MECH TECH GLOBAL

Reliable – Robust – Reasonable

701TXV

Vibration Analyzer

User's manual

Tel: +91-8800047150, Mobile: 9711075595, E-mail: mechtechglobal18@gmail.com

TABLE OF CONTENTS

GENERAL INSTRUCTIONS

Precautions

To prevent possible electrical shock, fire, injury, or damage to the device:

Read the user manual carefully.

Do not place the sensor on objects subject to high voltage. Failure to comply may result in injury or death.

The analyzer cannot be used in potentially explosive environments.

Take measures to prevent cables from getting into rotating parts of machines at the measuring point.

Do not expose the 701TXV to strong shocks, high humidity, or extreme temperatures.

Do not attempt to open the display as this may damage the system and void your after sales warranty.

The analyzer is serviced by one operator who has undergone special training and safety briefing when working with mechanisms and machines that have rotating parts, as well as when working with laser radiation sources.

Operation of the analyzer is allowed only after familiarization with this OM.

The analyzer supplier is not responsible for the misuse of the equipment, nor for the interpretation of the measurement results.

This user manual may contain inaccuracies or typographical errors. We will be grateful if you report them to the email: info@alvibco.com. We will also be happy to receive your suggestions and wishes regarding the improvement of the analyzer and this manual.

Overview

The 701TXV Vibration Spectrum Analyzer (hereinafter referred to as analyzer) is a compact yet powerful instrument for overall vibration measurements, vibration spectrum analysis of rotating equipment, immediate ISO 10816 evaluation, route and off-route data acquisition, balancing of rotary machinery. Route files and data file sharing via email make it ideal for collecting data from remote sites. Easy to use, with free firmware updates, comes with data management and reporting software.

Optionally, the analyzer can be completed with measuring units and a set of accessories for high-precision laser alignment of horizontal and vertical mechanisms, geometric measurements.

System set

The 701TXV kit includes:

- 701TXV display unit;
- Accelerometer, cable 1.5 m, magnet for mounting on a curved surface - 2 or 4 pcs;
- Optical sensor, magnetic stand;
- USB charger;
- USB cable;
- ConSpect software and User Manual on the device drive;
- Carry case for transportation and storage.

Optional, when ordering the version with Laser Alignment System:

- Sensors S, M with cables or wireless;
- Universal V-brackets with chains;
- Rods 100mm, 150mm;
- Tape measure 3m.

Specifications

Input - 2 or 4 inputs for connecting IEPE or charge type accelerometers with known sensitivity, switchable. Optical sensor input.

ADC converter - 24 bits

Frequency range - 1... 50000 Hz

Vibration measurement range (depends on used accelerometers):

Acceleration - 200 m/s2

Speed - 200 mm/s

Displacement - 2000 uM

Accuracy - 5%

FFT spectrum resolution - 100, 200, 400, 800, 1600, 3200, 6400, 12800, 25600, 51200, 102400 lines

Balancing – up to 8 planes, up to 16 points

Speed measurement range - 10... 200000 rpm

Accuracy – ±0.1% and ±1rpm

Temperature measurement range (*Optional function) – -70°C to 380°C.

Accuracy – ±0.5% (0…+60°C), ±1% (-40…+120°C), ±2% (-70…+180°C), ±4% (-70…+380°C)

Bearings Tester (*Optional function) – measurement range 120 dBa, (-30…+90dB)

Accuracy - ±5 dB

Laser Alignment System (*Optional function) – shaft alignment, geometrical functions

Storage - 4 GB, micro-SD card

PC interface - USB

Display - color, sunlight readable, ¼ VGA 3.5”, *optional 480x800, 5” version

Battery - Li-Ion rechargeable, up to 8 hours of continuous operation

Dimensions - 220 x 102 x 40 mm

Weight - 470 g

BASICS

Keypad

To turn the display unit on and off - press and hold the power button  for ~2 seconds.

In the event of a system freeze, when the device does not respond to any keys - press and hold the power button  for ~ 10 seconds, the system will be reset and restarted.

To close any currently active window without saving, other than the device's main menu, press the

button (it serves as the backspace key).

The 

button in most cases is used to apply (save) changes (selection) and exit (from editing windows or from the current window).

Autosave

All procedures are designed with automatic saving. To temporarily interrupt the current work, press

key, you will exit to the main menu of the device. The data of the interrupted measurement will be automatically saved, and the device can be turned off.

Battery charging

The battery can be charged with a USB charger or via the USB port of a PC/laptop.

Immediately after connecting the charger to the display unit, there are a few seconds to change the charge current - press and hold the button for ~2 seconds until the LED changes the flash rate.

Low speed flash - normal charge, high speed - fast charge. Keep in mind that the PC/Laptop USB port can only provide a normal charge.

When the battery is fully charged, charging will stop, and the LED will turn off. Recharging does not occur even if the USB cable remains connected.

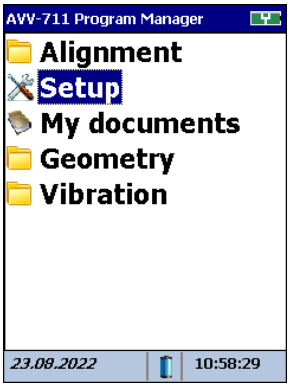
Main Menu

After turning on the device, the main menu is displayed on the screen.

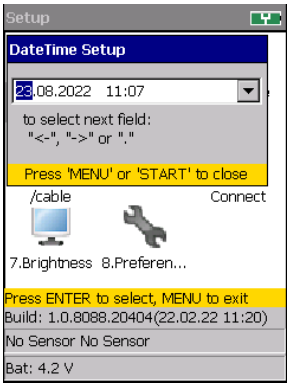
To call a menu item - move the cursor to this item and press the START key .

Setup Menu

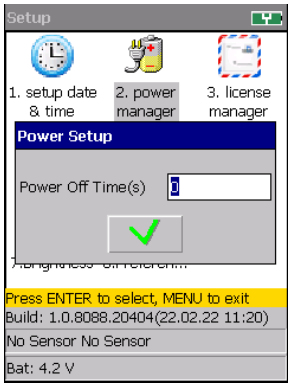
To invoke the configuration menu - move the cursor and press the START button.



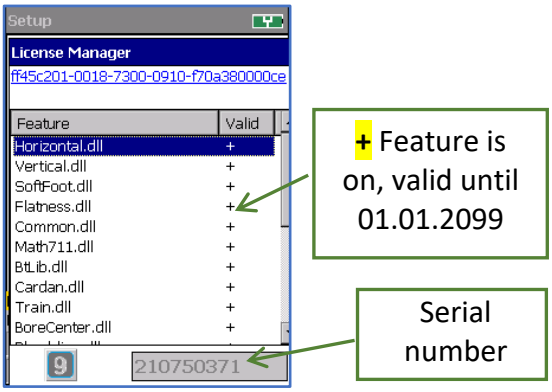
– date and time setup



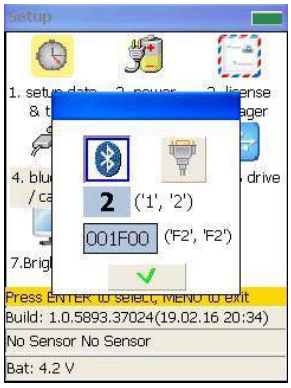
– auto off delay time. Is disabled when set to 0



– to install a license file that enables measurement functions. Press 9, navigate to the license file, then press ENTER to open and install the licenses.



– to switch between wireless/cable transducer's connection.

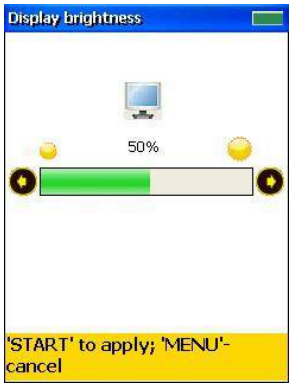


– Language of the user interface

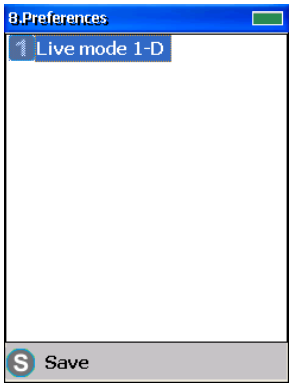
Use the ▲▼ keys to select the language, then press START

– to switch the device to USB storage device mode. By default, a device can be connected to a PC via Microsoft Windows Mobile Device Center. USB storage device mode can be used as an alternate mode.

– Adjusting the brightness of the display backlight

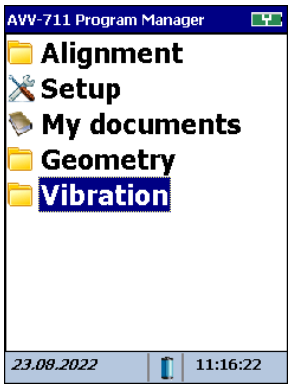


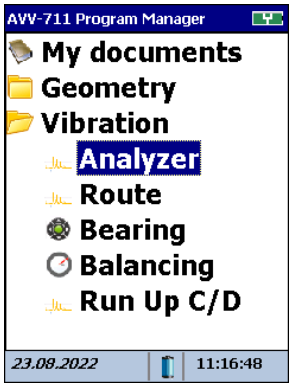
- to select the default alignment mode – 1-d or 2-d dual-axis mode. In the dual-axis mode, both horizontal and vertical alignment of the machine with real-time data updates can be performed in the static position of the transducers (e.g., 3 hours). For QB-TSM sensors, the only available mode is 1-D.

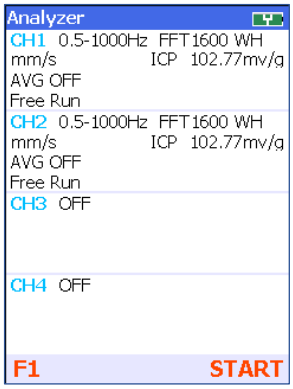


VIBRATION ANALYZER. VIBRATION MENU

Move the cursor and select the mode.

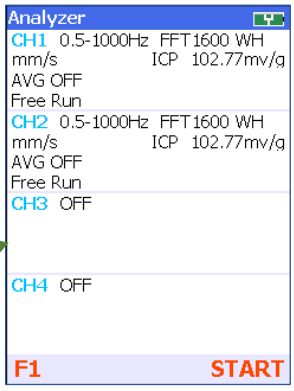




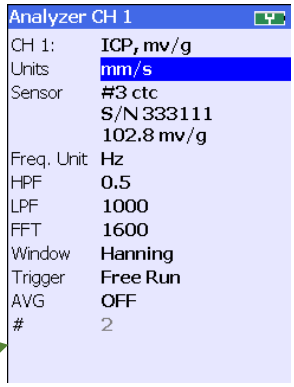


Setting Spectrum Analyzer Parameters

To enter the analyzer parameters change menu - press F1.



Analyzer Main Menu

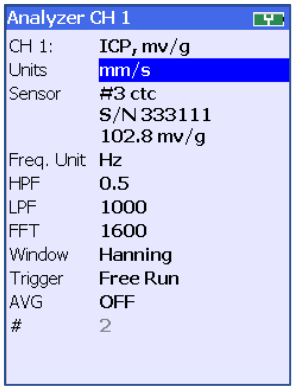


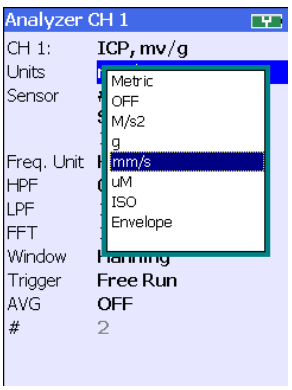
Analyzer parameters change menu

Units

Move the cursor to Units and click ENTER

Use the ↑↓ keys to select units of measurement – for example, **mm/s** and press ENTER to confirm.

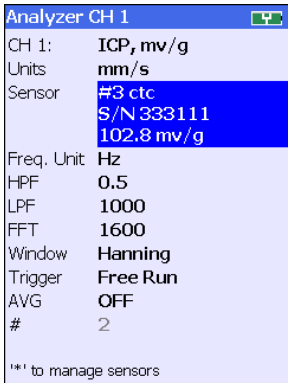


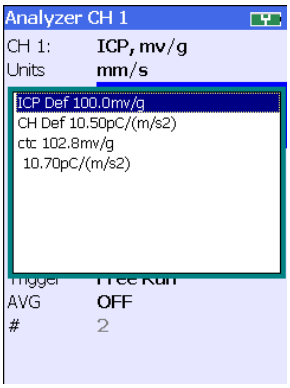


Sensor

Move the cursor to the **Sensor** and press ENTER

Use the ▲▼ keys to select the type of sensor – for example**, ICP** and press ENTER to confirm.

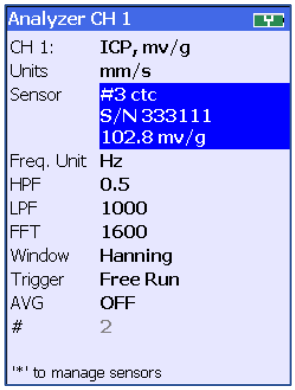


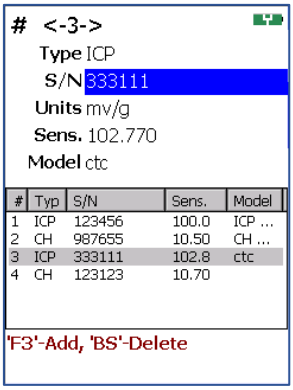


Setting the Sensor Conversion Factor

Move the cursor to the **Sensor** and press *

Use the ▲▼ keys to select the sensor parameter that you want to change, such as Serial Number (C/N), and then press ENTER. Enter the new value from the keyboard and press ENTER to confirm. To confirm the new sensor settings, press START.

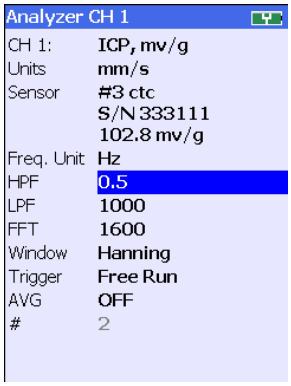


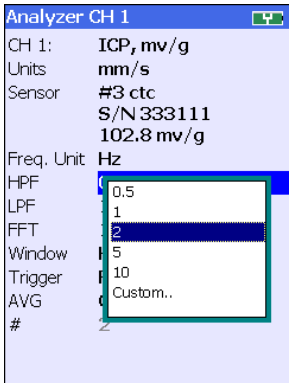


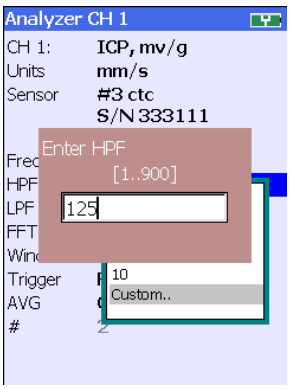
Setting the HPF cut-off frequency

Move the cursor to **the HPF** and press .

Use the keys to select the desired frequency of the HPF – for example **2 Hz** and press to confirm.





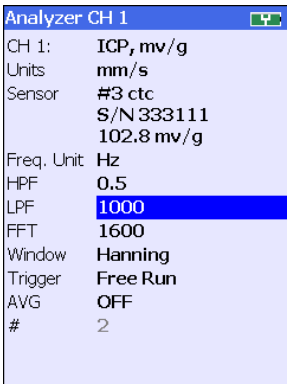


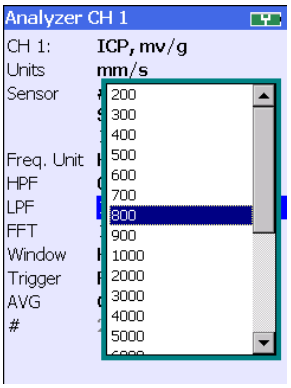
It is possible to select the preset values of the HPF - **0.5, 1, 2, 5, 10 Hz**. To enter an arbitrary value in the range of **1... 720 Hz** – select **Custom..**

Setting the LPF cut-off frequency

Move the cursor to the **LPF** and press .

Use the keys to select the desired LPF frequency – e.g. **800 Hz** and press to confirm.

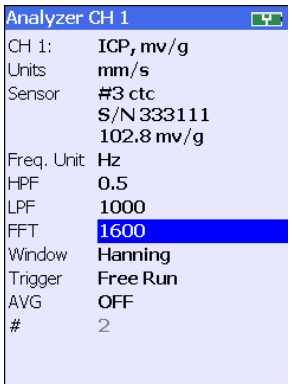


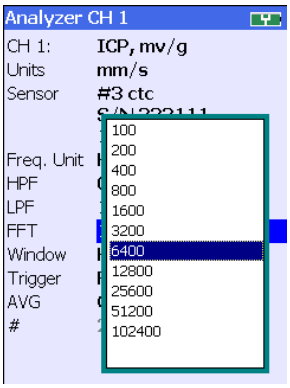


Setting the number of FFT lines

Move the cursor to the **FFT** and press ENTER.

