



VMI International AB

X Balancer™

Wireless balancing application



Manual guide

Starting the software.....	3
Bluetooth connection	3
Connection via USB adapter cable.....	8
Selecting COM port.....	9
Main screen	10
Program setup	13
Graphic options.....	13
Transducer unit.....	14
Balancing tuning.....	15
Polar diagram and set language	16
Options.....	17
Heather and show vibration	18
Angle offset, touche screen and angle indicator	19
Analysis tools	20
Resonance test	20
Spectrum.....	23
Balancing.....	27
Rotor setup.....	27
Initial run	31
Trial run 1	33
Trial run 2	34
The balancing run(s).....	35
Weight ditribution	37
Add vectors.....	39
Rotor files	40
Tool library	41
Translating the software	46
Manual encoder Z factor determation.....	48

Starting the software

After installation, the software can be started by clicking the icon shown in fig.1, which is present on the desktop.



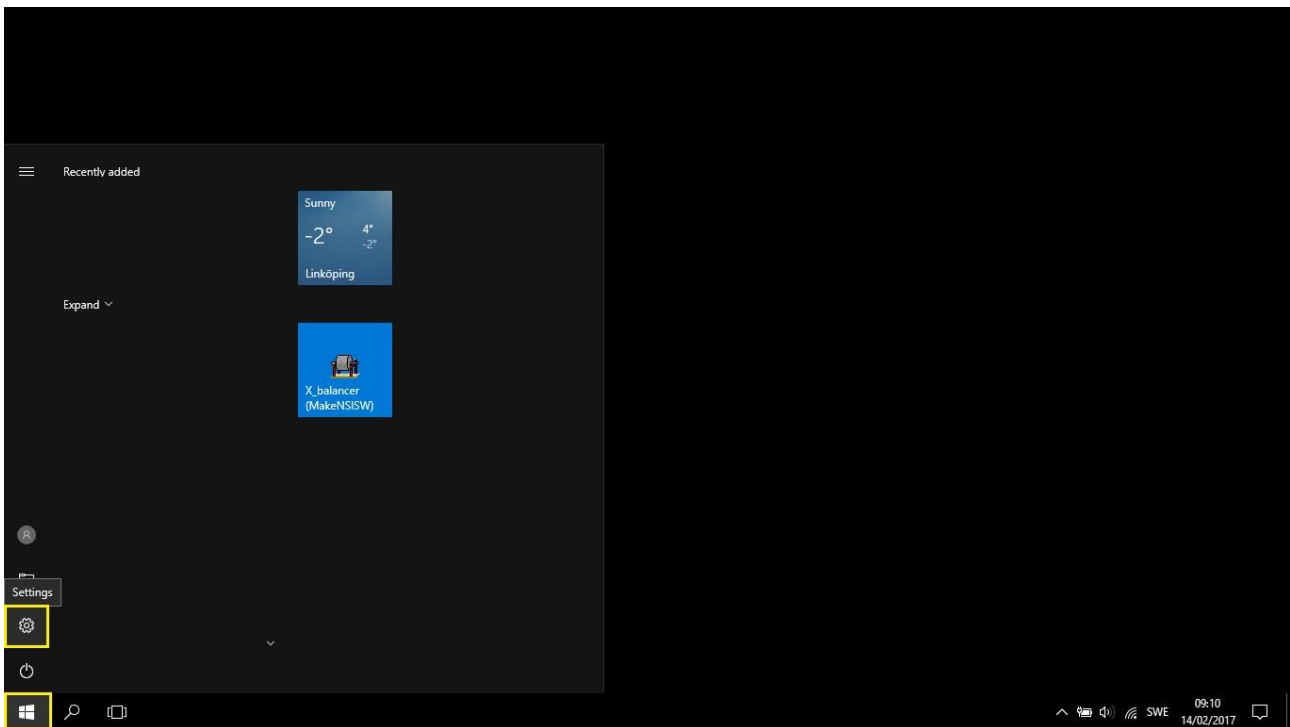
X Balancer™ instrument communicates to the PC with Bluetooth or USB/RS232 adapter.

Bluetooth connection

Pairing Bluetooth devices in Windows 10

For Bluetooth connection to other versions of Windows, please visit the Microsoft support on their website.

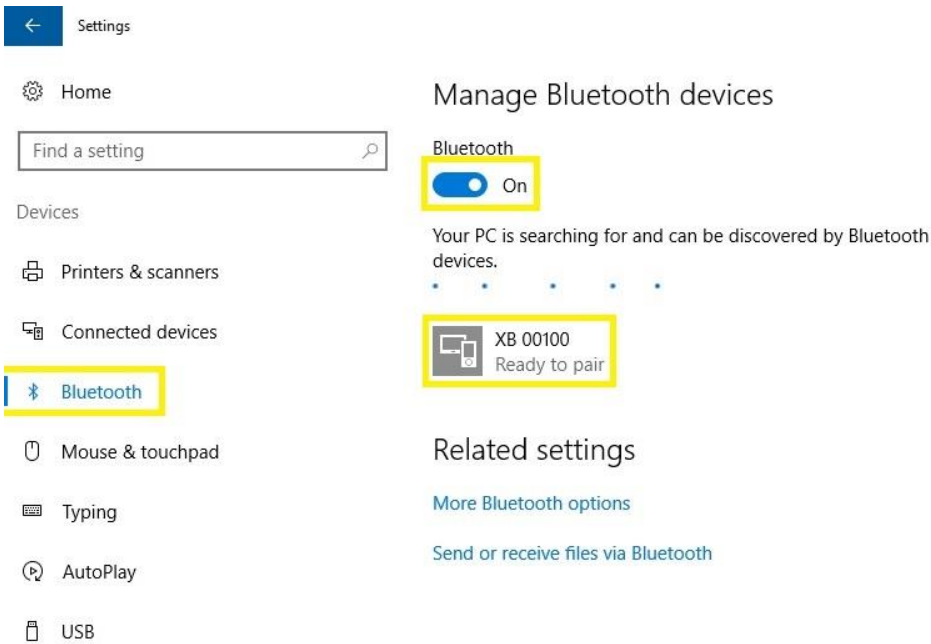
1. Start the instrument first, and be sure that the instrument is turned on during the entire procedure.
2. Click on the start button and open Settings.



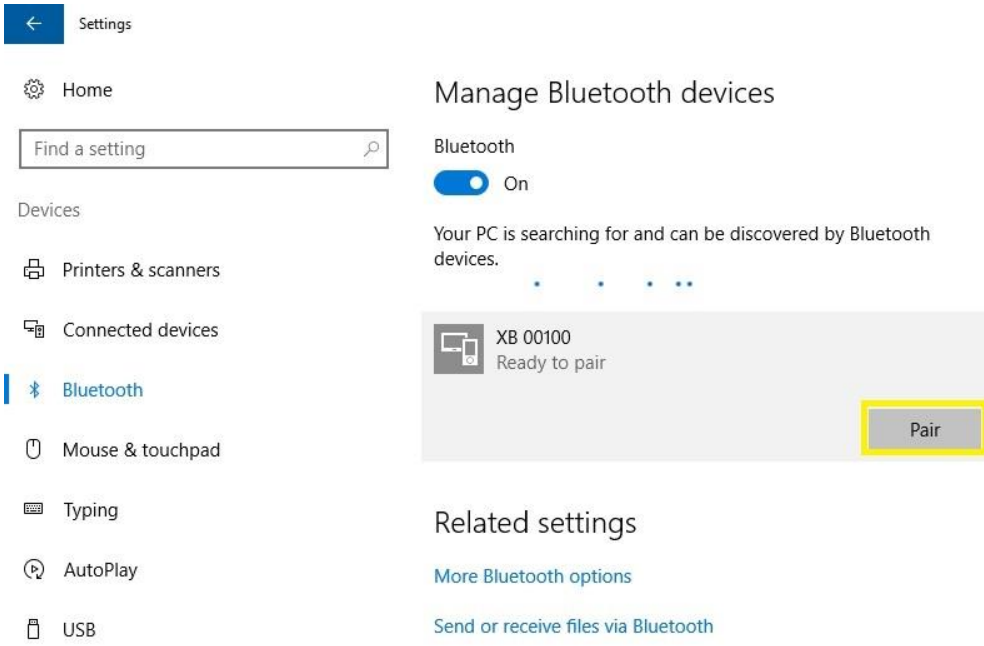
3. Click on Devices.



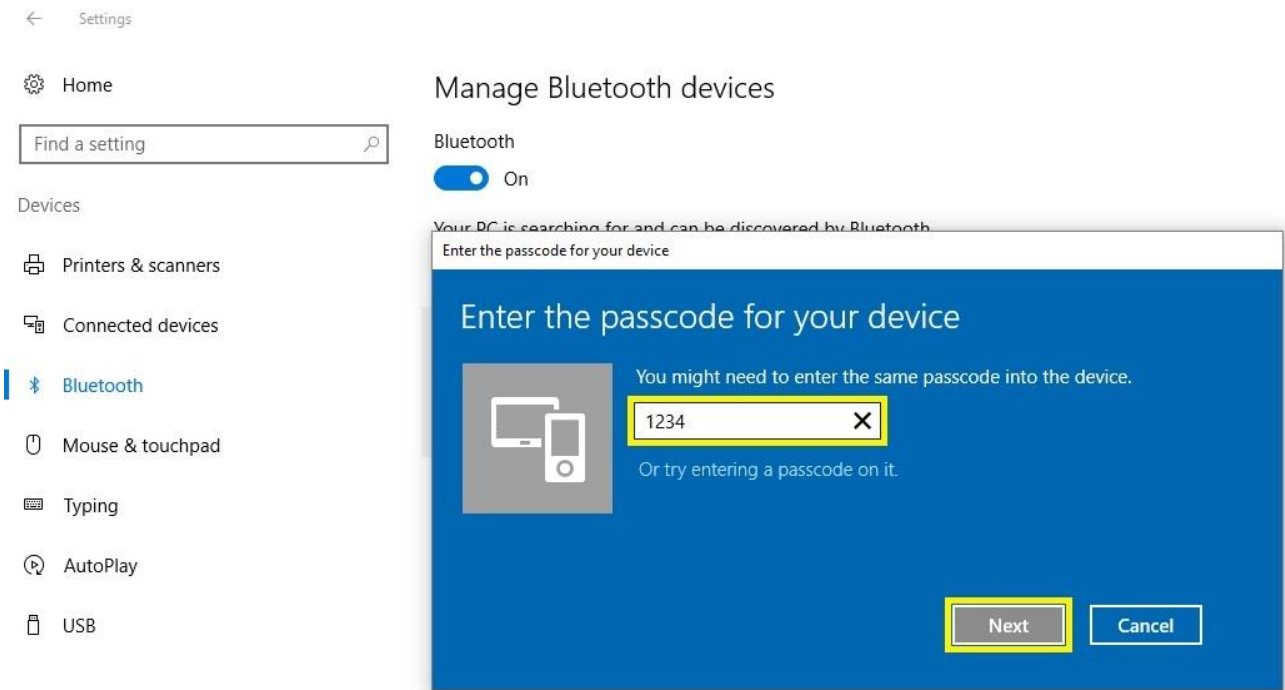
4. Select Bluetooth, make sure Bluetooth is turned on and wait until the X Balancer appears as a device with the serial number, as its name.



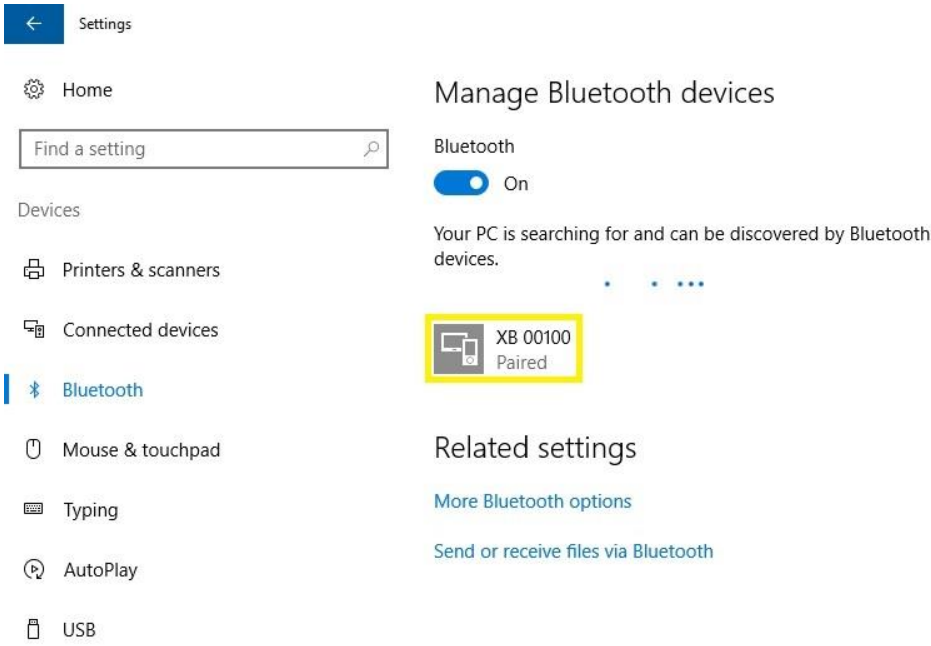
5. Click on Pair.



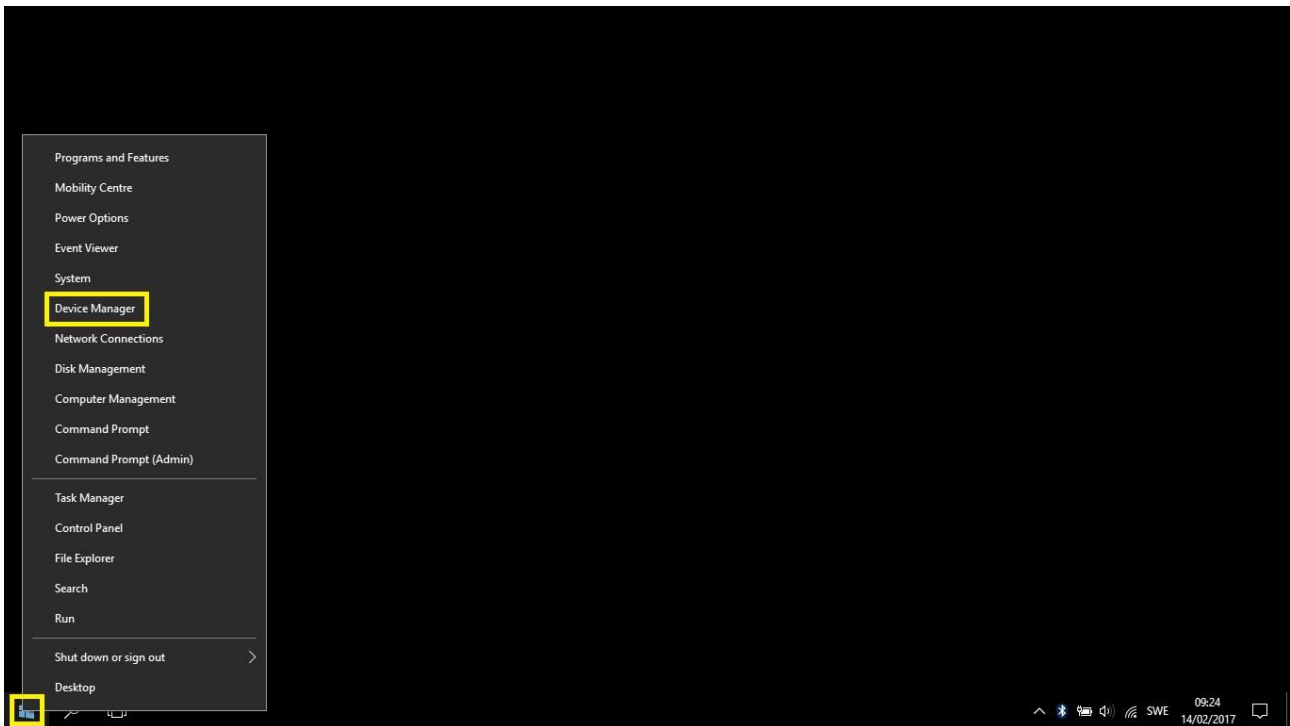
6. Enter **1234** as password and click on Next.



