



USER MANUAL AT

**acoem**



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## WELCOME TO OUR WORLD

*For more than 30 years, ACOEM has helped industries throughout the world to achieve more profitable and sustainable production. We have reached where we are today by having the courage to think beyond the norm and follow slightly unconventional paths. We have had the courage to make mistakes and find new directions. Through our resolve, ambition and knowledge we have become a global player and a leader in innovative, user-friendly reliability solutions.*

## **SUSTAINABLE INNOVATIONS**

During our 30+ years in this industry, we have explored, tweaked and tested more than anyone. Some might say we are incurable innovators whereas others might say that we are highly focused. They both probably have a point. If we had not been devoted and ambitious, we would not have been the first in

the field of laser alignment to have a touch screen. Nor would we have been pioneers in the use of visible lasers and dual measurement heads. Nor would we have been the first to bring a wireless vibration sensor for machine diagnostics. We are now the first to provide a combined alignment and diagnostic solution on standard mobile devices.

Over the years, we have learnt to never compromise on quality, and we are constantly in search of new, unexplored opportunities by combining advanced technology with design and function. By doing so, we have become the leading innovator in our industry. Not only do we minimize wear, production stoppages and costs, we also help save the environment. Natural resources are in short supply and if we can contribute to a more sustainable world by making it a little bit straighter, we could not be happier.

## **TRUE COMMITMENT**

One reason for our success is our solid commitment. We have ensured that we remain attentive to constantly pick up on the needs of the market. Our expert employees and dedicated dealers in over 70 countries are undoubtedly our most important asset. Satisfaction and team spirit are of particular importance to us and are consistently at the top of our priority list. With experience from a wide range of industries and manufacturing processes, we are fully aware of the problems and needs of our end-customers. We are passionate about what we do, and we are driven by the desire to eliminate anything in the industry worldwide that may be even slightly out of line.

## **PURE USABILITY**

Our design and user-friendliness are carefully interwoven. As we develop new products, they also become cleaner, smarter, more functional and more robust. An industrial environment is demanding, infinitely more difficult to work in and inevitably subject to time pressure. There is no place for equipment with unnecessary functions, complicated interfaces and that is difficult to assemble.

Usability and user friendliness mean everything, not only to us but also to our customers. We have designed products that are easy to learn and can be incorporated quickly. By removing non-essential functions, we make life less difficult for our users – and probably a little more difficult for our competitors.

## END USER LICENSE AGREEMENT

The rights to use the software in this product are offered only on the conditions that you agree to all the terms stated below, i.e. the end user agreement. By using this product, you agree to be bound by this agreement. If you do not accept this agreement your sole remedy is to return the entire unused product, hardware and software, promptly to your place of purchase for a refund.

The user is granted a single license to use the software contained in this product. Use is only permitted on the hardware it has been installed on at the time of purchase. The software may not be removed from the hardware. The software contained in the system is the property of ACOEM group, any copying or redistribution is strictly prohibited.

Modifying, disassembling, reverse engineering or decompiling the system or any part thereof is strictly prohibited.

Disclaimer of warranties: To the maximum extent permitted by applicable law, ACOEM and its suppliers provide the software contained in this product 'as is' and with all faults, and hereby disclaim all other warranties either expressed, implied or statutory.

Limited liability: No liability shall exceed the price of the product, and the sole remedy, if any, to any claim shall be a right of return and refund.

ACOEM or its suppliers shall, to the maximum extent permitted by applicable law, not be liable to any indirect, special, incidental, punitive, and consequential damages arising from the use of the system or any part thereof, authorized or unauthorized.

ACOEM group is headquartered in Lyon, France. For more information please visit [acoem.com](http://acoem.com)





# DECLARATION OF CONFORMITY

In accordance with  
2014/35/EU Low Voltage Directive  
2014/53/EU Radio Equipment Directive  
2012/19/EC Waste electrical and electronic  
equipment (WEEE)  
2011/65/EU Restriction of the use of certain  
hazardous substances (RoHS)  
2006/66/EU Battery Directive  
2001/95/EC CE marking directive

## **Type of equipment**

Alignment Tool

## **Brand name or trade mark**

ACOEM

## **Type designation(s)/Model no(s)**

1-1216 M7  
1-1217 S7  
1-1063 P1

## **Manufacturer's name, address, telephone & fax no**

ACOEM AB  
Box 7  
SE-431 21 Mölndal  
Sweden

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

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

**Standard/Test report/Technical construction file/Normative document**

EN 61000-6-3:2007.

EN 61000-6-2:2005, EN 61000-4-2, -3, -4, -5, -6, -11.

EN 61010-1:2010

ISO9001:2015 Ref. No/ Issued by: DNV Certification AB Certification No. 2009-SKM-AQ-2704/2009-SKM-AE-1419.

The laser is classified in accordance with the International Standard IEC-60825-1:2014, USA FDA Standard 21 CFR, Ch 1, Part 1040.10 and 1040.11 except for deviations pursuant to laser notice No. 50, dated June 24, 2007.

The wireless device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions;

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

**Additional information**

The product was CE-marked in 2020.

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

**Date and place of issue**

Mölnadal 2020-04-16

**Signature of authorized person**A handwritten signature in black ink, appearing to read 'Hans Svensson', written in a cursive style.

Hans Svensson, Managing Director



## SAFETY

Retain and follow all product safety and operating instructions. Observe all warnings on the product and in the operating instructions.

Failure to observe the safety pre-cautions and operating instructions can cause bodily injury, fire, and damage to the equipment.

Do not disassemble, modify or use the equipment in other ways than explained in the operating instructions. ACOEM AB will not accept any liability for such use.



## **WARNING!**

Do not mount equipment on running machines and take all appropriate measures to prevent unintentional start-up of machines. Make sure to fully comply with all appropriate shut down procedures, safety measures and regulations at worksite and local regulations regarding safety in a machine environment.

## LASER PRECAUTIONS

The system uses laser diodes with a power output of  $< 1.0$  mW. The laser classification is Class 2.

Class 2 is considered safe for its intended use with only minor precautions required. These are:

- Never stare directly into the laser transmitter.
- Never shine the laser directly into anyone else's eyes.



COMPLIES WITH 21 CFR 1040.10 AND 1040.11  
EXCEPT FOR DEVIATIONS PURSUANT TO  
LASER NOTICE No. 50, DATED JUNE 24, 2007



### CAUTION!

USE OF CONTROLS OR  
ADJUSTMENTS OR  
PERFORMANCE OF  
PROCEDURES OTHER THAN  
THOSE SPECIFIED HEREIN  
MAY RESULT IN HAZARDOUS  
RADIATION EXPOSURE.

Your system complies with the requirements in:

- IEC-60825-1:2007
- British Standard BS EN 60825-1
- DIN EN 60825-1
- USA FDA Standard 21 CFR, Ch 1, Part 1040.10 and 1040.11

## POWER SUPPLY

The sensors are powered by high-capacity rechargeable Li-Ion batteries mounted in the sensors or by the external power unit.



The sensors (M7 and S7) can be connected to their charger and charged while lying in the case. It is important that the lid of the case is open during the charging and that the charger is placed outside the case or else the system will not be charged properly and might be damaged.

Do not expose the power adapter to rain or wet conditions.

Always unplug the charger from the electrical outlet after charging.

Leaving a display unit or a measurement unit with an empty battery for a prolonged time can reduce the capacity of the battery or even damage the battery.

If the system is not used for a long time, charge the batteries to approximately 50-75% before storing the system, if kept in storage repeat this every 3-4 month (if needed).

When used in typical conditions the battery will sustain good capacity for approximately 2-3 years before needing replacement. Contact your sales representative for battery replacement.

The batteries contain safety circuitry to operate safely with the display unit. The unit can therefore only be used with the Li-Ion batteries supplied by ACOEM.

Improper replacement of batteries can cause damage and risk for personal injury.





## **WARNING!**

BATTERY REPLACEMENT SHALL ONLY BE PERFORMED BY AUTHORIZED ACOEM REPRESENTATIVES.

USE OF ANY OTHER BATTERIES THAN THOSE SUPPLIED BY ACOEM WILL CAUSE SEVERE DAMAGE TO THE SENSOR AND CAN CAUSE RISK FOR PERSONAL INJURY!

Handle any batteries with care. Batteries pose a burn hazard if handled improperly. Do not disassemble and keep away from heat sources. Handle damaged or leaking batteries with extreme care. Please keep in mind that batteries can harm the environment. Dispose of batteries in accordance with local regulatory guidelines, if in doubt contact your local sales representative.

Only use the external power adapters supplied by ACOEM for use with the sensors. Using other power adapters can cause damage to the unit and personal injury.

## WIRELESS TRANSCEIVER

The sensors are fitted with Bluetooth wireless transceivers.