Use the ▲▼ keys to select the required number of FFT lines – for example **6400** and press ENTER to confirm.

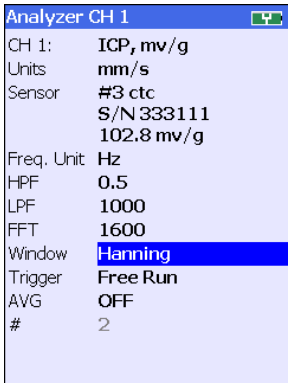


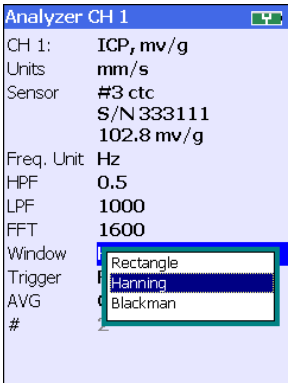


Setting the FFT window type

Move the cursor to **Window** and press ENTER.

Use the ▲▼ keys to select the desired FFT window – for example **Hanning** and press ENTER to confirm.

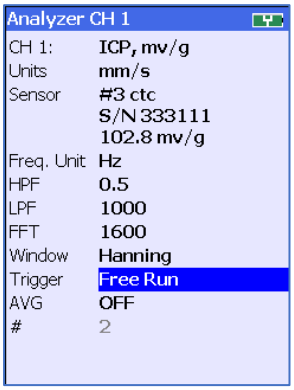


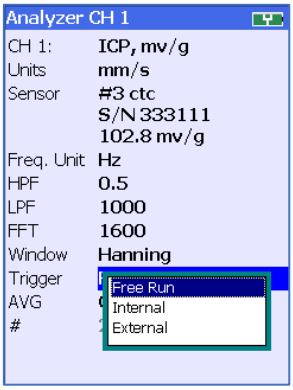


Trigger Type

Move the cursor to **Trigger** and press ENTER.

Use the ▲▼ keys to select the desired type of measurement start – for example **Free run** and press ENTER to confirm.

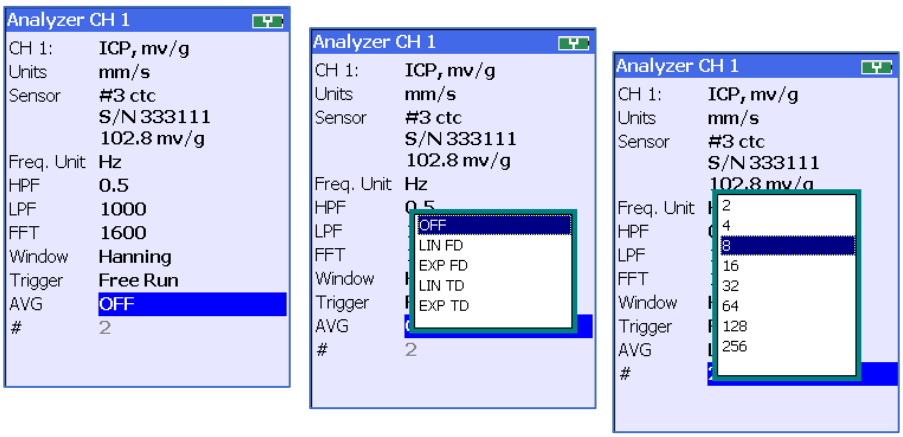




Set the Averaging mode

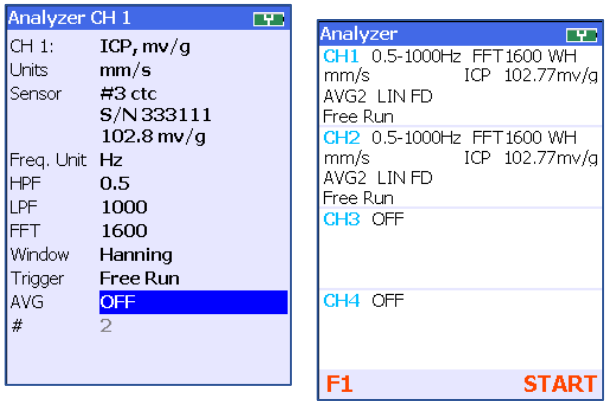
Move the cursor to **Averaging** and press ENTER.

Use the ▲▼ keys to select the desired averaging type – for example, **Lin FD** (Linear, Frequency Domain) and press ENTER to confirm. Then select the number of measurements to be averaged and press ENTER to confirm.



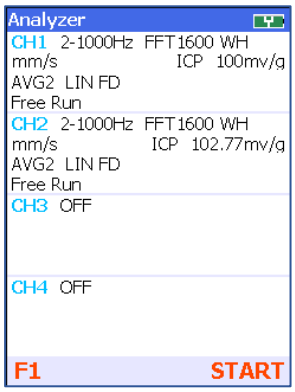
Confirmation of Spectrum Analyzer parameters

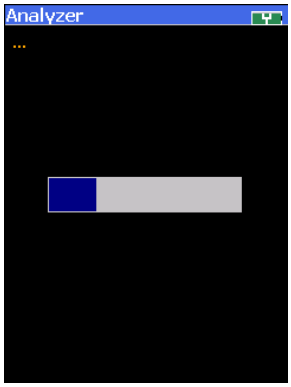
After the measurement parameter settings are completed, press START to confirm and return to the main menu of the analyzer.

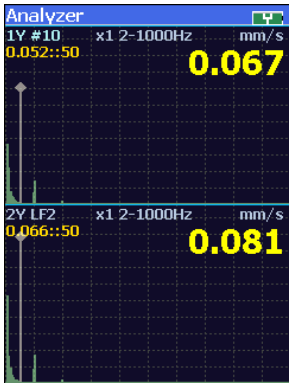


Starting a Measurement

Install the sensors on the measurement object and press the START key.







Controls in measurement mode

7 - Switching between FFT and Time function modes

4 - stop/resume measurement

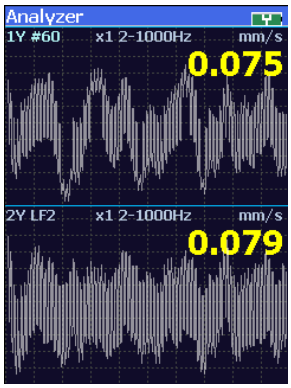
 - select the channel in which the cursor is active

 - cursor movement (measurement must be stopped by pressing 4)

5 - setting the cursor to the maximum harmonic of the spectrum

6 - cursor type switching – **frequency/cycles per minute/harmonic number**

3 - change the display mode on the display

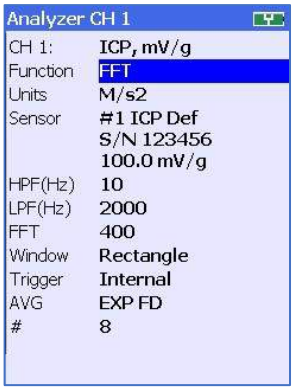


Bump test

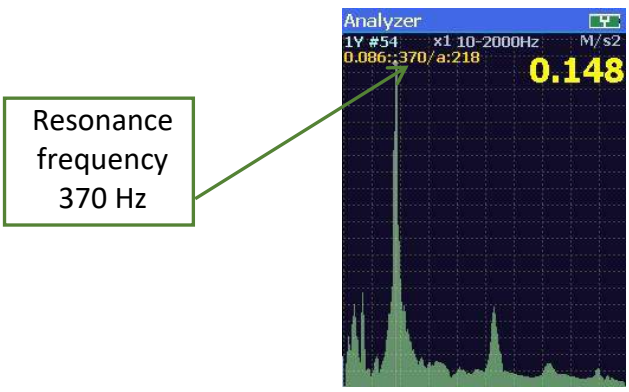
The bump test is an effective vibration analysis method used to identify resonance frequencies within a machine's structure. This test involves striking the machine's structure while it is stationary and simultaneously performing a measurement. Proper selection of the hammer or mallet, as well as the force and direction of the impact, is crucial to introduce appropriate frequencies without causing damage.

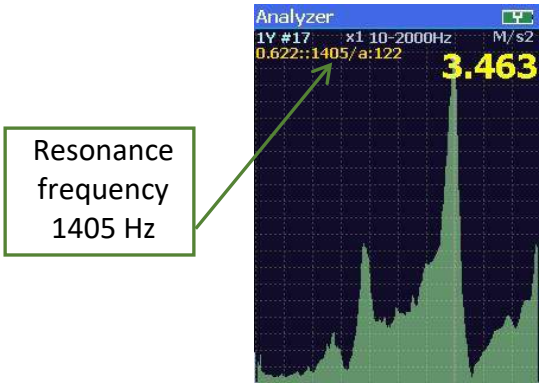
To conduct measurements:

- set Trigger to Internal
- set appropriate parameters
- start measurement



Device will take readings every time object under test is bumped





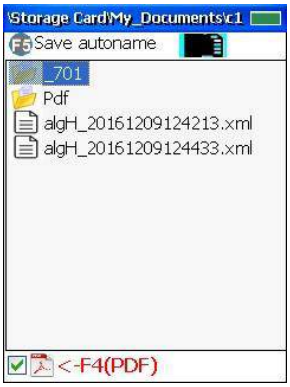
Record measurement files

To save a file - press a 8 key in the results menu.

Files can be saved on the internal SD card or on the flash drive connected to the USB host connector of the device.

Use F2 to select a disk

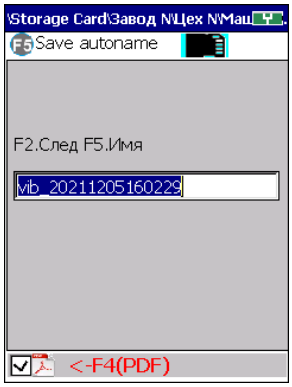
Use START CLR ◄ ► ▲ ▼ to select a folder



Use START to open a folder

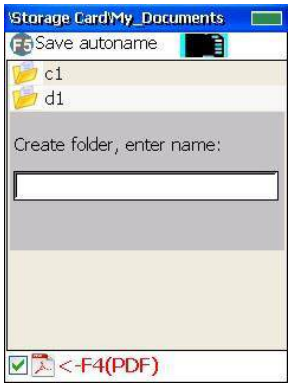
Use CLR to move up one level

Use 7 PQRS to create a new folder



Use F4 for ON/OFF generation of reports in PDF format

Press ENTER or F5 to write a report file with a default name



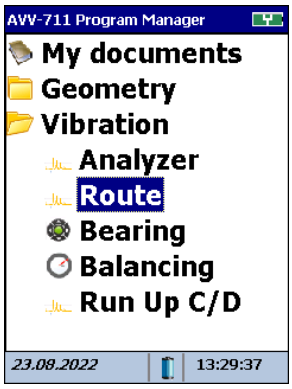
Press 8 TUV to edit the file name, then click ENTER to write the file

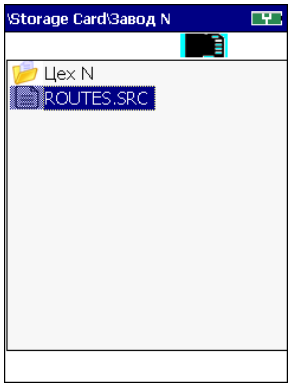
Route-based measurements

Use ConSpect software to create a route and upload the route file to the device

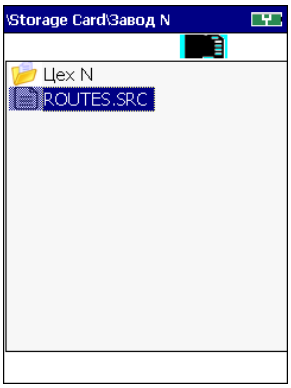
Go to the **Vibration/Route menu,** press START

Device will enter the file explorer.

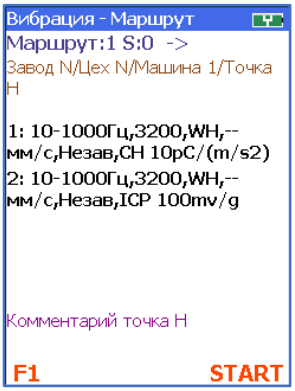




Open the folder with the route file, place the cursor on the ROUTES.SRC file and click START.



Use ◀ ▶ to review or randomly select route points



Set the sensor at the measurement point and press START. The instrument performs the measurement with the specified parameters and saves the files to the destination folder corresponding to the route point.

BEARINGS TESTER

Bearings tester function is based on shock pulse measurement and Kurtosis measurement.

Shock Pulse measurement

The most favorable conditions for the operation of bearings occur when their components are separated by a film of lubricant that prevents collisions. However, manufacturing defects, in-service damage, contamination, lack or absence of lubrication create conditions for collisions of bearing elements, resulting in acoustic vibrations in a wide range of frequencies in the bearing body – so called shock pulses.

Even a new bearing is a source of shock pulses from the moment it is commissioned, for which the amplitude of the shock acceleration is denoted by dBi.

The dBi value indicates the condition of a new, properly installed and lubricated bearing.

As defects in the bearing develop, the amplitude of shock pulses increases. Value exceeding the dBi characterizes the damage and is used to assess the condition of the bearing:

0..20 - good condition

20..35 – satisfactory condition

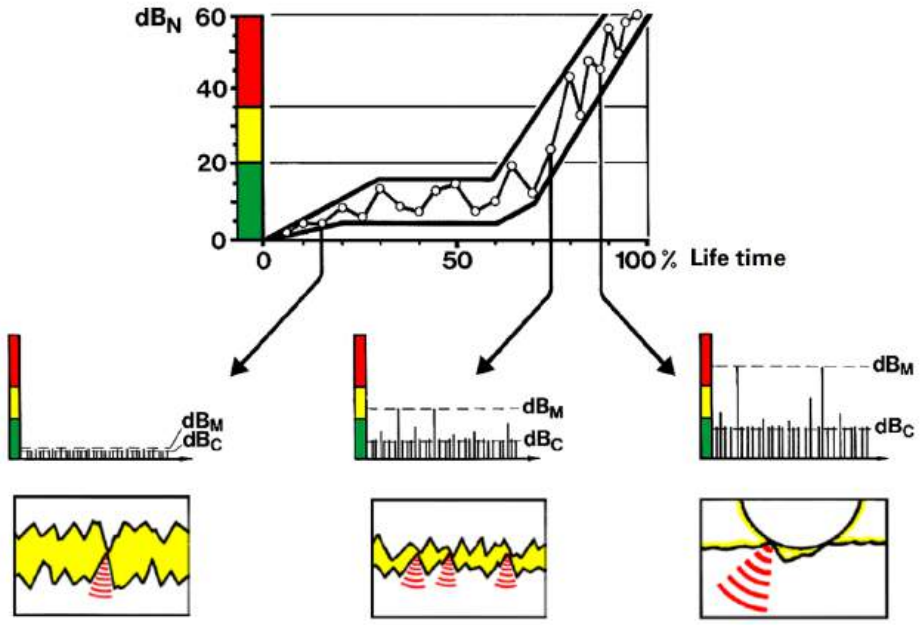
>35.. - Poor condition, risk of failure

Depending on the type of damage in the bearing, the nature of the forced oscillations recorded by the device also changes.

When measured, device allows you to distinguish and measure two characteristic values of the shock pulse amplitude – the carpet value - dBc, and the maximum - dBm values.

The carpet value dBc corresponds to frequent collisions of bearing elements and characterizes the state of lubrication. For example, when measuring the impact acceleration amplitude of a well-lubricated and properly mounted bearing, the dBm value will be slightly greater than dBc.

If we measure the amplitude of the impact acceleration of a damaged bearing, they are detected by the maximum values - dBm, while the value of dBc depends on the state of lubrication and can increase greatly with a lack of lubrication, accompanied by frequent metal-to-metal contacts. An example of a change in the values of these values is shown in Fig.



An increase in the carpet dBc value can be caused not only by deterioration in the condition of the lubricant, but also by other causes, such as misalignment of the shafts in the coupling of the drive. It is quite easy to distinguish between these phenomena: if the shafts are skewed, the same pattern will be observed for the bearings on both sides of the coupling.

When measuring the amplitude of the shock acceleration of gearbox bearings, the result obtained may be affected by shocks occurring in the gearing, which can be transmitted to the bearings. However, in most cases, the noise of the gears is so low that it does not affect the measurement results.

In the case of impacts resulting from gear defects, the maximum value of dBm increases dramatically on both sides of the gear at the same time.