7. Wait until the device is shown as Paired and close the settings window.

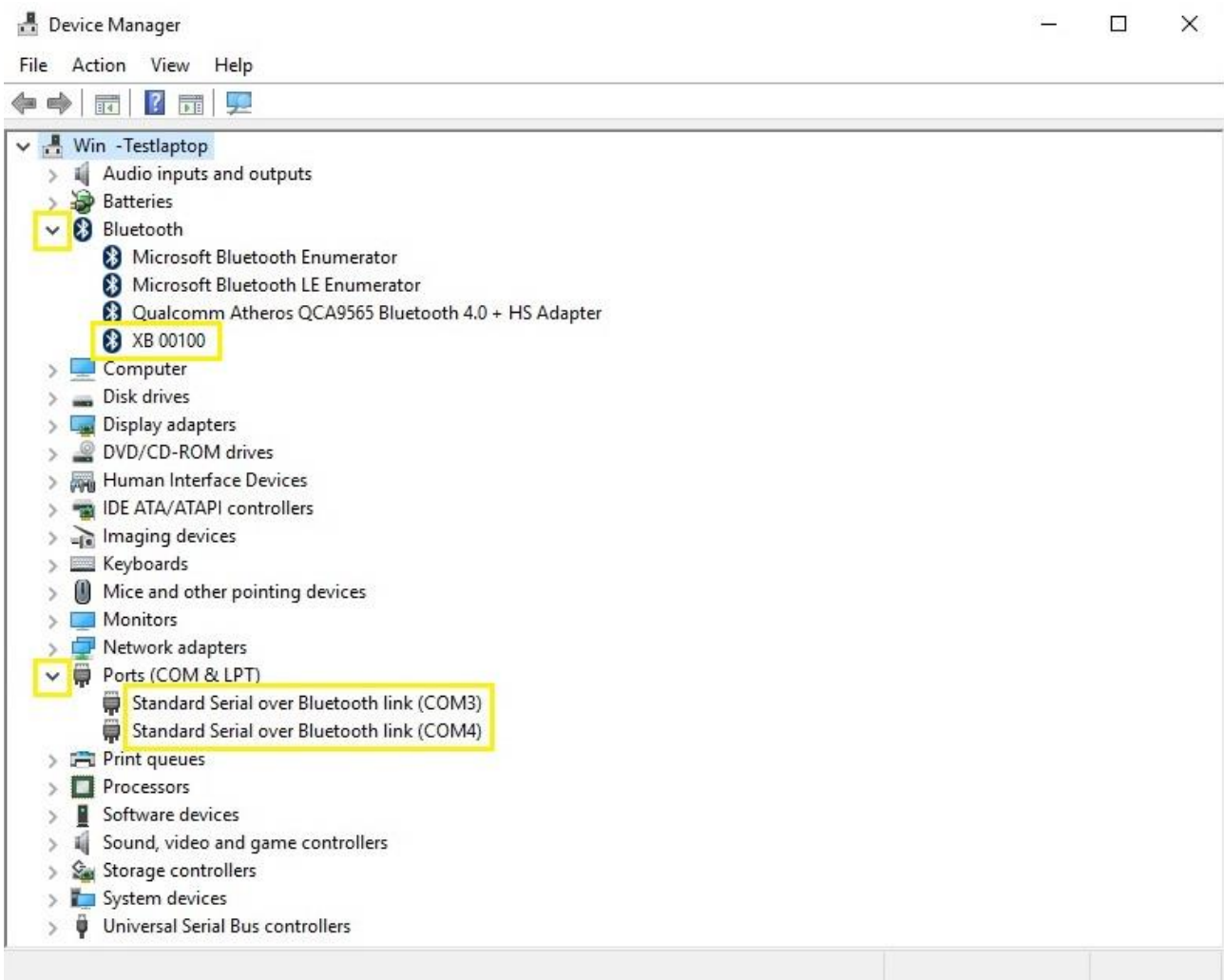


8. Two COM ports will be assigned to the X balancer when the Bluetooth pairing is completed. To see those numbers, right-click the Start button and select Device Manager.



9. Here it is shown X Balancer's serial number as a registered Bluetooth device and two COM port numbers assigned for Bluetooth. These two numbers will appear in the communications port in the program setup menu on X Balancer software.

Note! These two numbers can be varied at each pairing time but will be the same as long as the pairing is retained even when PC or X Balancer turned off.

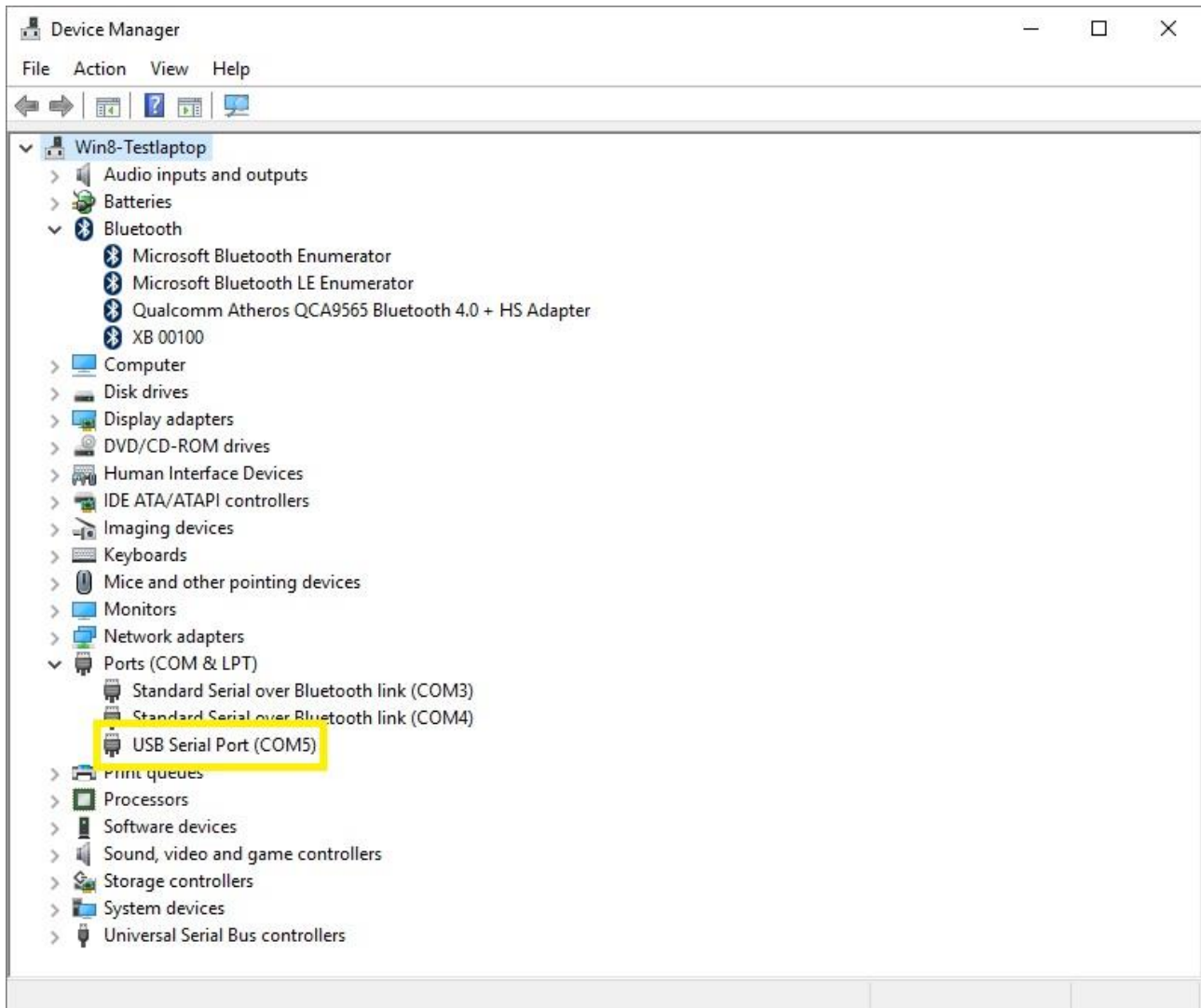


Connection via USB adapter cable

Connect X Balancer and PC, with an adapter cable that can be purchased as an accessory from VMI's local distributor. USB end into the PC and 3.5mm audio connector to X Balancer. Let Windows install the necessary driver automatically or download it from VMI's website and install it manually. This driver is for FTDI chip located in the adapter.

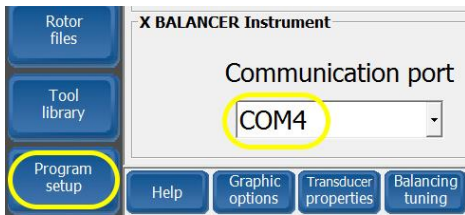
Repeat step 8 earlier.

Here it is shown one COM port number assigned for USB Serial Port



Selecting the COM port on X Balancer software

1. Click on the "Program Setup", open the list of COM ports under the "Communication port" and select one of those figures that appeared in step 9 earlier.



2. click "Save & Close" to store the port number.



6. Restart X Balancer™ software in the PC and wait until the communication between the X Balancer™ and the PC is established via Bluetooth. Note that the Bluetooth icon located to the left of the clock is blue when the communication between the instrument and the computer is correct. Red symbol means that communication is interrupted.

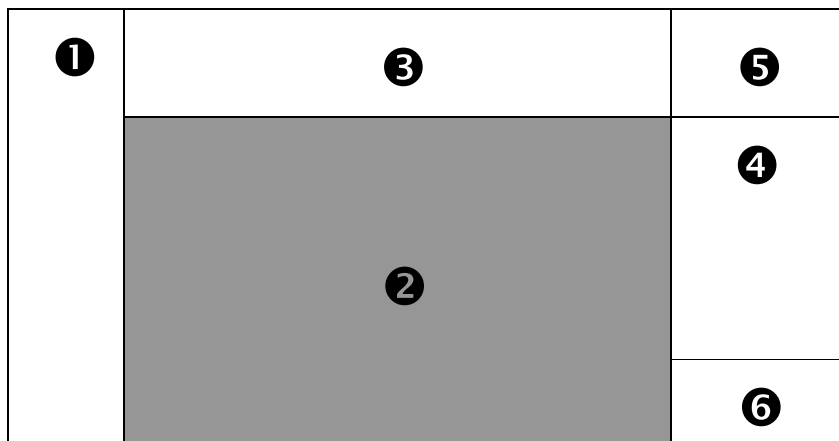
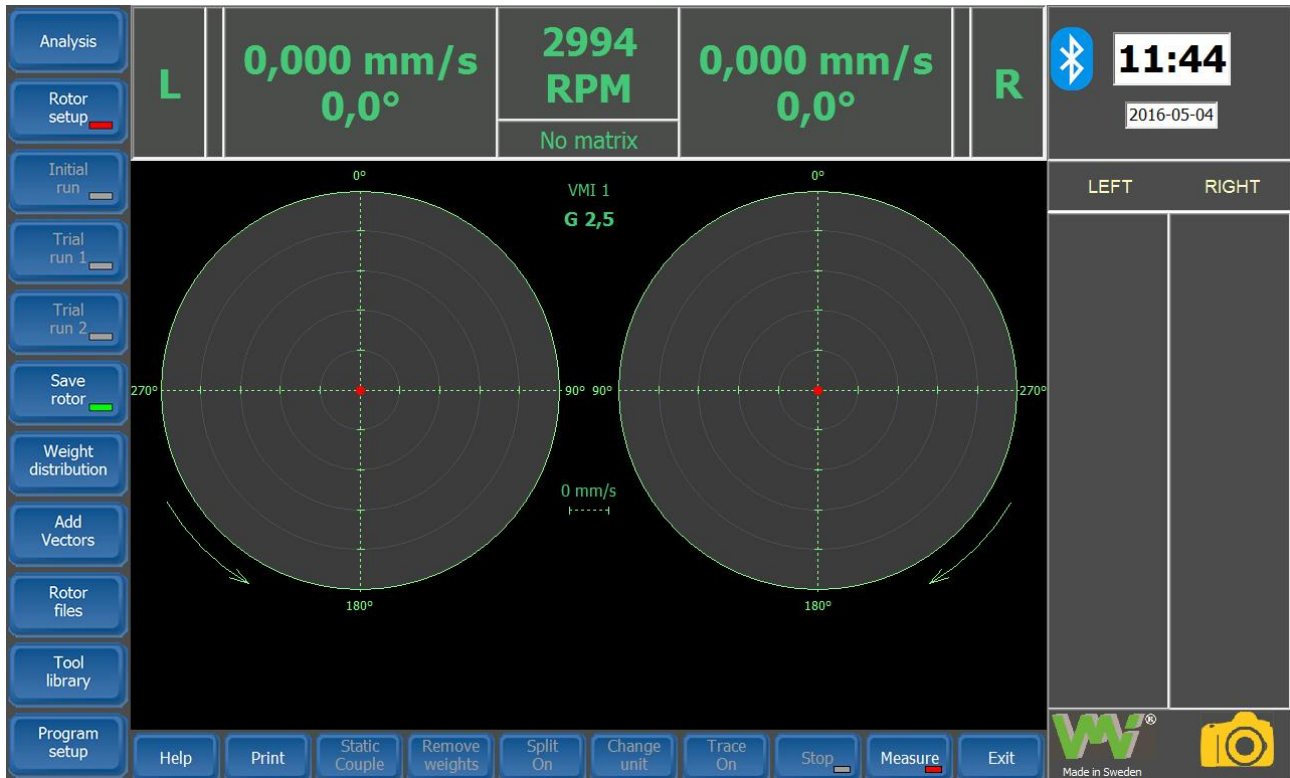
If the symbol stays red, change the COM port number to the other as shown in step 9 earlier and click on "Save & Close" to save the port number.



NOTE! Always start the instrument before the software in the PC, to get a stable communication.

Main Screen

When the software is activated, the view will be as below.



1 - Main Toolbar – The main toolbar is always visible, but it is active when section 2 displays the **Main Menu**.

2 - Menu section - In this section, all the menus will be displayed. Each menu has its own specific toolbar, which becomes active in its related menu.

3 - Display section – In this section will be displayed the measurements. The current speed will continuously updated. Amplitude, phase and unbalance values are automatically updated when the measuring session is completed.

4 - History of the last vibration measurements – This list consists of the last amplitude and phase measurements (excepting the trial measurements). The vibration measuring unit is the one displayed in the section **3**.

5 - Upper info section – This section consists of a clock, date and communication status

6 - Lower info section – Here appears the name of measuring interface and an icon to activate the video camera.



Analysis Allows to measure spectrum before and after balancing and do a resonance test

Rotor setup – Allows you to start a new balancing session and to introduce specific data of the rotor to be balanced..

Initial run – Performs an initial reading of rotor vibration.

Trial run 1 – Performs a calibration reading, with the trial weight in the left correction plane (first balancing plane).

Trial run 2 – Performs a calibration reading with the trial weight in the right correction plane (second balancing plane).

Save rotor (Action) – Saves the current balancing session in the rotor database. This is an optional action; the current rotor is saved into a temporary memory on the disk. If the computer instantly stops, the latest data of that rotor are completely restored. Saving the rotors can be useful to keep a history of the balancing sessions or to restore the rotor for a further balancing session.

Weight distribution – Allows you set the positions for the correction weight distribution.

Add vectors. Displays a menu that allows the vectorial addition of the unbalance weights.

Rotor files - Full data of different rotors can be permanently stored for further viewing, deleting, or restoration.

Tool library - Allows you to add new tools (axes) and to measure the residual vibration, in order to use them for specific rotor balancing, when required (false axes).

Program setup – Program options can be set using this command.

Note! Some buttons display a green or a red indicator (can also be flashing). The green indicator means that the action was already performed. The red one indicates that the action wasn't carried out. If flashing red indicates that it is logically the next action to perform.



Help – Presents an informative text.

Print – Displays a preview of the balancing certificate that can be printed or saved as a Rich Text File (.rtf).

