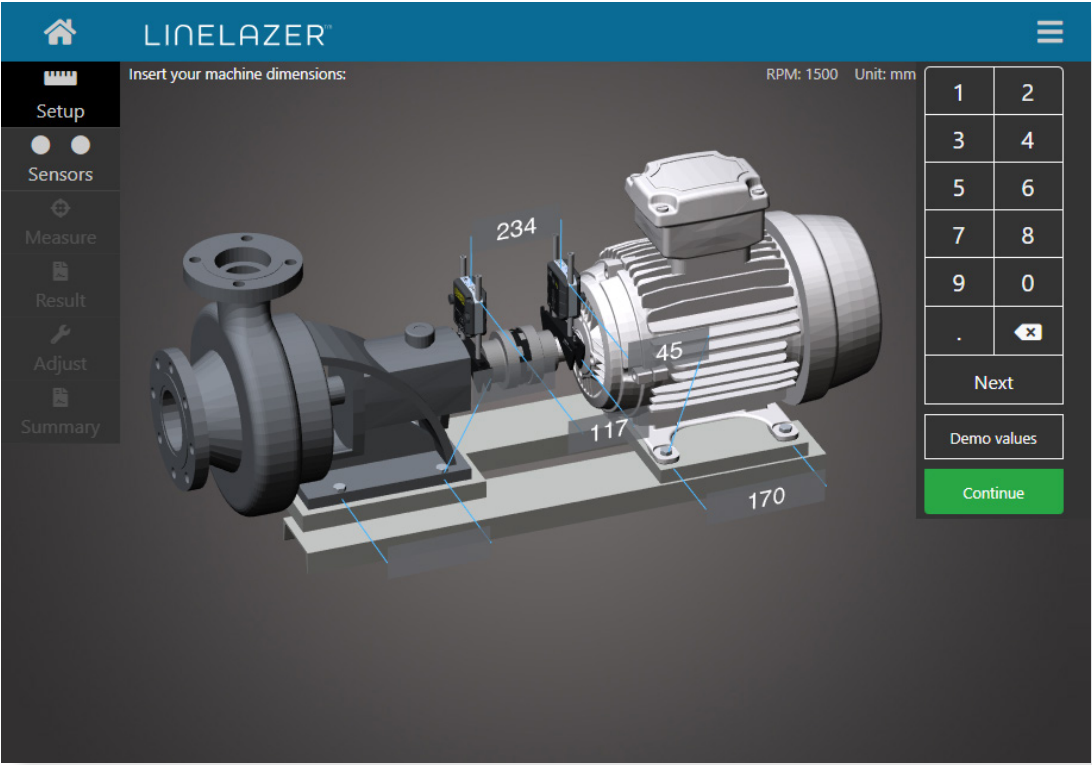


# LINELAZER™



LineLazer app User guide

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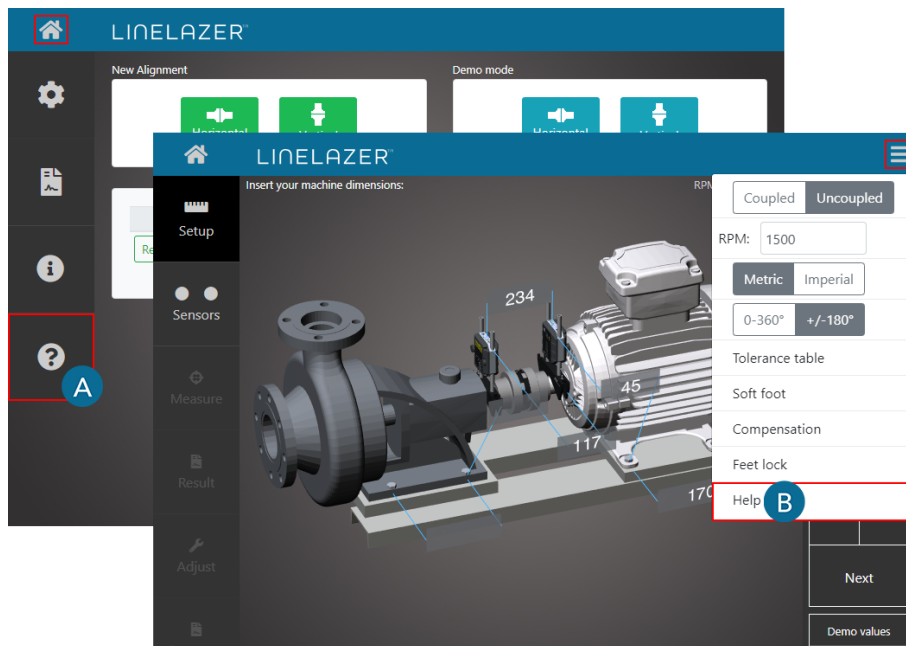
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## 1. General information

### 1.1 Integrated help



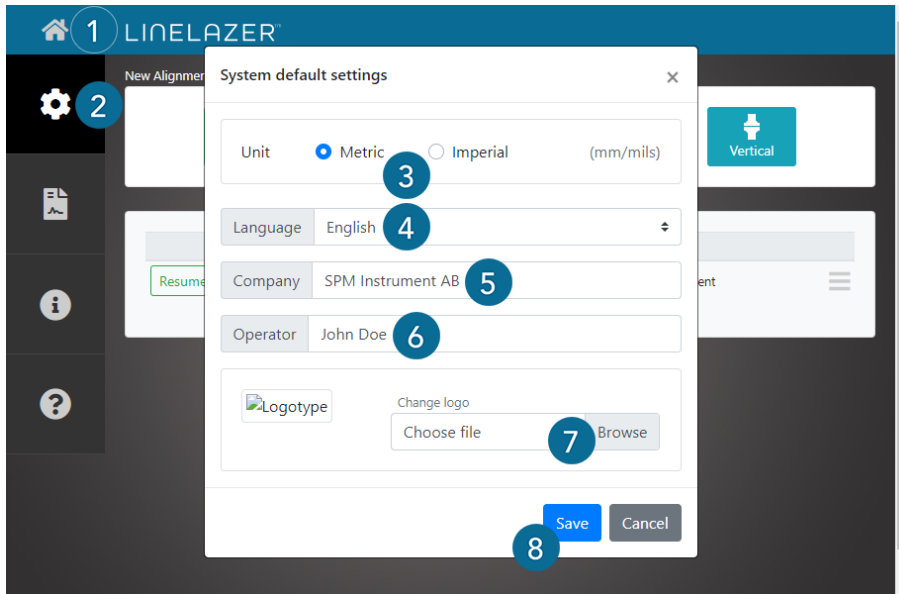
Help is available through the '?' icon (A) at the Home screen, or the **Help** button (B) in the right panel menu in the upper right corner of the chosen alignment.

## 2. Settings

### 2.1 System default settings

The units available to choose for your measurements is either metric (mm) or imperial (inch).

To personalise your reports, you can add your company name, the name of the operator and a company logotype in the settings menu. This information will be generated as part of your reports. For further information about reports, see "Report" on page 9.



1. Go to the Home screen.
2. Tap **Settings**.
3. Select **Metric** (mm) or **Imperial** (inch). During your alignment, the selected unit is shown in the upper right corner of your screen.
4. In the drop-down menu, select your preferred language.
5. Input the name of the company.
6. Input the name of the operator.
7. Tap **Browse** to upload your company logotype. Select your logotype via the browser window.  
**NOTE:** The logotype must be in either JPEG or PNG format, and cannot be larger than 5 MB.
8. Tap **Save**.

### 2.2 Device settings

Settings such as time and date, display options and Wi-Fi connection are all determined by the system settings of the device you are using to display the LineLazer app.

#### 2.2.1 Time and Date

The time and date displayed on your screen and included when you generate alignment reports is set by the device you use. To change the time and date, refer to the manufacturer's manual of your device.

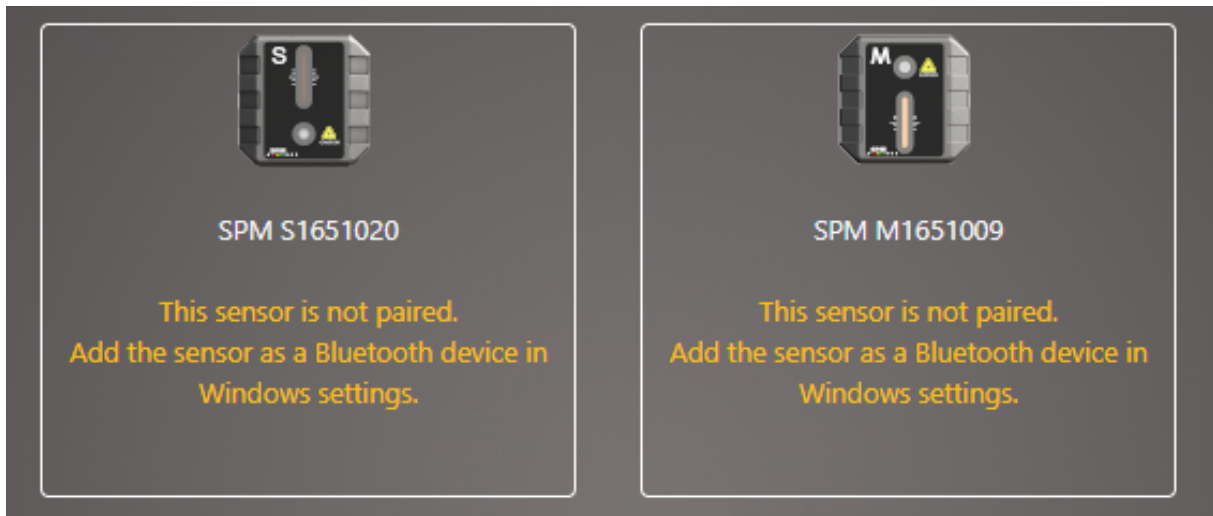
#### 2.2.2 Display

The display settings and brightness are determined by the device you use. To change the display settings, refer to the manufacturer's manual of your device.

## 2. Settings

### 2.2.3 Wi-Fi and Bluetooth connection

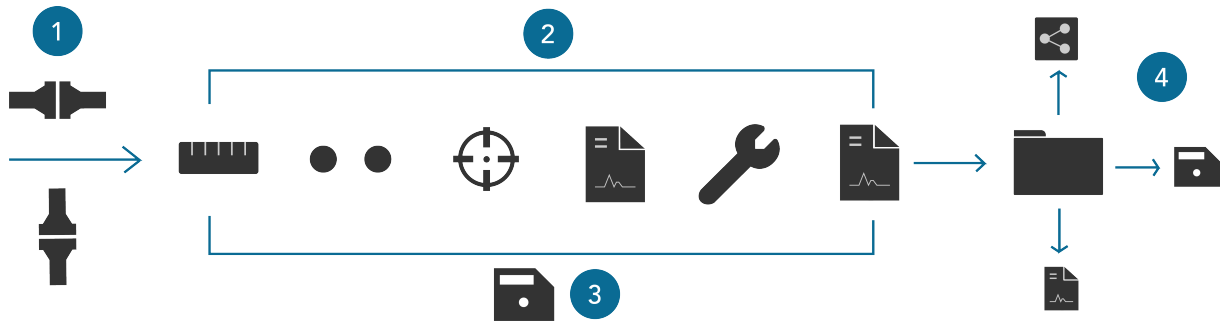
The Wi-Fi connection is set through the settings on the device you use. To establish or check your Wi-Fi connection, refer to the manufacturer's manual of your device.



To establish a connection between the LineLazer alignment sensors and your device, make sure Bluetooth is turned on and active during your alignment. To establish or check your Bluetooth connection, refer to the manufacturer's manual of your device.

