

FLUKE®

Reliability

ROTALIGN® touch EX

db® PRÜFTECHNIK

On-board help

ROTALIGN touch EX

On-board help



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System packages

The intrinsically safe ROTALIGN touch EX system combines an intrinsically safe ruggedized tablet with the intrinsically safe sensALIGN 5 EX sensor and laser units.

The system incorporates built-in connectivity (WiFi and RFID), and a built-in camera. It is available in the Zone 1 (Class I, Division 1) category.

Available package

- ALI 52.000-Z1 — This package uses the ecom Class I, certified ruggedized tablet ALI 52.200-Z1


**Note**

Check and ensure that the delivered package items conform to the purchase order and the packing list. Reference may also be made to the online product catalog.

Contact PRÜFTECHNIK Condition Monitoring or your local sales representative if any package items are damaged or missing.

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Home screen

The home screen is displayed when the device is switched on. The home screen may also be accessed by tapping  the "Home" icon.



Tapping the respective icon accesses the following respective functions:

- **(1)** The "Horizontal alignment" icon is used to access the [horizontal alignment](#) application.
- **(2)** The "Soft foot" icon is used to access [soft foot](#) measurement.
- **(3)** The "Vertical alignment" icon is used to access the [vertical alignment](#) application. If this icon is inactive, tap the "New asset" icon **(5)** to activate the vertical alignment icon.
- **(4)** The "RFID" icon is used to open assets assigned to respective RFID tags.
- **(5)** The "New asset" icon is used to start a new asset (this may be a pump-motor combination).



Note

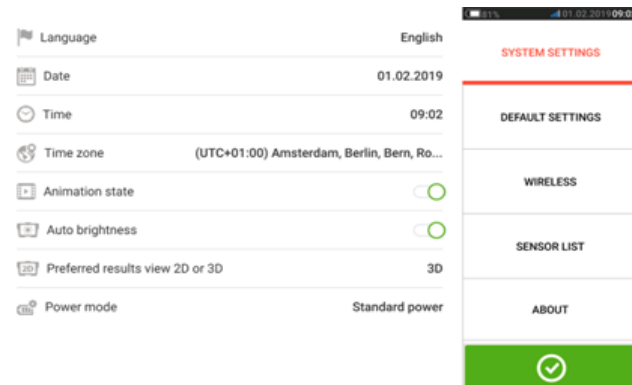
For any opened asset, different applications that may include shaft alignment and soft foot measurement, may be performed.

- **(6)** The "Camera" icon is used to access the built-in camera.
- **(7)** The "Asset park" icon is used to display all saved assets and templates.
- **(8)** The "Resume" icon is used to resume last asset opened (provided it was saved) when the device is switched on.
- **(9)** The "Gallery" icon is used to display all images taken within the Shaft application.
- **(10)** The "Upload" icon is used to save asset measurements in the [Cloud drive](#).
- **(11)** The "Download" icon is used to open asset measurements from the [Cloud drive](#).
- **(12)** The "[Configuration](#)" icon is used to configure the Shaft application settings (which include language, date, time, default settings), and access its built-in mobile connectivity. Mobile connectivity enables the device to access the Cloud functionality that allows wireless file sharing.
- **(13)** The "Back" icon is used to return to previous screen.
- **(14)** The "Power-off" icon is used to turn the touch device off.
- **(15)** The "Camera LED on/off" icon is used to turn the camera LEDs on/off.
- **(16)** The "Help" icon is used to access the on-board help file.

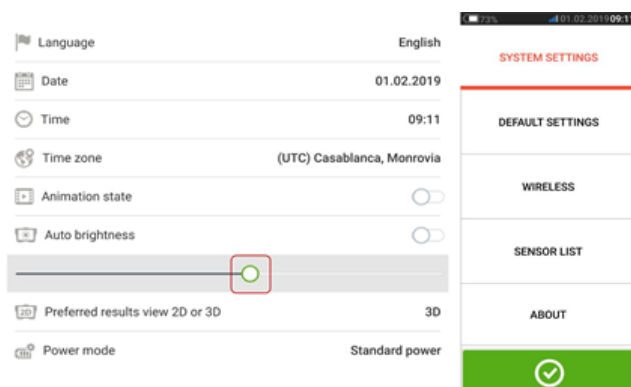
Configuration

The following settings and items may be accessed via the configuration icon:

- 'System settings' sets the following items:

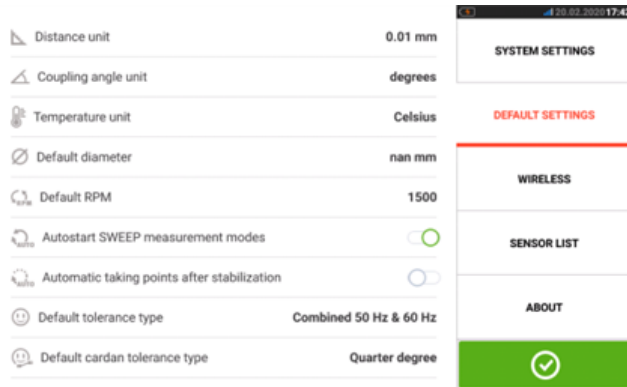


- > Language (system language);
- > Date;
- > Time;
- > Time zone;
- > Animation state — regulates the transition between the dimension, measure and results screens. Two options are available – fast and standard. If "Animation state" is on, the transition between screens is set to standard and therefore noticeable. If off, the transition is fast.
- > Auto brightness – adjusts the display brightness of the touch device. If "Auto brightness" is on, the display brightness adjusts automatically. If off, then the display brightness may be manually adjusted by dragging the brightness slider to the left or right.



- > Preferred results view 2D or 3D
- > Power mode – used to manage the power usage in the touch device. Four power scheme options are available.

- 'Default settings' is used to set units of length, angle and temperature; the default diameter may be set here. It is also used to activate or deactivate the automatic start of Sweep as well as automatic taking of readings after stabilization, especially in point measurement modes. Type of tolerance to be used may also be set here.

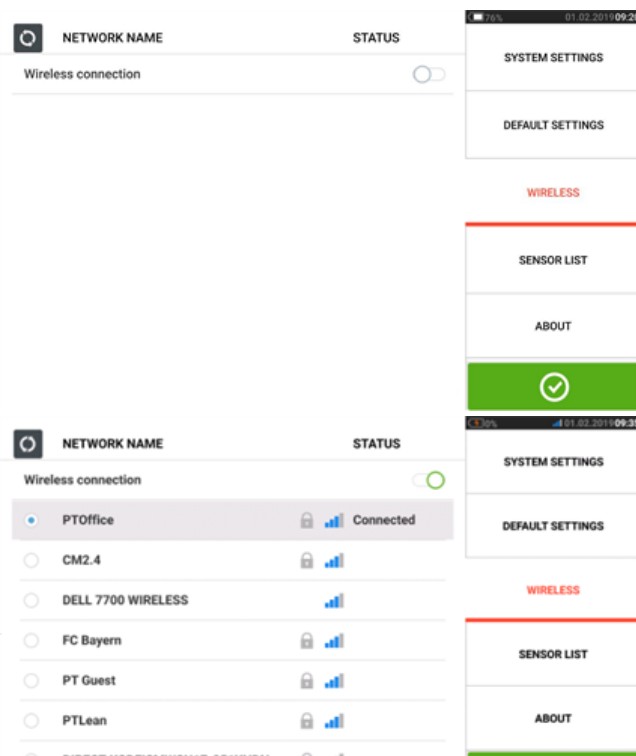


Note

When using metric units, the resolution of physical quantities used within the device may be set to two (0.01 mm) or three (0.001 mm) decimal places. This measurement precision is available in "Measurement", "Results" and "Live Move" screens. The "Dimensions" screen uses only positive integers.

The set time zone is coupled to the default RPM unless the default RPM is edited independently. Setting the time zone to say "Central America" results in a default RPM of 1800. Setting the "London" time zone results in a default RPM of 1500.

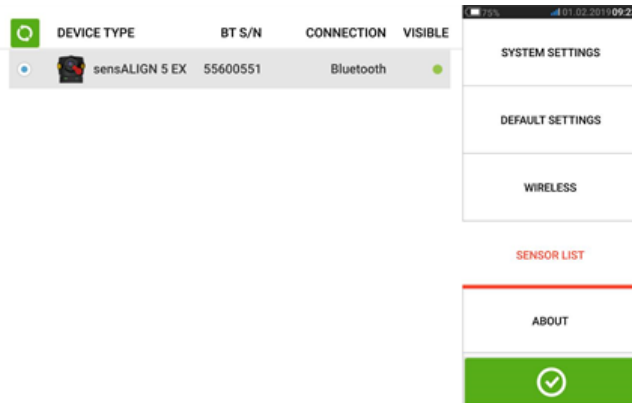
- When activated, 'Wireless connection' is used to connect the touch device to available WiFi networks.



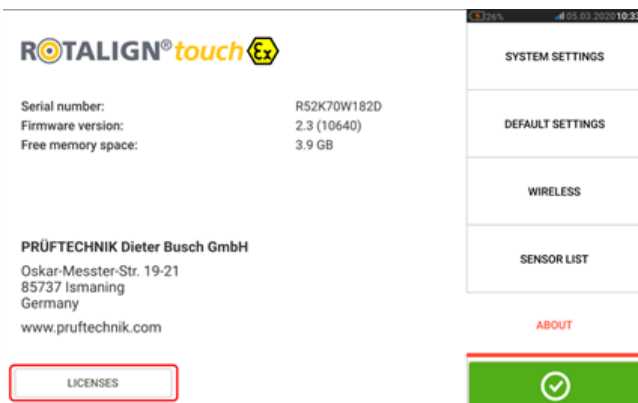
**Note**

The touch device may be connected only to WiFi networks that do not open separate web browsers to login.

- '[Sensor list](#)' displays all available sensors.



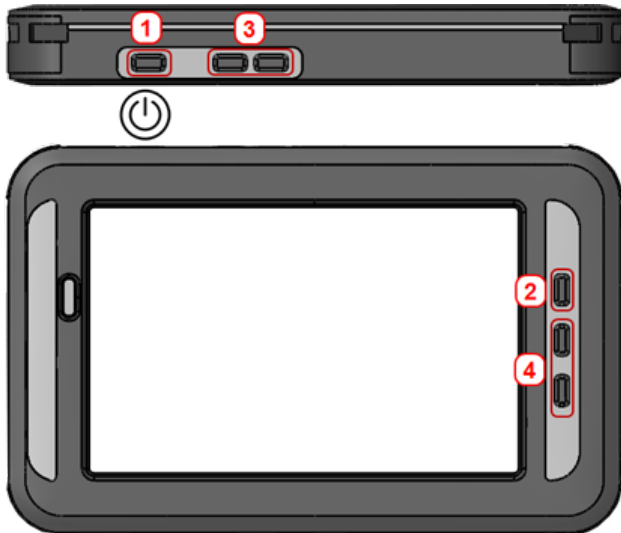
- The "About" screen displays the device features level (ROTALIGN touch EX), serial number, firmware version of the application and available memory space. Open source licenses and other Android legal requirements may also be accessed via this screen by tapping "LICENSES".



Components

The main measuring components for shaft alignment are the intrinsically safe ruggedized tablet, the intrinsically safe sensor, the intrinsically safe laser and the intrinsically safe RF module.

Ruggedized tablet



Note

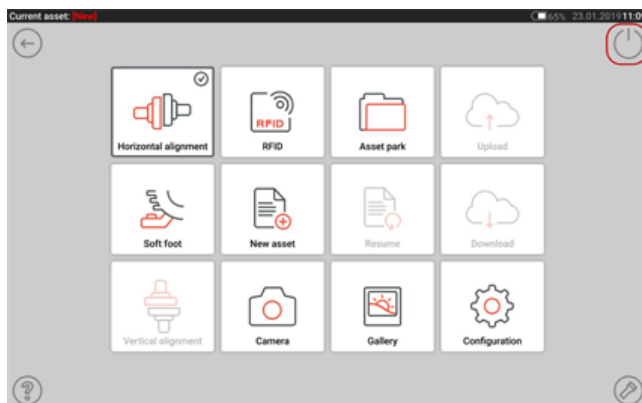
For details on usage of the ruggedized tablet please refer to the included ecom tablet manual.


The only application running on this intrinsically safe ruggedized tablet is Shaft Alignment. Additional apps cannot be installed in this dedicated device.

In this version of the tablet device, the hard keys (3 and 4) have been disabled. The hard key (2) may be used to capture screenshots.

Starting the Shaft Alignment application

Switch the ruggedized tablet on by pressing and holding down the power key (1). Once switched on, the application home screen opens.



Tap the power icon [] appearing in the home screen to exit the application, and sends the ruggedized tablet to sleep mode.



Note

To switch the ruggedized tablet off, press and hold down the power hard key, and then tap the "power off" icon that appears on the display.

Intrinsically safe RF module

The intrinsically safe RF module is used for wireless communication between the intrinsically safe sensor and the intrinsically safe ruggedized tablet.



1: Intrinsically safe RF module; **2:** Intrinsically safe sensALIGN 5 sensor; **3:** Bracket frame for the supplied compact chain-type bracket set; **4:** Support posts for the supplied compact chain-type bracket set



Note

For details on the intrinsically safe RF module please refer to the included RF module operating handbook DOC 04.202.

Intrinsically safe sensor and laser

Refer to "sensALIGN 5 EX components" on page 19

Information on the sensor and laser may be found in the related topic below.

sensALIGN 5 EX components

sensALIGN 5 EX laser

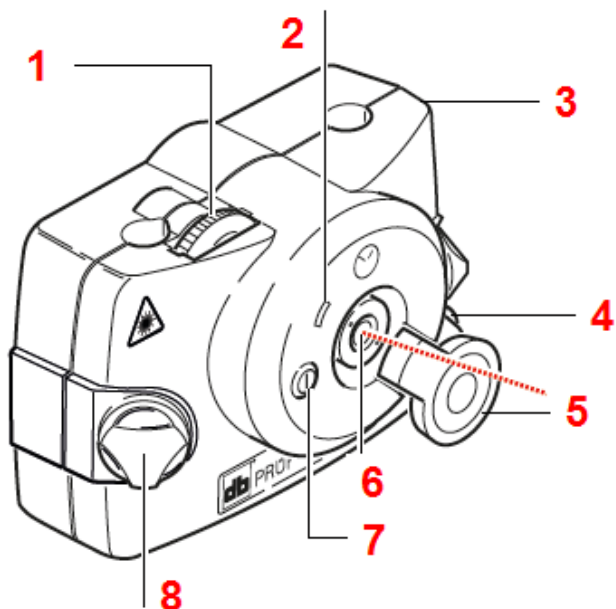
The semiconductor laser diode emits a ray of red light (wavelength 630 – 680 nm) which is visible where it strikes a surface. The Class 2 laser beam is emitted with a diameter of approx. 5 mm (3/16”).

The laser is turned on by pressing its On/Off push button switch. The “beam active” LED lights red.



WARNING

With the laser on, DO NOT stare into the laser beam!



1: Vertical beam position adjustment thumbwheel; **2:** “Beam active” indicator LED; **3:** Rubber housing; **4:** Horizontal beam position thumbwheel; **5:** Laser dust cap in “open position”; **6:** Laser emission aperture; **7:** On/Off push button switch; **8:** Locking knob

The beam is adjusted during set-up by changing its vertical and horizontal angles using the position thumbwheels, so that the beam strikes the sensor lens perpendicular to the lens surface.

The laser is water and dust resistant (IP 65). The internal optics and electronics are internally sealed, preventing possible contamination.



CAUTION

The battery compartment is not watertight. If water enters this compartment, open it and dry it out. The two AA size batteries should then be replaced.

Laser batteries

The laser is powered using two high energy AA size alkali-manganese 1.5 V batteries (use only Duracell Industrial ID 1500 or Energizer E91). These provide a typical operating duration of 120 hours.



CAUTION

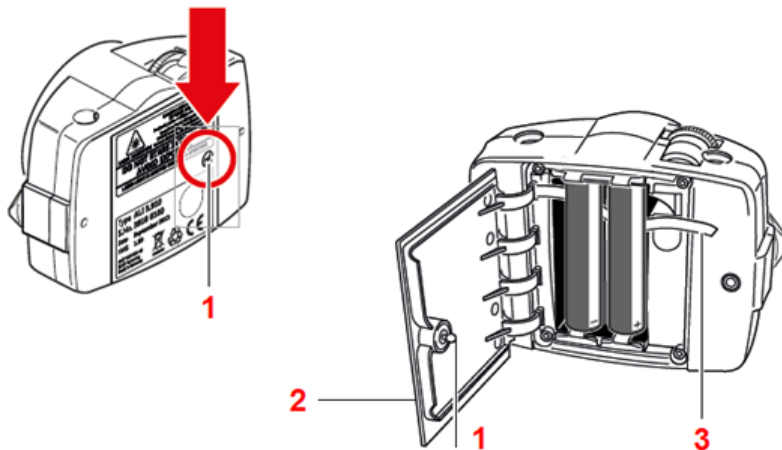
As the battery becomes depleted, the colour of the 'laser active' indicator LED changes from green (full) to yellow (half full) to red (empty). When this occurs, the batteries should be replaced.

If the laser is not in use for extended periods of time, a month or more, the batteries should be removed from the unit.

Replacing laser batteries



Batteries must be changed only outside the explosive area! Note that only alkali-manganese batteries can be used in explosive atmospheres.



The batteries are replaced by undoing the quarter-turn screw (1) on the battery compartment cover (2) by rotating it by at least 90° (1/4 turn). With the screw loosened, lift the cover, and then use the red strap (3) to remove the batteries. Replace both batteries at the same time.



CAUTION

Under no circumstances may the two smaller housing hex head screws be removed, as that would void all warranty coverage.



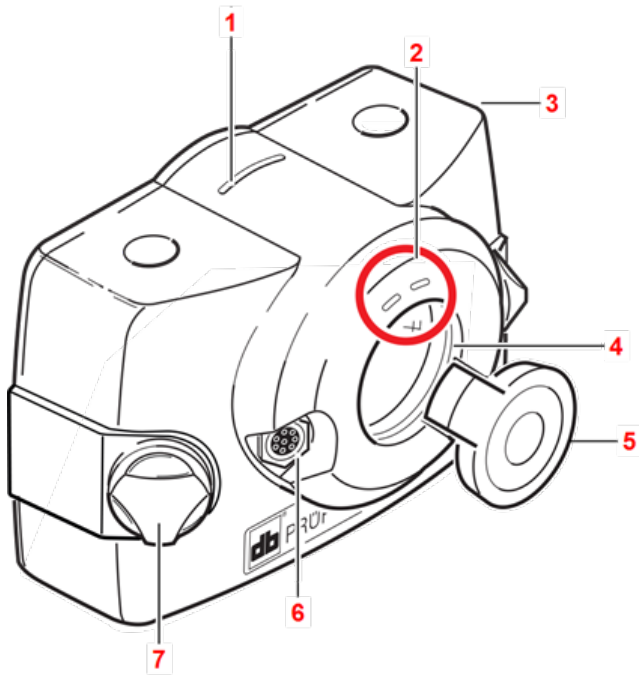
Used batteries should be disposed of in an environmentally-sound manner!

sensALIGN 5 EX sensor

The sensor contains two position detectors, which measure the exact position of the laser beam as the shafts are rotated. The sensor also contains an electronic inclinometer for shaft rotation measurements.

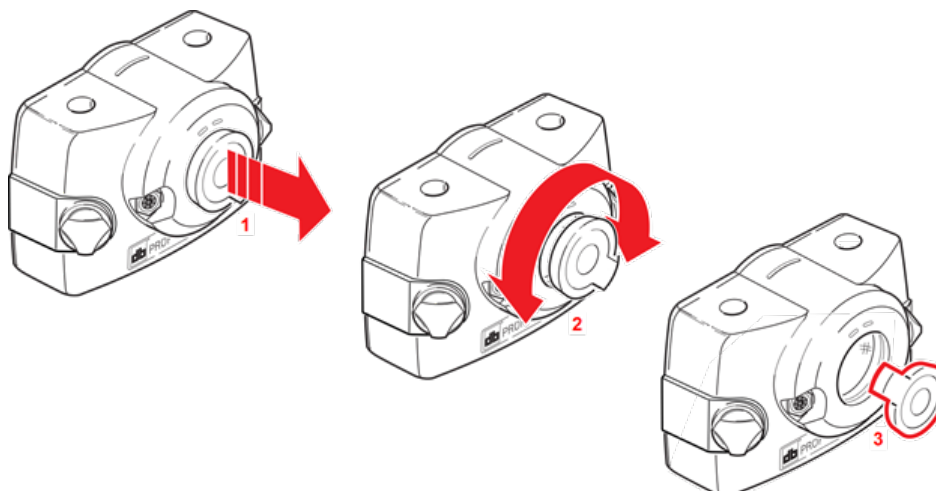
The sensor has two indicator LEDs on its front side, one green and the other red, to indicate beam adjustment.

The sensor is powered using the intrinsically safe RF module via the module cable.



1: Distance marking; **2:** Laser beam position LEDs; **3:** Rubber housing; **4:** Scratch-resistant lens; **5:** Sensor dust cap in "open position"; **6:** Cable socket; **7:** Locking knob

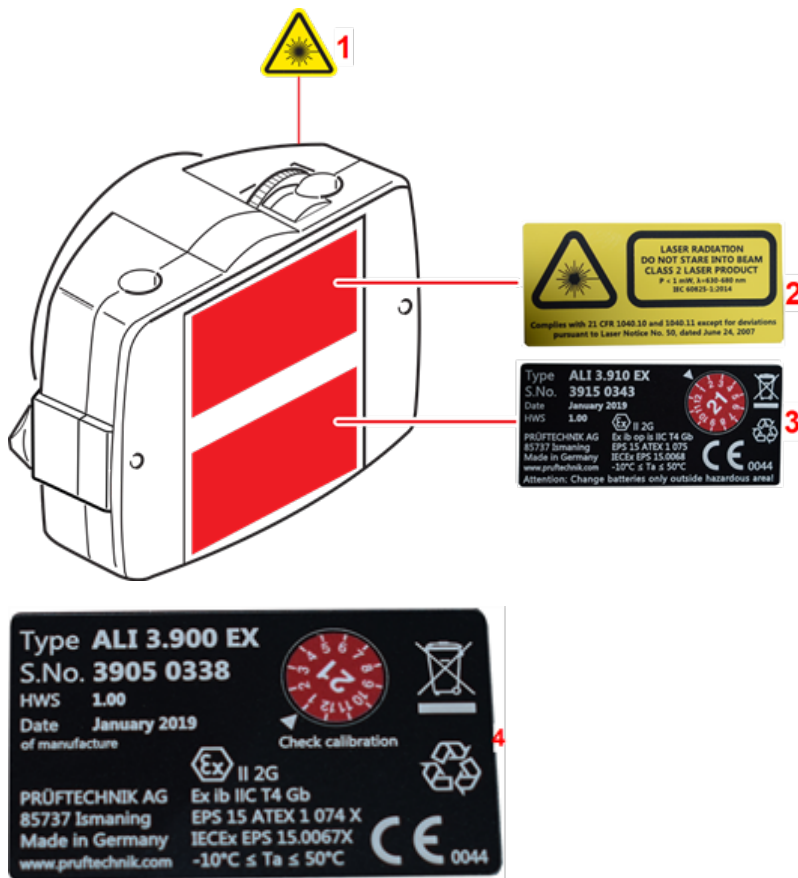
Opening the sensor/laser aperture



- **(1)** Lift the dust cap slightly in the direction shown by the bold red arrow.
- **(2)** Rotate the dust cap in either direction as shown by the bold red arrow.
- **(3)** Lock the dust cap in its "open position" highlighted in red.

Sensor and laser labelling

Labels used in communicating laser safety and other general information are to be found affixed to the housing of the system components.



- **(1)** The laser beam hazard symbol label is affixed at the front of the laser head.
- **(2)** The laser safety warning label is affixed to the back of the laser.
- **(3)** The laser identification label and the laser inspection label are affixed to the back of the laser.
- **(4)** The sensor identification label and the sensor inspection label are affixed to the back of the sensor.

Mounting components

Mounting brackets



Note

The system is delivered with fully assembled brackets, and with the intrinsically safe sensALIGN 5 laser, sensALIGN 5 sensor and RF module already assembled. In this case, the bracket holding the laser is mounted on the shaft on the left side of the couplings or the solid coupling hub on the left side. The bracket assembly holding the sensor connected to the RF module is mounted on the shaft on the right side of the couplings or the solid coupling hub on the right side.

Mount the brackets on either side of the coupling on either the shafts or on the solid coupling hubs, and both at the same rotational position.

Please note the following in order to obtain the highest possible measurement accuracy and to avoid damage to equipment:



CAUTION

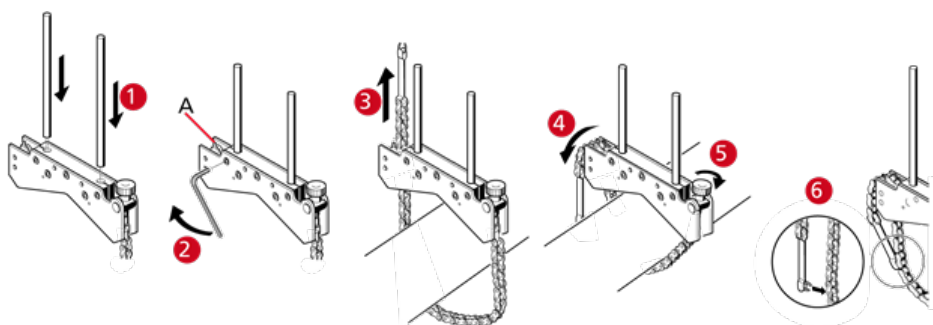
Ensure that the brackets fit solidly onto their mounting surfaces! Do not use self-constructed mounting brackets, or modify the original bracket configuration supplied by PRÜFTECHNIK (for example, do not use support posts longer than those supplied with the bracket).



Note

If the brackets have not been fully assembled, follow the mounting procedure below.

Bracket mounting procedure



- Choose the shortest support posts which will still allow the laser beam to pass over or through the coupling. Insert the support posts into the bracket.
- Fasten them in place by tightening the hex screws on the sides of the bracket frame.
- Place the bracket on the shaft or coupling, wrap the chain around the shaft and feed it through the other side of the bracket: if the shaft is smaller than the width of the bracket

frame, insert the chain from the inside of the bracket as shown in the diagram; if the shaft is larger than the bracket width, insert the chain into the frame from the outside.

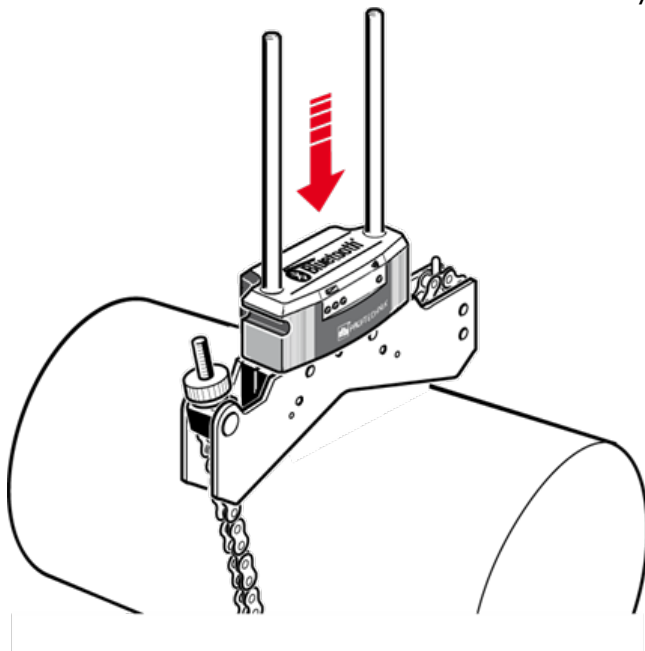
- Catch the chain loosely on the anchor peg (**A**).
- Turn the bracket thumbscrew to tighten the assembly onto the shaft.
- Clip the loose end of the chain back onto itself.

The bracket should now be tight upon the shaft. Do not push or pull on the bracket to check, since this could loosen its mounting.

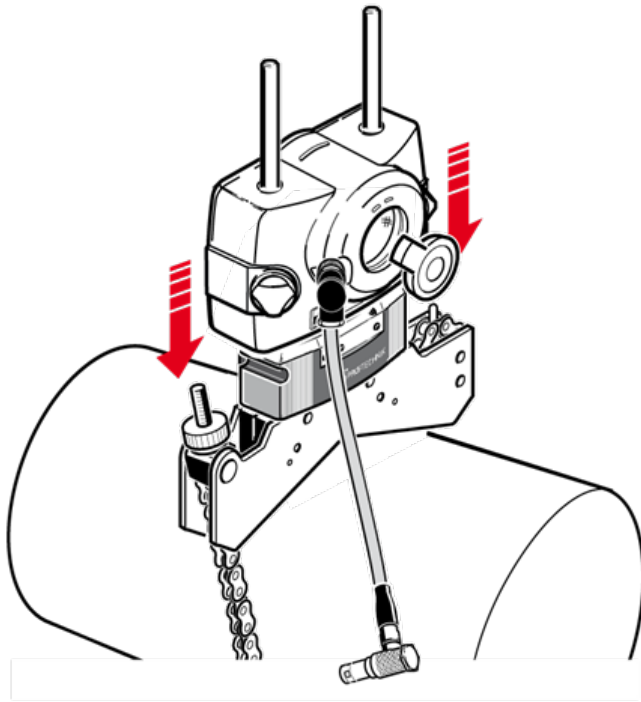
To remove the brackets, loosen the thumbscrew, then remove the chain from its anchor peg.

Mount intrinsically safe RF module, sensALIGN 5 sensor and laser

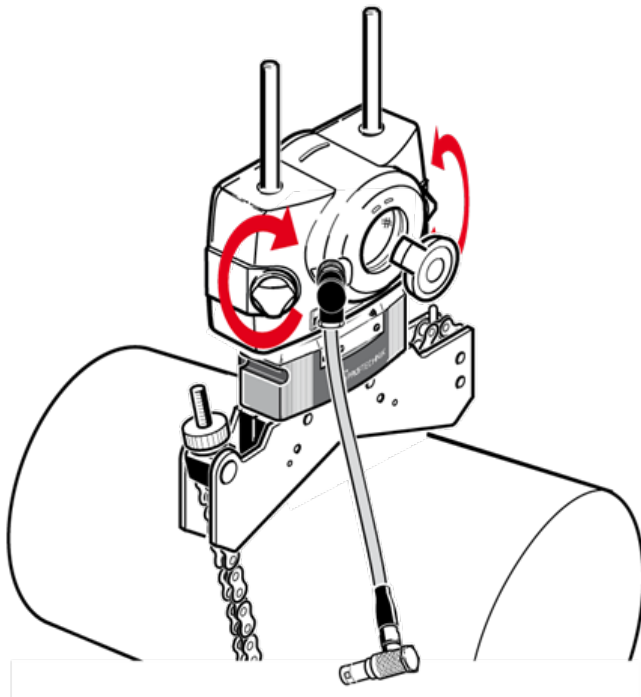
- Mount the RF module on the support posts of the bracket fixed on the shaft of the right machine (usually moveable machine). The module clamps on the support posts. It is recommended to slide the RF module all the way down onto the bracket frame.



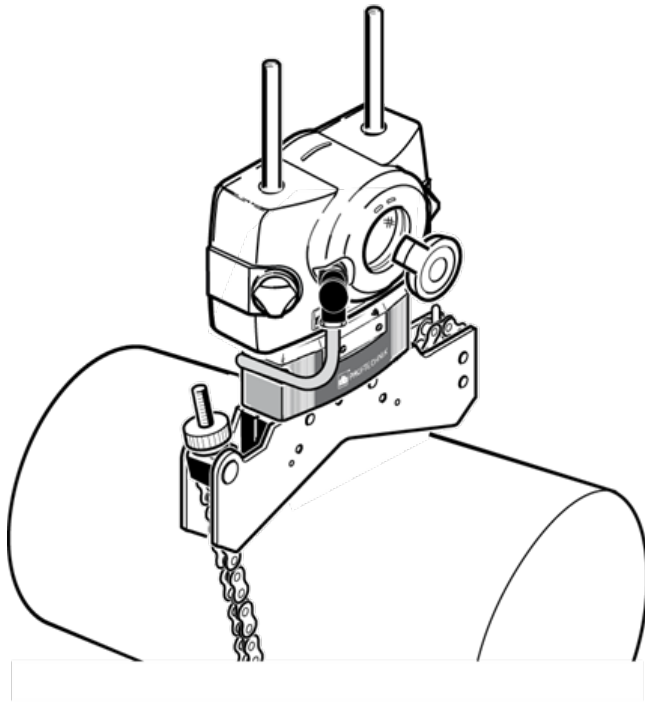
- Mount the intrinsically safe sensALIGN 5 sensor on the same support posts as the RF module. The yellow locking knobs should be loose enough to allow the sensor slide onto the support posts. Lower the sensor as close to the RF module as possible.



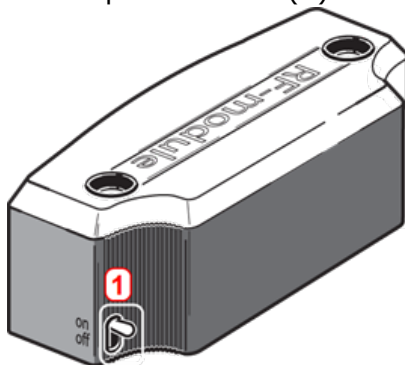
- Clamp the sensor onto the support posts by tightening the yellow knobs.



- Connect the sensor to the RF module using the RF module cable. The shorter 90-degree connector of the RF module cable is connected to the 8-pin sensor socket. The keyway orientation should be noted, and the knurled sleeve of the connector screwed in until it is snug. The longer 90-degree connector of the RF module cable is inserted into the four-pin socket on the side of the RF module with a groove, matching the red dot on the plug to the groove on the socket to ensure proper plug orientation.



- Use its power switch (**1**) to turn the intrinsically safe RF module on.



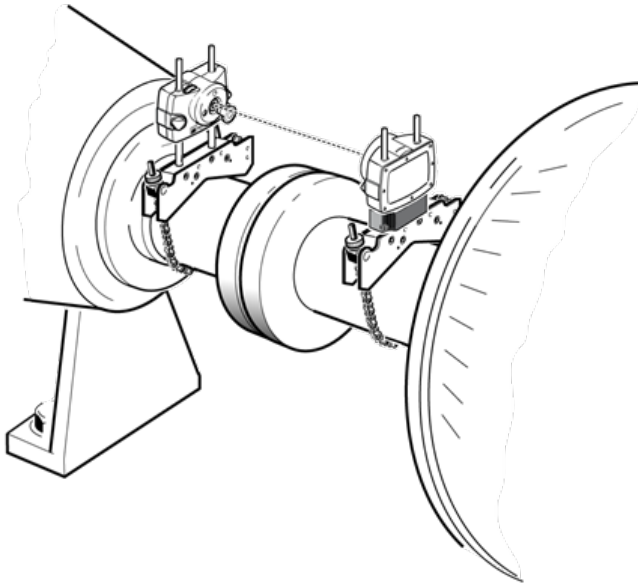
The intrinsically safe RF module powers the intrinsically safe sensor.