Make sure that there are no restrictions on the use of radio transceivers at the site of operation before using the wireless transceivers.



### **WARNING!**

Before using the wireless transceivers make sure that there are no restrictions on the use of radio transceivers at the site. Do not use on aircraft.

## CARE

### PACKING THE CASE



## CLEANING

The system should be cleaned with a cotton cloth or a cotton bud moistened with a mild soap solution, except for the detector and laser window surfaces, which should be cleaned with alcohol.

For the best possible function, the laser diode apertures, detector surfaces and connector terminals should be kept free from grease or dirt.



Do not use paper tissue, which can scratch the detector surface.



Do not use acetone.

The chains on the V-brackets are delivered dry. If the system is used in highly corrosive environments, the chains should be oiled.

## **DATE OF CALIBRATION DISCREPANCY**

Our instruments store the electronic date of the latest calibration of the instrument. Due to production processes and storage time, this date will differ from the date of the calibration certificate. Hence, it is the date of the calibration certificate which is important and that indicates when the next calibration is due.

## APPS

The following apps are available in the AT system.



Horizontal Shaft Alignment



Vertical Shaft Alignment



Pre-Alignment



Download the apps from Google Play or App Store.

The Horizontal Shaft Alignment app and the Vertical Shaft Alignment app work with the sensors M7 and S7.

The Pre-Alignment app works with the Run-Out probe P1.

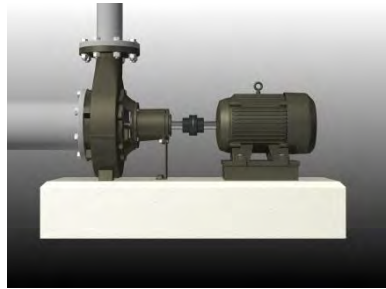




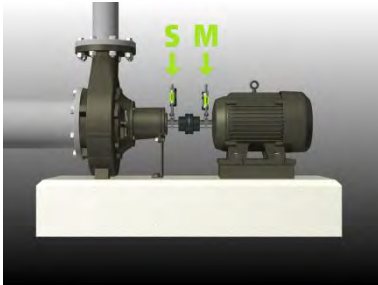
## SHAFT ALIGNMENT HORIZONTAL MACHINES

### INTRODUCTION

Shaft alignment: Determine and adjust the relative position of two machines that are connected, such as a motor and a pump, so that the rotational centers of the shafts are collinear, when the machines are working in a normal operating condition. Correction of horizontal shaft alignment is done by moving the front and the rear pair of one machine's feet, vertically and horizontally, until the shafts are aligned within the given tolerances. A tolerance table is available in the system.



The system has two measuring units that are placed on each shaft by using the fixtures supplied with the system.



After rotating the shafts into different measuring positions the system calculates the relative distance between the two shafts in two planes. The distances between the two measuring planes, distance to the coupling and distances to the machine feet are entered into the system. The display box then shows the actual alignment condition together with the position of the feet. Adjustment of the machine can be made directly, according to the displayed values.

The alignment results can be saved for further documentation purposes.



## PRE-ALIGNMENT FUNCTIONS

To obtain the best possible conditions for shaft alignment, it is necessary to perform some pre-alignment checks. In many cases it is necessary to make these checks in order to obtain precise alignment. It is often impossible to reach the desired alignment results if you do not make any pre-alignment checks.

Before going on site, check the following:

- What are the required tolerances?
- Any offsets for dynamic movements?
- Are there any restrictions for mounting the measuring system?
- Is it possible to rotate the shafts?
- What shim size is needed?

Before setting up the alignment system on the machine, check the machine foundation, bolt and shim condition. Also check if there are any restrictions in adjusting the machine (if e.g. there is enough space to move the machine).

After the visual checks have been performed, there are some conditions that must be considered:

- Check that the machine has the right temperature for alignment.
- Take away old rusty shims (check that you can remove shims).
- Check coupling assembly and loosen the coupling bolts.
- Check soft foot conditions.
- Mechanical looseness.
- Check coupling and shaft run-out.

- Pipe work strain.
- Coarse alignment.
- Check coupling gap (axial alignment).

The Pre-Alignment app can be used for several Pre-Alignment checks.

There is also a Softcheck function in the Horizontal Shaft Alignment app.

## STARTING

Turn on the sensors.

Turn on the tablet.



Start the Horizontal Shaft Alignment app.

Go to settings for connecting the sensors, if they are not already connected.



Settings.

Settings are described in the end of the chapter.

## MOUNTING

The sensor marked "M" should be mounted on the movable machine and the sensor marked "S" on the stationary machine. The sensors shall be assembled on their V-bracket and placed front to front on each side of the coupling.

Hold the V-bracket upright and mount it on the shafts of the measurement object.



Lift the open end of the chain, tension it so that the slack is removed and attach it to the hook.



Firmly tighten the chain with the tensioning screw. Use the supplied tensioning tool. Do not over-tighten. If the shaft diameter is too large the chains can be extended with extension chains.



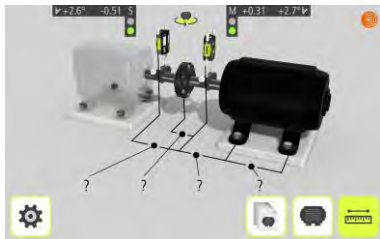
Adjust the height of the sensor by sliding it on the posts until a line of sight is obtained for both lasers. Secure its position by locking both clamping devices on the back of both units.



## MACHINE CONFIGURATION

The screen displays the movable machine.

The traffic lights show green when the laser hits the detector.



Select to enter distances and tolerances or select a pre-defined machine or work order from the machine list.



Touch the distance icon, to enter distances and tolerance.



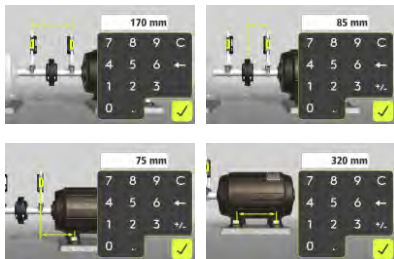
Touch the machine list icon, to select a pre-defined machine or work order.

It is also possible to go to the configuration screen, for configuring the machine.



Go to the configuration screen.

## Measure and enter distances



You must enter all the distances. The distance between the sensors, the distance between the center of the coupling and the M-sensor, the distance between the M-sensor and the first pair of feet and the distance between the first and the second pairs of feet.

## Enter tolerances

Alignment tolerances depend to a large extent on the rotation speed of the shafts. Machine alignment should be carried out within the manufacturer's tolerances.

The tolerances are the maximum allowed deviation from desired values.

The screenshot shows a table with four rows. The first row has a radio button selected. The second row has a checked checkbox. The third and fourth rows have unchecked checkboxes. A yellow checkmark is visible in the bottom right corner of the interface.

	rpm	$\pm$ mm/100	$\pm$ mm
<input type="radio"/>	0-2000	0.08	0.10
<input checked="" type="checkbox"/>	2000-3000	0.07	0.07
<input type="checkbox"/>	3000-4000	0.06	0.05
<input type="checkbox"/>	4000-6000	0.05	0.03

Tolerance Table mm-mode

	rpm	± mils/"	± mils
<input type="checkbox"/>	3600	0.5	2.0
<input type="checkbox"/>	1800	0.7	4.0
<input checked="" type="checkbox"/>	1200	1.0	6.0
<input type="checkbox"/>	900	1.5	8.0



Tolerance Table inch-mode



Select the tolerance to use in the alignment by touching its check box to the left.



Confirm.



## MACHINE LIST



to the top of the list, click on the work order column header.

The machine list shows pre-defined machines and work orders.

Work orders requires connection to the ACOEM Augmented Mechanics Platform. (See Settings and Cloud Synchronization in the end of this chapter.)

It is possible to order the machine list depending on each column status by touching the column header.

For example: In order to bring all overdue work orders that have to be managed urgently

## Pre-defined machines

Pre-defined machines can be created in the configuration screen.

A pre-defined machine is shown with a machine symbol, machine name and creation date.

Touch a machine to expand the view and show more details.



Confirm to measure the selected machine.

Other options in the expanded view.



PDF report.



Delete the machine.

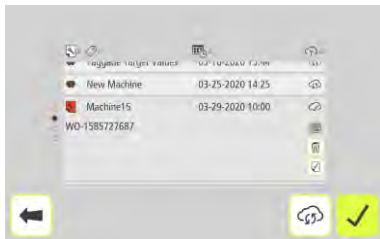


Upload to cloud.

## Work orders

A work order is shown with a work order status symbol, machine name and due date.

Touch a work order to expand the view and show more details.



Confirm to measure the selected work order.

Other options in the expanded view.