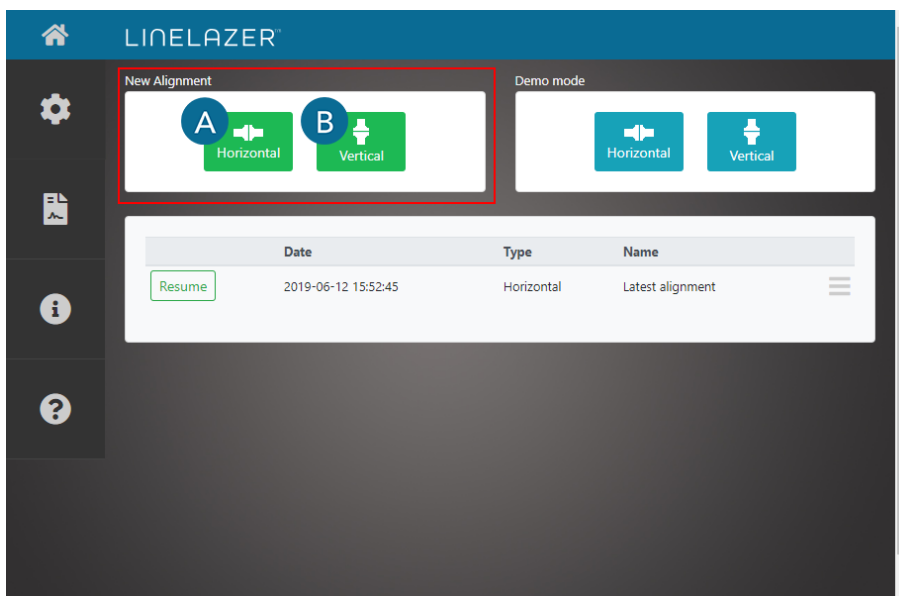
**NOTE:** If the LineLazer app is run on Windows, you must pair the LineLazer alignment sensors in the Bluetooth settings of your device before starting the alignment. If the sensors are not paired, you will get an error message in the LineLazer app when searching for LineLazer alignment sensors.

### 3. Alignment workflow



1. Start the alignment. For further information regarding this step, see "Horizontal alignment" on page 18 or "Vertical alignment" on page 28.
2. The alignment will take you through all necessary steps automatically.
3. Measurements are saved automatically throughout the workflow. Tap the Home icon or move on to another task. The measurement will be waiting for you in the file manager on the Home screen. For further information, see "Alignment library" on page 8.
4. When you complete an alignment, you can choose to save it, share it, report it or remeasure. If you save the alignment, it will appear at the Home screen under the Alignment library. You cannot edit the alignment after saving it, however you can go back to create a report at any time through the Alignment library.

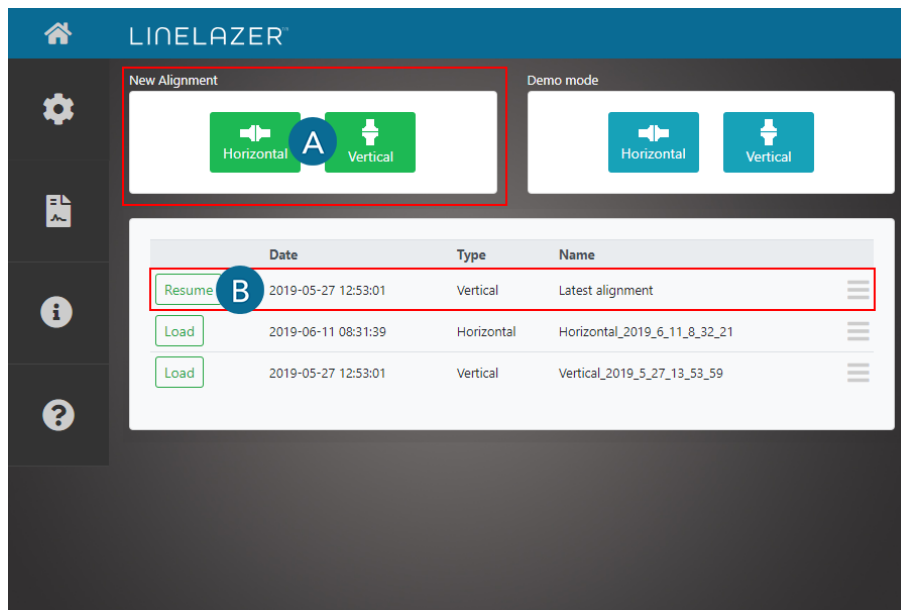
#### 3.1 New alignment



To start a new alignment, tap either **Horizontal** (A) or **Vertical** (B) under New Alignment, depending on the machine type you are going to align. For further information, see "Horizontal alignment" on page 18 or "Vertical alignment" on page 28.

## 3. Alignment workflow

### 3.2 Continue alignment



If you already have an active alignment session, tap the **Horizontal** or **Vertical** buttons (A), or tap **Resume** (B) next to the alignment called "Latest Alignment" in the Alignment library. This will simply take you to the alignment you started earlier.

### 3.3 Saving and completing an alignment

Your alignment is always saved automatically. You do not need to save manually.

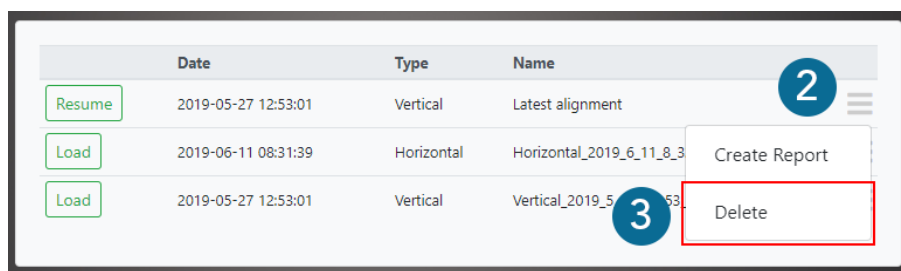
When you complete a measurement and reach the alignment summary, you have a few choices. By tapping **Save**, the file is added to the Alignment library at the Home screen. Once the alignment is saved, it is completed and cannot be edited.

Usually, you save only when you have completed your alignment. Saving an alignment makes it final, and you can no longer edit the properties.

1. Tap **Save**.
2. Choose an alignment name or keep the default option in the pop-up window.
3. Tap **Save** when you are pleased with the alignment name. Your saved alignment is now visible in the Alignment library at the Home screen.

### 3.4 Removing an alignment

If you would like to delete your current session and start a new one, you can do so through the Alignment library. For information about the Alignment library, see "Alignment library" on the next page.



1. Go to the Alignment library at the Home screen.
2. Tap the menu icon to the right of the alignment you want to delete.

### 3. Alignment workflow

3. Tap **Delete**.

**NOTE:** There is no way of recovering a deleted alignment – once you tap Delete the decision is final.

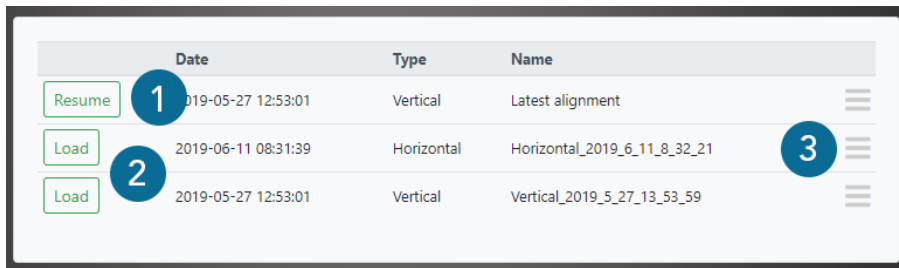
### 3.5 Using a saved alignment as a template

If you frequently carry out alignment on the same machine, or if your machines share machine dimensions, it is easy to use the settings from an old measurement as a template.

1. Go to the Alignment library at the Home screen.
2. Tap **Load** to the left of the alignment you want to use as a template. This will open a new alignment with machine dimensions and other settings identical to those entered in the loaded alignment.
3. Carry out the rest of the alignment according to the workflow.

### 3.6 Alignment library

The Alignment library can be found on the Home screen, underneath the New Alignment options. Through the Alignment library you can see all saved alignments, as well as ongoing alignments that have not yet been completed.



	Date	Type	Name	
<b>Resume</b> 1	2019-05-27 12:53:01	Vertical	Latest alignment	
<b>Load</b> 2	2019-06-11 08:31:39	Horizontal	Horizontal_2019_6_11_8_32_21	3
<b>Load</b>	2019-05-27 12:53:01	Vertical	Vertical_2019_5_27_13_53_59	

1. Tap **Resume** next to an alignment that have not yet been completed to continue working on that alignment. For further information, see "Continue alignment" on the previous page.
2. Tap **Load** next to an alignment to use the settings of that alignment as a template. For further information, see "Using a saved alignment as a template" above.
3. Tap the **menu** icon to the right of the alignment to:
  - a. Create a report. For further information, see "Report" on the next page.
  - b. Delete your measurement. For further information, see "Removing an alignment" on the previous page.

## 4. Report

The LineLazer app comes with a report function from which you can easily create summarised reports on all alignments.

The report contains:

# Alignment report

Date printed : 2019-05-27 09:18:21

Alignment type: Horizontal

RPM: 1500

Unit: mm

Coupled: true

Started: 2019-05-17 13:28:25

Name: DefaultAlignment

1

Dimensions:

M F1 - F2: 117

Sensor - Coupling: 234

M sensor - M F1: 45

Sensor - sensor: 170

S F1 - F2: 0

S Sensor - S F1: 0

2

Result before:

Horizontal

Angle: 0,00

Angle Status: None

Offset: 0,00

Offset Status: None

3

Vertical

Angle: 0,00

Angle Status: None

Offset: 0,00

Offset Status: None

Result after:

Horizontal

Angle: 0,00

Angle Status: None

Offset: 0,00

Offset Status: None

4

Vertical

Angle: 0,00

Angle Status: None

Offset: 0,00

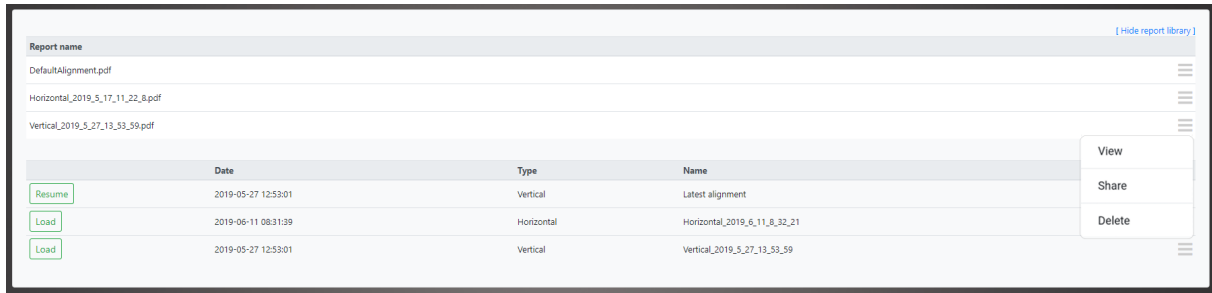
Offset Status: None

1. Alignment type and general information.
2. Machine settings and dimensions.
3. Result before the alignment.
4. Result after the alignment.

### 4.1 Report library

The Report library can be accessed from the Home screen, by tapping the **Report library** icon in the menu to the left. The Report library contains a complete list of all reports generated from previous alignments in the list called "Report name", and you can easily view, share (only available for Android) or delete reports by tapping the menu bar next to each report.

## 4. Report



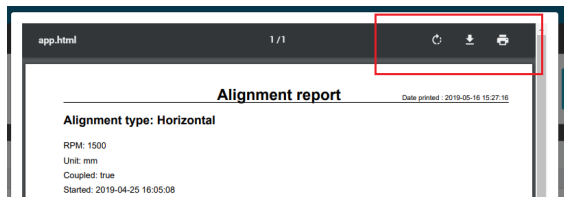
The Report library also contains shortcuts to all saved alignments from the Alignment library, and you can create new reports on chosen alignments by tapping the menu bar next to each alignment. Any new reports created will be visible in the "Report name" list.

### 4.2 Generating a report

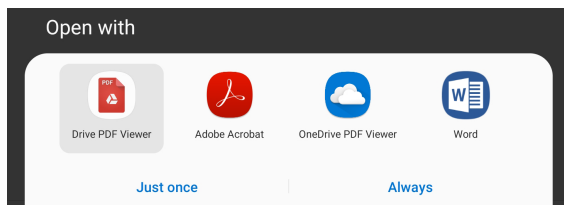
Generated reports are displayed in the Report library where they can be viewed, downloaded or shared (only available for Android).