Static/Couple or **Left/Right** – The unbalance correction readout is available in both static and couple components or dynamic (left/ right). This button is active only if the display unit is gr or gmm .

Add / Remove weight - Offers the facility of displaying the amount that should be either added (+) or removed (-).This button is active only if the display unit is gr or gmm.

Split On/Off - Enables the operator to accurately split one correction weight into two available positions i.e. blades, bolt holes, etc.

Change unit - The operator can select the readout vibration unit or the correction weight unit in gr or gmm.

Trace On/ Off - Enables or disable the trace record on the polar diagrams to be shown. Pressing this button will show three additional commands. Zoom in, Zoom out and Trace.



the first measurement with white small circle and the last measurement with red little circle.

The measurements are numbered. If the mouse is active, when you position it onto the circles, you can read the amplitude and phase. The measuring unit is displayed in the display section.

If you press **Trace** button, then a table with the last measurements will appear on the screen (the measuring unit is the one shown in section. The last displayed measurement is in yellow.

Measure and **Stop** buttons – The **Measure** button enables the measurement mode (amplitude and phase). **Stop** button commands the interruption of current measurement. If **Stop readings** option was previously set, then the measurement will be automatically finalized when the averaging was completed.

Note! If the trial runs haven't been performed (there is no response matrix), then the measurement may still be carried out, but the result will be displayed only in vibration units. This kind of measurement won't be added to the history of measurements.

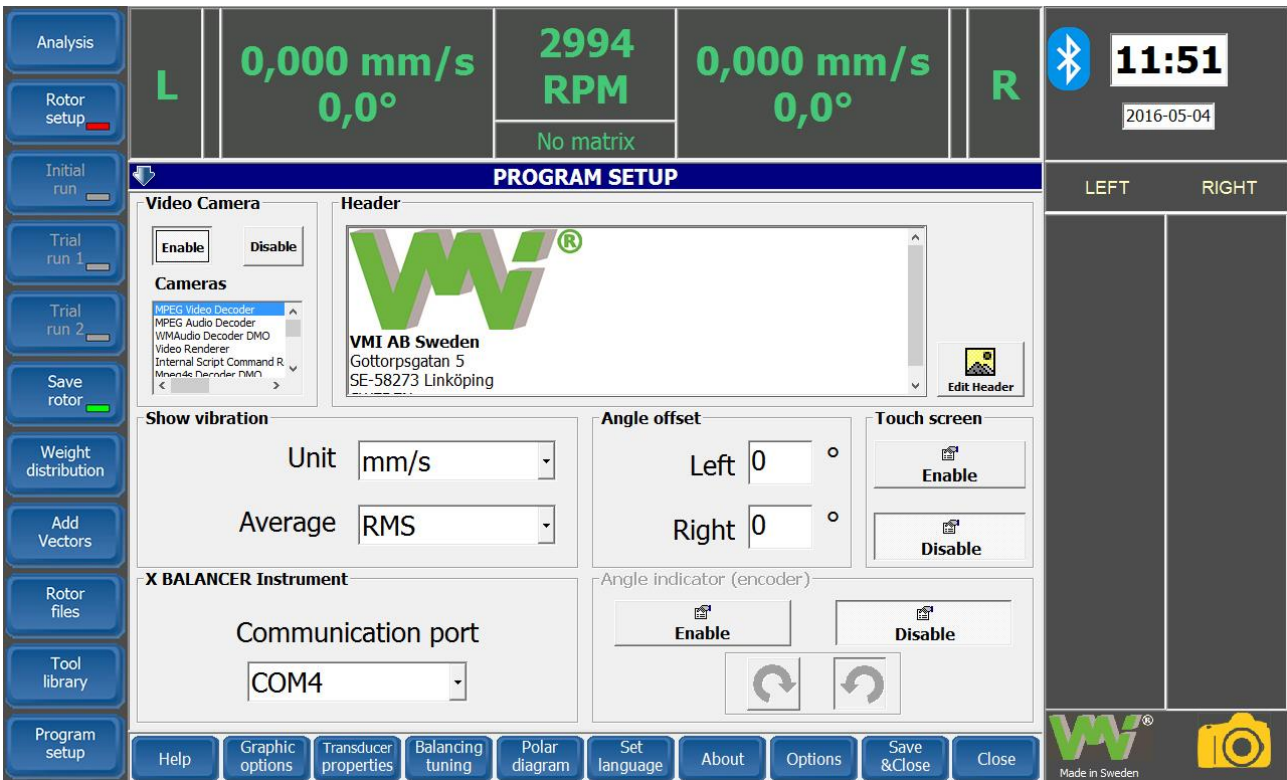
Exit – This button allows you to exit the program. The last balancing session will be automatically saved into a buffer memory, even if the rotor hasn't been saved before in the database. When the program restarts, all data will be automatically restored.

Program setup

Click on the button **Program setup**, located in the lower left corner of the screen.



When the command is activated, the screen changes to the view shown as below



Help – Presents an informative text.

Graphic options

The program allows you to configure how the buttons and the numbers will appear when the measurements will be displayed on the screen. Make the settings, then press Save. The new settings will have effect when the application will be restarted.



Transducer properties

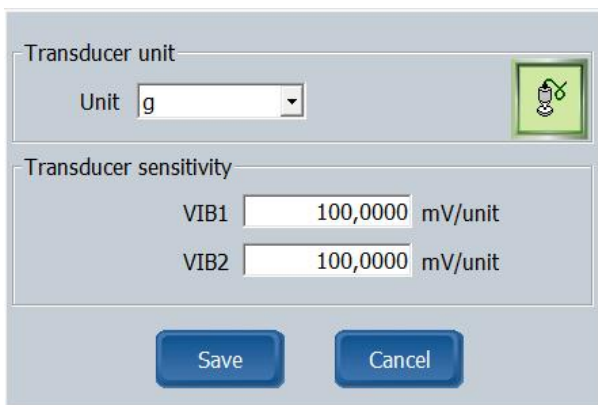
X Balancer™ is supplied with two accelerometers, it is possible to connect other kind of sensors, but it must be ordered from VMI or authorized dealer.

It is important to enter correct parameters for the transducers before performing any measurements. Click on the **Transducer properties** button.

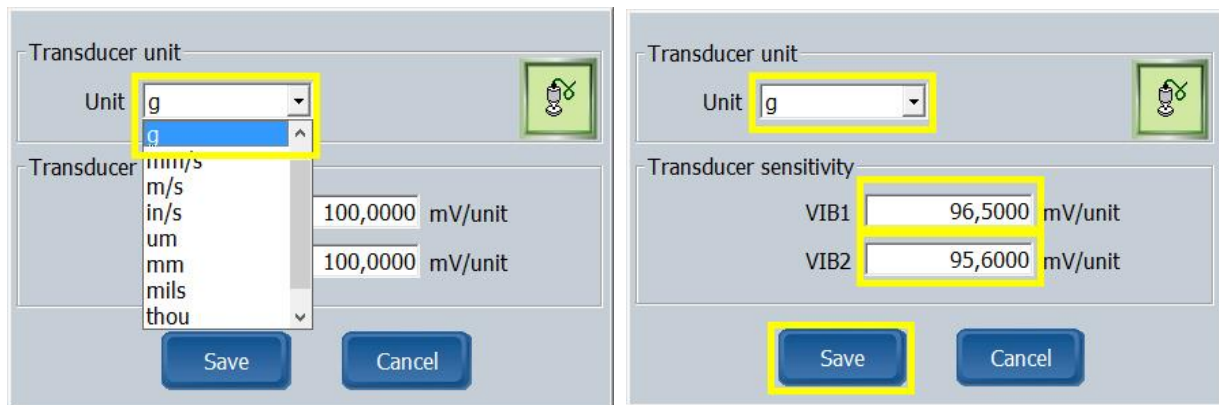


The Transducer Properties window will be displayed. Two different parameters must be entered.

- **Transducer Unit** (which also determines the Transducer Type)
- **Transducer Sensitivity** for left and right channel



Scroll down in the **Unit** section.



Select the correct unit as below:

- If the transducers are **Accelerometers**, Unit may be either **m/s²** or **G**.
- If the transducers are **Velocity Sensors**, Unit may be **mm/s**, **m/s** or **in/s**.
- If the transducers are **Displacement Sensors**, Unit may be **um**, **mm**, **mils** or **thou**.

Note! Both transducers for left and right channel must be of the same type.

When correct values have been entered for Unit and Transducer sensitivity, click the **Save** button. The values are now stored and **Program setup** menu will appear.

Balancing Tuning

This is an important setting, because it determines the way the amplitude and phase measurements will be averaged. The setting significance in this menu is:

The screenshot shows a 'Balancing Tuning' menu with the following settings:

- Initial measurement cycles: (2 ...12)
- Max. average cycles: (8 ...64)
- Speed tolerance: (1..5%) %
- Warning limit for trial weight too low**
- Amplitude change: (10..50%) %
- OR
- Phase change: (10..45°) °

At the bottom of the menu are two buttons: 'Save' and 'Cancel'.

Initial measurement cycles - Before starting the averaging procedure, a number of additional rotations can be performed, in order to allow speed balancing to become stable. You can choose between 2 to 12 cycles.

Max. Average cycles – The number of averaging depends on measurement consistency. If these are repeatable, then a minimum number of measurements should be collected, but not less than 8. If the measurement dispersion is higher, to establish the correct average, several measurement cycles are required. This setting sets the maximum average number, and then the averaging is completed.

***Note!** If you select Stop reading = Disable, in the Options menu, this setting has no effect. The user should complete the averaging by pressing STOP in the main menu.*

Speed tolerance – The whole balancing procedure will be accomplished with a constant speed that is determined at the initial measurement, in the response matrix calculation. If during balancing, the speed exceeds a fixed tolerance (by default 1%), then the averaging will be temporarily interrupted, and a warning message will be displayed on the screen. When the speed becomes stable again, the measurement procedure (as well as the averaging) will continue.

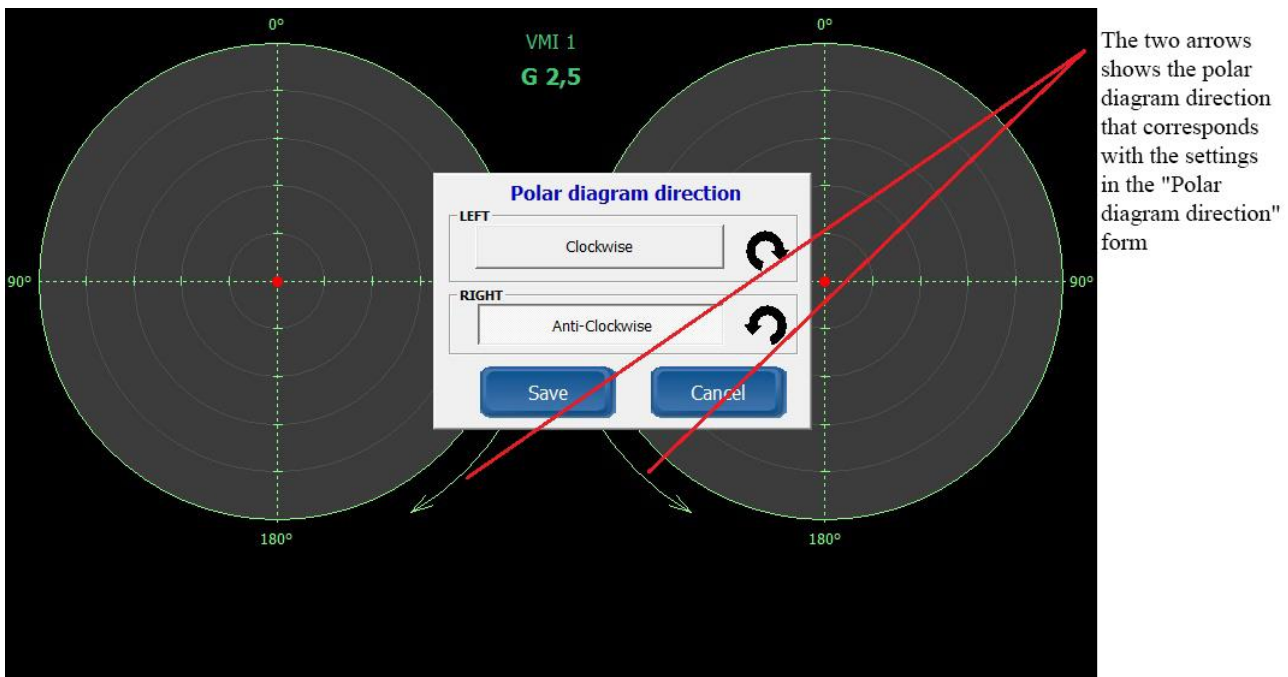
Warning limit for the trial weight – To get a proper response matrix, the trial weight should significantly change the balance condition of the rotor. It is generally accepted that the trial weight must change the vibration amplitude and/ or phase with minimum 30%, respectively 30°. The user may change these values. When the measurements have been completed, just press **Save**.

Polar diagram

An essential useful option is the ability to specify the direction of the polar diagrams, drawn in the main view window. To display the Polar diagram direction form, go to **Program setup**, click on **Polar diagram** button.



The polar diagram represents the left- and right balancing planes. You can specify direction, clockwise or anti-clockwise, separate for each diagram.



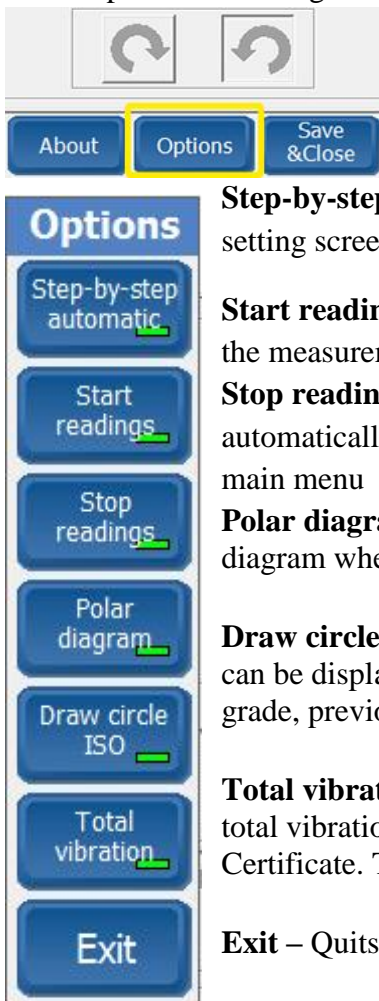
The two arrows shows the polar diagram direction that corresponds with the settings in the "Polar diagram direction" form

Set Language

It is possible to choose desire language by clicking the name of the language and save it. Please see page 47.

Options

These options are settings for the balancing procedure



Step-by-step automatic – The application automatically advances from the rotor setting screens, to the rotor calibration screens.

Start readings – When the rotor reaches the proper speed set in the **Initial Run** the measurements will automatically start.

Stop readings – When the averaging is good enough, the measurements will be automatically stopped. This action is similar with the manual **Stop** command in the main menu

Polar diagram – This recommended setting allows you to display the polar diagram when perform the calibration sessions.

Draw circle ISO – During balancing, onto the polar diagram in the main menu, can be displayed circles with red and green sectors, related to the balance quality grade, previously set, in accordance with ISO 1940/1 standard.

Total vibration – If this option is active, at the end of each measuring cycle, the total vibration value (only in mm/s RMS) will also be printed in the final Balancing Certificate. This setting can delay with a couple of seconds the averaging cycle.

Exit – Quits the **Option** menu, saving the current settings made here.