PDF report.



Delete the work order.



Close the work order.



Upload to cloud.

### Work order status



Work order to realize,  
not started.



Work order soon overdue  
(<1 week).



Work order closed.



Work order overdue.

### Cloud sync status



Waiting to be synced.

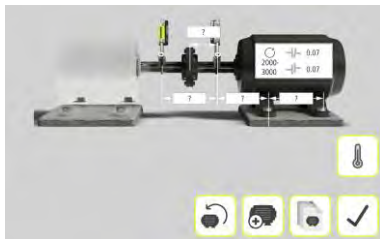


Synced.



Not connected to cloud.

## CONFIGURATION SCREEN

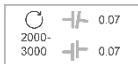


### Distances



Opens window for entering distance.

### Tolerance table



Opens the tolerance table.

### Target Values



Opens Target Values.

### Add New Machine



Adds the pre-defined machine to the machine list.

### Machine List



Opens the machine list.

### Restart



Deletes all entered data and restarts the app.

## Confirm



Confirms the machine configuration.

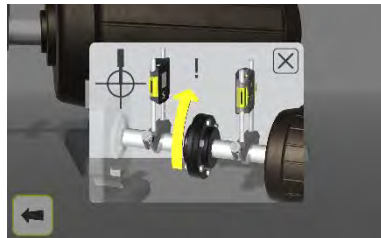
## SOFTCHECK™



Go to Softcheck for checking soft foot conditions.

A soft foot condition needs to be corrected before any alignment takes place. If not, the measurement result will be of no value. It is more or less impossible to establish if there is a soft foot condition without using some kind of measurement tool. The Softcheck application checks each foot and displays the result in mm or mils.

Place the sensors at the 12 o'clock position.



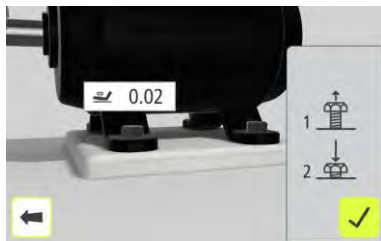
All the distances must be entered, before checking for soft foot.

Check that all foot bolts are firmly tightened.

## Measurement value registration

The application will guide you to the different feet.

The first foot.

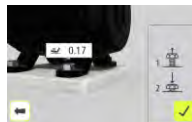


1. Loosen the bolt fully and wait a few seconds.
2. Tighten the bolt firmly, preferably with a torque wrench.
3. Register the measurement value.



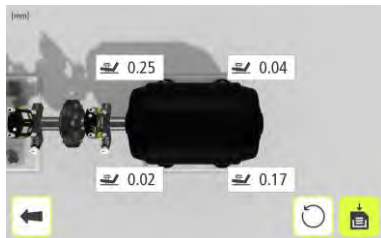
Touch the confirmation icon.

Repeat the procedure at the rest of the feet.





## Measurement result and Corrections



Make the necessary corrections and then check each foot again (the values show approximately how many shims that are needed to eliminate the soft foot).

Re-measurements can be done by touching the re-measure icon to re-measure all feet, or by touching a single foot to re-measure just that foot.



Re-measure all feet.



Re-measure a single foot.

The Softcheck result can be saved separately.



Touch the save icon to save the result.

(The measurement is saved in the app and can be handled further by generating a PDF report.)

## TARGET VALUES



Go to Target Values for entering target values.

(Target Values are reached from the configuration screen.)

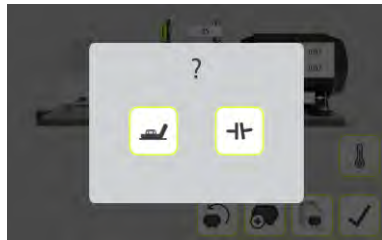
### Introduction

Most machines develop a certain amount of heat while running. In the best case both the driving and the driven machine are affected equally requiring no input of compensation values. But in some applications the driven machine is either hotter, i.e. a pump for hot liquid, or cooler than the driving machine.

Machine manufacturers define the thermal expansion of machines differently, but in most cases, you will find it as a factor of deliberate misalignment expressed in parallel offset and angular error.

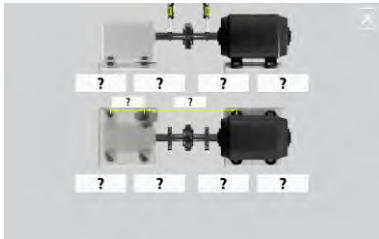
You can pre-set target values before starting your alignment work. Accepted values are feet values and angle and offset values.

The entered values are target values. Target values mean that these are the values at which the machine should be positioned when not running (cold condition) in order to obtain correct alignment while the machine is running (hot condition).



Select one of two ways to express the offset values: Feet values or angle and offset values.

## Feet values

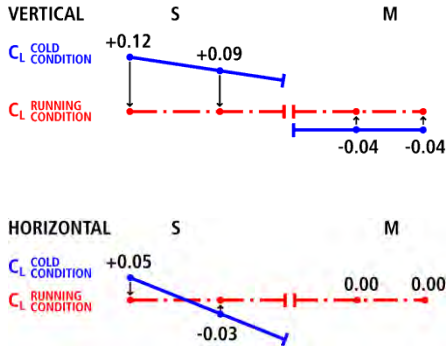


Touch the feet value boxes. Enter target values for the feet in mm or mils according to the pre-set measurement unit together with the required distances.



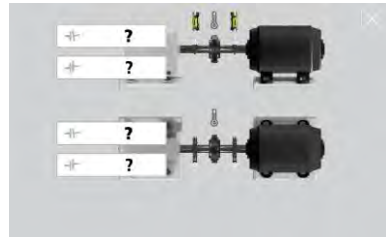
In the example above, the stationary machine will shrink vertically by 0.12 mm at the rear feet and 0.09 mm at front feet while the movable machine will expand 0.04 mm while running.

Horizontally, the rear feet will move 0.05 mm towards you and the front feet will move 0.03 mm away from you while the movable machine does not change its position while running.



After having entered these feet values, the system calculates how the movable machine should be positioned (target position) in cold condition to obtain perfect alignment during running condition.

## Angle and offset values

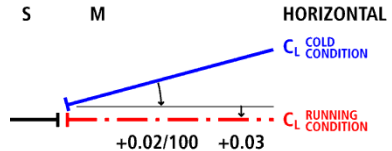
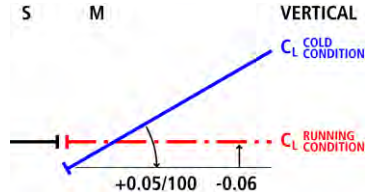


Touch the value boxes and enter target values for the angles in mm/100 mm and target values for the offsets in mm, or mils/inch and mils, according to the pre-set measurement unit.



In the example above, the movable machine should be vertically adjusted to a position with an angular misalignment of  $+0.05 \text{ mm}/100 \text{ mm}$  and an offset of  $-0.06 \text{ mm}$ .

Horizontally, the movable machine should be positioned with a  $+0.02 \text{ mm}/100 \text{ mm}$  angular misalignment and a  $+0.03 \text{ mm}$  offset, in cold condition to obtain perfect alignment while running.



## MEASUREMENT METHOD



### Tripoint™ method

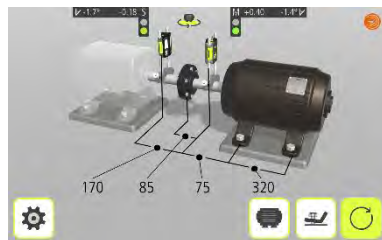
In the Tripoint method, the alignment condition can be calculated by taking three points while rotating the shaft at least 90°.

NOTE: The shafts should be coupled during measurement in order to achieve as reliable and accurate results as possible, when using the Tripoint method.

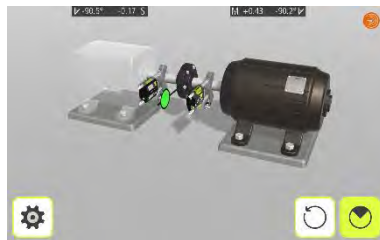
TIP: The larger the angle over which the three points are measured, the fewer moves, and repeat measurements will have to be made. Minimum angle between readings is 45°.

Shadowed sensors suggest suitable measurement positions.

## MEASUREMENT POINT REGISTRATION



Go to measurement.



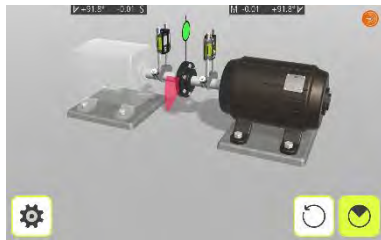
Set the sensors at approximately the same rotational angle at the first measurement position.



Touch the measurement icon, to register the first position.

