

Exit

Exits the Settings and returns to the application.

CONFIGURATION





Up to 3 circles with 99 points on each circle can be measured.

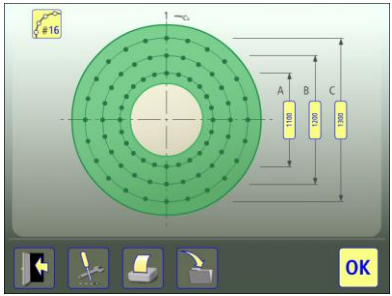
Number of points is selected by entering diameters and number of points on a circle.

Enter diameters and number of points on a circle

Touch and release the icon to enter diameters.

Measure and enter diameters.

Touch the icon to enter number of points on a circle.



The selected area is marked in green.

Confirm configuration

Confirm the configuration and continue to summary screen.

Touch the OK icon to confirm the configuration.

Save configuration

The configuration (diameters number of points on a circle and tolerance) can be saved separately, to be opened up later.

Touch the save icon to save the configuration.

Change configuration

The diameters and number of points on a circle can be changed. When measurement point registration has started, number of points can only be changed to a multiple of the origin number of points.

Touch and release the icon to change a diameter.

Touch the icon to change number of points on a circle.

Circles can be deleted if there are no measured points on them.

Touch the delete icon to remove a circle.

COARSE ADJUSTMENT

Three reference points

1. Position the laser transmitter at one end of the measurement object, on the object or on a tripod.
2. Mark the measurement points and name them as they will be shown in the flatness software (A1, A2 etc).
3. Position the receiver as close as possible to the laser transmitter. Adjust the height of the laser transmitter and the receiver until the laser beam hits the centre of the target.
4. Move the receiver to a second point on the measurement object far from the transmitter. Adjust the angle of the laser beam with one of the adjustment screws until it hits the centre of the target.
5. Move the receiver to a third point on the measurement object in a direction perpendicular to the other two points far from the transmitter. Adjust the angle of the laser beam with the second adjustment screw until it hits the centre of the target.
6. Repeat the procedure until the laser beam hits the centre of the target at all three points. Check that the beam falls into the target centre at all measurement points before starting the flatness measurement.

One reference point – Levelling

To check how a surface is positioned according to level, it is necessary to set the laser plane in level. This is done by adjusting the micrometer screws on the laser transmitter and by using the built-in spirit level in both directions.

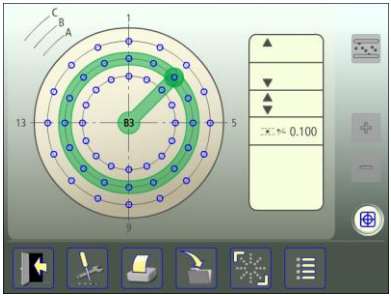
REPEATABILITY TEST

Before starting the flatness measurement, we recommend you to perform a repeatability test. See chapter “Repeatability Test” in the Fixturlaser XA manual.

Do the repeatability test at a position far from the laser transmitter.

MEASUREMENT

Summary screen



The summary screen shows all the measurement points.

The measurement point registration is done in the measurement point screen.

Touch and release a point to open the measurement point screen.

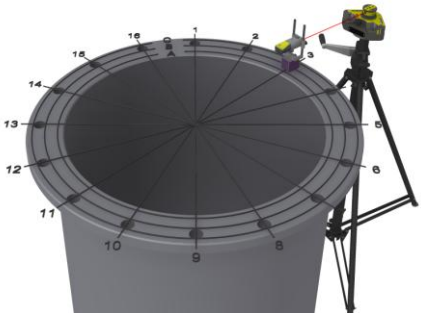
The touched point is marked with green.

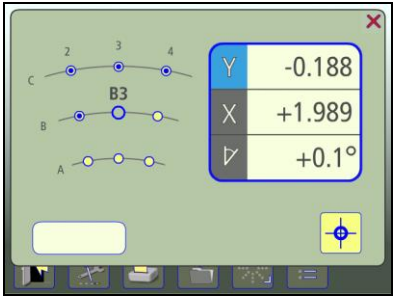
If you want to change configuration, it is possible to return to the configuration.

Touch and release the configuration icon to go to configuration.

Measurement point registration

Place the receiver on the point to be measured. Make sure that the laser beam hits the target.





Live values are indicated with a blue flashing frame around the values.

Touch the register icon to register the measurement point.

The colour indicates the status of the Y value in relation to the selected tolerance.

