VIBRO-LASER™

OPERATION MANUAL
VIBRO-LASER

CONTENT

PREFACE

Thank you for your purchase of a VIBRO-LASER alignment system!

We are sure that you have made the right choice and hope that the system will not only meet your expectations but exceed them as well.

Before system operation it is important that you read and understand this manual, most significantly the chapters on safety and maintenance.

This manual is intended to provide information on the various operations and control procedures for the software and hardware of the system.

ALWAYS ALIGNED™

Klim, Fedya, Misha, Olga, Vladimir, Mike & Megh

LIMITED WARRANTY

This product is manufactured with the greatest care following the VIBRO-LASER quality control system. Should the product fail within one (1) year from the date of purchase under normal usage conditions, VIBRO-LASER will repair or replace the product free of charge in accordance with our warranty policy as solely interpreted by VIBRO-LASER.

1. Using new or refurbished replacement parts.

2. Exchange the product with a product that is new or which has been manufactured from new or serviceable used parts and is at least functionally equivalent to the original product.

Proof of purchase date is required, and sent together with a copy of the original purchase document. Warranty is valid under normal usage conditions as described in the user's manual included with the product. The warranty covers failure on VIBRO-LASER products that could be related to material and/or fabrication errors. The warranty is valid only in the country of purchase by the original purchaser. The warranty is not valid in the following cases:

- If the product is broken due to mishandling or incorrect operation

- If the product has been exposed to extreme temperature, calamity, chock or high voltage.

- If the product has been modified, repaired or disassembled by unauthorized personnel.

- Compensation for possible damage due to failure on VIBRO-LASER product is not included in the warranty. Freight cost to VIBRO-LASER is not included in the warranty.

Note!
Before delivery of the product for warranty repair, it is the responsibility of the buyer to backup all data. Data recovery is not included in the warranty service and VIBRO-LASER is not responsible for data that may be lost or damaged during transit or repair!

LITHIUM ION BATTERY LIMITED WARRANTY

Lithium ion batteries inevitably lose power during their lifetimes, depending on usage temperatures and the number of charging cycles. Therefore, the internal rechargeable batteries used in VIBRO-LASER products are not included in our general 1-year warranty. There is 6 months warranty for the battery capacity not to fall below 70 % (a normal change means that the battery must have more than 70 % capacity after more than 300 charging cycles). A 1 year warranty applies if the battery becomes unusable because of a manufacturing fault or factors that VIBRO-LASER could be expected to have control of, or if the battery displays abnormal loss of capacity in relation to use.

SAFETY INSTRUCTIONS

Follow all the safety and control rules, regulation, procedures, and general common sense VIBRO-LASER is not responsible whatsoever for any injuries, loss of production or capacity, or any failure of any kind as a result of the user/owner not following instructions as set forth in this manual, on product labels, in their work area, or general industry practices and common sense. Do take notice of any warning labels on the device and in the operation manuals.
Lack of the consideration to such warning labels may cause personal injuries and damage to the equipment.

LASER LIGHT SOURCE HANDLING RULES

VIBRO-LASER system uses laser diodes with 1.0 MW output capacity, which complies with the Class 2 standards of SS-EN-60825-1-1994. This class is considered to be safe for operation providing the following precautionary measures are taken:

- strictly follow safety rules during operation;
- the device might be used only for its intended purpose;
- do not use the device if it or its parts are damaged in any way;
- do not open laser source blocks;

- do not look in the laser source when it is working;
- do not direct laser beam into other people's eyes;
- All repair or calibration of the laser source may only be completed by VIBRO-LASER or those authorized by VIBRO-LASER in writing.

CHARGING THE SENSOR

Attention!
It is forbidden to charge the sensor units in an explosion-hazard area!

It is only allowed to use the original power USB cables. Use of any other USB cables may cause personal injuries and damage to the equipment.

During the charging of **S** and **M** sensor units the charge LED indicator will illuminate.

After the indicator is off, please disconnect the adapter from the sensor units.

Follow your facility/company lock out tag out equipment shutdown rules

- Do not use vibro-laser until the equipment to be aligned is verified 100% de-energized

MAINTENANCE

- The system should be cleaned with a lint free cotton cloth or cotton buds dampened with mild soap solution. Detector and laser windows, however, should be wiped with alcohol swabs or cleaning pad.
- Do not use paper tissues as they may damage the surface of the detector;
- Do not use acetone;
- To insure proper operation and life keep your VIBRO-LASER product clean. It is best practice to clean the system after use.

INTENDED PURPOSE

VIBRO-LASER shaft alignment systems are a portable high-precision device designed for alignment control of rotating machines (pumps, electric motors, reduction units, compressors, etc).

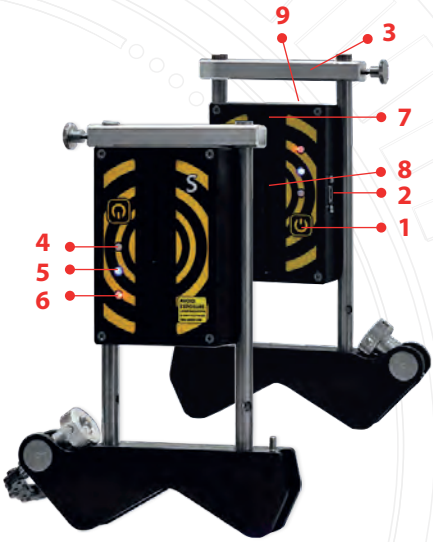
SPECIFICATIONS

SENSOR UNITS M and S

Material	Anodized aluminium
Dimensions	90mm x 60mm x 32mm
Laser emission	Diode laser with wavelength 635nm, class II
Laser power	< 1 mW
Distance between blocks	up to 10 m
Detector receiver length	30 mm
Detector type	Digital — CCD detector
Detector resolution	0,001 mm
Measuring accuracy	0,3% ± 7um
Digital inclinator	0.1
Protection class	IP65
Batteries	lithium-ion
Time of operation	up to 20 hours
Bluetooth 4.0	Yes
Operating temperature	from -0 ° C to +60 ° C

SYSTEM DESCRIPTION

SENSOR UNITS M and S



1 ON/OFF button (hold for 2-3 seconds to turn off)

2 Mini USB port (for charging)

3 Clamping bar with screw

4 Charge indicator (illuminates green during charging then turns off)

5 Connection indicator (illuminates blue when connects, blinks during transfer)

6 ON indicator (illuminates red when ready for work, illuminates green when ready for measurements)

7 Laser beam window

8 Detector receiver

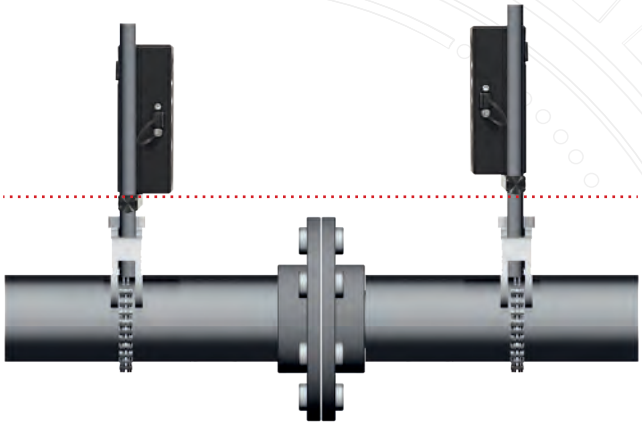
9 Adjustment screw (for vertical laser positioning).