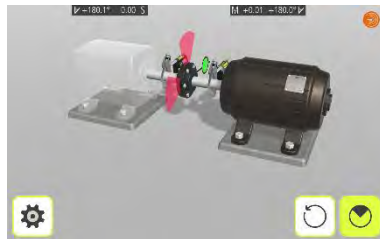
Rotate the shafts to the next position. The shafts must be rotated over a minimum of  $45^\circ$ .

Red sector shows already measured zone. The Register icon is not shown if the rotation is less than  $45^\circ$ .



Touch the measurement icon, to register the second position.

Rotate the shafts to the third position.

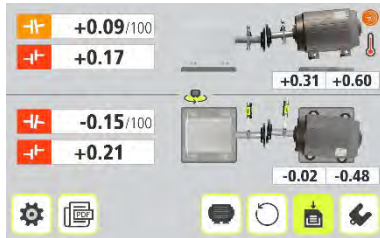


Touch the measurement icon, to register the third position.

TIP: When registering the third position at the 3 o'clock position, the sensors will already be in the right position for horizontal alignment.



## MEASUREMENT RESULTS



The Measurement Result screen shows coupling values and foot values in both the vertical and horizontal direction.

The symbol to the left of the coupling values indicates the angular direction and offset, and also if the values are within tolerance.



Within tolerance (green).



Within double tolerance (yellow and inverted).



Out of double tolerance (red and inverted).



When a coupling is in tolerance in one direction, this is indicated with a check symbol at the motor.

## EVALUATING AND SAVING THE RESULT

The angle and offset values are used to determine the alignment quality. These values are compared with the alignment tolerances to determine whether correction is necessary. If suitable tolerances are selected in the tolerance table, the symbols described above indicate if the angle and offset values are within tolerance or not.

The foot values indicate the movable machine's foot positions where corrections can be made.

Depending on the result, the program will also guide the user.

First, the program will always guide the user to save the measurement.



Touch the save icon to save the result.

(The measurement is saved in the app and can be handled further by generating a PDF report.)

Then, if the measurement result shows that the machine is misaligned, the user will be guided to go to shimming.

If the measurement result is within tolerance and has been saved, the user will be guided to do a PDF report.

**NOTE:** It is necessary to make a PDF report for documenting and exporting the measurement from the app.

## VERTIZONTAL™

Align faster with the VertiZontal Moves feature.



First correct the vertical misalignment in the shimming screen. The system shows how much you need to remove or add shims in order to correct the machine vertically.



Next correct the horizontal misalignment in the alignment screen. The system goes live and will deliver real time values during the adjustment phase.

## SHIMMING



The Shimming screen shows foot values in the vertical direction as suitable shim values (0.05 mm / 1 mil).

The arrows show if shims must be added or removed to adjust the machine in the vertical direction.

The check signs show that shimming is not needed.

When shimming is completed, continue to alignment for adjustments in the horizontal direction.

6.30



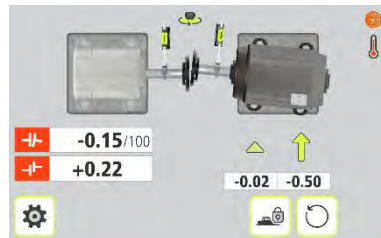
Go to alignment.

## ALIGNMENT

If the machine has been adjusted vertically in the shimming screen, only the horizontal direction remains to align.

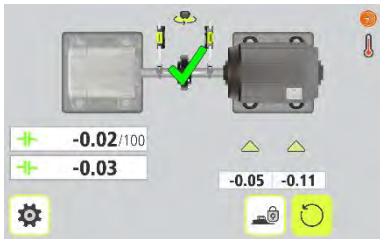
If the machine has not been adjusted in the shimming screen, alignment in the vertical direction must be done first.

### Horizontal direction



Rotate the shafts to the 3 or 9 o'clock position, if they are not already positioned there. The angle guide helps you to reach the right position.

Adjust the machine horizontally until the values for both angular and parallel alignment are within tolerance. The arrows by the feet show in which direction the machine should be moved.

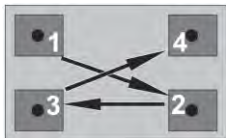


Alignment is now completed. To confirm the result, re-do the measurement.



Re-measure.

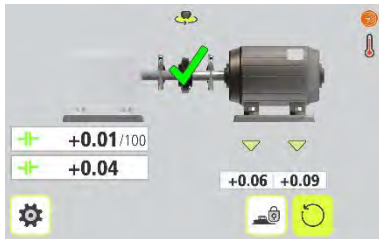
Tighten the bolts using the tightening sequence, as below.



## Vertical direction

To check or align in the vertical direction, rotate the shafts to the 12 or 6 o'clock position. The angle guide helps you to reach the right position.

Adjust the machine vertically until the values for both angular and parallel alignment are within tolerance. The arrows by the feet show in which direction the machine should be moved.



## FEET LOCK FUNCTION

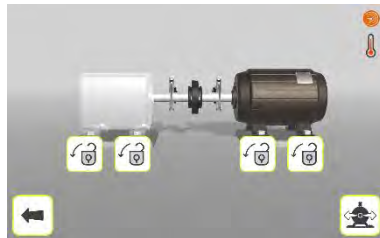
In some cases, the machine that is displayed as the movable machine is not movable, or maybe some of the feet are not adjustable. In order to perform proper alignment in these cases, the Feet Lock function can be used. This function allows you to select which feet are locked and which feet are adjustable.

Feet Lock is available both in shimming and alignment.



Touch the Feet Lock icon to enter the Feet Lock function.

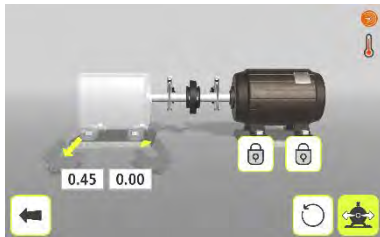
Enter dimensions. The required distances are those between the first and second pairs of feet on the stationary machine and between the first pair of feet on the stationary machine and the first pair of feet on the movable machine.



Select the two pairs of feet you want to lock.

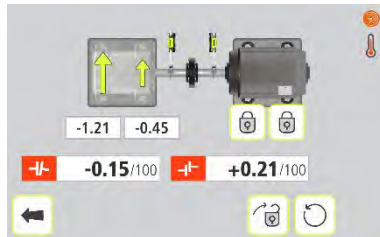


## Feet Lock Shimming



Shim values are shown for the two pairs of feet that are not locked.

## Feet Lock Alignment



Live values are shown for the two pairs of feet that are not locked.

## SCREEN FLIP

Screen Flip enables the user to see the machine set-up from the actual view.



Touch the Screen Flip icon to change view.



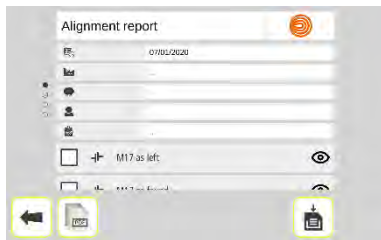
## PDF REPORT

A PDF report with several measurements can be generated.



Touch the PDF icon to create a PDF report.

(The PDF icon is found in the result screen and in the setting screen.)



## Enter data

Touch the white field at the top to enter a header for the PDF report.

Touch the white fields to enter date, site, machine, user and note.

## Select files



Touch the check box to the left to select files.

## Customized logo

Touch the logo up to the right to change it.

## Generate and save the PDF report



Touch the save icon to generate and save the PDF report.

Enter a file name and confirm.

The PDF report will then be shown, for further handling. It can be downloaded or shared using standard features of the tablet.

### **View a file**



Touch the eye to view a file.

### **PDF-report list**



Touch the PDF list icon to view existing PDF-reports.

## OTHER FEATURES

### Looseness indicator



The system has a function for detecting coupling backlash and looseness in order to achieve optimum accuracy. The system will display the looseness indicator if one of the following conditions is met:

- The M and S units are more than  $3^\circ$  apart.

- The mutual angular position changes more than  $0.7^\circ$  from that when the first measurement point was taken.

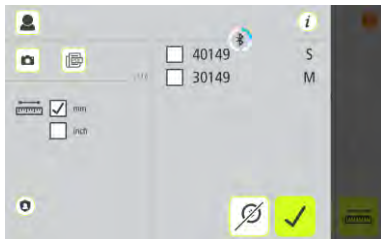
When the coupling backlash or looseness is eliminated to avoid any of the above conditions, the looseness indicator will automatically disappear.

### Target Value symbol



When Target Values are used in the measurement, this is indicated with the Target Value symbol in the upper right corner of the screen.

## SETTINGS



### User Log in



Touch the User icon to log in to the ACOEM Augmented Mechanics Platform.