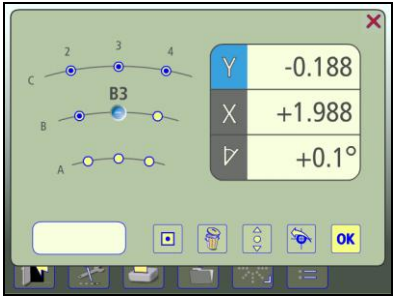
Within tolerance.

Positive values within double tolerance.

Negative values within double tolerance.

Positive values out of double tolerance.

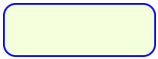
Negative values out of double tolerance.



When a measurement point is registered, fixed values are indicated without a blue flashing frame around the values.

Note

A note with up to 20 characters can be entered at each point.



Touch the icon for entering a note.

Neighbor points

It is possible to continue directly to a neighbor point in the measurement point screen. In other words, it is not necessary to return to the summary screen between each point.

Touch a neighbor point to go to it.

Unmeasured neighbor point.

Measured neighbor point.

Remeasure a point

Touch the remeasure icon.

Delete a point

Touch the delete icon.

Return to summary screen

Touch the OK icon to return to summary screen.

REFERENCES

There are different ways to select references.

Manually selected reference points

One or three points can be selected in the measurement point screen.

Select point as reference.

Reference points for positive values only

Selects reference points for positive values only. When selecting positive values only, suitable reference points are automatically selected. Can be selected in the summary screen. Use only after points have been measured.

Select reference points for positive values only.

Reference points for negative values only

Selects reference points for negative values only. When selecting negative values only, suitable reference points are automatically selected. Can be selected in the summary screen. Use only after points is measured.

Select reference points for negative values only.

Best fit

Contrary to the selection of reference points, best fit is a function that can be enabled or disabled. The function calculates a reference plane that minimizes the deviation from measured points. In flatness, a minimum of three measured points is required in order for the function to be accessible. It is also required that not all the measured points lie on a straight line in order for the function to be accessible. When the

function is enabled, it will continuously recalculate a reference plane whenever the input parameters to the function are changed. These parameters are changed if a new point is measured, a point is remeasured, a measured point is removed or if a user given distance is changed. The best fit reference plane will however not be recalculated if the user aligns a measured point.

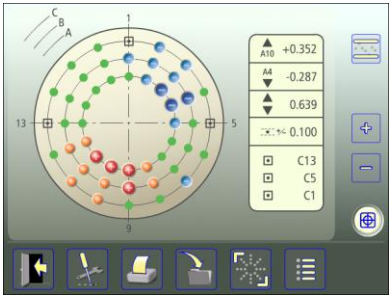
Enable the best fit function.

Update best fit calculations.

Disable the best fit function.

MEASUREMENT RESULT

Summary screen



Summary screen with up to 16 points on a circle.

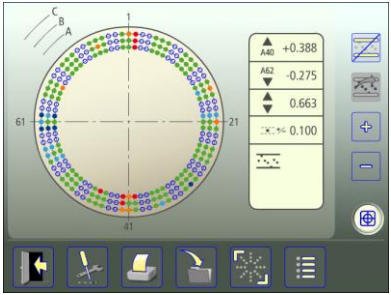
The summary screen shows all the measurement points.

The symbols indicate status of the measurement point.

- Values within tolerance.
- Positive values within double tolerance.
- Negative values within double tolerance.
- Positive values out of double tolerance.
- Negative values out of double tolerance.
- Unmeasured point.
- Reference point.
- Inactive reference point.

Tolerance, maximum and minimum values and the difference between the maximum and the minimum values are also shown.

When there are more than 16 points on a circle, the points are shown with colour dots only.



Summary screen with more than 16 points on a circle and best fit.

Measurement values at each point can be seen in the measurement point screen or in the list screen.

Touch and release a point to open the measurement point screen.

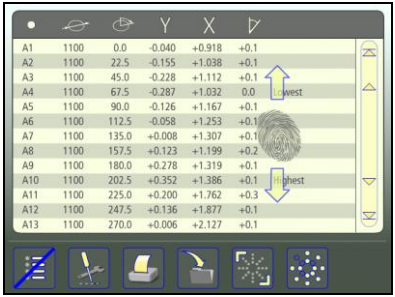
Touch the list icon to go to list.

Save measurement

The measurement can be saved anytime and be opened later.

Touch the save icon to save the measurement.

List screen



Touch the summary screen icon to go back to summary screen.

The list screen shows all the measurement points in a list with distances, values, and notes if any.

The list can be scrolled up and down with a finger or by using the arrows at the right.