Header

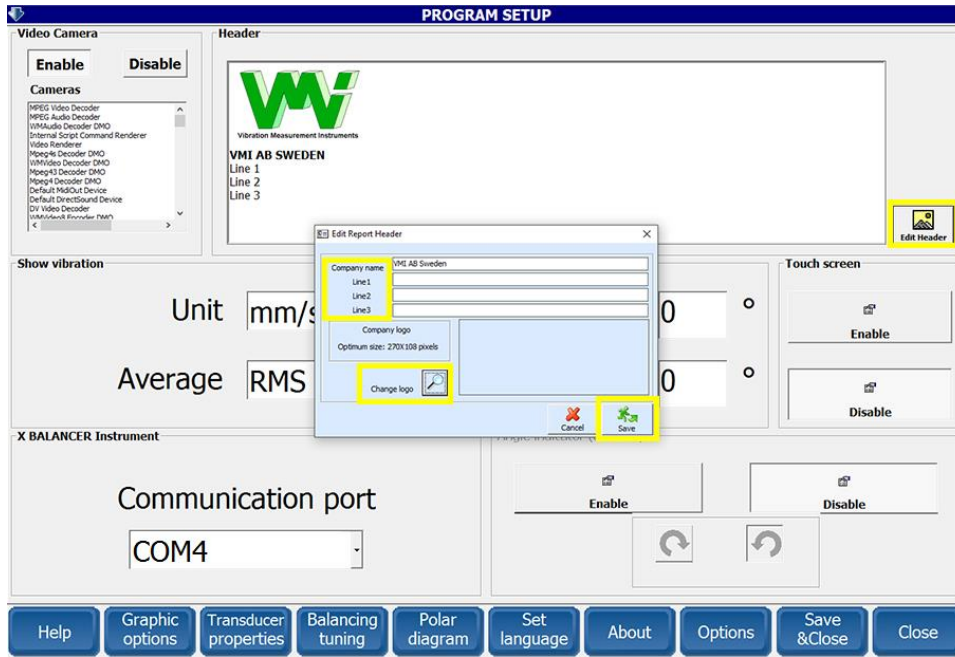
This allows to choose the company logo, name and address of the balancing report.

Click on **Edit Header**, Edit report Header window will appear.

Enter the company name in the first field and address or other information such as phone number or web address in the other three fields.

Click on the Change logo and select your logo in BMP format from your hard drive. The size should not exceed 270 x 108 pixels.

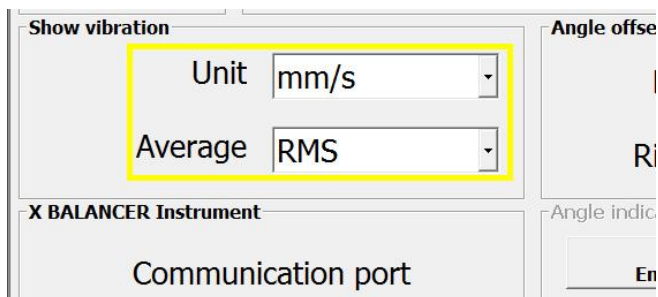
Click on the Save.



Show vibration

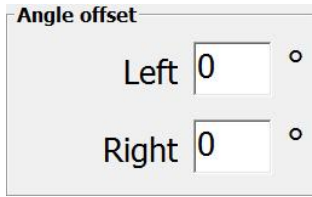
There are two fields in the Program setup menu below **Show vibration** which makes it possible to enter a value for **Unit** and **Average**. These parameters specifies which unit shall be used when the vibration levels are presented on the screen. It is recommended to select **mm/s** in the field **Unit** and **RMS** in the field **Average** when using accelerometers.

If the unit is another than the one used for the transducer properties, the program will automatically calculate correct values.



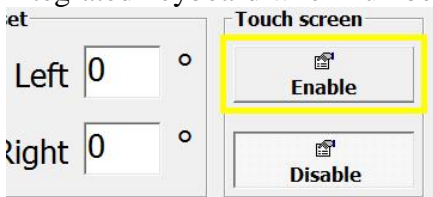
Angle offset

This can be adjusted in a range of 0 to 360 degrees, and the offset will be added to the angle indication. This adjustment doesn't influence the balancing procedure, but just changes the screen indication



Touch screen

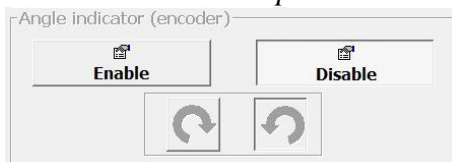
Click on the Enable to use X Balancer™ software in a tablet. This makes it possible to use the integrated keyboard when numbers or letters needs to be entered.



Angle indicator (Encoder)

Some of the balancing interfaces have an angle indicator (encoder), especially those used onto the balancing machines. If the interface is connected to an encoder, just set it to Enable. It is also possible to choose the direction of rotation in which angle indication increases (clockwise or anti-clockwise). If an Encoder is used, it must be calibrated before you start balancing

Note! The Encoder option is not included in the handheld version



Click on Save & Close to save all modifications and exit the Program setup. The system is now properly setup and ready for use.



Analysis tools

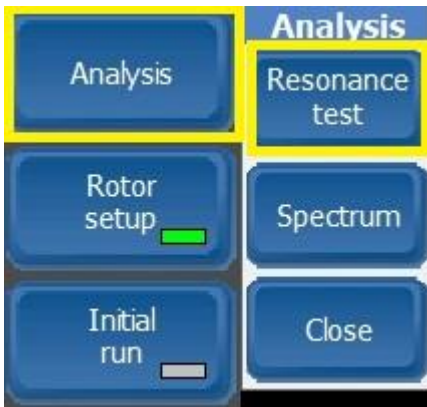
Here are two helpful tools for analyzing vibration and resonance in the machine. Spectrum displays the frequency and amplitude of the highest peak and the resonance test shows the machines resonance frequency by making a coast-down.

Resonance test

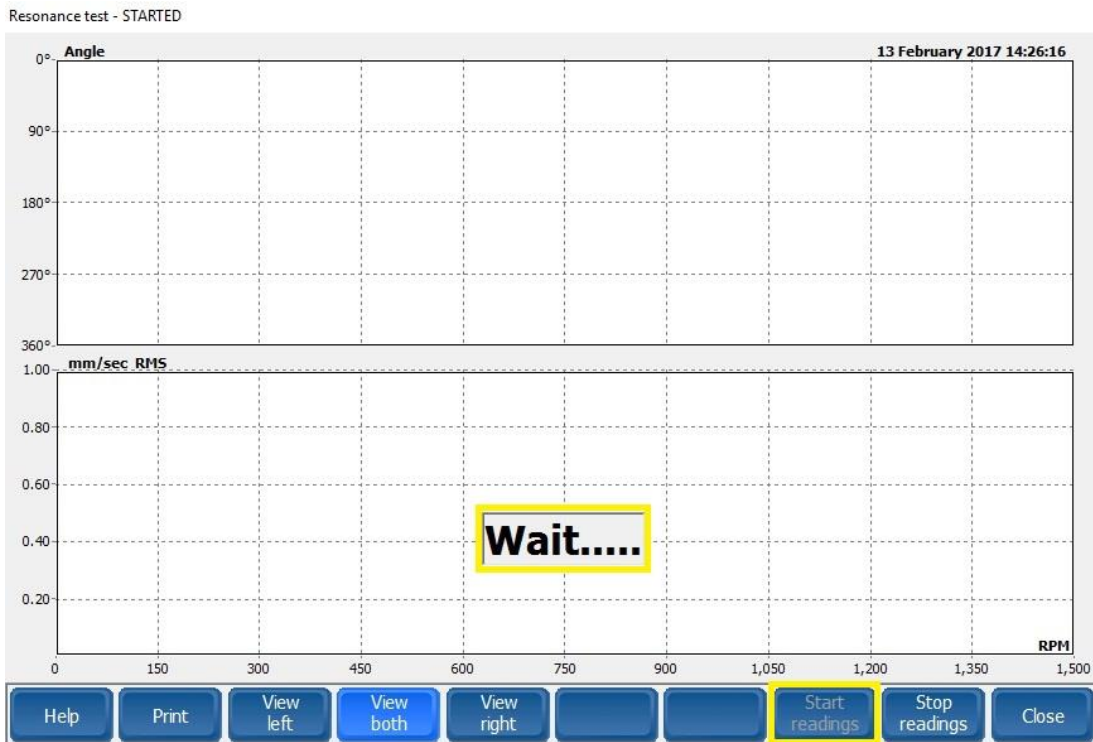
We recommend performing a resonance test before balancing. All machines have one or more resonance frequencies, which should be avoided during the balancing procedure. One way is to change the speed of the rotor to a resonance free area.

To perform resonance test:

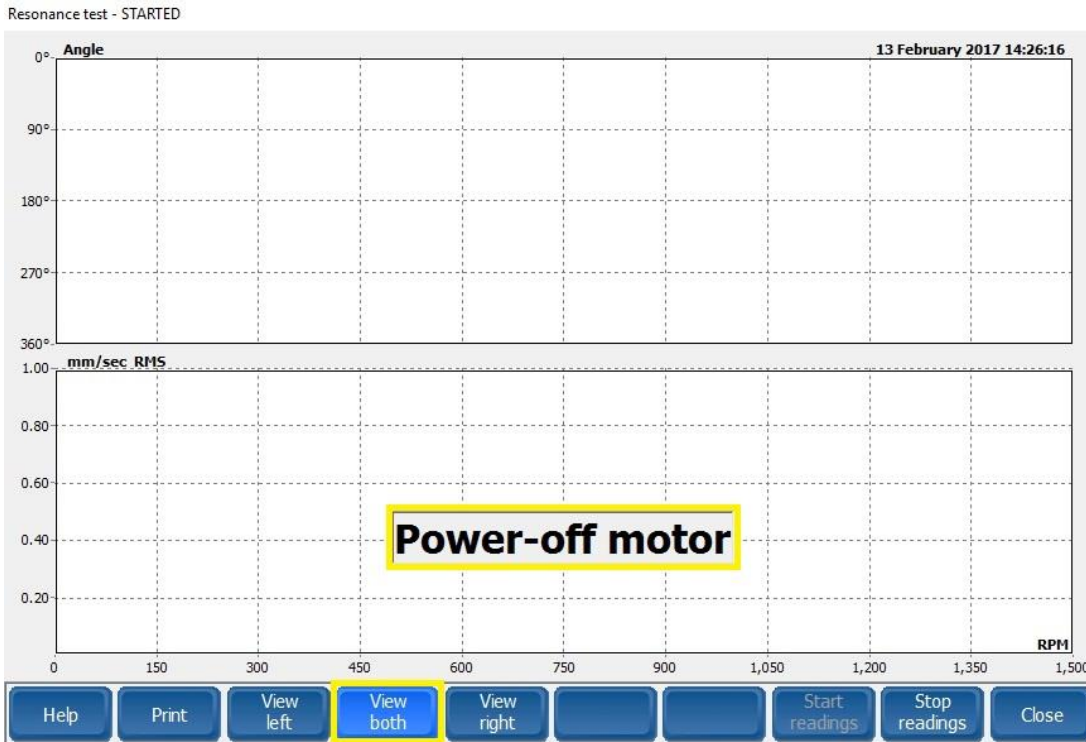
1. Adjust the rotor speed
2. Click on the **Analysis**, and then **Resonance test**



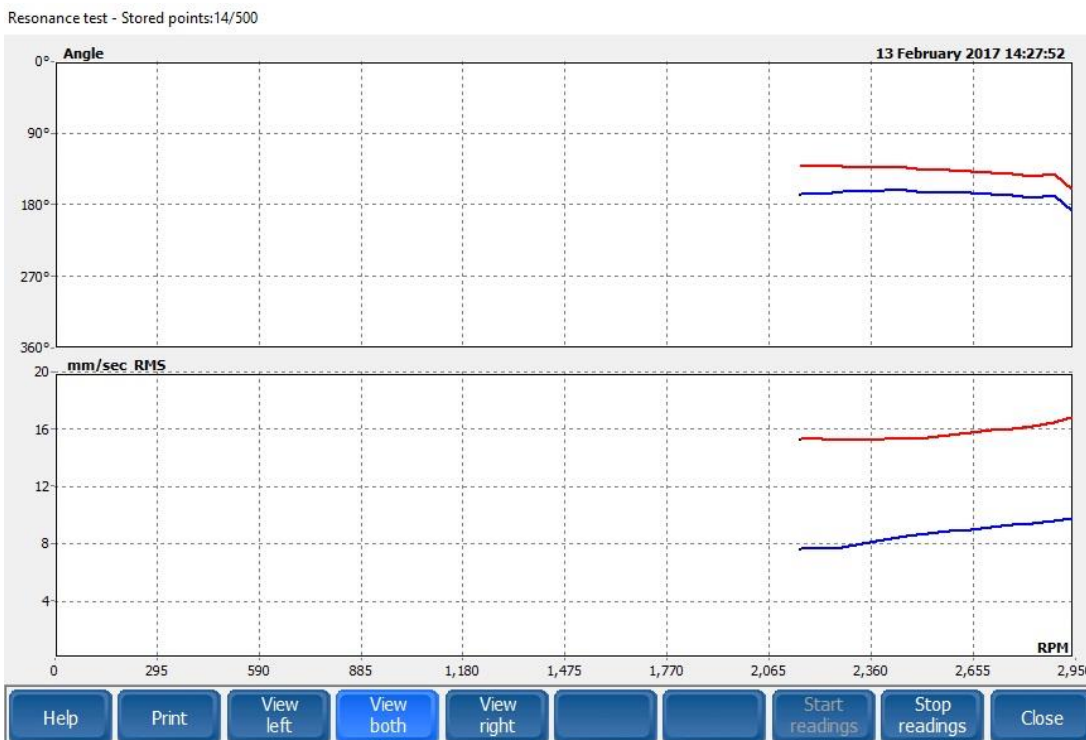
3. Click **Start readings** and wait until the instrument is ready to perform the test.



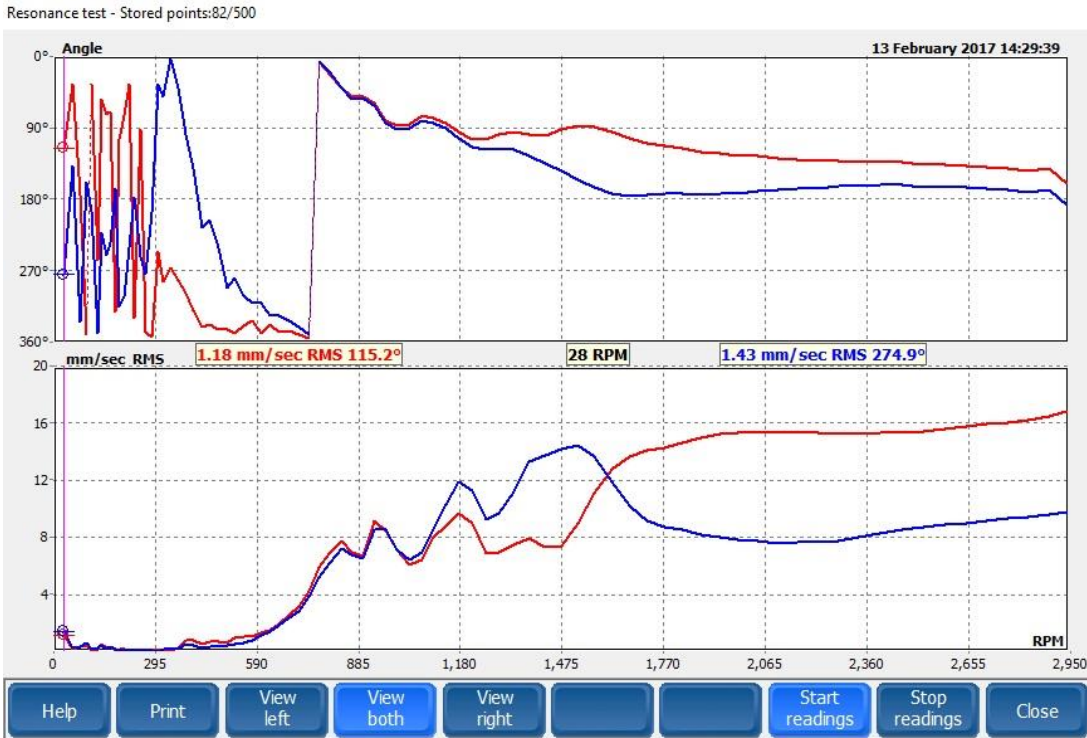
- When Power-off motor appear, stop the motor by turning off the power. It is important that the rotor eventually stops by itself. Click View both if two plane balancing