LABELING

Model, and Serial Number are printed on the name plate on the back of sensor units.

PREPARATION FOR WORK

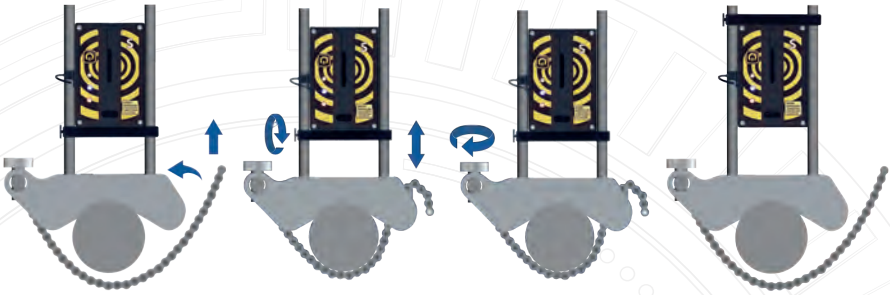
Fix the sensor unit with the M label to the movable part of the machine, and then fix the S-labeled sensor unit to the stationary. Mounting each sensor for each side as shown below.



The sensor units should be fixed with a shift (see the figure).

Note!
Fix the sensors at a reasonable distance from eachother not beyond 10m

- Place the v-bracket vertically on the shaft of the machine being aligned. Take the loose end of the chain and pull it to remove the whipping, then fix it to the hook. (Fig. A)
- Pull the chain tightly via the screw. Try to avoid excessive tightness. (Fig. B)
- If the shaft diameter is too big, use extension chains or replace with common chains from any hardware store or industrial supplier to make the chain longer. (Fig. C)
- Correct the height of the units by slowly moving them along the bars until the laser beam points to the center of the receiver of each unit. Fix the units with the locking screw on the clamping bar. (You can fine tune the beams with the dial)
- Clamping bars might be fixed under units (recommended) as above them. (Figr. D)



(Fig. A) (Fig. B) (Fig. C) (Fig. D)

Attention!
M unit laser direction can be adjusted with the adjusting screw at the top of the unit. Normally, it is not required, but it may be needed if the distance between units is large.

PRELIMINARY WORKS

Before start of the alignment check for following:

- What are the alignment tolerances required?
- Are there any thermal compensation requirements?
- Are there any size restrictions for measurement system installation?
- Are the shafts able to be rotated?
- What size shims will be needed?

Before the installation of the measurement system to the machine, check its base, bolts and preinstalled shims. Check for restrictions (is there enough space for moving the machine).

After the visual check proceed with the following:

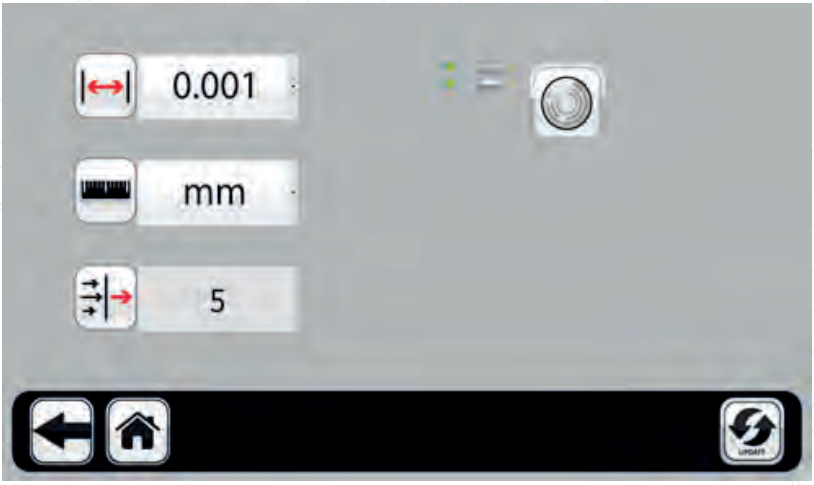
- Remove old and rusty shims (if removable);

- Check socket joint and loosen fasteners;
- Check for soft foot;
- Check how loose is the machine;
- Check for run out of the shaft and the socket joint;
- Check for pipe strain;
- Check for end clearance between the shafts (axial alignment).

SETTINGS

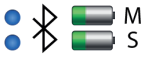
Mount the sensor units on the shafts.
Turn the **S** and **M** units on (the red LED indicator goes on).
Turn the **VIBRO-LASER** software.

Touch the Icon "**Global settings**" 



Touch the Icon "**Sensor units search**"

When connected, the indicators will illuminate in blue.



Attention! After initial use the sensor units will be automatically connected by default.

Choose Measurement Resolution.

Choose units of measurement (millimeters or inches). Choose between metric and imperial measurement convention, and the necessary resolution (default setting is 0.01 mm or 0.4 mils).

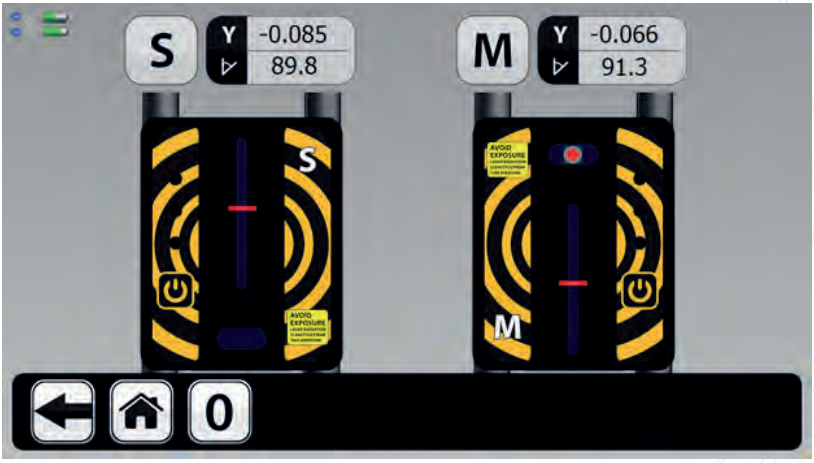
Set the averaging filter from 1 to 20

Attention!
If laser beam passes through air with variable temperature or in the case of significant background noise, the beam directionality may be affected.

Variation of the results might be caused by instability of measurement process. Try reducing the intensity of air movement between laser and the detector (e.G. By replacing the heat sources or closing doors). If the results are still instable, increase the filter value. Default setting is 1. Most common values are from 1 to 3.

SENSOR UNIT READINGS

Start the program by touching the Icon «**Sensor Unit Readings**» in the main menu 



During the program loading the display shows data received directly from the sensor units (position of the laser beam on the sensor and inclinometer angle).