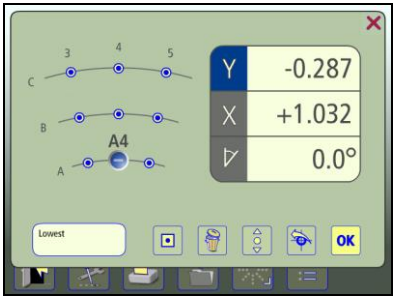
Evaluating the result

The result is presented in relation to the selected references. The direction is depending on how the receiver is placed. If the receiver is placed according to the mounting instructions, Y values are showing the vertical direction. In the vertical direction (Y), positive values mean that the measurement object at this point is higher than the reference plan, and negative values that the measurement object is lower than the reference plan.

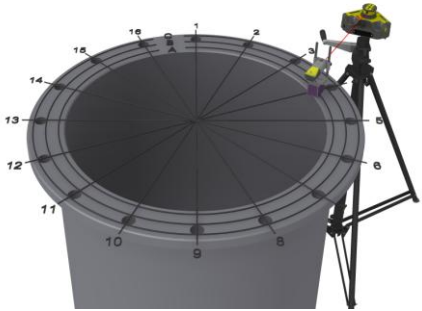
These values are compared with the tolerance to determine whether correction is necessary. When a tolerance is selected, the symbols indicate if the values are within tolerance or not.

ALIGNMENT

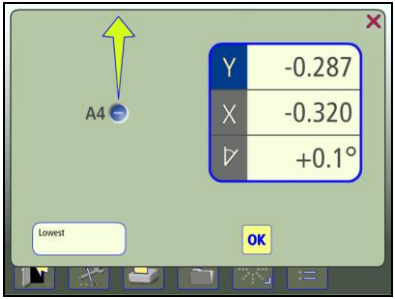
Select the point to be aligned in the summary screen.



Place the receiver on the point. Make sure that the laser beam hits the target.



Touch the alignment icon.



The actual Y value for the selected point goes live and alignment can be made towards zero. Zero will be in accordance to selected references.

Adjust vertically until the Y value for the selected measurement point is within tolerance.

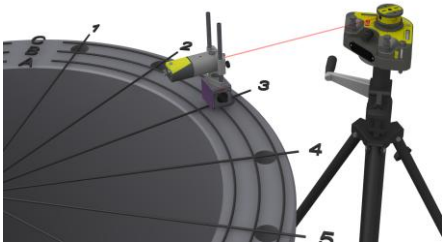
The arrow show in which direction to adjust.

Touch the OK icon.

Note: Depending on your application, alignment at one point might affect other measurement points. It is therefore recommended to remeasure all points when all adjustments are made.

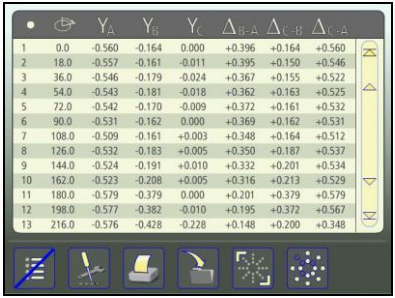
FLANGE MEASUREMENT

Flange measurement is used when taper of a flange is to be measured.



When flange measurement is activated, an alternative list screen is shown.

In each row, the points at each circle position are shown next to each other. To their right, the taper is shown.



•	⟳	Y_A	Y_B	Y_C	Δ_{B-A}	Δ_{C-B}	Δ_{C-A}
1	0.0	-0.560	-0.164	0.000	+0.396	+0.164	+0.560
2	18.0	-0.557	-0.161	-0.011	+0.395	+0.150	+0.546
3	36.0	-0.546	-0.179	-0.024	+0.367	+0.155	+0.522
4	54.0	-0.543	-0.181	-0.018	+0.362	+0.163	+0.525
5	72.0	-0.542	-0.170	-0.009	+0.372	+0.161	+0.532
6	90.0	-0.531	-0.162	0.000	+0.369	+0.162	+0.531
7	108.0	-0.509	-0.161	+0.003	+0.348	+0.164	+0.512
8	126.0	-0.532	-0.183	+0.005	+0.350	+0.187	+0.537
9	144.0	-0.524	-0.191	+0.010	+0.332	+0.201	+0.534
10	162.0	-0.523	-0.208	+0.005	+0.316	+0.213	+0.529
11	180.0	-0.579	-0.379	0.000	+0.201	+0.379	+0.579
12	198.0	-0.577	-0.382	-0.010	+0.195	+0.372	+0.567
13	216.0	-0.576	-0.428	-0.228	+0.148	+0.200	+0.348

Example:

First row at 0.0°:
A1, B1, C1, A1-B1, B1-C1, A1-C1

Second row at 22.5°:
A2, B2, C2, A2-B2, B2-C2, A2-C2

etc

The taper can be shown in mm/mils or degrees/radians.