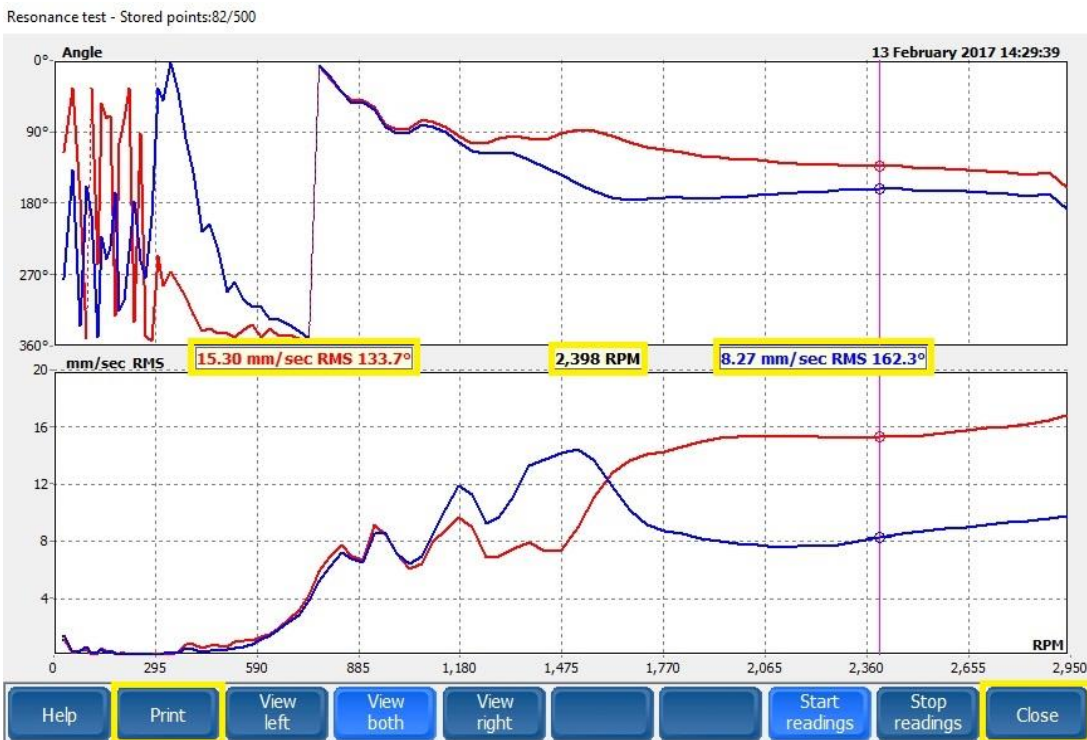
- The measurement will start automatically when speed decreases.



6. Wait until the rotor stops completely.



7. The picture below shows the phase angle and total value for both planes. The resonances starting at 1770 RPM and repeated several times before the rotor stops. This shows that the best rotor speed for balancing here, is in a range between 2000 RPM and 2950 RPM. It is possible to print or create a PDF file of the results, by clicking on the **Print**. Click **Close** to close window.



Measuring Spectra

Before start balancing, we recommend measuring the total vibration to find the unbalance part of the total vibrations. Unbalance is always detected/shown at the running speed. Only the part of the vibration that is unbalance can be reduced by a successful performed balancing.

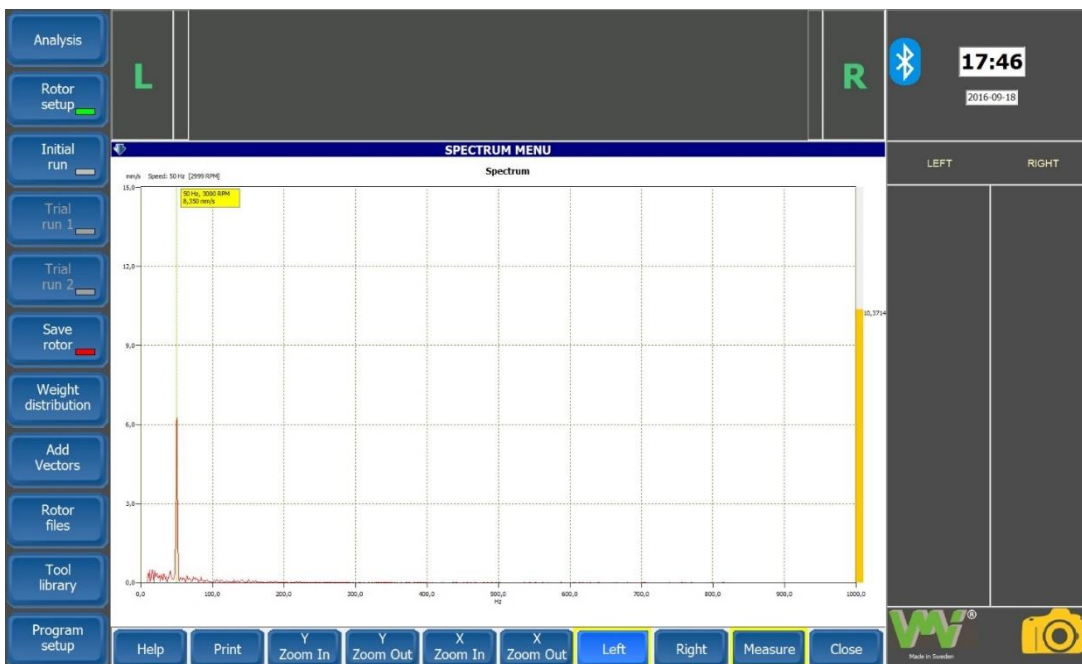
Note! If the Total vibration value RMS is 5.8 mm/s and the unbalance is 4 mm/s at the running speed. The maximum reduce of vibration can be to a new RMS value = 4, 2 mm/s depending on the calculation of *Route min square*. It is although important to document the spectra before and after the balancing.

To measure the spectrum:

1. Adjust the rotor speed
2. Click on the **Analysis**, and then **Spectrum**

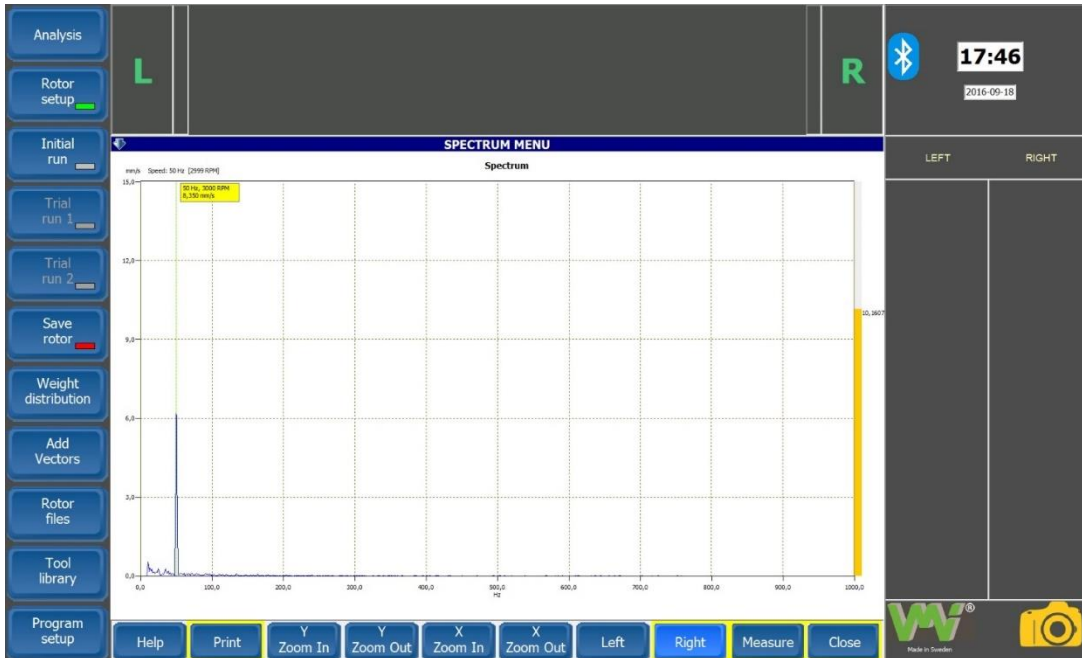


3. Click on **Left** and then on **Measure**. Wait until the spectrum is displayed in the window

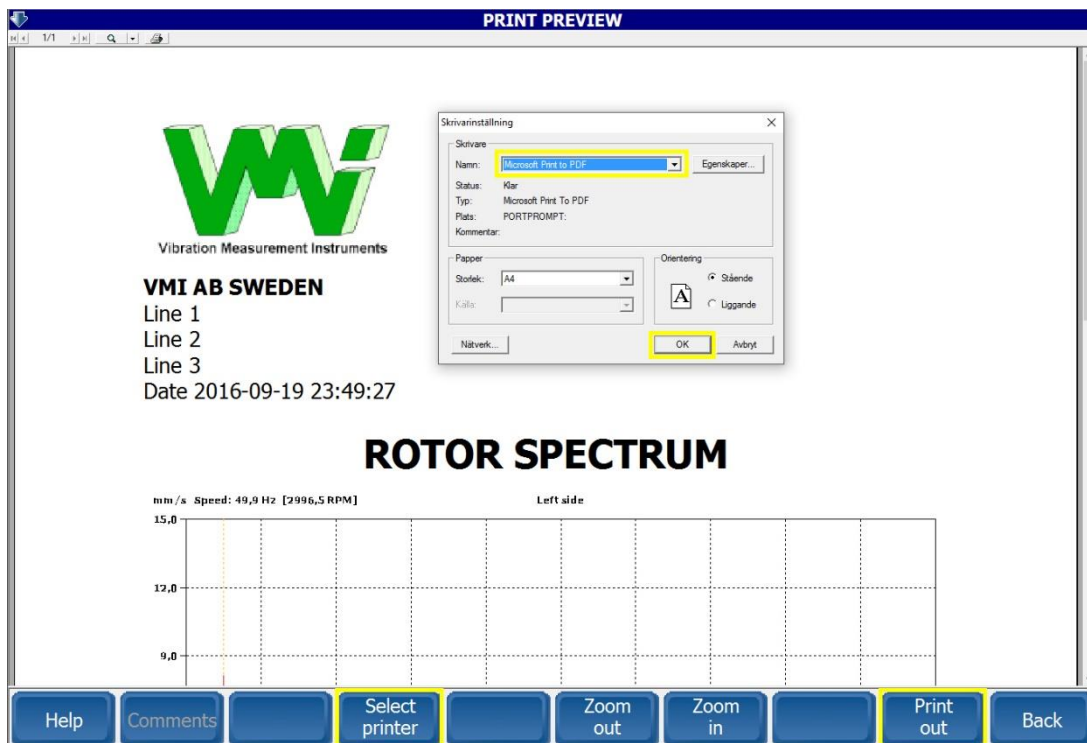


- Select the right plane by clicking **Right** and then **Measure**. Wait until the spectrum is displayed in the window and click **Print** to save the result.

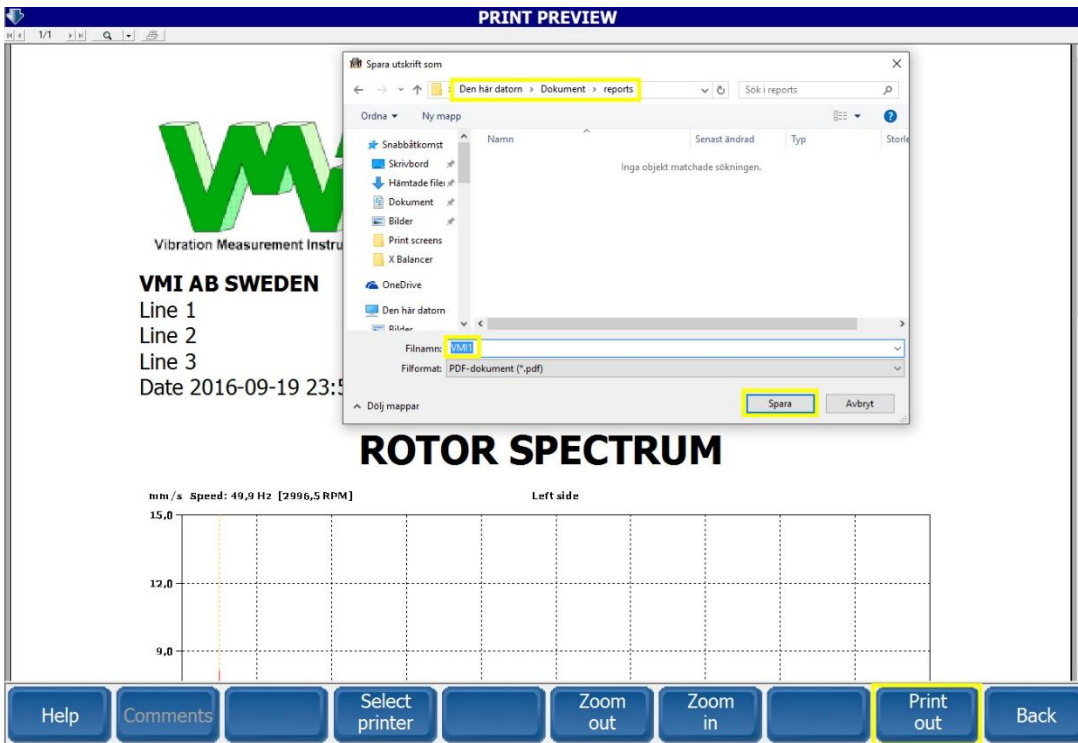
*Note! If the spectrum is not displayed, click **Measure** again. **Measure** button is not clickable while the instrument measures.*



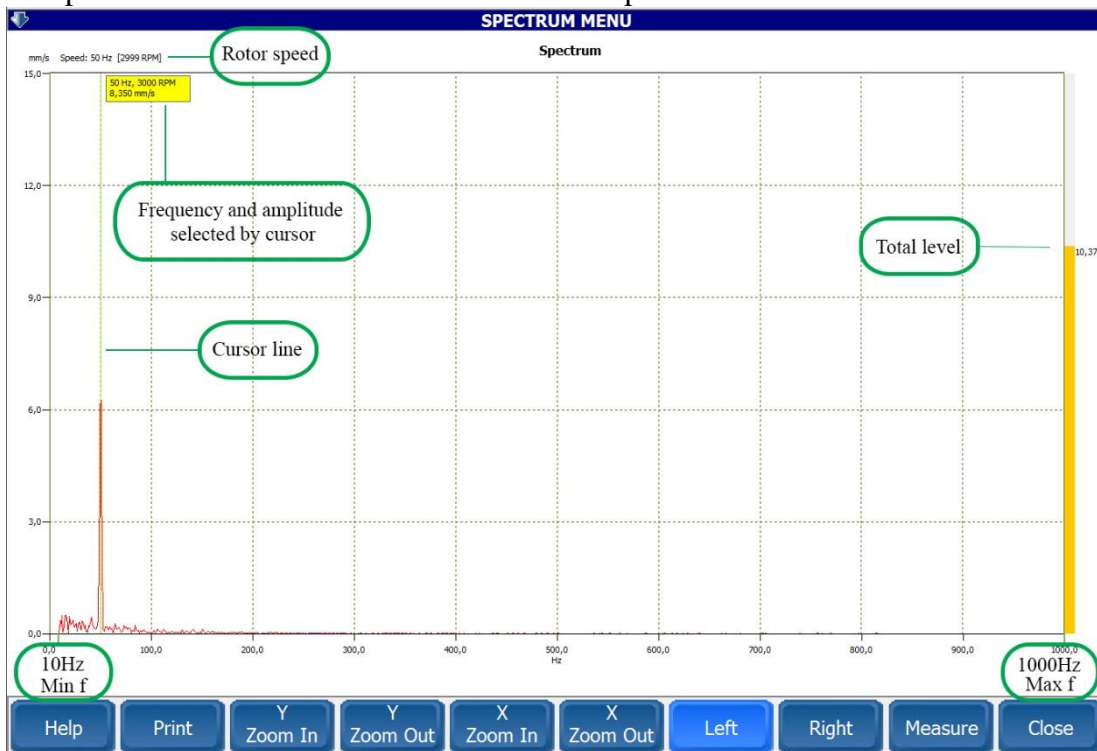
- A Print Preview window will appear, click **Select Printer**, choose **Microsoft Print to PDF**, click **OK**



6. Name the file and choose where to save it in the PC, then click **Save**.



The picture below shows various details of the spectrum window.