Note

For details on the intrinsically safe RF module please refer to the included RF module operating handbook DOC 04.202.

- Mount the intrinsically safe sensALIGN 5 laser on the support posts of the bracket fixed on the shaft of the left machine (usually reference machine) – as viewed from normal working position. Ensure that the yellow locking knobs are loosened enough to let you slide the housing onto the support posts.
Switch the laser on by pressing its On/Off push button (**1**). Ensure that the laser beam can pass over or through the coupling and is not blocked.



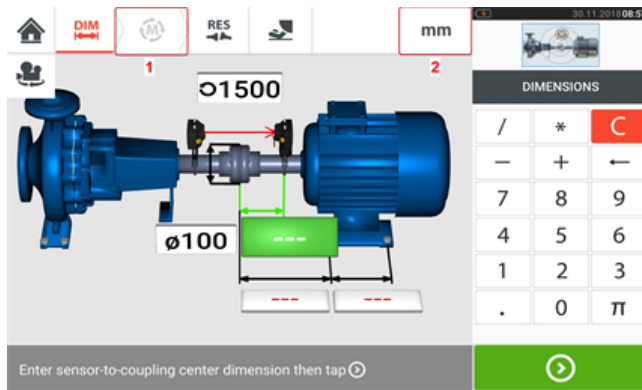
Both the sensor (**3**) and laser (**2**) should be at the same height, as low as possible, yet high enough for the beam to clear the coupling flange. They should also visually appear to be rotationally aligned to each other.


Make the final adjustments, loosening the brackets slightly if necessary, then rotating them, and re-tightening.


In some cases, if the coupling is large enough, a coupling bolt can be removed and the laser beam shot through the bolt hole, in order to avoid protruding radially beyond the coupling's outer diameter (O.D.).

Both sensor and laser should be at the same height, as low as possible, yet just high enough for the beam to clear the coupling flange. They should also visually appear to be rotationally aligned to each other.

Dimensions



- (1) Grayed out icons are disabled within the active screen. The 'Measure' icon is enabled after all dimensions have been entered.
- (2) Tap the measurement units icon  to set desired units. The icon toggles between "mm" and "inch".


Tap the dimension fields and enter all required dimensions. The user may elect to tap  the 'Next' button to proceed to enter next dimension. Dimensions may be entered only when the dimension field is highlighted green.




Note


If units are set to Imperial system, inch fractions may be entered as follows: For $\frac{1}{8}$ " enter $1/8 = 0.125$ "; For $10 \frac{3}{8}$ " enter $10 + 3/8 = 10.375$ ".

The coupling diameter value may be determined by entering the measured circumference of the coupling and dividing the value by π (pi) (= 3.142). For example $33"/\pi = 10.5$ "; Or $330 \text{ mm}/\pi = 105 \text{ mm}$

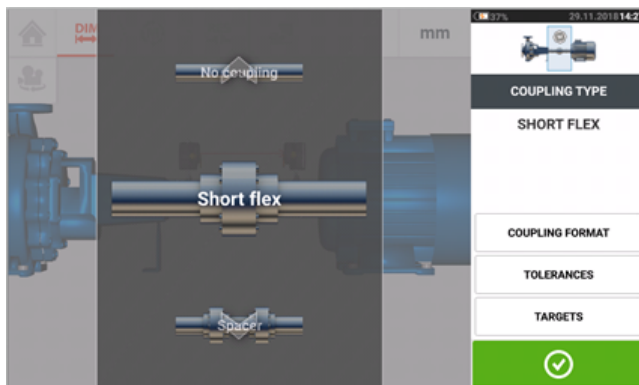
The rotate machine view icon  is used to rotate the view of the machines and mounted components on the display.

Machine and coupling properties may be edited by tapping the respective machine or coupling.

When all required dimensions have been entered, the 'Measure' icon  appears.

Tap  to proceed with measurement.

Coupling properties



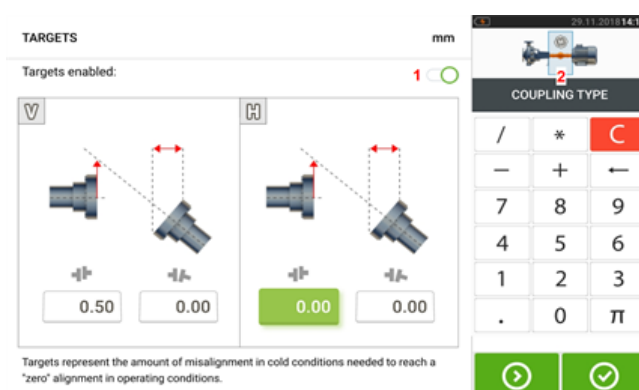
Swipe the carousel up or down and select desired coupling type. The following coupling types are available for selection:

- Short flex — These couplings feature fitted transmission elements with play (such as teeth, claws or bolts) or elastic connecting elements like rubber 'tires' or springs.
- Spacer shaft — When the coupling halves are joined by a spacer element, its length must be entered.
- **Cardan shaft** — Just as with regular spacer shafts, the shaft length (between coupling planes) must be entered.
- Single plane — The coupling halves are bolted directly together. Loosen the bolts before taking measurements, since they would otherwise distort the true alignment condition.
- No coupling — This coupling format is intended for use with CNC machines. In this format, the length between the two shafts must be entered. The measurement mode for this coupling format is Multipoint.

Targets


Targets are misalignment values specified as an offset and an angle in two perpendicular planes (horizontal and vertical) and used to compensate for dynamic loads.



Access the coupling targets screen by tapping the item "Targets".



The displayed coupling format depends on the type of coupling selected.

To enter any target specifications at the coupling, tap the corresponding value box then proceed to enter the target value using the onscreen keyboard. Cycle through the value boxes

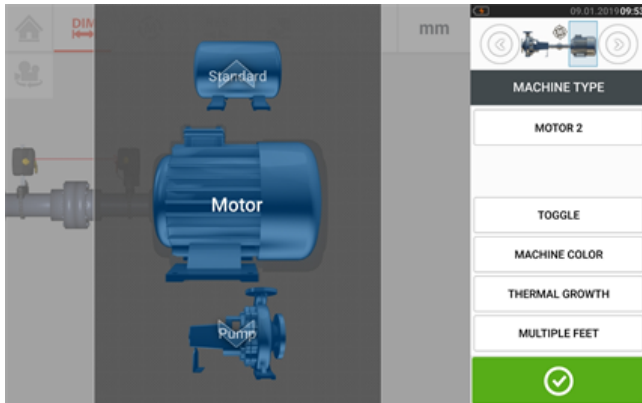
using . Alternatively, tap the desired value box.


Target specification values are activated by swiping the icon  to the right [1]. When target values are enabled, the coupling [2] within the mini train inset at the top-right corner appears in orange. After target values have been entered, tap  to proceed.

Machine properties

The following lifelike machine graphics are available:

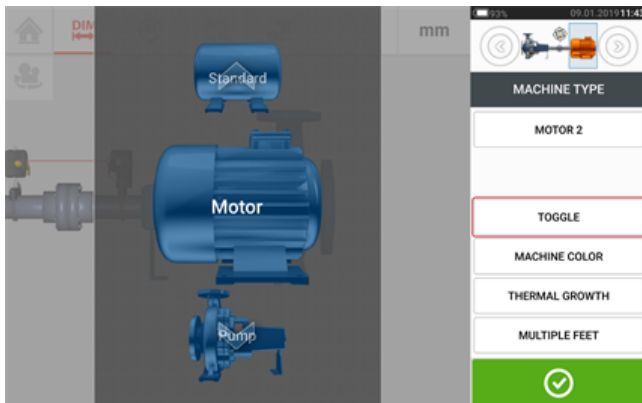
1. Generic standard machine; 2. Motor; 3. Pump; 4. Split case pump; 5. Fan; 6. Center hung fan; 7. Blower; 8. Compressor; 9. Gearbox; 10. Rotor gearbox; 11. Diesel engine; 12. Generator; 13. Gas turbine; 14. Shaft with no supports; 15. Shaft with a single support; 16. Shaft with two supports



Swipe the machine carousel up or down and select desired machine. Position desired machine at the centre of the carousel then tap  to confirm selection and return to the dimensions screen.

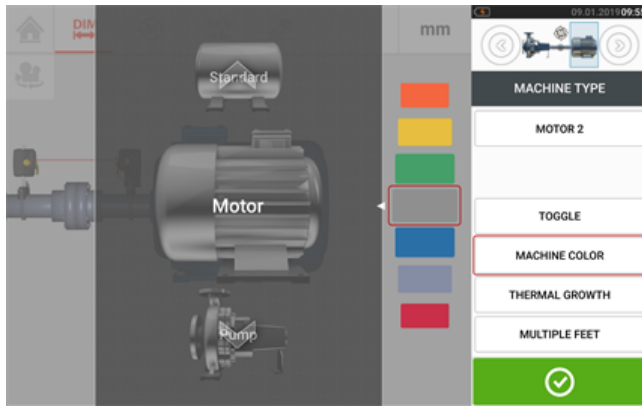
Toggle


"Toggle" is used change the orientation of the selected machine along the shaft axes. In the following example, the motor has been flipped so as to connect the non-drive side to the coupling.



Machine colour

The desired machine colour may be set from this screen by tapping the item "Machine colour". A colour palette appears.



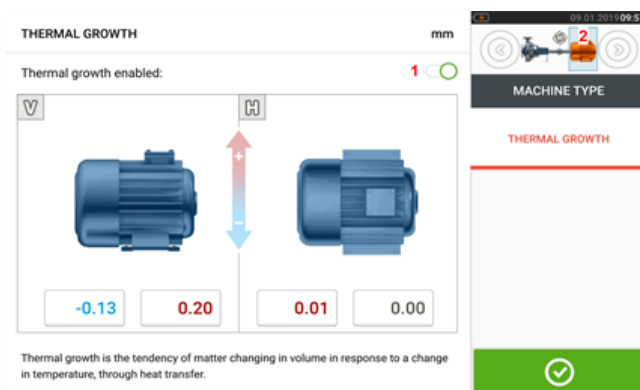
Swipe the colour palette up or down to select the desired colour then tap  to confirm selection and return to the dimensions with the machines having the desired colour.


Thermal growth



Thermal growth is the movement of shaft centerlines associated with or due to a change in machinery temperature between the idle and operating conditions.

Access the thermal growth screen by tapping the item "Thermal growth".

Thermal growth values can be entered only when machine feet have been defined.



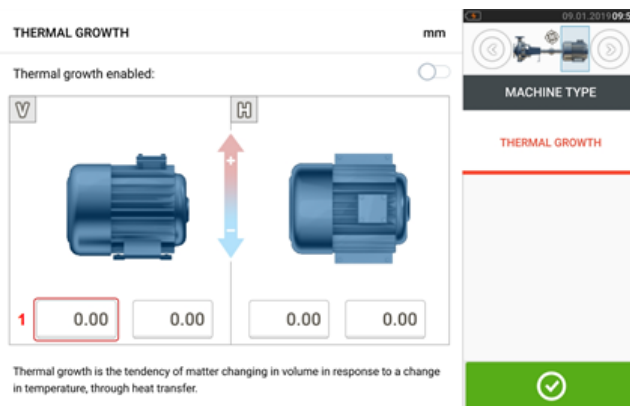
To enter any specified thermal growth value at the required foot position, tap the corresponding value box then proceed to enter the thermal growth value using the onscreen keyboard. Cycle through the value boxes using . Alternatively, tap the desired foot position.

Thermal growth values are activated by swiping the icon  to the right [1]. When thermal growth values are enabled, the corresponding machine within the mini train inset at the top-right corner appears in orange [2]. After thermal growth values have been entered, tap  to proceed.

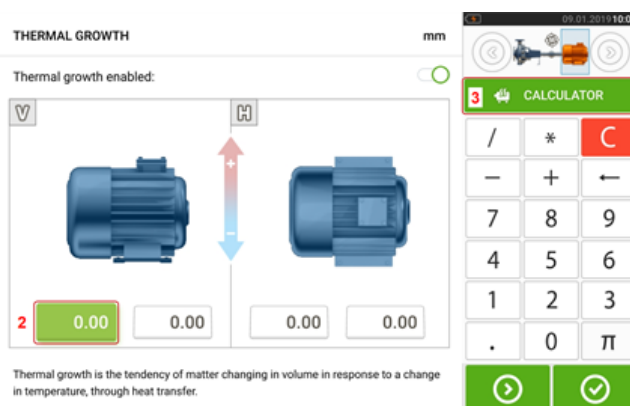
Thermal growth calculator

The calculator is used to calculate thermal growth compensation if no other values are available. Thermal growth is calculated from the material coefficient of linear thermal expansion, expected temperature difference and length of the shaft centerline from the shim plane.

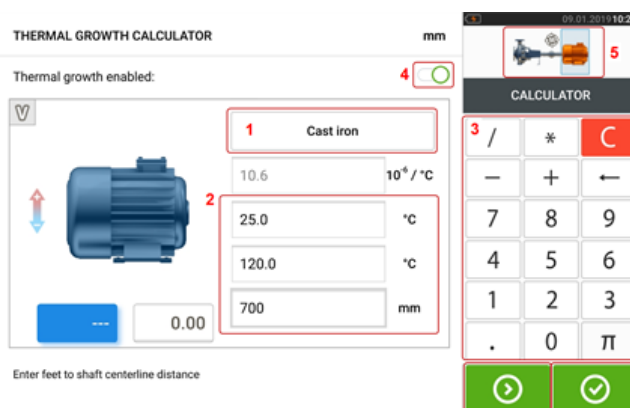
After accessing the thermal growth screen, tap value box of feet pair [1] where thermal growth is to be entered.



The box is highlighted green [2], and the 'Calculator' tab [3] appears.




Tap 'Calculator' tab [3] to access the thermal growth calculator screen.

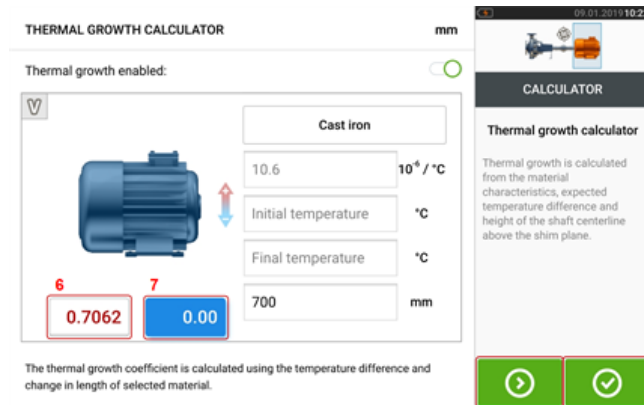



Tap (1) and select machine material. The corresponding linear thermal expansion appears. Enter the three values [2] required to calculate the thermal growth value for the selected feet pair using the onscreen keyboard [3]. The three values are:

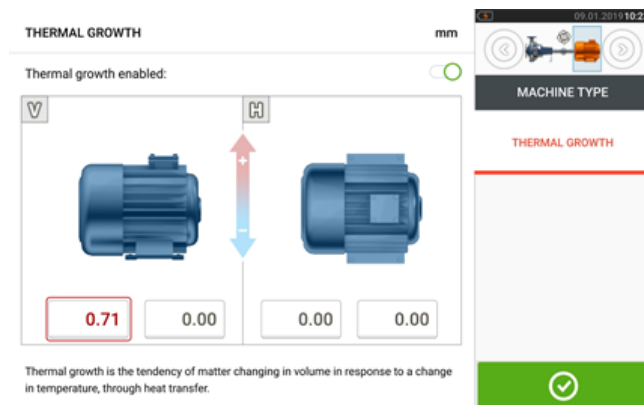
- Ambient temperature (initial temperature)
- Machine running temperature (final temperature)
- Distance from machine base (or shimming plane) to the shaft centerline (length)

With thermal growth values enabled [4], the corresponding machine within the mini train inset at the top-right corner appears in orange [5].

Tap  to simultaneously display the calculated thermal growth value for the respective feet pair [6] and toggle to the next feet pair [7].



Tap  to return to the thermal growth screen showing the calculated values.



Multiple feet


The item "Multiple feet" is primarily used to determine foot corrections in a multiple feet machine, and is therefore accessible also in the result screen. The dimension between the feet may be defined in the 'Multiple feet' screen which is accessed by tapping the item "Multiple feet".





If already entered, the 'Multiple feet' screen will show the dimension between the front feet and the back feet [1].

**Note**

Machine intermediate feet cannot be displayed in the dimension screen.

Tap  to add any intermediate feet.

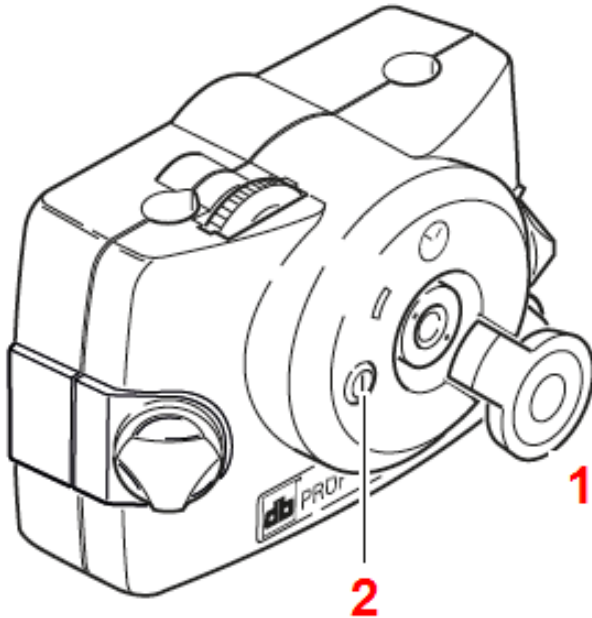


- The intermediate feet pair is added after the front feet.
- Enter this dimension in the row that appears.
- If desired, intermediate feet may be deleted by tapping .
- Tap  to exit the 'Multiple feet' screen.

Laser beam adjustment (sensALIGN 5 EX)

Using sensALIGN 5 laser and sensor

1. Open the laser aperture by lifting and the rotating the dust cap until it rests in its "open" position (**1**). Switch the laser on by pressing its On/Off push button switch (**2**). Leave the sensor dust cap on its "close" position.



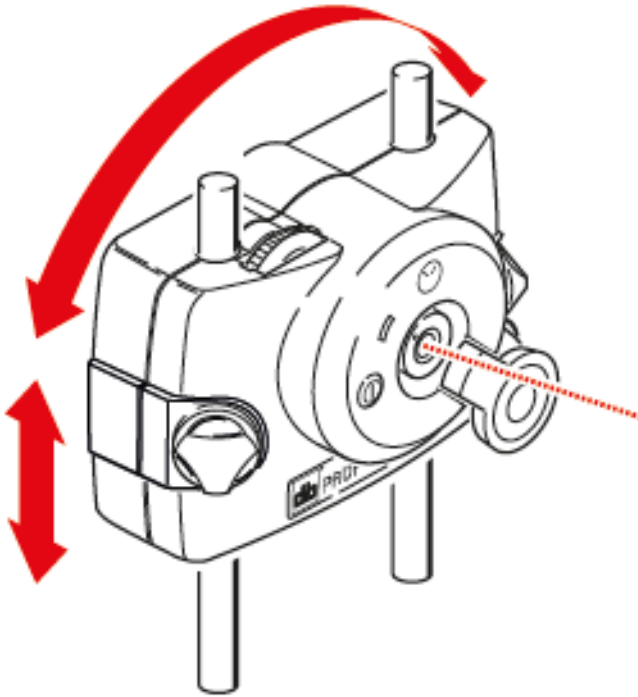
WARNING

Do not stare into the laser beam!

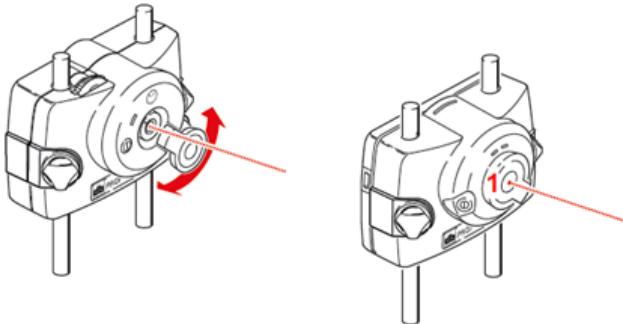
2. If the laser and sensor have been roughly positioned to each other during mounting, the laser beam should strike the sensor dust cap. If the beam be so far off target that it misses the sensor completely, hold a sheet of paper in front of the sensor to locate the beam and readjust it onto the sensor as follows:

3. Reposition the components until the laser beam strikes the sensor cap:

- vertically: loosen the locking knobs and adjust the height.
- horizontally: loosen the bracket and turn the laser and/or sensor brackets into line with one another.



4. Use the adjustment wheels on the laser to center the laser beam on the sensor dust cap (**1**), and then open the sensor aperture by lifting and rotating its dust cap until it rests on its "open" position.



Note

It is highly recommended that before mounting the laser on its bracket, both yellow adjustment thumbwheels be brought to the approximate center of their travel range. This will ensure that the beam is emitted from the laser as straight as possible and not at an angle.

Also make sure both brackets are rotationally aligned to each other. These precautions will greatly facilitate the beam adjustment process.

Laser beam adjustment

Laser adjustment wizard

The laser adjustment wizard is the primary laser beam adjustment feature in the touch device. If the sensor is initialized, and the laser beam is not centered, use the wizard to adjust the laser beam correctly. The wizard arrows indicate the direction and amount in which movement should take place.



- The wizard arrows next to the laser position thumbwheels (**1** and **2**) indicate the direction and magnitude in which the thumbwheels are to be moved in order to adjust the laser beam correctly.
- The wizard arrows away from the thumbwheels (e.g. **3**) indicate the direction and magnitude to move the laser physically for correct adjustment.
- The attained laser beam status is shown in **4**.
- **5** shows the position of the laser beam on the position detectors.

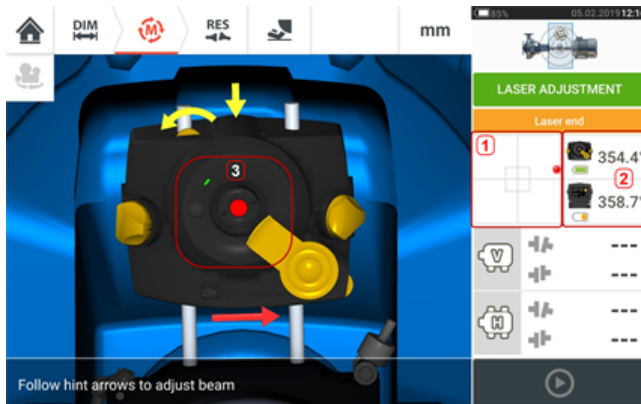
- The wizard arrows decrease in magnitude and occurrence as the laser beam status improves, disappearing completely once the laser beam is centered.
- Measurement may commence once the laser beam is centered.

It may however be necessary to preadjust the laser beam without using the wizard. In that case, proceed as follows:

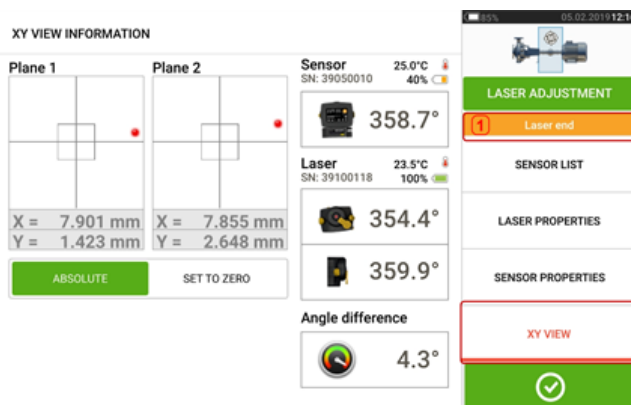
- "Laser beam adjustment (sensALIGN 5 EX)" on page 36

XY View

The XY View function is used to facilitate the centering of the laser beam on the two sensor detector planes before proceeding with measurement.

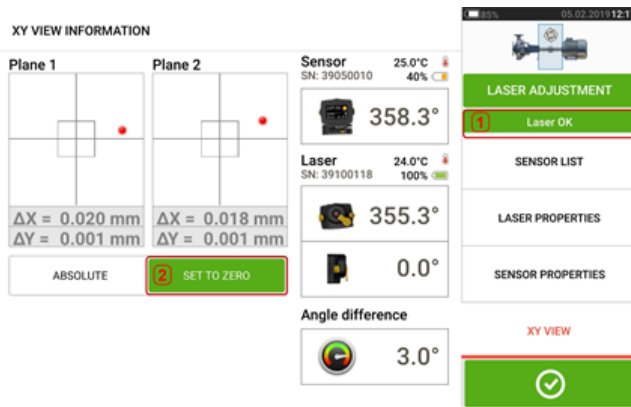


- Tap the shown detector area **(1)** to directly access the XY View screen.
- The XY View screen may be accessed using the menu item "XY View" which appears when the "sensor/laser area" **(2)** is tapped.
- The XY View screen may be accessed using the menu item "XY View" which appears when the laser **(3)** is tapped.



The two sensor detector planes are displayed on the XY View screen. Center the laser beam dots in both planes using both beam position thumbwheels. In some cases it may be necessary to move the sensor along the support posts or sideways by loosening the chain type bracket and slightly rotating it.

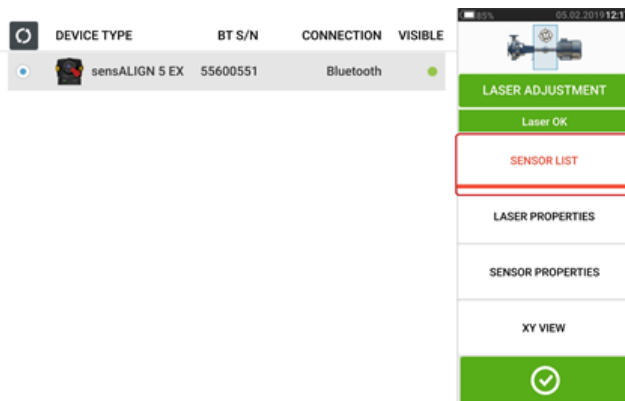
The "Set to zero" function may be used to check the effect of environmental and machinery vibration on the measurement. Note that the "Set to zero" is active only when the laser beam status [1] is "OK" or "Centered".



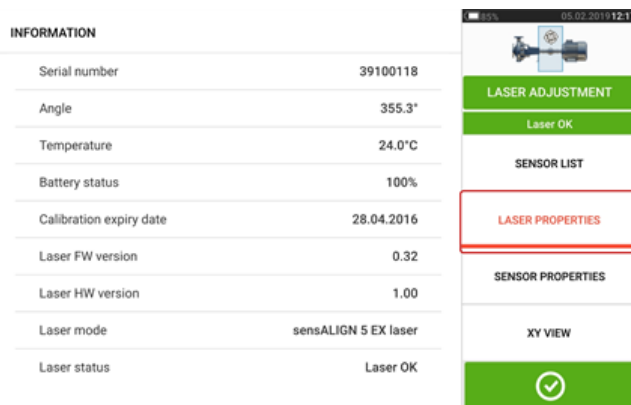
If the laser beam status is "OK" or "Centered" [1] tap "Set to zero" [2] to set the XY values of the two detector planes to 0,0. These values are then monitored to check the stability of the values. Tap "Absolute" to return to the absolute values.

Note that the menu items on the screen may be used to display following items:

Sensor list – displays serial number of sensors detected or previously used, as well as type of connection used for communication.



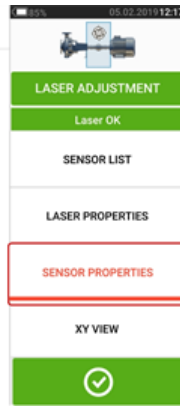
Laser properties – displays detailed information of the laser unit in use



Sensor properties – displays detailed information of the sensor unit in use

INFORMATION

Serial number	39050010
Angle	358.3°
Temperature	25.0°C
Battery status	40%
Calibration expiry date	24.09.2017
Sensor FW version	1.10
Sensor HW version	0.91
Laser status	Laser OK

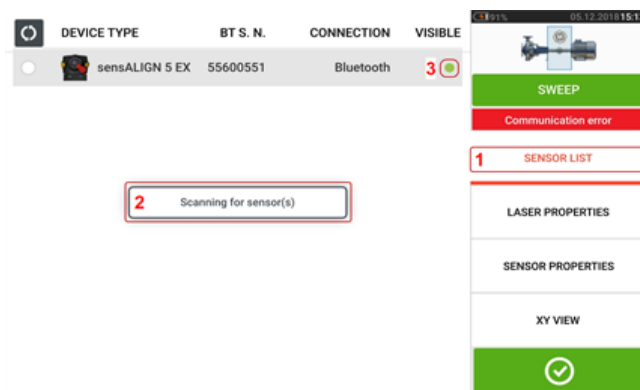


Initializing sensor

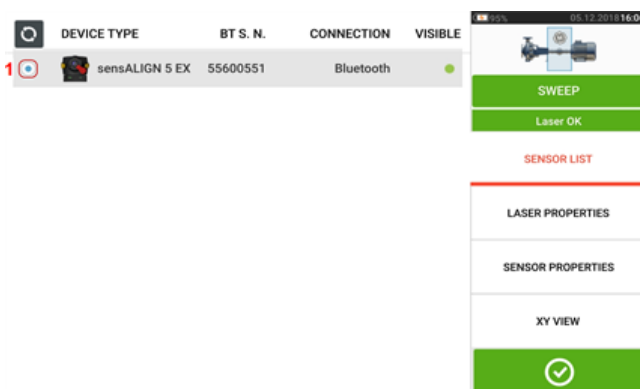
The hint "Communication error" [1] suggests that the sensor has not been initialized although the laser beam may have been correctly adjusted.



Tap the detector and sensor/laser area [2] to access the menu item 'Sensor list'.



Tap menu item 'Sensor list' [1] to view scanned sensors. The hint 'Scanning for sensor(s)' [2] appears during the scanning process. As soon as the sensor is detected, it is listed down and a green bold dot [3] appears next to the detected sensor.



Initialize the sensor by tapping the listed sensor. A bold blue dot [1] signifies that the sensor is initialized.

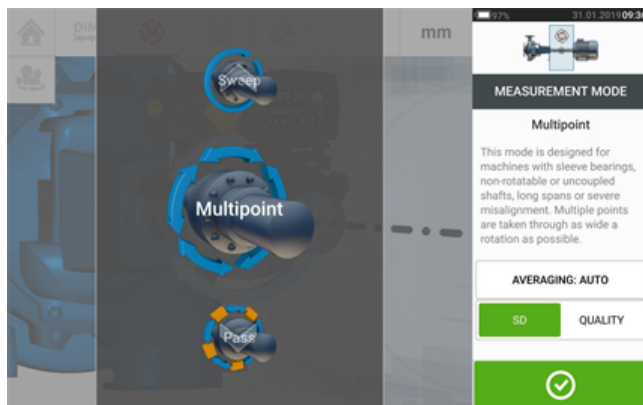
Measurement

The desired measurement mode is selected while in the measurement screen.



Tap the measurement mode header [1] to access the measurement mode carousel.

Swipe the carousel up or down and select desired measurement mode.



In the above example, Multipoint measurement has been selected. The quality of the measurement may be displayed either as a measurement standard deviation (SD) or measurement quality factor.

Standard deviation (SD) is the root mean square deviation (mean of the means) of the measurement points. It describes how closely a group of data points are clustered around the average of those data points. It is a measure of the measurement calibre. The smaller the SD, the better the quality of the data collected.

Measurement quality is a factor defined by the following measurement and environmental criteria: angular rotation, standard deviation of the measurement ellipse, vibration, rotation evenness, angular rotation inertia, direction of rotation, speed and filter output. The higher the factor, the better the quality of measurement.

The desired factor is set by tapping the corresponding item. The averaging is set by tapping the 'Averaging' button.

Averaging

In certain industrial conditions, it may be necessary to increase the number of measurements (recorded laser pulses) to be averaged when taking readings to attain the desired accuracy. Particular cases include environments with increased machinery vibration. An increased averaging also improves the accuracy when measuring sleeve bearings, white metal bearings and journal bearings.

Averaging is possible in 'point' measurements such as 'Multipoint' and 'Static mode'.



Set the averaging by tapping the 'Averaging' button [1]. A scale [2] used to set the averaging value appears on the screen. Tap desired averaging value which then appears in the 'Averaging' button [1].

Measurement modes


The following measurement modes are available for horizontal machine configurations:

- "Continuous Sweep measurement" on page 47 – This mode is used to measure standard coupled machines. The shafts are rotated continuously in machine rotational direction until acceptable measurement quality is attained.
- "Pass mode" on page 55 – Pass measurement mode is used for uncoupled and non-rotatable shafts (one or both). The laser is rotated past the sensor at different rotational positions.
- "Multipoint measurement" on page 51 – This is the mode used to measure uncoupled shafts, non-rotational shafts, sleeve bearings [journal (radial) bearings], white metal bearings, shafts that are hard to turn, shafts with herky-jerky rotation, situations with long spans or severe misalignment that will readily cause the beam to fall out of range.
- "Static measurement" on page 53 – This mode is used to measure [vertical mounted machines](#).

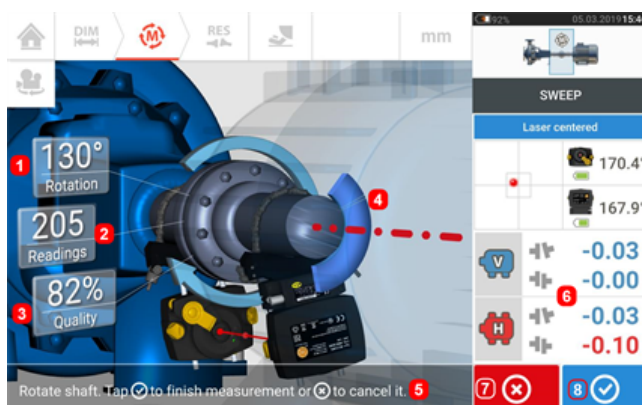
Continuous Sweep measurement

This is the default measurement mode and is used to measure standard horizontal coupled machines.