### Info



Touch the Info icon to go to website for downloading user manual.

### Photo



Touch the Photo icon to take a photo.

### PDF report



Touch the PDF icon to create a PDF report.

### Measurement unit



Select mm or inch.

### Privacy policy



Touch the Privacy Policy icon to go to website for information about privacy policy.

## Bluetooth settings

When entering settings, the system starts searching for pair able sensors.

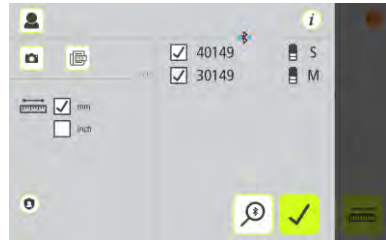
Only ACOEM sensors, that are switched on, will be discovered.



Pair able sensors will appear in the list.



Select the sensors to pair.  
(Maximum two units.)



Paired units are marked with a check mark.

If there are units paired to the app, they must be unpaired before it is possible to pair new units.



To unpair units, touch the check mark icon beside the units.

## Search



Starts searching for pairable sensors.

## Cancel search



Stops searching for pairable sensors.

## Confirm



Exits the Settings and returns to the application.



## CLOUD SYNCHRONIZATION

Accessing the ACOEM Augmented Mechanics Platform allows for easy collaborative work, sharing machines, results, and providing a centralized multi-technical view (alignment, vibration) for a more effective decision making on maintenance action and plant performance.

### User authentication

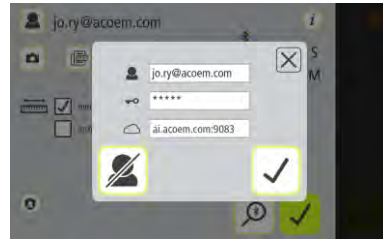
To exchange data between the ACOEM Horizontal Shaft Alignment app and the cloud, the user must be logged in with a valid login and password. To do so, it is possible to authenticate from the app settings.

Click on the User icon and fill in your login and password that were provided at the creation of your account on the ACOEM Augmented Mechanics Platform (ai.acoem.com).



### NOTE!

The validity of your information will be checked every time a synchronize action is triggered from the app.



Confirm.



Log out.

## Upload a machine

Machines that are created in the configuration screen can be uploaded to the cloud.

To do so, from the machine list, display the machine details and touch the upload icon.



Upload to cloud.

## Upload all completed work orders

From the machine list, touching the cloud synchronization icon will upload all completed and closed work orders.



Cloud synchronization.

## Download available work orders

From the machine list, touching the cloud synchronization icon will automatically download all work orders assigned to the user logged in to the app.

Machines to be measured with due date will then appear in the machine list.



Cloud synchronization.

## Completing a work order

Once a job is performed, the work order must be closed by the user prior to the upload to the cloud.

Once the work order is closed, its status is automatically updated in the machine list.

It means that the machine results and report are ready to be uploaded to the cloud and shared with other users.

A work order can either be closed from the result screen or from the machine list, by touching the work order closing icon.



Close the work order.





## SHAFT ALIGNMENT VERTICAL MACHINES

### INTRODUCTION

Shaft alignment: Determine and adjust the relative position of two machines that are connected, such as a motor and a pump, so that the rotational centers of the shafts are collinear, when the machines are working at a normal operating temperature. Correction of vertical shaft alignment is done by moving the flange of the machine until the shafts are aligned within given tolerances. A tolerance table is available in the system.



The system has two measuring units that are placed on each shaft by using the fixtures supplied with the system.



After rotating the shafts to different measuring positions, the system calculates the relative distance between the two shafts in two planes. The distances between the two measuring planes, distance to the coupling, number of bolts and pitch circle diameter are entered into the system. The display box then shows the actual alignment condition together with the position of the feet. Adjustment of the machine can be made according to the values displayed. The angular misalignment is corrected by placing shims under the bolts and offset is corrected by moving them laterally.

The alignment results can be saved for further documentation purposes.

## PRE-ALIGNMENT FUNCTIONS

To obtain the best possible conditions for shaft alignment, it is necessary to perform some pre-alignment checks. In many cases it is necessary to make these checks in order to obtain precise alignment. It is often impossible to reach the desired alignment results if you do not make any pre-alignment checks.

Before going on site, check the following:

What are the required tolerances?

Any offsets for dynamic movements?

Are there any restrictions for mounting the measuring system?

Is it possible to rotate the shafts?

What shim size is needed?

Before setting up the alignment system on the machine, check the machine foundation, bolt and shim conditions. Also check if there are any restrictions in adjusting the machine (if e.g. there is enough space to move the machine).

After the visual checks have been performed, there are some conditions that must be considered:

- Check that the machine has the right temperature for alignment?
- Take away old rusty shims (check that you can remove shims).
- Check coupling assembly and loosen the coupling bolts.
- Check soft foot conditions.
- Mechanical looseness.
- Check coupling and shaft run-out.

- Pipe work strain.
- Coarse alignment.
- Check coupling gap (axial alignment).

The Pre-Alignment app can be used for several Pre-Alignment checks.



## STARTING

Turn on the sensors.

Turn on the tablet.



Start the Vertical Shaft Alignment app.

Go to settings for connecting the sensors, if they are not already connected.



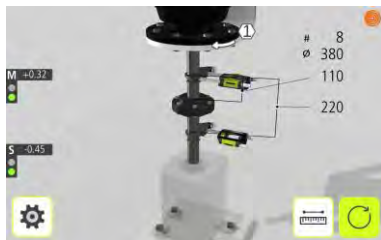
Settings.

Settings are described in the end of the chapter.

## MOUNTING

The sensors are mounted as described in chapter “Shaft Alignment Horizontal Machines”.

## MACHINE CONFIGURATION

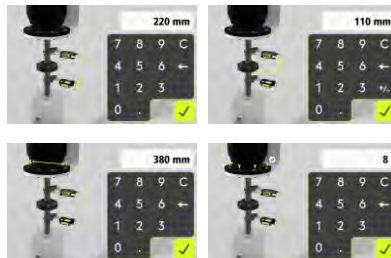


The screen displays the movable machine. The traffic lights show green when the laser hits the detector.



Touch the distance icon.

## Measure and enter distances

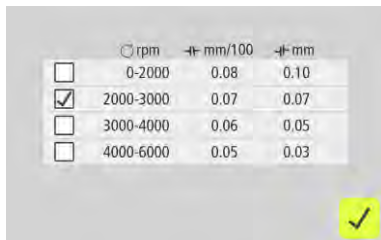


You must enter all the distances. The distance between the sensors, the distance between the center of the coupling and the M-sensor, the pitch circle diameter and the number of bolts.

## Enter tolerances

Alignment tolerances depend to a large extent on the rotation speed of the shafts. Machine alignment should be carried out within the manufacturer's tolerances.

The tolerances are the maximum allowed deviation from desired values.



	rpm	mm/100	mm
<input type="checkbox"/>	0-2000	0.08	0.10
<input checked="" type="checkbox"/>	2000-3000	0.07	0.07
<input type="checkbox"/>	3000-4000	0.06	0.05
<input type="checkbox"/>	4000-6000	0.05	0.03

Tolerance Table mm-mode



	rpm	mils/in	mils
<input type="checkbox"/>	3600	0.5	2.0
<input type="checkbox"/>	1800	0.7	4.0
<input checked="" type="checkbox"/>	1200	1.0	6.0
<input type="checkbox"/>	900	1.5	8.0

Tolerance Table inch-mode



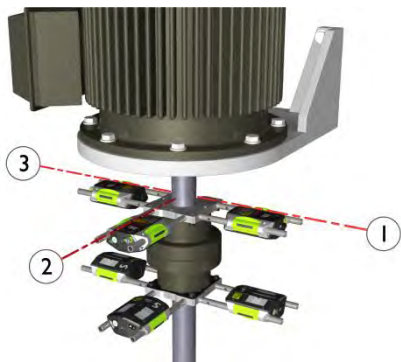
Select the tolerance to use in the alignment by touching its check box to the left.



Confirm.

## MEASUREMENT METHOD

In the Vertical Shaft Alignment program, machinery positions are calculated by taking three points with 180° of rotation.

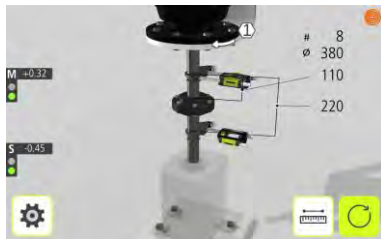


Place yourself at the position corresponding to the second measurement position, where it is easiest to turn the shafts through 180°.

The first measurement position must be at bolt number 1.

Tip: Mark the positions 1, 2 and 3 before you start measuring.