You can easily create a report on any saved alignments through the Report library.

1. From the Home screen, tap the **Report library** icon in the menu to the left.
2. Next to the alignment of your choice (indicated with a green **Load** or **Resume** button), tap the **menu** icon.
3. In the menu, choose **Create Report**.
4. The report will be opened in an embedded PDF reader. Print or download the report using the tools in the top menu.



5. Choose in which format you would like to generate the report and where to open it.



### 4.3 Sharing reports

**NOTE:** This function is only available for Android devices.

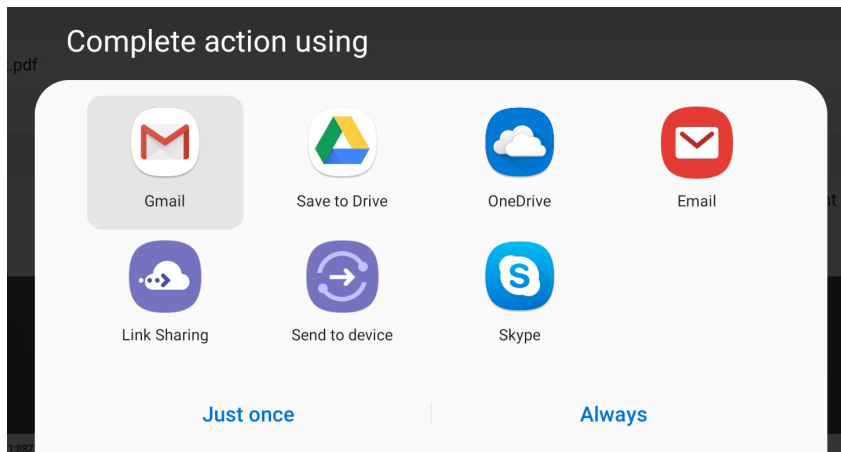
Reports can be shared quickly, easily and on multiple channels through the Report library.

1. From the Home screen, tap the **Report library** icon in the menu to the left.
2. Next to the report you would like to share, tap the **menu** icon.
3. In the menu, choose **Share**.



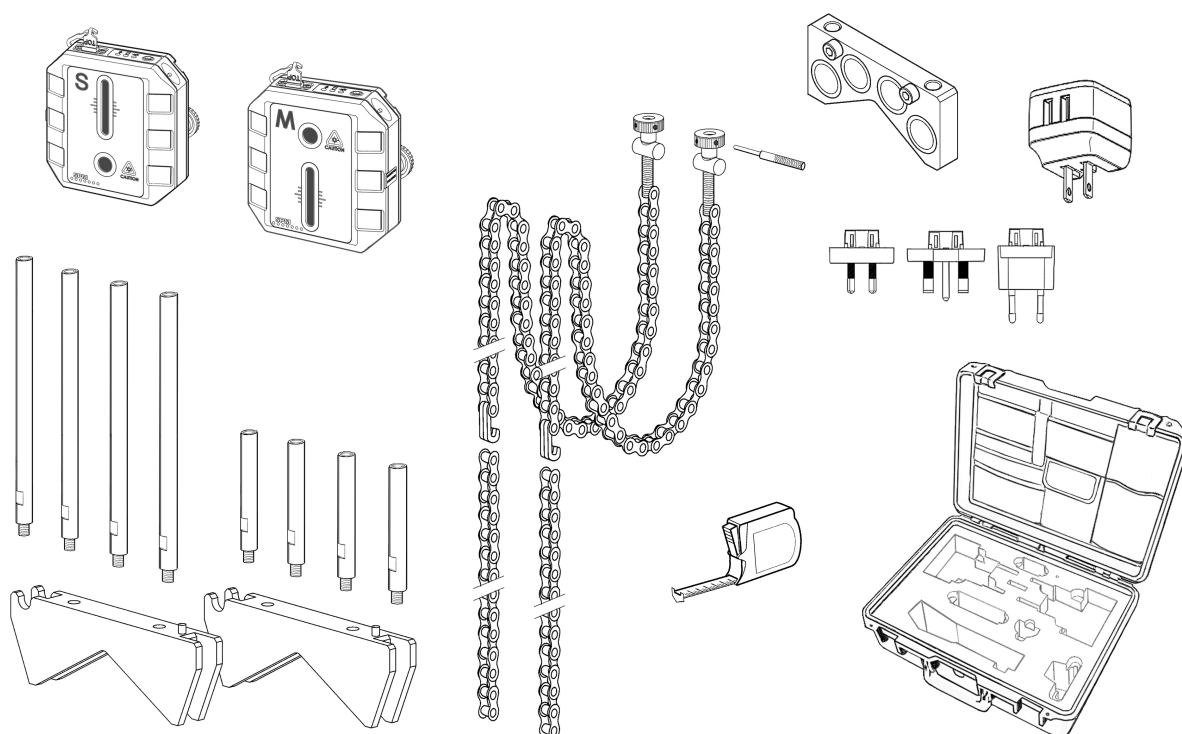
## 4. Report

4. Choose on which channel you would like to share the report.



5. Complete the following actions.
6. When completed, your report has been shared.

## 5. Shaft alignment equipment



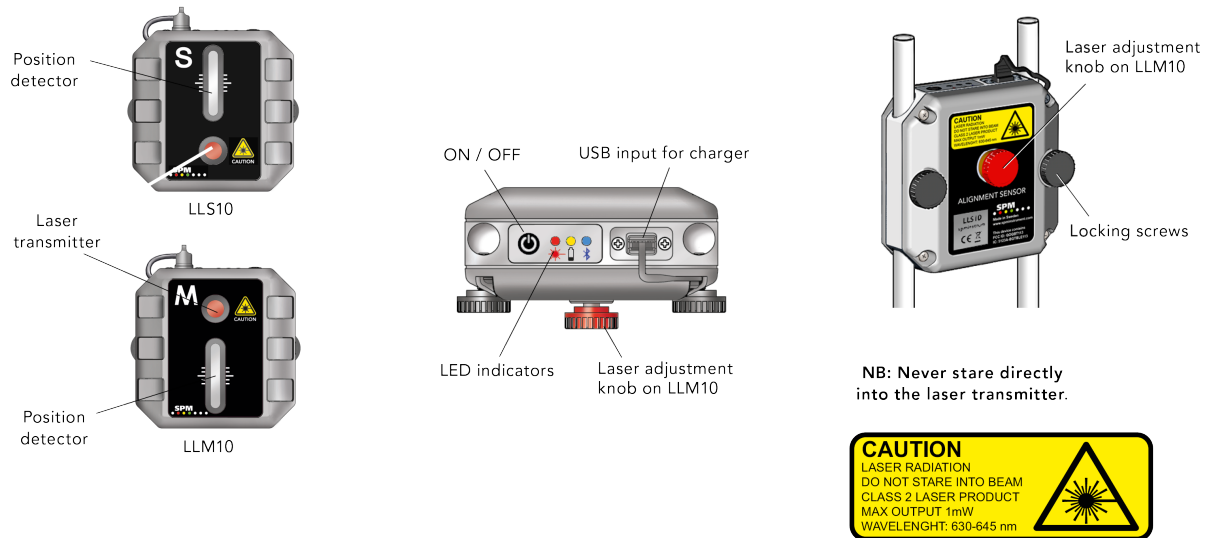
The alignment kit LLA500 contains LineLazer alignment sensors, brackets, chains, rods, battery charger, cables and a tape measure – all in a convenient carrying case. This kit fits a multitude of applications, e.g. compressors, gearboxes, generators and pumps. The battery charger 90624 with two USB outputs is used for charging the LineLazer alignment sensors. The alignment kit LLA501 contains the same equipment as LLA500 but without the carrying case.

### Alignment kit LLA500/LLA501 for LineLazer alignment app

LLS10	1 pc.	Alignment sensor, S position	MAA70	1 pc.	Tape measure
LLM10	1 pc.	Alignment sensor, M position	TOL21	1 pc.	Torquing tool for chains and rods
90624	1 pc.	Charger, dual USB, incl. interchangeable AC plugs, 100–240VAC, 50-60 Hz, 17W	81339	1 pc.	Plastic box
CAB94	2 pcs.	Charger cable, USB Type A to Mini-B USB, length 1.5 m	<b>Options</b>		
LLB25	2 pcs.	Shaft bracket for chain	LLB26	Magnetic bracket	
LLB11	2 pcs.	Extension chain, length 1000 mm	<b>Spare parts</b>		
LLB12	2 pcs.	Chain with tension adapter, length 500 mm	LLB20	Supporting rod, 80 mm	
LLB13	1 set	Supporting rod, 80 mm, set of 4	LLB21	Supporting rod, 150 mm	
LLB14	1 set	Supporting rod, 150 mm, set of 4			

## 5. Shaft alignment equipment

### 5.1 LineLazer alignment sensors



The LineLazer alignment sensors provide maximum accuracy using a spread laser beam in combination with a 28.7 mm detector. Through digital filtering, the laser beam can be distinguished from interfering light sources. Both LineLazer alignment sensors are transmitters/detectors. The LineLazer alignment sensors LLS10 and LLM10 are identical with exception of the position of laser diode/-detector and a laser adjustment screw on LLM10. The sensors communicate wirelessly with the LineLazer app via Bluetooth.

The LineLazer alignment sensors have dual axis precision inclinometers which measure the angle of rotation of both LineLazer alignment sensors at all times. This means that the shaft can be rotated at will in both directions.

The temperature and battery level of each LineLazer alignment sensor is available when the LineLazer alignment sensors are connected. For further information, see "Connecting the sensors" on page 22.

#### 5.1.1 LineLazer alignment sensor overview

The alignment sensor panel has a USB input connector for battery charger, a switch for power ON/OFF and three LEDs for status indication.

The laser beam is fine-tuned with the red adjustment knob on the rear of the M sensor (LLM10). There is normally no need to fine-tune the laser, but might be necessary when measuring at long distances.

For optimal function, keep the laser diode and detector window surfaces clean and protected from scratches. Clean the laser and detector windows with a cotton cloth and alcohol.

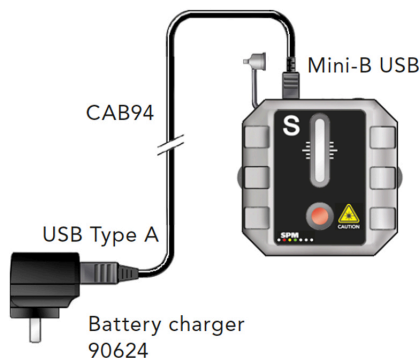
##### 5.1.1.1 Thermal effect on the LineLazer alignment sensor

Electronic components are affected by ambient temperature and internal heat generation. It is therefore inappropriate to take an alignment sensor from a cold storage site and start using it in a hot area or vice versa without waiting for the sensor to reach the same temperature as the environment.

Similarly, the self-heating of the components can affect the measurement result. To minimize this effect, wait a few minutes before performing the first measurement after the alignment sensor has been turned on.



## 5. Shaft alignment equipment

### 5.1.2 Charging the LineLazer alignment sensors batteries



*Incorrectly installed batteries or incorrect battery type may cause serious damage to the laser device, personal injury, and fire.*

#### Battery charger connected

LED	Off	Fixed	Blinking	Fast blinking
 		Fully charged	Charging	Fault indication

The batteries are recharged with the battery charger 90624 with changeable AC plugs. The charger has two USB outputs for charging of both alignment sensors simultaneously. The batteries can also be charged by connecting the sensors to a PC, a power pack or any USB charger with the specifications 5V/500mA. The sensors can be operated while plugged into the charger.

New alignment sensors should be fully charged before use.

The yellow battery LED is blinking while charging and lights constantly when the batteries are fully charged.

Operating and charging time may vary depending on the ambient temperature and the condition of the batteries.

It is possible to charge the batteries during alignment. However, do not charge the batteries in moist environments or outside the specified battery charge temperature range.