Lowest showed frequency is 10 Hz and the highest is 1000 Hz.

The cursor line can be moved sideways over the entire frequency band by 1 Hz resolution, and the yellow field shows the current frequency and amplitude.

The rotor speed is displayed on the top left, and the total value is displayed with a yellow bar at the right side.

The buttons, **X Zoom In** and **X Zoom Out**, zooms frequency coordinate by four steps 125, 250, 500 & 1000 Hz. This coordinate does not change automatically and is at 1000 Hz by default.

The buttons, **Y Zoom In** and **Y Zoom Out**, zooms amplitude coordinate. Default value is automatically determined by the total value of the vibration.

Balancing according to ISO 1940

This chapter describes how to perform the balancing if any balancing class required. Otherwise it's not necessary to fill in all data.

The first step, when balancing a machine, is to specify the structure of the rotating part (Rotor). This is done in the Rotor setup sub-menu. Open this menu by select the Rotor setup button.

Rotor setup



1. Click **New rotor** in the menu.

Rotor setup menu and the Rotor setup screen. This picture shown the first rotor in library

ROTOR SETUP

Rotor name: Default Name
Rotor description: Default Description

Quality grade: G 2,5

Rotor weight: 100 Kg

Maximum speed: 1500 RPM

Wide symmetric/asymmetric rotor

Dimensions in [mm]: 100, 50, 1000, 1000, 2000

ACCEPTED RESIDUAL UNBALANCE

LEFT	RIGHT
7,958 μm	7,958 μm
796 gmm	796 gmm
7,96 gr @ 100 mm	15,9 gr @ 50 mm

Buttons: Help, Print, Prev. rotor, Next rotor, Edit previous, Edit next, Copy last, New rotor, Save & Close, Close

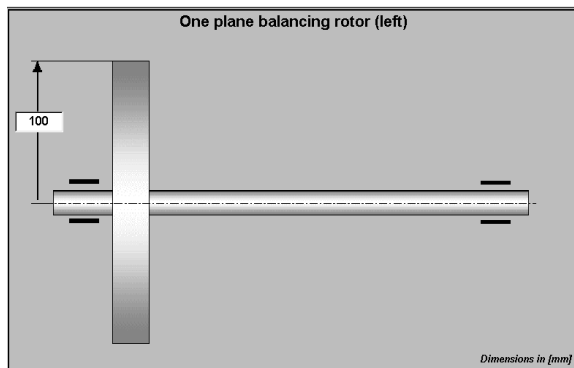
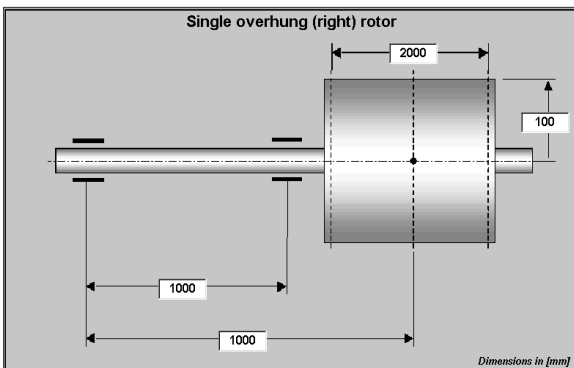
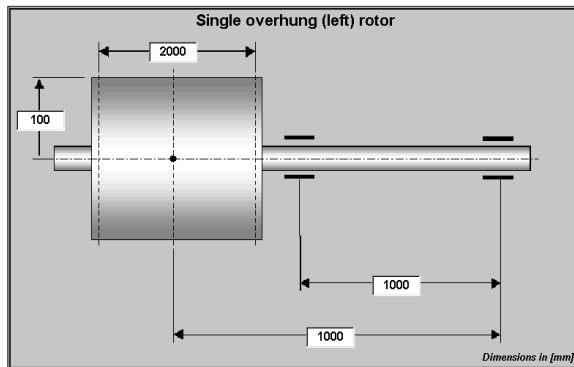
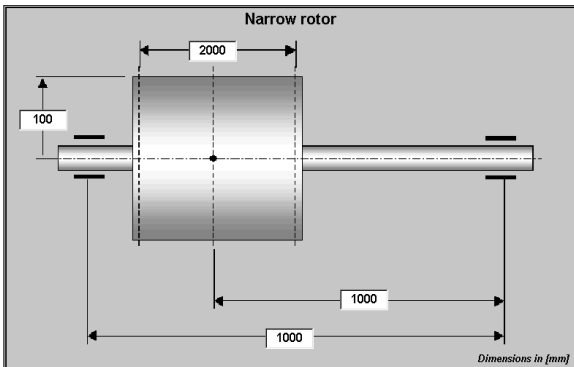
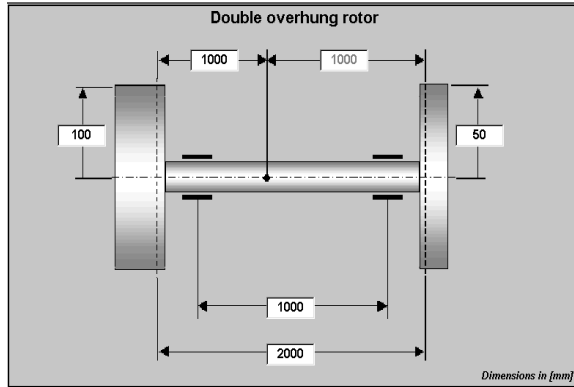
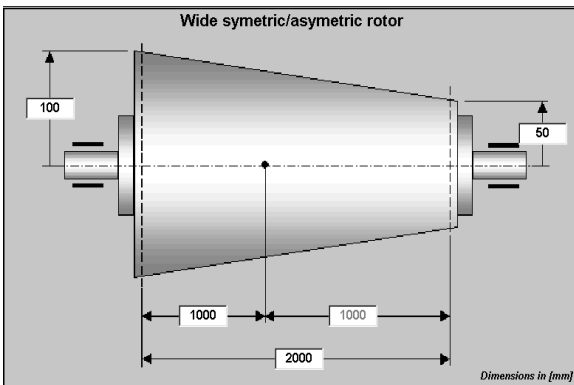
Help Presents an informative text regarding this menu

Print – A *Configuration report*, including *Response Matrix* will be printed out

Previous Rotor/ Next Rotor This command allows you to select a type of rotor in the list below:

Note! After performing trial runs, you cannot change the rotor type any more. If you still insist to do this, you may get wrong balancing results!

If there is no rotor in the list to match to the real configuration, just select the closest type of rotor in the list.



Edit previous Move the cursor to the previous editing box.

Edit next Move the cursor to the next editing box.

Copy last The last rotor matrix will be copied for a new balancing session.

New rotor A new balancing session will begin. All data in the current session will be lost, if they aren't saved before.

Save & Main - Save the selection and quit the **Rotor setup** screen.

Close - Quit the **Rotor setup** screen. All changes will be ignored.

2. Use the **Next rotor** and **Prev. rotor** buttons, to select a proper rotor configuration, from the library.



3. Choose the **Quality grade** according to ISO 1940 standard. See the description below:

- G0.4** Spindle discs and armatures of precision grinders
 - Gyroscopes
- G1** Tape recorder and phonograph (gramophone) drives.
 - Grinding-machine drives.
 - Small electric armatures with special requirements
- G2.5** Gas and steam turbines, including marine main turbines (merchant service)
 - Rigid turbo-generator rotors
 - Computer memory discs
 - Turbo-compressors
 - Machine tool drives
 - Medium and large electric armatures with special requirements
 - Small electric armatures not qualifying for one or both of the conditions specified for small electric armatures of balance quality grade
- G6.3** Turbine driven pumps
 - Parts of process plant machines.
 - Marine main turbine gears (merchant service) Centrifuge drums.
 - Paper machinery rolls; print rolls
 - Fans
 - Assembled aircraft gas turbine rotors
 - Flywheels
 - Pump impellers
 - Machine tool and general machinery parts
 - Medium and large electric armatures (of electric motors having at least 80 mm shaft height) without special requirements
 - Small electric armatures, often mass-produced, in vibration insensitive applications and/or with vibration isolating mountings
 - Individual components of engines under special requirements
- G16** Drive shafts (propeller or cardan shafts) with special requirements
 - Parts of crushing machines
 - Parts of agricultural machinery
 - Individual components of engines (gasoline or diesel) for cars, trucks and locomotives
 - Crankshaft/drives of engines with six or more cylinders under special requirements
- G40** Car wheels, wheel rims, wheel sets, drive shafts
 - Crankshaft/drives of elastically mounted, fast, four-cycle engines (gasoline or diesel) with six or more cylinders
 - Crankshaft/drives of engines of cars, trucks, and locomotives
- G100** Crankshaft/drives of fast diesel engines with six or more cylinders
 - Complete engines (gasoline or diesel) for cars, trucks, and locomotives
- G250** Crankshaft/drives of rigidly mounted, fast, four-cylinder diesel engines
- G630** Crankshaft/drives of rigidly mounted large, four-cycle engines
 - Crankshaft/drives of elastically mounted marine diesel engines
- G1600** Crankshaft/drives of rigidly mounted large two-cycle engines
- G4000** Crankshaft/ drives of rigidly mounted slow marine diesel engines with uneven number of cylinders

Editing rotor weight – Rotor mass is expressed in Kg.

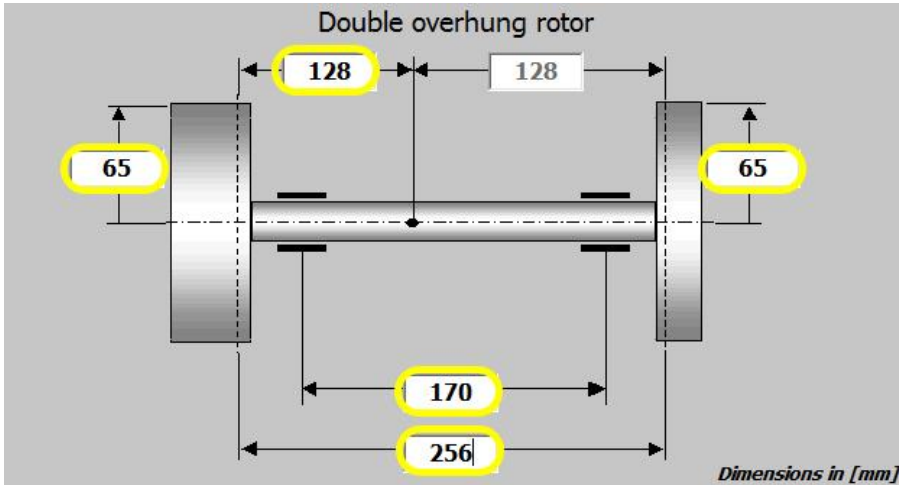
Editing the maximum operating speed – The maximum operating speed is not the same with the balancing speed. On the balancing machines, in particular, balancing is performed at much lower speeds. This value is used to calculate the maximum admissible residual unbalance.

4. Enter the **Rotor weight**.

5. Enter the **Maximum speed** of the rotor.

Note! This is the Maximum rotor speed, not the balancing speed.

6. Enter the rotor dimension fields (see example with “double overhung rotor below)



7. Fill in the **Rotor name** and **Rotor Description** fields, at the top of the Rotor setup screen.

The screenshot shows the "ROTOR SETUP" screen. It has a blue header with a dropdown arrow on the left and the text "ROTOR SETUP". Below the header, there are two input fields:

- Rotor name**: Default Name
- Rotor description**: Default Description

8. Store the completed rotor definition, by clicking the **Save & Close**



From these parameters, the “Permissible Residual Unbalance” is calculated, and displayed in the lower left part of the screen.

Initial run

Before the actual balancing can be performed, the characteristics/unbalance for the rotor must be determined. This is done during the initial run, without any balancing weight mounted, then two trial runs with trial weights mounted in first the left and then the right balancing plane (2 plane balancing). The steps are as follows.

1. Click **Initial run** button, in the Main Menu.



This command opens the Initial run screen, with a picture of the selected rotor together with some instructions on top and the Initial run sub-menu, located at the bottom.

Help Presents an informative text regarding this menu

Print Print the chosen rotor

Resonance test Perform a resonance test of the rotor

Tool selection A tool can be selected to balance the rotor. The tools must be previously defined into the **Tool Library** menu.

Tool On/Off The selected tool can be activated. The tool bias vibration will appear on the screen (in red).

Spectrum Allows you to measure the spectrum

Delete All the existing calibration data will be deleted. A full calibration session must be performed again. This command is required when you need to change the balancing speed.

Stop Stops the measurements of initial run vibrations.

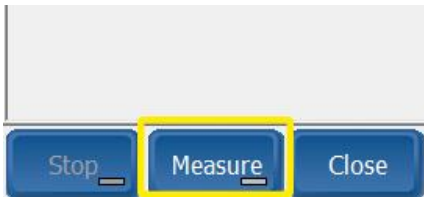
Measure Enables the measurement mode. The instrument will display live data from the rotor. To get stable measurements, just use the **Stop** command, to save the readings.

Close Return to the **Main Menu**

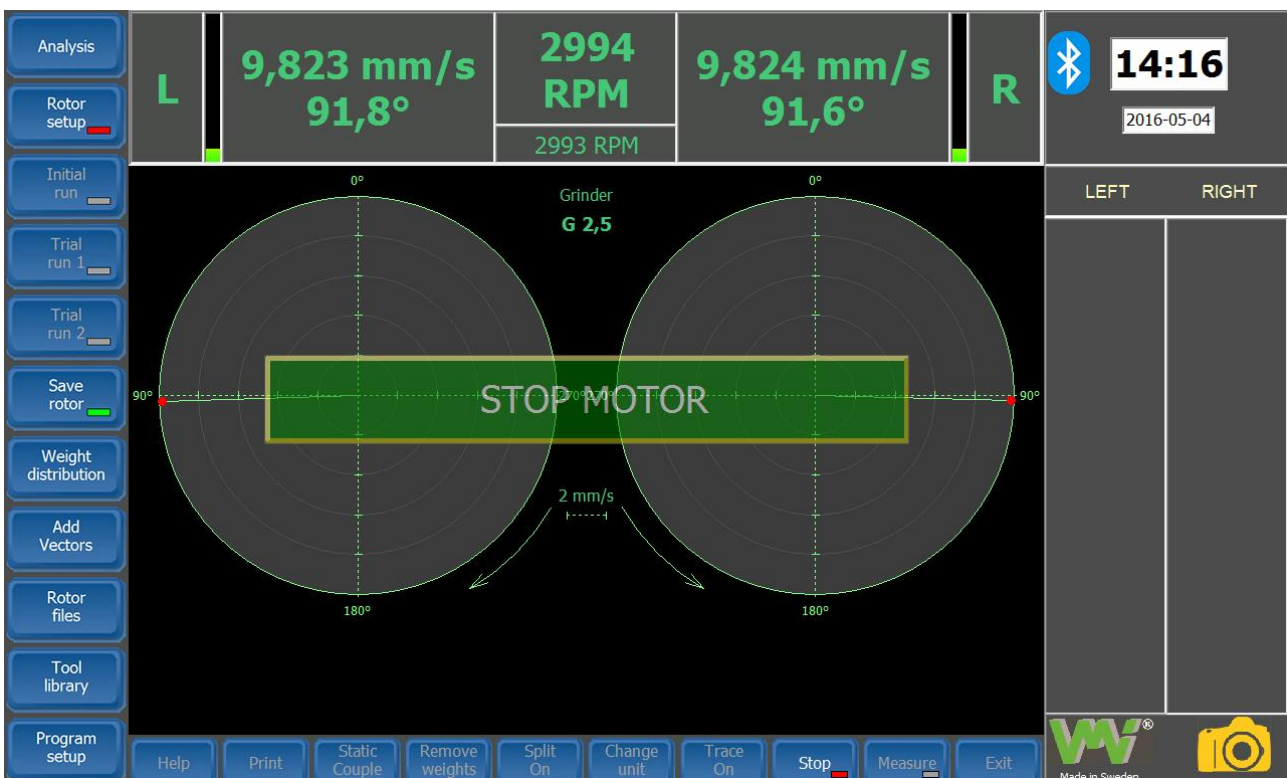
- Switch the machine ON, adjust the rotor speed to the preferred balancing speed. The current rotation speed is displayed at the top of the main screen, as below



- When the RPM indication has stabilized, press the **Measure** button.