## MEASUREMENT POINT REGISTRATION



Go to measurement.

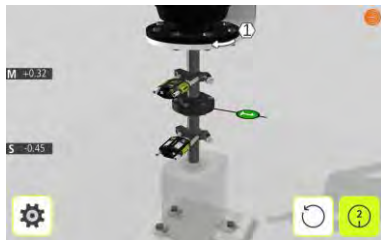


Set the sensors at approximately the same rotational angle at the first measurement position, with bolt number 1 to the right.



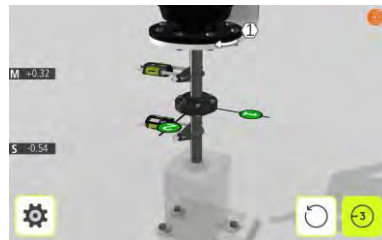
Touch the register icon to register the first position.

Rotate the shafts 90° to the second position (where you are standing).



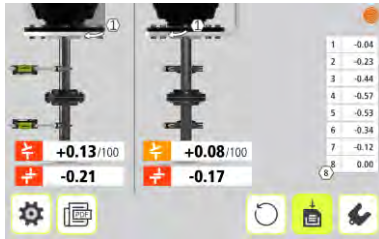
Touch the register icon to register the second position.

Rotate the shafts 90° to the third position, to the left.



Touch the register icon to register the third position.

## MEASUREMENT RESULTS



The Measurement Result screen shows coupling values in both directions, and bolt values.

The symbol to the left of the coupling values indicates the angular direction and offset, and also if the values are within tolerance.



Within tolerance (green).



Within double tolerance (yellow and inverted).



Out of double tolerance (red and inverted).



When a coupling is in tolerance in one direction, this is indicated with a check symbol at the motor.

## EVALUATING AND SAVING THE RESULT

The angle and offset values are used to determine the alignment quality. These values are compared with the alignment tolerances to determine whether correction is necessary. If suitable tolerances are selected in the tolerance table, the symbols described above indicate if the angle and offset values are within tolerance or not.

The bolt values indicate the movable machine's bolt positions where corrections can be made.

Depending on the result, the program will also guide the user.

First, the program will always guide the user to save the measurement.



Touch the save icon to save the result.

(The measurement is saved in the app and can be handled further by generating a PDF report.)

Then, if the measurement result shows that the machine is misaligned, the user will be guided to go to shimming.



Go to shimming

If the measurement result is within tolerance and has been saved, the user will be guided to do a PDF report.

**NOTE:** It is necessary to make a PDF report for documenting and exporting the measurement from the app.



## SHIMMING



The Shimming screen shows bolt values as suitable shim values (0.05 mm / 1 mil).

Adjust the angular error by placing shims under the bolts as required.

The arrow shows if shims must be added to adjust the machine.

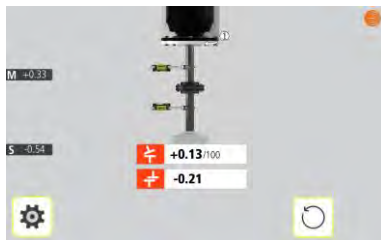
The check sign shows that shimming is not needed.

When shimming is completed, continue to alignment for adjustments of parallel offset.



Go to alignment.

## ALIGNMENT



If the angular error has been correctly adjusted in the shimming screen the angular value should now be in tolerance.

Now adjust the parallel offset in both directions. The parallel offset is displayed live in the first direction when the sensors are placed in position 1, and in the second direction when they are placed in position 2.

Check that both the angular value and the parallel offset are within the required tolerances once the adjustments are completed.

Alignment is now complete. To confirm the result, re-do the measurement.



Re-measure.

## PDF REPORT

A PDF report with several measurements can be generated.



Touch the PDF icon to create a PDF report.

(The PDF icon is found in the result screen and in the setting screen.)



## Enter data

Touch the white field at the top to enter a header for the PDF report.

Touch the white fields to enter date, site, machine, user and note.

## Select files



Touch the check box to the left to select files.

## Customized Logo

Touch the logo up to the right to change it.

## Generate and save the PDF report



Touch the save icon to generate and save the PDF report.

Enter a file name and confirm.

The PDF report will then be shown, for further handling. It can be downloaded or shared using standard features of the tablet.

## View a file



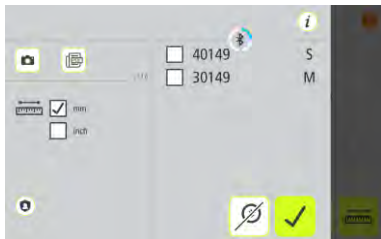
Touch the eye to view a file.

## PDF-report list



Touch the PDF list icon to view existing PDF-reports.

## SETTINGS



### Info



Touch the Info icon to go to website for downloading user manual.

### Photo



Touch the Photo icon to take a photo.

### PDF report



Touch the PDF icon to create a PDF report.

### Measurement unit



Select mm or inch.

### Privacy policy



Touch the Privacy Policy icon to go to website for information about privacy policy.

## Bluetooth settings

When entering settings, the system starts searching for pair able sensors.

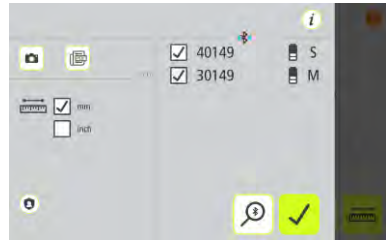
Only ACOEM sensors, that are switched on, will be discovered.



Pair able sensors will appear in the list.



Select the sensors to pair.  
(Maximum two units.)



Paired units are marked with a check mark.

If there are units paired to the app, they must be unpaired before it is possible to pair new units.



To unpair units, touch the check mark icon beside the units.

## Search



Starts searching for pairable sensors.

## Cancel search



Stops searching for pairable sensors.

## Confirm



Exits the Settings and returns to the application.







## PRE-ALIGNMENT



## STARTING

Turn on the sensors.

Turn on the tablet.



Start the Pre-Alignment app.

Go to settings for connecting the sensors, if they are not already connected.



Settings.

Settings are described in the end of the chapter.

## HOME MENU



Run-Out



Bearing Clearance



Softcheck ROP



Sensor Display ROP



Max Min ROP



Settings



PDF report

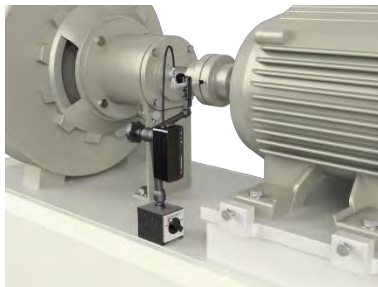
## RUN-OUT



Start Run-Out.

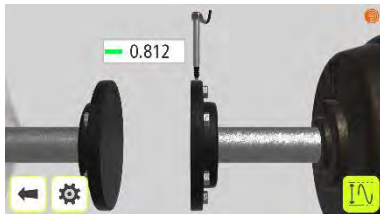


Select a position to measure.



Place the Run-Out Probe on the measurement object.

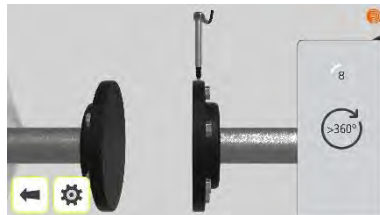
## Rim



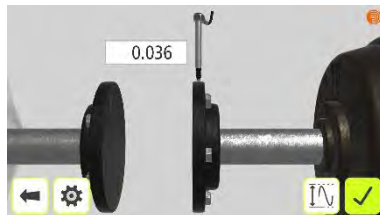
Make sure that the Run-Out Probe is at a suitable part of the measuring range before starting the measurement.



Start measuring run-out.



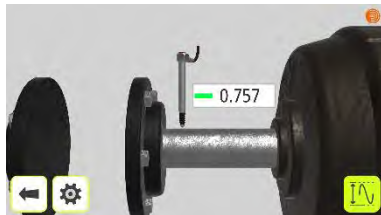
Rotate the shaft  $>360^\circ$ .



Confirm the measurement.



## Shaft



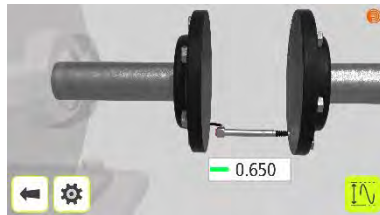
Start measuring run-out.

Rotate the shaft  $>360^\circ$ .



Confirm the measurement.

## Face



Start measuring run-out.

Rotate the shaft  $>360^\circ$ .



Confirm the measurement.

## Result



Touch the save icon to save the result.

(The measurement is saved in the app and can be handled further by generating a PDF report.)

## BEARING CLEARANCE



Start Bearing Clearance.