#### 5.1.2.1 Extending battery life




Avoid deep cycling of the batteries. Each cycle wears the batteries down by a small amount and a partial discharge is better than a full discharge. Li-ion is maintenance-free, and the battery lasts longest when operating between 30 and 80 percent. Store the sensors in a cool and dry place partially charged.

The batteries gradually self-discharge even if stored in a partially charged state. Self-discharge increases with age, usage and elevated temperature.

## 5. Shaft alignment equipment

### 5.1.3 LED status indicators

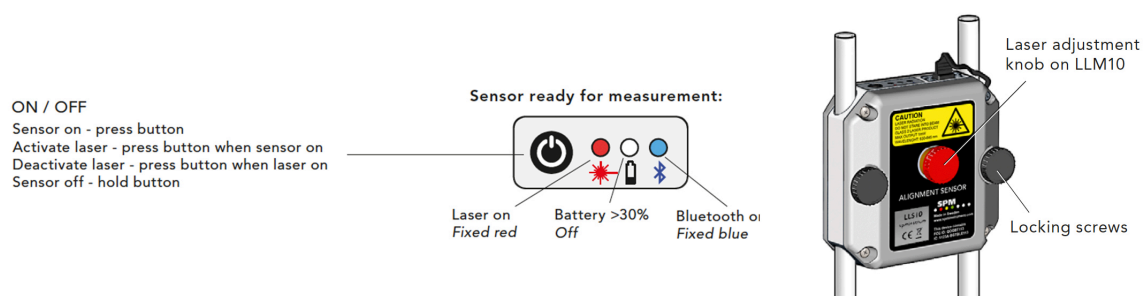
#### Alignment sensor on

LED	Off	Fixed	Blinking	Fast blinking
	Laser off	Laser on	–	Fault indication
	>30% battery power	–	10–30% battery power	<10% battery power
	Bluetooth off	Connected	–	Searching / Ready to connect

A fixed blue LED (Bluetooth on) and a fixed red LED (laser diode on) shows that the sensor is ready for measurement. For various other states, see the tables above.

All LEDs blink once at start up. If the yellow and red LEDs are blinking alternately, the bootloader is active. The blue LED indicates that Bluetooth is active.

### 5.1.4 Adjust and fine-tune the LineLazer alignment sensors

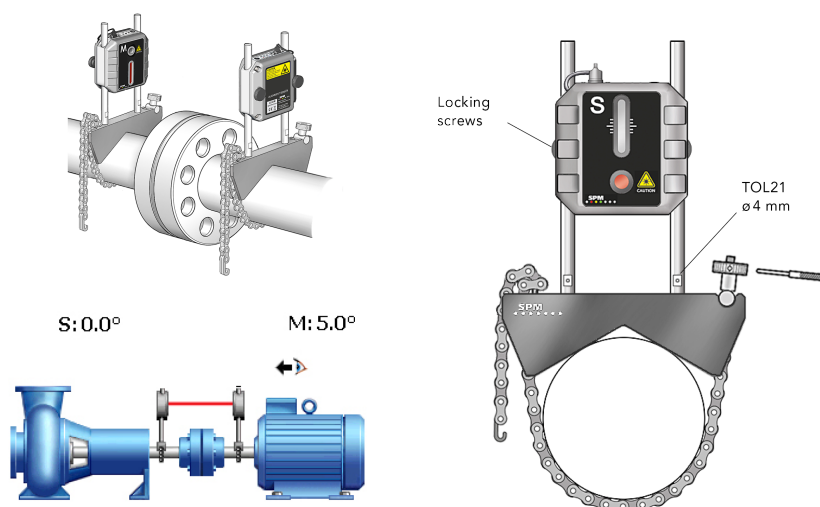


Adjust the laser beam to the centre of the targets by adjusting the height of the alignment sensors on the rods until a line of sight is obtained for both lasers. Secure the positions by locking the locking screws. Always tighten both locking screws firmly so that the alignment sensor is mounted as stable as possible. If necessary, fine-tune the laser with the red adjustment knob on the rear of the M sensor (LLM10).

The alignment sensors are ready for measurement when the red and blue LED indicators lights steadily.

## 5. Shaft alignment equipment

### 5.2 Setting up LineLazer alignment sensors



1. The LineLazer alignment sensor marked M is placed on the movable machine and the sensor marked S is placed on the stationary machine. The LineLazer alignment sensors can be placed up to 10 m (32ft 9") apart.
2. Attach the LineLazer alignment sensors as shown, firmly but without undue force. Use the supplied tool when tightening the rods. Mount the chain tensioner on the shaft bracket, hold the bracket upright and attach the chain to the hook. Tighten the chain with the tensioning screw. If necessary, use the supplied tool (TOL21). Do not overtighten.
3. Adjust the laser beam to the centre of the targets by adjusting the height of the LineLazer alignment sensors on the rods until a line of sight is obtained for both lasers. Secure the positions by locking the locking screws. Always tighten both locking screws firmly so that the LineLazer alignment sensor is mounted as stable as possible. If necessary, fine-tune the laser with the red adjustment knob on the rear of the M sensor (LLM10).
4. The LineLazer alignment sensors are ready for measurement when the red and blue LED indicators lights steadily.

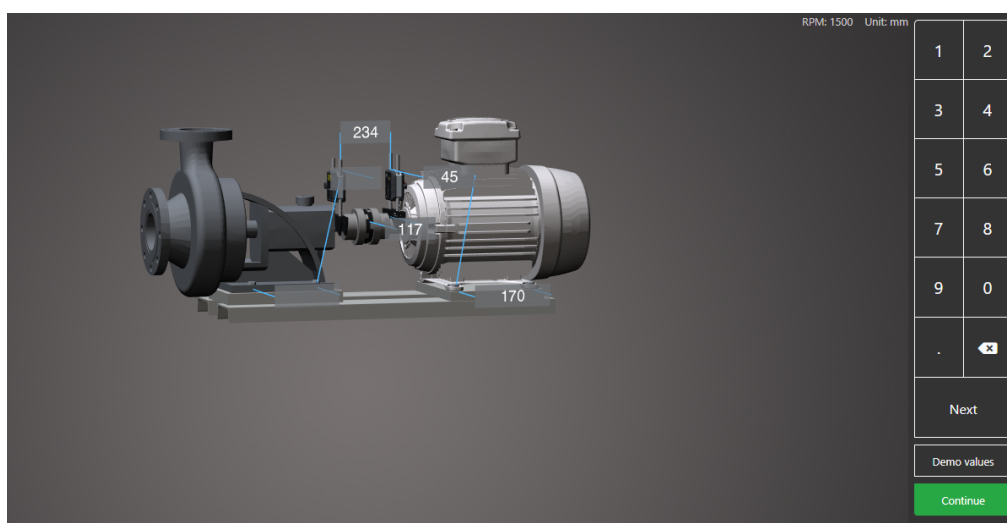
### 5.3 Connecting the LineLazer alignment sensors to the app

The LineLazer alignment sensors are connected as a step when you start up a new measurement. You do not need to connect the LineLazer alignment sensors in advance or prepare anything before you start a new measurement other than mounting the LineLazer alignment sensors according to the set guidelines. For further information, see "Connecting the sensors" on page 22.

## 6. Demo alignment

For training purposes, the LineLazer app comes with a demo mode available through the Home screen. Demo mode has predefined machine dimensions and you do not need to connect your own sensors but can simulate a result based on a real alignment.

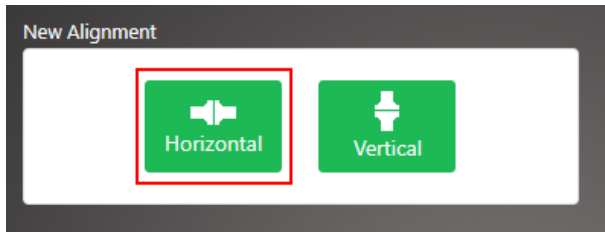
1. To start a new demo alignment, tap **Horizontal** or **Vertical** under "Demo mode" on the Home screen.
2. The alignments will go through the same steps as either the Horizontal (see "Horizontal alignment" on the next page) or Vertical (see "Vertical alignment" on page 28) live alignments. Differences being:
  - a. Machine set-up can be automatically inserted using the "Demo Values" button.
  - b. Under sensors, you do not have to connect live sensors. The LineLazer alignment sensors can be simulated.



3. Saved demo alignments or demo reports will be visible in the Alignment library and Report library. Demo alignments are marked either Horizontal (demo) or Vertical (demo) in the Type column.

## 7. Horizontal alignment

### 7.1 New horizontal alignment



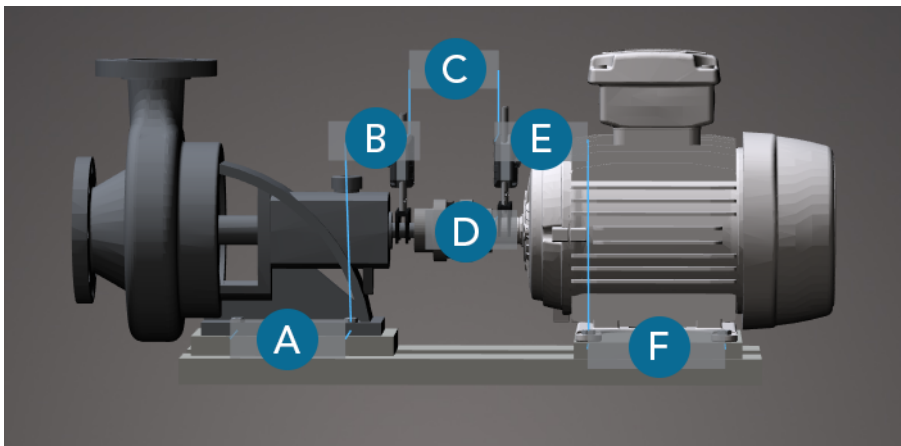
To start a new horizontal alignment, tap the **Horizontal** button under New Alignment at the Home screen.

### 7.2 Setup

When you first start a new horizontal measurement, or tap **Setup** in the left toolbar, you open the Setup window. This window contains the first few steps in your alignment.

#### 7.2.1 Inserting machine dimensions

Once starting a new horizontal alignment, you always start with entering the highlighted machine distances in the 3D model. Tap the grey fields to enter the corresponding dimensions.



The dimensions are:

- A. The distance between the second and first feet (SF2 & SF1) pair on the S machine.
- B. The distance between the first foot (SF1) and the S LineLazer alignment sensor.
- C. The distance between the M and S LineLazer alignment sensors.
- D. The distance between the centre of the coupling and the M LineLazer alignment sensor.
- E. The distance between the M LineLazer alignment sensor and the first foot (MF1) on the M machine.
- F. The distance between the first and second feet (MF1 & MF2) pair on the M machine.

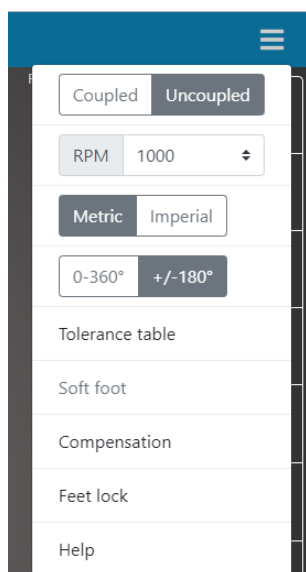
You can skip entering machine dimensions and move on to the next step, however you cannot receive a result until machine dimensions are entered.

#### 7.2.2 Machine setup

To set other machine properties, such as RPM, coupled/uncoupled, change the units between metric and imperial, add compensation, feet lock or check for soft foot; tap the **right panel menu** icon in the upper right corner.



## 7. Horizontal alignment



### 7.2.2.1 Coupling

To change between coupled and uncoupled machines:

1. Tap the **right panel menu** icon in the upper right corner.
2. Select **Coupled** or **Uncoupled** in the menu.

### 7.2.2.2 Angle selection

Angle selection is set at  $\pm 180^\circ$  as a default. You can change the angle selection to either 0 to  $360^\circ$  or  $\pm 180^\circ$  (clockwise via 3.00 hours to 6.00 hours or counter clockwise via 9.00 hours to 6.00 hours).

1. Tap the **right panel menu** icon in the upper right corner.
2. Choose  $\pm 180^\circ$  or 0 to  $360^\circ$  in the menu.