If no value is available, the display shows 

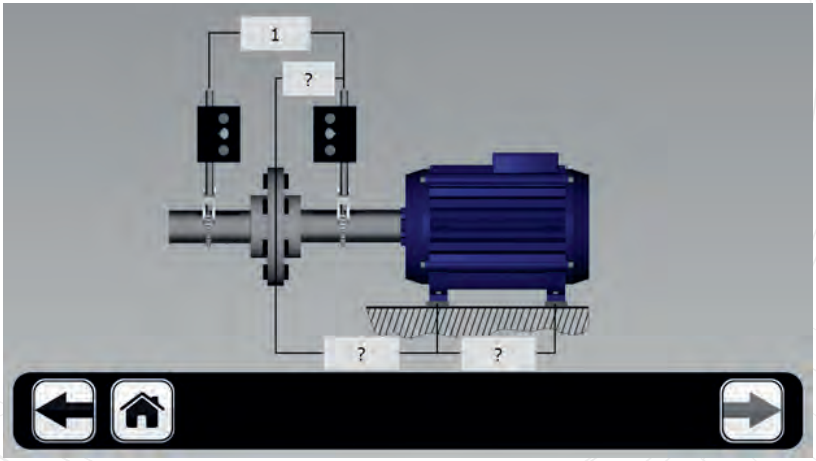
To reset the readings touch the Icon 

SOFT FOOT

Note!
Before any alignment the soft foot (loose fit of the base) should be addressed. Otherwise the results of a precision alignment will be inneffective. The removal of the soft foot is impossible without any measuring devices. In your VIBRO-LASER embedded alignment program you are able to provide to identify and correct soft foot.

Touch the Icon "**Soft foot**" 

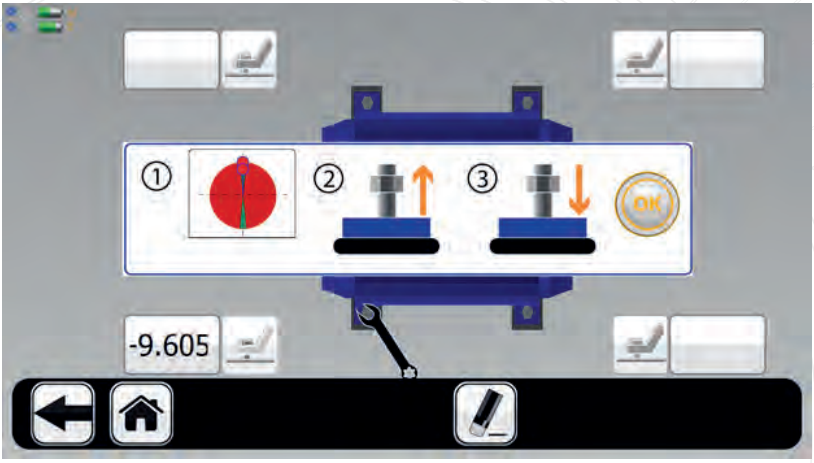
Before Soft Foot process you need to enter following dimensions: distance between bars; distance between M unit and first set of feet; distance between the first and the second sets of feet.



Set the units to the 12 o'clock (the green LED indicator of M and S units will glow green).
Check bolt tensioning of each foot.

Touch the Icon "**Next**" 

Choose the bolt by touching the Icon 



First loosen the chosen bolt completely, then tighten it firmly. It is recommended to use a torque wrench for tightening.

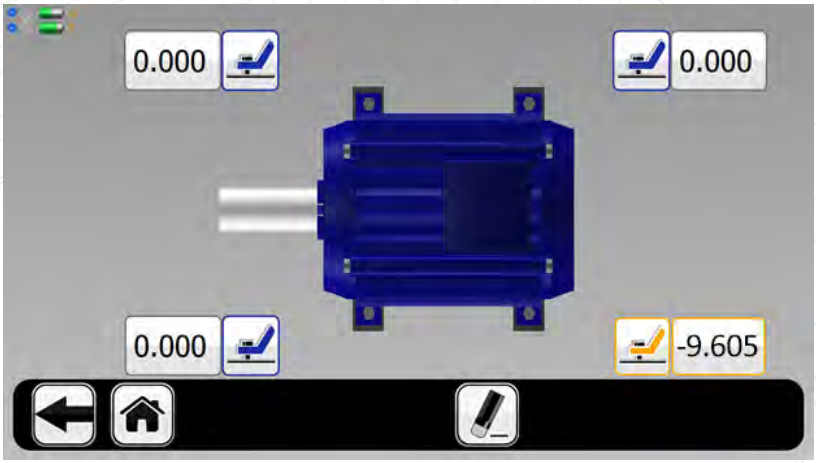
Save the measurement result by touching the "OK" Icon

Repeat these actions for other bolts.

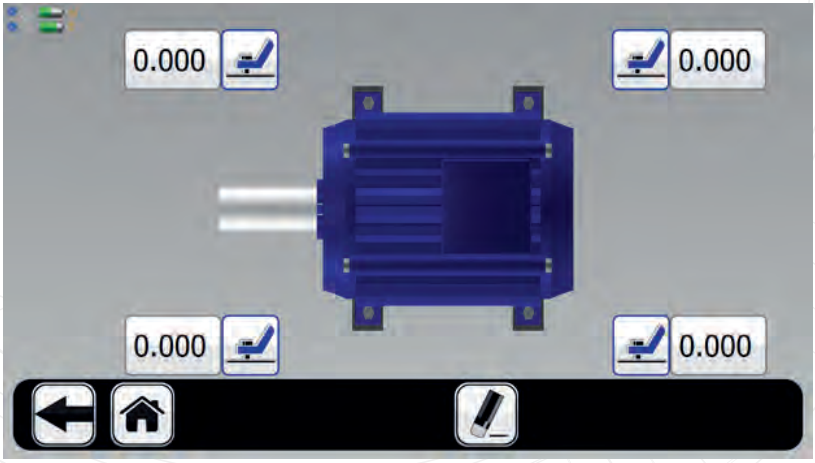
Note!
You can carry out new measurement at any time by touching the corresponding Icon.

To reset measurements touch the Icon 

Values show shim plate thickness to eliminate the soft foot.



Make the required corrections then check each foot once more.



Note!
Allowed values from 0mm to 0.06 mm

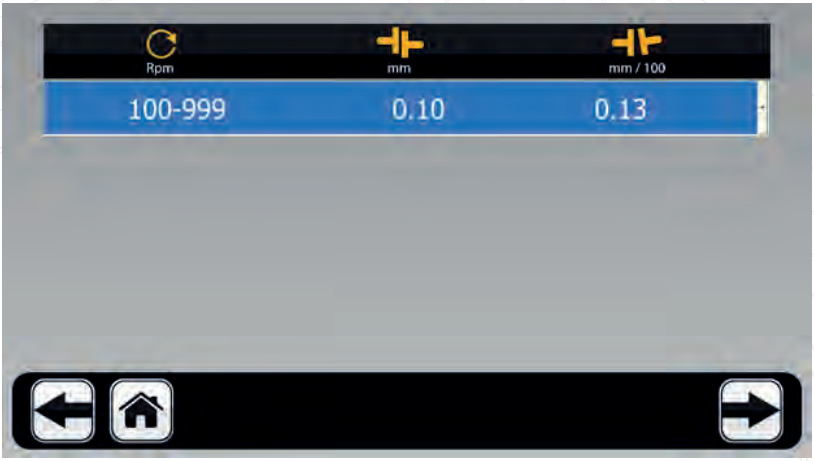
HORIZONTAL ALIGNMENT

Touch the icon "**Horizontal alignment**" in main men

Complete the alignment procedure step by step, following the arrow indicator.