The greatest effect of monitoring the technical condition of bearings is achieved when recording the measurement results with the construction of a graphical dependence in time. At the same time, it becomes possible to predict the technical condition. An example of processing measurement results is given in Table 1 (page 14).

Measurement results can be stored in the device memory.

Kurtosis

In the case of a serviceable bearing, the probability density of stationary random vibrations that occur in a serviceable bearing due to frictional forces can be considered to be in accordance with the normal law. The appearance of defects accompanied by impacts between the bearing bodies and raceways leads to a change in the shape of the probability density curve **p(x)** and, accordingly, to a change in the numerical value of the kurtosis coefficient **E**. Moreover, the more developed the defect, the sharper the density curve becomes.

Based on the results of the analysis of a large sample of defective and non-defective bearings, the following threshold values of the kurtosis coefficient were established:

Ku < 3 – corresponds to the good condition of the bearing;

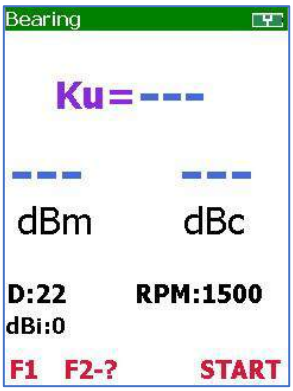
Ku > 3 – the bearing can be operated until the next replacement;

Ku > 5 – the bearing is not allowed to be used.

The statistic index Kurtosis is insensitive to changes in rotational speed and load and does not require knowledge of the bearing size to be diagnosed and repeated measurements. The kurtosis coefficient is sensitive to the lubrication condition of the bearing, so it can also be used to diagnose plain bearings. The Kurtosis measurement cannot identify a defect, so it is recommended to use it at the stage of preliminary assessment of the technical condition of bearings, and to identify and localize defects, use more accurate methods of vibration diagnostics.

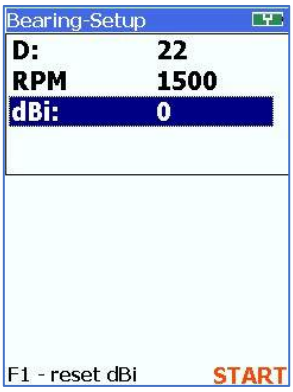
Operation

- Enter **Bearings** menu:

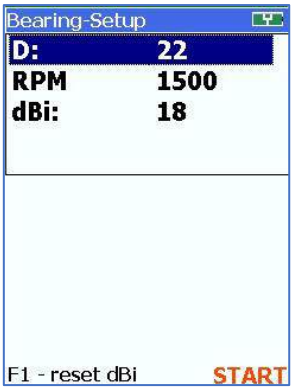


To set dBi

- press ENTER key, set dBi value
- confirm by ENTER key
- use F1 key to calculate dBi value based on D and RPM



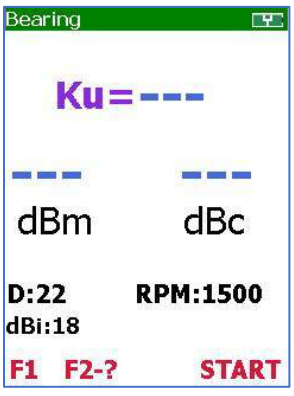
If dBi value is unknown just enter the bearings shaft diameter and RPM then press F1 key, device will calculate the dBi value:



Measurement

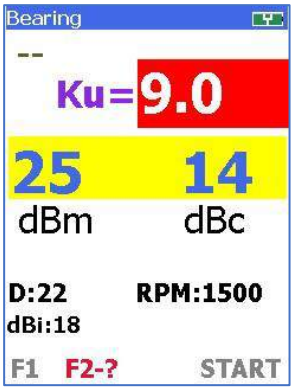
- connect P77B probe to the device socket
- press the probe tip against the measuring point with a pressure force of about 1 kg
- press START key

Header color will change to blue when measurement is active.



Measured data is continuously updated until the next press of the START key which will terminate measurement.

To facilitate evaluation of the result, the device displays data on a colored background of green, yellow, or red.



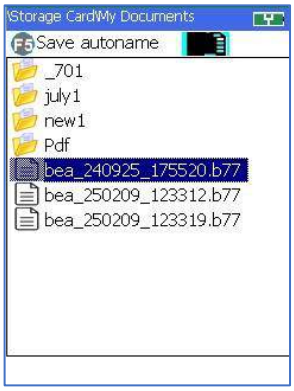
Green – corresponds to the good condition of the bearing;

Yellow – the bearing can be operated until the next replacement;

Red – the bearing is not allowed to be used.

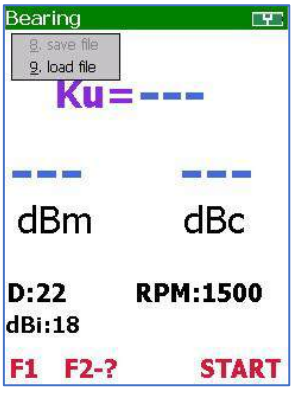
To save report file

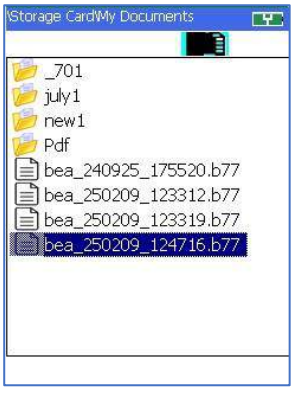
- stop measurement by START key
- press 8 key
- browse to destination folder, press to F5 save file



To open report file

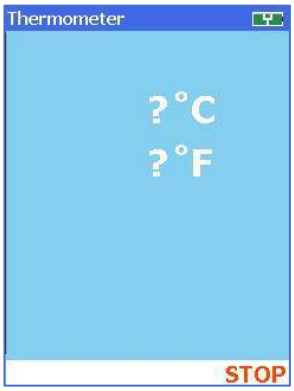
- press 9 key
- move cursor to file to open, press START key





IR THERMOMETER

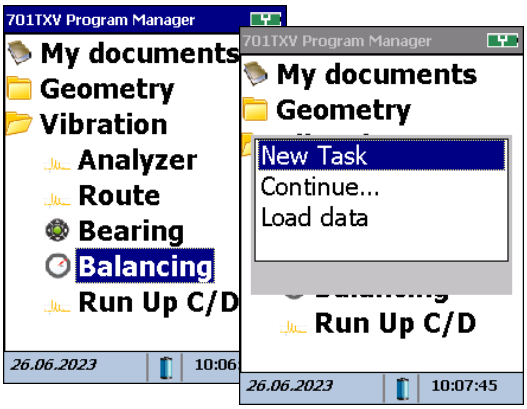
- Enter Thermometer menu
- connect P77T2 probe to the device socket
- aim probe to the object
- use START key to start/stop measurement



BALANCING

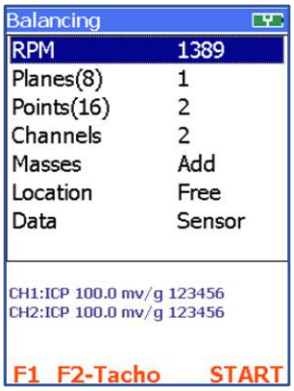
Setup Balancing parameters

Enter Balancing function.

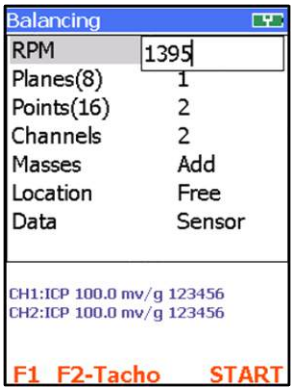


Use  to choose parameter to setup.

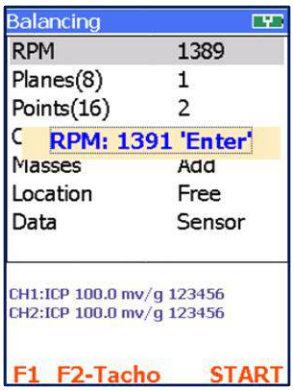
Press  to edit parameter value.



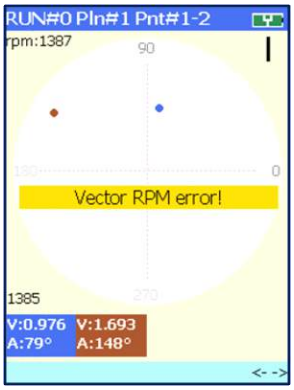
Set **RPM** of the machine at which balancing will be conducted.



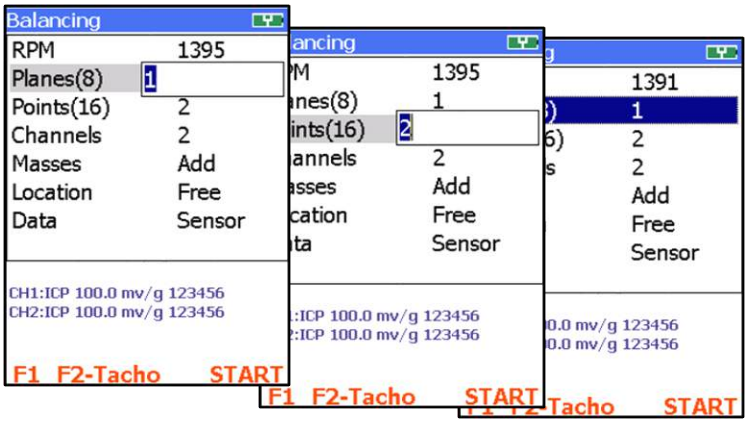
It is also possible to run tachometer measurement to get actual machine RPM. Press  to do so, then press  to apply measured RPM.



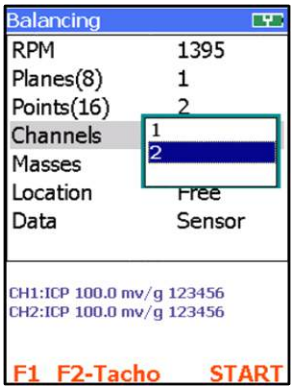
If actual RPM and balancing RPM differs by more than 5% device will display error message while measurement is in progress



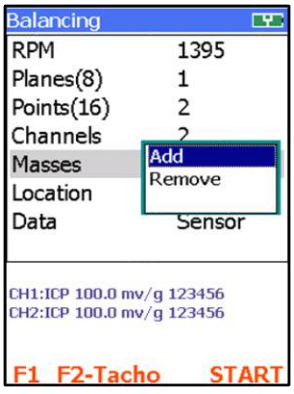
Set number of **Planes** (where correction weights will be attached) and number of **Points** (where the accelerometer will be measuring the vibration levels)



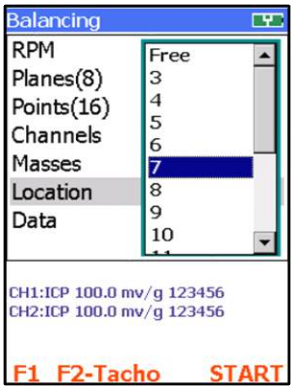
Set number of channels used to take readings.



Balancing weights can be preset to **Add** or **Remove**.

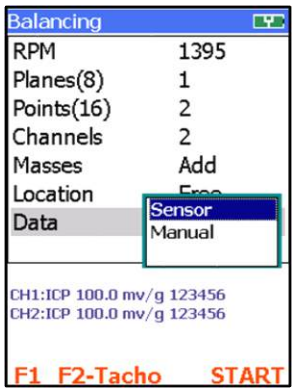


Correction weights can be attached at any angular position - **Free Loc.** Or at **Fixed Locations** (e.g., at the fan blades). Number of Fixed locations can be set in the range of 3 to 18 locations.



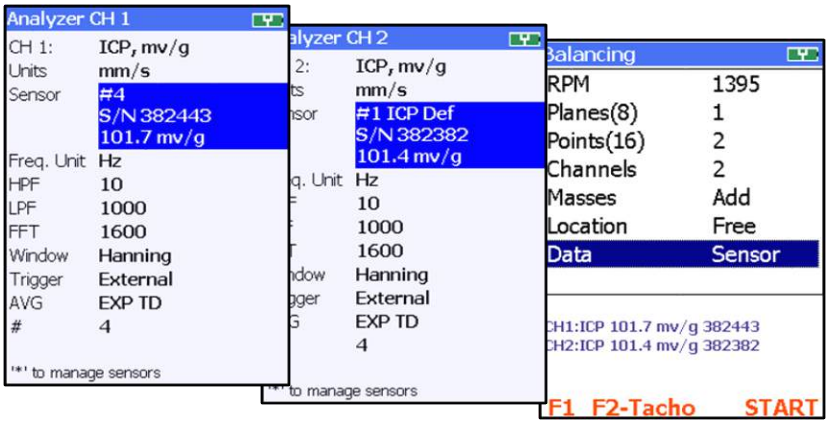
*Balancing program assumes that angles (and fixed location numbering) are aways calculated **counter wise** machine rotation direction!*

Data source should be set to Sensor.



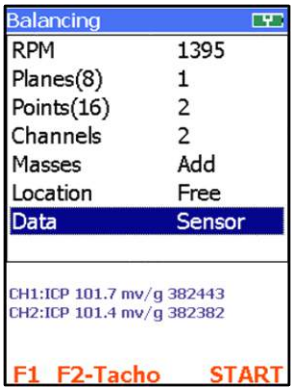
Choose sensors used to take readings.

Press START to confirm.



Now all is set, and device is ready for measurement.

Press START to start measurement.



Balancing in one plane

SAFETY PRECAUTIONS

Vibration measurement and balancing involves measurement on rotating machines. Always keep a safe distance to rotating parts and secure transducers and transducer cables from rotating parts.

Balancing involves mounting of trial and balancing weights on the rotor. Always secure the start switch with a locker and use the emergency switch for double safety before working with the rotor.

This is especially important when the machine is remote controlled.

The device manufacturer cannot take responsibility for any accidents on people and machines.

Heed all warnings and recommendations to prevent data loss, data inaccuracy, damage to the instrument, or injury to yourself!

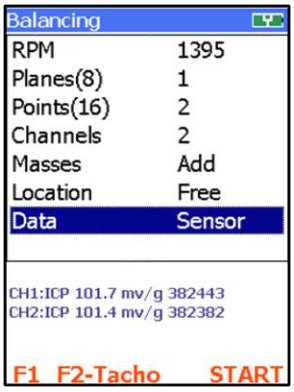
One-Plane Balancing Procedure Overview

- Run 0 - the initial vibration (unbalance) measurement.
- Run 1 – vibration measurement with trial weight attached in plane A
- Stop the machine, attach calculated correction weight at the specified angle on balance planes A.

Trim run 1… – Start the machine and measure residual vibration level. Once measurement stopped device will calculate trim weight, to further reduce the vibration. If residual vibration is higher than target value – attach trim weight and perform another trim run. Repeat trim runs until required vibration level is achieved.

Example: Balancing procedure flow (one plane, two points)

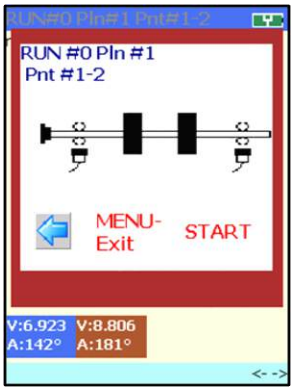
Set Balancing parameters.



Place accelerometers at measurement points

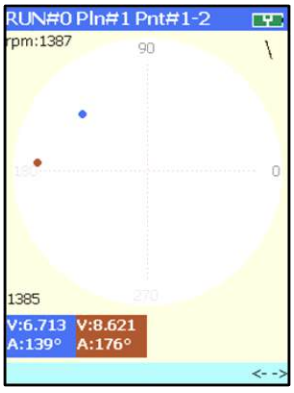
Run the machine

Press START



Wait reading to stabilize.

Press START



Confirm reading is accepted.

Press START

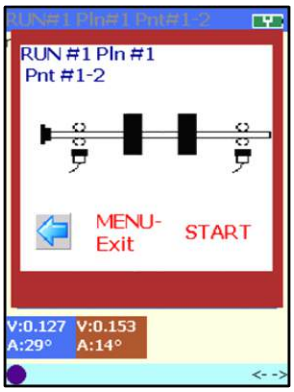
Stop the machine.

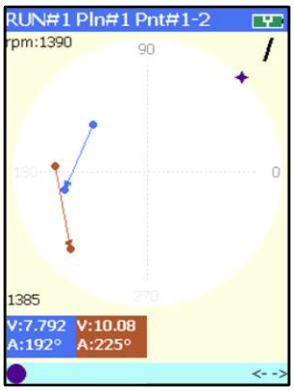
Attach the trial weight.