Once the laser beam has been centered, measurement may be started automatically when the shafts are rotated or by tapping  or 'M' (1). Rotate shafts through as wide an angle as possible.


As shafts are rotated, and depending on the physical condition of the machines, the rotational arc changes color from red (quality < 40%) to amber (quality $\geq 40\% < 60\%$) to green (quality $\geq 60\% < 80\%$) to blue (quality $\geq 80\%$). Coupling results are displayed as soon as the measurement quality attains 40% (rotational arc turns amber).





- (1) Rotational angle covered by the shafts
- (2) Measurement positions taken
- (3) Measurement quality
- (4) Rotational arc
- (5) Hint
- (6) Coupling results displayed as soon as the measurement quality reaches 40% (rotational arc is orange)
- (7) 'Cancel' icon
- (8) 'Proceed' icon

Tapping  the 'Cancel' icon discards current measurement. Tapping  the 'Proceed' icon allows measurement results to be accessed or the measurement repeated.



Note that the color of the 'Proceed' icon  corresponds to the color of the rotational arc which denotes the attained measurement quality.

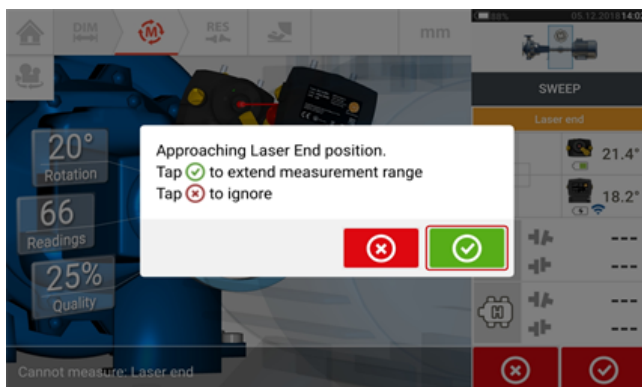



- (1) Tap  to re-measure machines.
- (2) Tap  to view machine foot results.

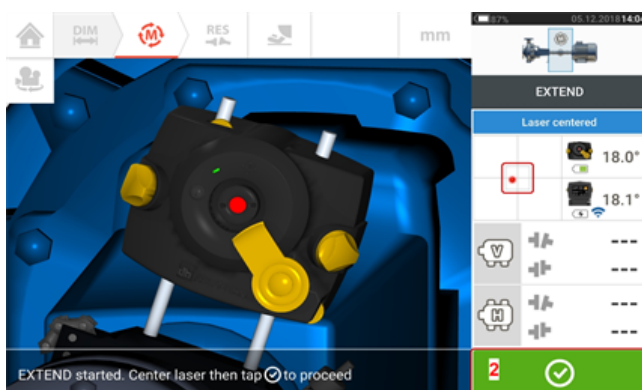
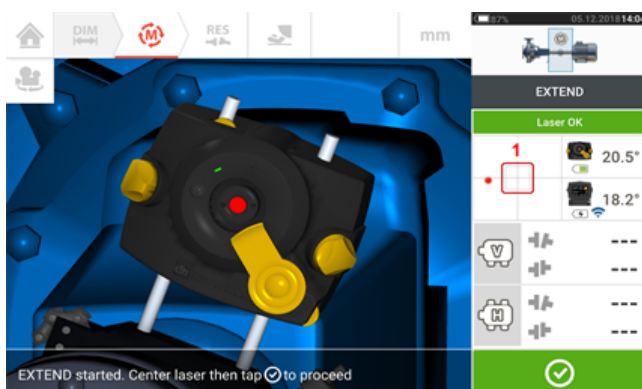
Extending measurement range when using Continuous Sweep

This feature automatically activates the extension of the measurement range while in Continuous Sweep measurement mode. This range extension allows the adjustment of the laser beam such that it does not miss the detector surface when measuring shafts with gross misalignment or angular misalignment over large distances.


- When taking measurement using **Continuous Sweep**, and the laser beam approaches the end of the detector surface, a hint automatically appears on the display.

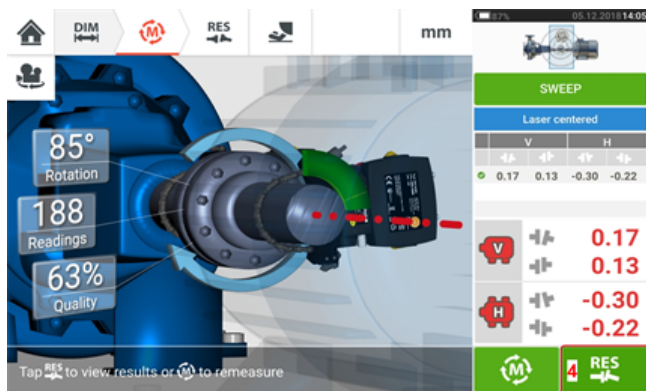




- Tap  to proceed to extend the measurement range. The program interrupts measurement and switches to the laser beam adjustment screen. The current beam position is automatically recorded and taken as the starting point for range extension. Follow the hints on the display and use the two yellow beam position thumbwheels to readjust the laser beam dot into the detector area target square (1).



- With the laser beam centered, tap

 (2) then continue with measurement by rotating the shafts further.



- After rotating the shafts through as wide an angle as possible, tap  (3) to proceed to results, then  (4) to view results.


Multipoint measurement

This mode is used to measure shafts which are either difficult to turn continuously or allow measurement only in certain rotational positions. The method can also be used to measure uncoupled shafts, nonrotatable shafts, sleeve bearings, white metal bearings and journal (radial) bearings, shafts that are difficult to turn, shafts with herky-jerky rotation, situations with long spans or severe misalignment that will readily cause the beam to fall out of range.

If not yet completed, enter machine dimensions, then center laser beam.



- **(1)** 'Next' icon – tap to take initial measurement point
- **(2)** Hint to tap 'Next' icon

Tap  the 'Next' icon to take the initial measurement point then rotate the shafts in their normal direction of operation, to the next measurement position.




- **(1)** Coupling area to be tapped to take next measurement
- **(2)** Number of points already taken
- **(3)** 'Cancel' icon – used to cancel current measurement and start new measurement


Tap the coupling area **[1]** to take the measurement point. Rotate shafts further, taking measurement points by tapping the coupling area **[1]**. Take as many measurement points through as wide a rotational angle as possible.



- **(1)** Rotational arc showing points taken and rotational angle covered by the shafts. The arc changes color from red [$< 60^\circ$] -> amber -> green [$> 70^\circ$]
- **(2)** Rotational angle completed by the shafts for current measurement
- **(3)** Number of measurement points taken for current measurement
- **(4)** Standard deviation attained in current measurement
- **(5)** 'Proceed' icon – tap to continue to view measurement results

The 'Proceed' icon  (whose color changes with the rotational arc) becomes active after three measurement points have been taken.

The horizontal and vertical coupling results are displayed when the shafts are rotated at least over 60° , and a minimum of three measurement positions are recorded. If however, [measurement quality](#) has been selected, the coupling results are displayed when the rotational arc **(1)** turns yellow.

Tap  the 'Proceed' icon to continue to view results or to re-measure.

If required, Live Move may be accessed via the 'Results' screen.

Static measurement


This measurement mode is used for uncoupled shafts, nonrotatable shafts and vertical foot-mounted or flange-mounted machines.

If not yet completed, enter dimensions then centre laser beam.





- **(1)** 'The 'left/right' navigation icons are used to position the displayed laser and sensor at an angular rotation corresponding to the actual position of the components as mounted on the shafts.
- **(2)** On-screen hint to position displayed laser and sensor then take measurement point

Turn the shafts to any of the eight 45° positions (i.e. 12:00, 1:30, 3:00, 4:30, 6:00, 7:30, 9:00 or 10:30 o'clock position viewed from sensor towards laser). Position shaft as accurately as

possible using either an external inclinometer or protractor. Tap the pulsating **M** or  to take the first measurement point.





- **(1)** Number of points already taken (in this example initial point)
- **(2)** Tap pulsating **M** to take next measurement
- **(3)** On-screen hint to position displayed laser and sensor then take measurement point
- **(4)** 'Cancel' icon – used to cancel current measurement and start new measurement

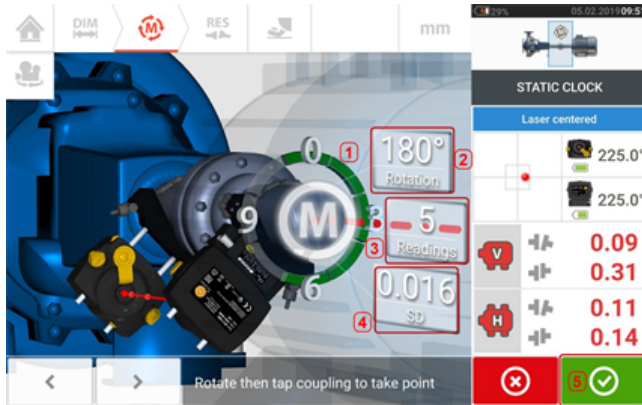
Rotate shaft to the next measurement position. The displayed laser and sensor must be at the same angular position as the mounted components. Use  or  to position the displayed sensor and laser then take next measurement point by tapping the pulsating **M** **[2]**.



Note

After taking a measurement point, the displayed laser and sensor move to the next clock position on the display.
 If shaft rotation restrictions hinder the taking of measurements at particular shaft positions, bypass these using  or .

Measurements must be taken in at least three positions over 90°, but more measurements over a wider angle is recommended.




- **(1)** Rotational arc showing rotational angle covered by the shafts during measurement. The arc changes colour from red [$< 60^\circ$] -> amber -> green [$> 70^\circ$]
- **(2)** Rotational angle completed by the shafts for current measurement
- **(3)** Number of measurement points taken for current measurement
- **(4)** Measurement quality for current measurement
- **(5)** 'Proceed' icon – tap to continue to view measurement results

Pass mode

In this mode, the shaft supporting the laser is rotated so that the laser beam strikes the sensor lens as it passes it. Measurements are taken when the laser beam passes through the middle sector of the detector.

- Center the laser beam. A pulsating **M** (1) indicates that measurement may be taken.



- Tap **M** or  to take initial measurement point.



- Rotate the shaft supporting one of the measurement heads (say laser) to the next position, then rotate the shaft supporting the other head (say sensor) slowly past the opposite head. Measurement is automatically taken as the laser beam strikes and passes the sensor detector.



Note

The sensALIGN 5 sensor laser beam adjustment LED on the front of its housing blinks green.

- Repeat step 3 taking measurements in as many positions and over as wide an angle as possible. Coupling results (1) will be displayed if measurements have been taken in at least three positions over at least 60° rotation.



- After taking sufficient measurement positions, tap  to proceed to results.



- Tap  to view results.



Note

If only one shaft is not easily rotatable while the other can be freely rotated, always mount the sensor on the nonrotatable shaft (use the magnetic sliding bracket ALI 2.230). Do NOT mount the laser on the not-easily-rotatable shaft, even if this means setting up your laser and sensor opposite to the way you normally would for alignment purposes. You can always invert the movable and stationary machines by using the 'rotate machine view' functionality. Enter all dimensions in accordance with your actual set-up, following the normal orientation of the laser and sensor in the dimensions screen.


Manual and dial gauge entries

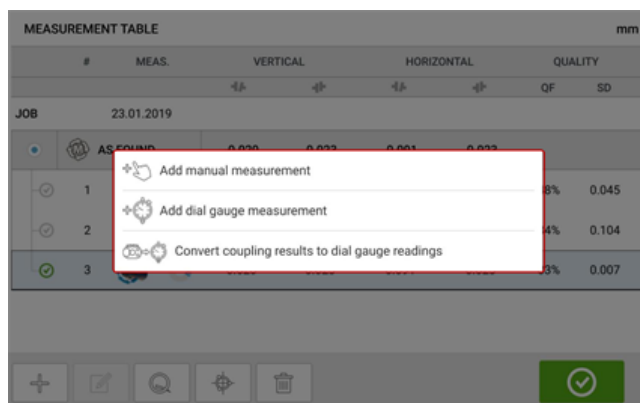
The [measurement table](#) may also be used for the following functionalities:

- Entering manual readings
- Addition of a dial gauge measurement and displaying coupling results
- Converting alignment results obtained using sensor-laser measurement into the comparable dial gauge readings

MEASUREMENT TABLE								mm
#	MEAS.	VERTICAL		HORIZONTAL		QUALITY		
		↕	↕	↔	↔	QF	SD	
JOB								23.01.2019
•	AS FOUND	-0.020	0.023	0.091	0.023			
1		0.016	-0.012	-0.032	0.012	48%	0.045	
2		0.013	0.012	0.054	-0.024	34%	0.104	
3		-0.020	0.023	0.091	0.023	83%	0.007	



When in the measurement table screen, tap . The manual entry and dial gauge functionalities are displayed.

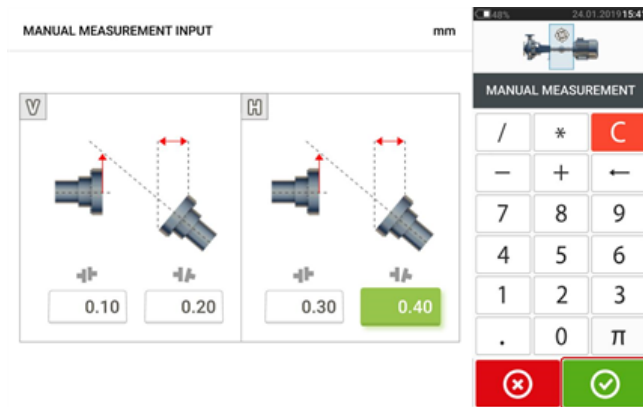



Note

1. If the measurement table is accessed for a new asset without any measurements, the two options available are "Add manual measurement" and "Add dial gauge measurement".
2. For a new asset, the measurement table may be accessed via the measurement screen [coupling results area](#) by entering the sensor-to-coupling center dimension.
3. For a new asset without sensor-to-coupling center dimension, the measurement table is accessed by tapping the [coupling results area](#) in the results screen.

Entering manual measurement values


With the three items displayed, tap the option "Add manual measurement", then proceed to enter the coupling values manually.



After entering all values, tap  to return to the measurement table. The added manual value appears in the measurement table. The hand symbol next to the entry signifies that it is a manual entry.

MEASUREMENT TABLE mm

#	MEAS.	VERTICAL		HORIZONTAL		QUALITY	
		\pm	\pm	\pm	\pm	QF	SD
JOB 23.01.2019							
AS FOUND		0.200	0.100	0.400	0.300		
1		0.016	-0.012	-0.032	0.012	48%	0.045
2		0.013	0.012	0.054	-0.024	34%	0.104
3		-0.020	0.023	0.091	0.023	83%	0.007
4		0.200	0.100	0.400	0.300	--	--

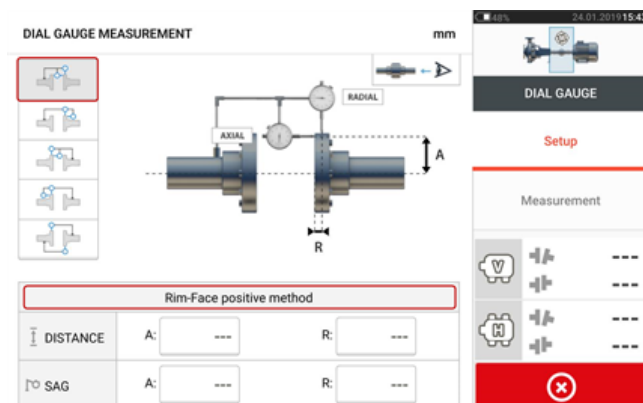


Addition of a dial gauge measurement

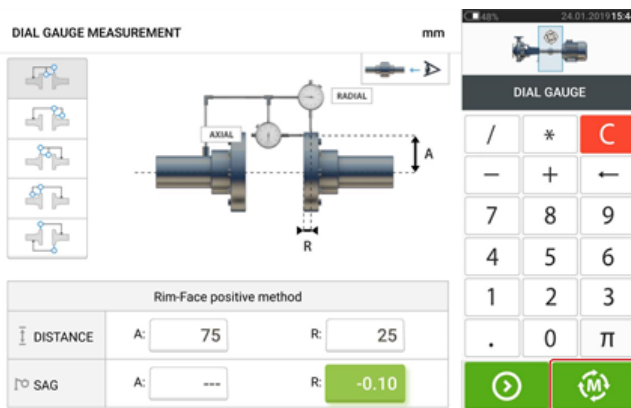
With the three items displayed, tap the option "Add dial gauge measurement", then select desired dial gauge set-up. Five set-up methods are available:


- Rim and face (positive)
- Rim and face (negative)
- Rim and face (reversed)
- Rim and face (negative reversed)
- Reverse indicator


In the following example the rim and face (positive) method has been selected.




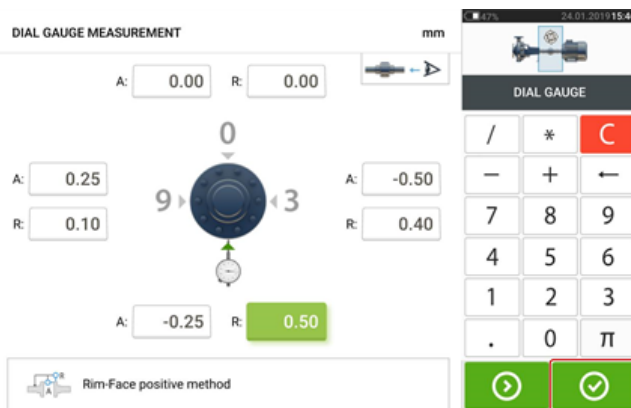
Enter the required dimensions and the amount of bracket sag. In this example, the axial distance A is 75 mm, the radial distance R is 25 mm and the indicator bracket sag R is -0.10 mm.



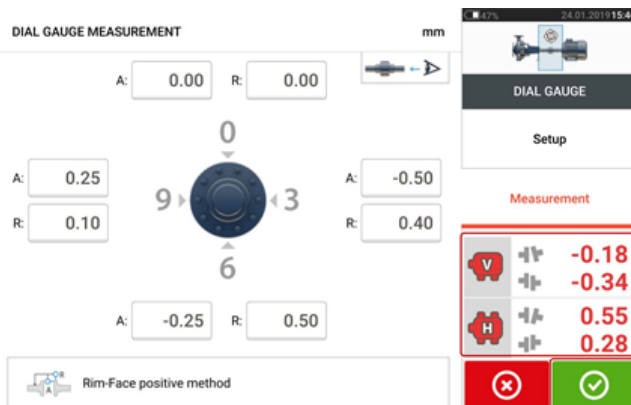
 **Note**


The "Measure" icon  appears as soon as both axial and radial distances have been entered. It is therefore possible to proceed to measurement without entering the sag value.

Enter the measured dial gauge readings then tap  to display coupling results.



Dial gauge readings are now displayed as coupling results in terms of gap and offset.



The dial gauge measurement is now listed on the measurement table which is accessed by tapping . The dial gauge measurement is identifiable by dial indicator symbol next to the entry.

MEASUREMENT TABLE		mm					
#	MEAS.	VERTICAL		HORIZONTAL		QUALITY	
		↕	↕	↔	↔	QF	SD
	AS FOUND	-0.183	-0.342	0.550	0.275		
1		0.016	-0.012	-0.032	0.012	48%	0.045
2		0.013	0.012	0.054	-0.024	34%	0.104
3		-0.020	0.023	0.091	0.023	83%	0.007
4		0.200	0.100	0.400	0.300	--	--
5		-0.183	-0.342	0.550	0.275	--	--

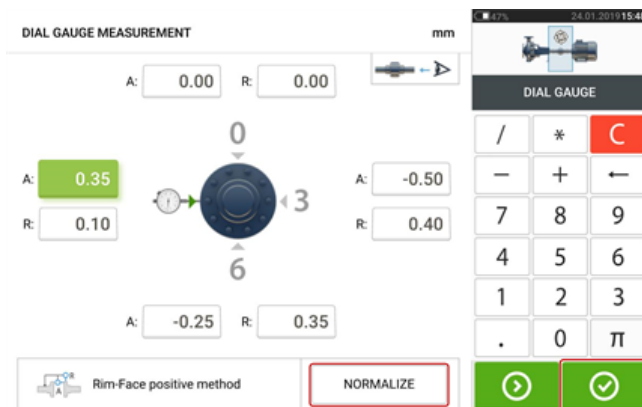
Validity rule

Dial indicator readings are taken at the 12, 3, 6 and 9 o'clock positions. The validity rule states that when shafts are rotated, the sum of the dial indicator readings at the 12 and 6 o'clock positions must equal that of the 3 and 9 o'clock positions.

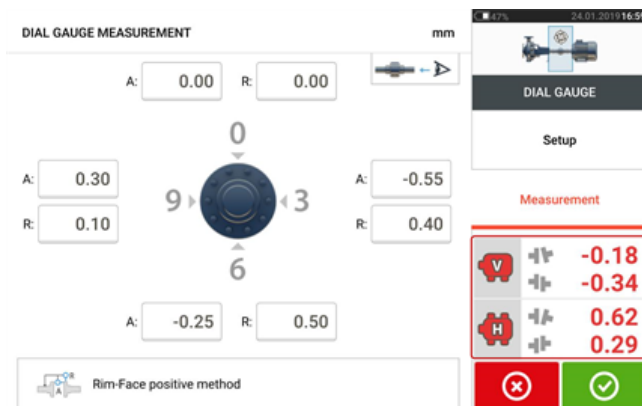
$$TOP + BOTTOM = SIDE + SIDE$$

The validity rule works because readings are taken around the circumference of a circular object.

If the above is not true, then the measurement should be repeated. The touch device incorporates a functionality used to check the validity rule. If the entered dial gauge measurement values do not conform to the validity rule, the hint "Normalize" appears on the screen.



Tap "Normalize" to view the adjusted dial gauge values. The coupling results may also be viewed directly by tapping





Note

The adjusted dial gauge values conform to the validity rule. The displayed coupling results are not affected by the validation process.

Convert coupling results to dial gauge readings

From the measurement table, select measurement whose coupling results are to be converted to dial gauge values.

MEASUREMENT TABLE		mm					
#	MEAS.	VERTICAL		HORIZONTAL		QUALITY	
		↕	↕	↔	↔	QF	SD
JOB 23.01.2019							
AS FOUND		-0.020	0.023	0.091	0.023		
1		0.016	-0.012	-0.032	0.012	48%	0.045
2		0.013	0.012	0.054	-0.024	34%	0.104
3		-0.020	0.023	0.091	0.023	83%	0.007



Tap then tap the option "Convert measurement to dial gauge". Select the desired dial gauge set-up, then enter the axial (A) and radial (R) dimensions, and the amount of bracket sag.

DIAL GAUGE MEASUREMENT

Rim-Face positive method

DISTANCE	A: 75	R: 25
SAG	A: ---	R: -0.10

DIAL GAUGE

Calculator interface with buttons for /, *, C, -, +, ←, 7, 8, 9, 4, 5, 6, 1, 2, 3, ., 0, π, and a green arrow button.

Tap to view the fitting dial gauge values and the corresponding coupling results.

DIAL GAUGE MEASUREMENT

A: 0.00 R: 0.00

A: 0.05 R: -0.08

A: -0.03 R: -0.15

Rim-Face positive method

DIAL GAUGE

Setup

Measurement


V	↕	-0.02
	↕	0.02
H	↔	0.09
	↔	0.02

Buttons for cancel (X) and confirm (checkmark).




Note

The calculated dial gauge values conform to the validity rule.

This conversion is now listed on the measurement table which is accessed by tapping .

MEASUREMENT TABLE mm

#	MEAS.	VERTICAL		HORIZONTAL		QUALITY	
		↕	↕	↔	↔	QF	SD
JOB 23.01.2019							
	AS FOUND	-0.020	0.023	0.091	0.023		
1		0.016	-0.012	-0.032	0.012	48%	0.045
2		0.013	0.012	0.054	-0.024	34%	0.104
3		-0.020	0.023	0.091	0.023	83%	0.007
4		-0.020	0.023	0.091	0.023	--	--



The converted coupling results correspond to those obtained directly using the touch device. The dial gauge measurement entry is identified by the dial indicator symbol next to the entry.

Extend measurement range manually

Measurement range may be extended manually in Multipoint and Static measurement modes. This range extension allows the adjustment of the laser beam such that it does not miss the detector surface when measuring shafts with gross misalignment or angular misalignment over large distances. During measurement, manual extension is prompted by accessing the XY view before 'Laser End' is displayed.

- If the laser dot (1) on the display continues to move further away from the center of the detector screen while rotating shafts to take measurements using Multipoint measurement mode, tap the detector area (2) to access the "XY view" screen.

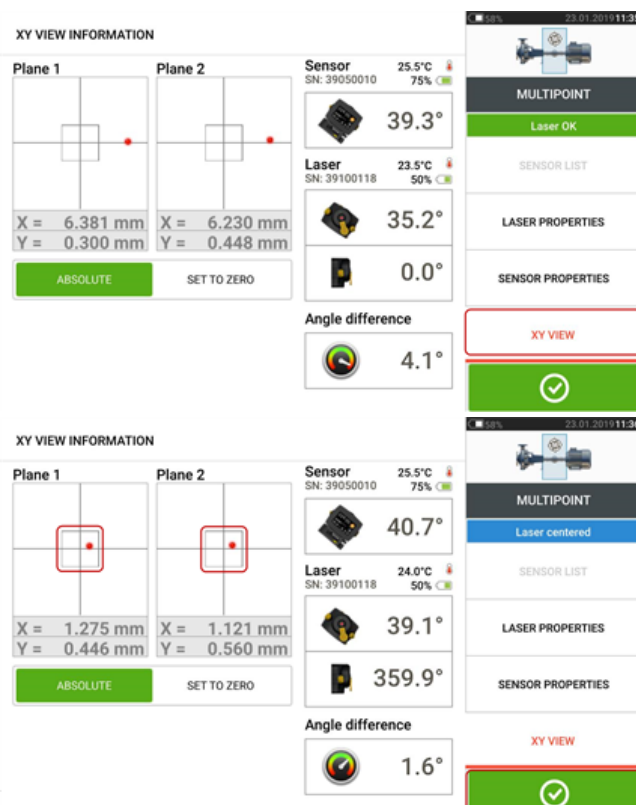


- After accessing the "XY view", use the two yellow laser horizontal and vertical position thumbwheels and adjust the laser dots such that they are positioned inside or very close to the square targets.





Note

During the laser adjustment procedure, avoid readjusting the sensor.



- With the laser beam centered, tap  then continue with measurement by rotating the shafts further.



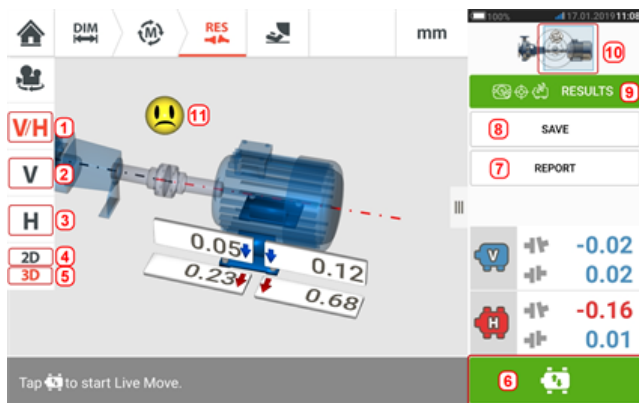
- After rotating the shafts through as wide an angle as possible, tap  (1) to proceed to results, then  (2) to view results.



Note

The colour of the proceed icon [] depends on the attained measurement quality.

Results



- **(1)** Displays both horizontal and vertical foot results in 2-D simultaneously
- **(2)** Used to display vertical foot results only
- **(3)** Used to display horizontal foot results only
- **(4)** Used to display foot results in 2-D
- **(5)** Used to display foot results in 3-D
- **(6)** Starts Live Move
- **(7)** Used to generate asset measurement report
- **(8)** Used to save asset measurements in asset park
- **(9)** Used to select results mode
- **(10)** Tapping the slider on the machines icon opens the triple "Train Manager" / "Train Setup" / "Train Fixation" screen
- **(11)** Alignment condition tolerance symbol

In the results screen, the three icons    – dimensions, measurement and results – are active and may be used anytime.

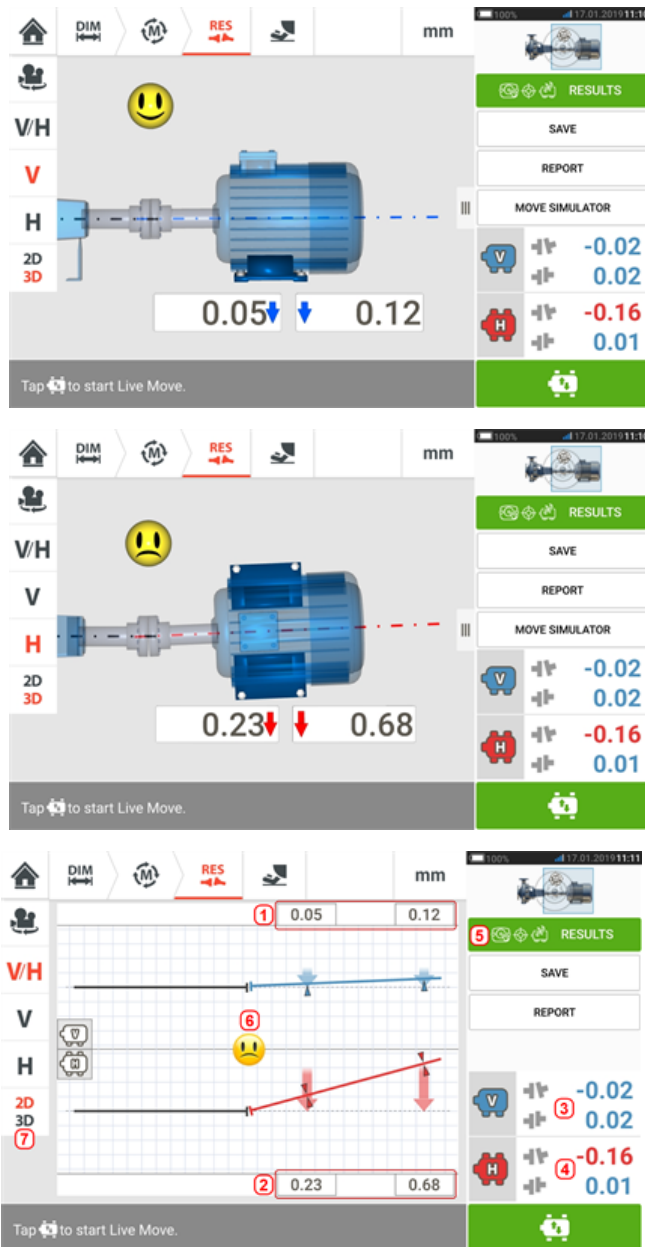
The 2D V and H foot results screens show the vertical (V) and horizontal (H) foot positions respectively.

The colors of the bold arrows next to the feet correction values are directly related to the coupling alignment condition as follows:

Blue – excellent [foot should not be moved]

Green – good [if possible foot should remain unaltered]

Red – poor [foot requires moving to attain a better alignment condition]



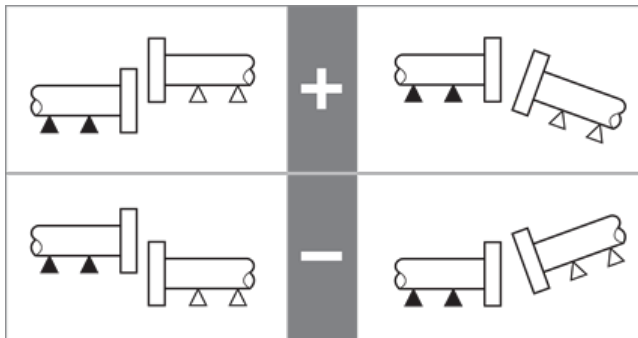
- **(1)** Vertical foot position results
- **(2)** Horizontal foot position results
- **(3)** Vertical coupling results
- **(4)** Horizontal coupling results
- **(5)** Selected results mode
- **(6)** Alignment condition tolerance symbol
- **(7)** Horizontal and Vertical foot results in 2D

Sign convention

Coupling gap is positive when open at top or side away from viewer. The viewer is considered to be standing in front of the machines as they appear on the display.

Offset is positive when the right shaft axis is higher than the left shaft axis or further away from the viewer than the left axis.

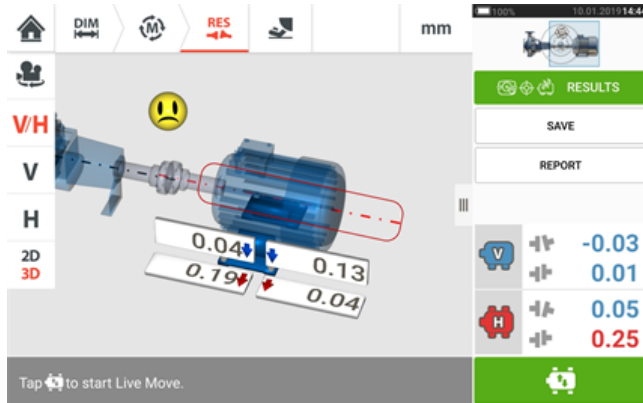
Both vertical and horizontal results show the foot position relative to the centerline of machine designated stationary. Positive values indicate that machine is upwards or away from viewer. Negative values indicate that machine is downwards or towards the viewer.




Multiple feet results

Foot corrections

Foot corrections in a multiple feet machine are viewed from the result screen.




Tap the machine centerline to access the results multiple feet screen.




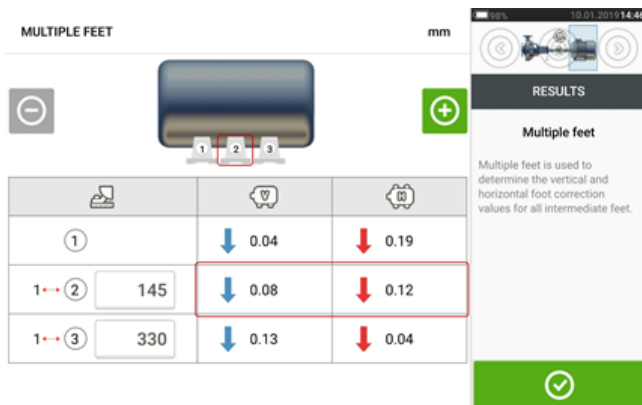
Note
 If the machine intermediate feet were already defined within machine properties, then the foot corrections for the intermediate feet will be displayed. In the following example, the intermediate feet has not been defined.



Tap  to add any intermediate feet.



Enter the dimension between the front feet and the intermediate feet in the row that appears then tap .