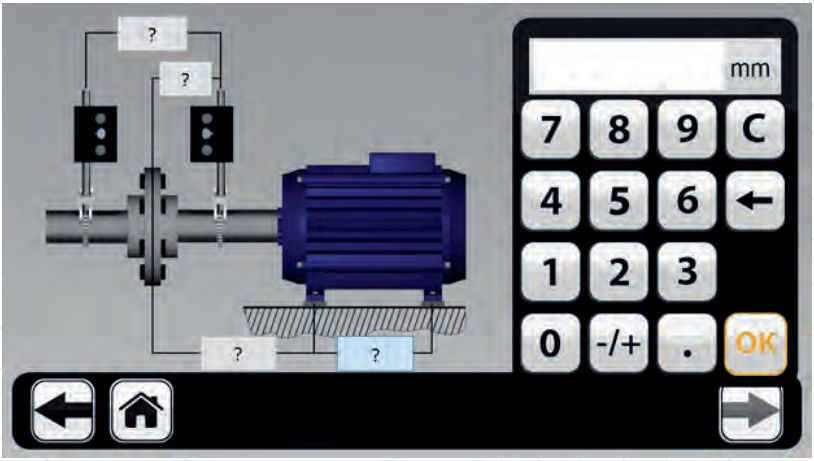
Note!
You can backup to the horizontal alignment menu anytime to confirm your step.

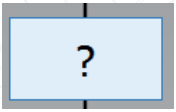
Insert the tolerance values according to the rotation rate of the machine.



Touch the icon 

Insert the dimensions



Touch the icon to insert the dimensions. 

The field activates a calculator interface. To submit the inserted dimensions, touch **OK**.

Use the supplied tape measure for measuring:

- Distance between the BARS CENTRES OF M and S UNITS
- Distance between the center of coupling joint and the BAR CENTER of M unit
- Distance between M unit and the first set of feet (support).
- Distance between the first and the second set of feet (support).

Touch the Icon 

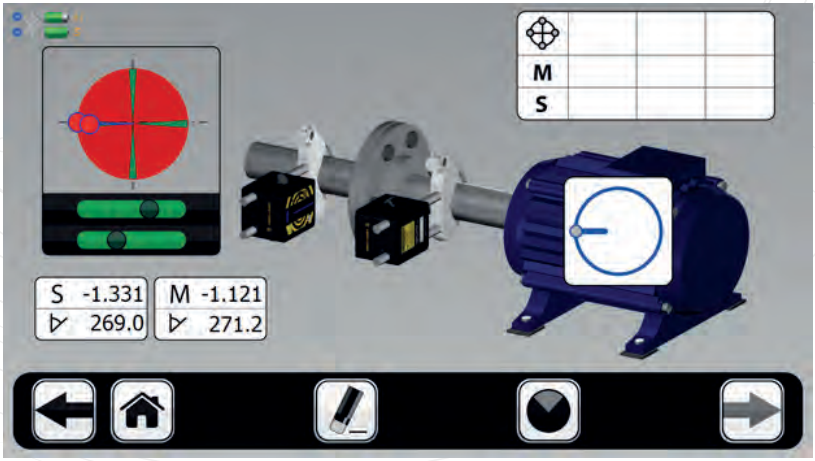
CARRY OUT MEASUREMENTS (9-3-12 METHOD)

This type of measurement requires rotating the shaft with the **M** and **S** units in such a way that flag indicator on the information circle is in the green zone (3-6-9-12o'clock).

Note!

For results please take measurements in at least three of four possible control positions.

Set the **M** and **S** sensor units to the 9 o'clock green zone in such a way that they have roughly the same angles (control the angles of **M** and **S** sensor units via the virtual level).

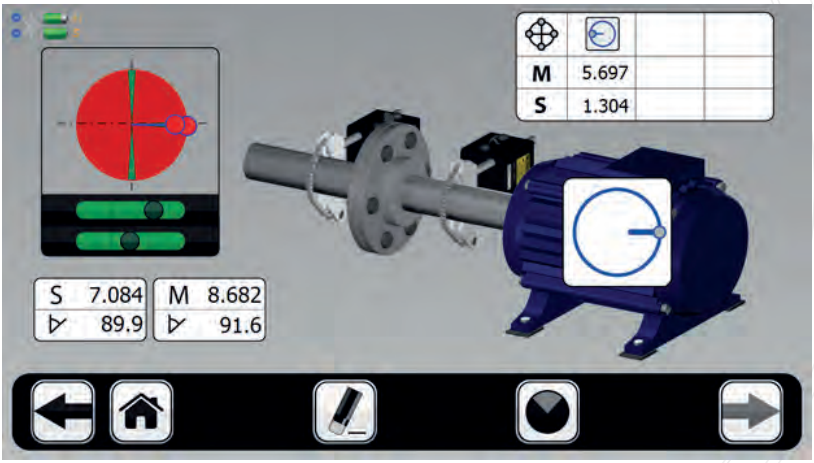


Touch the Icon 

The first measurement is registered in the table.

To reset the data, touch the Icon 

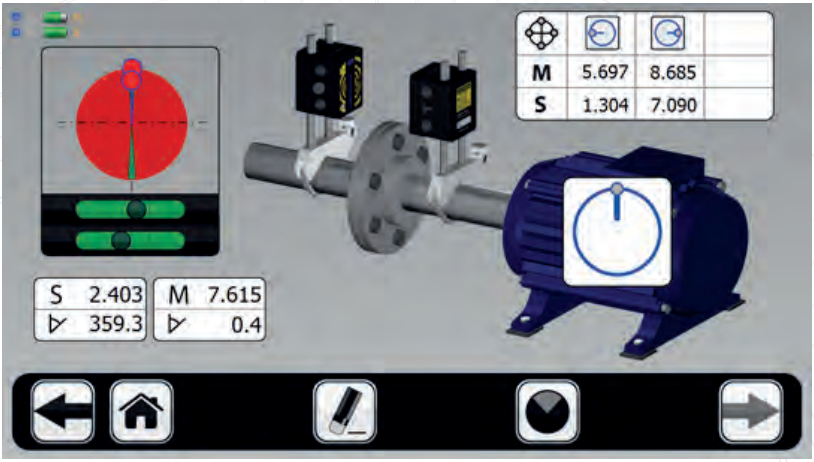
Turn the shafts to **the 3 o'clock.**



Tap the measurement icon 

The second measurement is registered in the table.

Turn the shafts to **the 12 o'clock**

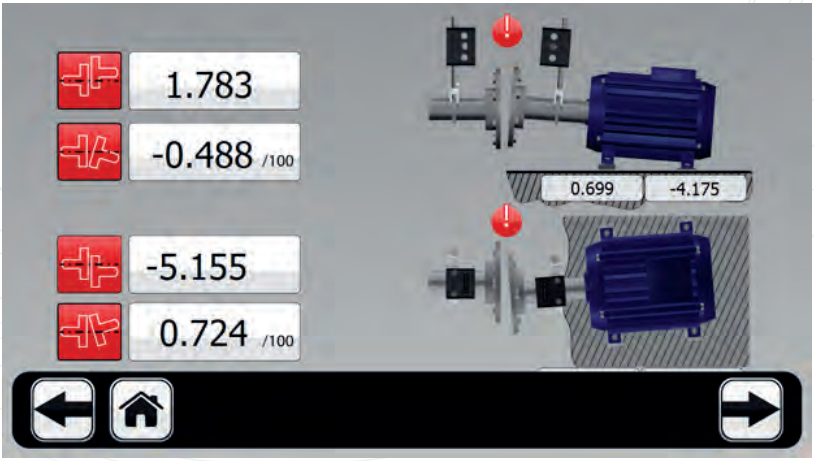


Touch the measurement icon 

The third measurement is registered in the table.