Enter trial weight and angle, at which it is attached.

Press START

Start the machine.





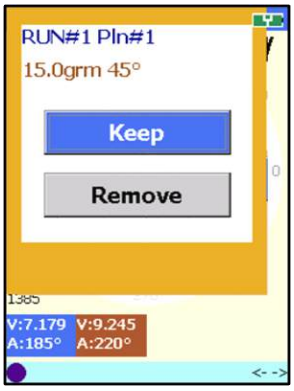
Press START

Wait reading to stabilize.

Press START

Confirm reading is accepted.

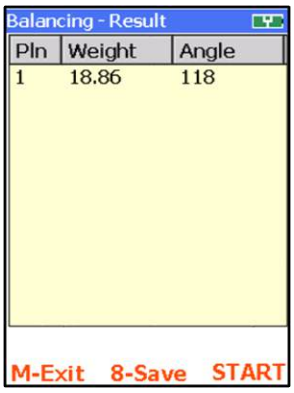
Stop the machine.



Now one needs to decide whether to keep or remove the trial weight from Plane #1.

E.g. trial weight can remain attached if vibration levels decreased.

Chose option and press START.



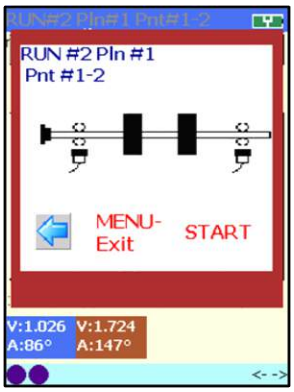
Device displays calculated correction weight to be attached to eliminate disbalance.

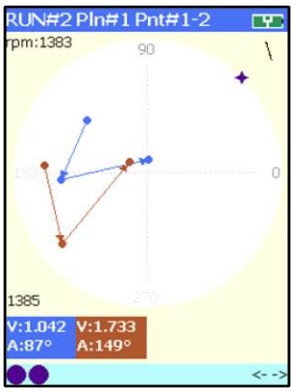
Residual vibration can be measured now.

Start the machine.

Press START

Wait reading to stabilize.



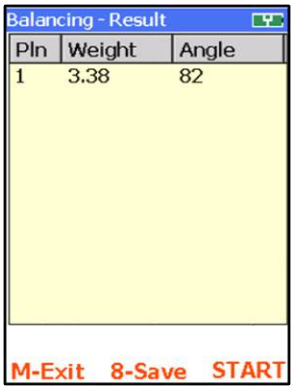


Confirm reading is accepted.

Press START

Stop the machine.

Device displays calculated trim weight to be attached to further eliminate disbalance.

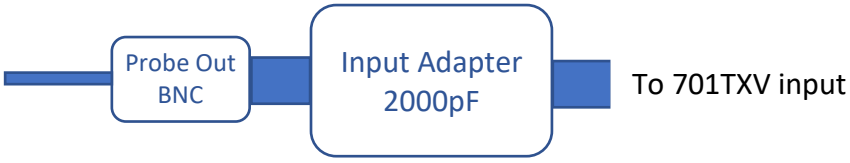


USING OPTIONAL ACCESSORIES

Stroboscope

Eddy Current Probe

Connect the Eddy Current Probe via the Input adapter.



Set 701TXV input to Charge mode, Acceleration, m/c^2.

Set the 701TXV Sensor sensitivity as per equation:

Sens, pC = (Input Adapter capacitance, nF) x (Eddy Current Probe sensitivity, mV/uM).

* 2000pF = 2nF.

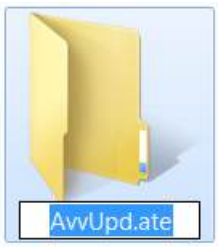
e.g. (2nF) x (8mV/uM) = 16, so the 701TXV Sensor sensitivity should be set to 16pC, thus 701TXV will display readings in uM.

FIRMWARE UPGRADE

Firmware Upgrade using pen drive

Make sure that device battery is fully charged!

1. Insert USB thumb drive into PC/Laptop port. In the root directory of USB thumb drive – create the folder **AvvUpd.ate**



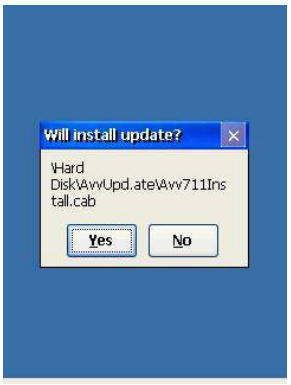
2. Copy firmware file **Avv711Intall.cab** to this folder

3. Remove USB thumb drive from PC/Laptop port and insert it to the qb701 USB host port. Press and hold key for ~2 sec to turn qb701 on.

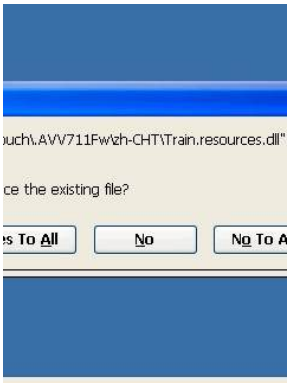
4. Invoke firmware updater by pressing keys simultaneously.

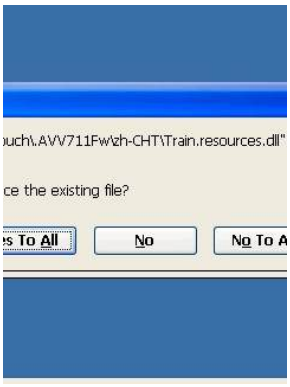
5. Press to confirm search for USB

6. Press to confirm start of firmware upgrade.



7. Press key then to confirm replace of all existing files





8. Press key to choose NO, then press

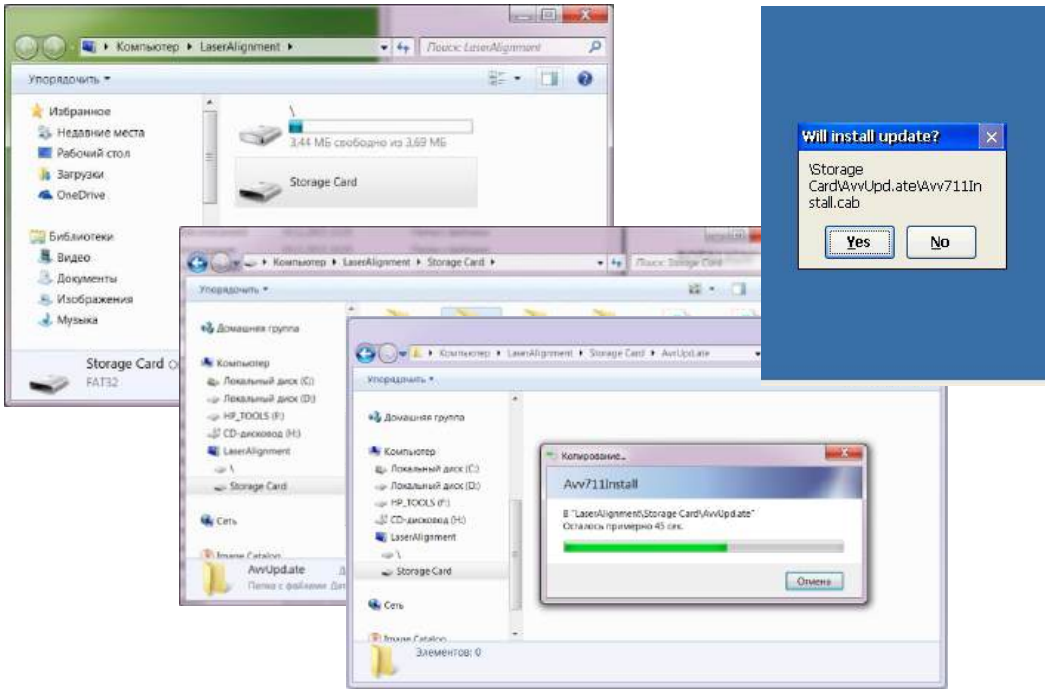
9. Firmware upgrade will run. Once finished press to turn device OFF

Firmware Upgrade Using Windows Mobile Device Center

Make sure that device battery is fully charged!

1. Connect AVV-711 to PC via USB cable. Press and hold  key for ~2 sec to turn qb701 on. Windows Mobile Device center will launch. Connect to qb701 and browse to the folder “Storage Card/LaserAlignment/AvvUpd.ate/” and paste there the firmware file **Avv711Install.cab**

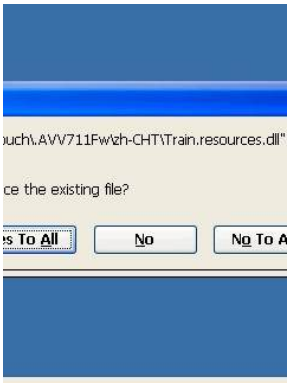
2. Wait until file copied.



3. Invoke firmware updater by pressing  keys simultaneously.

4. Press  to confirm start of firmware upgrade.

5. Press key then to confirm replace of all existing files



6. Press key to choose NO, then press

7. Firmware upgrade will run. Once finished press to turn device OFF

LASER ALIGNMENT SYSTEM. GENERAL

Safety Precautions

Be sure the machines to be measured, cannot be started unintentionally as this can cause injuries. For this purpose, before the mounting of equipment, either block the power switch in the “Off” position or remove the safety fuses. These precautionary rules must be followed until the measuring system is dismantled from the measured machine.

Laser Safety Precautions

The KOHTECT qb701 alignment system is the class II laser device at typical wavelength of 650nm, delivered output power of less than 1 mW and maximum radiant energy per pulse of 0.1 mJ. The Class II laser comply with requirement outlined by USA’s FDA as well as international ANSI, BS 4803 and IEC 825 standard. Be sure to follow the following safety precautions to avoid personal injuries and damage to the system

- **Do not look directly into the laser beam at any time!**
- **Do not direct laser beam on to the people’s eyes!**

ATTENTION!

Do not expose qb701 parts to heavy impacts, high humidity and extreme temperature.

Do not try open / dismantle measuring units and the display unit – this can damage the system, and your after-sales service warranty will come void.

INJURY RESPONSIBILITY DISCLAIMER

Neither the NPP KOHTECT enterprise nor our authorized dealers are liable for the damages caused to machinery or equipment by use of the qb701 system. We carefully check text of this manual to eliminate errors, nonetheless there may be mistakes or inaccuracy involved. We will be grateful for your reporting to us about any error, and we will be able to correct them in the subsequent editions of the manual.

EC Declaration of conformity

We, NPP KOHTECT, 167, Pogranichnaya str., 201, Nikolaev, Ukraine herewith declare that the following product:

Shaft Alignment Tool **qb701**

has been designed and manufactured in accordance with: EMC DIRECTIVE 2004/108/EC as outlined in the harmonized norm for EN 61326-1:2013 Electrical equipment for measurement, control and laboratory use –

Part 1: General Requirements,

EN 55011: 2009 +A1:2010, EN 61000-4-2: 2009, EN 61000-4-3: 2006 +A1:2008 +A2:2010, EN 61000-4-4: 2004 +A1:2010, EN 61000-4-5: 2006, EN 61000-4-6: 2009, EN 61000-4-11: 2004

EUROPEAN ROHS DIRECTIVE 2011/65/EU

The laser is classified in accordance with the EN 60825-1:2007. The laser complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Kiev, Ukraine, Dec 17, 2015

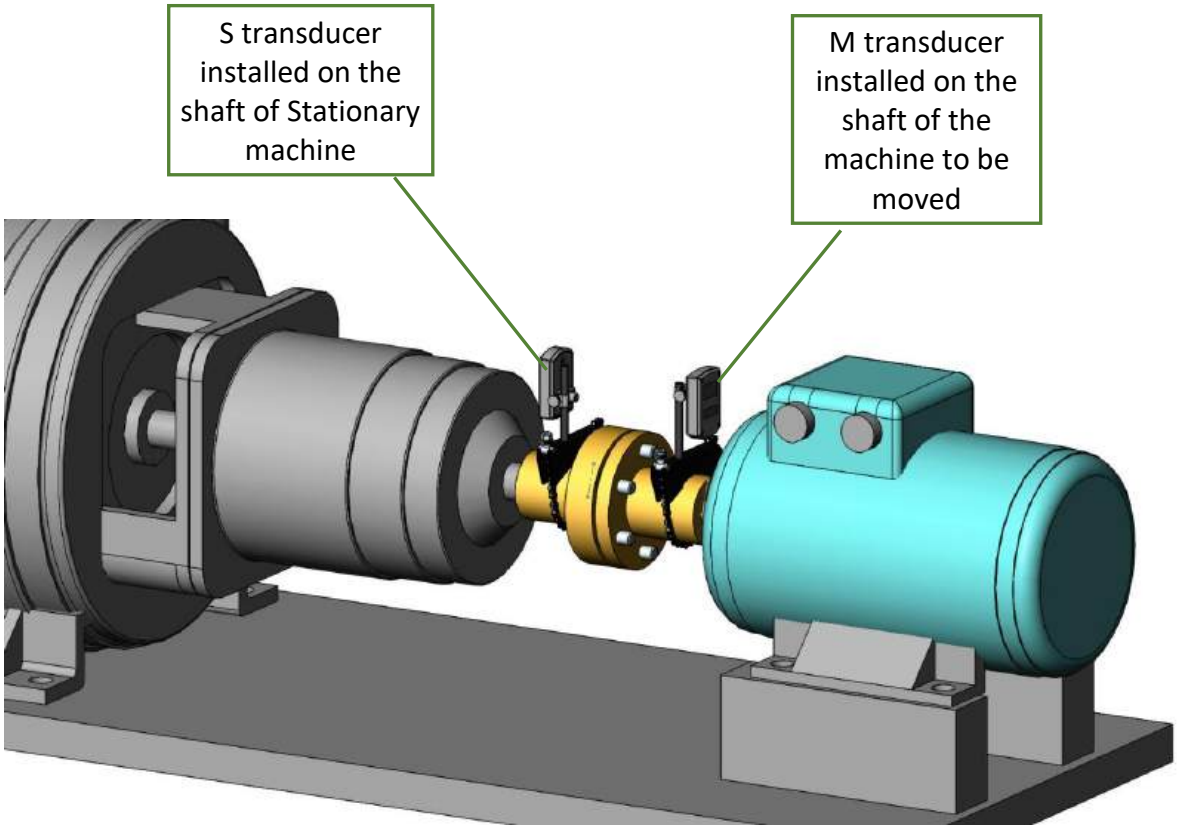
Oleg Ivanov, Head of Product Development

TECHNICAL DESCRIPTION

Designation

qb701 alignment system (further as System) is designed for measurement of shaft axis misalignment of coupled machines, and calculation of movable machine adjustment required to eliminate misalignment that exceeds permissible tolerances;

The machine alignment means adjustment of the relative position of two coupled machines (e.g. motor and pump) so that the center line of the axis will be concentric when the machines are running under normal working conditions.



Misalignment Parameters

Misalignment of any rotating machine is expressed in parallel (Offset) and angular (Gap) of the shafts. Most frequently in practice, both of them are present simultaneously. Different kinds of misalignment of axes are shown in Fig. 2.

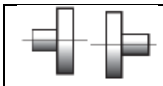
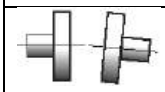
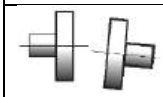
	Parallel misalignment of axes – Offset (displacement)
	Angular misalignment of axes – Gap
	Parallel and angular misalignment of axes – (Offset + Gap)

Fig 2

The parallel (Offset) and angular (Gap) misalignment of axes is determined in two mutually perpendicular planes. For the purpose of elimination of the parallel and angular misalignment of axes, in each of the planes a correction of position of the movable machine (M) will be done.

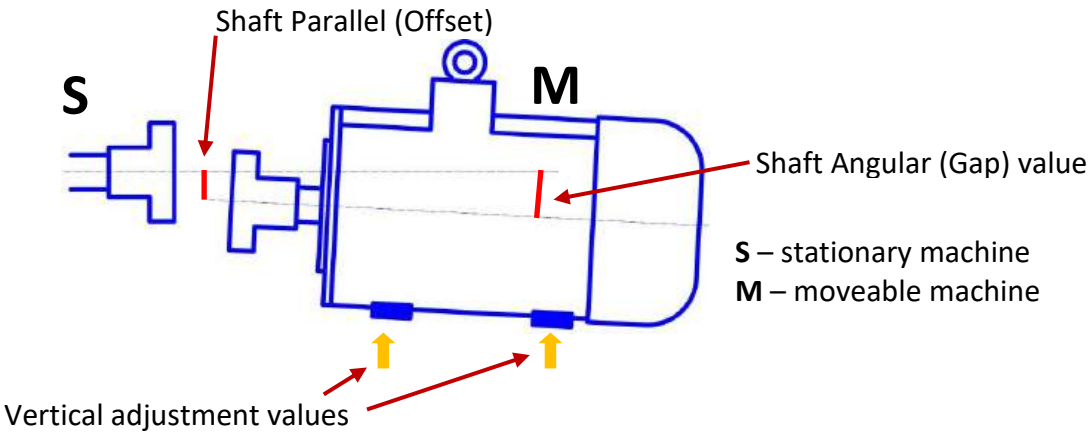
For the horizontal mounted machine – the movable machine (M) position is adjusted in the horizontal and vertical planes.