OTHER FEATURES

Sensor display

Sensor Display can be reached directly in the summary screen.

Starts Sensor Display.

See chapter ”Sensor Display” in the Fixturlaser XA manual.

Reference Receiver

A reference receiver, a second receiver, is used in applications where you want to check that the reference, the laser beam, has not moved during the measurement sequence.

The reference receiver is normally mounted at far distance from the laser transmitter to more easily detect any movements of the laser.

When the laser beam is adjusted to its final position and the reference is established, the values from the reference receiver are set to zero in the Sensor Display. It is possible, at any time during the measurement, to enter the Sensor Display and check that the values are still zero.

MEMORY MANAGER

FILE MANAGER

See chapter “Memory Manager” in the Fixturlaser XA manual.

SAVE MEASUREMENT

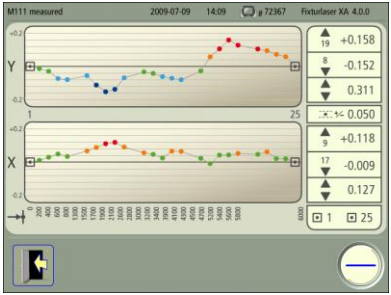
See chapter “Memory Manager” in the Fixturlaser XA manual.

TRANSFER FILES TO A PC

See chapter “Memory Manager” in the Fixturlaser XA manual.

Note: Apart from the picture file (jpeg) and a text file (txt), there will also be a list file (lst) in the PC for straightness and flatness measurements.

STRAIGHTNESS MEASUREMENT



The screen displays measurement results, distances*, tolerance, references, file name, date and time, serial number of the display unit, program and program version.

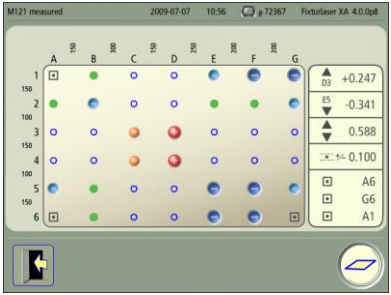
*) If the number of points exceeds 25, only the distance to the last point is shown.

It is possible to go directly to Straightness measurement to continue measuring. All measurement data will be uploaded.

Exits the measurement file.

Go to Straightness Measurement by touching this icon.

RECTANGULAR FLATNESS MEASUREMENT



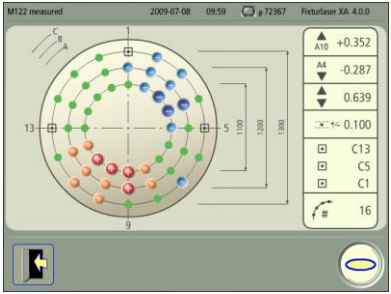
The screen displays measurement results, distances, tolerance, references, file name, date and time, serial number of the display unit, program and program version.

It is possible to go directly to Rectangular Flatness Measurement to continue measuring. All measurement data will be uploaded.

Exits the measurement file.

Go to Rectangular Flatness Measurement by touching this icon.

CIRCULAR FLATNESS MEASUREMENT



The screen displays measurement results, diameters, number of points on a circle, tolerance, references, file name, date and time, serial number of the display unit, program and program version.

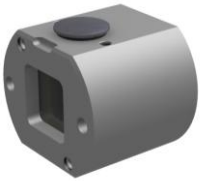
It is possible to go directly to Circular Flatness Measurement to continue measuring. All measurement data will be uploaded.

Exits the measurement file.

Go to Circular Flatness Measurement by touching this icon.

RECEIVERS RM & RS

Receivers with 2-axes detector and inclinometer.



The receivers for the Fixturlaser XA Geometry come in two versions, the RM and the RS. The RM is intended to be used as the principal measurement receiver and the RS as the additional stationary reference receiver.

Hence when both receivers are connected the values displayed and recorded by the measurement applications are those of the RM. The RS can be viewed by accessing Sensor Display from the summary screen.

Except for the name, the receivers are identical and if only an RS is connected it will act as the measurement receiver.

MOUNTING

Mounting to magnetic base

The receiver is mounted on the magnetic base with extension fixture together with the receiver adapter and the rods.

Mount the receiver to the receiver adapter with the supplied screws. Mount the rods to the magnetic base with extension fixture. Slide the receiver on to the rods, as shown in picture.

Note: Make sure that the receiver is properly locked in its position.

Mounting to the receiver fork

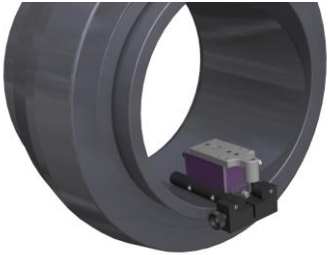
Mount the receiver to the receiver fork, as shown in picture.