Touch the Icon 

Results of measurements



This screen shows the misalignment values according to the coupling joint and the feet position (horizontal as well as vertical). Symbols on the left of the value indicate angular and parallel misalignment and bias directions, as well as indicates whether the values are within the allowable limits.


Within the tolerance limits (green)


Within the doubled tolerance limits (yellow)


Beyond the doubled tolerance limits (red)

Symbols next to the soupling joint REPEAT THE LIMIT READINGS.


Within the tolerance limits


Within the doubled tolerance limits


Beyond the doubled tolerance limits.

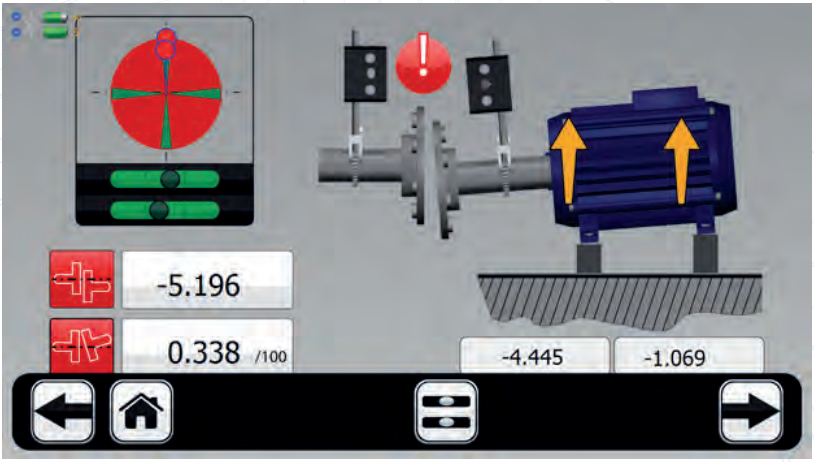
Note!.
The symbols above show whether the misalignment and bias values are within the selected tolerances.

Touch the Icon 

Live Alignment Mode

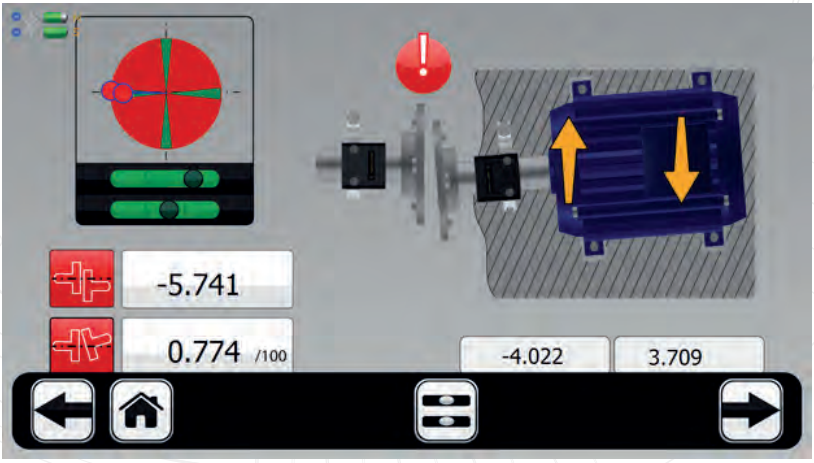
To adjust the shafts position vertically, rotate the shafts to **12 or 6 o'clock**.

To set the **M** and **S** sensor units, use the displayed virtual levels. Adjust the machine's vertical position until the values are within the allowable limits. Arrows next to the feet show the direction to move the machine in real time.



Note!
Use VIBRO-LASER SHIMS to align the machine vertically.

To adjust the shafts position horizontally, rotate the shafts to 3 or 9 o'clock. Use the displayed virtual levels for precise alignment. Adjust the machine's horizontal position until the values are within the allowable limits according to the arrows next to the feet.



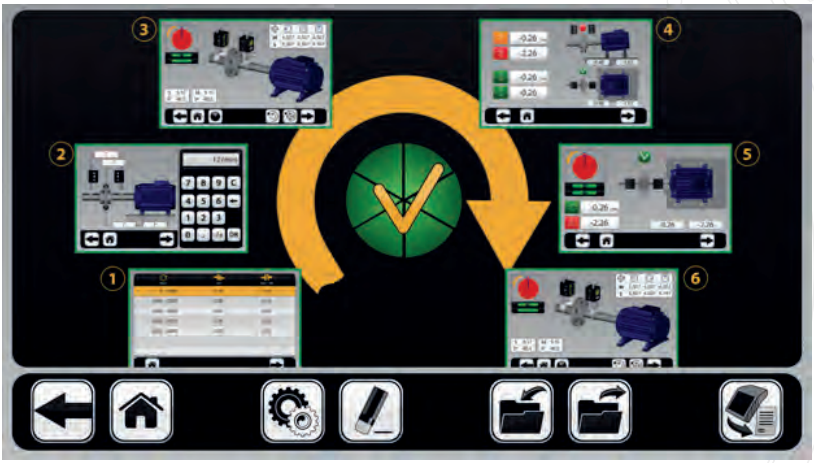
Note!
First adjust the position of the machine vertically, then horizontally.

Note!
Tighten the foot bolts crosswise with same force using a calibrated torque wrench to avoid changes of results!

The alignment is complete

To carry out
the verification measurements touch 

Carry out the verification measurement using the Clock method.
After the verification measurement the Horizontal Alignment menu is opened.



Note!
To carry out more precise alignment after the verification measurement - use the Live Alignment to continue align.

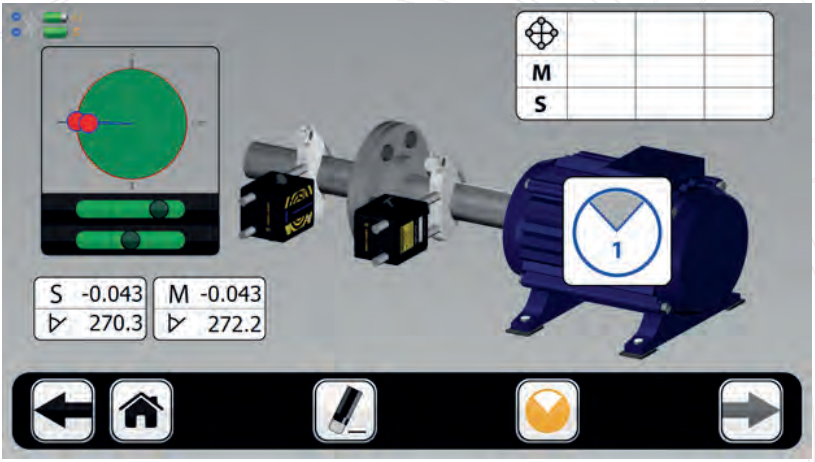
Save results, touch the Icon 

CUT ANGLE METHOD

If 180 degree rotation of the shaft is impossible for some reason, please use the CUT ANGLE METHOD.
The minimal rotation required is 40 degrees. The more rotation, the better and more precise the alignment.