- If the **Stop reading Automatic** option is activated (see **Program setup** sub-menu), wait until the reading stops and a stop sign **Stop Motor** appears. If not, wait until the vibration and phase readings are steady and click **Stop** button.



- Stop the machine, decrease the rotation speed to zero.
- The **Initial run** is then completed. Press **Close** to return to the Main Menu and store the results.

Trial run 1

If the **Step-by-step Automatic** option is activated (see **Program setup** sub-menu), the program will automatically open the **Trial Run 1** screen. If not, press the **Trial Run 1** button, in the Main menu



Trial Run 1 menu contains the image of the selected rotor and some information at the top, instructions on the lower part and parameter fields at the right side.

Note! The values in the parameter fields are just suggestions, and may be amended if necessary.

Help Presents an informative text regarding this menu

Print Print the chosen rotor

Edit previous Moves the cursor to the previous editing box

Edit next Moves the cursor to the next editing box

Stop Stops the measurements of the trial run

Measure Enables the measurement mode. The instrument will display live data from the roto. To get stable measurements, just use the **Stop** command, to save the readings.

Close Return to the **Main Menu**.

1. Mount the specified trial weight in the **Left plane** of the rotor and start the motor and adjust the speed to the balancing speed.

Note! The position where the trial weight is placed will be regarded as position 0°

If for some reason the angle where the trial weight is placed, must be changed, enter the new value

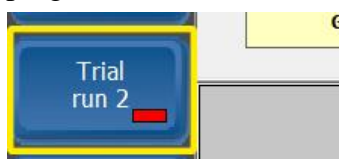
in the field **Angel**.

2. If the **Start reading Automatic** option is activated (see **Program setup** sub-menu), the vibration readings will begin, when the rotor reaches the balancing speed. If not, click **Measure**.
Note! Sometimes it's necessary to adjust the speed, Imbalances, as test weight causes can sometimes change the speed of the rotor.

3. If the **Stop reading Automatic** option is activated (see **Program setup** sub-menu), wait until the readings are stopped. If not, wait until the vibration and phase readings are stable and click **Stop**.
4. Stop the motor and decrease the rotation speed to zero.
5. Trial run 1 is now complete. Remove the trial weight 1 and click **Close** to store the results and return to the Main Menu.

Trial run 2

If the **Step-by-step Automatic** option is activated (see **Program setup** sub-menu and fig. 16), the program will automatically open the **Trial Run 2** menu. If not, click **Trial Run 2** in the Main



Menu.

Trial Run 2 menu contains the image of the selected rotor and some information at the top, instructions on the lower part and parameter fields at the right side.

Note! The values in the parameter fields are just suggestions, and may be amended if necessary

TRIAL RUN 2	
Rotor name Grinder	Rotor description Exemple
<p>Double overhung rotor</p> <p>Left plane Right plane</p>	
<p>1 - Place 2 grams in right plane 2 - Adjust the rotor speed 2993 RPM 3 - Measure the vibrations for Trial run 2 4 - Remove trial weight and close trial run to continue next step</p>	
Proposed trial weight 2 gr	Radius 65 mm
Angle 0°	
<p>Help Print Edit previous Edit next Stop Measure Close</p>	

Help Presents an informative text regarding this menu

Print Print the choosen rotor

Edit previous Moves the cursor to the previous editing box

Edit next Moves the cursor to the next editing box

Stop Stops the measurements of the trial run

Measure Enables the measurement mode. The instrument will display live data from the roto. To get stable measurements, just use the **Stop** command, to save the readings.

Close Return to the Main Menu.

1. Mount the specified trial weight in the **Left plane** of the rotor and start the motor and adjust the speed to the balancing speed.
Note! The position where the trial weight is placed will be regarded as position 0°
 If for some reason the angle where the trial weight is placed, must be changed, enter the new value
 in the field **Angel**.
2. If the **Start reading Automatic** option is activated (see **Program setup** sub-menu), the vibration readings will begin, when the rotor reaches the balancing speed. If not, click **Measure**.
Note! Sometimes it's necessary to adjust the speed, Imbalances, as test weight causes can sometimes change the speed of the rotor.
3. If the **Stop reading Automatic** option is activated (see **Program setup** sub-menu), wait until the readings are stopped. If not, wait until the vibration and phase readings are stable and click **Stop**.
4. Stop the motor and decrease the rotation speed to zero.
5. Trial run 1 is now complete. Remove the trial weight 1 and click **Close** to store the results and return to the Main Menu.

The balancing run(s)

After the Trial runs, the program has analyzed the un-balance in the machine. At the top of the Main screen, suggestions for balancing weights and angles in the left- and right plane are presented.



1. Place the balancing weights as close as possible to the proposed angles to get the best result
2. Start the machine and adjust the balancing speed.

3. If the **Start reading Automatic** option is activated, the vibration readings will begin when the rotor reaches the balancing speed. If not, click **Measure** to start.
4. If the **Stop reading Automatic** option is activated, wait until the readings are stopped. If not, wait until the vibration and phase readings are stable click.
5. Stop the motor and decrease the rotation speed to zero.

The main screen will be updated with new recommendations. If the vibrations measured are within the limits for the selected quality grade for a plane, the text OK shows in green, close to the corresponding polar diagram. An example of how the results from a successful balancing run may look can be seen as below.

6. Repeat steps 1 to 5 above, until the rotor is properly balanced, according to the specified tolerance.



In this case, vibrations in both planes are within limits. This is acknowledged with a green "OK" for each plane.

Inside the polar diagrams, the green area represents the allowed vibration under the selected Quality grade. If any vibration level had been in the red area, more balancing had been required.

Weight distribution

WEIGHT DISTRIBUTION SETUP

Left plane

Right plane

No.of positions

Zero at position

No.of positions

Zero at position

Help
Print
Edit previous
Edit next
Delete
3Weight
Save &Close
Close

Help Shows an informative text

Print A split Report will be printed out.

Edit previous Moves the cursor to the previous editing box.

Edit next Moves the cursor to the next editing box.

Delete Deletes all previous settings for vector splitting.

3Weight - This is a special menu used to balance the grinding stones. They are equipped with a channel in which there are three correction weights that can be moved circumferentially.

3 Weight Correction

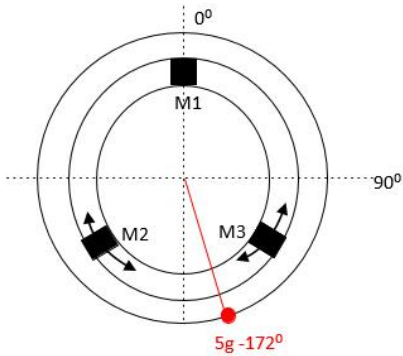
gram

Weight No	LEFT	RIGHT
#1	219	343
#2	335	102
#3	104	225

CALCULATE
CLOSE

For each balancing plan can be set a number of split positions at which the weight distribution is physically possible (but minimum three). It can also be indicated the appearance of the first position (it can be "zero" or any other value). This first position corresponds to 0°.

The weight angles can be calculated by pressing **CALCULATE**.

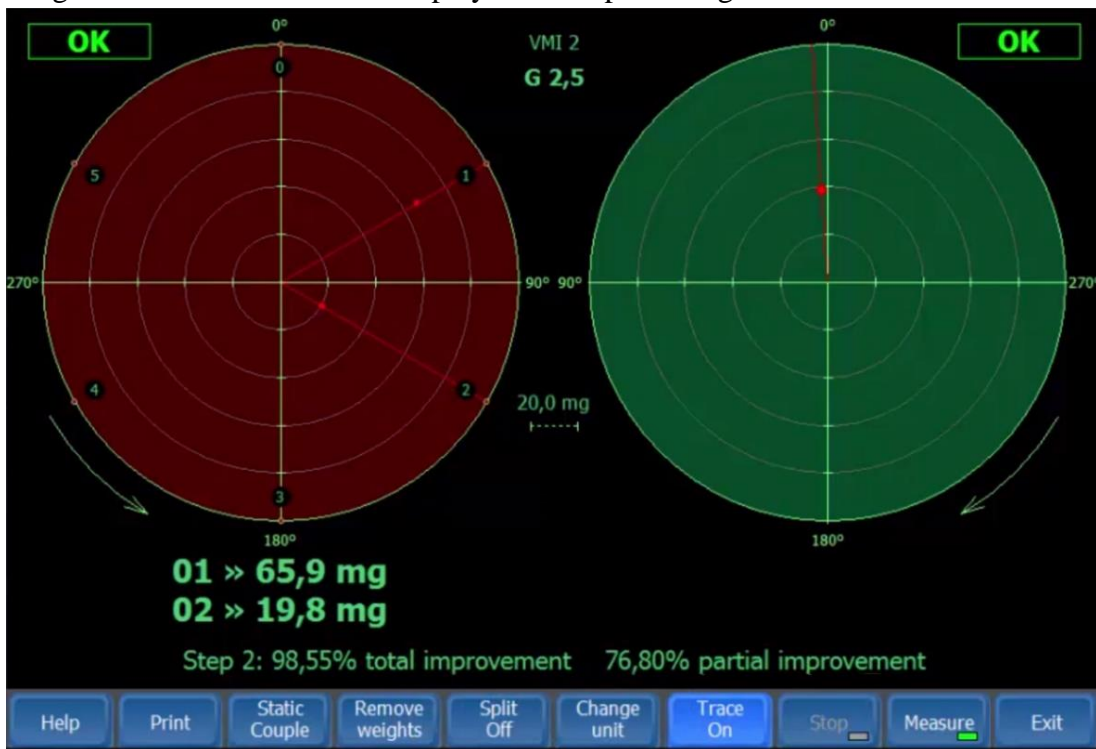


Save & Main – Saves last settings and quit the **SPLIT SETUP** menu.

Close - Quits the **Split Setup** menu, without saving last settings.

Using weight distribution in rotor balancing

If the value "No. of positions" is more than three, it is considered that the weight distribution is set for that channel. In the main screen, any moment, when the **Split ON / OFF** button is pressed, the weight distribution values are displayed in the polar diagram



The correction weight is always distributed on those two positions that are closest to the initial angle.

Note! The vector split amounts must be positioned at the same radius as the original single vector

Add vectors

ADD VECTORS			
No.	Weight (gr.)	Angle (°)	Left plane
1	8,02	188,2	
2	2,85	219,2	
3	1,28	223,5	
4	0,90	232,2	
5	0,61	236,7	
6	0,55	243,9	
7	0,35	250,1	
8	0,33	257,6	
9	0	0	
10	0	0	
11	0	0	
12	0	0	

TOTAL WEIGHT 13,9 gr@206,5°

Buttons: Help, Print, Transfer weights, Edit previous, Edit next, Left plane, Right plane, Clear table, Close

Help – Shows an informative text

Transfer weights - The values in the balancing history are automatically added in the table (depending on the selected plan by pressing **LEFT/ RIGHT**)

Previous – Moves the cursor to the previous panel for editing

Next – Moves the cursor to the next panel for editing

Left/Right plane – Selects the plane to make the calculation

Clear table – Clears all the values in the table (for the selected plane)

Close - Quits the **Add Vector** menu

Add Vectors procedure

When multiple unbalance corrections have been found necessary to achieve a required balancing tolerance, the vector addition facility enables the operator to resolve a series of correction weights into one weight at one angular position. In the vector **ADD** mode, simply add the amounts and angles of each correction weight as follows:

1. Press **Clear** to remove all previous data.
2. Press **Next** until *Vector 1* amount panel is highlighted.
3. Introduce *Vector 1* Amount from the keypad. The new amount will now be displayed in *Vector 1* Amount.
4. Press **Next** until Vector 1 Angle panel is highlighted.
5. Proceed to introduce *Vector 1* Angle.
6. Continue to introduce the additional vectors in the same manner.
7. On completion, the resultant vector will be shown onto a polar display, and also numerically displayed in the bottom SUM panel.
8. Press **Close** to return to your original polar display.

Rotor files

ROTOR FILES			
ID	Date & time	Rotor name	Rotor description
9	04-Sep-15 18:42	SINGLE PLANE	SINGLE PLANE
3	29-Aug-15 15:20	TEST	TEST ROTOR
21	29-Aug-15 15:12	DEFAULT NAME	DEFAULT DESCRIPTION
20	02-Jun-15 11:43	ROTOR COPY	ROTOR COPY FROM THE LAST
19	09-Jan-14 15:08	DEFAULT NAME12	DEFAULT DESCRIPTION12
17	17-May-13 09:40	NUME IMPLICIT	DECRIERE IMPLICITĂ
15	19-Apr-12 10:42	RUEL	RUEL DEMO
13	29-Oct-10 19:55	TEST(M)	CER(M)
12	29-Oct-10 19:53	BDEFAULT NAME	BDEFAULT DESCRIPTION
11	29-Oct-10 19:50	ADEFAULT NAME	ADEFAULT DESCRIPTION
8	24-Dec-09 18:29	NUME IMPLICIT	DESCRIERE IMPLICITĂ
7	06-Nov-09 14:08	DEFAULT NAME1(M)	DEFAULT DESCRIPTION1(M)
6	02-Sep-09 09:17	DEFAULT NAME1	DEFAULT DESCRIPTION1
5	22-Mar-09 13:26	DEFAULT NAME	DEFAULT DESCRIPTION
4	20-Nov-08 11:24	NUME IMPLICIT	DECRIERE IMPLICITĂ
2	15-Jul-08 12:08	WDEFAULT NAME	FDEFAULT DESCRIPTION
1	01-Jan-04 04:06	CVB	QDEFAULT DESCRIPTION

Buttons: Help, Print, Delete rotor, Print Preview, Find rotor, Import rotor, Response matrix, Restore rotor, Close

Help Shows an informative text.

Delete rotor Allows you to delete a rotor definition. Then, the rotor can be restored.

Print preview Displays a preview of the selected rotor balancing report.

Find rotor Allows you to search by name a rotor. The command is useful when there are many records in the database.

Import rotor Allows you to import rotors from another database.

Restore matrix Restores a rotor (only the response matrix) and returns to the **Main** screen. Use this command when another rotor must be balanced (with the same response matrix).

Restore rotor Restores a rotor (including all fine balancing measurements) and returns to the **Main** screen. Use this command when you want to continue a previously saved balancing session.

Close Quits the **Rotor Files** screen, without restoring.

Tool Library

TOOL LIBRARY	
Rotor name	Rotor description
TABLETE	Beskrivning av namnlös
New tool #2	DEFAULT DESCRIPTION
Scula noua #3	DECRIERE IMPLICITA
Scula noua #4	DECRIERE IMPLICITA
123-8976	Tool for Pump rotors

Tool name	Tool description
123-8976	Tool for Pump rotors

Balancing speed

411 RPM

F1 Help	F2 Print	F3 Previous tool	F4 Next tool	F5 Add tool	F6 Remove tool	F7 Delete	F8 Stop	F9 Measure	Close
---------	----------	------------------	--------------	-------------	----------------	-----------	---------	------------	-------

Help – Shows an informative text.

Prev tool – Moves the cursor to the previous tool definition for editing.

Next tool – Move the cursor to the next tool definition for editing.

Add tool – Allows you to add a new balancing tool.

Remove tool – Allows you to delete a balancing tool in the database.

Delete - Clears bias vibration readings for the selected tool. Use this command only if you want to change the speed for bias vibration readings. Otherwise, you can press directly **MEASURE** to take a new bias vibrations reading.

Measure/start – Allows you to measure a bias vibration, respectively to stop the measuring procedure.

Close - Quits the **Tool Compensation Library** screen.

Tool compensation method

Terminology

The following terms are used in this paragraph.

Balancing tool A shaft used to support any machinery part that can't be balanced alone.

Rotating part Any machinery part, generally without any possibility to be balanced alone in a balancing machine (E.g., narrow pumps or compressors, rotor, electrical motor fans, grinding wheel)

Tool assembly A balancing tool with a rotating part mounted, suitable to be fitted in a standard balancing machine.