For the vertical mounted machine, operator determines arrangement of the correction planes, basing on considerations of the convenience and technological effectiveness of moving of the movable (M) machine.

Stationary machine (S) - in the process of eliminating of the axes misalignment the position of this machine stay static, i.e. it does not move.

Movable machine (M) – the machine, which position is adjusted for eliminating of the parallel and angular misalignment of axes.

The measurement system calculates the values of the angular and parallel misalignment of axes in the plane of the coupling (in two mutually perpendicular planes), and the adjustment values for the machine feet on the movable (M) machine, that is necessary for elimination of this misalignment of axes. Fig. 3 shows misalignment of axes and the values for its correction just for vertical plane.



Specification and Features

- Separation distance between measuring transducer units, up to 10 m
- Display unit operating temperature range, -10..+55 degree C
- Display unit and transducer's ingress protection level – IP65
- Measurement accuracy, 1%+0.01
- Laser type: Visible red 635-670 nm, <1 mW
- Detector type: CCD, length 30 mm
- Display resolution, 0.01 or 0.001 mm, (1 or 0.1 mil)
- Measuring resolution, 0.001mm
- Electronic inclinometer resolution, 0.1 degree
- Display unit battery: Rechargeable Li-Ion battery, 10hrs to recharge
- Transducers battery: Rechargeable Li-Po battery, 12hrs to recharge
- Gross weight, incl. carry case, 3.9 kg
- Built-in application programs and options:
    - horizontal shaft alignment at any shaft position, from 60°, up to 360º, up to 36 readings can be measured; auto sweep mode can be used;
    - vertical (flange machine) shaft alignment;
    - editable misalignment tolerances;
    - setup options;
    - soft foot;
    - thermal growth;
    - shimming simulator to calculate for expected residual misalignment;

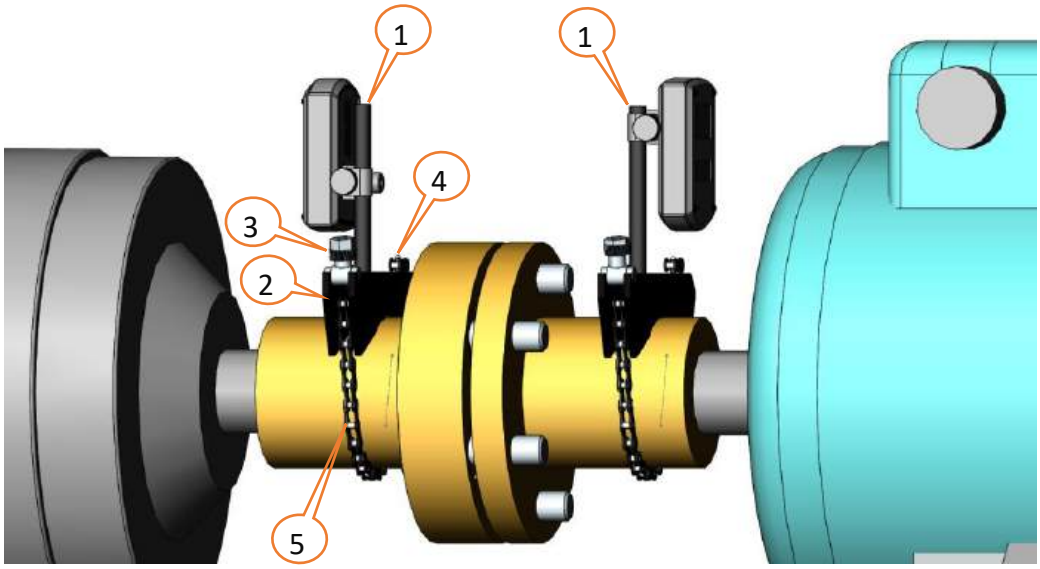
System Package

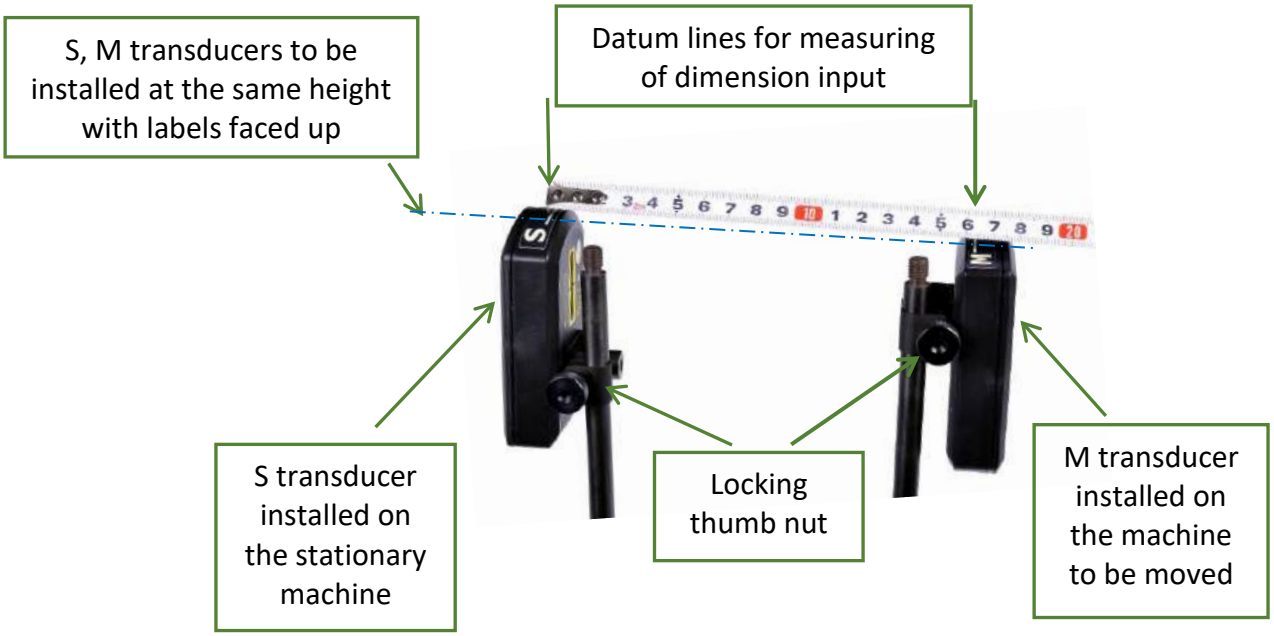
1. The System includes (Fig. 1):
2. AVV-711 display unit
3. two measuring transducer units – S, M
4. universal V-brackets for transducers mounting, chains for 15..250mm shafts, extension chains for shafts up to 500mm diameter, rods 100mm x2, 150mm x2, stackable, allen key x2
5. measuring tape, 3m
6. 120…240 Volts AC charger
7. USB PC communication cable
8. Operating instructions manual and ConSpect freeware on the internal drive of display unit
9. Carrying case with form-inserted

System overview

Mounting Transducers

- Firmly tighten rods 1 into the shaft brackets 2.
- Put thumb nut 3 into the bracket 2, then hook the chain 5 on the stud 4.
- Firmly tighten the thumb nut 3. Shaft brackets with rods must be mounted at the same angular position.
- Mount transducers on the rods. Always try to mount transducers at minimal possible radial height. Make sure that transducers are not touching brackets or machine parts.





Laser Beam Adjustment

- Loosen thumb nut and horizontally adjust transducer so the middle of the laser line is at the transducer's window.
- Slightly tighten thumb nut then vertically adjust laser line to the center of the transducer's window.
- Firmly tighten the thumb nut.
- Adjust second transducer in the same way.

Use an angular adjustment only. Do not change transducers installation height!

GETTING STARTED

Common control keys consideration

To turn ON/OFF display unit and transducers – press and hold the power button for ~2 sec.

In case the system hangs and device did not respond to any keys - press and hold the power button for ~10 sec, the system will be reset.

To close any currently active window, without saving, except main menu of the device, press menu button (it serves as escape key).

The START button in most cases causes applying (saving) changes (invoke selection) and exit (from edit box; or from current window, except such windows as collect data, aligning, soft foot and so on where it is not applicable).

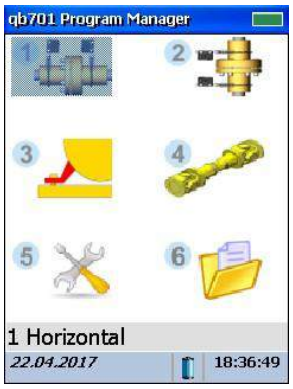
To invoke menu item – move cursor to this item and press START key, or just press the shortcut key regardless of the cursor position. In most cases the shortcut key is depicted left to the menu item.

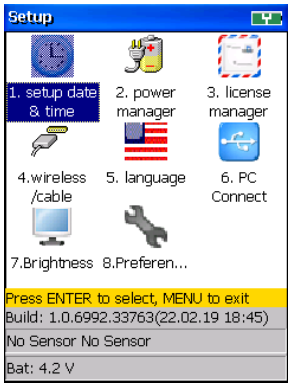
Auto save

All procedures are designed with auto save. For temporarily shut down your current work press menu until program exits to main menu of the device. Data saved now and device can be turned off.

Device setup

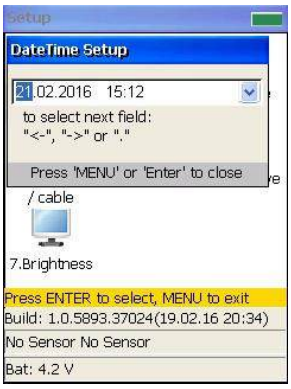
To invoke Setup menu – move cursor to Setup icon and press START button, or press 5 key.



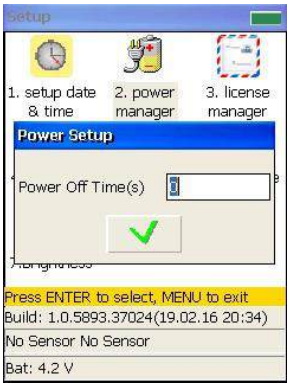


Setup Menu Items

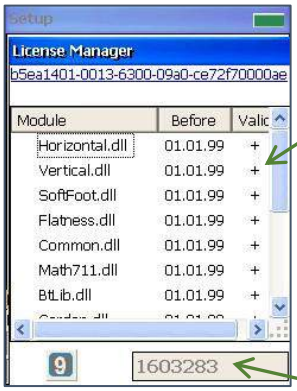
– to setup date and time



– to set device auto off delay in seconds. When set to 0 – auto off is disabled.



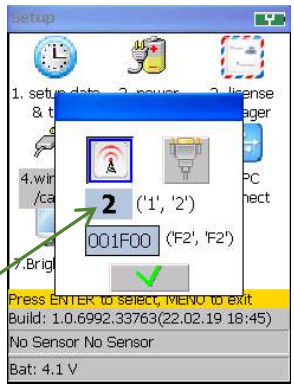
– to install license file which enables measurement functions. Press 9, browse to the license file, press Enter to open and install licenses.



+ Function enabled, valid until

Serial number

– to switch between wireless/cable transducers connection. For wireless connection – press 1 or 2 to enter number of transducers to be connected



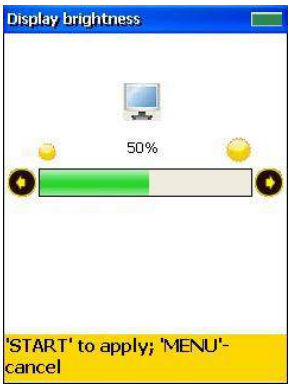
Number of transducers to

– to choose user interface language

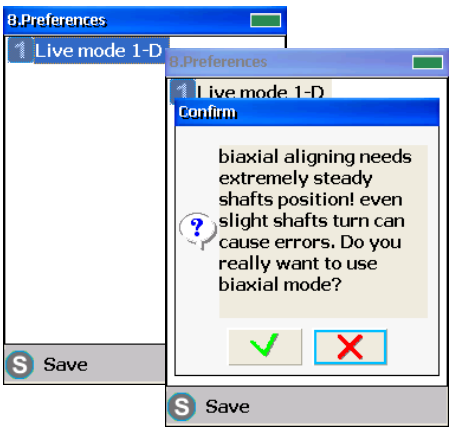
Use keys to choose language, then press START

– to switch qb701 into USB storage device mode. By default Microsoft device can be connected to the PC via Windows Mobile Device Center. USB mass storage device mode can be used as alternative.

– to adjust the display backlight brightness



- to choose default alignment mode 1-D or 2-D biaxial mode. In biaxial mode both horizontal and vertical machine aligning with live data update could be made at a static TSM transducers position (e.g. 3 h). For QB-1-D. transducers the only available mode is



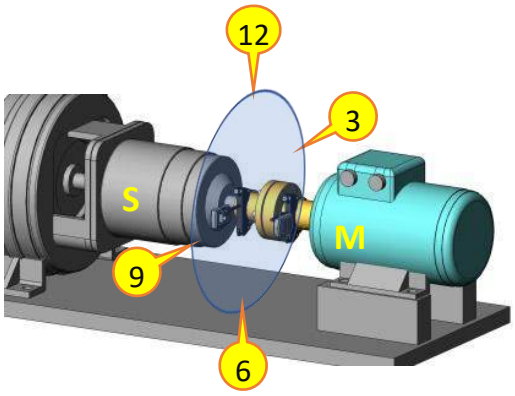
HORIZONTAL MACHINE ALIGNMENT

Short Explanation

- Mount transducers on shafts
- Run Horizontal program
- Enter dimensions
- Set parameters. E.g. Measurement mode – clock type (9-12-3 o'clock positions)
- Turn shafts with transducers at first position 9 o'clock (90°). Press Start to take readings
- Turn shafts with transducers at second position 12 o'clock (180°). Press Start to take readings
- Turn shafts with transducers at last position 3 o'clock (270°). Press Start to take readings
- After that device will calculate misalignment and displays required corrections for Movable machine

Transducer's Positions Conventions

While taking measurements, it is necessary to follow conventions for transducers positions on the shafts with the S and M measuring transducers with regard to the relative position of the S and M machines as depicted on the figure.



Angular positions in degrees adopted in the device are as follows:

6 o'clock - 0°

9 o'clock - 90°

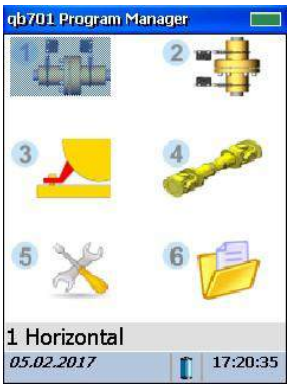
12 o'clock - 180°

3 o'clock - 270°

Parameters

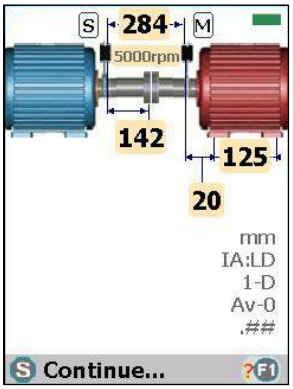
In Main Menu run **Horizontal** program.

Choose **New Task**.