Select a position to measure.



Place the Run-Out Probe on the measurement object.



Make sure that the Run-Out Probe is at a suitable part of the measuring range before starting the measurement.



Start measuring bearing clearance.



Lift the shaft.



Confirm the measurement.



## Result



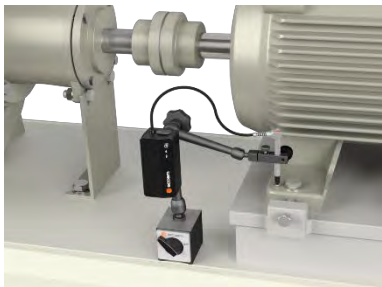
Touch the save icon to save the result.

(The measurement is saved in the app and can be handled further by generating a PDF report.)

## SOFTCHECK ROP



Start Softcheck ROP.



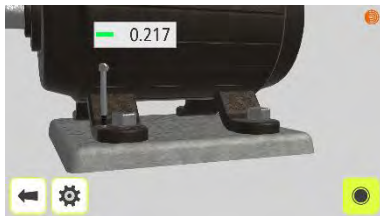
A soft foot condition needs to be corrected before any alignment takes place. If not, the measurement result will be of no value. It is more or less impossible to establish if there is a soft foot condition without using some kind of measurement tool. The Softcheck ROP application checks each foot and displays the result in mm or mils.

Check that all foot bolts are firmly tightened.

## Measurement value registration

The program will guide you to the different feet.

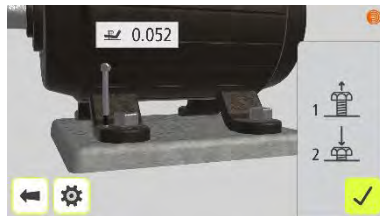
The first foot.



1. Place the Run-Out Probe at the first foot.
2. Start measuring.



Touch the measurement icon.



3. Loosen the bolt fully and wait a few seconds.
4. Tighten the bolt firmly, preferably with a dynamometric wrench.
5. Register the measurement value.



Touch the confirmation icon.

Repeat the procedure at the rest of the feet.

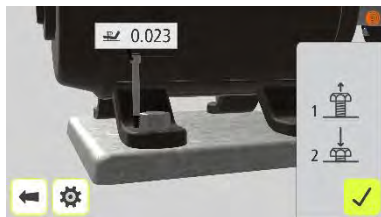
The second foot.



The fourth foot.



The third foot.



## Measurement result



Touch the save icon to save the result.

(The measurement is saved in the app and can be handled further by generating a PDF report.)

## Corrections

Make the necessary corrections and then check each foot again (the values show approximately how many shims that are needed to eliminate the soft foot).

Re-measurements can be done by touching the re-measure icon to re-measure all feet, or by touching a single foot to re-measure just that foot.



Re-measure all feet.



Re-measure a single foot.

## SENSOR DISPLAY ROP



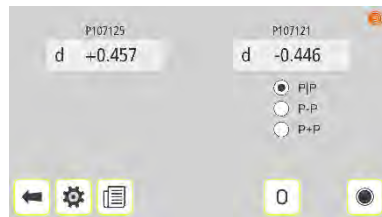
Start Sensor Display ROP.

The Sensor Display for the Run-Out Probe can be used for different applications where you want to use the readings from the linear sensor in various ways. The program is used with up to two sensors, P, connected to the display unit.

The Sensor Display application shows the values from both sensors. Each sensor is measuring the distance (d). The displayed values are shown live. They can also be zeroed to increase the usage in several applications. It is also possible to register measuring values.

When the Run-Out Probe is used to measure the position of an object to a rotational center, the values can be zeroed and then halved.

Make sure that the Run-Out Probe is at a suitable part of the measuring range before zeroing.

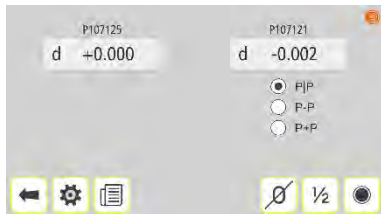


When entering Sensor Display ROP, raw data from the connected Run-Out Probes are displayed.

## Zero values



Zero values.



After zeroing values, they can also be halved.  
It is also possible to return to raw values.



Halve values.

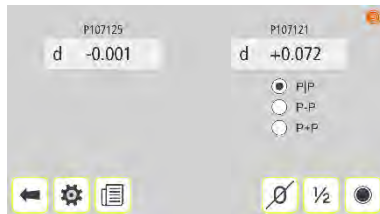


Return to raw values.

## Register values



Register values.



Registered values will be added to the list.



Go to list.

## P|P, P-P and P+P

The values from the second pen (to the right) can either be displayed separately or relative to the first pen (to the left), either P-P or P+P.

## List



	Type	d P107125	d P107121	P P	
1	13:12	REL	-0.001	+0.074	+0.074
2	13:12	REL	-0.001	+0.073	+0.073
3	13:12	REL	-0.001	+0.073	+0.073
4	13:12	REL	-0.001	+0.037	+0.037
5	13:14	REL	+0.001	+0.139	+0.139
6	13:14	REL	+0.000	+0.070	+0.070
7	13:15	REL	+0.000	-0.014	-0.014



Save the list.



Return to Sensor Display.



Return to Home Menu.



## MAX MIN ROP



Start Max Min ROP.

Max Min ROP for the Run-Out Probe can be used for several applications where the user wants to measure the displacement of an object to a rotational center.

Measuring values from the Run-Out Probe are continuously registered under a dedicated sampling time.

Result from the measurement are shown directly on the screen. The maximum value (Max) and the minimum value (Min) are shown together with the difference (Max-Min).

The measuring result can be added to a list, that can be saved for further documentation.

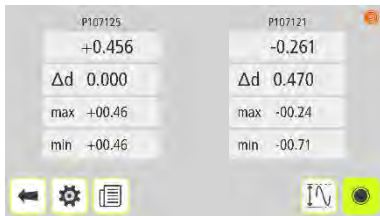


When entering Max Min ROP, raw data from the connected Run-Out Probes are displayed.

Adjust the position of the probes to be within the measuring range, using the raw data on the screen.



Measure max min.



When max min is measured the difference during the measurement is displayed. The max and min values are also displayed.

The displayed measurement result can be registered and added to the list.

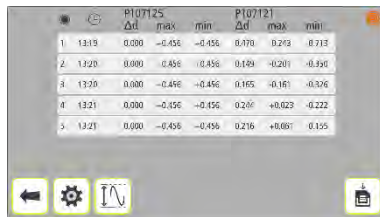


Register the measurement.

When the measurement is registered it will be added to the list.



Go to the list.



Touch the save icon to save the list.

(The measurement is saved in the app and can be handled further by generating a PDF report.)

## PDF REPORT

A PDF report with several measurements can be generated.



Touch the PDF icon to create a PDF report.

(The PDF icon is found in the home menu and in the setting screen.)

### Enter data

Touch the white field at the top to enter a header for the PDF report.

Touch the white fields to enter date, site, machine, user and note.

### Select files



Touch the check box to the left to select files.

## Customized logo

Touch the logo up to the right to change it.

### Generate and save the PDF report



Touch the save icon to generate and save the PDF report.

Enter a file name and confirm.

The PDF report will then be shown, for further handling.

### View a file



Touch the eye to view a file.

### PDF-report list



Touch the PDF list icon to view existing PDF-reports.

## SETTINGS



### Info



Touch the Info icon to go to website for downloading user manual.

### Photo



Touch the Photo icon to take a photo.

### PDF report



Touch the PDF icon to create a PDF report.

### Measurement unit



Select mm or inch.

### Sampling time



Touch the white box to enter sampling time.

## Bluetooth settings

When entering settings, the system starts searching for pair able sensors.

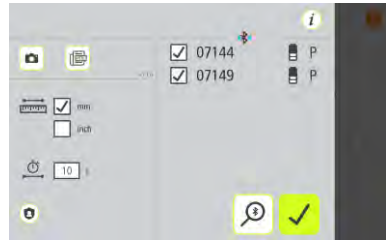
Only ACOEM sensors, that are switched on, will be discovered.



Pair able sensors will appear in the list.



Select the sensors to pair.  
(Maximum two units.)



Paired units are marked with a check mark.

If there are units paired to the app, they must be unpaired before it is possible to pair new units.



To unpair units, touch the check mark icon beside the units.

## Search



Starts searching for pairable sensors.

## Cancel search



Stops searching for pairable sensors.

## Confirm



Exits the Settings and returns to the application.