Placing of the probe guide

Place the probe guide, as shown in picture.

Placing of the magnetic base for bores

Place the magnetic base for bores, with the axial guide attached to the edge, as in picture.



LASER TRANSMITTER T110

Battery powered laser transmitter of diode type with built-in micrometer screws for adjustment of the laser beam in horizontal and vertical level.

Coarse adjustment
(untighten the lock ring)

Fine adjustment
(tighten the lock ring)

MOUNTING

Mounting to magnetic base

The T110 is mounted on the magnetic base together with the rod adapter, the rods and the universal bracket.

Mount the universal bracket to the T110 with the supplied screws. Mount the rod adapter on the magnetic base with the supplied screw. Attach the rods to the rod adapter, and then slide the universal bracket with the laser transmitter onto the rods, as shown in picture.

Mounting to the transmitter beam fixture

Mount the T1110 to the transmitter beam fixture, as shown in picture.

LASER TRANSMITTER T111

Laser transmitter of diode type with built-in micrometer screws for adjustment of the laser beam in horizontal and vertical level. The T111 is powered by the supplied AC-adapter (110/230 Volts).

Coarse adjustment
(untighten the lock ring)

Fine adjustment
(tighten the lock ring)

MOUNTING

See T110.

LASER TRANSMITTER T21

Battery powered laser transmitter of diode type. The laser transmitter has a built-in angular prism in a turret allowing the creation of a 360° laser plane. Laser beam levelling can be made in the X and Y coordinates as well as parallel adjustments. The turret can easily be detached giving a laser beam perpendicular to the X-Y plane.

Coarse adjustment
(untighten the lock ring)

Fine adjustment
(tighten the lock ring)

MOUNTING

Straightness

The T21 is mounted on the magnetic base together with the rod adapter and the rods.

Mount the rod adapter on the magnetic base with the supplied screw. Attach the rods, and then slide the T21 onto the rods, as shown in picture.

Flatness

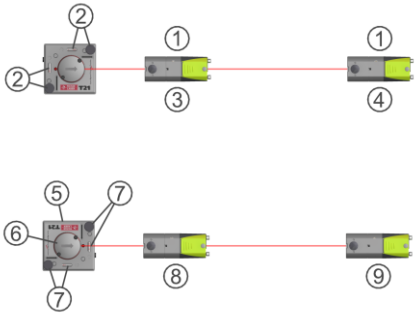
The T21 can either be mounted on a magnetic base or on a tripod.

When using the magnetic base, mount the rod adapter on the magnetic base with the supplied screw. Attach the T21 onto the adapter with the two supplied screws, as shown in picture.

On a tripod, use the supplied screws to attach the T21.

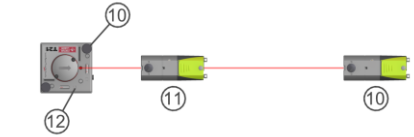
CALIBRATION OF THE SPIRIT LEVELS

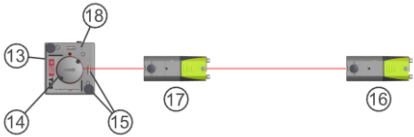
Position the T21 on a table with flat surface which is in level within 0.2 mm/m in both directions. Mark two positions for the receiver at a distance of 1 metre minimum from each other.



1. Min 1 metre between the detector positions.
2. Zero the levels with the micrometre screws.
3. Zero the value on the screen.
4. Read and note the displayed value.
5. Turn the T21 180°.
6. Turn the turret 180°.
7. Zero the levels with the micrometer screws.
8. Zero the value on the screen.
9. Read and note the displayed value.

The value at 9 should be the same (within 0.2 mm/m) as at 4 if the level for this axis is correctly adjusted. Any difference is divided by two and then added to the lowest of these values, which results in the value R.





10. Adjust to the R value using the micrometer screws.
11. Check the zeroing, zero again and re-adjust to R if necessary.
12. Zero the level with the tool.
13. Turn the T21 90°.
14. Turn the turret 90°.
15. Zero the level with the micrometer screws.
16. Adjust to the R value using the micrometer screws.
17. Check the zeroing.
18. Zero the level with the tool.

LASER TRANSMITTER T220

Battery powered laser transmitter of diode type with built-in spirit levels and an angular prism. It is equipped with micrometer screws for adjustment of the laser beam in horizontal and vertical level. The optical head can be rotated 360° in order to project a reference plane with the laser beam.