The screenshot shows the 'MULTIPLE FEET' interface. At the top, there is a diagram of a machine with three feet labeled 1, 2, and 3. Below the diagram is a table with three rows and three columns. The first row has a header with icons for a document, a vertical arrow, and a horizontal arrow. The second row has a circled '1' in the first column, a blue downward arrow with '0.04' in the second column, and a red downward arrow with '0.19' in the third column. The third row has '1 → 2' and '145' in the first column, a blue downward arrow with '0.08' in the second column, and a red downward arrow with '0.12' in the third column. The fourth row has '1 → 3' and '330' in the first column, a blue downward arrow with '0.13' in the second column, and a red downward arrow with '0.04' in the third column. To the right of the table is a 'RESULTS' panel with the title 'Multiple feet' and a description: 'Multiple feet is used to determine the vertical and horizontal foot correction values for all intermediate feet.' At the bottom of the panel is a green checkmark icon.

	Vertical	Horizontal
①	↓ 0.04	↓ 0.19
1 → ② 145	↓ 0.08	↓ 0.12
1 → ③ 330	↓ 0.13	↓ 0.04

The foot correction values for the intermediate feet appear in the corresponding row.

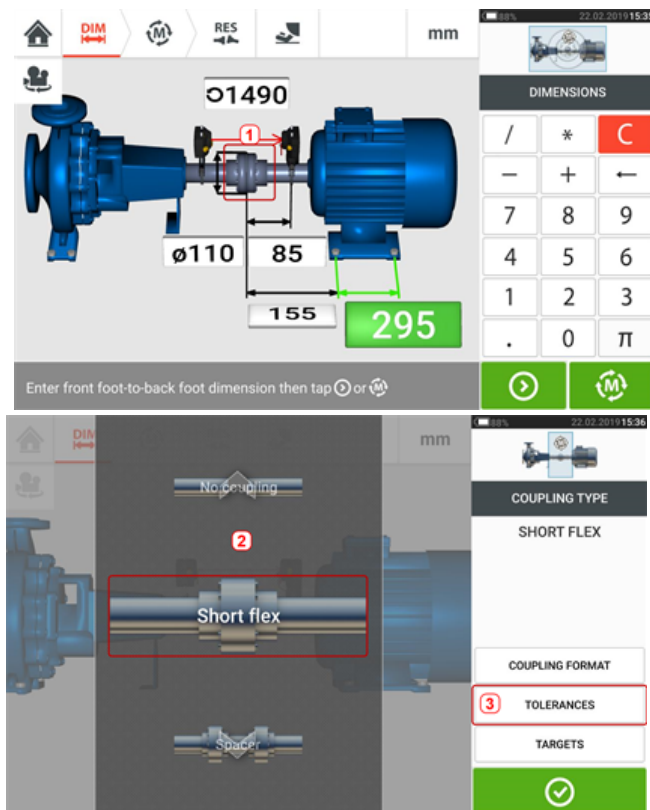
Tolerances

Alignment quality is evaluated through comparison with tolerances based upon entered machine dimensions and RPM.

The tolerance ranges are compiled as tables according to type of coupling, coupling format, and diameter (for the gap value) as well as RPM. When the coupling type is spacer, the tolerance table values are determined by the length of the spacer shaft and the RPM.

For cardan, tolerances are available for $1/2^\circ$ and $1/4^\circ$ limits.

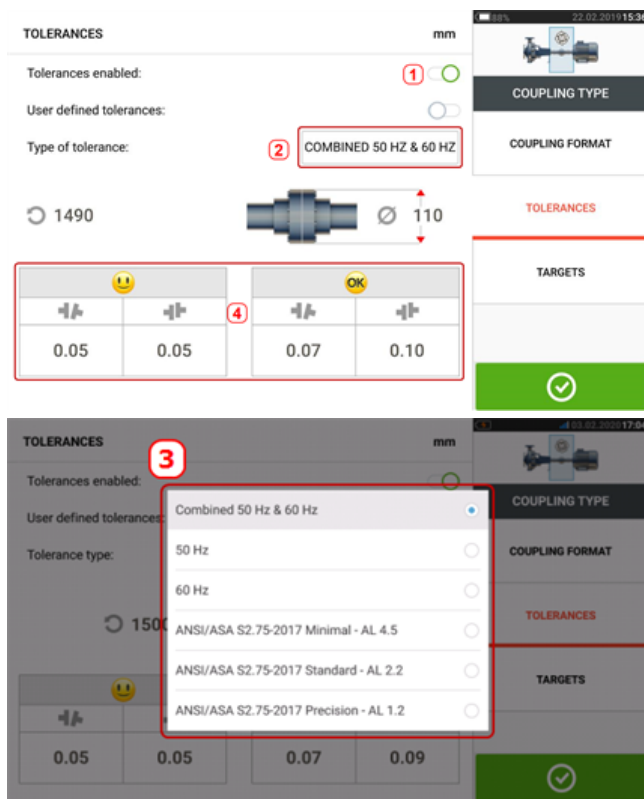
Tolerances are accessed via the dimensions screen.



Tap the coupling (1), then use the carousel that appears to select the desired coupling type (2). Tap 'Tolerances' (3) to access the coupling tolerance table.

Available tolerance tables

The available tolerance tables are based on machine operating frequency.

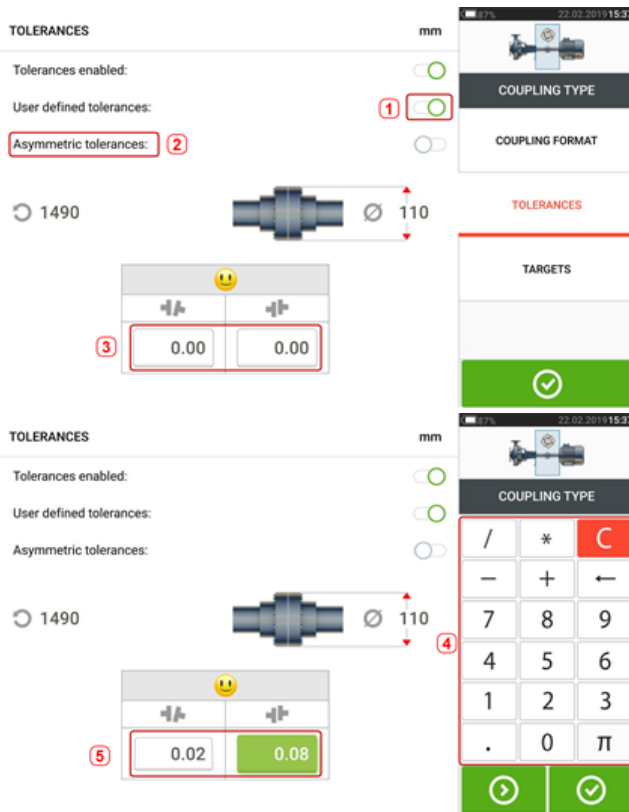


Swipe the icon (1) to the right to enable tolerances. Tap (2) to select desired type of tolerance. A pop-up menu (3) appears showing available tolerances. Tap desired type to display the corresponding tolerance table (4).

ANSI standard specification tolerances

The Acoustical Society of America (ASA) developed shaft alignment tolerances for both short flex and spacer couplings on standard rotating machinery. These tolerances are an approved American National Standards Institute (ANSI) specification, and are grouped into three tiers (minimal, standard and precision).

User defined tolerances



Swipe the icon (1) to the right to enable user defined tolerances. Asymmetric tolerances (2) can be activated only when user defined tolerances are enabled. In asymmetric tolerances, the tolerance values for the two coupling planes are not the same. Tap (3) to edit user defined tolerances using the onscreen keyboard (4). The edited values are then displayed (5).

Asymmetric and symmetric tolerances

The image displays two screenshots of a software interface for setting tolerances on a part with a diameter of 110 mm. The part is labeled '1490'.

Top Screenshot (Asymmetric tolerances disabled):

- TOLERANCES:** Tolerances enabled: ; User defined tolerances: ; Asymmetric tolerances: (marked with a red 1).
- COUPLING TYPE:** COUPLING TYPE; COUPLING FORMAT.
- TOLERANCES:** TOLERANCES.
- TARGETS:** TARGETS.
- Values:** The tolerance table shows symmetric values: 0.02 and 0.08 (marked with a red 2).

Bottom Screenshot (Asymmetric tolerances enabled):

- TOLERANCES:** Tolerances enabled: ; User defined tolerances: ; Asymmetric tolerances: (marked with a red 3).
- COUPLING TYPE:** COUPLING TYPE; COUPLING FORMAT.
- TOLERANCES:** TOLERANCES.
- TARGETS:** TARGETS.
- Values:** The tolerance table shows asymmetric values: 0.00, 0.08, 0.02, and 0.00 (marked with a red 4).

When asymmetric tolerances have not been enabled (1), the displayed specified tolerances (2) are symmetric. The gap and offset tolerances for both horizontal and vertical planes are identical.

If asymmetric tolerances are enabled (3) all four specified values are displayed (4).

Tolerance table based on coupling format

TOLERANCES mm

Tolerances enabled:

User defined tolerances:

Type of tolerance: COMBINED 50 HZ & 60 HZ

1490

☹️		OK	
⊖	⊕	⊖	⊕
0.05	0.05	0.07	0.10

TOLERANCES mm | *

Tolerances enabled:

User defined tolerances:

Type of tolerance: COMBINED 50 HZ & 60 HZ

1490

☹️		OK	
∠	⊕	∠	⊕
0.03	0.05	0.04	0.10

For the same type of tolerance, RPM, and coupling diameter, the tolerances value differ according to the coupling format selected. Coupling format (1) is gap/offset for short flex coupling, and (2) is angle/offset for short flex coupling. Change coupling format by tapping 3.




Note

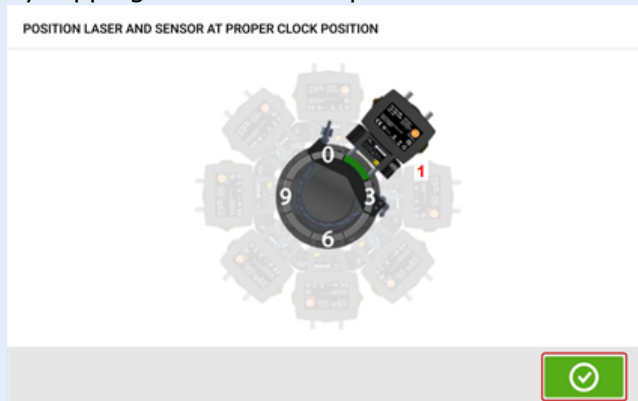
There are no tolerance tables for consolidated spacer shaft coupling formats. Consolidated formats consider the spoolpiece or jackshaft as an extension of either the right or left shaft.

Live Move screen

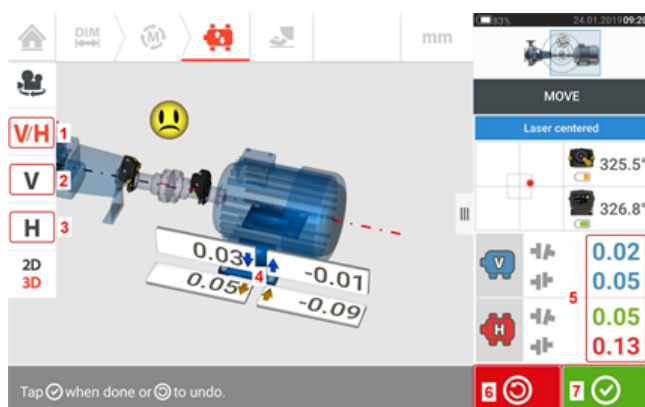


Note


If Static measurement mode is selected, the Live Move screen is accessed only after the desired 45° clock position **(1)** of the sensor and laser has been selected and confirmed by tapping  in the position selection screen that appears.

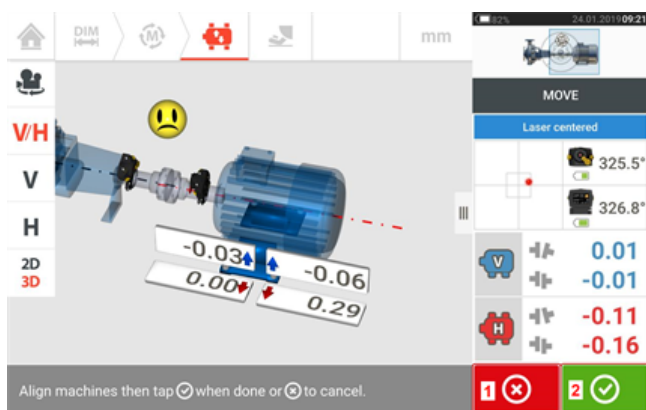




Live Move is monitored in both horizontal (H) and vertical (V) planes simultaneously.



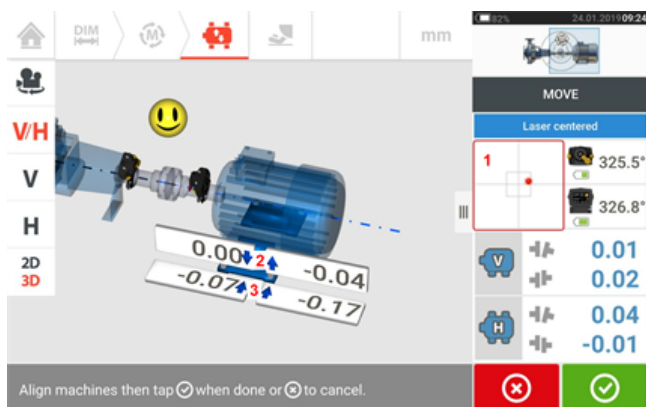
- **(1)** Tap the 'V/H' icon to follow both vertical and horizontal foot corrections simultaneously
- **(2)** Tap the 'V' icon to follow the vertical foot corrections
- **(3)** Tap the 'H' icon to follow the horizontal foot corrections
- **(4)** Arrows indicate direction and magnitude to move machine feet
- **(5)** Tolerance coded gap and offset coupling values
- **(6)** Tapping the 'Undo' icon allows user to re-measure or start Live Move afresh
- **(7)** Tapping the 'Proceed' icon allows user to re-measure or start Live Move afresh

Once Live Move has been detected, the 'Cancel' icon  replaces the 'Undo' icon .



- (1) Tapping  the 'Cancel' icon prompts the 'Cancel Move' hint.
- (2) Tapping  the 'Proceed' icon allows Live Move to be started afresh or the machines be remeasured.

If the laser beam is centered, tapping  starts Live Move automatically.



If the laser beam is not centered, tap the detector area on the screen [1] to access the [XY View](#).



CAUTION

Do NOT attempt to move the machine using heavy sledgehammer blows. This can cause bearing damage, and also produce inaccurate Live Move results. Jack bolts on the feet or other mechanical or hydraulic devices are recommended for moving machines.


Correct the alignment condition by shimming and moving the machines laterally following the bold vertical [2] and horizontal [3] arrows. The color coded bold arrows signify the attained coupling tolerance as follows: Blue (excellent condition); Green (good condition) and Red (poor condition). Machines should be moved to within acceptable tolerances indicated by a happy smiley [😊] (excellent tolerance) or an OK icon [OK] (acceptable tolerance) while observing shaft alignment best practices.

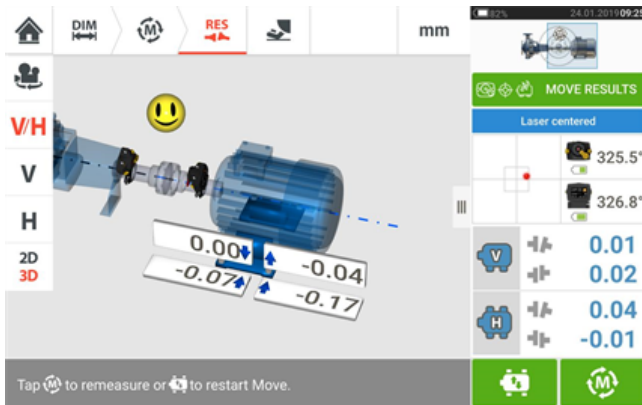



Note

The system monitors both horizontal and vertical Live Move concurrently. If the vertical

view (V) is selected when the function Live Move function is started, only the vertical condition will be displayed (although both planes are being monitored simultaneously). Likewise, if the horizontal view (H) is selected, then only the horizontal condition will be displayed (but both planes monitored simultaneously).


After moving machines to within tolerance, tighten the foot bolts then tap .



Tap  to remeasure and verify the Live Move results, and confirm new alignment condition.

Move simulator

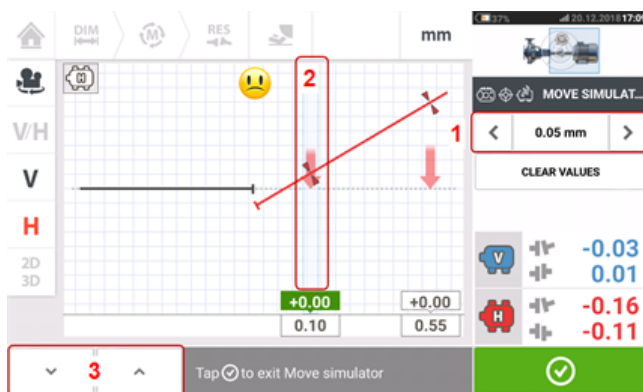
As the name suggests, the Move simulator is used to simulate shim values and horizontal movement corrections that are required to correct the alignment condition. The simulator takes into account the shim thickness available and the amount by which the machines can be physically moved.



 **Note**
 Move simulator can be used on a single plane only (either **V**ertical or **H**orizontal). Simulation is possible for the current (or "as left") measurement only. And the simulation may be carried out in 2D or 3D view.

The Move simulator is initiated from the results screen. After taking a measurement, display the results in either 2D or 3D and on a single plane only.





Tap 'Move simulator' (1).



Tap  to increase movement step value or  to decrease step value (1). The step value ranges from 0.025 mm – 1.0 mm for metric units and 1.0 thou – 40.0 thou for imperial units.

Tap machine feet pair to be simulated. A light blue cursor appears on the selected feet pair (2).


With the cursor on the selected feet pair, tap  to move the machine downwards (in **V**ertical view) or towards viewer (in **H**orizontal view) by the movement step value factor. Tapping  moves the machine upwards (in **V**ertical view) or away from viewer (in **H**orizontal view) [3] by the movement step value factor. Carry out the simulation while observing the

displayed color-coded shaft and coupling, the bold tolerance arrows and the smiley. Aim for a happy smiley (indicated by blue shaft and tolerance arrows) or an 'OK' smiley (indicated by green shaft and tolerance arrows).



The amount and direction in which the machine should be moved are displayed on the value boxes (1) above the measured feet values.

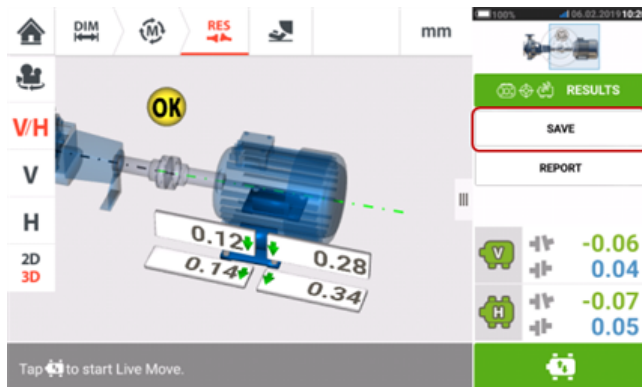
To remove the simulation values, tap 'Clear values' (2).

Tap  (3) to exit the Move simulator.

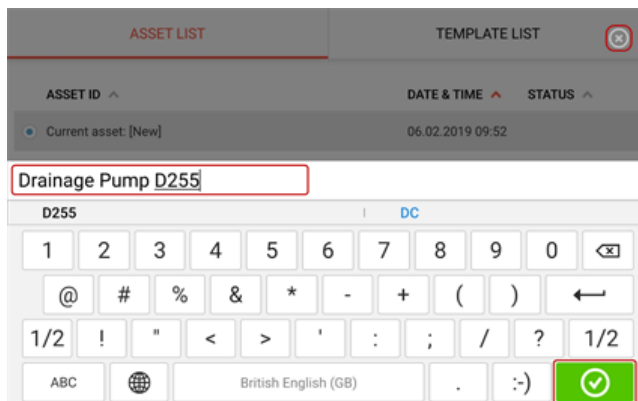
Saving asset measurements


Saving an asset

Before switching off the instrument, dimensions, measurements, results and all settings can be saved for analysis, future use or record purposes in the instrument's memory or transferred via Cloud or USB to ARC 4.0 the PC software. Asset measurements are saved from the results screen.




To save an asset measurement, tap the menu item "Save" then use the onscreen keyboard to enter the measurement file name.



Once asset name has been entered, tap  to save the asset under "Asset park". This is the location where asset measurements are saved.



Note

If for any given reason, the asset is not to be saved, tap the cancel icon [

Asset refers to machinery and equipment within a plant. The asset is listed as an Asset ID. Access "Asset park" via the home screen.

ASSET LIST		TEMPLATE LIST
ASSET ID ^	DATE & TIME ^	STATUS ^
<input checked="" type="radio"/> Drainage Pump D255	06.02.2019 10:23	
<input type="radio"/> Drainage Pump 223D	05.02.2019 14:00	
<input type="radio"/> Drainage Pump 223D	05.02.2019 12:33	
<input type="radio"/> Motor-Pump 3345D	05.02.2019 10:26	
<input type="radio"/> ACME_007A	04.02.2019 16:46	

The status envelopes indicate whether an asset has been measured or not.

- This icon shows that the asset has been imported from ARC 4.0 but is yet to be opened.
- This icon shows that the asset has been opened but the alignment measurement has not been completed.
- This icon shows that the alignment measurement has been completed.

Asset list options

ASSET LIST		TEMPLATE LIST
ASSET ID ^	DATE & TIME ^	STATUS ^
<input checked="" type="radio"/> ACME_1490	06.02.2019 10:09	
<input type="radio"/> Motor-Pump 3345D	06.02.2019 10:05	
<input type="radio"/> ACME_007A	06.02.2019 10:04	
<input type="radio"/> Drainage Pump D255	06.02.2019 09:53	



By tapping the respective icon, the following actions may be taken on any selected asset.

- (1)** Uploads the selected asset to the cloud. Note: The action is completed only if wireless connection is enabled.

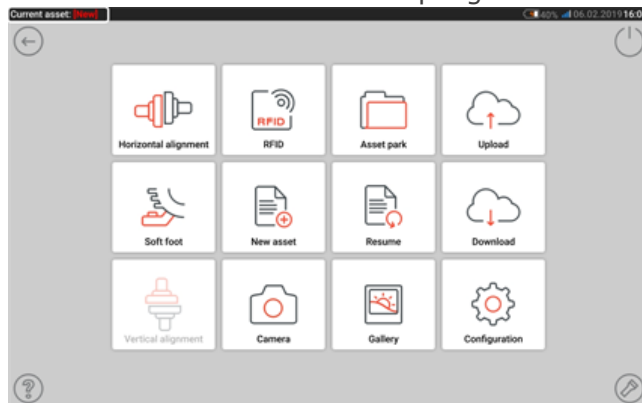
ASSET LIST		TEMPLATE LIST
ASSET ID ^	DATE & TIME ^	STATUS ^
<input checked="" type="radio"/> Drainage Pump D255	06.02.2019 10:23	
<input type="radio"/> Drainage Pump 223D	05.02.2019 14:00	
<input type="radio"/> Drainage Pump 223D		
<input type="radio"/> Motor-Pump 3345D	05.02.2019 10:26	
<input type="radio"/> ACME_007A	04.02.2019 16:46	

Finished - Drainage Pump D255 uploaded to cloud.

- **(2)** Assigns selected asset to an RFID tag.

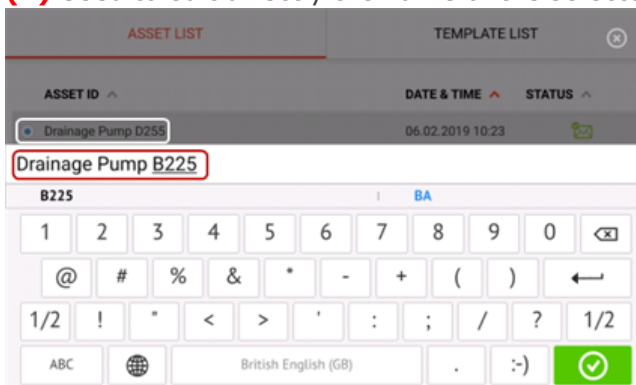



- **(3)** Opens the selected asset a new asset. The new asset will be a copy of the selected asset without the sensor-to-coupling center dimension and any asset measurements.



Start desired application by tapping the appropriate icon on the home screen. The new asset opens and may be edited as required. Assets opened in this manner are used as templates. This asset is then saved with a new asset name.

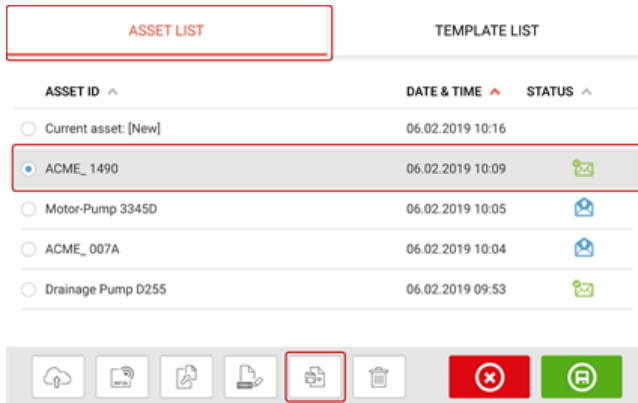
- **(4)** Used to edit directly the name of the selected asset.




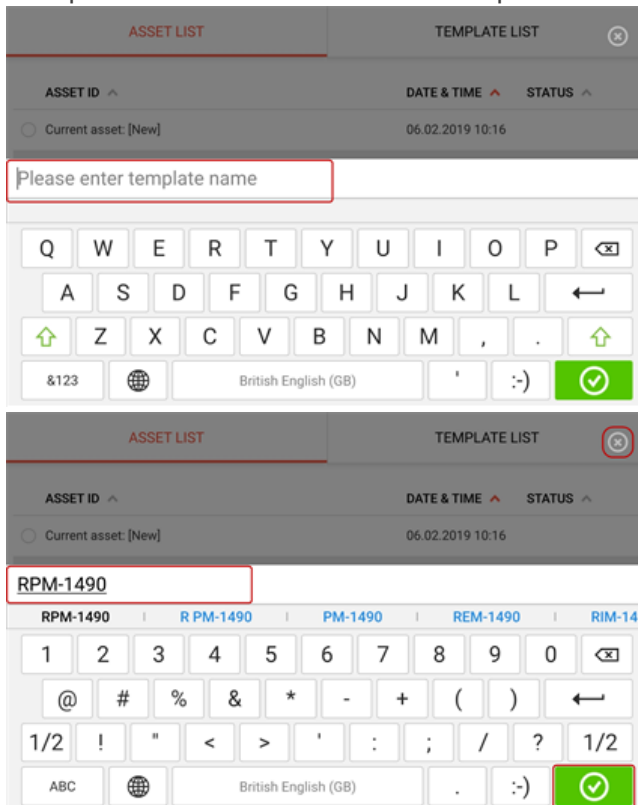
Once completed, tap . The asset will now appear in the asset list with the new name.


- **(5)** Used to create a template. A template is a file that serves as a pattern for alignment set-ups that are repeated frequently. Their main purpose is to save time by not having to reconfigure the same set-up many times. It can contain all known dimensions (except sensor-to-coupling center), target specifications, thermal growth values, tolerances, preferred measure mode, preferred machine icons and coupling types.

> After an asset has been created and saved, it appears on the asset list.




> Tap  to save the asset as a template.



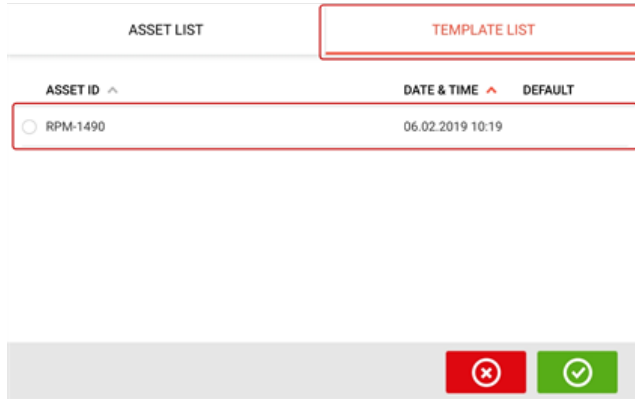
> Enter name of template then tap .





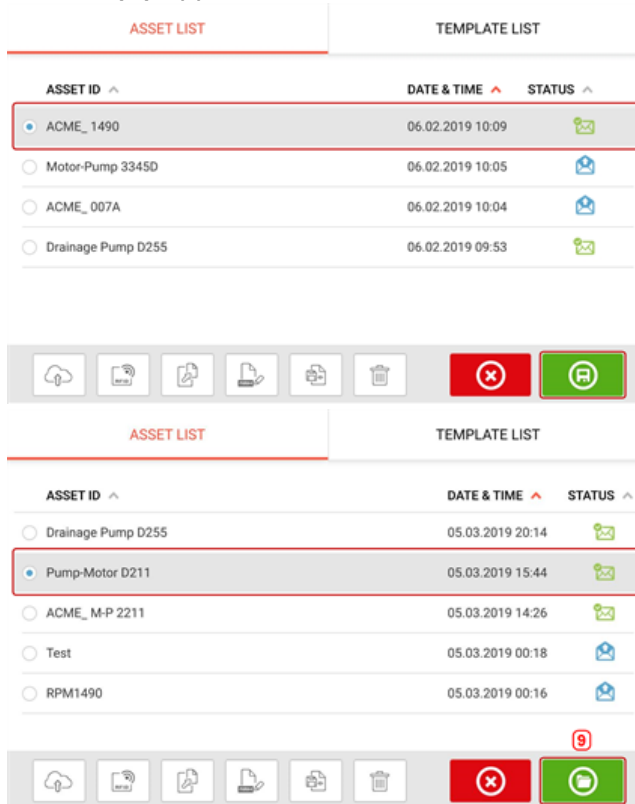
Note

If for any given reason, the template is not to be saved, tap the cancel icon [.

> The created template now appears on the template list.



- **(6)** Used to delete selected asset.
- **(7)** Used to exit the asset list/template list screen and return to the home screen.
- **(8)** This symbol () signifies that the selected asset is open and running in the background. The symbol serves the dual purpose of either opening the selected asset or saving any changes that may have been applied to the asset but not yet saved. If an asset that was previously saved but currently not open is selected, then the symbol  **(9)** appears.



Note

If the selected asset has not been previously saved then all the asset list options **(1)** are inactive.

ASSET LIST		TEMPLATE LIST	
ASSET ID ^	DATE & TIME ^	STATUS ^	
<input checked="" type="radio"/> Current asset: [New]	06.02.2019 10:16		
<input type="radio"/> ACME_1490	06.02.2019 10:09		
<input type="radio"/> Motor-Pump 3345D	06.02.2019 10:05		
<input type="radio"/> ACME_007A	06.02.2019 10:04		
<input type="radio"/> Drainage Pump D255	06.02.2019 09:53		

1

Default template

It may be necessary to define any one template as the default template. The default template will be used whenever a new asset is opened within the home screen.

> All available templates are listed on the template list.

ASSET LIST		TEMPLATE LIST	
ASSET ID ^	DATE & TIME ^	DEFAULT	
<input type="radio"/> Pump-Motor2	06.02.2019 10:28		
<input type="radio"/> PMG1	06.02.2019 10:26		
<input checked="" type="radio"/> RPM-1490	06.02.2019 10:19		

1

> Select template to be designated as default, then tap (1).

ASSET LIST		TEMPLATE LIST	
ASSET ID ^	DATE & TIME ^	DEFAULT	
<input checked="" type="radio"/> RPM-1490	06.02.2019 10:19	1	
<input type="radio"/> Pump-Motor2	06.02.2019 10:28		
<input type="radio"/> PMG1	06.02.2019 10:26		

2 **3**

> The default template now appears on the template list with a check mark (1).

> To revert the default template to a normal template, tap (2).

> **Note:** The designated default template cannot be deleted (3). To delete it, it must first be reverted to a normal template.

Note: If no template is selected, all template list options are unavailable.

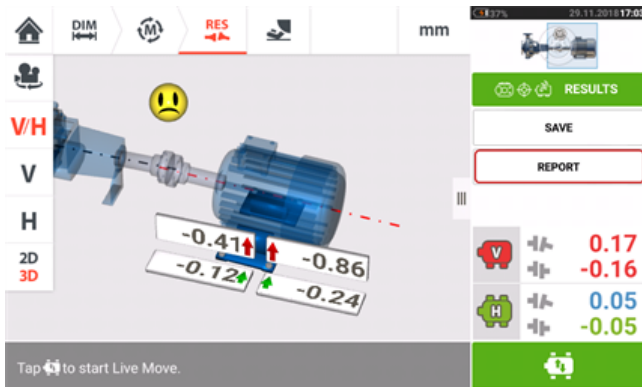
ASSET LIST	TEMPLATE LIST	
ASSET ID ^	DATE & TIME ^	DEFAULT
<input type="radio"/> RPM-1490	06.02.2019 10:19	
<input type="radio"/> Pump-Motor2	06.02.2019 10:28	
<input type="radio"/> PMG1	06.02.2019 10:26	

<input type="text"/>	<input type="button" value="✖"/>	<input type="button" value="✔"/>
----------------------	----------------------------------	----------------------------------

Generating reports

Generating measurement reports

Asset measurement reports may be saved directly on the touch tablet device as a PDF. Measurement reports are generated from the results screen.



Tap the menu item "Report". The "Generating report" screen opens.

GENERATING REPORT	
Show report logo	<input type="checkbox"/>
Machine alignment information	<input type="checkbox"/>
Date	30.11.2018
Results as found	<input type="checkbox"/>
Tolerances	<input type="checkbox"/>
Axial clearance	<input type="checkbox"/>
Signature	<input type="checkbox"/>


If not yet done, tap the icon to activate "Machine alignment information". Once activated, enter the necessary information using the onscreen keyboard. If desired, the items "Show report logo", "Results as found", "Tolerances", "Axial clearance" and "Signature" is activated by tapping their respective icon .

GENERATING REPORT	
Machine alignment information	<input checked="" type="checkbox"/> 1
Pump House	2
ACME 225D	3
A. N. Other	4
Scheduled Maintenance	5
Date	6 30.11.2018
Results as found	<input type="checkbox"/> 7

- **(1)** "Machine alignment information" activated
- **(2)** Location where asset is positioned
- **(3)** Asset (Machine) ID


- (4) Name of operator
- (5) Any other machine relevant notes
- (6) Date is set automatically
- (7) In this case, "Results as found" has been activated

Tap  to save the asset measurement report as PDF to the ruggedized tablet.