### 7.2.2.3 RPM and tolerance

Selecting the RPM of your machine is very important for an accurate alignment. The RPM value you select will automatically be matched with the appropriate tolerance.

To find the tolerance table, tap the right panel menu in the upper right corner and pick Tolerance table.

The standard **Active tolerance table** is called 'Default':

Active tolerance table:		
Default		
RPM	Offset [mm]	Angular error [mm/100]
1000	0.13/0.07	0.10/0.06
2000	0.10/0.05	0.08/0.05
3000	0.07/0.03	0.07/0.04
4000	0.04/0.02	0.06/0.03
5000	0.03/0.01	0.05/0.02
6000	0.03/0.01	0.04/0.01

## 7. Horizontal alignment

As you can see, the higher the RPM of your machine, the smaller the tolerance.

For the active tolerance table:

1. Tap the **right panel menu** icon in the upper right corner.
2. Select the **RPM**. The tolerance will automatically be set corresponding to the RPM selected.

**Custom** tolerance tables allows the user to use their own evaluation standards for their machines. To add a custom tolerance table:

1. Tap the **right panel menu** icon in the upper right corner and pick **Tolerance table**.
2. Tap **New table**.

RPM	Offset [mm]	Angular error [mm/100]
3000	0.4 	0.3 
1000	0.2 / 0.1	0.3 / 0.2
2000	0.3 / 0.2	0.4 / 0.3

3. Enter a descriptive **Name** relevant for your machine type or standard, such as "Pump X-90" or "ISO XXXX-XX".
4. Enter an **RPM** value and its relevant **Offset** and **Angular error** values for yellow and green evaluation status.
  - Values under green limit = Green evaluation status
  - Values over green limit and under yellow limit = Yellow evaluation status
  - (Values above yellow limit = Red evaluation status)
5. Tap **Add to table**.
6. If your standard contains several RPMs, repeat steps 4-5 to add new rows with relevant values for each RPM.
7. Tap **Save**.
8. Under **Active tolerance table**, select the newly created table from the list.
9. Tap **Close**. The tolerance table used is displayed on the screen.
10. If the custom tolerance table contains several RPMs, select relevant RPM from the list in the right panel menu. The tolerance will automatically be set corresponding to the RPM selected.

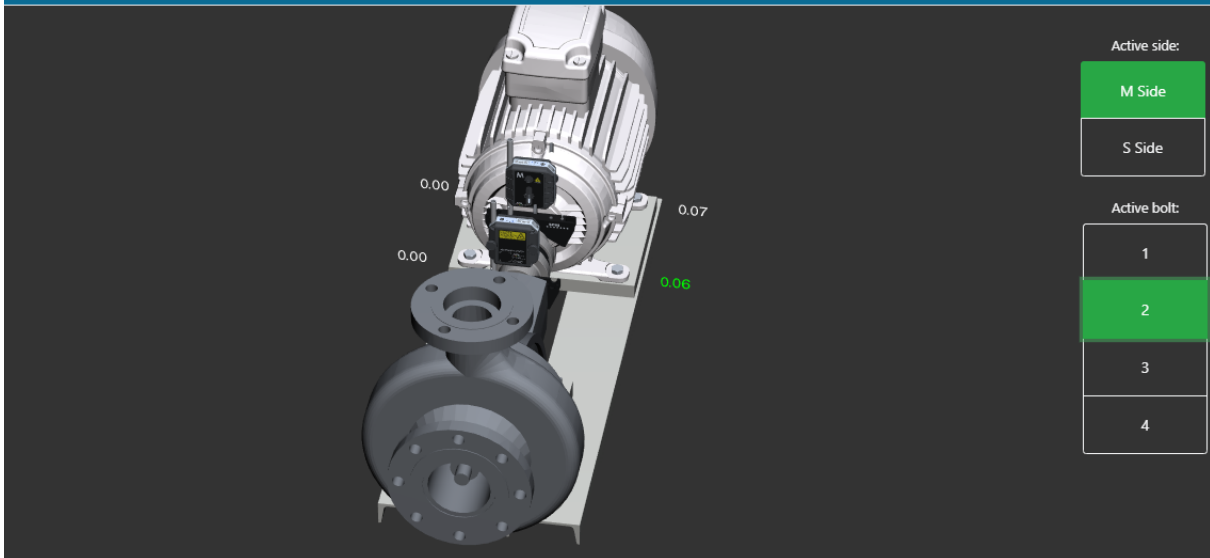
### 7.2.2.4 Soft foot

Soft foot is the condition when the machine is resting on three feet instead of all four. The soft foot has no proper contact with the machine foundation. Prior to alignment, soft foot is eliminated by placing shims under the foot until the machine is properly supported. To perform a soft foot measurement, add machine dimensions first.

## 7. Horizontal alignment

### Soft foot adjustment

Close



1. Tap the **right panel menu** icon in the upper right corner.
2. Select **Soft Foot** in the menu.
3. Select active side and begin measurement by highlighting a bolt. Measurement is live.
4. Stop measurement by choosing another bolt.
5. Once all bolts have been measured, compensate any soft feet by adding shims until properly supported. Measure again to verify the result.

#### 7.2.2.5 Compensation

Different rates of thermal expansion in the M machine relative to the S machine can have a considerable effect on horizontal shaft alignment. If the S machine has the same thermal properties as the M machine, there is no problem. If there is a significant difference, one can either try to align the machines before they cool, or one must compensate for the difference.

Manufacturers will normally supply data on their machines' thermal properties. When estimating thermal rise, check

- operating temperature of both machines
- thermal expansion of both machines
- environment influences on machine temperature, such as strong sunshine and other heat sources, effect of cooling systems, etc.

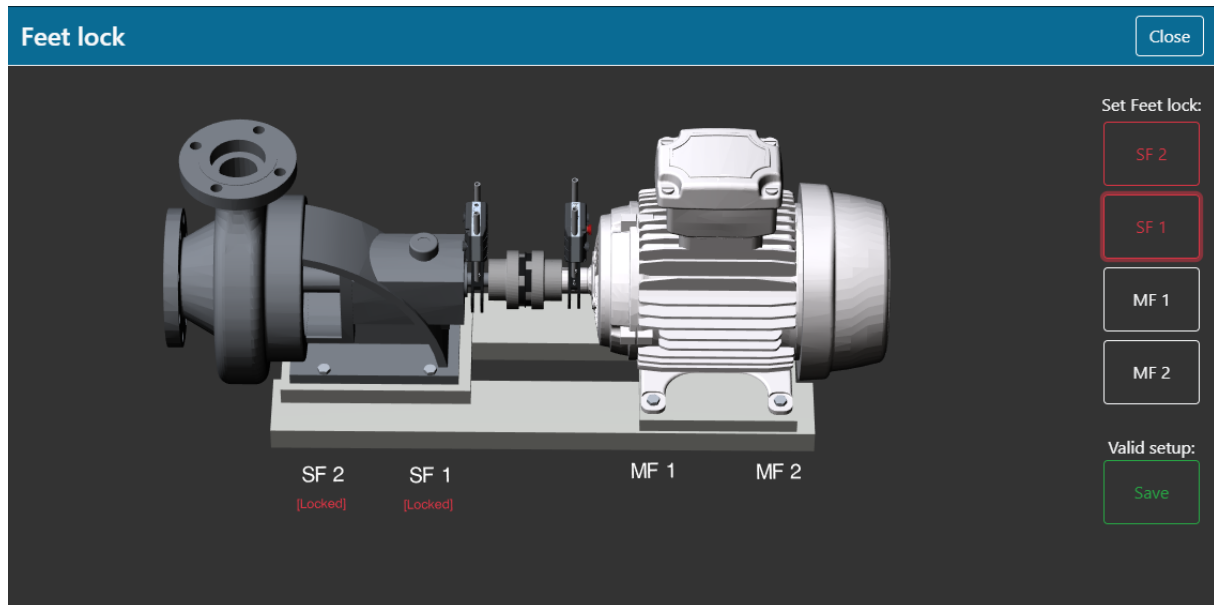
1. Tap the **right panel menu** icon in the upper right corner.
2. Select **Compensation** in the menu.
3. Input the values for the vertical and horizontal feet, on foot one and two (F1 and F2) on the applicable (S and/or M) machine.
4. Tap **Save**.

#### 7.2.2.6 Feet lock

Feet lock is a function that shows alternative ways of correcting misalignment. It is used after the measurement results are saved and displayed.

As a default, the feet of the S (stationary) machine are locked.

## 7. Horizontal alignment



You can set other constellations, e.g.:

- Lock the feet of the M machine.
- Lock the pairs farthest from the coupling, F2 on both M and S.
- Lock the pairs nearest the coupling, F1 on both M and S.

The LineLazer app will recalculate the values for vertical and horizontal position for the unlocked feet when you change the setting.

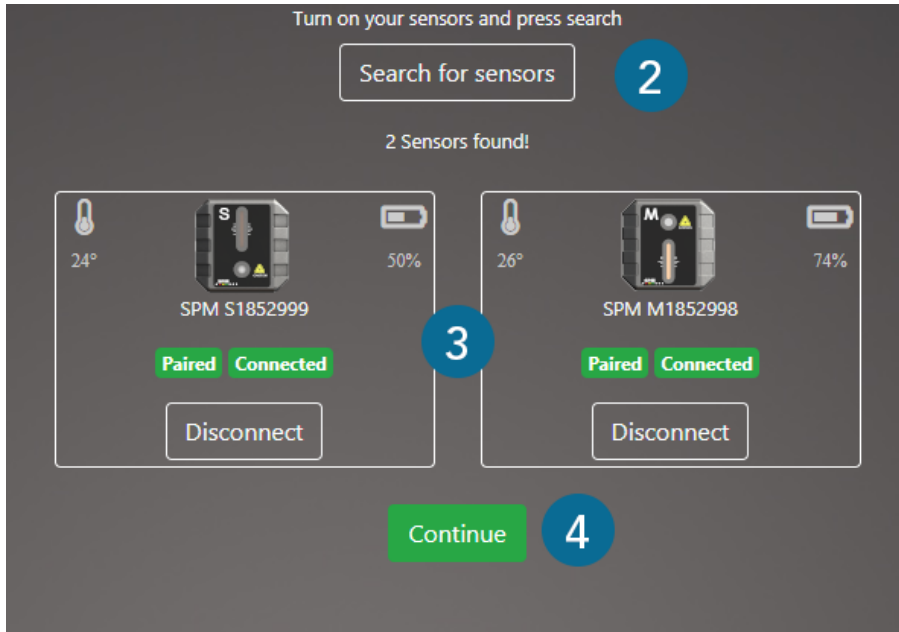
1. Tap the **right panel menu** icon in the upper right corner.
2. Select **Feet lock** in the menu.
3. Lock or unlock the feet until you are pleased with the settings. Feet are locked if the corresponding button is red, and [Locked] is visible under the chosen feet.
4. Tap **Save**.

### 7.3 Connecting the sensors

When you have continued from the Setup section, or tapped **Sensors** in the left toolbar, you open the Sensor window.

The next step in your alignment is to turn on and connect the LineLazer alignment sensors to the LineLazer app. Make sure that the LineLazer alignment sensors are turned on, and that the blue led either blinks fast (indicating that the sensors are searching or ready to connect) or is fixed (indicating that the sensors are connected). Also make sure that Bluetooth is turned on in the device you are running the LineLazer app on.

## 7. Horizontal alignment



1. Turn on your LineLazer alignment sensors.
2. Tap **Search for sensors**.
3. When the LineLazer alignment sensors are found, check that they are paired – if not, refer to "Device settings" on page 4. Tap **Connect** under each sensor.
4. Tap **Continue** to move onto Measurement.

The battery level and sensor temperature are indicated for both sensors. For loading the battery, refer to "Charging the LineLazer alignment sensors batteries" on page 14. The LineLazer alignment sensors have an operating temperature of –10 to +50 °C (14 to 122 °F).

### 7.4 Measure

When you have continued from the Connecting the Sensors section, or tapped **Measure** in the left toolbar, you open the Measure window. From here, you can choose which measurement type and then carry it out. You choose measurement type with the buttons in the top right hand corner.