1. Turret with built-in angular prism.
2. Laser apertures.
3. Horizontal spirit levels with adjustment screws.
4. Protractor with 15° increment.
5. Vertical spirit levels with adjustment screws.
6. Knob for rotating of optical head.
7. 4 batteries LR6. Pull the ends together and pull out the cassette.
8. Laser On/Off switch.
9. LED indicating laser transmitter activity.
10. Levelling, coarse adjustment. With lock ring.
11. Levelling, fine adjustment.
12. Direction selector for laser beam. Vertical or horizontal mode by turning ring.

Coarse adjustment
(untighten the lock ring)

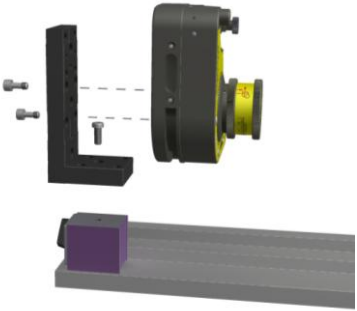
Fine adjustment
(tighten the lock ring)

MOUNTING

Straightness

The T220 can either be mounted on a magnetic base together with the angular bracket or be mounted on a tripod.

Mount the angular bracket on a magnetic base or on a tripod. Mount the T220 to the angular bracket, as shown in picture. Use the supplied screws.



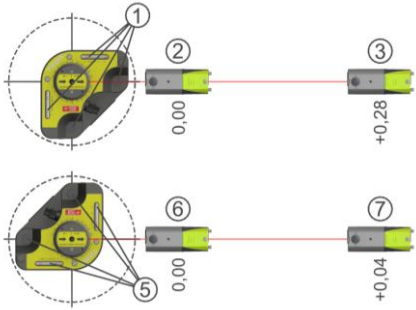
Flatness

The T220 can either be placed directly on the measurement object or be mounted on a tripod.

Mount the T220 on a tripod as shown in picture. Use the supplied screws.

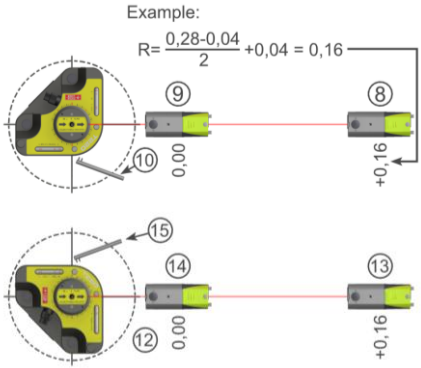
CALIBRATION OF THE SPIRIT LEVELS

Position the T220 on a table with flat surface which is in level within 0.02 mm/m in both directions. Mark two positions for the detector unit at a minimum distance of 1 metre from each other.



1. Zero the levels with the micrometre screws.
2. Zero the value on the screen.
3. Read and note the displayed value.
4. Turn the T220 180° and turn the turret.
5. Zero the levels with the micrometer screws.
6. Zero the value on the screen.
7. Read and note the displayed value.

   The value at 7 should be the same (within 0.02 mm/m) as at 3 if the level for this axis is correctly adjusted. Any difference is divided by two and then added to the lowest of these vales, which results in the value R.



8. Adjust to the R value using the micrometer screws.
9. Check the zeroing, zero again and re-adjust to R if necessary.
10. Zero the level with the tool.
11. Turn the T220 90° and turn the turret.
12. Zero the level with the micrometer screws.
13. Adjust to the R value using the micrometer screws.
14. Check the zeroing.
15. Zero the level with the tool.

LASER MODULES TM & TS

Modules with laser transmitter of diode type with built-in screws for adjustment of the laser beam in horizontal and vertical level.

The laser modules come in two versions, the TM and the TS. The TM is intended to be used together with the receiver RM and the TS together with the receiver RS.

Except for the name, the laser modules are identical.

MOUNTING

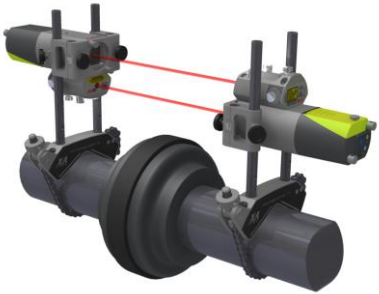
The laser modules are mounted on the receivers RM & RS.

Mount the laser module on the receiver, as in picture.

The receiver together with the laser module are mounted on the V-block together with the receiver adapter and the rods.

The RM & TM should be mounted on the movable machine and the RS & TS on the stationary machine.

See also mounting in the chapter “Shaft Alignment Horizontal Machines” in the Fixturlaser XA manual.



Note: When using the “Detector holder 22 mm offset”, the distance has to be measured from the zero point according to the label.