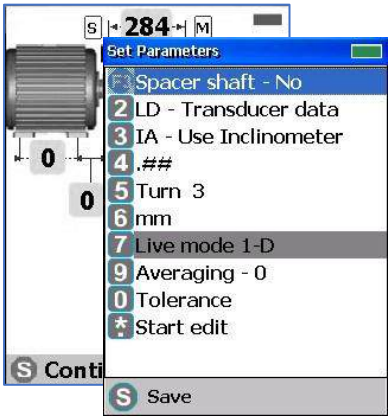


Machine dimensions / measurement setup screen

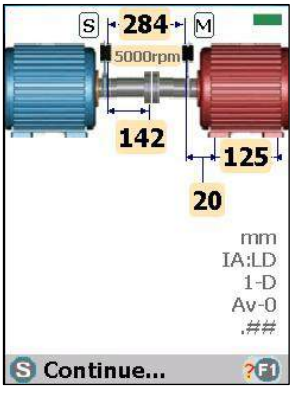
Press * key to start editing of the dimensions values

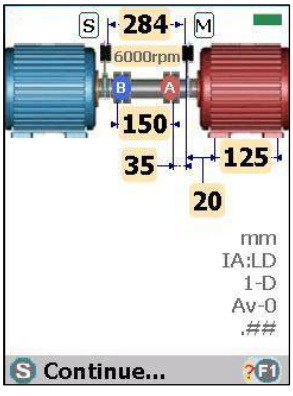


Press F1 key for parameters/key legend:



Press F3 - to toggle Spacer shaft **Yes/No**



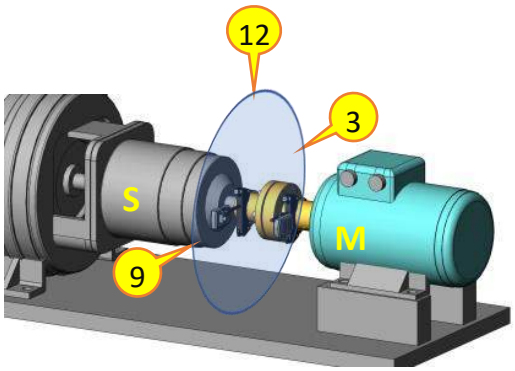


Press 2 - to toggle data input – **LD** transducer's data / **MD** – manual data

Press 3 - to toggle angle input – **IA** use inclinometer / **MA** manual angle. Manual angle input used for vertical machines, when electronic inclinometer cannot be used.

Press 4 - to toggle displayed precision – 2 or 3 digit.

Press F1 then 5 - to toggle measurement mode:



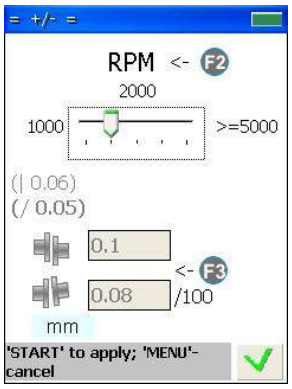
Turn 3 - clock mode **9-12-3 o'clock** – readings to be taken at three predefined shaft positions – 9 o'clock, then 12 o'clock, then 3 o'clock. After that, device will proceed to the result screen.

Turn 4 points – readings to be taken at four predefined shaft positions separated by 90° or 45° (3hr / 1:30hr). After that the device will proceed to the result screen.

Multipoint mode – measurements may be taken at any of minimum 3 up to 36 positions. After taking enough readings one should press F5 to proceed to the result screen.

Tolerance Setup

Press 0 to enter tolerance setup menu.



Press F2 to use predefined RPM/tolerance table

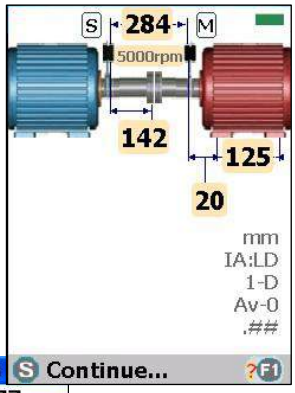
Press F3 to enter user defined tolerance values

Press START to save changes, menu to discard changes.

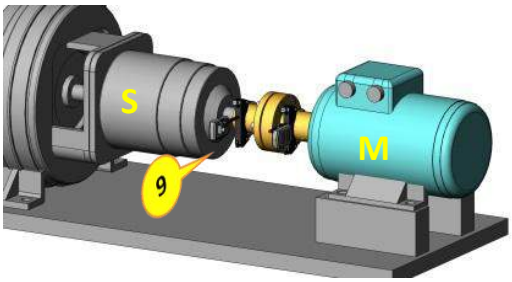
Taking Measurements. Clock Mode

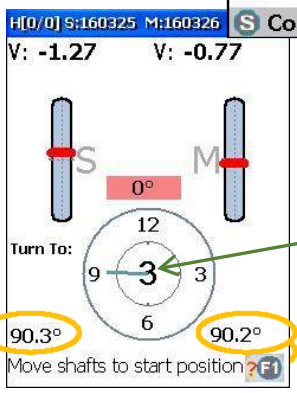
Press * *to edit dimensions.*

Set parameters and enter dimensions then press START key to proceed.



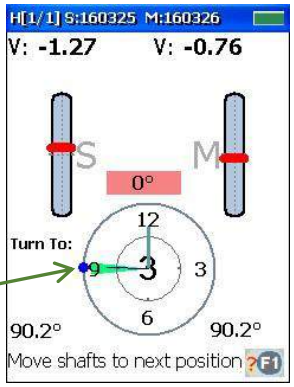
Turn shafts to first position – 9 o'clock (90°)





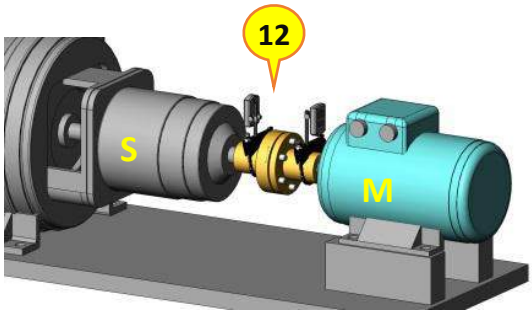
3 – clock mode
***** – multipoint

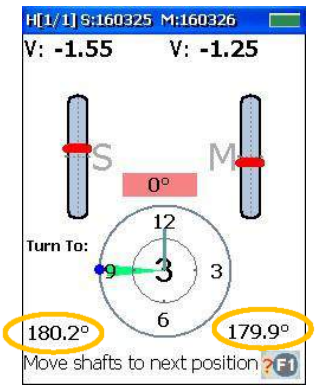
Press START to take first reading.



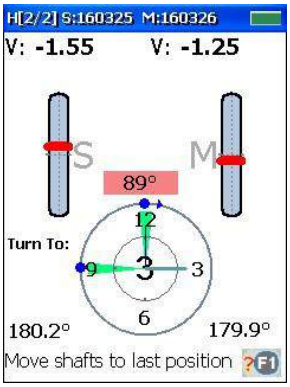
First measurement

Turn shafts to second position – 12 o'clock (180°)

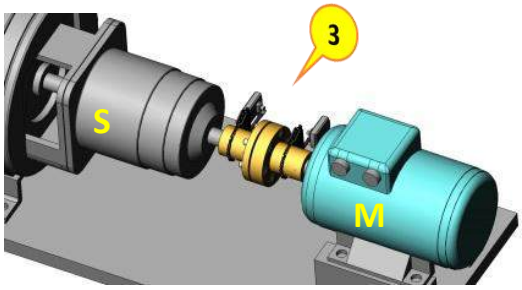


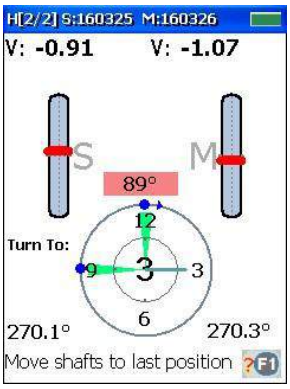


Press START to take second reading.

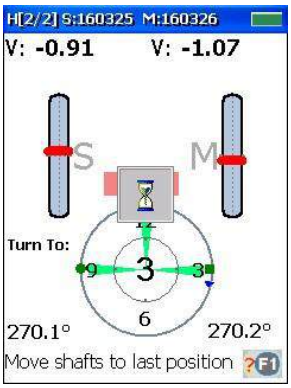


Turn shafts to third/last position – 3 o'clock (270°)

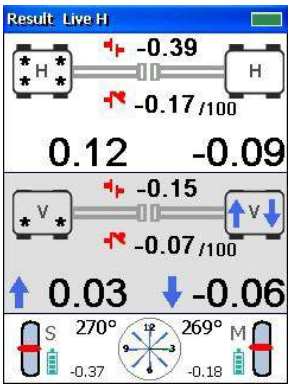




Press START to take third reading.



When three reading are taken device will proceed to the result screen.



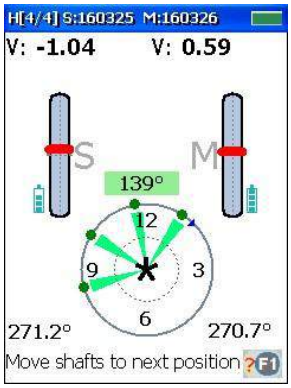
Taking Measurements. Multipoint Mode

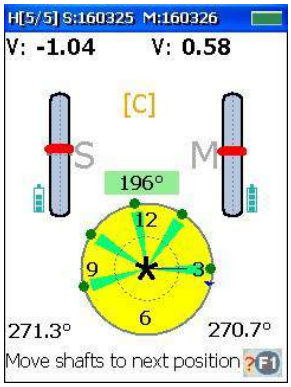
In multipoit mode readings can be collected at any shafts position minimum 3 up to 36 positions.

qb701 is able to calculate misalignment after collecting at least 3 points within as little as 70 degree range. **However always try to cover as wide shaft turn angle as possible.**

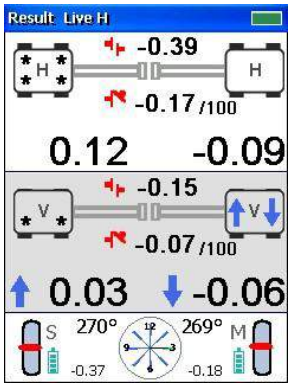
Press START to take reading, and then turn shafts to next position.

Yellow clock face means that point is already collected and shafts should be turned to next position.





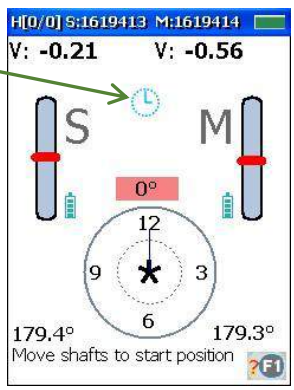
When enough readings are collected – press F5 to proceed to the result screen.



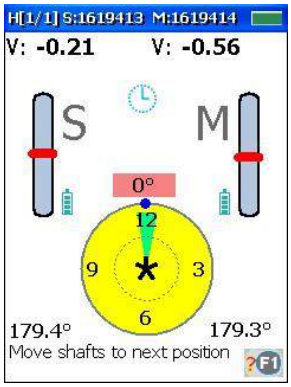
Taking Readings. Auto Shooting mode

Turn shafts to first position, then press F4 key to activate auto shooting mode.

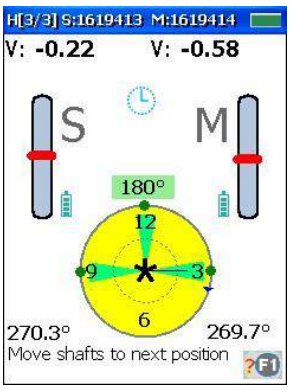
Auto shooting mode is active



When auto shooting mode is active – device waits for stable shaft position then automatically records data and prompts to move shafts to the next position.



Auto shooting mode can be activated in both Clock mode and Multipoint mode.

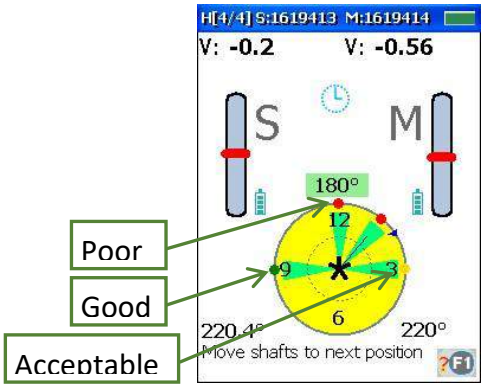


When device is in Multipoint mode and enough readings are collected – press F5 to proceed to the result screen.

When device is in Clock mode and three/four readings are taken device will automatically proceed to the result screen.

Readings quality assessment

While taking readings device performs assessment of data quality based on standard deviation. Quality is indicated by color of dots at measurement positions:



Blue – assessment is impossible (too few points collected)

Green – good quality

Yellow – acceptable quality

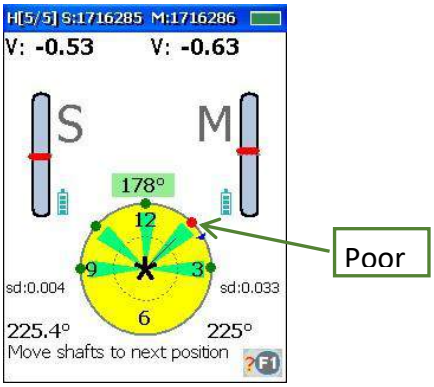
Red – poor quality, must be re-measured.

The factors which may affect readings – high vibration, partial clipping of the laser beam, mechanical looseness, accidental alteration of transducers position (e.g. by touching it).

Readings quality assessment is useful option which helps to detect such conditions.

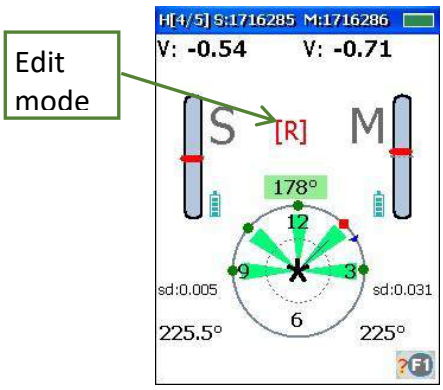
Editing of measurement points

It is possible to edit collected data when poor quality data is detected.



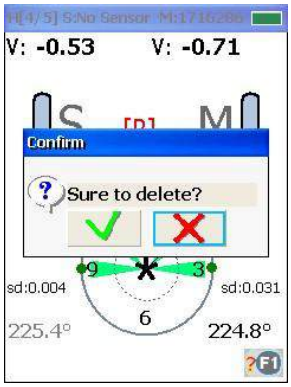
Press key to activate edit mode

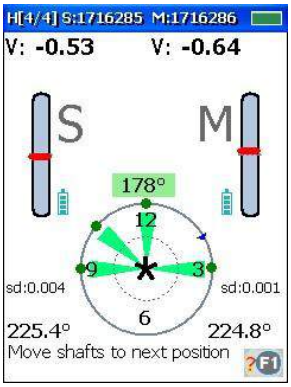
Use keys to scroll over collected readings



Use to delete readings

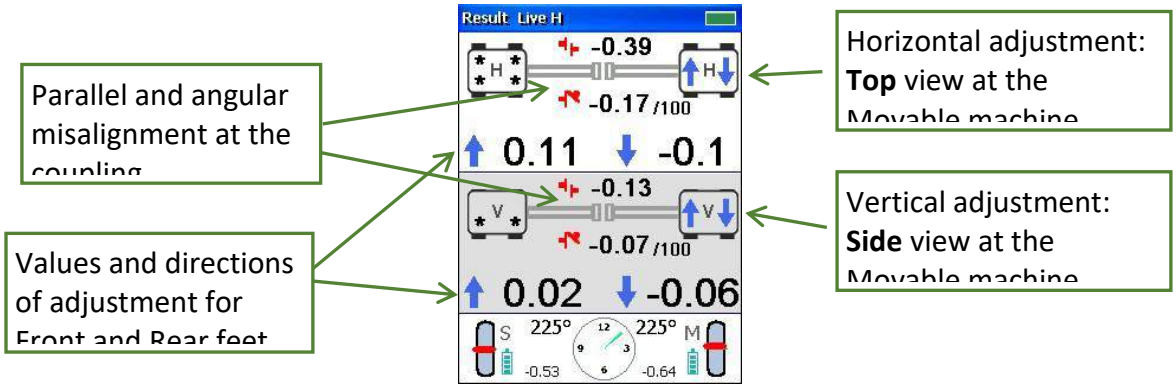
Use key to quit edit mode (press until cursor points to the last measurement, then quit)





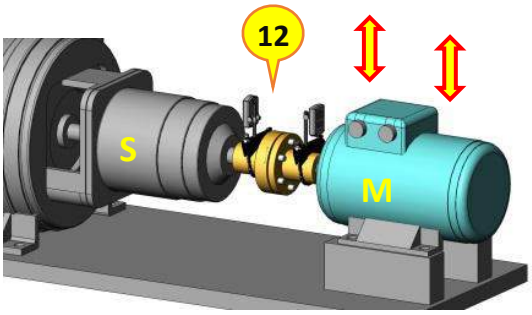
Result Screen

On the result screen device displays parallel and angular misalignment at the coupling and values of the required corrections in horizontal and vertical directions for movable machine. Blue arrows clearly displays directions in which movable machine must be moved to eliminate misalignment.