 **Note**

The report as a PDF may be accessed by connecting the tablet device to a PC. The report is located in the folder "Reports" which is accessed via 'ROTALIGN touch EX'/'Media'/'Reports'.

The generated PDF report saved together with the asset may also be accessed via the software platform ARC 4.0 in "Asset Attachments".

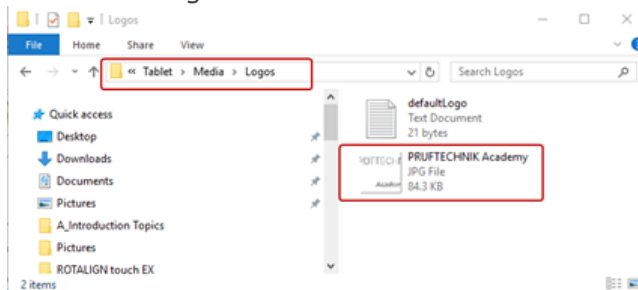
Tapping  saves the machine alignment information, then returns the user to the Results screen.


Report logo

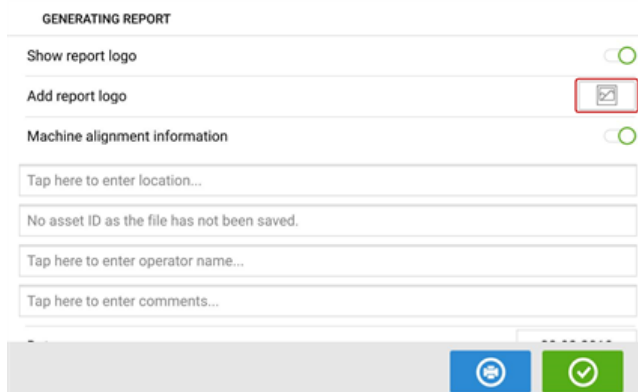
The desired report logo must initially be saved within the touch device before it can be added to the measurement report.

Note: Adding a new logo to the report logo gallery is only possible if the item "Show report logo" is activated.


- With the tablet device connected to a PC and access allowed, save the desired logo in the folder "Logos" which is accessed via 'ROTALIGN touch EX'/'Media'/'Logos'.

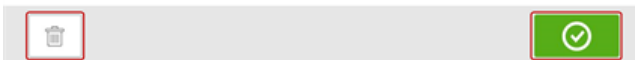


- Disconnect the tablet device from the PC and then tap the "Add report logo" icon .



The report logo gallery opens.

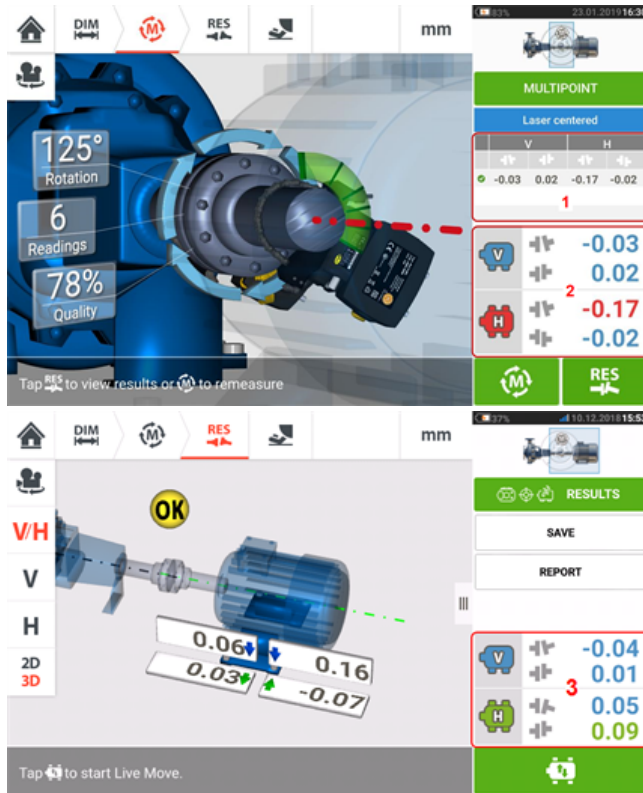
- From the report logo gallery, tap the desired logo and then tap . The selected logo will now appear on the PDF measurement report when "Show report logo" is activated.



Note: The delete icon is active. In this case, the added logo can be deleted from the gallery.

Measurement table

The measurement table is used to register and display all Shaft alignment, and any Live Move measurements taken on the current couplings. Access the measurement table by tapping either the results repeatability table (1) or coupling results (2) / (3).



The following items are included in the measurement table for each measurement.

MEASUREMENT TABLE										mm	
#	MEAS.	VERTICAL		HORIZONTAL		QUALITY					
		↕	↕	↔	↔	QF	SD				
JOB	10.12.2018	17									
AS FOUND	14	-0.040	0.009	0.179	0.252						
1	1	-0.035	0.037	0.196	0.236	56%	0.026				
2	2	-0.040	0.009	0.179	0.252	67%	0.004				
MOVE	15	-0.049	0.007	0.039	0.090						
AS LEFT	16	-0.042	0.006	0.046	0.091						

MEASUREMENT TABLE										mm	
MEASUREMENT DETAILS								SENSOR			
DATE & TIME	DISTANCE	AVG [s]	ROTATION	EXTEND	S/N	REC					
8	9	10	11								
23.01.2019 16:29:28	85	Auto	↻		39050010	24.09					
23.01.2019 16:31:38	85	0.03	↻		39050010	24.09					
23.01.2019 16:32:14	85	0.50			39050010	24.09					
23.01.2019 16:33:43	85	Auto	↻		39050010	24.09					

MEASUREMENT TABLE				mm			
MEASUREMENT DETAILS			SENSOR		LASER		
MODE	AVG [S]	ROTATION	EXTEND	S/N	RECAL	S/N	RECAL
				12	13		
Auto				39050010	24.09.2017	39100118	28.04.2016
0.03				39050010	24.09.2017	39100118	28.04.2016
0.50				39050010	24.09.2017	39100118	28.04.2016
Auto				39050010	24.09.2017	39100118	28.04.2016

- **(1)** Tap the check box to include the measurement in calculating the averaged results that is displayed on the results screen. Included measurements have a green check mark. The check mark remains grayed out if the measurement is not selected.
- **(2)** Measurements in chronological order
- **(3)** Used measurement mode
- **(4)** The rotational angle covered during measurement
- **(5)** Vertical and horizontal gap and offset values
- **(6)** Measurement quality factor (QF)
- **(7)** Measurement standard deviation (SD)
- **(8)** Date and time when measurement was taken
- **(9)** Dimension sensor-to-coupling centre
- **(10)** Averaging used
- **(11)** Direction of shaft rotation during measurement
- **(12)** Serial number of sensor used and recalibration due date
- **(13)** Serial number of laser used and recalibration due date

The "AS FOUND" coupling result **(14)** shows the initial alignment condition of the machines before any Live Move is performed. The displayed result could be an average of selected measurements. In the following table, the "AS FOUND" coupling result is the selected measurement number 2 only.

The "MOVE" result **(15)** shows the alignment condition after Live Move.

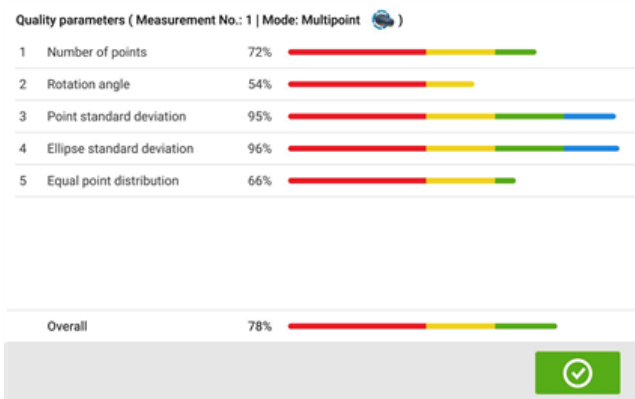
The "AS LEFT" coupling result **(16)** shows the alignment condition measured after Live Move. The displayed result could be an average of selected measurements. In the following table, the "AS LEFT" coupling result is the average of measurements numbers 1 and 2.


The "JOB" date **(17)** appears whenever a new alignment job is started.

Swipe horizontally to view all columns in the table and vertically to view all rows in the table.

Tap to delete highlighted "AS LEFT" reading from the measurement table.

Tap to display the parameters determining the quality factor of the measurement.



Tap  to exit the measurement table.

Measurement quality

Measurement quality is depicted using the following colour codes:

Blue – excellent; Green – acceptable; Yellow – not acceptable; Red – poor

Measurement quality is based on the following measurement and environmental criteria:


- Rotation angle – the angle through which the sensor and/or shaft is rotated during measurement
- Ellipse standard deviation – the root mean square deviation of the measurement points on the calculated ellipse
- Environmental vibration – the level of external vibration e.g. from neighbouring running machine(s)
- Rotation evenness – the smoothness of the measurement rotation e.g. if there is any friction during the rotation that 'jerks' the shaft
- Angle rotation inertia – abrupt changes in the measurement rotation speed e.g. releasing and re-applying a break during the rotation
- Rotation direction – change in the measurement rotational direction
- Rotational speed – how fast the sensor and/or shaft is rotated during measurement
- Filter output – the amount of measurement data filtered out

Editing measurement data

To improve the quality of the alignment results, it is possible to edit measurement data that could have been affected by external circumstances such as bracketing touching piping arrangement. The editing options are accessed via the [measurement table](#).

MEASUREMENT TABLE		mm					
#	MEAS.	VERTICAL		HORIZONTAL		QUALITY	
		↔	↔	↔	↔	QF	SD
JOB 21.02.2019							
AS FOUND		0.090	0.306	0.095	0.090		
1		0.095	0.308	0.104	0.140	70%	0.006
2		0.090	0.306	0.095	0.090	86%	0.004












When in the measurement table screen, tap desired measurement (1) then tap  (2) to access the measurement data screen.

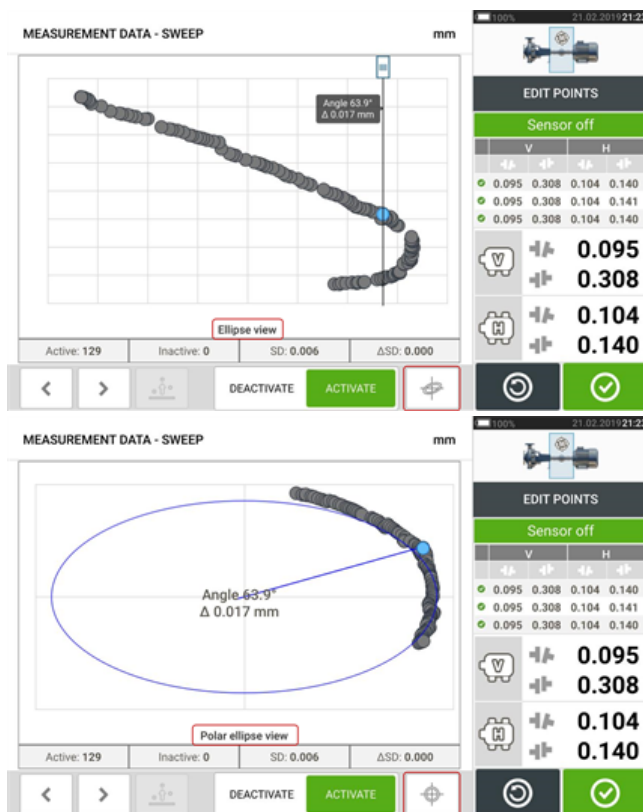
Broken ellipse

The most commonly used deviation diagram is referred to as 'broken ellipse'. During measurement, the laser beam traverses an arc that is dependent on the alignment condition of the rotating shafts. Over a complete 360° rotation, the beam describes an ellipse. Cutting the ellipse and laying it out flat results in the deviation diagram 'broken ellipse'. In this diagram points out of track are clearly seen.



- **(1)** Tap  or  to cycle through the points.
- **(2)** Currently selected point is active. The point is made inactive by tapping 'Deactivate'.
- **(3)** Shows currently displayed deviation diagram or sensor plane. Tap icon to cycle through available deviation diagrams and sensor planes. These include: Broken ellipse []; Ellipse []; Polar ellipse []; Sensor plane []; Sensor plane zoomed []
- **(4)** Tap  to automatically select the point with the highest deviation within the diagram. The cursor **(5)** springs automatically to this point. Note that the icon is inactive when the currently highlighted point has the highest deviation within the group.
- **(5)** The cursor is used to highlight any point in the diagram. The selected point is highlighted blue.
- **(6)** Currently selected point is inactive. The point is made active by tapping 'Activate'.
- **(7)** The 'undo' icon  is used to reverse all changes made before saving the asset measurement.

Other deviation diagrams



The image shows two screenshots of the measurement software interface. Both screenshots display a 'MEASUREMENT DATA - SWEEP' plot with a series of points forming a curve. The top plot is labeled 'Ellipse view' and shows a blue ellipse fitted to the points. The bottom plot is labeled 'Polar ellipse view' and shows a blue polar ellipse fitted to the points. Both plots show 'Angle: 63.9°' and 'Δ: 0.017 mm'. The interface includes a 'DEACTIVATE' button, an 'ACTIVATE' button, and a 'Sensor off' indicator. A table of data is visible on the right side of each screenshot.

EDIT POINTS			
Sensor off			
V	H	V	H
0.095	0.308	0.104	0.140
0.095	0.308	0.104	0.141
0.095	0.308	0.104	0.140



All deviation diagrams show the actual number of active and inactive points, the current standard deviation (SD), and the total change in standard deviation (delta SD) when deviant points are deactivated.

What is the effect of deactivating individual points?

Individual points are deactivated in order to lower the standard deviation value. Change in standard deviation impacts the V and H results displayed in the results repeatability table. Results with a green check mark indicate results with better standard deviation.

Using Cloud drive

To set up the PRÜFTECHNIK Cloud drive, an ALIGNMENT RELIABILITY CENTER 4.0 (ARC 4.0) licence is required. The Cloud drive allows the sharing of up-to-date asset measurements from different devices via the PC software ARC 4.0.



Note

Wireless connection between the ruggedized tablet and a network must be established to enable assets to be transferred via ARC 4.0.

Transferring an asset to the Cloud drive

After finalizing a measurement save the asset (1) then upload it to Cloud drive.

ASSET LIST		TEMPLATE LIST	
ASSET ID ^	DATE & TIME ^	STATUS ^	
<input type="radio"/> Grundfoss 45324	04.02.2019 12:53		
<input type="radio"/> Drainage Pump 224D	04.02.2019 12:52		
<input checked="" type="radio"/> ACME_002DE (1)	04.02.2019 12:52		

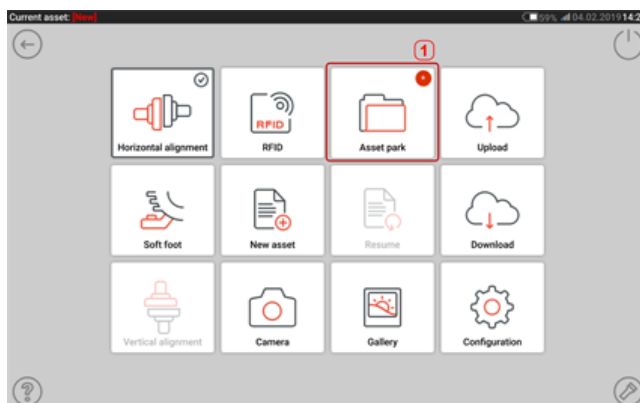


Tap the "Upload" icon (2) The asset appears in ARC 4.0 "Exchange" view with the status "complete". Drag and drop the asset in its appropriate location on the Cloud drive.

Downloading an asset from Cloud drive

From the ARC 4.0 "Exchange" view, drag and drop the desired asset into the Name pane. The asset appears with the status "ready".

From the touch device home screen, tap the "Download" icon . The selected asset appears in the asset park (1).



Tap the "Asset park" icon to open the asset in the ruggedized tablet .

RFID




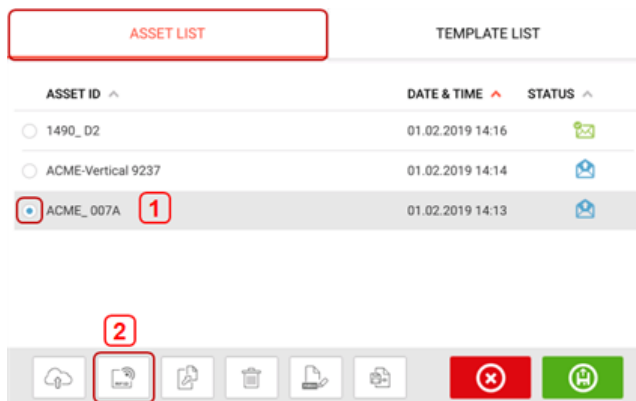
Only intrinsically safe RFID tags must be used in explosive atmospheres.

The ruggedized tablet uses this automatic identification technology to perform the following:

- Identify assets to be aligned
- Enter corresponding assets directly into the device
- Store data and results under the correct asset automatically

Assigning a saved asset to an RFID tag

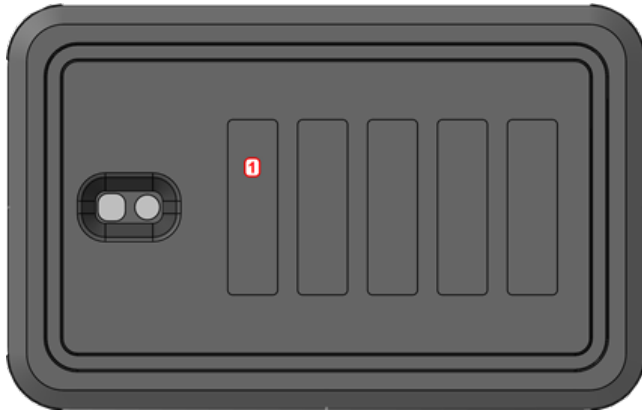
From the home screen, tap  the "Asset park" icon to display assets saved.



Tap the asset [**1**] that is to be assigned to the RFID tag, then tap the RFID icon [**2**].



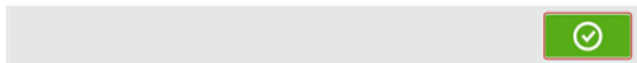
Position the touch device such that its built-in NFC antenna is as close to the RFID tag as possible (less than a centimeter).




- **(1)** Near Field Communication (NFC) antenna symbol

As soon as data has been written on the RFID tag, the corresponding hint appears on the display.

RECORDING TO RFID TAG




Tap  to exit the screen.



Note

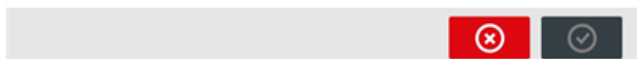
If however, data had already been assigned to the RFID tag, a hint requesting over-writing of the data appears.

Opening an asset measurement assigned to an RFID tag

From the home screen, tap  the "RFID" icon.

READING FROM RFID TAG


Place touch device close to the RFID tag, then wait until data is read from the tag.

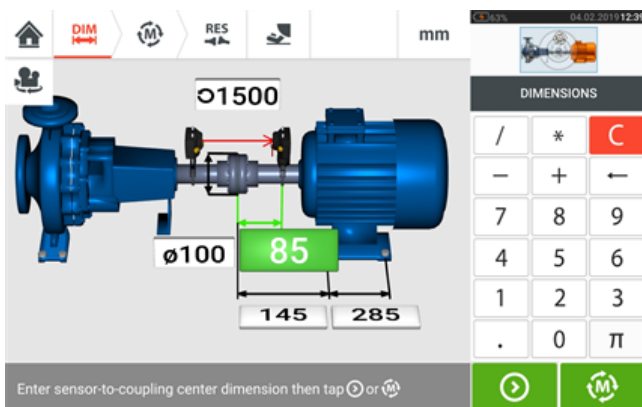


Position the touch device such that its built-in NFC antenna is as close to the RFID tag as possible (less than a centimeter).

READING FROM RFID TAG




Tap  to open the asset measurement.

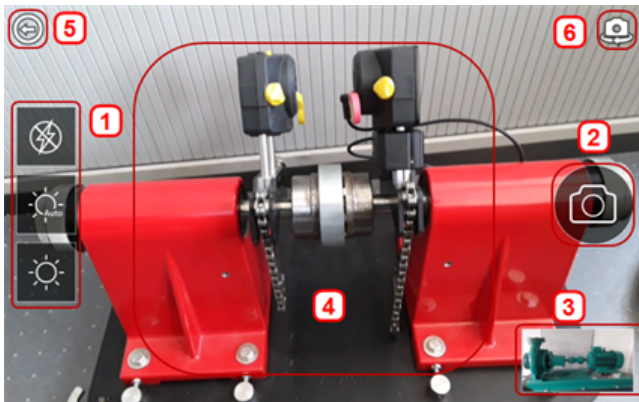


Note




If however, no data had been written on the RFID tag, a hint on missing information appears.

Built-in camera

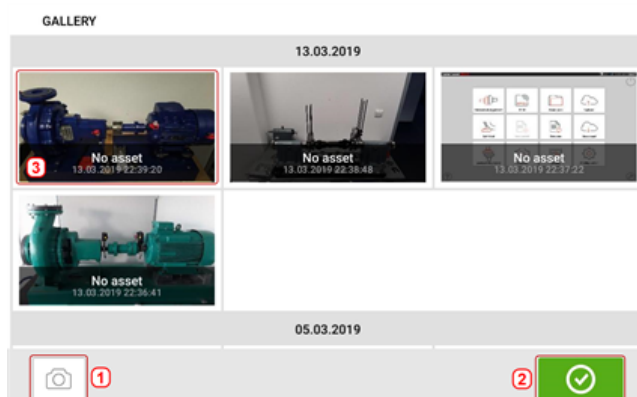
Tap  the 'Camera' icon to access the function.




Focus the device on the object to be photographed. The object is displayed on the screen.


- **(1)** Camera settings for indoor, outdoor and night imaging, including automatic light setting – Tap desired light setting icon (Flash may be turned on/off; Auto mode is for automatic light setting).
- **(2)** Tap  the "Take picture" icon to take a photo of the object focused on the display.
- **(3)** Tap this location to access the device gallery. All images taken using the touch device are saved at this location.
- **(4)** Object to be photographed
- **(5)** Tap  to return to home screen.
- **(6)** Tap  to switch between the front- and rear-facing cameras.

Gallery



To view all images saved in the gallery, touch then drag up or down. All images are displayed as miniatures.

- **(1)** Tapping  returns user to the image settings screen where objects may be photographed.

- (2) Tapping  opens the home screen.
- (3) Tap any miniature to view the image in full scale.

How to capture a screen shot on the touch device

Select the desired screen then press the Back hard key (1) long enough. The message 'Screenshot saved' appears on the display.





The captured image may be viewed in the gallery.



Note

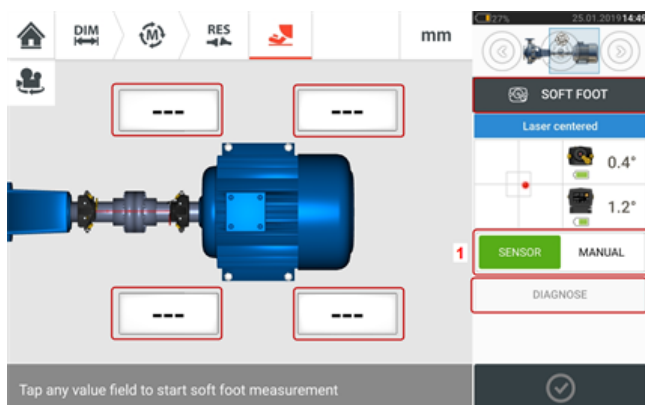
Images saved to the gallery may only be transferred to a PC if assigned to an asset. Before taking the desired photo or screenshot the corresponding new or existing asset must be opened. The captured image may then be transferred to the PC software ARC 4.0.

Soft foot

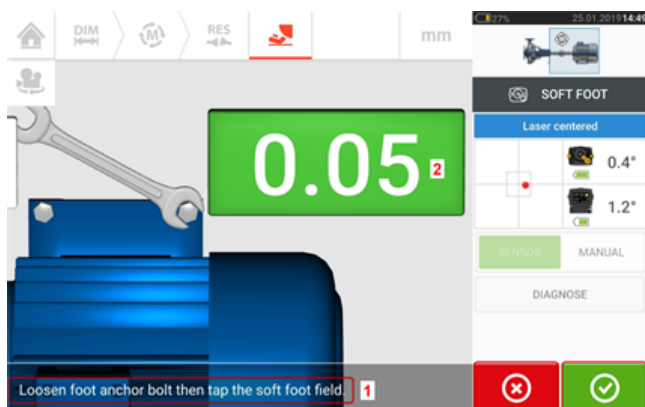
Soft foot measurement can be started from any screen where the 'Soft foot' icon [] is active. Tap  to start soft foot measurement. The values may be determined by sensor measurement or entered manually from values established using manual methods such as feeler gauges and shims.

Sensor measurement



Activate sensor measurement by swiping the green button **(1)** to "Sensor". The laser beam must have the status "Laser centered" or "Laser OK". Refer to laser beam adjustment.

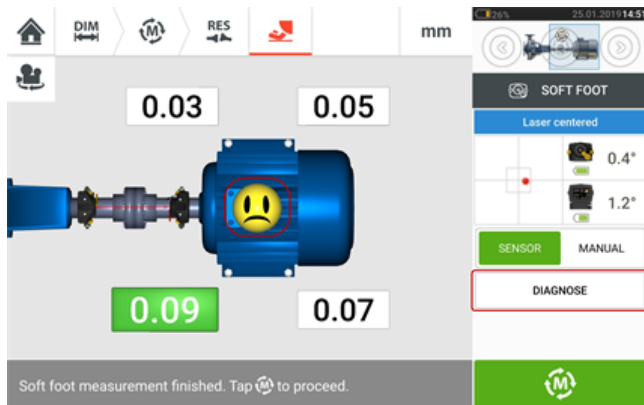


Tap any one of the four pulsating value fields to start soft foot measurement at the respective machine foot.



Loosen the corresponding foot bolt (see hint **1**). The recorded soft foot value is displayed [**2**].

When the soft foot value stabilizes, tap  the 'Proceed' icon or recorded value **(2)**, then tighten the bolt (see hint **1**). If desired, the soft foot measurement at the corresponding foot is canceled by tapping  the 'Cancel' icon. The above soft foot measurement procedure is repeated for all four feet positions.



If however soft foot is detected, the item 'Diagnose' is active. Tap 'Diagnose' to start the soft foot wizard which guides the user through diagnosis and correction of soft foot.



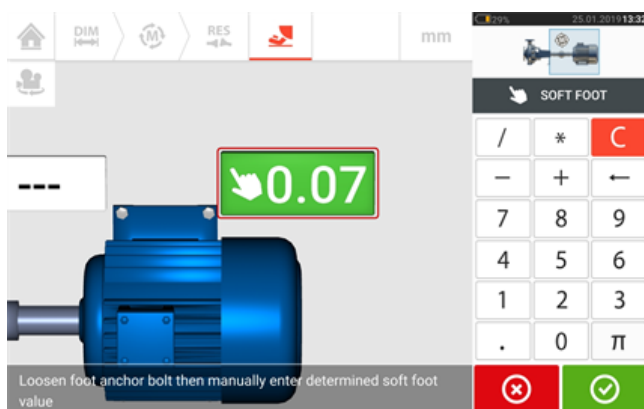
Note

The set soft foot tolerance may be displayed by tapping the smiley within the machine.

Manual entry

Manual entries are made by first swiping the green button to "Manual". Manual entries are signified by the finger icon on the display.

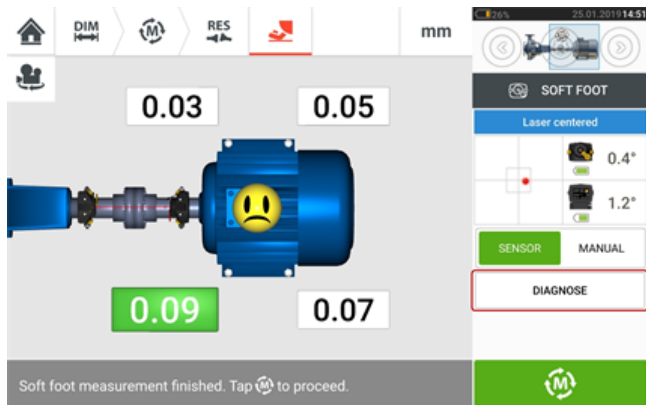
Tap any one of the four pulsating value fields then proceed to enter the soft foot value at the respective machine foot using the onscreen keyboard.



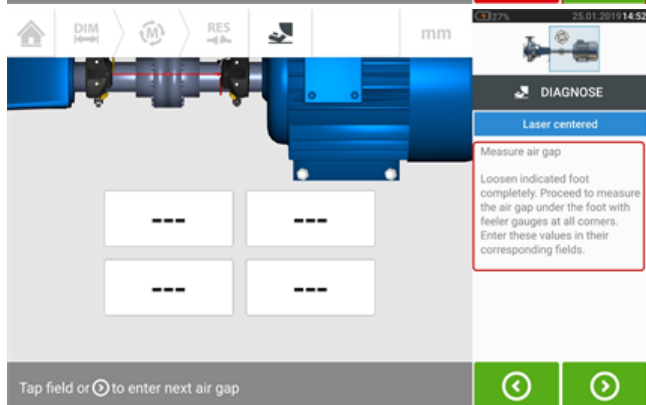
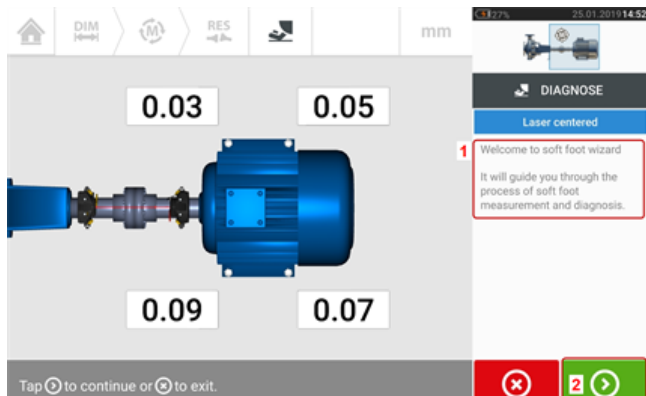
Repeat the procedure for all four feet positions.


If necessary, diagnosis may be carried out using the soft foot wizard.

Soft foot wizard



Tap 'Diagnose' to start the soft foot wizard. The wizard guides the user through diagnosis and correction of soft foot.



A welcome hint (1) appears after the wizard is started. Tap  (2) to proceed to the next wizard step. Follow the wizard instructions carefully. Hints on the type of soft foot detected and the suggested action will be displayed.



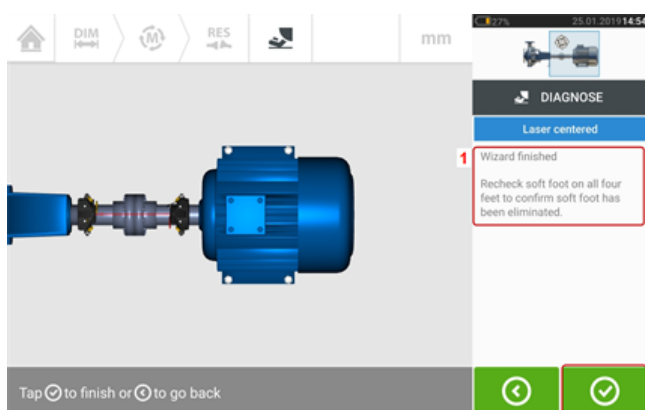
Note

The wizard steps are dependent on the type of soft foot detected.


Types of soft foot

These include:

- Rocking soft foot – in this case, the highest values are diagonally opposed
- Angled soft foot – mostly observed in machine with bent foot or when the base plate is bowed
- Squishy soft foot – results from dirt or too many shims
- Induced soft foot – due to external forces such as pipe strain



After cycling through all the given wizard steps, the 'Wizard finished' hint (1) appears.

Tap  to return to the soft foot measure screen. Measure soft foot again to check whether soft foot has been eliminated.

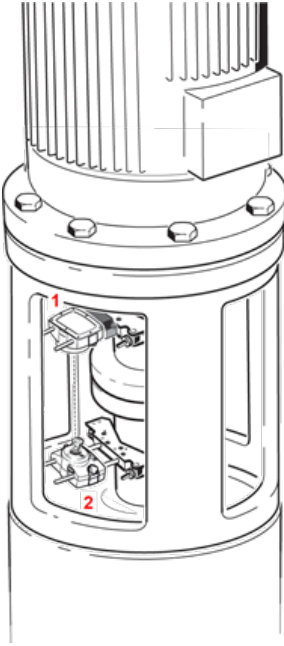
Vertical flanged machines

A typical vertical machine arrangement comprises one machine mounted on top of the other using a bolted flange.

Flange-mounted machines may have a vertical or horizontal orientation. In either case, alignment corrections are made directly at the flange.

Angularity is corrected by inserting or removing shims between the flanges. The touch device calculates the shimming thickness for each flange bolt.

Offset is corrected by positioning the flange laterally.

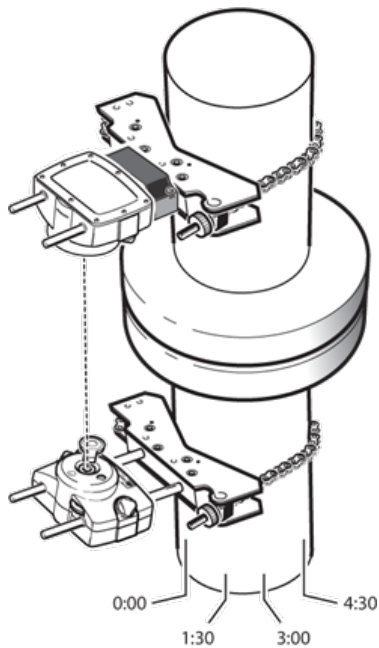


- **(1)** Sensor connected to RF module
- **(2)** Laser

The laser and sensor are mounted on either side of the coupling as for horizontal machines, with the laser on the shaft of the bottom machine. As the electronic inclinometer cannot directly determine the rotation angle of vertical shafts, the measurement mode for vertical machines is Static Clock and vertiSWEEP.