WIRELESS OPTION

See also chapter "Wireless Option" in the Fixturlaser XA manual.

The optional "Wireless Option" consists of one or two wireless transceivers/-battery packs. This option replaces the standard cables. The wireless option uses standard Bluetooth technology.

1. Battery status indicator.
    a. Flashing red – low battery.
2. Status indicator.
    a. Continuously green – ON and connected.
    b. Flashing green – ON and trying to connect.
3. On/off button.
4. Battery compartment.

TECHNICAL SPECIFICATION – FIXTURLASER RM/RS

RM Part. No: 1-0832

RS Part. No: 1-0833

Housing material	Anodized aluminium
Operating temperature	0 to 50°C (32 to 122°F)
Storage temperature	-20 to 70°C (-4 to 158°F)
Relative humidity	10 – 90%
Weight	116 g (4.09 oz)
Dimensions (with cable attached)	57 mm x 50 mm x 40 mm (2.2 in x 2.0 in x 1.6 in)
Dimensions (with wireless transmitter 1-0835 attached)	124 mm x 50 mm x 40 mm (4.9 in x 2.0 in x 1.6 in)
Environmental protection	IP 65
Detector	2-axis PSD
Detector size	20 mm x 20 mm (0.8 in x 0,8 in)
Detector resolution	1 µm
Measurement accuracy	1% ± 3 µm

Ambient light protection	Optical filtering and ambient light signal rejection
Inclinometer resolution	0.1°
Inclinometer accuracy	±0.5°

TECHNICAL SPECIFICATION – FIXTURLASER T110

T110 Part. No: 1-0390

Housing material	Anodized aluminum
Operating temperature	0 to 50°C (32 to 122°F)
Storage temperature	-20 to 70°C (-4 to 158°F)
Relative humidity	10 – 90%
Weight	1100 g (2.43 lbs)
Dimensions	60 mm x 60 mm x 140 mm (2.4 in x 2.4 in x 5.5 in)
Laser	650 nm class II diode laser
Laser power	< 1 mW
Measurement distance	Up to 50 m (164 ft)
Power supply	2 batteries type LR6 (AA)
Warming up time	10 min
Operating time	15 hours

TECHNICAL SPECIFICATION – FIXTURLASER T111

T111 Part. No: 1-0285

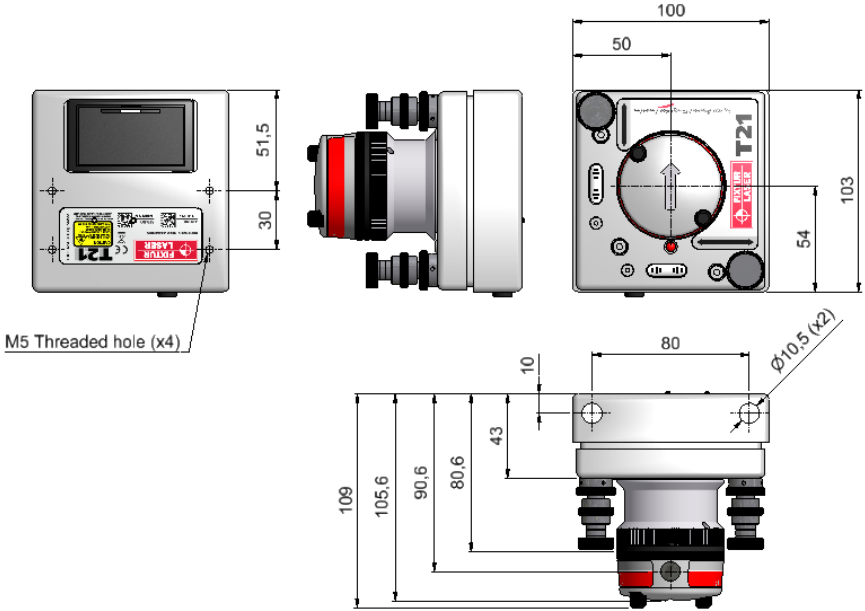
Housing material	Anodized aluminum
Operating temperature	0 to 50°C (32 to 122°F)
Storage temperature	-20 to 70°C (-4 to 158°F)
Relative humidity	10 – 90%
Weight	1030 g (2.27 lbs)
Dimensions	60 mm x 60 mm x 140 mm (2.4 in x 2.4 in x 5.5 in)
Laser	650 nm class II diode laser
Laser power	< 1 mW
Measurement distance	Up to 50 m (164 ft)
Power supply	AC-adapter 110/230 Volts
Warming up time	10 min