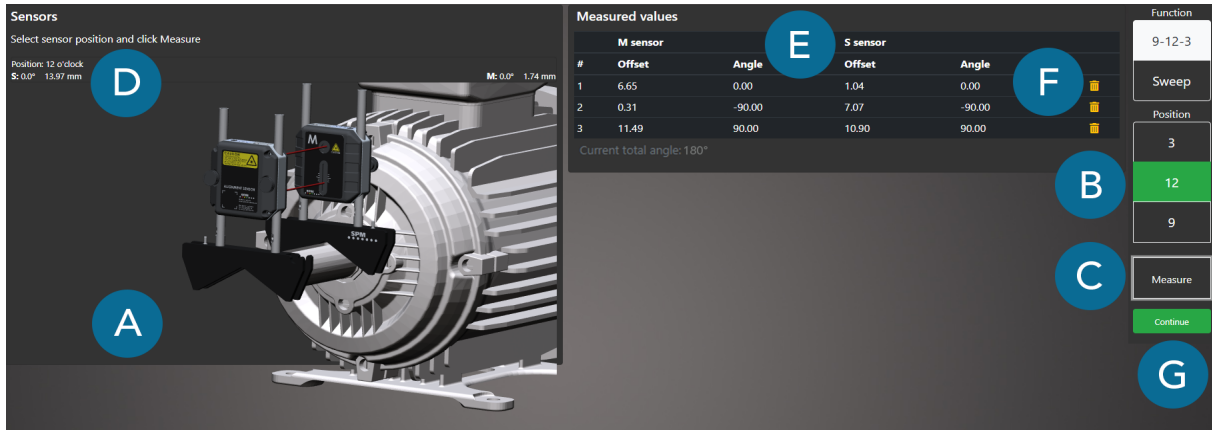
#### 7.4.1 3-12-9 o'clock positioning

The name 3-12-9 indicates three positions – 3, 12 and 9 o'clock where measurements are taken.

Before measuring, make sure you

- mount the LineLazer alignment sensors correctly, see "Setting up LineLazer alignment sensors" on page 16
- insert the correct machine dimensions (see "Inserting machine dimensions" on page 18), this is required to calculate results
- if needed, perform a Soft foot measurement (see "Soft foot " on page 20 ).

## 7. Horizontal alignment



1. Position the LineLazer alignment sensors in the 9 o'clock position on the machine. Control that the lasers are adjusted to the centre, using the adjustment knob on the back of the M sensor.
2. The LineLazer app will, using the Bluetooth connection, automatically recognize the position of your LineLazer alignment sensors and store the measuring result under the right position. The position of your LineLazer alignment sensors is visible in the model (A) or the buttons 9, 12 or 3 marked green (B).
3. The **Measure** button (C), as well as the live values above the 3D model (D), will be red when the LineLazer alignment sensors are stabilizing or if the LineLazer alignment sensors have lost connection. When the Measure button turns green, a measurement can be started. When you are ready, tap **Measure** (C) to start the measurement.
4. The LineLazer app will automatically move on to the next measurement position. Move the LineLazer alignment sensors on the machine to the corresponding position.
5. Repeat until all measurements are taken.

**NOTE:** For improved accuracy of the result, make sure that the angle between the first and the last measurement is at least 100°. If it is less than 100°, you cannot go through to the next step indicated by the Continue button being red. Current total angle is shown underneath the Measured Values table (E).

6. Your measurements will be displayed in the Measured Values table (D). If you would like to remove a result, tap the **yellow trash can** symbol (E) next to the result.
7. When you are pleased with your measurements, tap **Continue** (G).

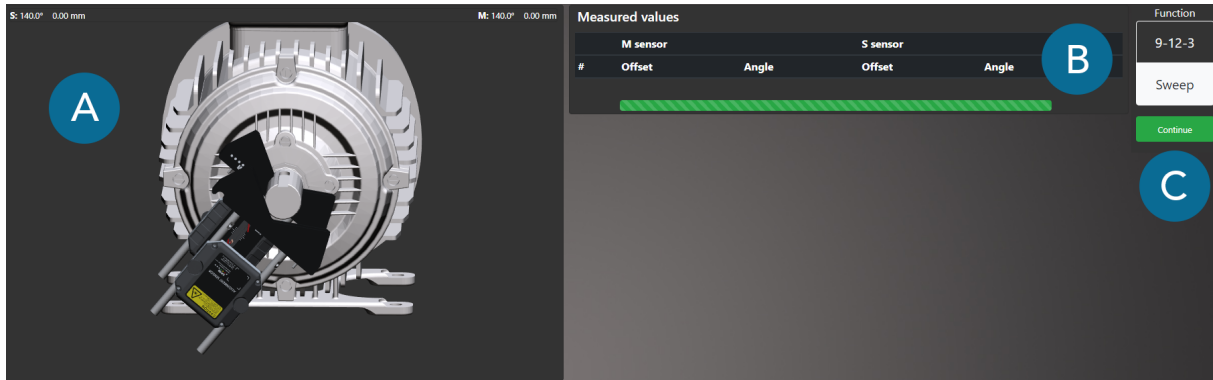
### 7.5 Sweep

**NOTE:** LineLazer alignment sensors bought before the release of the LineLazer app must be updated with new firmware before the Sweep function can be used. Please contact your local SPM representative for assistance.

Before measuring, make sure you

- mount the LineLazer alignment sensors correctly, see "Setting up LineLazer alignment sensors" on page 16
- insert the correct machine dimensions (see "Inserting machine dimensions" on page 18), this is required to calculate results
- if needed, perform a Soft foot measurement (see "Soft foot " on page 20 ).

## 7. Horizontal alignment



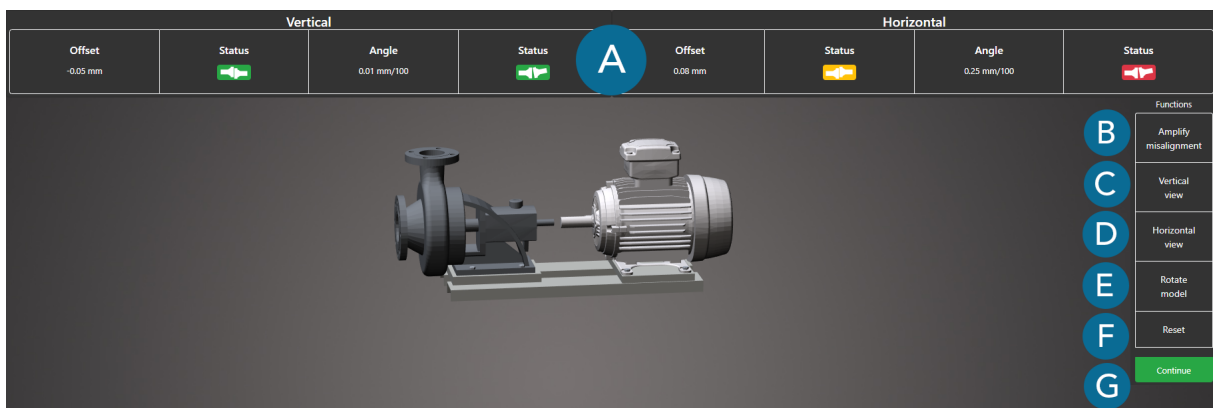
1. Before starting a sweep measurement, you must read and accept the Sweep Function Agreement, setting out the safety details for the measurement itself. As sweep function is performed on a running machine, it is important that you follow the instructions carefully. If you do not tap Agree, a Sweep measurement will not start.
2. The sweep measurement will start automatically when your machine starts running, the LineLazer app will, using the Bluetooth connection, automatically recognize the position of your LineLazer alignment sensors – visible in the alignment model (A).
3. Measured values will be stored automatically, progress is shown in the bar in the measured values table (B). The bar will be red as long as the measurement is still active.
4. When the bar turns green, the measurement is complete.
5. Tap **Continue** (C).

### 7.6 Result

When you have continued from the Measure section, or simply tapped **Result** in the left toolbar, you open the Result window.

The results in the result window are calculated only if you have entered the Machine Dimensions (see "Inserting machine dimensions" on page 18).

#### 7.6.1 Result table



The result table (A) presents offset, and angle values are displayed in both the vertical and horizontal direction. The results are based on the measuring values measured in the previous step.

Status is indicated by either green, yellow or red symbols, indicating the severity of the misalignment.

Green values are considered within tolerance, while yellow and red are not within tolerance and adjustments are recommended.

## 7. Horizontal alignment

### 7.6.2 Functions toolbar

The toolbar on the right in the Results window includes further functions.

- B. **Amplify Misalignment:** By tapping this button, the model depicting the misalignment will amplify the symptom. The more times you tap the button, the more will the misalignment be amplified. The purpose of this function is to visualise the misalignment in a way that you more easily can see. In most cases, it can be quite difficult to visually see the misalignment because it is so small.
- C. **Vertical View:** Tapping Vertical View allows you to see the misalignment from above. In this view, you can also use the Amplify Misalignment function to further amplify the misalignment.
- D. **Horizontal View:** The Horizontal View allows you to easily identify Horizontal misalignment by showing the machine from the side. In this view, you can also use the Amplify Misalignment function to further amplify the misalignment.
- E. **Rotate Model:** By tapping Rotate Model, the model will slowly rotate. In this view, you can also use the Amplify Misalignment function to further amplify the misalignment.

To reset any of the functions, tap **Reset** (F).

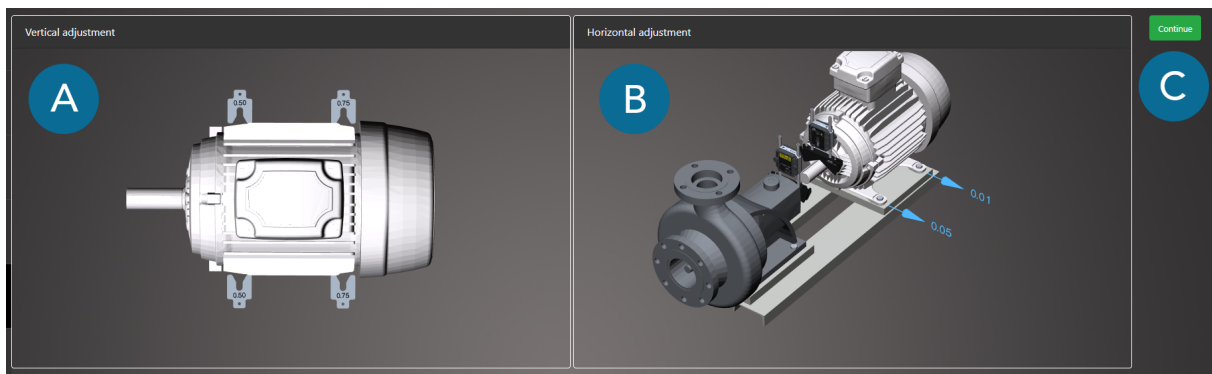
To move on to adjustment, tap **Continue** (G).

## 7.7 Adjustment

When you have continued from the Result section, or tapped **Adjust** in the left toolbar, you open the Adjust window.

The Adjust window presents actions to take based on the results of the measurement. Live values are showing the current state of the misalignment, and as you start to align the machine the values will change corresponding with the action taken.

The models illustrating the necessary adjustments can easily be moved and turned to more clearly show you what needs to be done.



**Vertical Adjustment (A):** The Vertical Adjustment box shows how you should shim the machine to achieve vertical alignment. For vertical adjustment, locate the sensors at 12 o'clock position.

**Horizontal Adjustment (B):** The Horizontal Adjustment box shows how you should move the machine to achieve horizontal alignment. For horizontal adjustment, locate the sensors at 3 or 9 o'clock position.

**NOTE:** In live alignments, the active adjustment window will light up or be greyed out depending on the position of your sensors. Vertical adjustment will be available when the sensors are in the 12 o'clock position and horizontal when the sensors are either in the 3 or 9 o'clock position.