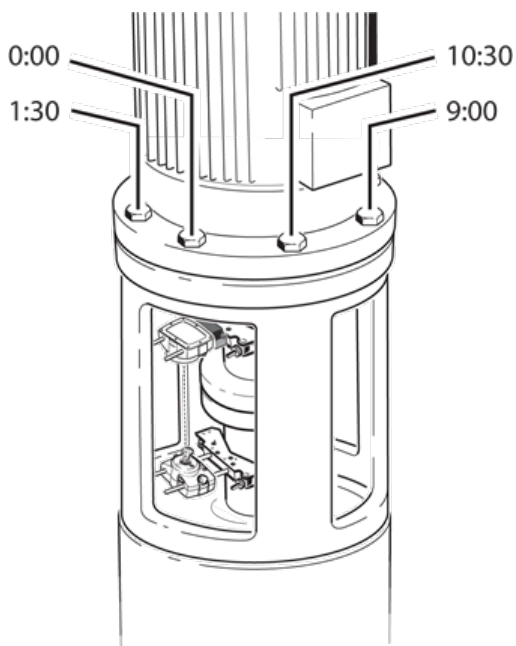
Marking measurement positions

For Static Clock measurement mode, the eight 45° measurement positions used with these procedures must be marked accordingly on the machine.




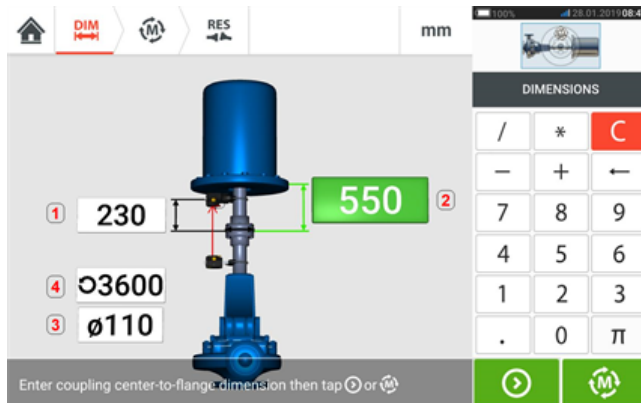
- Mark a reference position on the coupling housing close to the shaft and in line with a convenient external reference or flange bolt. Likewise, mark a reference point on the shaft.
- Measure the circumference of the shaft and divide by eight.
- Use this distance to make seven more evenly-spaced marks on the shaft beginning at your chosen start point. Number the points counterclockwise as seen from sensor to laser, beginning with 0 first, followed by 1:30, 3:00, 4:30, 6:00, 7:30, 9:00 and 10:30.

For circular housings, measure the circumference of the coupling housing and divide by eight. Use this distance to make eight evenly-spaced marks on the housing beginning at your chosen start point. Number the points clockwise looking down onto the shaft with 0 as the first, followed by 1:30, 3:00, 4:30, 6:00, 7:30, 9:00 and 10:30.

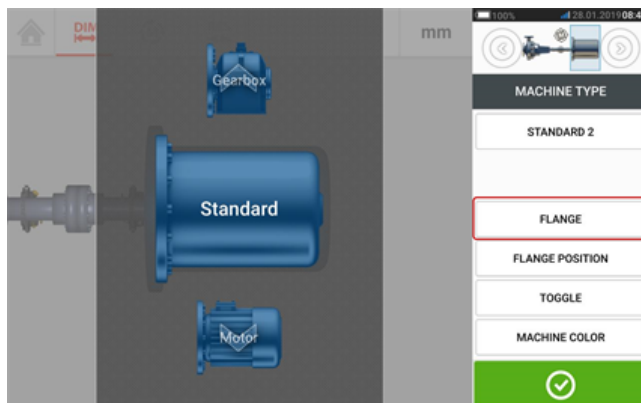


Set-up

- Mount the laser and the sensor on either side of the coupling, ensuring that they are aligned exactly with the 0 or reference mark.
- Switch the touch device on, then tap  in the home screen to start the vertical alignment application.
- Configure the machines as appropriate by tapping the machines and coupling to select the desired machine type or coupling from the respective carousel.
- Enter the following required machine dimensions:

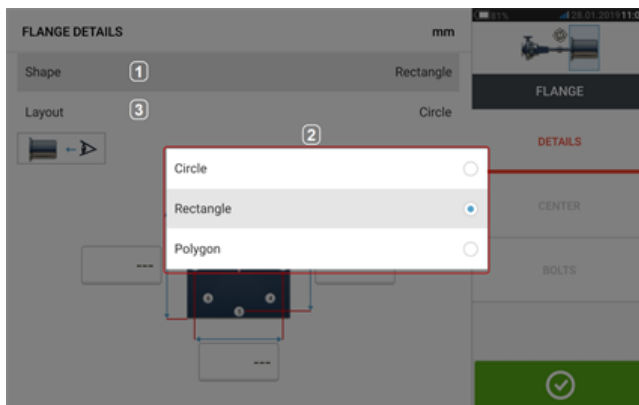


- **(1)** Sensor to coupling center
 - **(2)** Coupling center to flange
 - **(3)** Coupling diameter
 - **(4)** RPM
- When entering machine dimensions, the flange geometry must be taken into account. Tap the flange-mounted machine.

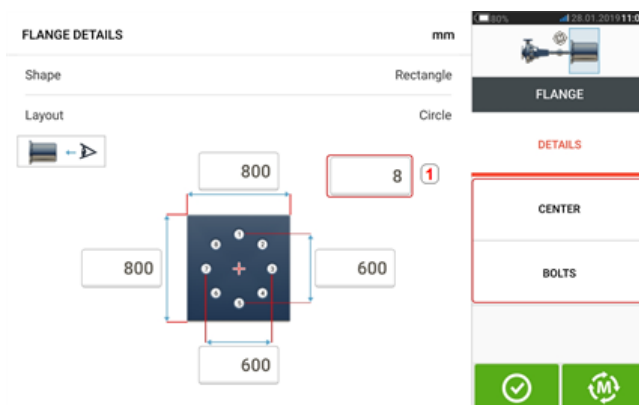


The menu items on the screen may be used to edit machine name, access the "Flange details" screen, change the flange position with respect to the shaft, flip the machine along the shaft axis (toggle) and edit machine color.

- Tap 'Flange' to access the "Flange details" screen where the flange may be edited.




- Tap the 'Shape' area [1] to select the shape of the flange from the pop-up menu [2] that appears. In the above example, the selected shape of the flange is "Rectangle".
- Tap the 'Layout' area [3] to select the pattern formed by the bolts from the pop-up menu that appears.
- Tap the respective value boxes then use the onscreen keyboard to enter flange dimensions and bolt pattern lengths. The number of bolts is edited by tapping [1] then entering the value directly. After entering the dimensions, tap the displayed flange area to close the onscreen keyboard.



'Center' is used to define the exact location of the center of the shafts and is expressed in X,Y coordinates.

'Bolts' is used to define the exact position of the bolts on the flange, which are also expressed in X,Y coordinates.

- After all the required dimensions have been entered, tap  to proceed with measuring.

The following measurement procedures are available for vertical flanged machines:


"Vertical flanged machines – vertiSWEEP" on page 110 (default measure mode)

"Vertical flanged machines – Static clock" on page 113

Vertical flanged machines – vertiSWEEP

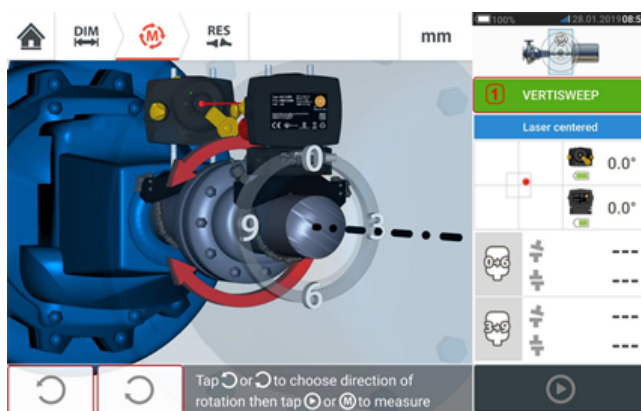
Measure using vertiSWEEP




- Center the laser beam.






Note
vertiSWEEP is the default measurement mode for vertically mounted machines. The alternative Static clock measurement mode may be accessed by tapping **(1)** in screen below.

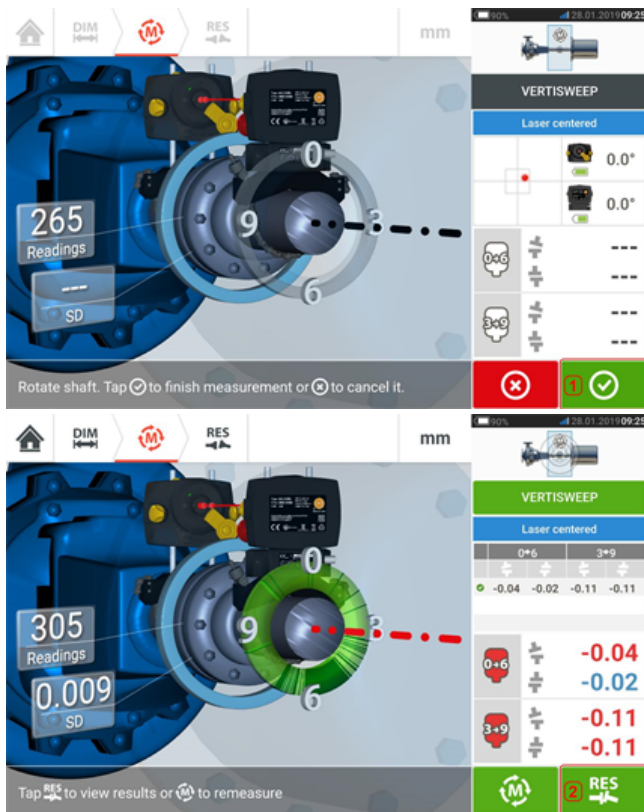
- Position the shafts such that sensor and laser are both at the '0' reference mark position.



- Use  or  and select the direction in which the shafts will be rotated. Once the direction to rotate the shafts is selected, measurement is activated and the letter 'M' **(1)** appears and also  **(2)** becomes active.



- Tap either 'M' or  then rotate the shafts through an angle greater than 360°.
- After rotating the shafts through the required angle, tap  **(1)** to display coupling results. Tap  **(2)** to display shimming corrections.



Note
 If the measurements have a high standard deviation [>0.05 mm (>2 thou)] resulting from say bearing play, stiff coupling or radial play in coupling, a hint suggesting the use of Static measurement mode appears on the screen. In this case, the measurement mode should be changed to Static measurement.



- **(1)** Flange correction in 0-6 direction
- **(2)** Flange correction in 3-9 direction
- **(3)** Bolt position
- **(4)** Shimming values
- **(5)** Coupling gap and offset in the 0-6 direction

- **(6)** Coupling gap and offset in the 3-9 direction
- **(7)** Shim correction modes
- **(8)** Shim correction mode used in this example
- **(9)** Initiates Live Move

Shimming modes



Shimming modes are defined as follows:

- **(1)** mode indicates all positive shimming
- **(2)** mode indicates "zero/plus" shimming. In this mode, one bolt position is forced to zero and the rest are positive
- **(3)** mode indicates optimized shimming. In this mode, half of the corrections will be positive, and the other half negative.
- **(4)** mode indicates "zero/minus" shimming. In this mode, one bolt position is forced to zero and the rest are negative.
- **(5)** mode indicates all negative shimming

Vertical flanged machines – Static clock

Measure using Static measurement mode

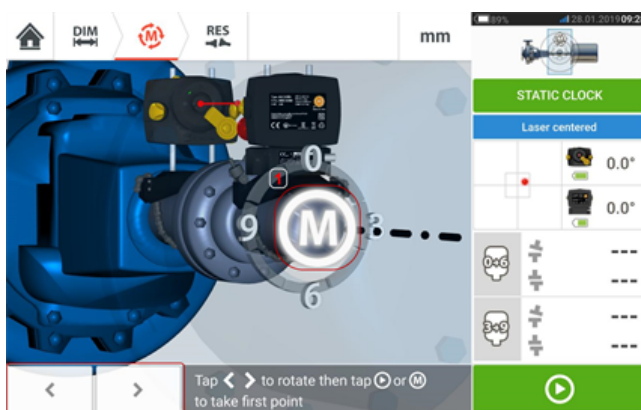
- Center the laser beam.






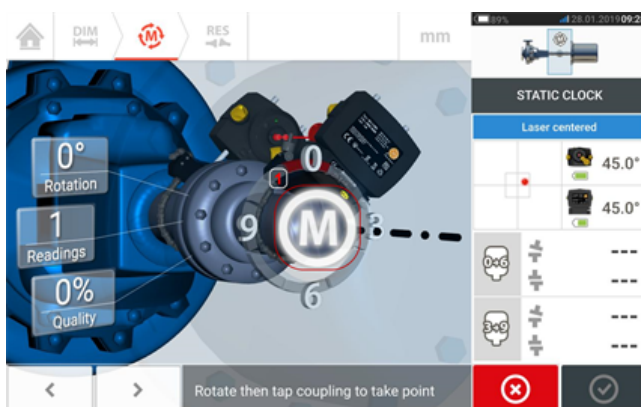
Note

Static measurement mode is used for vertically mounted machines.

- Rotate the shafts to the first measurement position. If using the coupling housing numbering convention, the reference mark and the measurement position 0 should be aligned or matched to each other.





- Use  or  to position the displayed sensor and laser at the angular rotation corresponding to the actual position of the components mounted on the shafts, then tap **M (1)** or  to take the first measurement point.
- Rotate shaft to the second measurement position (e.g. 1:30). If the chosen measurement position does not correspond to the angle selected automatically on the display, use the navigation keys to manually position the sensor and laser at desired angle on the display. Take the measurement point by tapping **M (1)**.




- Take the maximum number of measurement points to maximize the quality of results.






- Tap  to proceed to view measurement results.


 **Note**

The colour of the "Proceed" icon [] denotes the attained measurement quality.



 **Note**

If flange dimensions have not been defined, the flange icon  appears. Tap  to enter missing flange dimensions.

- Tap  to view measurement results.



- **(1)** Flange correction in 0-6 direction
- **(2)** Flange correction in 3-9 direction
- **(3)** Bolt position
- **(4)** Shimming values
- **(5)** Coupling gap and offset in the 0-6 direction
- **(6)** Coupling gap and offset in the 3-9 direction
- **(7)** Shim correction modes
- **(8)** Shim correction mode used in this example
- **(9)** Initiates Live Move

The shimming mode used in the above example is "all positive" shimming.

Live Move – Vertical machines

Alignment is carried out by correcting angularity and offset.



- (1) Angularity corrections are made by shimming at the given bolt locations.
- (2) Offset corrections are made by moving the machine laterally.

Correcting angularity

It is recommended (but not obligatory) to correct angularity first:

1. Loosen the flange bolts then lift the movable machine.



WARNING


The machine bolts must be undamaged and removable.

2. Angularity corrections are made by shimming. The shimming values at the respective bolt positions are shown on the screen. Insert (or remove) shims with the correct thickness under the selected bolt. Loosen the flange bolts then lift the movable machine.
3. Tighten the bolts back down, then take another set of readings to confirm shimming corrections; repeat shimming if necessary.
4. Once satisfied that overall angular misalignment is in tolerance, and no more shimming is required, proceed to correct offset.

Correcting offset


1. Offset corrections are carried out using the Live Move function.

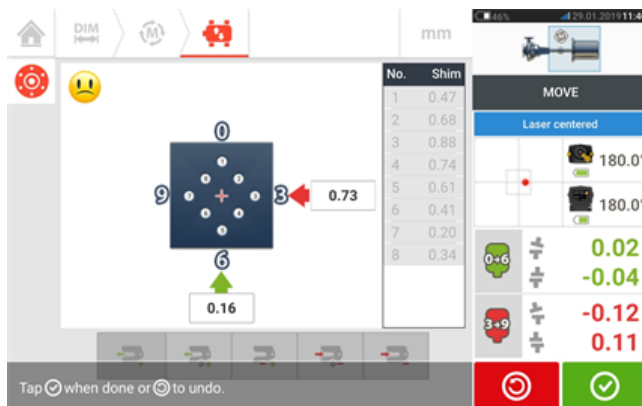





2. Tap  to start Live Move. A hint screen requesting the angular position of both sensor and laser appears.



In the above example, the desired angular position of both sensor and laser is the 12:00 o'clock position **(1)**.

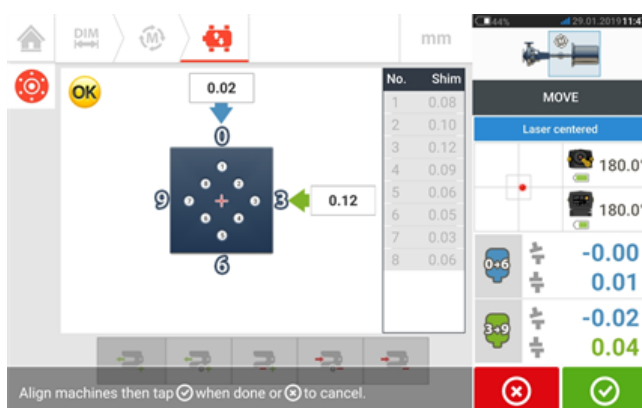
3. Tap **(1)** to position the screen sensor at this position then tap  to proceed.



4. Loosen the flange bolts. Once Live Move has been detected, the 'Cancel' icon  replaces the 'Undo' icon . The 'Cancel' icon  prompts the 'Cancel Live Move' hint.

5. Move the machine laterally in the direction of the bold yellow arrows to perform offset corrections. Monitor the arrows on the Live Move screen.

- Corrections should be brought as close as possible to zero.
- Use appropriate tools (e.g. jackscrews) to position the machine.
- Take care not to let the shims slip out of place during lateral positioning.

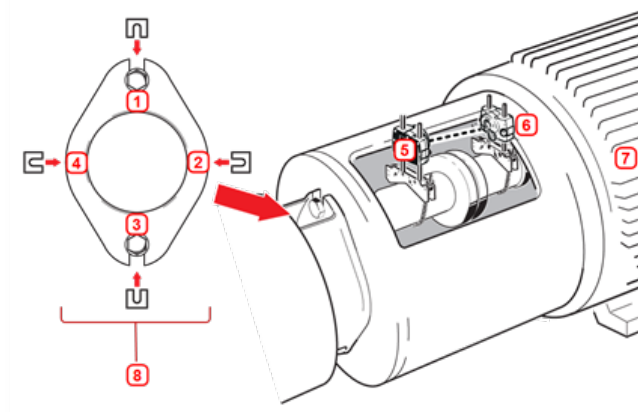


6. When offset is in tolerance, tighten the flange bolts. Remeasure to check if the new alignment condition is in tolerance.
7. If not, repeat the above steps until alignment is in tolerance.

Horizontal flanged machines

Flange-mounted horizontal machines

When machines are joined by means of flange, their alignment is determined by inserting the proper combination of shims at the flange bolts and, depending on the flange type, between the faces of the flanges. The requirements are similar to those for aligning vertical machines. When the shaft rotates around a horizontal axis, the electronic inclinometer detects the rotational position during measurement, which may be taken in any desired measurement mode. Based on the measurements taken, the touch device determines the thicknesses of shims to be fitted between the flanges required to align the shafts.

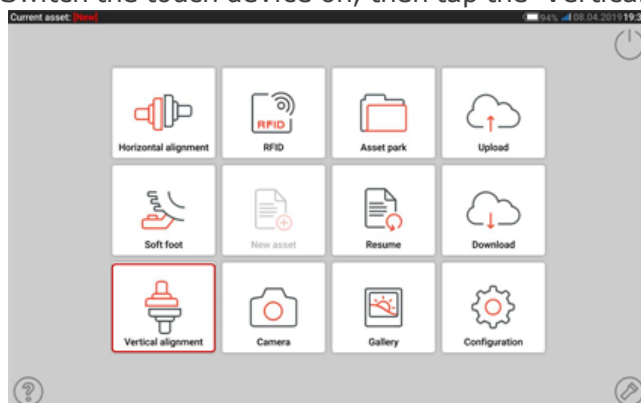


- **(1) – (4)** Flange shimming positions
- **(5)** Laser
- **(6)** Sensor
- **(7)** Machine to be aligned
- **(8)** End view of flange (as seen from left)

Shown here are the shimming locations for a two-bolt flange, a special case of the normal circular flange shape.

Set-up

- Mount the laser and the sensor as required (horizontally).
- Switch the touch device on, then tap the 'Vertical alignment' icon in the home screen.

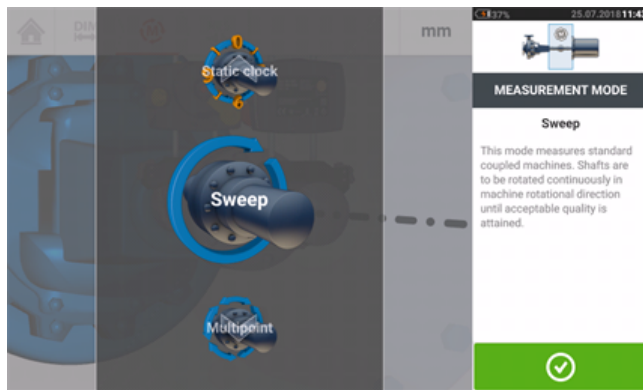


- Proceed to configure the machines as described in "Vertical flanged machines" on page 106.

- Due to the horizontal mounting of both sensor and laser, all corresponding horizontal shaft alignment measurement modes are available once the sensor has been initialized.



- Tap **(1)** and select the desired measurement mode then proceed to carry out measurement. (See "Measurement modes" on page 46).




The coupling results icons for the horizontal flange application show 0-6 (for **V**ertical) and 3-9 (for **H**orizontal).

Machine train alignment

The following is a step-by-step approach for measuring the alignment condition of a three-machine train.


Groups of up to 6 machines coupled together may be measured.

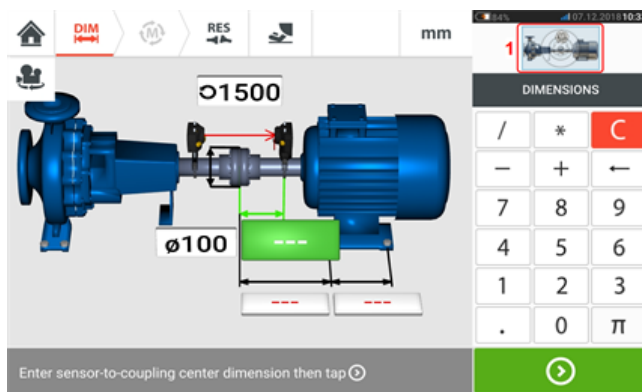
The components should be mounted and laser beam adjusted as required.

From the home screen, tap  the "New asset" icon to create a new asset.

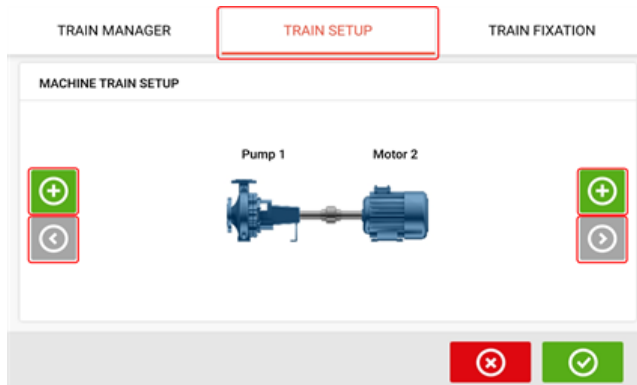


Note

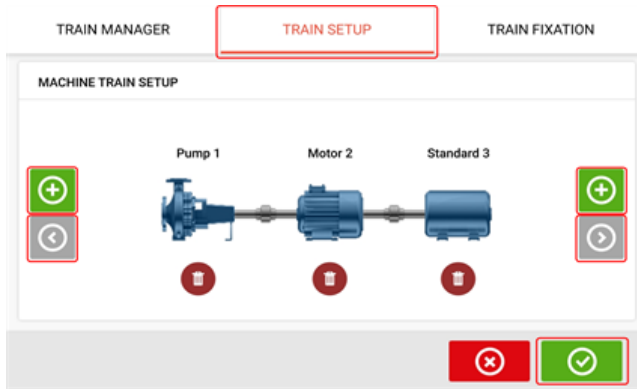
The horizontal shaft alignment icon [] may be used to create a new asset if it has no check mark. The check mark on the icon denotes that another asset is currently opened.




Tap the mini train inset at the top-right corner (1) to access the "Train set-up" screen.




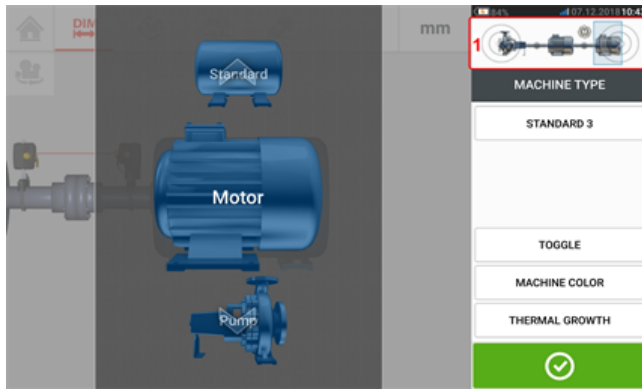
Tap either of the two 'Add machine' icons [] to add a machine to the respective side of the train.



The 'Add machine' and 'Scroll machine train arrow' icons are grayed out when inactive.


When active, the 'Scroll machine train arrow' icon [] is blue and signifies there are machines in the respective directions that are currently not on display. The active arrows are used to scroll these machines into view.


After adding the required number of machines to the train, tap  to return to the dimensions screen then use the carousel to configure the machines as desired.

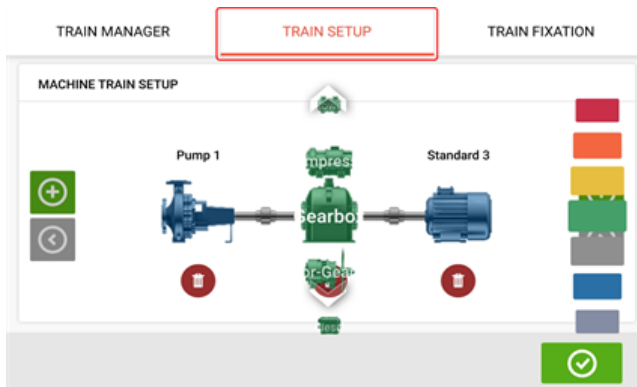


To access the different elements within the machine train, tap the corresponding element within the mini train inset [**1**] at the top right corner of the screen.

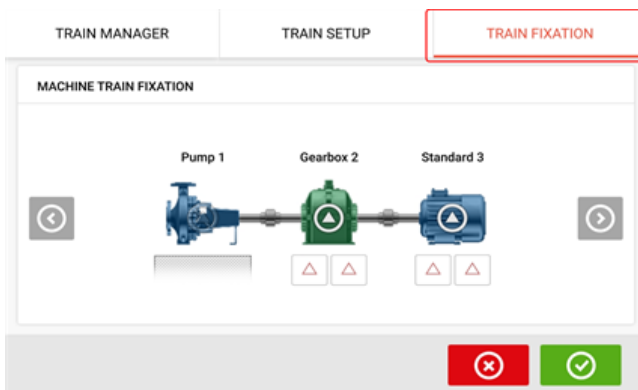
Alternatively, the desired machine and coupling types including the machinery color may be specified within the "Train set-up" screen. Tap the element to be specified then use the respective carousel to select desired machine or coupling type. The machine carousel appears

together with the color carousel. After specifying desired element, tap  to proceed.

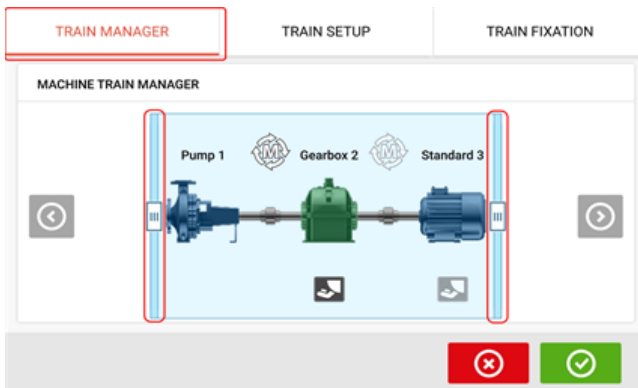
When all machine train elements have been specified, tap  to return to the dimensions screen to enter the required machine train dimensions.




The "Train fixation" screen which is also accessed by tapping the mini train inset is used to fix and unfix machine feet pairs or entire machine.




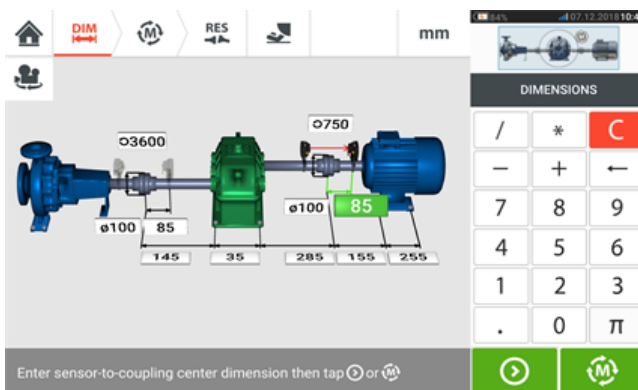
The "Train manager" screen which is also accessed by tapping the mini train inset is used to select a maximum of three machines that may be displayed in completeness including the related dimensions.




Use the sliding bars and select machines to be displayed in completeness.

 Note that the machines selected within the train manager screen are the same ones displayed in both the dimensions and results screens.

Tap  to return to the dimensions screen displaying the selected section of the machine train with the respective dimensions.




Measurement

Tap  from the dimensions screen then proceed to initialize sensor mounted across the coupling as displayed on the machine train inset [1].




The measurement mode used in measuring the coupling in this example is Continuous Sweep [2].




After rotating the shafts through as wide an angle as possible, then tap  to finish measurement on the specified coupling.



Tap  to switch measurement to the next coupling.

Switch both laser and sensor off then dismount them from the presently measured coupling and mount them across the next coupling. When ready, switch both laser and sensor on.




 **Note**
 Please make sure when moving the laser and sensor to each coupling that the dimension from sensor to coupling center is entered correctly in the dimensions screen. Always make sure the coupling you are measuring is the one actually highlighted in the mini train inset (1)!


The measurement mode (2) used in measuring the next coupling in this example is Multipoint.



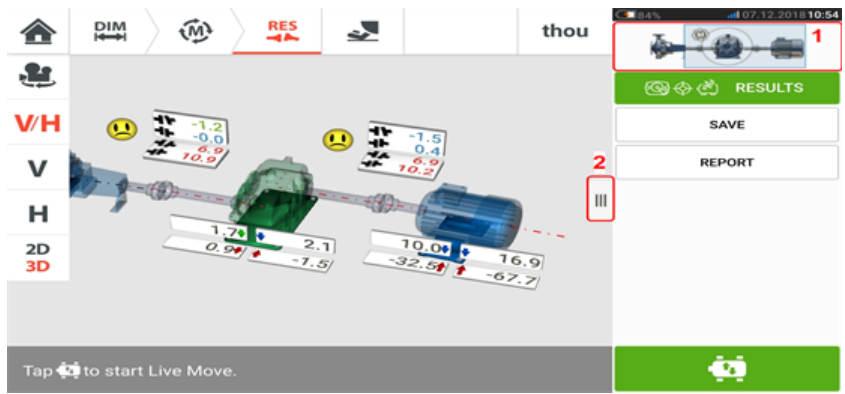
When measurement across both couplings is completed, tap  to proceed to view results.




Tap  to display and evaluate both feet and coupling results.

 **Note**

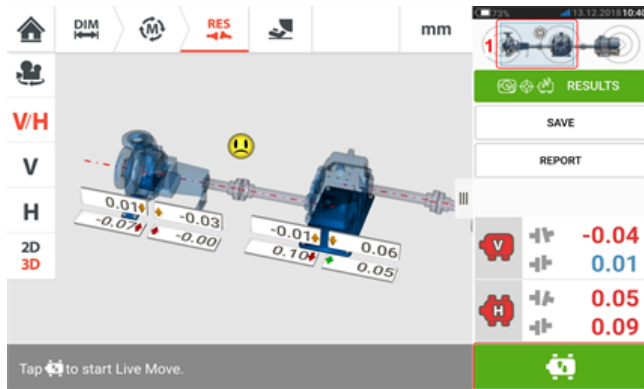
The results displayed are for the coupling(s) selected in the mini train inset (1).
To view the results display in full scale mode, tap (2).




Tap , the "Move" icon, to perform alignment corrections involving shimming and lateral positioning of the three-machine train.

Live Move – machine train alignment

Decide which pair of machines to move in a train, one may need to re-install and re-adjust the laser and sensor across the chosen coupling. Be sure to install the sensor at exactly the same location on the shaft or coupling as previously, or re-enter the new correct distance from the sensor to the coupling. In the following example, the chosen machine pair is pump (left machine) and gearbox (right machine) as shown by the highlighting window on the mini train inset (1).



Tap  to start Live Move. If all machines are designated movable, then the "Fixed feet" screen for the selected coupling position appears.




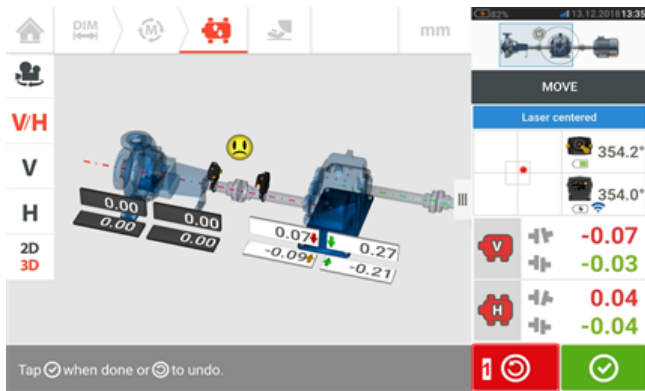
Note



The grayed out machine indicates that the measurement focus (see mini train inset [1]) is NOT on the coupling next to this particular machine but to the coupling connecting the other two machines.


TRAIN FIXATION



Tap feet on the machine train to be designated stationary then tap  to proceed with Live Move.




Start machine corrections. As soon as machine movement is detected, the "Undo" icon  is replaced by the "Cancel" icon .

 **CAUTION**


Do NOT attempt to move the machine using heavy sledgehammer blows. This can cause bearing damage, and also produce inaccurate Live Move results. Jack bolts on the feet or other mechanical or hydraulic devices are recommended for moving machines.



Move the machines until the alignment condition is within the specified tolerance which is indicated by the smiley (1) then tap  to finish Live Move.