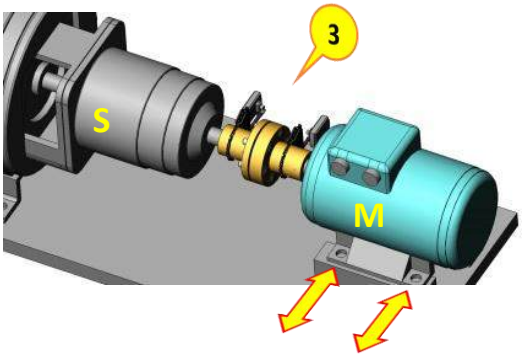


Movable machine Adjustment

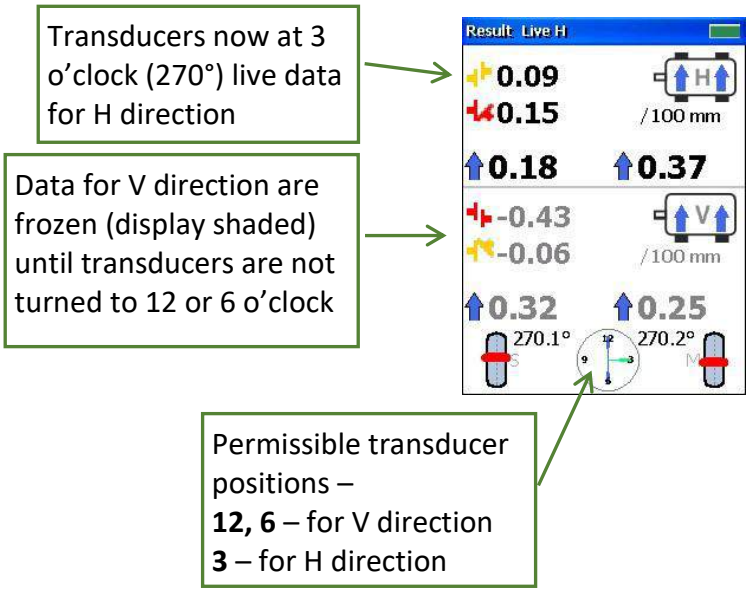
To make adjustment in **vertical** direction transducers must be turned to 6 or 12 o'clock (0° or 180°) position.



To make adjustment in **horizontal** direction transducers must be turned to 9 or 3 o'clock (90° or 270°) position.



Device may reduce number of available transducers positions for machine adjustment. Permissible transducer positions are indicated at the clock face. Only permissible transducer positions can be used for machine adjustment.

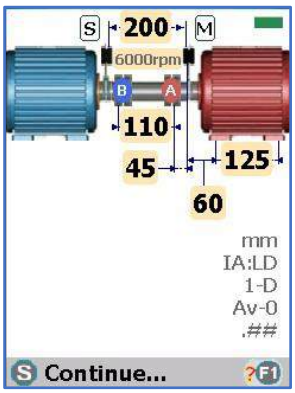


Machines with Spacer Shaft

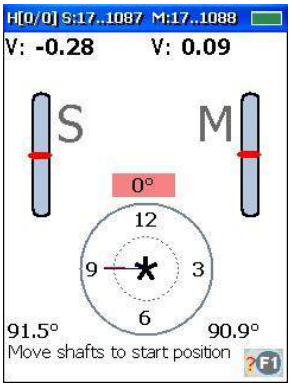
Press F3 to activate Spacer Shaft option.

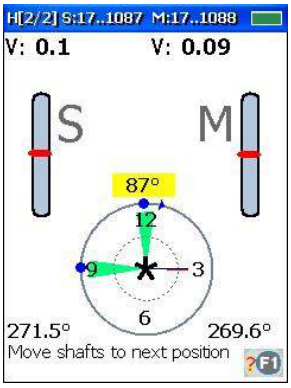
Procedure and options are the same as for Horizontal program.

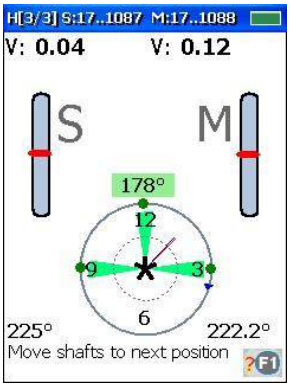
Enter machine dimensions.



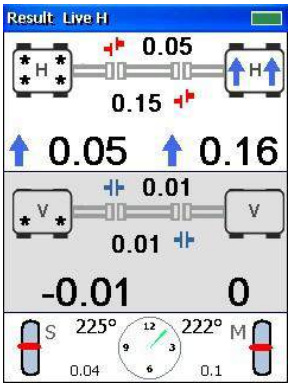
Collect readings.

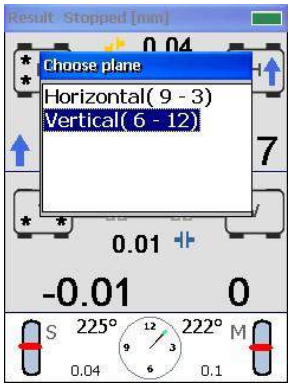






Make moveable machine correction.

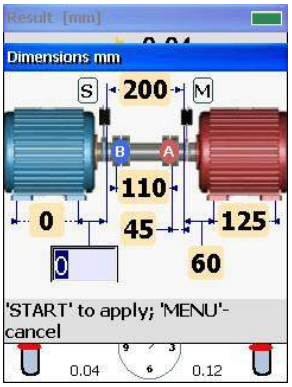


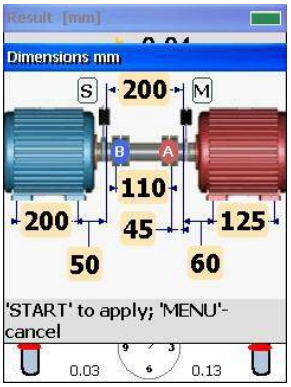


Lock Feet Pair

In some cases could be practical to swap movable machine. This function is applicable for Machines with and without Spacer shaft.

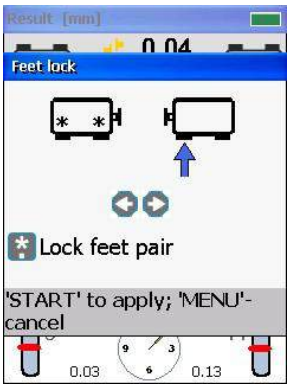
Press 9 key. Device will prompt to enter missed dimensions.

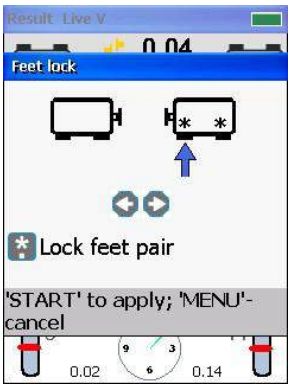


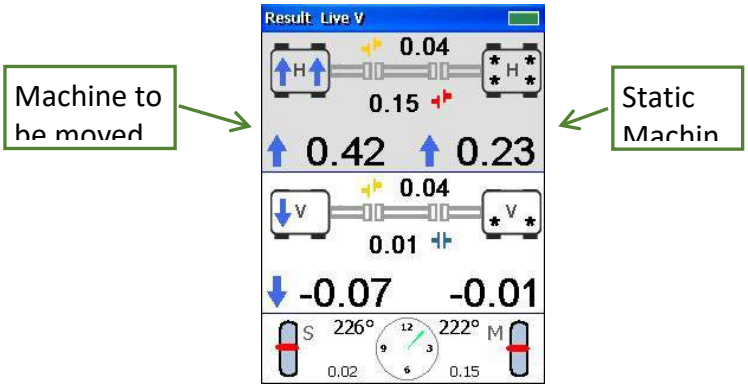


Press * key to lock feet pair.

Press START to apply.

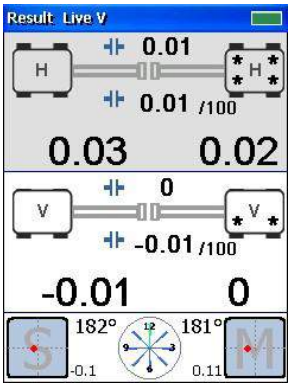






Report file saving

Report file can be saved at any stage of alignment

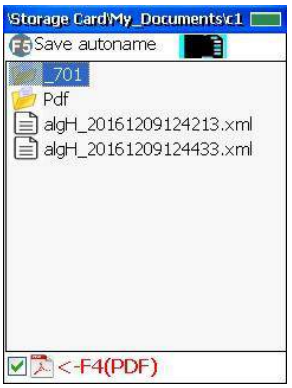


To save report file – press 8 key in the result screen

Reports can be saved to internal SD card or to thumb drive connected to USB host socket of the AVV-711 display unit

Use F2 key to choose drive

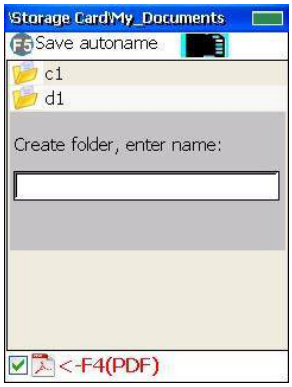
Use START CLR ◄ ► ▲ ▼ keys to browse folders



Use START to open folder

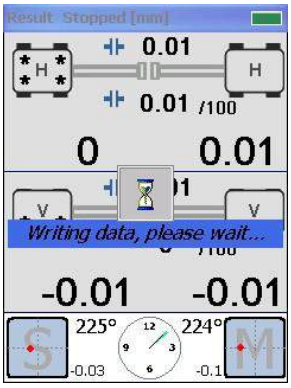
Use CLR to move one level up

Use 7 to create new folder

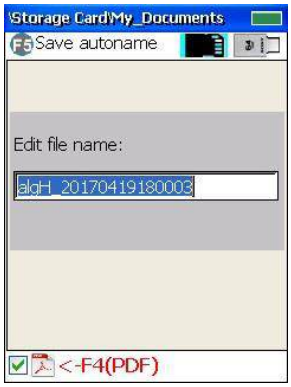


Use F4 to turn on/off PDF reports generation

Press ENTER or F5 key to save report with default name



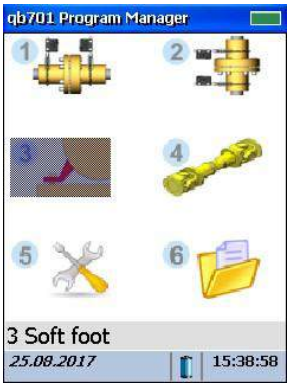
Press 8 TUV to edit file name, then press ENTER to save file



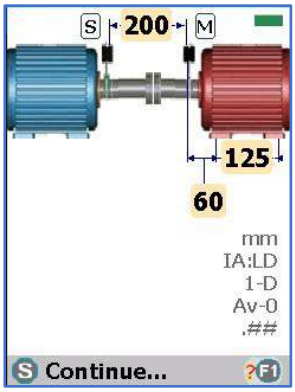
SOFT FOOT

Soft foot condition makes impossible proper machine alignment. So it should be eliminated prior to conduct alignment work. Soft Foot program intended for this purpose.

In Main Menu run **Soft Foot** program.



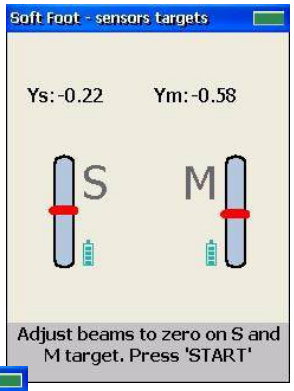
Enter distances

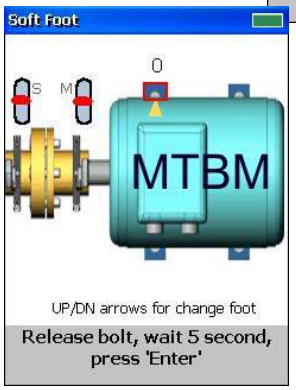


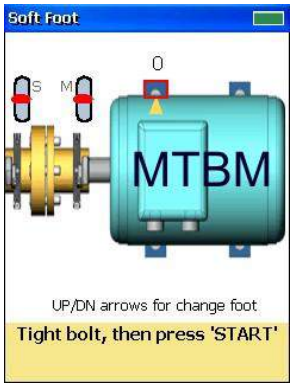
Make sure that all foots are tightened.

Turn shafts with transducers at 12 o'clock position.

Press START key to proceed.

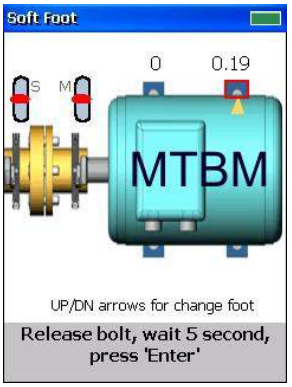


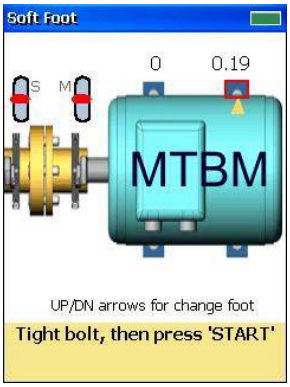




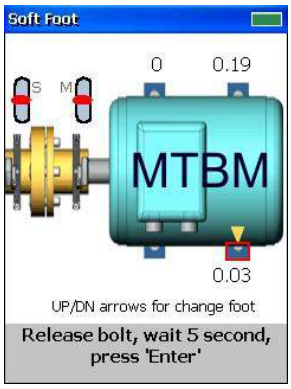
- Loosen first bolt fully
- Wait about 5 sec
- Press ENTER key
- Tighten bolt firmly
- Press START key
- Loosen second bolt fully

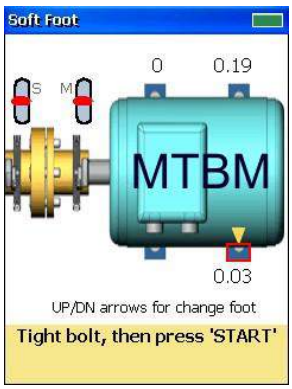
- Wait about 5 sec
- Press ENTER key
- Tighten bolt firmly
- Press START key



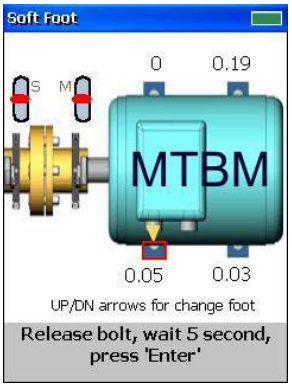


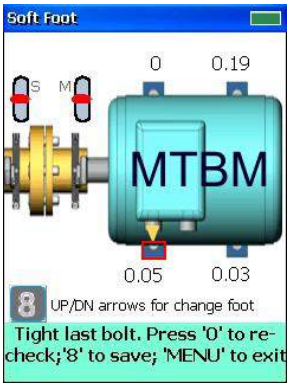
- Loosen third bolt fully
- Wait about 5 sec
- Press ENTER key
- Tighten bolt firmly
- Press START key





- Loosen fourth bolt fully
- Wait about 5 sec
- Press ENTER key
- Tighten bolt firmly
- Press START key





Bolt selection sequence can be changed by manually selecting the bolt by arrow keys.

VERTICAL MACHINE ALIGNMENT

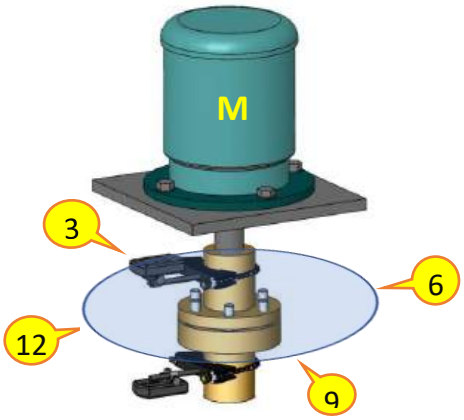
Short Explanation

- Mount transducers on shafts
- Run Vertical program
- Mark on the machine three positions spaced by 90° (9-12-3 o'clock positions)
- Enter dimensions
- Set parameters. E.g. Tolerances.
- Turn shafts with transducers at first position 9 o'clock (90°). Press Start to take readings
- Turn shafts with transducers at second position 12 o'clock (180°). Press Start to take readings
- Turn shafts with transducers at last position 3 o'clock (270°). Press Start to take readings

After that device will calculate misalignment and displays required corrections for Movable machine

Transducer's Positions Conventions

While taking measurements, it is necessary to follow conventions for transducers positions on the shafts with the S and M measuring transducers with regard to the relative position of the S and M machines as depicted on the figure.