To adjust horizontal machines:



## 7. Horizontal alignment

1. Start with vertical adjustment. Make sure the sensors are in the 12 o'clock position.
2. Do the shim work to achieve vertical alignment. The 3D models show live values.
3. Do the vertical adjustment. Reposition the sensors to the 3 or 9 o'clock position.
4. Move the machine to achieve horizontal alignment. The 3D models show live values.
5. When you have completed the adjustments, tap **Continue** (C).

### 7.8 Summary

When you have continued from the Adjust section, or tapped **Summary** in the left toolbar, you open the Summary window.

The summary window presents a summarised version of the alignment, with measurements before and the adjustments (if any) made in the previous section.

Result before							
Vertical				Horizontal			
Offset	Status	Angle	Status	Offset	Status	Angle	Status
-0.05 mm		0.01 mm/100		0.08 mm		0.25 mm/100	

Result after							
Vertical				Horizontal			
Offset	Status	Angle	Status	Offset	Status	Angle	Status
-0.05 mm		0.01 mm/100		0.08 mm		0.02 mm/100	

### 7.9 Saving, remeasuring or creating a report

Alignment summary	
<div> Save</div> <div> Remeasure</div>	

Tap **Save** to save the summary, making it visible in the Alignment library on the Home screen (see "Saving and completing an alignment" on page 7). Saving completes the alignment, and changes cannot be made once the alignment has been saved.

To take new measurements to control the final values, tap **Remeasure**.

To create a **Report** on your alignment, it needs to be saved first. Then from the Alignment library at the Home screen:

1. Tap the menu icon to the right of the alignment and select **Create report**.

	Date	Type	Name	
	2023-05-09 16:51:02	Horizontal ( Demo )	Latest alignment	
	2023-05-09 16:51:02	Horizontal ( Demo )	Horizontal_2023	
	2023-05-09 16:51:02	Horizontal ( Demo )	Horizontal_2023	

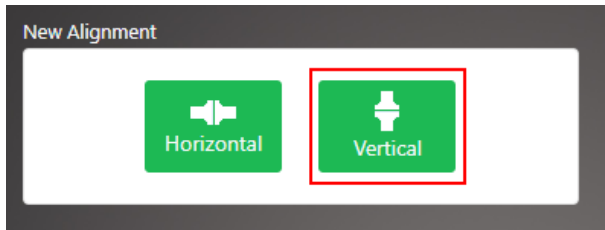
Create Report

Delete

For further information about reports, see "Report" on page 9.

## 8. Vertical alignment

### 8.1 New vertical alignment



To start a new vertical alignment, tap the **Vertical** button under New Alignment at the Home screen.

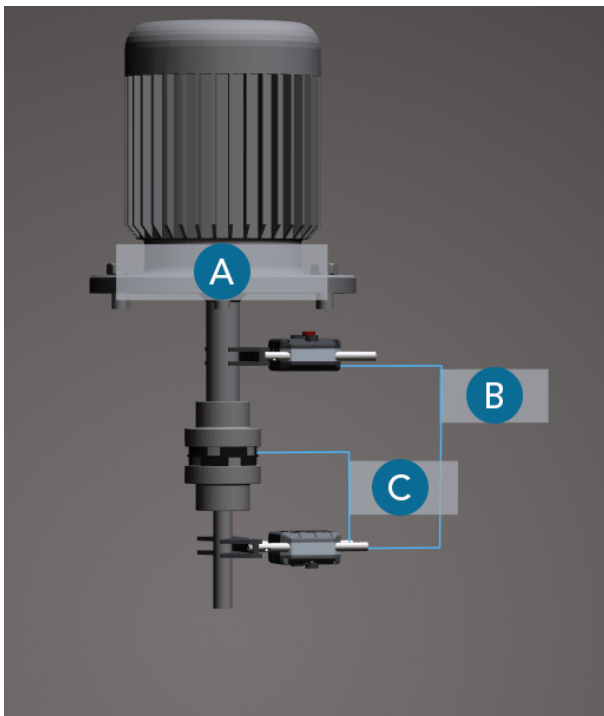
### 8.2 Setup

When you first start a new vertical measurement, or tap **Setup** in the left toolbar, you open the Setup window. This window contains the first few steps in your alignment.

#### 8.2.1 Inserting machine dimensions

Once starting a new horizontal alignment, you always start with entering the highlighted machine distances in the 3D model. Tap the grey fields to enter the corresponding dimensions.

The dimensions are:



- A. The distance between the centre of opposed holding bolts on the M machine.
- B. The distance between the M and S LineLazer alignment sensors.
- C. The distance between the centre of the coupling and the S LineLazer alignment sensor.

#### 8.2.2 Machine setup

To set other machine properties, such as number of bolts, RPM, coupled/uncoupled or change units between metric and imperial; tap the **right panel menu** icon in the upper right corner.

## 8. Vertical alignment

Number of bolts

4 6 8 10 12

Coupled Uncoupled

RPM 1000

Metric Imperial

0-360° +/-180°

Tolerance table

Help

### 8.2.2.1 Number of bolts

To input the number of holding bolts:

1. Tap the **right panel menu** icon.
2. Under **Number of Bolts**, choose which number corresponds with your machine.

### 8.2.2.2 Coupling

To change between coupled and uncoupled machines:

1. Tap the **right panel menu** icon.
2. Choose **Coupled** or **Uncoupled** in the menu.

### 8.2.2.3 RPM and tolerance

Selecting the RPM of your machine is very important for an accurate alignment. The RPM value you select will automatically be matched with the appropriate tolerance.

To find the tolerance table, tap the right panel menu in the upper right corner and pick Tolerance table.

The standard **Active tolerance table** is called '**Default**':

Active tolerance table:

Default

RPM	Offset [mm]	Angular error [mm/100]
1000	0.13/0.07	0.10/0.06
2000	0.10/0.05	0.08/0.05
3000	0.07/0.03	0.07/0.04
4000	0.04/0.02	0.06/0.03
5000	0.03/0.01	0.05/0.02
6000	0.03/0.01	0.04/0.01

New table Close

As you can see, the higher the RPM of your machine, the smaller the tolerance.

For the active tolerance table:

## 8. Vertical alignment

1. Tap the **right panel menu** icon in the upper right corner.
2. Select the **RPM**. The tolerance will automatically be set corresponding to the RPM selected.

**Custom** tolerance tables allows the user to use their own evaluation standards for their machines. To add a custom tolerance table:

1. Tap the **right panel menu** icon in the upper right corner and pick **Tolerance table**.
2. Tap **New table**.

RPM	Offset [mm]	Angular error [mm/100]
3000	0,4	0,3
1000	0.2 / 0.1	0.3 / 0.2
2000	0.3 / 0.2	0.4 / 0.3

3. Enter a descriptive **Name** relevant for your machine type or standard, such as "Pump X-90" or "ISO XXXX-XX".
4. Enter an **RPM** value and its relevant **Offset** and **Angular error** values for yellow and green evaluation status.
  - Values under green limit = Green evaluation status
  - Values over green limit and under yellow limit = Yellow evaluation status
  - (Values above yellow limit = Red evaluation status)
5. Tap **Add to table**.
6. If your standard contains several RPMs, repeat steps 4-5 to add new rows with relevant values for each RPM.
7. Tap **Save**.
8. Under **Active tolerance table**, select the newly created table from the list.
9. Tap **Close**. The tolerance table used is displayed on the screen.
10. If the custom tolerance table contains several RPMs, select relevant RPM from the list in the right panel menu. The tolerance will automatically be set corresponding to the RPM selected.

### 8.2.2.4 Angle selection

Angle selection is set at  $\pm 180^\circ$  as a default. You can change the angle selection to either 0 to  $360^\circ$  or  $\pm 180^\circ$  (clockwise via 3.00 hours to 6.00 hours or counter clockwise via 9.00 hours to 6.00 hours).

1. Tap the **right panel menu** icon in the upper right corner.
2. Choose  $\pm 180^\circ$  or 0 to  $360^\circ$  in the menu.

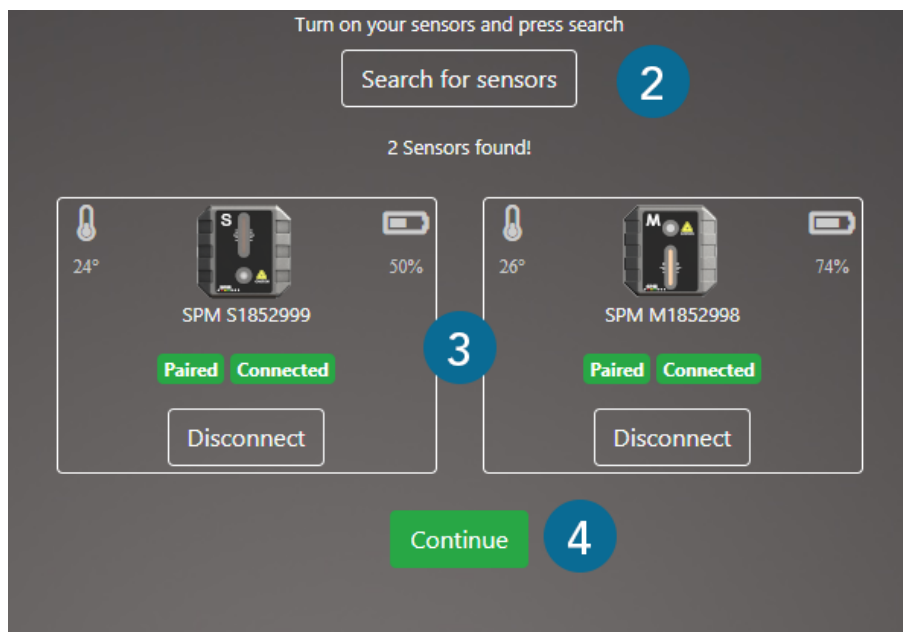
## 8.3 Connecting the sensors

When you have continued from the Setup section, or tapped **Sensors** in the left toolbar, you open the Sensor window.

The next step in your alignment is to turn on and connect the LineLazer alignment sensors to the LineLazer app. Make sure that the LineLazer alignment sensors are turned on, and that the blue led either blinks fast (indicating that the sensors are searching or ready to connect) or is fixed (indicating

## 8. Vertical alignment

that the sensors are connected). Also make sure that Bluetooth is turned on in the device you are running the LineLazer app on.



1. Turn on your LineLazer alignment sensors.
2. Tap **Search for sensors**.
3. When the LineLazer alignment sensors are found, check that they are paired – if not, refer to "Device settings" on page 4. Tap **Connect** under each sensor.
4. Tap **Continue** to move onto Measurement.

The battery level and sensor temperature are indicated for both sensors. For loading the battery, refer to "Charging the LineLazer alignment sensors batteries" on page 14. The LineLazer alignment sensors have an operating temperature of  $-10$  to  $+50$  °C (14 to 122 °F).

### 8.4 Measure

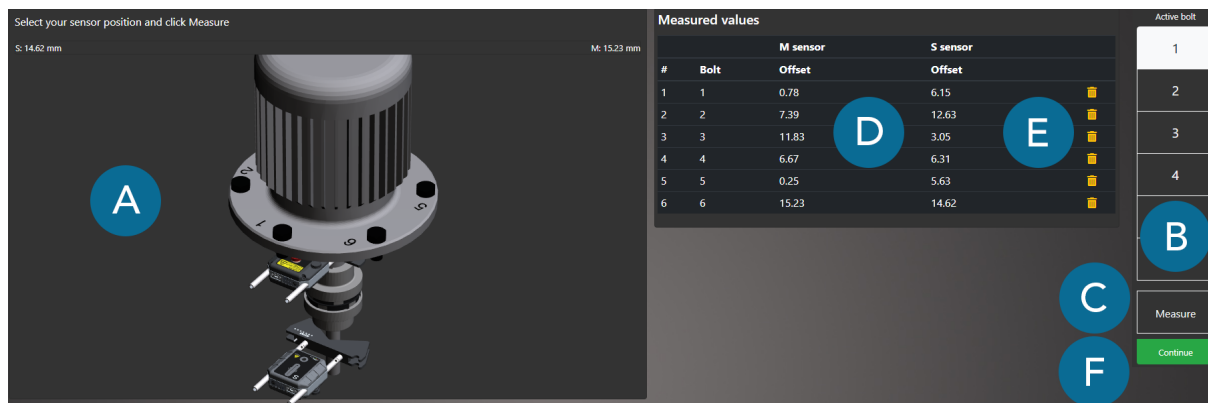
When you have continued from the Connecting the Sensors section, or tapped **Measure** in the left toolbar, you open the Measure window.