Access the "Train manager" by tapping the mini train inset, to view the alignment condition of the entire machine train.

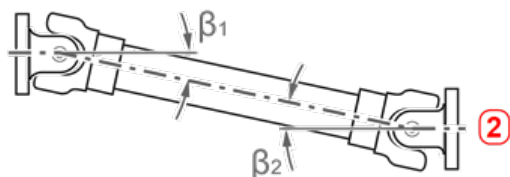
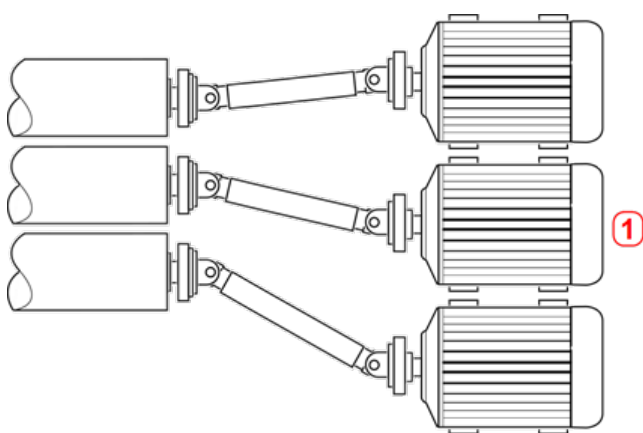


Tap  and remeasure to confirm the alignment condition. If the smiley icons return a happy face or an OK, then the alignment condition is within tolerance. If not, repeat the Live Move procedure.

Cardan shaft alignment

Cardan drives are installed and operated with a large offset between the driver and the driven shaft. Depending on the type of cardan shaft in place, a minimum deflection angle of the universal joints may be necessary in order to ensure sufficient lubricant circulation, which in turn prevents the universal joints from seizing. A large difference in the deflection angles β_1 and β_2 (refer to image below) leads to rapid fluctuation of the driven shaft RPM during operation, which can lead to grave consequences for electronically-controlled synchronous and asynchronous AC drive motors.

For smooth operation the machines should be aligned such that the driving and driven machine shaft centerlines are parallel. Precise alignment reduces the rotational irregularities of the cardan shaft to a minimum, so that the uneven bearing loading during cardan shaft rotation is also minimized, the service life of the components is extended and the chance of unexpected machine failure is reduced.



- **(1)** Positioning of machines in an area with limited space
- **(2)** For optimal running condition, the deflection angle β_1 and β_2 should be equal

Measurement procedures in the cardan application

For cardan applications, select the coupling type 'Cardan' when configuring the machines.

The following measurement procedures are available for cardan applications:

- Cardan rotating plane – This is the default measurement procedure for cardan applications. This procedure allows precise measurement of machines joined by cardan shafts without having to remove the cardan shaft. This procedure is used in conjunction with cardan rotating arm bracket.
- Multipoint – In this procedure, the cardan must be dismantled. Measurement is carried out using Multipoint measurement mode in conjunction with the cardan offset bracket.
- Static clock – In this procedure, the cardan must be dismantled. Measurement is carried out using static measurement mode in conjunction with the cardan offset bracket.

Cardan shaft alignment - Using rotating arm bracket

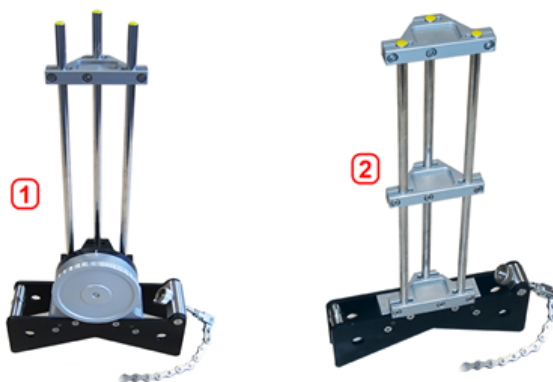
Measurement using the rotating arm bracket allows precise measurement of machines joined by cardan shafts without having to remove the cardan shaft, which must be rotated to take measurements.



Note

Based upon experience, it is suggested that both sensALIGN laser and sensor should first be mounted on their respective brackets together with the anti-torsion bridges, then the bracket assemblies with the components mounted on the respective machine shafts.

It must be ensured that the surface where the cardan rotating arm bracket is to be mounted is clean, smooth, cylindrical, even and provides the necessary surface contact. Should the surface be painted, ensure that paint is stripped off the four areas with contact to the bracket 'V' frame.



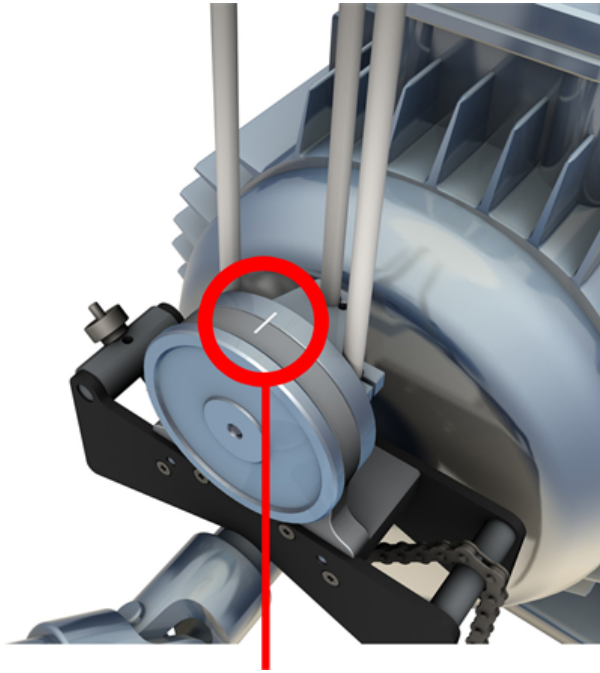
- **(1)** Cardan rotating arm bracket for mounting sensor
- **(2)** Large chain type bracket for mounting laser

Mounting laser, sensor and RF module

1. Mount the laser on the support posts of the large chain type bracket, and then mount an anti-torsion bridge on the laser support posts to provide the necessary rigidity to the long support posts.
2. Mount the sensor and the RF module on the support posts of the cardan rotating arm bracket then mount an anti-torsion bridge on the sensor support posts to provide the necessary rigidity to the long support posts.

Mounting the brackets on the shafts

Mount the large chain type bracket holding the laser on the shaft of the left machine (usually reference machine), and the cardan rotating arm bracket holding the sensor and the RF module on the shaft of the right machine (usually moveable machine) – as viewed from normal working position. Ensure that both markings on the rotating arm are in line.

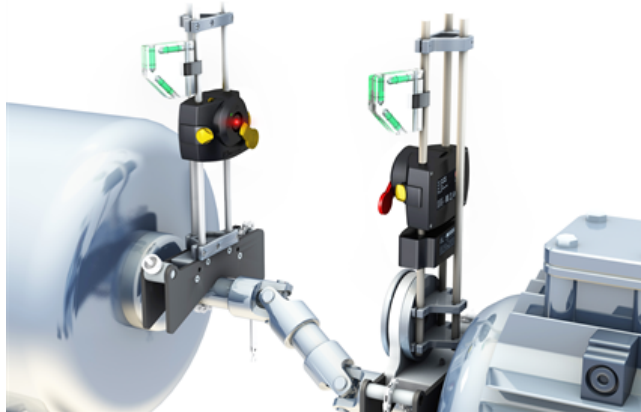


Use the external inclinometers to position both brackets at the same rotational angle. Remove the external inclinometers, then switch the laser on.



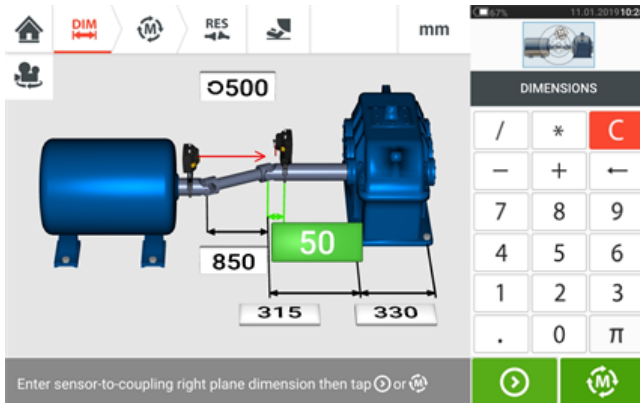
WARNING


Do not stare into the laser beam!.



Cardan shaft alignment - Rotating plane measurement procedure

1. Switch sensor, laser and the touch device on, then proceed to set up the machines.

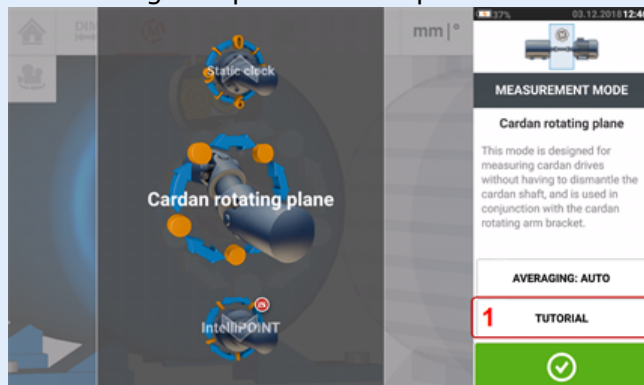


2. After setting up the machines and entering all required machine dimensions, tap  to proceed with measurement.



Note

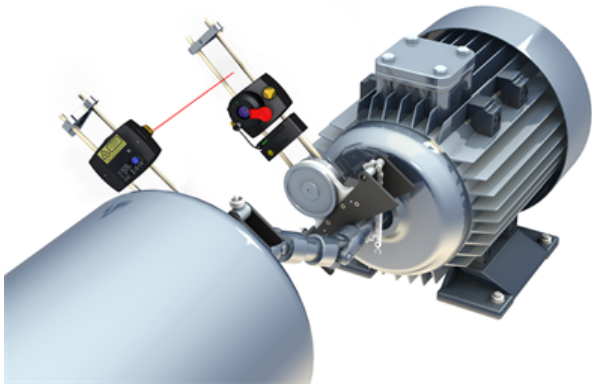
'Cardan mode' (cardan rotating plane) is the default measurement mode for cardan shafts. It is recommended that users familiarize themselves with the steps required for the rotating arm procedure. Tap **1** to access the available tutorial.



Taking measurements

In a crowded plant, it is necessary to determine the optimal position to start measurement. The objective is to ensure that the line of sight between the sensor and laser is maintained through as wide a rotational angle as possible when the cardan shaft is rotated in its normal direction of machine rotation.

1. Rotate the cardan shaft in the normal direction of machine rotation to the first measurement position.
2. Loosen the rotating arm wheel, then rotate the frame with the support posts until the laser beam strikes the middle sensor support post.
3. When the laser beam strikes this support post, retighten the rotating arm wheel.

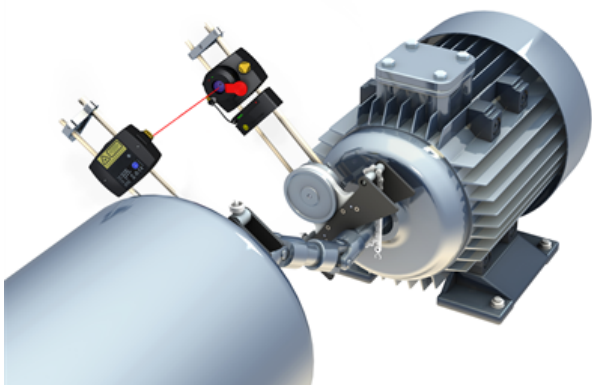


4. Loosen the sensor by undoing the yellow locking knobs, and then slide the sensor up and down the support posts to ensure that the laser beam strikes the center of the red dust cap.
5. Fasten the sensor at this position by tightening the yellow locking knobs, and then open the sensor aperture so that the laser beam strikes the aperture.



Note

DO NOT touch the two yellow beam position thumbwheels.



6. The laser beam should now be apparent in the laser adjustment screen.



7. Once measuring has stabilized, the letter 'M' appears below **1** as shown in the above screen.



Note

For this measurement procedure automatic measurement after stabilization must be disabled in [default settings](#).

8. Tap 'M' to take the measurement point.

9. Cover the sensor aperture, then rotate the cardan shaft approximately 10° - 20° to the next measurement point.



Note

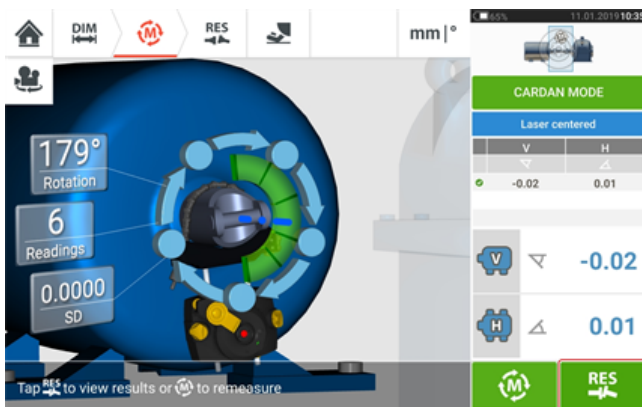
Determine this position depending on the accessible angle of rotation, and the minimum requirement of five measurement points through a rotational angle greater than 60°.

10. Repeat steps 2 to 8 for all necessary measurement points.



Note

Taking measurements at points evenly distributed along the rotational arc has a positive influence in the quality of the measurement attained.



11. Tap  to view cardan alignment results.



Cardan shaft alignment – Using cardan offset bracket

Cardan offset brackets

Two types of cardan offset brackets are available.

- The large type allows precise measurement of machines joined by cardan shafts over distances of up to 10 m (33 ft) and shaft offsets of up to 1000 mm (39 3/8 in.).
- The smaller type also referred to as Lite, allows precise measurement of machines joined by cardan shafts over distances of up to 3 m (10 ft) and shaft offsets of up to 400 mm (15 3/4 in.).
- "Mounting cardan offset bracket lite (sensALIGN 5 EX laser)" on page 141

**Note**

Both sets of cardan offset brackets (large and lite) may be used with sensALIGN 5 sensor/laser combination.

Mounting large cardan offset bracket



Note

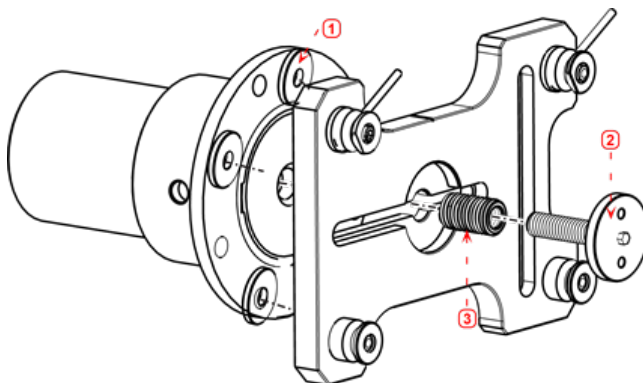
sensALIGN 5 laser may also be used with the large cardan offset bracket. When mounting and adjusting the sensALIGN 5 EX laser, please refer to "Mounting and adjusting the sensALIGN 5 EX laser" on page 143

Mounting the large cardan offset bracket and adjusting laser

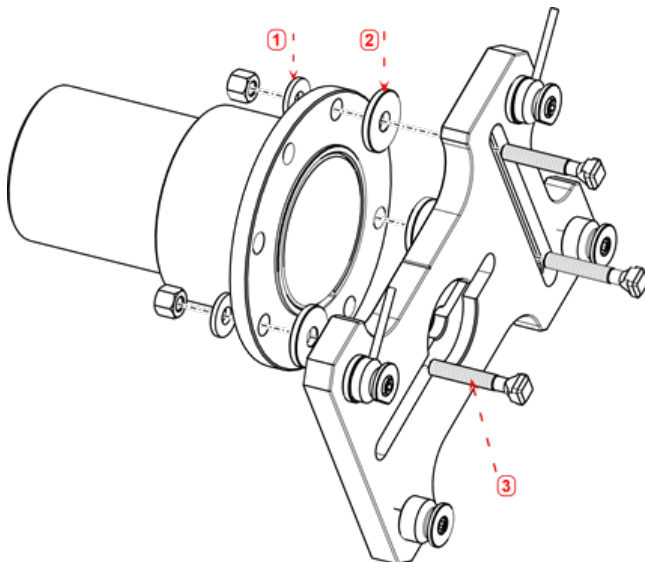
Mounting bracket

1. Mount the faceplate on the face of the coupling using the bolts supplied. The bracket is usually mounted on the coupling face of the non-rotatable shaft, for example, the roll in a paper mill. Two different mounting arrangements are available:

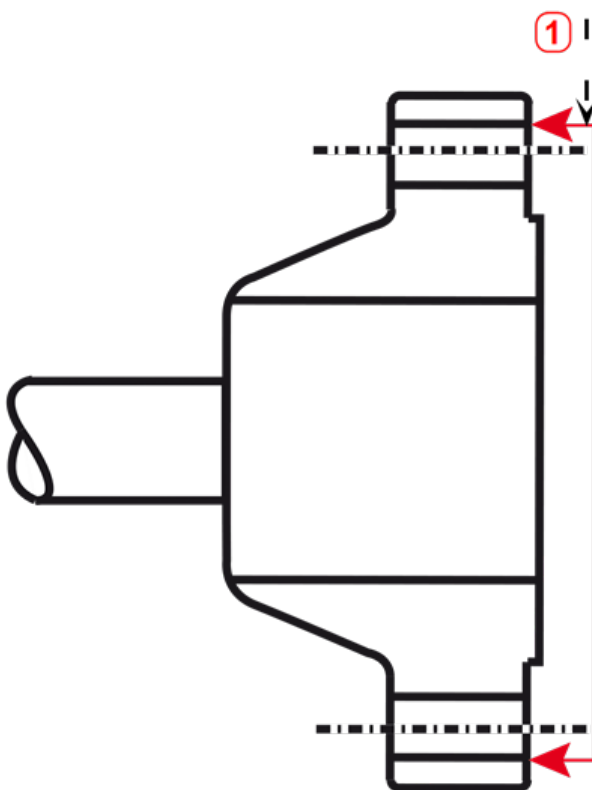
- If the shaft end or coupling face has a threaded hole in its center, the easiest and most rigid mounting method is to use the large center bolt as shown below. A thread adapter may be used as shown to fit the center bolt to larger bores.



- **(1)** Spacer
- **(2)** Center bolt – loosened and tightened using a spanner with a 17 mm (43/64") opening
- **(3)** Thread adapter
- The faceplate may also be attached to the coupling face using the three T-nut bolts, forming a three-point mounting.



- (1) Washer
- (2) Spacer
- (3) T-nut bolt



- (1) Reference surface

This coupling example has a raised face flange. The provide spacers are used to create a three-point plane to ensure that the faceplate and the coupling surface are joined together.

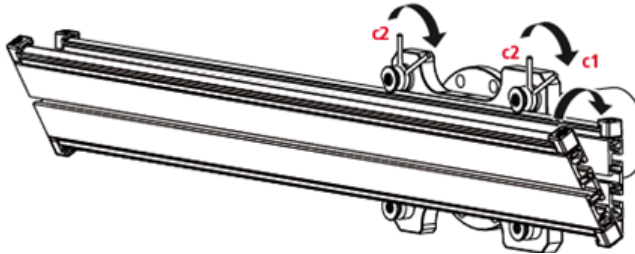


Note

Do not bolt down the faceplate as the laser is still to be adjusted.

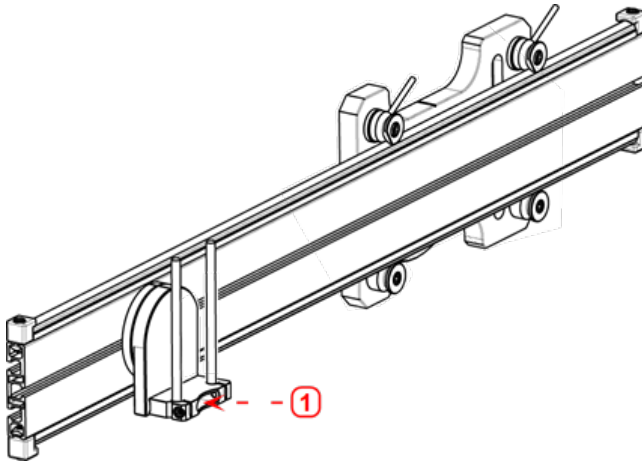
If the coupling has a raised face, the precision machined spacers are used as shown in order to separate the faceplate from the raised inner section of the coupling face while connecting the faceplate to the coupling face which is the reference surface.

2. Place the rail in the faceplate as shown below (c1), then use the two top levers (c2) to tighten the slide into place. Ensure that the center groove on the rail faces outwards.



Mounting the laser holder assembly on the rail

1. Loosen the handwheel slightly, then slide the laser holder assembly down the center groove of the rail.



- (1) Laser holder

Mounting and adjusting laser

For mounting and adjusting the sensALIGN 5 EX laser, please refer to "Mounting and adjusting the sensALIGN 5 EX laser" on page 143

Adjusting the laser beam to the machine rotational axis

For adjusting the sensALIGN 5 EX laser beam to the machine rotational axis, please refer to "Adjusting the sensALIGN 5 laser beam to machine's rotational axis" on page 144

Positioning laser and mounting sensor for measurement

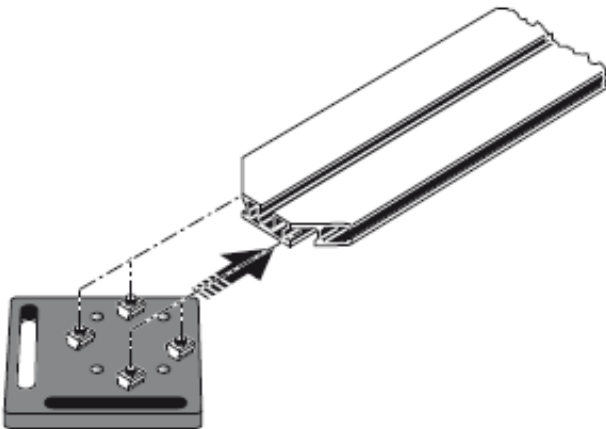
For positioning sensALIGN 5 EX laser and sensor for measurement, please refer to "Positioning sensALIGN 5 EX laser and mounting sensALIGN 5 EX sensor for measurement" on page 145

Mounting cardan offset bracket lite (sensALIGN 5 EX laser)

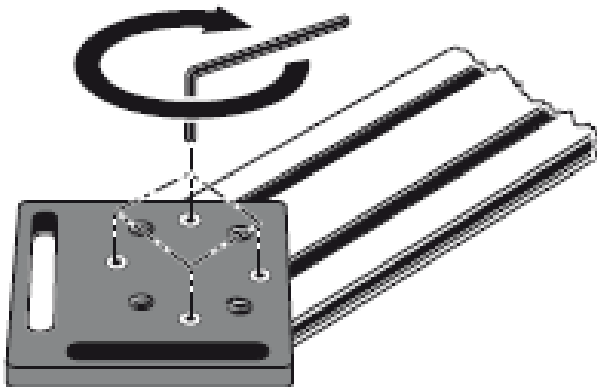
Mounting the cardan offset bracket lite and adjusting sensALIGN 5 laser

Mounting the faceplate to the rail

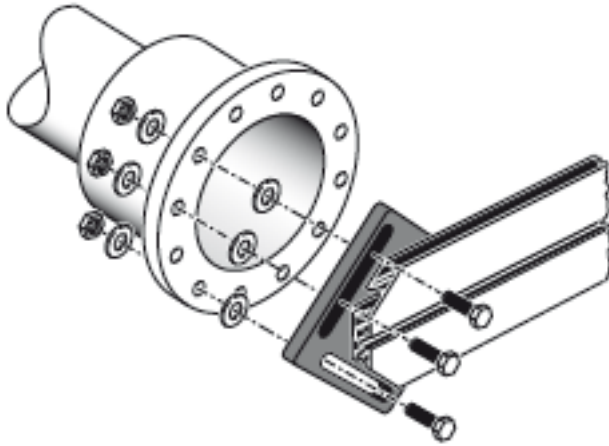
1. Slide the the faceplate down the rail as shown below. The four T-nuts should sit in the grooves.



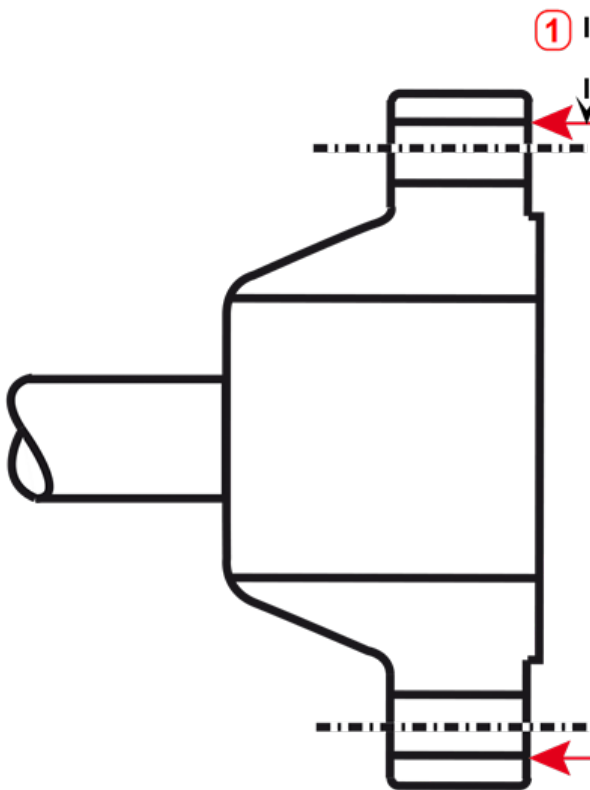
2. After positioning the faceplate on the rail, tighten the four socket head screws using the provided M5 allen key.



3. Mount the bracket assembly to the coupling face of the non-rotatable shaft. If the coupling face has a raised rim, the precision machined spacers are used as shown below in order to separate the bracket faceplate from the coupling face.



- (Without the spacers, there would be no direct contact between the faceplate and the coupling surface surrounding the bolt holes – exactly the location where the faceplate and coupling are being joined.)



- **(1)** Reference surface
- The coupling shown above has a raised face flange. The provided spacers are used to create a three-point plane to ensure that the faceplate and the coupling face, which is the reference surface are joined together.

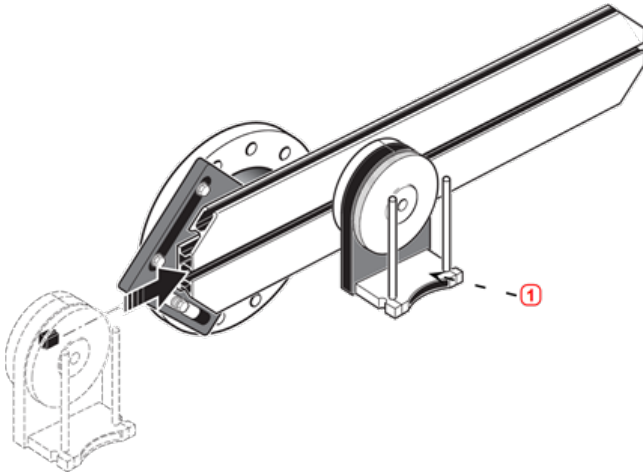


Note

The center part of the coupling face must not be used as a reference surface.

Mounting the laser holder assembly on to the rail

1. Loosen the handwheel slightly, then slide the laser holder assembly down the center groove of the rail, with the T-nut acting as a guide.

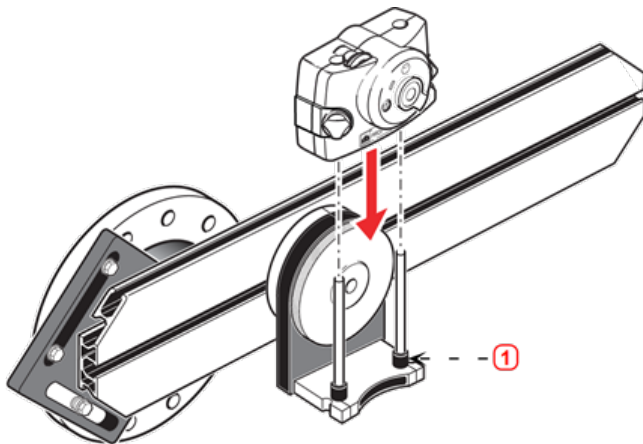


- **(1)** Laser holder

Mounting and adjusting the sensALIGN 5 EX laser

In this step, the laser beam is adjusted such that it is roughly colinear to the rotational axis of the laser holder assembly.

1. Slide the two black distance sleeves down the support posts.
2. Slide the laser onto the posts until it rests on the distance sleeves.



- **(1)** Distance sleeve (black)

3. Mark a set of target crosshairs on the shaft rotation centerline of the other machine coupling (if the flange has a center hole, a temporary target surface may be affixed to the hole).

4. Switch on the laser and adjust the beam to strike the center of the target on the opposite coupling:

- The objective is to adjust the laser beam such that it is roughly colinear to the rotational axis of the laser holder assembly; this will make it possible to make fine adjustments to the laser holder assembly's position afterwards, without having to realign the laser beam itself.

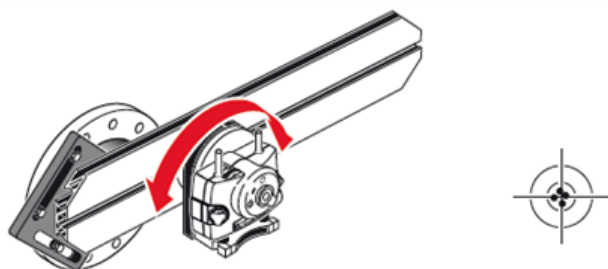
**Note**

The distance sleeves (black) influence the offset by positioning the laser beam on the same axis as the rotational axis of the laser holder assembly.

- The two yellow beam position thumbwheels are used to adjust the angular position of the laser beam. By rotating the laser assembly holder, the laser beam traces an 'approximate' circle. If the 'approximate' circle is a single dot at the center of the target, then the laser beam has been adjusted correctly. If that is not the case, repeat the laser beam adjustment process until the 'approximate' circle corresponds to a 'single dot' position.

**Note****sensALIGN 5 laser adjustment tip:**

If the beam describes a circle rather than a dot at the target when rotating the laser holder assembly, then note how big the circle is and use the yellow adjustment thumbwheels to move the laser beam back by half the distance it has moved when rotating the laser holder assembly 180° from its start position. Do this both vertically and horizontally. When correctly adjusted, you should be able to rotate the laser holder assembly a full 360° without the laser dot moving from the target center.

**Note**

As soon as a single dot position has been achieved, do not touch the laser thumbwheels.

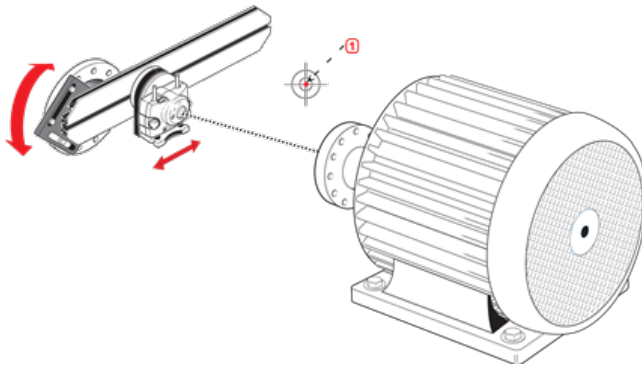
Adjusting the sensALIGN 5 laser beam to machine's rotational axis

In this step, the laser holder assembly is adjusted on the bracket such that the laser holder rotational axis is colinear with the rotational axis of machine to be aligned (which could be a motor or a gearbox).

**Note**

During this procedure, DO NOT touch the yellow laser beam position thumbwheels.

1. Carry out the vertical and horizontal adjustment of the laser holder assembly by sliding it horizontally through the bracket rails and positioning it vertically by rotating the bracket.



- **(1)** Laser dot

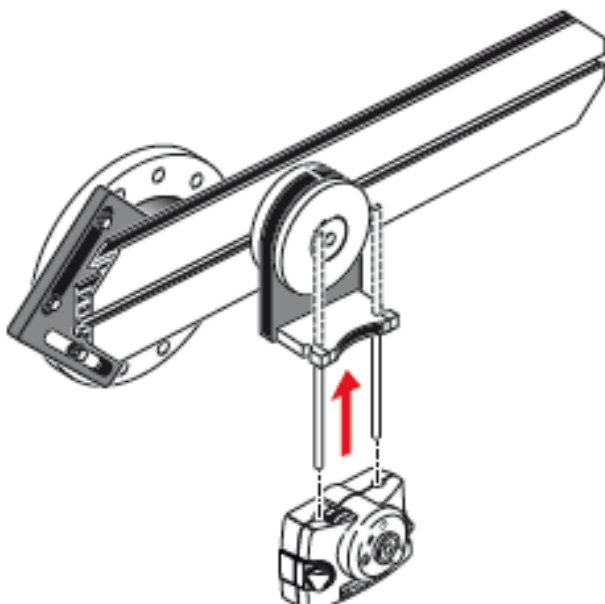
2. Repeat the above procedure until the laser beam strikes the center of the target placed on the rotational axis of machine to be aligned.

3. Once the laser beam has been centered on the target, tighten the faceplate on the coupling face using the provided hexagon socket head screws.

Positioning sensALIGN 5 EX laser and mounting sensALIGN 5 EX sensor for measurement

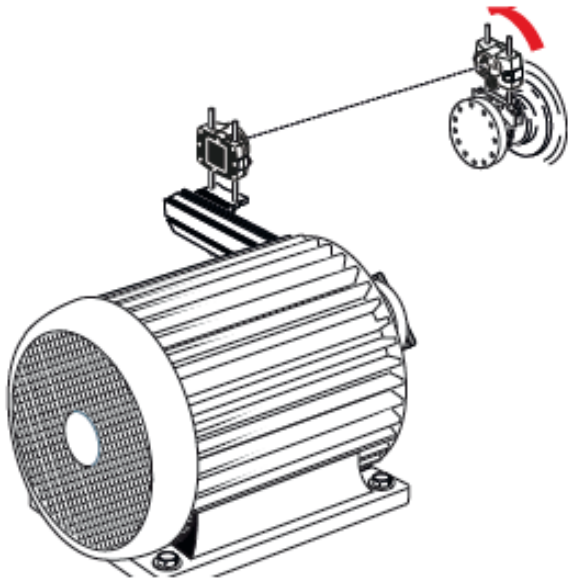
In this step, the laser is remounted on the underside of the laser holder while the sensor is mounted on the shaft of the machine to be aligned.