Angular positions in degrees adopted in the device are as follows:

6 o'clock - 0°

9 o'clock - 90°

12 o'clock - 180°

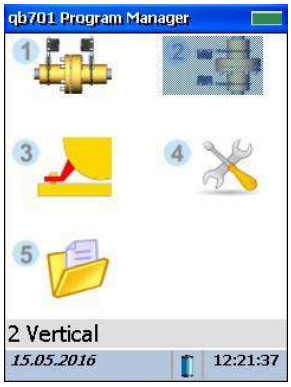
3 o'clock - 270°

The electronic inclinometers cannot be used on the vertical machines, so "Manual angle" is set by default. One should mark measurement positions on the machine prior to start measuring.

Parameters

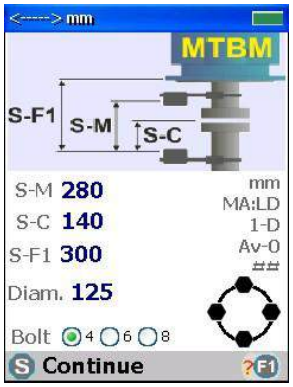
In Main Menu run **Vertical** program.

Choose **New Task**.

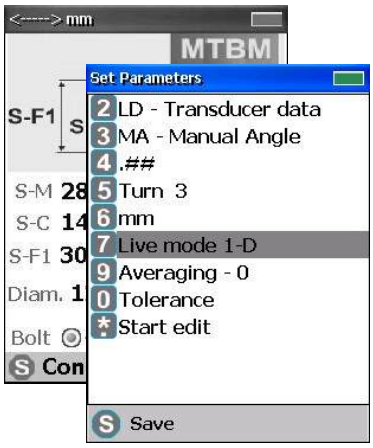


Machine dimensions / measurement setup screen

Press * key to edit dimensions values



Press F1 key for parameters/key legend:



Press 2 - to toggle data input – LD transducer's data / MD – manual data

Press 3 - to toggle angle input – IA use inclinometer / MA manual angle. Manual angle input used for vertical machines, since electronic inclinometer cannot be used.

Press 4 - to toggle displayed precision – 2 or 3 digits.

Press 5 - to toggle measurement mode: Clock mode **9-12-3 o'clock** – readings to be taken at three predefined shaft positions – 9 o'clock, then 12 o'clock, then 3 o'clock. Device will proceed to the result screen then.

Press 6 to switch displayed units mm/inch

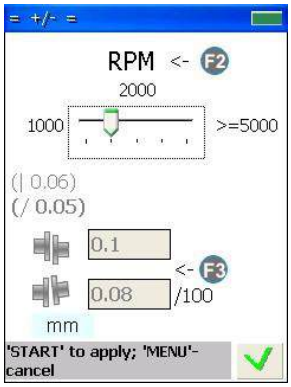
Multipoint mode – measurements may be taken at any minimum 3 up to 36 positions. After taking enough readings one should press F5 to proceed to the result screen. For Vertical machines inclinometer data is unavailable, so angle value for each point should be entered manually, taking into account mentioned above positions conventions.

Press DELETE to enter tolerance setup menu.

Press F2 to use predefined RPM/tolerance table

Press F3 to enter user defined tolerance values

Press START to save changes, MENU to discard changes.



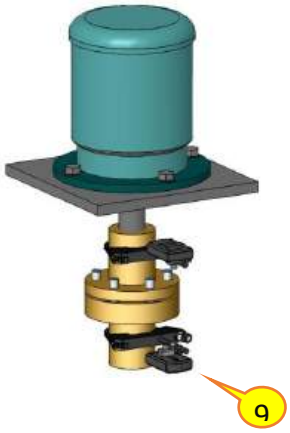
Taking Measurements. Clock Mode

*Press * to edit dimensions.*

Mark on the machine measurement positions separated by 90° (or 45°)

Set parameters and enter dimensions then press START key to proceed.

Turn shafts to first position – 9 o'clock (90°)



Press START to take first reading.

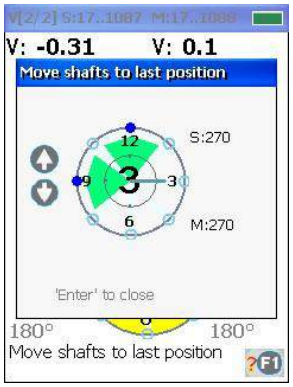
Arrow keys can be used to choose actual measurement position

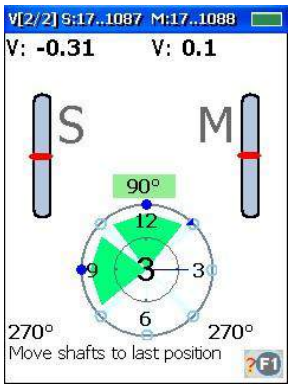
Turn shafts to second position – 12 o'clock (180°)

Press START to take second reading.

Turn shafts to third/last position –

3 o'clock (270°)





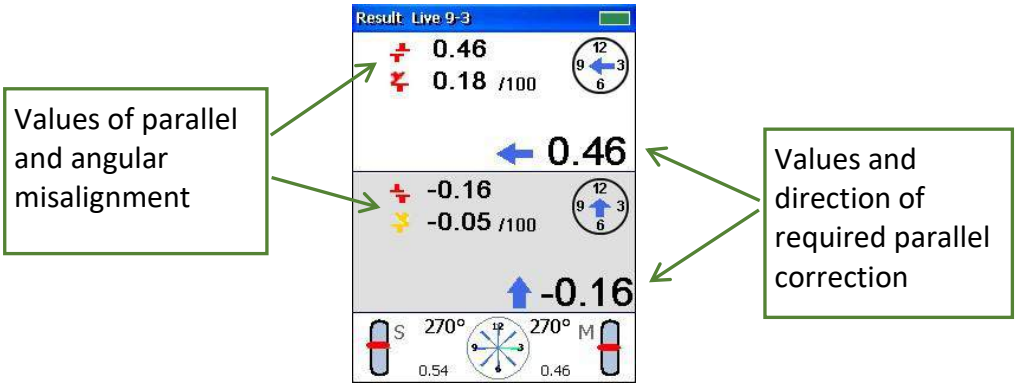
Press START to take third reading.

Measurement position selection window can be closed by ENTER key.

When three reading are taken device will proceed to the result screen.

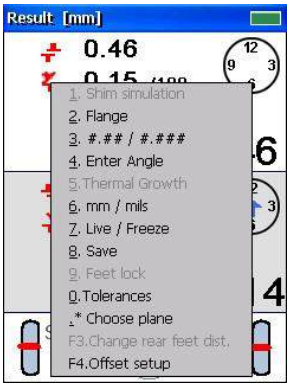
Result Screen

At this moment transducers are at 3 o'clock (270°) position – so device displays live updated values for 9-3 direction.

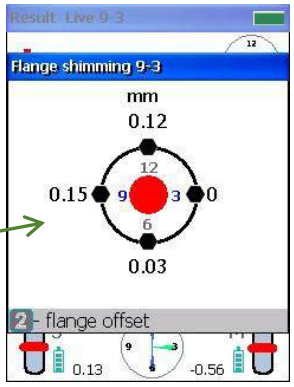


Blue arrows are displaying directions in which movable machine must be moved to eliminate parallel misalignment.

Keys legend can be invoked by F1 *key*



Press 2 key to toggle between parallel/shimming values screens.

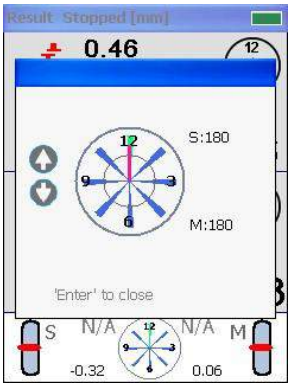


Shimming values

Press * key to choose plane (9-3 or 12-6) in which parallel correction will be performed.

To make correction in 9-3 plane transducers must be placed at 9 or 3 o'clock position.

To make correction in 12-6 plane transducers must be placed at 12 or 6 o'clock position.

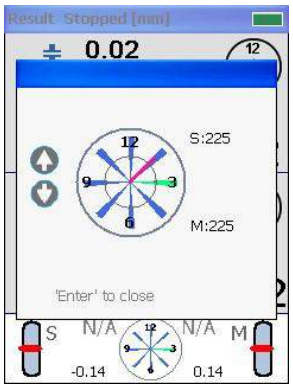


Use arrows keys ▲▼ to choose position at which transducers will be placed.

Turn shafts to place transducers in this position then press START key.

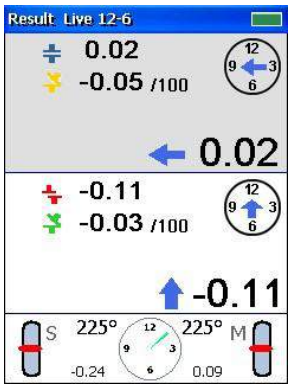
Machine Correction @45

In order to exclude the need to turn the shafts when switching correction plane, transducers can be placed at one of 45° positions: 10:30, 1:30, 4:30, 7:30 o'clock. This option can be used on Horizontal and Vertical machines.



Use arrows keys to choose position at which transducers will be placed, then press START key.

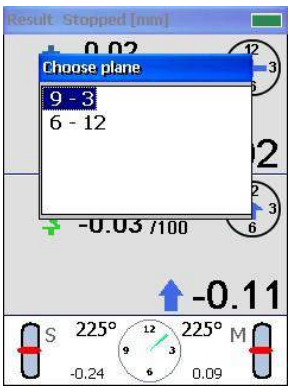
Live alignment at 12-6 plane.

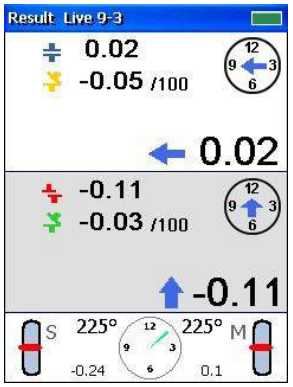


Press * key to choose 9-3 plane.

There is no need to turn shafts in this mode.

Transducers can be at static 45° position.





Color of coupling signs indicates value of misalignment. Green color indicates when residual misalignment is within tolerance. Black color is for perfect result. Always stop machine correction when residual misalignment is within tolerance. Do not try to reach zero.

Charging batteries

The battery can be charged by means of USB type AC charger or via PC/laptop USB port.

Immediately after connecting charger to the display unit there are few seconds to change charge current - press and hold ON button for ~2sec until LED changes flash rate.

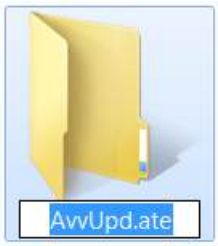
Low flash rate – normal charge, high rate – fast charge. Keep in mind that PC/laptop USB port can only provide normal charge.

Charging will be terminated and the LED will turns off when battery is fully charged. No overcharge occurs in case the USB cable is left connected.

Firmware Upgrade

Make sure that device battery is fully charged!

10. Insert USB thumb drive into PC/Laptop port. In the root directory of USB thumb drive – create the folder **AvvUpd.ate**



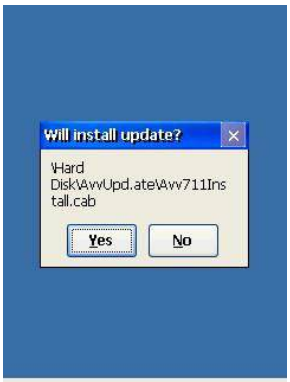
11. Copy firmware file **Avv711Intall.cab** to this folder

12. Remove USB thumb drive from PC/Laptop port and insert it to the qb701 USB host port. Press and hold key for ~2 sec to turn qb701 on.

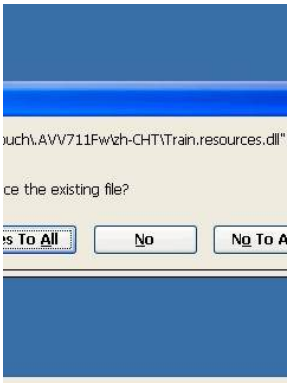
13. Invoke firmware updater by pressing keys simultaneously.

14. Press to conform search for USB

15. Press to confirm start of firmware upgrade.



16. Press key then to confirm replace of all existing files



17. Press key to choose NO, then press

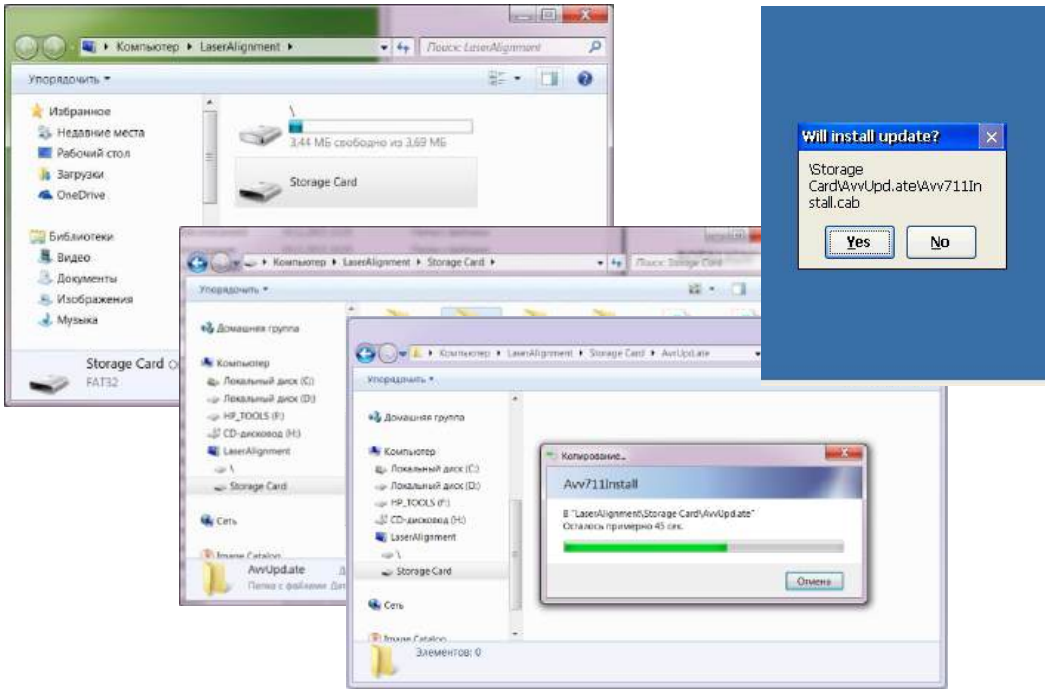
18. Firmware upgrade will run. Once finished press to turn device OFF

Firmware Upgrade Using Windows Mobile Device Center

Make sure that device battery is fully charged!

8. Connect AVV-711 to PC via USB cable. Press and hold  key for ~2 sec to turn qb701 on. Windows Mobile Device center will launch. Connect to qb701 and browse to the folder “Storage Card/LaserAlignment/AvvUpd.ate/” and paste there the firmware file **Avv711Install.cab**

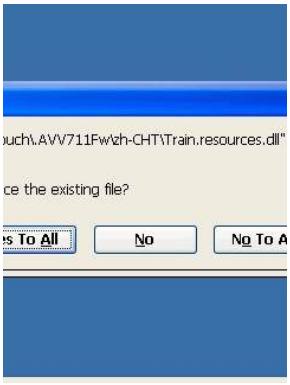
9. Wait until file copied.



10. Invoke firmware updater by pressing  keys simultaneously.

11. Press  to confirm start of firmware upgrade.

12. Press key then ENTER to confirm replace of all existing files



13. Press key to choose NO, then press ENTER

14. Firmware upgrade will run. Once finished press ENTER to turn device OFF

STANDARD TOLERANCES OF SHAFT MISALIGNMENT

This chapter provides the standards alignment tolerance of misalignment for standard industrial machinery with flexible coupling that can be used under condition only if existing in-house standards or the machine or coupling OEM have not given any blinding values, and must not be exceeded.

Speed, rpm	Good		Acceptable	
	Offset	Angular (Gap)	Offset	Angular (Gap)
Up to 1000	0,08	0,07	0,12	0,10
Up to 2000	0,06	0,05	0,10	0,08
Up to 3000	0,04	0,04	0,07	0,07
Up to 4000	0,03	0,03	0,05	0,05
More than 4000	0,02	0,02	0,04	0,04

DELIVERY SET

№	Description	Qty	Note
1.	Control Display Unit	1	
2.	Measuring Transducer Units S, M	2	
3.	Brackets Frame	2	
4.	Chains assembly	2	
5.	Supporting Rods	4	
6.	AC Charger, 100-240Volts	1	
7.	Tape Measure 2m	1	
8.	Carrying Case	1	
9.	Operating Instructions Manual (on internal SD card)	1	
10.	ConSpect Software (on internal SD card)	1	
11.	USB PC Communication Cable	1	

MECH TECH GLOBAL

Reliable – Robust – Reasonable

ISO 9001 CERTIFIED sic