N (north) is the position where you take the first measurement. The LineLazer app automatically starts with bolt 1. Mark the N position on the machine before turning the shaft.

Before measuring, make sure you

- mount the LineLazer alignment sensors correctly, see "Setting up LineLazer alignment sensors" on page 16
- insert the correct machine dimensions (see "Inserting machine dimensions" on page 18), this is required to calculate results
- mark the North position on the machine.

## 8. Vertical alignment



1. Start measuring on bolt 1. Position the LineLazer alignment sensors in the correct position and control that the lasers are adjusted to the centre, using the adjustment knob on the back of the M sensor.
2. The LineLazer app will, using the Bluetooth connection, automatically recognize the position of your LineLazer alignment sensors and store the measuring result under the right position. The position of your LineLazer alignment sensors is visible in the model (A) or the buttons indicating number of bolts marked green (B).
3. The measure button will be red when the LineLazer alignment sensors are stabilizing, when the button turns green a measurement can be started. When you are ready, tap **Measure** (C) to start the measurement.
4. The LineLazer app will automatically move on to the next measurement position. All you need to do is move the LineLazer alignment sensors on the machine to the corresponding position.
5. Repeat until at least 3 measurements are taken spread across at least 180°.
6. Your measurements will show up in the Measured Values table (D). If you would like to remove a result, tap the **yellow trash can** symbol (E) next to the result.
7. When you are pleased with your measurements, tap **Continue** (F).

### 8.5 Result

When you have continued from the Measure section, or simply tapped **Result** in the left toolbar, you open the Result window.

The results in the result window are calculated only if you have entered the Machine Dimensions (see "Inserting machine dimensions" on page 28).

#### 8.5.1 Result table



## 8. Vertical alignment

The result table (A) presents offset, and angle values are displayed in both the North to South (N-S) direction and West to East (W-E) direction. The results are based on the measuring values measured in the previous step.

Status is indicated by either green, yellow or red symbols, indicating the severity of the misalignment.

Green values are considered within tolerance, while yellow and red are not within tolerance and adjustments are recommended.

To move on to adjustment, tap **Continue** (B).

### 8.6 Adjustment

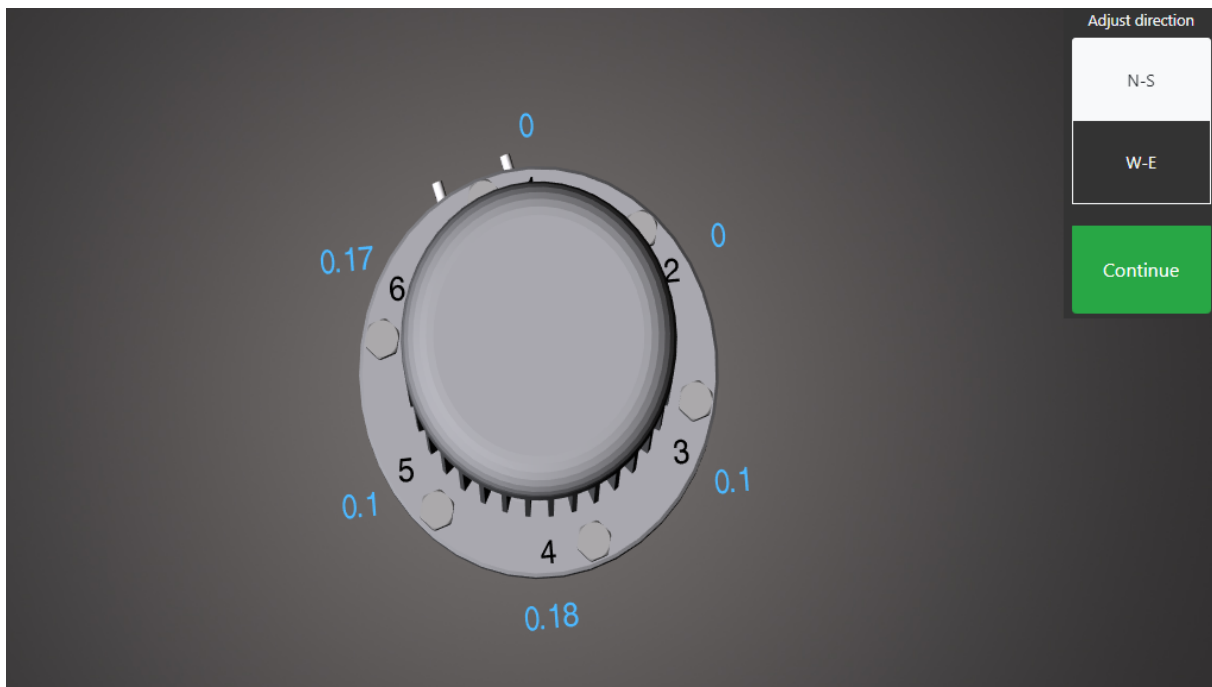
When you have continued from the Result section, or tapped **Adjust** in the left toolbar, you open the Adjust window.

The Adjust window presents actions to take based on the results of the measurement. Live values are showing the current state of the misalignment, and as you start to align the machine the values will change corresponding with the action taken.

The models illustrating the necessary adjustments can easily be moved and turned to more clearly show you what needs to be done.

North to South (N-S) Adjustment: For N-S adjustment, make sure the adjust direction is set to N-S. Locate the sensors at the North position.

West to East (N-S): For W-E adjustment, make sure the adjust direction is set to W-E. Locate the sensors at the East position.



To adjust vertical machines:

1. Select the direction (N-S or W-E) with the highest measuring result.
2. Locate the sensors in the correct position for your chosen direction. N-S: North position, W-E: East position.
3. Do the shim work to achieve alignment.
4. When you have completed the adjustments, tap **Continue**.

## 8. Vertical alignment

### 8.7 Summary

When you have continued from the Adjust section, or tapped **Summary** in the left toolbar, you open the Summary window.

The summary window presents a summarised version of the alignment, with measurements before and the adjustments (if any) made in the previous section.

Result before							
N-S				W-E			
Offset	Status	Angle	Status	Offset	Status	Angle	Status
-0.05 mm		0.01 mm/100		0.08 mm		0.25 mm/100	
Result after							
N-S				W-E			
Offset	Status	Angle	Status	Offset	Status	Angle	Status
-0.05 mm		0.01 mm/100		0.08 mm		0.02 mm/100	

### 8.8 Saving, remeasuring or creating a report

Alignment summary

Tap **Save** to save the summary, making it visible in the Alignment library on the Home screen (see "Saving and completing an alignment" on page 7). Saving completes the alignment, and changes cannot be made once the alignment has been saved.

To take new measurements to control the final values, tap **Remeasure**.

To create a **Report** on your alignment, it needs to be saved first. Then from the Alignment library at the Home screen:

1. Tap the menu icon to the right of the alignment and select **Create report**.

	Date	Type	Name	
	2023-05-09 16:51:02	Horizontal ( Demo )	Latest alignment	
	2023-05-09 16:51:02	Horizontal ( Demo )	Horizontal_2023	
	2023-05-09 16:51:02	Horizontal ( Demo )	Horizontal_2023	

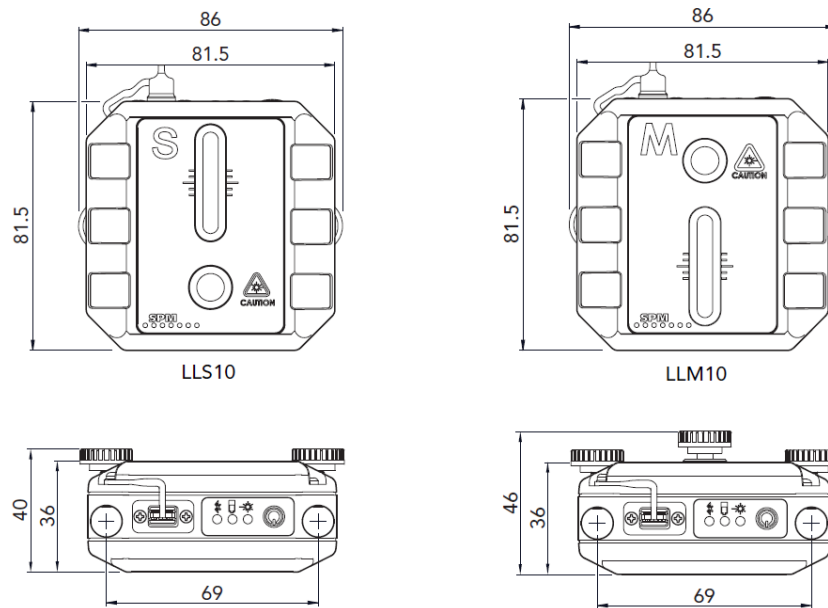
Create Report

Delete

For further information about reports, see "Report" on page 9.



## 9. Technical specifications



Laser type:	line laser, visible red light
Laser output power:	$\leq 1$ mW
Laser safety class:	Class II
Laser wavelength:	635 nm (Typ.)
Detector type:	CMOS Linear image sensor
Detector resolution:	7 $\mu$ m
Detector accuracy:	$\leq 0.3\% \pm 7\mu$ m
Detector protection:	optical filtering (from ambient light)
Detector size (length):	approx. 28.7mm ( $\approx 1.13$ in)
Measuring range:	up to 10m (32.8 ft)
Inclinometer type:	MEMS
Inclinometer resolution:	0.01°
Inclinometer accuracy:	$\leq \pm 0.2^\circ$
Firmware:	built-in self-diagnosis and functions for calibration, signal processing
Internal batteries:	Li-ion, rechargeable
Operating time:	> 12 hours normal use
Operating temperature:	-10 to +50 °C (14 to 122 °F)
Keyboard:	sealed membrane
Control indicators:	LED, red/yellow/blue
Connector type:	mini-B USB for communication and battery charge
Communication:	Bluetooth v4.0 Class II
Housing:	PC plastic/anodized aluminium
Protection class:	IP65
Dimensions:	LLS10; 86x81.5x40mm (3.4x3.2x1.6 in) LLM10; 86x81.5x46mm (3.4x3.2x1.8 in)
Weight:	approx. 230 g

### Part numbers

LLA500	Alignment kit for LineLazer app, with carrying case
LLA501	Alignment kit for LineLazer app, without carrying case

## 10. Legal notice

### 10.1 Safety

Before mounting the LineLazer alignment sensors, make the necessary safety precautions and secure the machine to minimize the risk of injuries and damages.



LineLazer is a class 2 laser product, which means you should never

- Stare directly into the laser transmitter or
- Aim the laser at somebody else

Do not:

- replace the battery pack or open the LineLazer alignment sensors. Incorrectly installed batteries or incorrect battery type may cause serious damage to the laser device, personal injury, and fire. For service, repairs or replacement of batteries, refer to your local SPM dealer.
- use the LineLazer alignment sensors in potentially explosive environments.

SPM Instrument AB does not take any responsibility for damages to your machine or facility due to incorrect use of the LineLazer alignment sensors, wrongful adjustments after alignments or other issues associated with wrongful or uninformed usage of our products.

### 10.2 Quality

SPM Instrument AB and our products are certified according to ISO9001:2015 as well as ISO14001:2015, certificate number 1066. SPM Instrument AB has held the ISO 9001 certification since 1995 and work continuously to obtain certification according to the latest ISO standard. Based on these standards, we measure, monitor and control our quality continuously. A FAT (factory acceptance test) is performed before you receive the product, to ensure quality and functionality.

SPM Instrument AB are responsible for the development, manufacturing and sales of measuring equipment for machine condition measurement. We also offer support in the form of training as well as inspection, repair and analysis services.

### 10.3 Copyright

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The user guide describes the product at the time of release. The contents of this user guide may be altered without notice and may not be regarded as a commitment from SPM Instrument AB. SPM Instrument AB takes no responsibility for possible errors or discrepancies in this user guide.