1. Switch off the laser and remove it from its holder.
2. Using the provided M4 Allen key, loosen the support posts then slide them through the laser holder base so that they protrude from the other side.



3. Retighten the M4 Allen screws to secure the support posts, then remount the laser onto the support posts.

4. Use the chain-type bracket or appropriate magnetic brackets to mount the sensor on the shaft of the machine to be moved (such as the motor or gearbox). The sensor is aligned to the laser by pushing or sliding the bracket supporting the sensor.



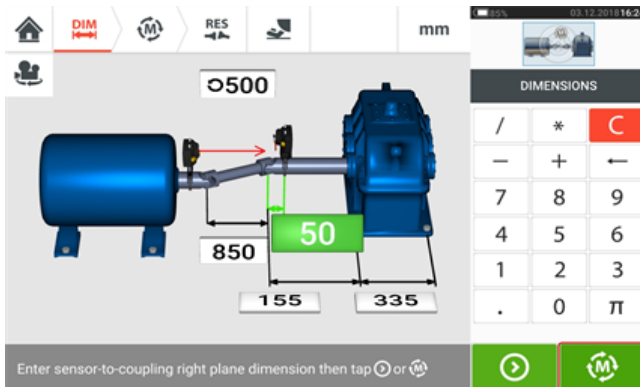
Note


DO NOT touch the laser or its laser position thumbwheels.

Cardan shaft alignment measurement procedure

This measurement procedure is used in conjunction with the cardan offset bracket. The cardan shaft joining the machines must be dismantled during measurement.

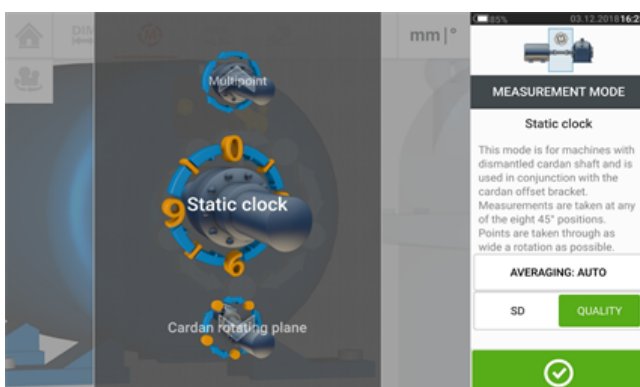
1. After mounting the cardan offset bracket and the measuring components, and then adjusting the laser, switch the touch device on, then proceed to set up the machines.




2. After setting up the machines and entering all required machine dimensions, tap  to proceed with measurement.





3. Tap **1** to select the desired measurement mode. In this case, the required measurement mode is "Static clock".

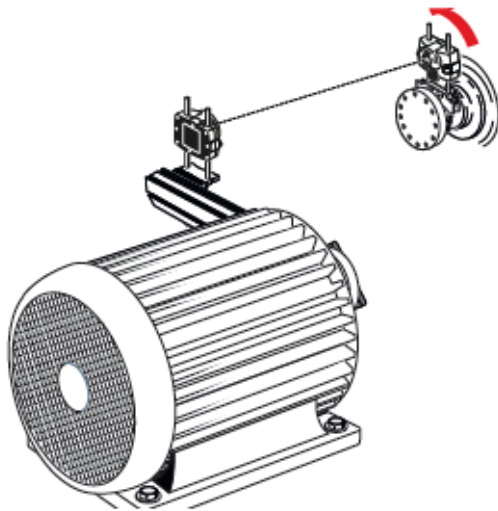




4. Tap  to continue with static clock measurement.



 **Note**
 Other measurement modes for cardan shafts when using sensALIGN 5 sensor and laser can be either multipoint or the cardan mode measurement.

5. Tap either the pulsating **M** (2) or  (3) to take initial measurement point.
6. Rotate the sensor and the laser to the next measurement position.




7. Use  or  to position the displayed laser at the desired measurement position, then tap the pulsating **M** to take measurement at the selected clock position.




8. Repeat steps 4 and 5 to take measurements in at least three clock positions over at least 70° of rotation. (Taking more position measurements improves the reliability of results.)



9. When enough measurement points over at least 70° rotation have been taken, tap  to stop measurement.



10. Tap  to view cardan alignment results.

Evaluation and alignment

Offset has no real influence in the alignment condition but any angularity at the rotational axes must be corrected.



As only angularity must be corrected in cardan shaft alignment, results displayed show only foot values for one pair of feet. Angularity may be presented in mrad or degrees. Cardan shaft units are set under default settings in configuration.




Note

A PRÜFTECHNIK cardan shaft tolerance table is available for $1/2^\circ$ and $1/4^\circ$ limits. The required tolerance type may be set under default settings in 'Configuration'.

Out of tolerance machines may be repositioned with the help of the Live Move function.

Best practice

Mounting sensor and laser

- >> The 'Dimensions' screen shows the sides where the sensor and laser are to be mounted. If necessary, use , the "Camera" icon to rotate the view on the screen to allow machines be viewed as they physically appear.
- >> Mount the brackets directly on the shafts or couplings.
- >> Mount sensor and laser as low as possible on the supplied support posts. The couplings must not block the path of the laser beam.
- >> Mount laser on the machine designated stationary and sensor on the machine designated moveable.
- >> Both sensor and laser must not touch one another or the machine casings during shaft rotation.

Entering dimensions

- >> Dimensions taken to within ± 3 mm [$\pm 1/8$ in.) are acceptable.
- >> When entering the dimension between the front and back feet, use the distance between the center of the two foot bolts.

Initializing sensor

- >> Should "communication error" occur, tap detector area below the hint "[Communication error](#)" then tap "Sensor list" to check whether the sensor has been detected.

Causes that may influence measurement

- >> Incorrect or loose mounting of bracket frame, support posts
- >> Incorrect or loose mounting of sensor and laser on the support posts
- >> Loose machine anchor bolts
- >> Unstable or damaged machine foundation
- >> Mounted components strike machine foundation or machine casings or frame during shaft rotation
- >> Mounted components moved during shaft rotation
- >> Uneven shaft rotation
- >> Change in temperature within machines
- >> External vibration from other rotating machines

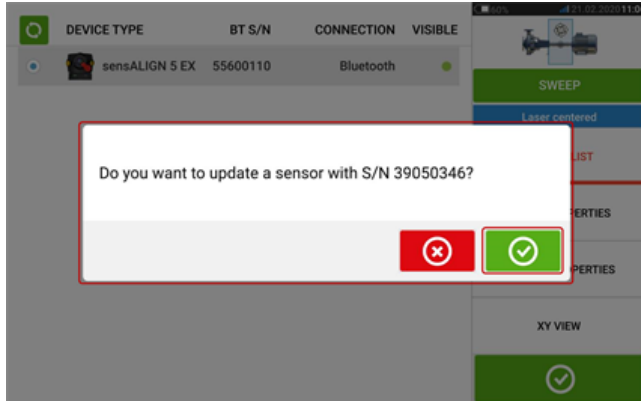
Results and Live Move


- >> V is the vertical orientation of the machines viewed from the side.
- >> H is the horizontal orientation of the machines viewed from the top.
- >> The foot results which are used in correcting misalignment are position values with respect to the reference machine.
- >> The bold colored foot tolerance arrows show the direction and magnitude in which to move the machine. The color code also shows the attained alignment tolerance.

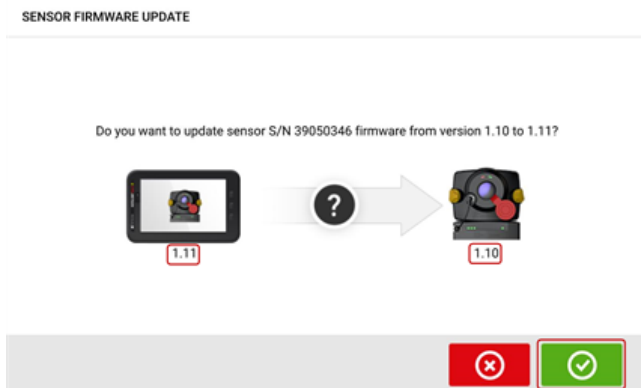
sensALIGN 5 EX sensor firmware update


Updating sensor firmware to a newer version

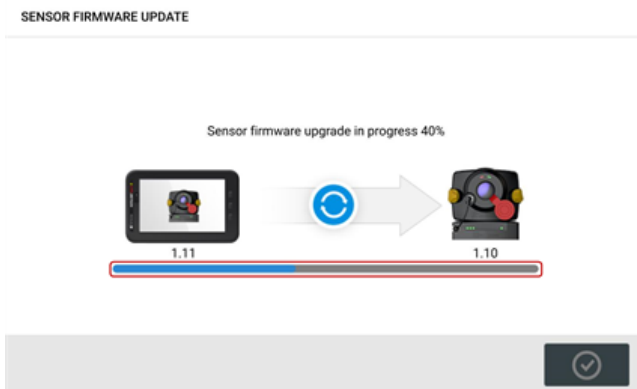
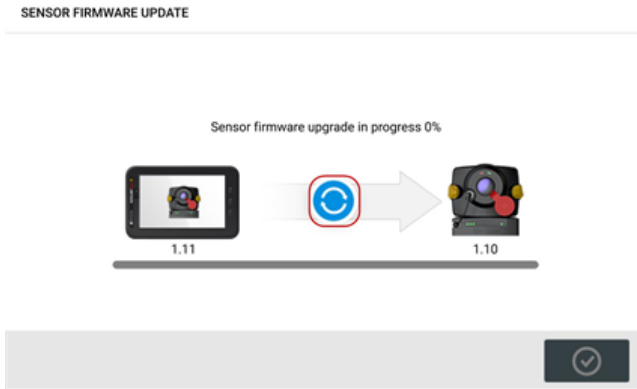
It is possible to carry out a sensor firmware update directly via the rugged touch device. If a sensor with an older firmware version is connected via Bluetooth to the rugged device, a sensor firmware update notification appears on the display.



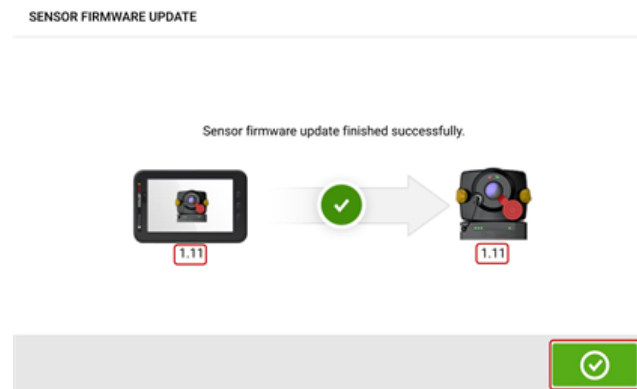
It is recommended to update the sensor firmware. Tap  to proceed to update the sensor. The following sensor firmware update screen appears.




The screen shows that a newer sensor firmware version is available within the rugged touch device. Tap  to update the sensor connected via Bluetooth.



Once the update process is successfully completed, the following screen appears.

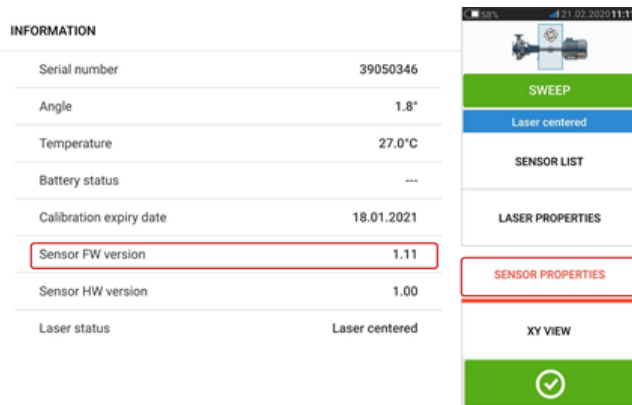


The sensor has now been updated to the newer version available on the rugged touch device.

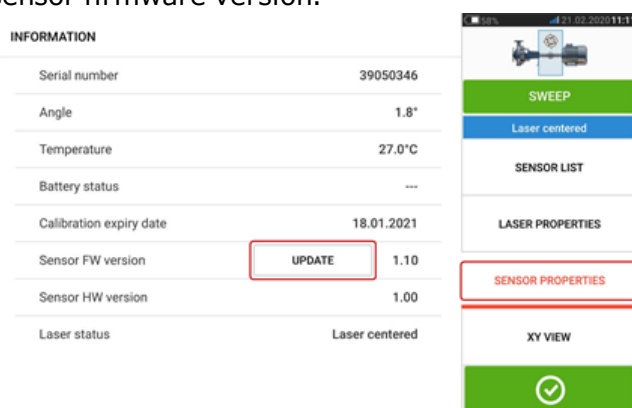
Tap  to exit the update screen.

The new sensor firmware version appears under "Sensor properties" which is accessed by tapping either sensor area **(1)** in the measurement screen.





If the sensor firmware update is not carried out when the notification appears, the update action may be initiated via "Sensor properties". An "UPDATE" hint appears next to the older sensor firmware version.



Tap "UPDATE" to proceed with the sensor firmware update.



Note

The sensor firmware update notification continues to appear once per day until the firm-ware update is completed.

Notification on sensor and laser calibration



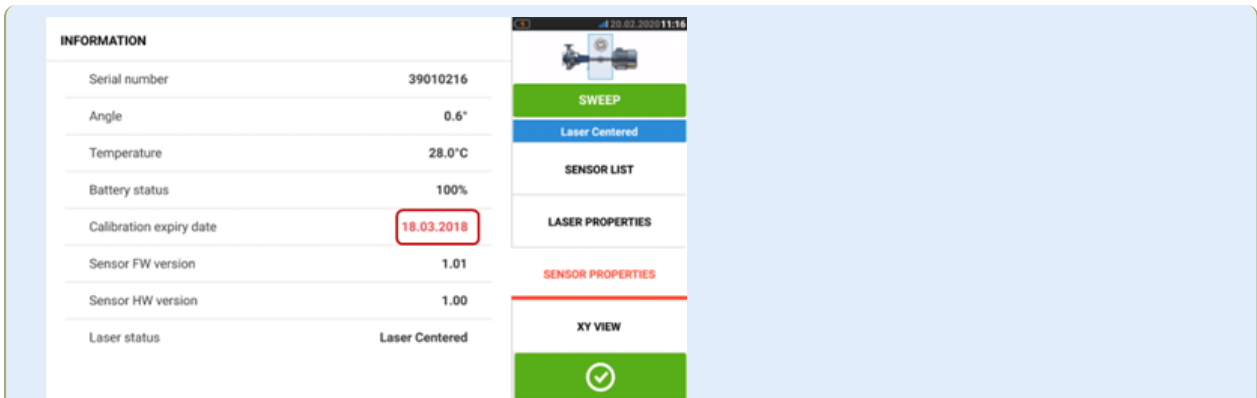
Note

The calibration accuracy of both the sensor and the laser should be checked every two years as indicated on the round label affixed to the back of the respective component. Both sensor and laser should be returned to an authorized PRÜFTECHNIK service center for calibration checking and inspection. You may contact your local PRÜFTECHNIK representative for assistance or visit www.pruftechnik.com.

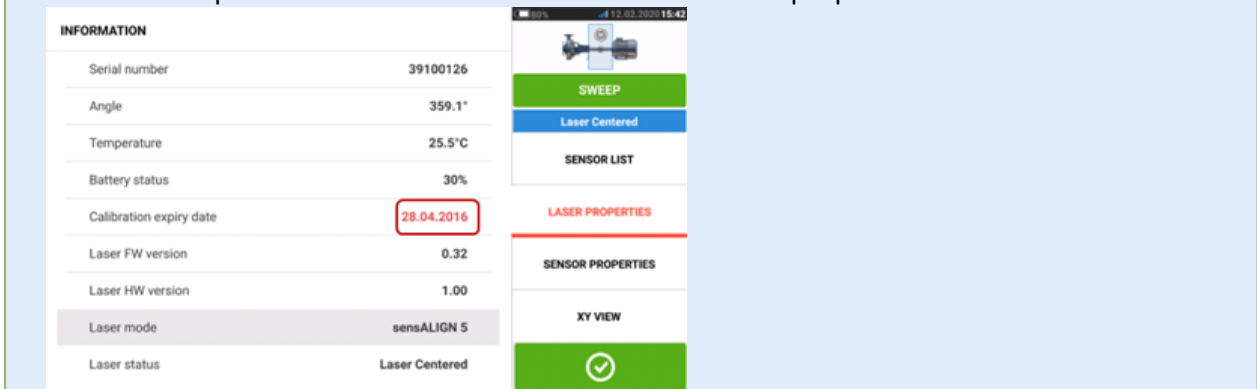


Note

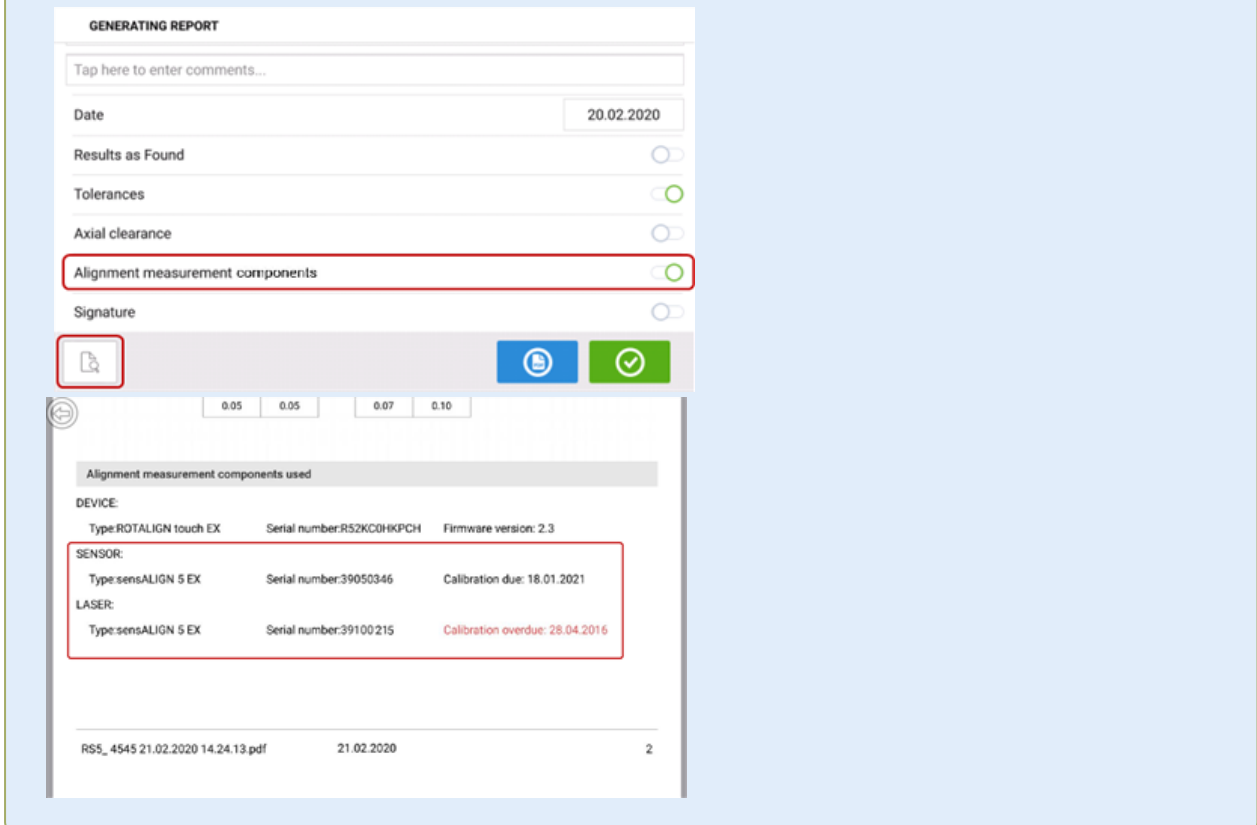
The sensor calibration due date is also found under "Sensor properties".



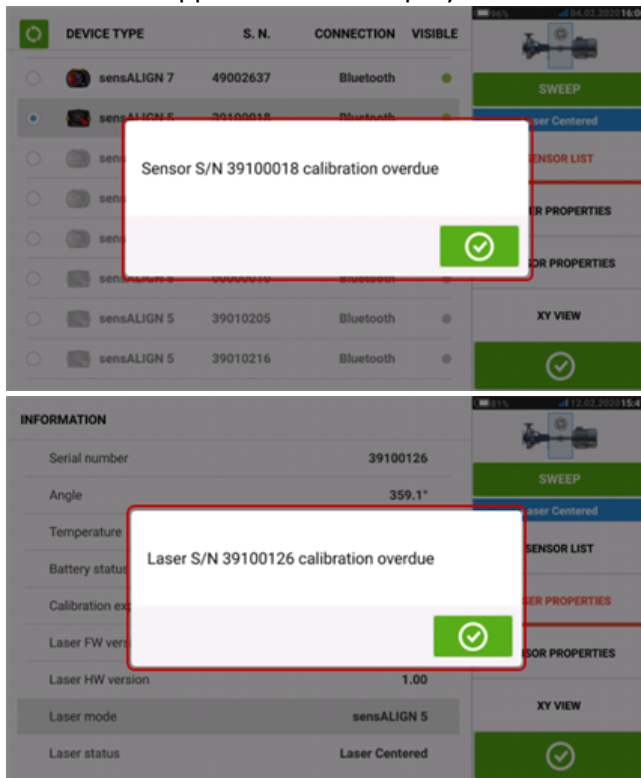
The laser inspection due date is also found under "Laser properties".




If the calibration due date has expired, the due date will be highlighted red. Both sensor and laser calibration due dates will also appear on the asset measurement report if the "Generating report" menu item "Alignment measurement components " is activated.



If the calibration due date of sensor and/or laser have expired and the components are connected via Bluetooth or cable to the rugged touch device, the corresponding calibration expiry notification appears on the display.

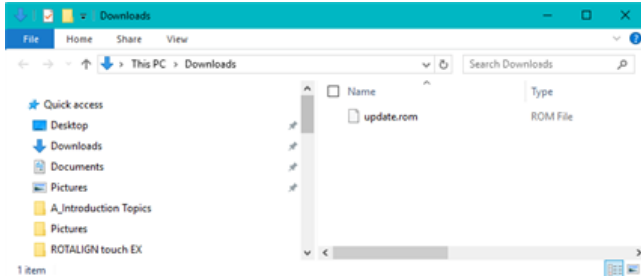


Tap  to close the notification.

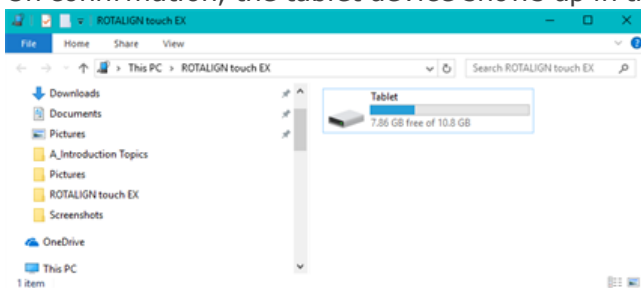
Appendix

Updating ROTALIGN touch EX to a newer firmware version

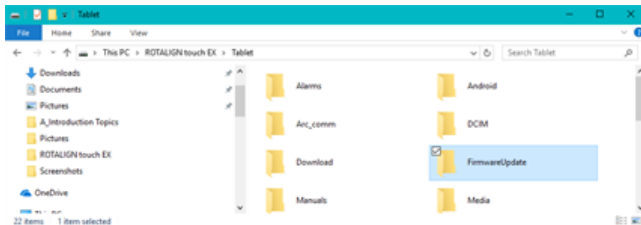
- Download the update file to the desired directory on a PC.



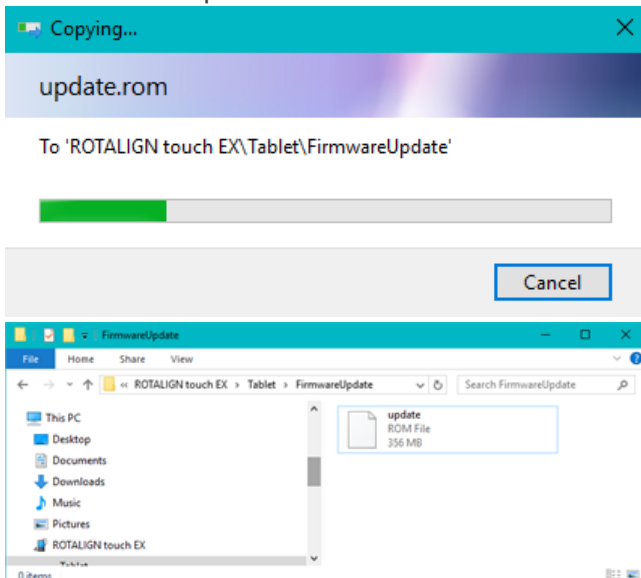
- Switch the tablet device on then connect it to the PC. A hint to allow the Windows PC access the tablet device appears.
- On confirmation, the tablet device shows up in the File Explorer.



- Double-click "Tablet" to access folders in the tablet device.




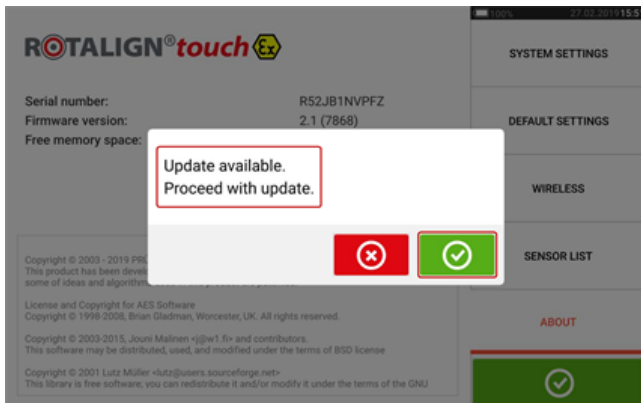
- Transfer the "update.rom" file to the tablet device folder "FirmwareUpdate".





- After the update file has been copied to the "FirmwareUpadte" folder, disconnect the tablet device from the PC. The following hint appears.



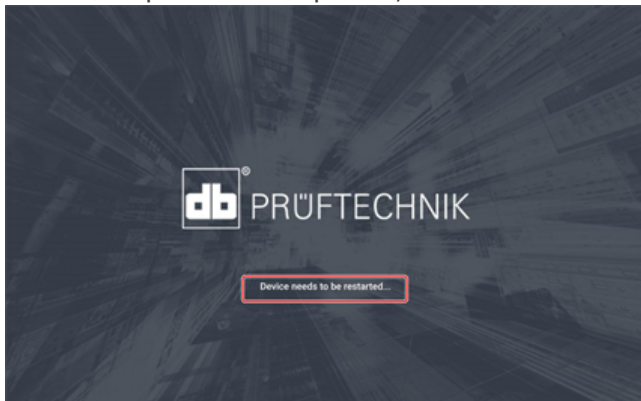
 **Note**
DO NOT tap the device or press any of the hard keys. Wait for the next hint to appear.



- Tap  to proceed with the firmware update

 **Note**
Follow all the update instructions carefully, and confirm all requested installations.

- Once the update is completed, a hint to restart the tablet device appears.

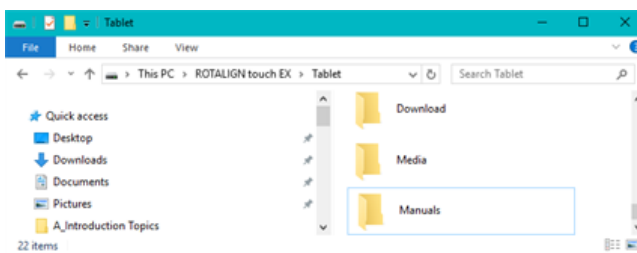


- Press and hold down the power key briefly. "Power off" and "Restart" icons appear on the display.
- Tap "Restart". The update is now completed and may be checked and confirmed in the "about" menu item in configuration after the restart.



Documentation

This on-board help and other relevant and related customer documents are saved as PDF files in the folder "Manuals" within the ruggedized tablet. To access this folder, the ruggedized tablet is connected to a Windows PC. Allow the Windows PC to access the ruggedized tablet and then double-click "Tablet" to access the required folder.



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Technical data – sensALIGN 5 EX sensor

sensALIGN 5 EX sensor	
Type	5-axis sensor: 2 planes (4 displacement axes and angle)
LED indicators	2 LEDs for laser adjustment
Environmental protection	IP 65 (dustproof and water jets resistant), shockproof Relative humidity: 10% to 90%
Ambient light protection	Yes
Temperature range	Operation: -10°C to 50°C (14°F to 122°F) Storage: -20°C to 60°C (-4°F to 140°F)
Dimensions	Approx. 105 x 74 x 53 mm (4 9/64" x 2 29/32" x 2 3/32")
Weight	Approx. 220 g (7.7 oz)
Measurement range	Unlimited, dynamically extendible (US. Patent 6,040,903)
Measurement resolution	1 µm (0.04 mil) and angular 10 µRad
Measurement rate	Approx. 20 Hz
Measurement accuracy (avg)	> 98 %
CE conformity	Refer to the CE compliance certificate in www.pruftechnik.com
Intrinsic safety	II 2G Ex ib IIC T4 Gb, Zone 1 Certificate numbers: EPS 15 ATEX 1074X; IECExEPS 15.0067X
Electrical data	
<p>Only for connection with certified equipment for power supply and data acquisition. The following intrinsic safe values (floating ground) shall never be exceeded:</p>	

Supply circuit	$U_{0,v} = 6 \text{ V}$
Data circuit	$U_{0,d} = +6 \text{ V}$
Output current for both circuits in summary	$I_{0,v} + I_{0,d} = 215 \text{ mA}$
Output power for both circuits in summary	$P_{0,v} + P_{0,d} = 1.25 \text{ W}$
Supply characteristic	rectangular
Maximum permissible external capacitance for $L_o < 2 \mu\text{H}$	$C_o = 30 \mu\text{F}$

Internal capacitance of sensALIGN 5 EX sensor	$C_i = 25.2 \mu\text{F}$
---	--------------------------

Internal inductance of sensALIGN 5 EX sensor	$L_i = 0 \mu\text{H}$
--	-----------------------

The supply circuit and the data circuits must be considered to be internally connected. It must be ensured that safety-relevant circuit parts are never damaged by feeding back power to the connected devices.

For connection with equipment for power supply and data acquisition, e.g. the following devices provided by PRÜFTECHNIK:	RF module EX, type ALI 4.621 EX
--	---------------------------------

Technical data – RF module

RF module	
Type	2.4 GHz, Class 1 connectivity, transmitting power 100 mW Contains FCC-ID POOWML-C40
Transmission distance	Up to 10 m [33 ft.] direct line of sight
LED indicators	1 LED for wireless communication 3 LEDs for battery status
Power supply	2 x 1.5 V IEC LR6 ("AA") batteries Only use Duracell Industrial ID 1500 or Energizer E91 Operating time: 14 hours typical use (based upon an operating cycle of 50% measurement, 50% standby)
Temperature range	Operation: -10°C to 40°C (14°F to 104°F)
Environmental protection	IP 65 (dustproof and water jets resistant), shockproof
Dimensions	Approx. 81 x 41 x 34 mm (3 1/8" x 1 11/16" x 1 5/16")
Weight	Approx. 133 g (4.7 oz.) including batteries and cable
EU declaration of conformity	Refer to the EU declaration of conformity in www.pruftechnik.com
Intrinsic safety	II 2G Ex ib IIC T4 Gb, Zone 1 Certificate number: IECEx ZLM 11.0009; ZELM 11 ATEX 0474
Electrical data	Maximum transmission power 282 mW
External circuits	
Interface circuit: (plug X1 pins 1-4)	In Type of Protection Intrinsic Safety Ex ib IIC Only for the connection of certified, intrinsically safe equipment/sensors without own energy source
Maximum values:	U _o = 5.9 V I _o = 200 mA P _o = 1.2 W trapezoidal characteristics
Maximum permissible external capacitance	Co = 30.64 µF
Maximum permissible external inductance	Lo = 2 µH

RF module			
	The value for the max. permissible external inductance is specified under consideration of EN 60079-11 section 10.1.5 in a way that the total inductivity is smaller than 1 % of the permissible value with respect to figure A.6 of EN 60079-11 and is therefore negligible. For a combination of external inductivity and capacity, the given maximum values remain valid.		
	Or	$U_i = +12\text{ V}$ $I_i = 200\text{ mA}$ $P_i = 1.2\text{ W}$	
	Maximum effective internal capacitance		$C_i = 360\text{ nF}$
	Maximum effective internal inductance		$L_i \approx 0\text{ }\mu\text{H}$
	Or when connected to the following sensors:		
	PRUFTECHNIK sensor type	EC type examination certificate	IECEX certificate
	ALI 12.100 EX	TUV 07 ATEX 554148	IECEX TUN 08.0003
	ALI 3.600-2 EX	TÜV 02 ATEX 1974+ Supplement 1	—
	ALI 3.600 EX	TUV 02 ATEX 1974	—
	ALI 3.900 EX	EPS 15 ATEX 1074X	IECEX EPS 15.0067X
Reference	<p>1. It is only allowed to use the prescribed Duracell Industrial ID 1500 or Energizer E91 battery types.</p> <p>2. The single cell is intrinsically safe. A battery change within the hazardous area is permissible.</p> <p>When handling the batteries within the hazardous area proceed with the required carefulness to avoid short-circuiting of the batteries.</p> <p>3. The supply and the transfer of the measured data of the connected equipment/sensor solely takes place via this EX RF module.</p>		

Technical data – sensALIGN 5 EX laser

sensALIGN 5 EX laser	
Type	Semiconductor laser
Power supply	Batteries 2 x 1.5 V IEC LR6 ("AA") Only use Duracell Industrial ID 1500 or Energizer E91 Operating time: 120 hours
Environmental protection	IP 65 (dustproof and water jets resistant), shockproof Relative humidity: 10% to 90%
Temperature range	Operation: -10°C to 50°C (14°F to 122°F) Storage: -20°C to 60°C (-4°F to 140°F)
Dimensions	Approx. 105 x 74 x 47 mm (4 9/64" x 2 29/32" x 1 27/32")
Weight	Approx. 225 g (7.9 oz)
Wavelength	630 – 680 nm (red, visible)
Safety class	Class 2 according to IEC 60825-1:2014 The laser complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.
Safety precautions	Do not look into laser beam
Beam power	< 1mW
Beam divergence	0.3 mrad
CE conformity	Refer to the CE compliance certificate in www.pruftechnik.com
Intrinsic safety	II 2G Ex ib op is IIC T4 Gb, Zone 1 Certificate number: EPS 15 ATEX 1 075; IECEx EPS 15.0068 Optical output power laser (failure) < 35 mW