## SENSORS M7 AND S7



1. ON/OFF button with status indication LED
  - a. Continuously green – On
  - b. Switching green/red – Gyro activated.
2. Mini USB for charging
3. Laser transmission indication LED
  - a. Green – laser transmission
4. Bluetooth indication LED
  - a. Continuously blue – paired and ready.
  - b. Flashing blue – searching/ready to pair
  - c. No light – Bluetooth disabled.



5. Battery status button – press to instantly show the battery status (also works when the unit is switched off).

6. Battery status LED
- a. One LED continuously red – less than 10% charge left.
  - b. One LED flashing red – less than 5% charge left.
  - c. One LED continuously orange – charging
  - d. One LED continuously green – fully charged.
7. Battery status LED when battery button is pressed
- a. Continuously green – battery status
  - b. Rolling green – battery charging



## **OPERATING MODES**

M7 and S7 units has two operating modes:  
On and Off.

Turn the units on and off by pressing the ON/OFF button firmly.

In case the units fail to respond, it is possible to turn it off by pressing down the ON button for more than 10 seconds.

## **CONNECTIONS**

### **Bluetooth connection**

The M7 and S7 units are connected by the built in Bluetooth connection. The units will automatically connect to the app when turned on as long as they are paired. See chapters about apps for instructions on how to pair measurement units.

To avoid accidental Bluetooth transmission in a restricted area the Bluetooth function can be completely disabled – contact your local sales representative for more information.

If the Bluetooth has been disabled (as indicated by the fact that the Bluetooth LED is not flashing or continuously blue when the unit is turned on) it can be enabled by pressing the battery status button quickly 5 times in a row.

## **POWER SUPPLY**

The M7 and S7 units are powered by a high-capacity rechargeable Li-Ion cell, or by the external power unit.

The operating time of the batteries is approximately 11 hours when the system is used for a typical alignment work (continuously on).

The M7 and S7 units can be charged with the supplied charger.

When the external power supply is connected, the unit will automatically start charging the batteries. This will be indicated by the first battery status LED turning orange, when the unit is fully charged the LED will turn green. By pressing the battery status button, the exact charging status can be monitored.

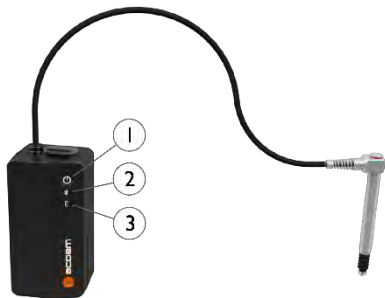
The charging time is approximately 8 hours for fully drained batteries. The charging time will be longer if the unit is turned on while being charged.

9.4

When used in typical conditions the batteries will sustain good capacity for approximately 2-3 years before needing replacement. Contact your sales representative for battery replacement.

The batteries contain safety circuitry to operate safely with the unit. The unit can therefore only be used with the Li-Ion batteries supplied by ACOEM. Improper replacement of batteries can cause damage and risk for personal injury. Please refer to the chapter on safety for further instructions.

## RUN-OUT PROBE P1



The Run-Out Probe is a battery operated, wireless linear gauge used for measuring run-out on shafts, coupling hubs, flanges and other components used on rotating machinery. It can also be used for distance measurements during adjustments of machinery, soft foot or checks of bearing clearances. The probe is wirelessly connected to the app for registration, display and

documentation of the measuring results.

1. ON/OFF button
2. Bluetooth indication LED
  - a. Continuously blue – paired and ready.
  - b. Flashing blue – searching/ready to pair
3. Battery status LED
  - a. Continuously red – less than 10% charge left.
  - b. Flashing red – less than 5% charge left.
  - c. Continuously orange – charging
  - d. Continuously green – fully charged.

## **OPERATING MODES**

P1 has two operating modes: On and Off.

Turn the unit on and off by pressing the ON/OFF button firmly.

## **CONNECTIONS**

### **Bluetooth connection**

The P1 unit is connected by the built in Bluetooth connection. The unit will automatically connect to the app when turned on as long as it is paired. See chapters about apps for instructions on how to pair the Run-Out Probe.

## **POWER SUPPLY**

The P1 unit are powered by a high-capacity rechargeable Li-Ion cell, or by the external power unit.

The operating time of the batteries is approximately 11 hours (continuously on).

The P1 unit is charged with the supplied charger.

When the external power supply is connected, the unit will automatically start charging the batteries. This will be indicated by the battery status LED turning orange, when the unit is fully charged the LED will turn green.

The charging time is approximately 8 hours for fully drained batteries. The charging time will be longer if the unit is turned on while being charged.

When used in typical conditions the batteries will sustain good capacity for approximately 2-3 years before needing replacement. Contact

your sales representative for battery replacement.

The batteries contain safety circuitry to operate safely with the unit. The unit can therefore only be used with the Li-Ion batteries supplied by ACOEM. Improper replacement of batteries can cause damage and risk for personal injury. Please refer to the chapter on safety for further instructions.



## TECHNICAL SPECIFICATION – M7 AND S7

### Art. No. M7 1-1216, S7 1-1217

Housing Material	Anodized Aluminum frame and high impact ABS plastic over molded with TPE rubber
Operating Temp	-10 to 50°C (14 to 122°F)
Storage Temp	-20 to 70°C (-4 to 158°F)
Long term storage temp	Room temp. 18 to 28°C (64 to 82°F)
Battery Charging Temp	0 to 40°C (32 to 104°F)
Relative humidity	10 – 90%
Weight	M7: 212 g (7,5 oz), S7: 186 g (6,6 oz)
Dimensions	92 mm x 77 mm x 33 mm (3,6 in x 3,0 in x 1,3 in)
Environmental protection	IP65 (Dust tight and protected against water jets)
Laser	650 nm class II diode laser
Laser line fan angle	6°
Laser line width (1/e <sup>2</sup> )	1.6 mm
Laser line divergence (full angle)	0.25 mrad
Laser power	< 1 mW
Measurement distance	Up to 10 m
Detector	2nd gen. scientific grade CCD
Detector length	30 mm (1,2 in)

Detector angular subtense	30 mrad/m (3mm/100mm per meter)
Detector resolution	1 $\mu\text{m}$
Measurement accuracy	0,3% $\pm$ 7 $\mu\text{m}$
Signal processing	Digital signal processing with sidespot rejection, edge detection, ambient light elimination and anti-vibration mode
Ambient light protection	Optical filtering and digital ambient light signal elimination
Inclinometer	Dual High Performance MEMS inclinometers
Inclinometer resolution	0,01°
Inclinometer accuracy	$\pm$ 0,2°
Gyroscope	6-Axis MEMS Inertial Motion Sensor with drift compensation and automatic field calibration
Gyroscope accuracy	$\pm$ 1°
Wireless communication	Class I Bluetooth transmitter
Communication range	10 m (33 ft)
Connectors	1 USB Mini port (IP67); Charging: 5V, 0,5A
Power supply	High performance Li Ion battery or external power.
Operating time	11 hours continuous use (measuring)
Battery Charging time (system off, room temperature)	8 h
Battery Capacity	10.4 Wh



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LED indicators

Unit state, laser transmission and 5 battery status indicators with instant battery check

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Specifications are subject to change without notice.



## TECHNICAL SPECIFICATION – P1

### Art. No. 1-1063

Housing Material	ABS plastic
Operating Temp	0 to 40°C (32 to 104°F)
Storage Temp	-20 to 60°C (-4 to 140°F)
Long term storage temp	Room temp. 18 to 28°C (64 to 82°F)
Battery Charging Temp	0 to 40°C (32 to 104°F)
Relative humidity	10 – 90%
Weight	142 g (5.0 oz)
Dimensions battery unit	44 x 91 x 33 mm (1.7 x 3,6 x 1,3 in)
Dimensions pen body	Length: 85 mm (3.34 in) Diameter: Ø 8 mm (Ø 0.31 in)
Length cable	400 mm (15.7 in)
Environmental protection	IP65
Measuring range	5 mm (0.20 in)
Mechanical travel	6.6 mm (0.26 in)
Measuring force	0.70 N ±25%
Repeatability	0.15 µm
Thermal drift	0.25 µm/°C
Accuracy error (K=Reading in mm)	±MAX(5+ 2*K ; 7*K ) µm
Contact type	Ø 3 mm (Ø 0.12 in) carbide

Contact thread	M2.5
Interface	Membrane Switch Keyboard
Wireless communication	Class I Bluetooth transceiver with multi-drop capability. BLE Bluetooth Low Energy (BT 4.0)
Communication range	10 m (33 ft)
Connectors	1 USB Mini micro port Charging: 5V, 0.5A
Power supply	Rechargeable Li Ion battery or external power supply.
Operating time	11 hours continuous use
Battery Charging time (system off, room temperature)	8 h
Battery Capacity	10.4 Wh
LED indicators	Wireless communication and battery status indicators.

Specifications are subject to change without notice.





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