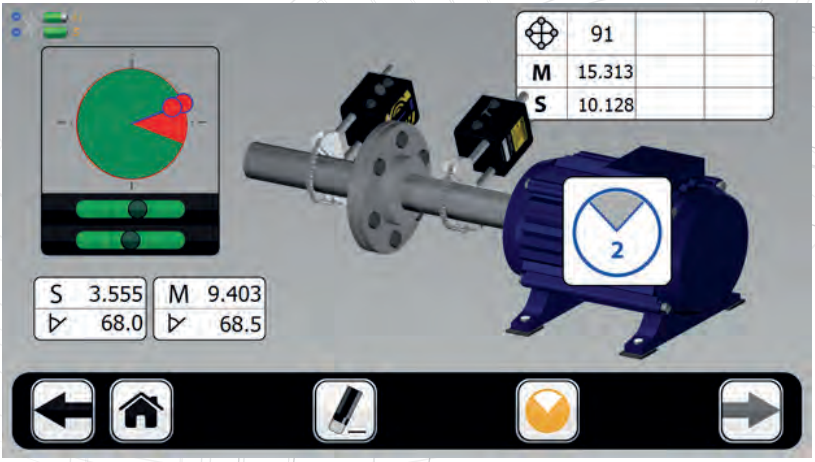
Touch the Icon 

Start measuring from any point.
Rotate shafts in the next position according to the animation.



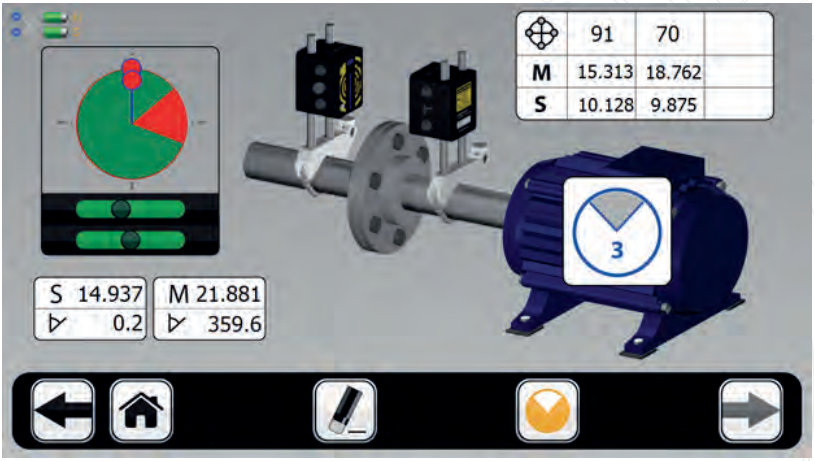
Touch **the measurement** Icon 

The first measurement is registered in the table.
Rotate shafts in the next position according to the animation.



Touch the Icon 

The second measurement is registered in the table.
Rotate shafts in the next position according to the animation.



Touch the Icon 

The third measurement is registered in the table.

Attention!
When taking measurements, rotate the shafts so the sectors do not overlap each other

Note!
For the best accurate maintain the sensors with maximum distance.

Note!
When using this method the shafts should be connected to provide maximum precision of the measurements and the alignment.

THERMAL EXPANSION CORRECTION

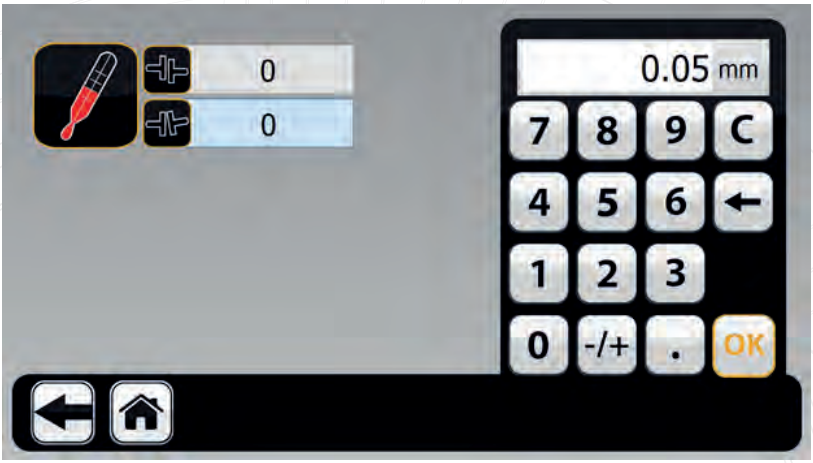
During the operation the equipment is exposed to various factors and forces.

The most common influence on alignment is change of the machine temperature which leads to the enlargement of a shaft and subsequent misalignment. This process is called thermal expansion or growth.

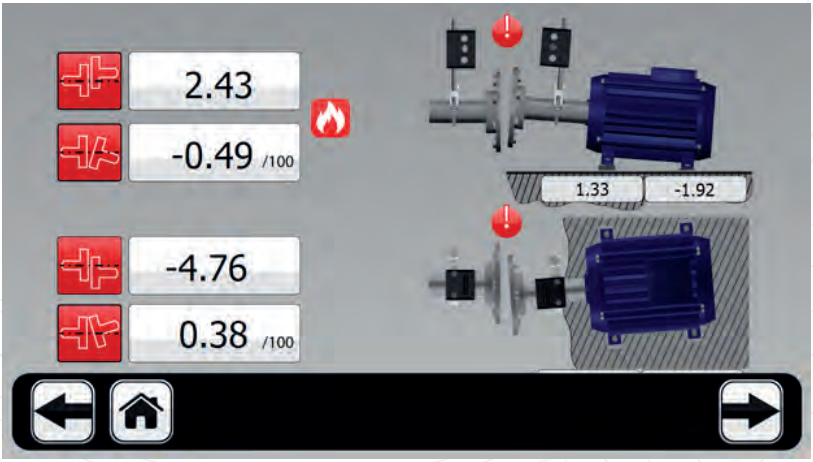
To compensate the thermal expansion you need to make a correction for the expansion of the cold machine during its heating through out operation.

Touch the icon in the alignment screen 

Insert the correction via calculator



When the results are received, the sign is shown, indicating that the thermal correction is made.



VERTICAL ALIGNMENT

Vertical shafts alignment is carried out by moving the machine flange/coupling until the axes are coaxial enough to stay in the assigned limits. The system is able to work with an allowance table.