TECHNICAL SPECIFICATION – FIXTURLASER T21

T21 Part. No: 1-0897

Housing material	Anodized aluminum
Operating temperature	0 to 50°C (32 to 122°F)
Storage temperature	-20 to 70°C (-4 to 158°F)
Relative humidity	10 – 90%
Weight	1150 g (2.54 oz)
Dimensions	100 mm x 103 mm x 109 mm (3.9 in x 4.0 in x 4.2 in)
Laser	650 nm class II diode laser
Laser power	< 1 mW
Measurement distance	Up to 20 m (66 ft)
Laser sweep flatness	±0.02 mm/m
Angular prism accuracy	±0.02 mm/m
Spirit level resolution	0.3 mm/m
Power supply	2 batteries type LR6 (AA)
Warming up time	10 min

Operating time	15 hours

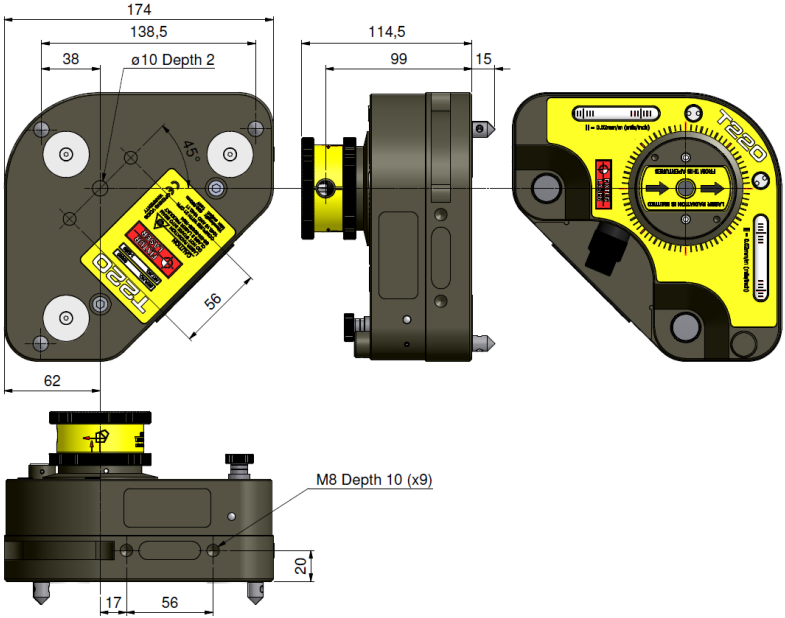

100
50
51,5
30
103
54
M5 Threaded hole (x4)
80
10
Ø10,5 (x2)
43
109
105,6
90,6
80,6
T21
FIXTURLASER

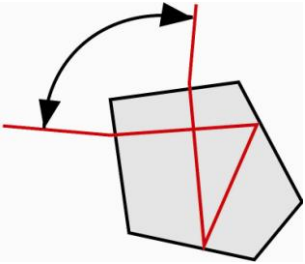
TECHNICAL SPECIFICATION – FIXTURLASER T220

T220 Part. No: 1-0289

Housing material	Anodized aluminum
Operating temperature	0 to 50°C (32 to 122°F)
Storage temperature	-20 to 70°C (-4 to 158°F)
Relative humidity	10 – 90%
Weight	3500 g (7.72 lbs)
Dimensions	175 mm x 175 mm x 115 mm (6.9 in x 6.9 in x 4.5 in)
Laser	650 nm class II diode laser
Laser power	< 1 mW
Measurement distance	Up to 50 m (164 ft)
Beam deviation from levels	< 0.02 mm/m
Laser sweep flatness	±0.02 mm/m
Angular prism accuracy	±0.02 mm/m
Spirit level resolution	0.02 mm/m
Tilt adjustment from level	±15 mm/m

Power supply	4 batteries type LR6 (AA)
Warming up time	10 min
Operating time	20 hours


174
138,5
38
ø10 Depth 2
45°
56
62
114,5
99
15
M8 Depth 10 (x9)
20
17
56



The built-in angular prism works as shown to the left. The incoming laser beam is deflected 90° ±0,02 mm/meter also if the beam hits the prism obliquely.

TECHNICAL SPECIFICATION – FIXTURLASER TM/TS

TM Part. No: 1-0836

TS Part. No: 1-0837

Housing material	Anodized aluminum
Operating temperature	0 to 50°C (32 to 122°F)
Storage temperature	-20 to 70°C (-4 to 158°F)
Relative humidity	10 – 90%
Weight	136 g (4.80 oz)
Dimensions	55 mm x 50 mm x 38 mm (2.2 in x 2.0 in x 1.5 in)
Laser	650 nm class II diode laser
Laser power	< 1 mW
Measurement distance	Up to 20 m (65 ft)
Warming up time	10 min

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