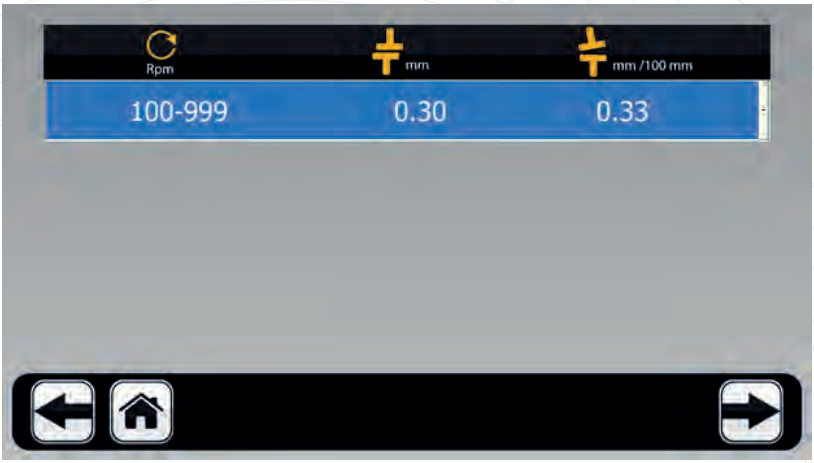
Touch the Icon 

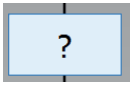
Complete the alignment procedure step by step, following the arrow indicator.

Note!

You can open the vertical alignment menu at anytime to verify your step

Insert the tolerance values according to the RPM of the machine.



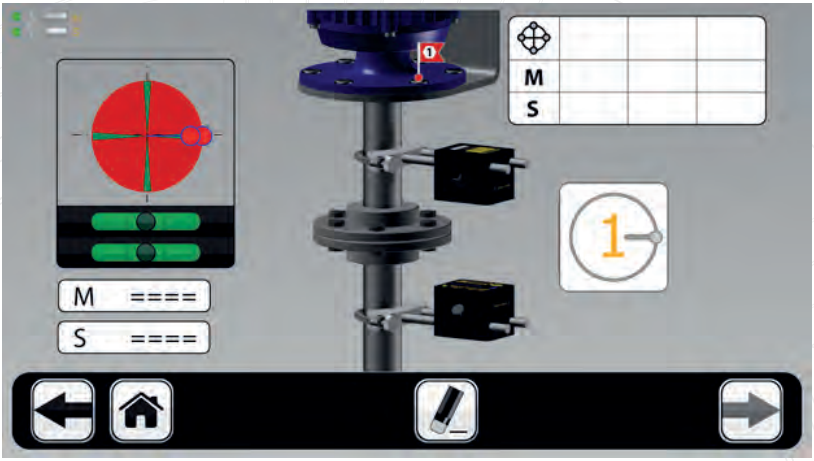
Touch the icon to insert the dimensions. 

VThe field activates a calculator interface. To submit the inserted dimensions, touch **OK**.

Use a measuring tape for measuring:

- Distance between the BARS CENTERS OF M and S UNITS
- Distance between the center of coupling joint and the BAR CENTER of M unit
- Distance between the centers of outer bolts.
- Number of bolts (it is helpful to use a paint market or grease pencil to mark the machine with the applicable bolt number for future

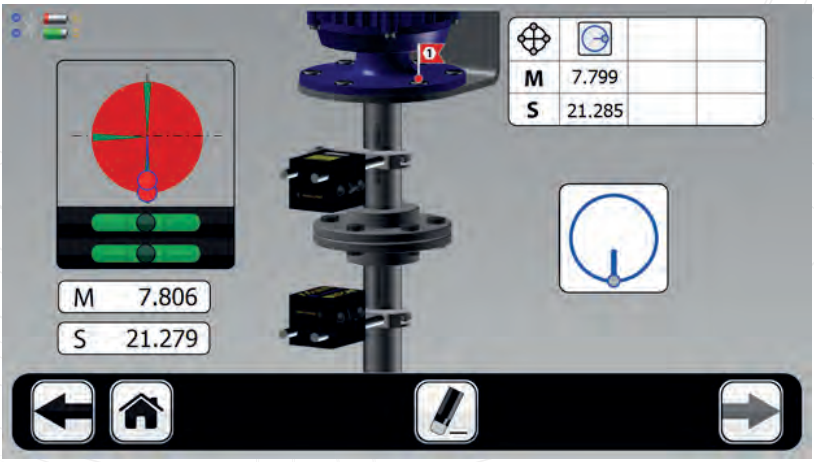
The vertical alignment program calculates the machine position by measurements in three shaft positions when they are rotated 180°.



Touch the measurement icon 

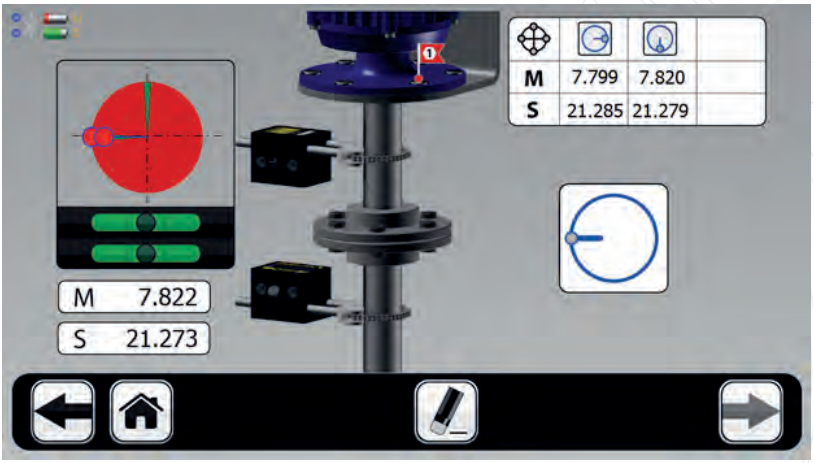
The first measurement is registered in the table.

Rotate shafts in the next position according to the animation.



Touch the measurement icon 

The second measurement is registered in the table.
Rotate shafts in the next position according to the animation.

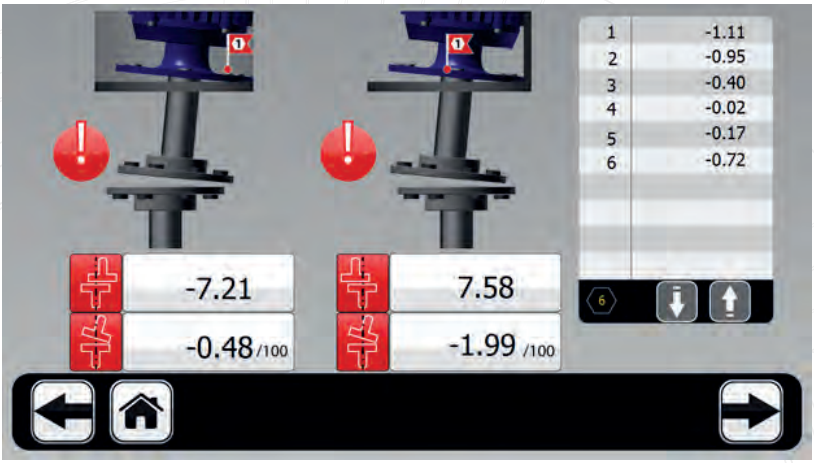


Touch the measurement icon 

The third measurement is registered in the table.

Touch the button
to get the measurement result 

The measurement results screen shows the misalignment values according to the coupling joint in both directions. Symbols on the left of the value stand for parallel and angular directions and also indicates whether the values are within the allowable limits.



The table on the right contains bolts numbers with designation of shims required for eliminating misalignment.

 within the allowable limits (green)

 within the doubled allowable limits (yellow)

 beyond the doubled allowable limits (red)

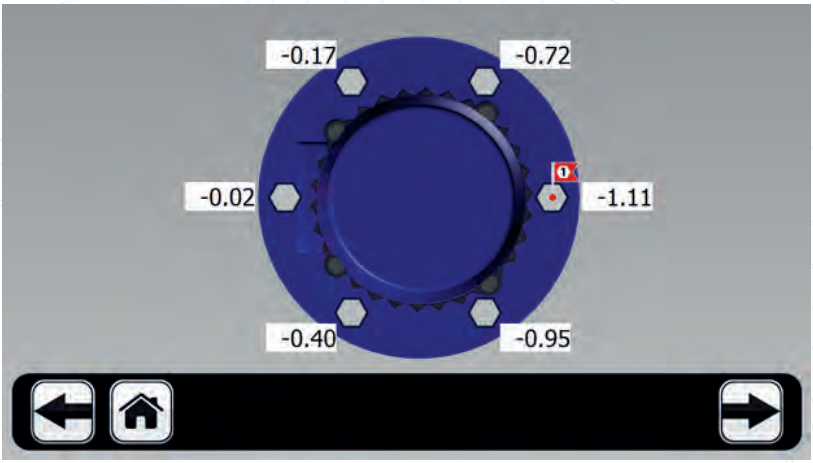
Symbols next to the socket joint **repeat the limit readings**.

 within the allowable limits

 within the doubled allowable limits

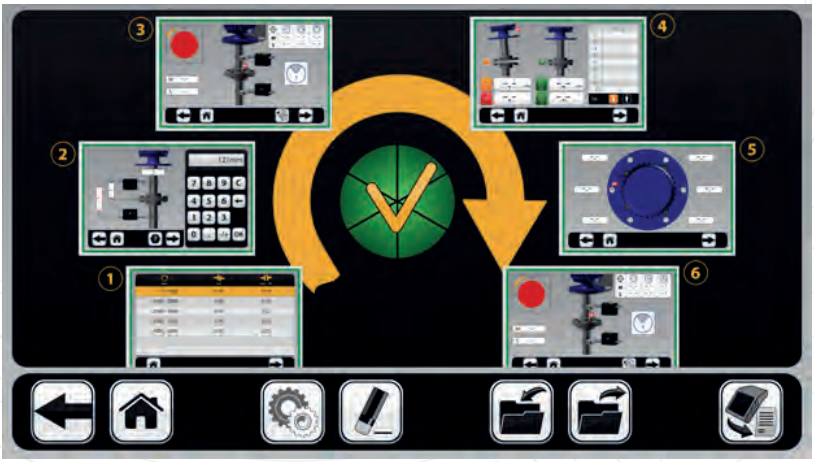
 beyond the doubled allowable limits

Touch the button
to get the measurement result 



To carry out **the verification measurements** touch 

Carry out the verification measurement.
After the verification measurement the Vertical Alignment menu is opened.



Save results by touching 

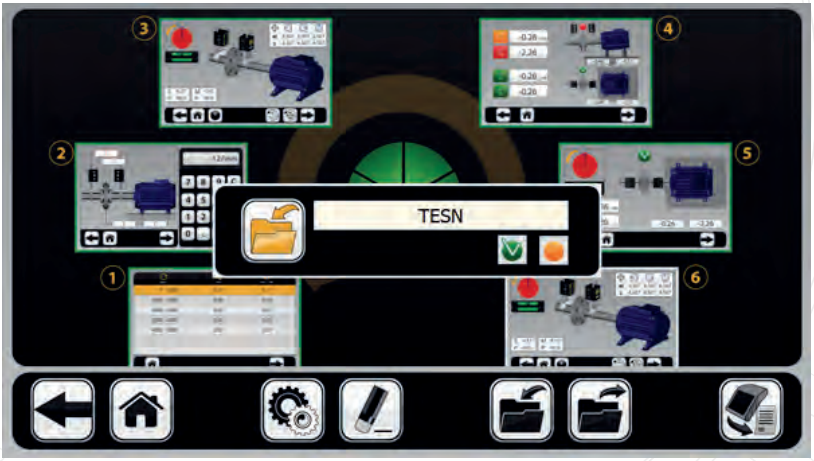
SAVING DATA AND REPORT CREATION

Note!
The program has autosaving function: every time the program is started, the previous result is shown.

To reset them, touch 

One of our system advantages is possibility to save, restore and edit the results of the alignment on any stage!

Touch the icon
to save **alignment results** 



Insert the name of the report with the virtual keyboard and touch 

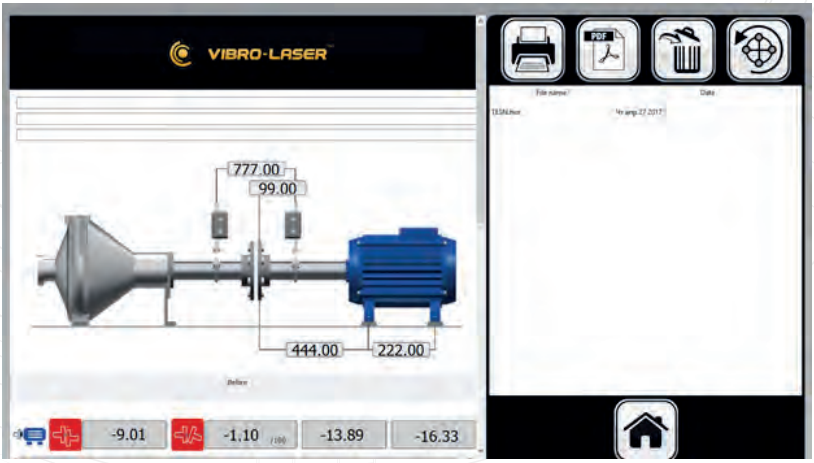
To cancel, touch 

To upload the results touch 

Note!
Upload a previously saved report and continue alignment from where you stopped.

To create a report touch 

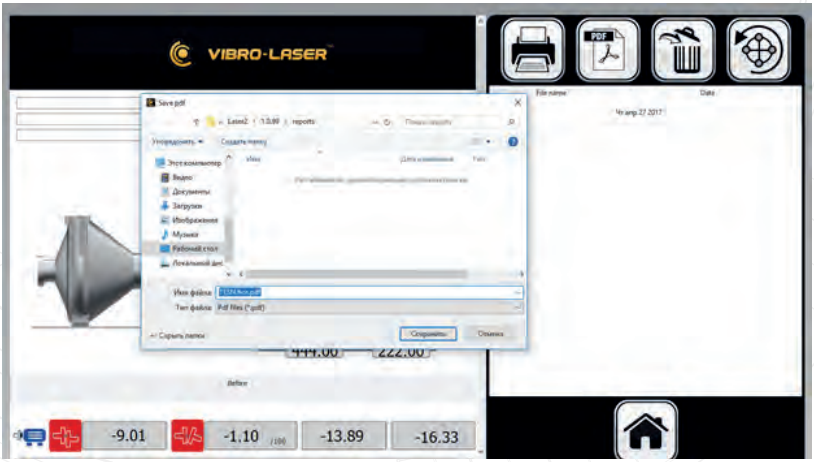
You can edit the report header with your machine and company information using the touch screen and virtual keyboard.



Options of report menu

Print the repor

Save the report as PDF



Save the report as PDF

INFORMATION ABOUT SYSTEM AND SOFTWARE

To see the system data, tap the button 

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