Tool compensation is a procedure in which, from a tool assembly, only the rotating part is balanced. The residual unbalance of the balancing tool not influences, anyhow, the balance accuracy of the rotating part.

Preliminary operations

Before using the tool compensation method, the followings operations must be completed:

- . The balancing tool must be balanced first. Always use two balancing planes.
- . Add the tool to the Tool Library. Determine the balancing tool bias vibration. To do this, take a reading.
- . Save the tool in the program memory; use a proper name to do this.

Note! Never change the position of the reflective tape on the tool shaft.

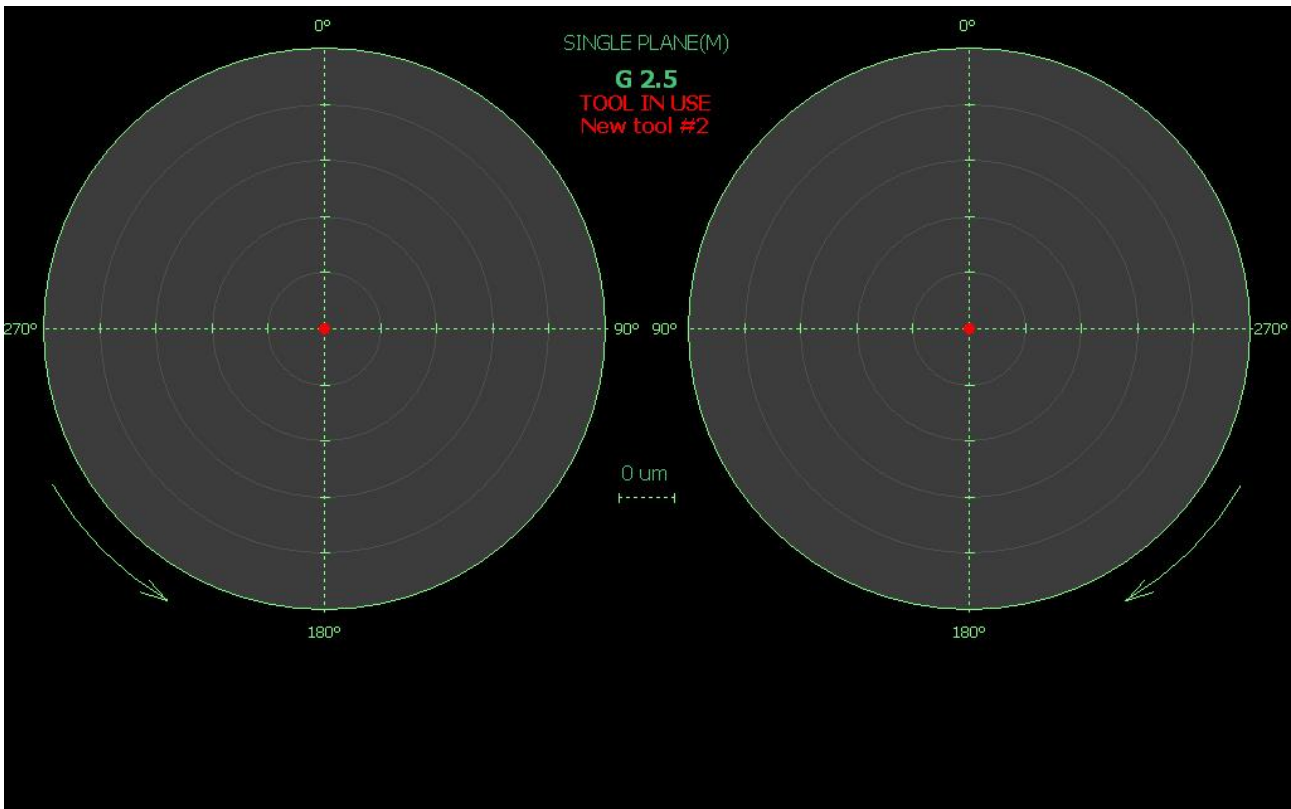
Balancing procedure with tool compensation

Fix properly the rotating part on the balancing tool.

Mount the assembly in the balancing machine. Use the tool reflective tape for the phase reference.

Properly set-up the rotor

In the **Initial Run** menu, press the **Tool Selection** button. In the middle of the screen, a small window will appear. Select the name of the tool.



Now, do the balancing as usual, using the same balancing speed.

The tool residual unbalance will be automatically compensated. Only the rotating part will be balanced.

Note! Same balance tool can be used for a series of rotating parts. Periodically rebalance each balancing tool, but don't change the balancing speed.

Determining permissible residual unbalance

International Standard ISO 1940/1 is a widely-accepted reference for selecting rigid rotor balance quality and for determining permissible residual unbalance.

Permissible residual unbalance is a function of G number (Balance Quality Grade), rotor weight, and maximum service speed of rotation.

U_{adm} can be calculated using the formula:

$$U_{adm} = 9545 \times G \times W/N \text{ [g x mm]}$$

G = Balance quality grade

W = Rotor weight (kg)

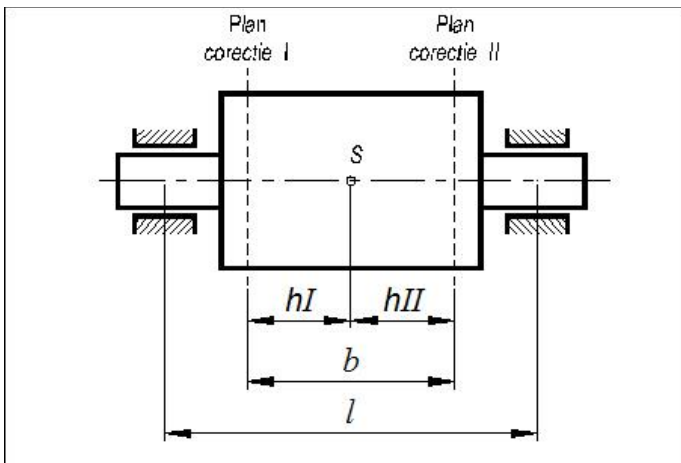
N = Maximum service speed (RPM)

U_{adm} is the total permissible residual unbalance and must be allocated to the balancing correction planes used, based on rotor dimensions and configuration.

For rotors balanced in a single correction plane, all of the U_{adm} applies to that correction plane.

For rotors balanced in two correction planes, U_{adm} must be allocated to each correction plane based on rotor configuration and dimensions.

SYMMETRICAL ROTORS



Rules for symmetrical rotors:

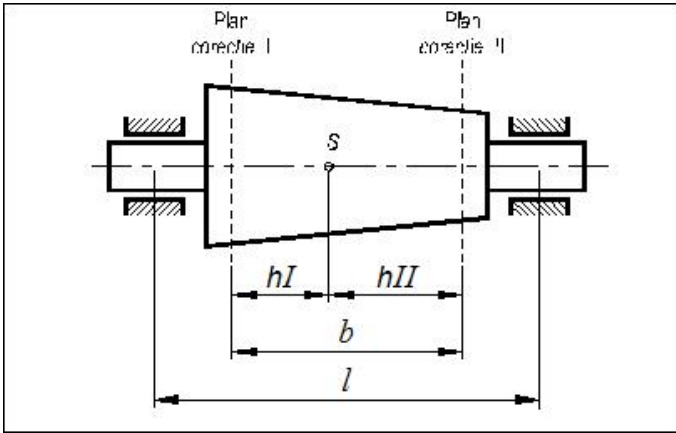
Correction planes are between bearings

Distance "b" is higher than 1/3 "l"

Correction planes are equidistant from the center of gravity

$$U_{adm \text{ LEFT}} = U_{adm \text{ RIGHT}} = U_{adm} / 2$$

ASYMMETRICAL ROTORS



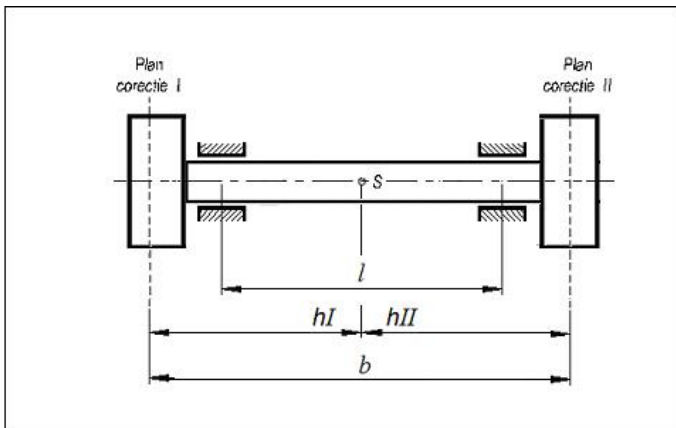
When correction planes are not equidistant from the center of gravity, then:

$$U_{adm} \text{ LEFT} = U_{adm} \frac{hII}{b}$$

$$U_{adm} \text{ RIGHT} = U_{adm} \frac{hI}{b}$$

The $U_{adm} \text{ LEFT}$ or $U_{adm} \text{ RIGHT}$ should not be less than 30% or more than 70% U_{adm} . If they are, then use the rules for narrow rotors.

ROTOR WITH OUTBOARD CORRECTION PLANES



Rules for rotors with correction planes outside the bearings:

Both correction planes are outboard of the bearings

$$b > l$$

Adjust U_{adm} by ratio l/b .

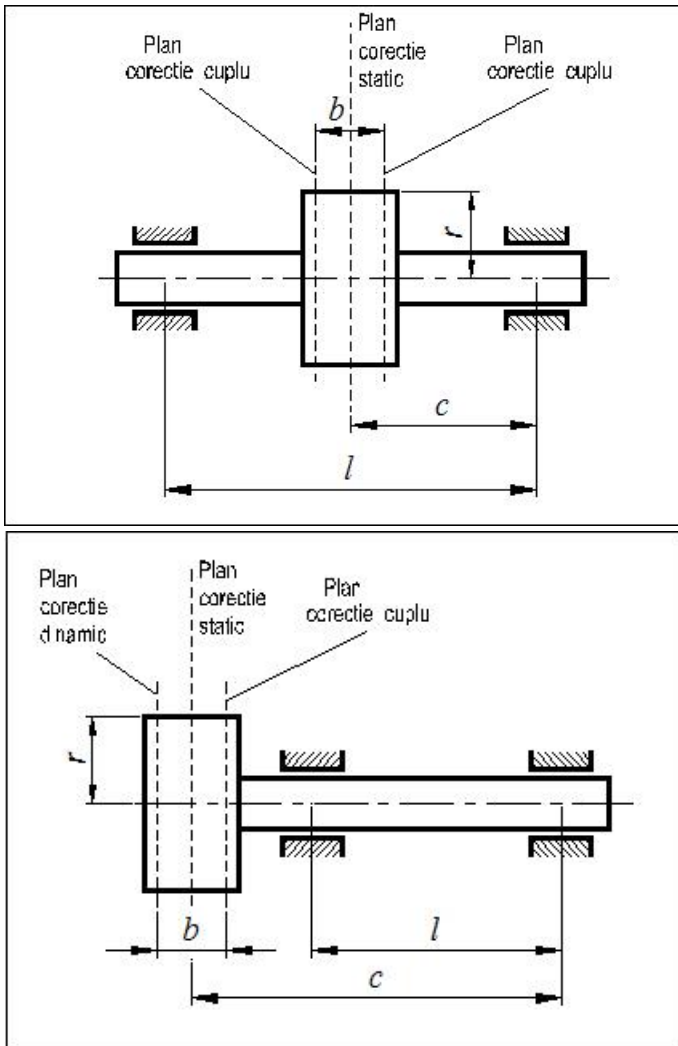
$$U_{adm} = U_{adm} \times (l/b)$$

When correction planes are not equidistant from the center of gravity, calculate $U_{adm} \text{ LEFT}$ and $U_{adm} \text{ RIGHT}$ as follows:

$$U_{adm} \text{ LEFT} = U_{adm} \times (hII/b)$$

$$U_{adm} \text{ RIGHT} = U_{adm} \times (hI/b)$$

OVERHUNG AND NARROW ROTORS



Rules for overhung and narrow rotors:

Distance between correction planes is less than 1/3 the distance between bearings ($b < 0.33 l$)

Couple corrections are made 180° apart in their respective planes.

The plane for static corrections may be a third plane or either of the planes used for couple corrections.

Permissible unbalance allocations for overhung and narrow rotors require that two plane unbalance corrections be divided into static and couple unbalance equivalent. Allocate U_{adm} as static and couple residual unbalance as follows:

$$U_{static} = U_{adm} \cdot 2 \times l / (2 \times c)$$

$$U_{couple} = U_{adm} \cdot 2 \times (3 \times l) / (4 \times b)^1$$

1. ISO 1940/1, "Balance Quality Requirements of Rigid Rotors.", International Organization for Standardization

2. ISO 1925, "Balancing Vocabulary", International Organization for Standardization

Translating the software

The software can be translated in any language. The software words are stored in a text files named Message.txt. When the software application is installed, under X Balancer directory is created a series of sub-directories as follows:

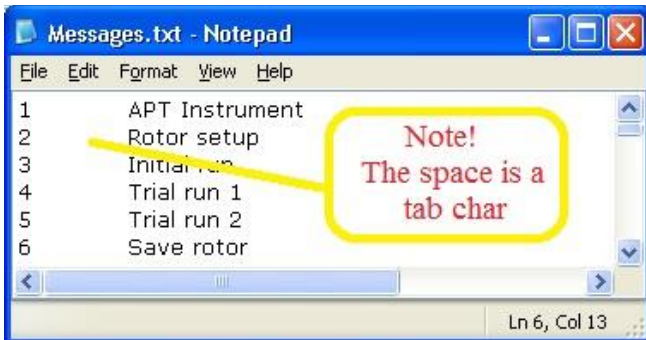
- Lang_Deutsch
- Lang_Ellinika
- Lang_English
- Lang_Espanol
- Lang_Magyar
- Lang_Romanian
- Lang_Suomi
- Lang_Svenska

Each of them contains a Message.txt file.

First action to take is to copy the Lang English folder and rename the folder with your language name:

- Lang_Deutsch
- Lang_Ellinika
- Lang_English
- Lang_Espanol
- Lang_Magyar
- Lang_Romanian
- Lang_Russian ← Your new folder
- Lang_Suomi
- Lang_Svenska

Edit first the Message.txt file, using the Notepad editor:



Between index number and text, a TAB must be inserted!

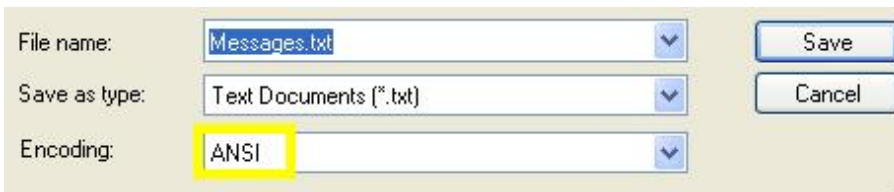
To be able to translate the message in your local language, the Windows system needs to be configured to accept that language.

The *message.txt* file is a text file. If your computer is not correctly configured to accept your language fonts, when you try to save the translation, the following warning message will appear:



If this happens, press **Cancel** and do not save the file in Unicode format, but change first the computer language support (see below).

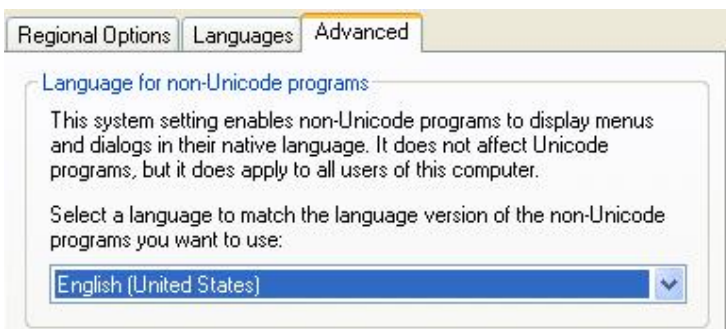
The file must be saved always as ANSI encoded text:



To set the Windows system properly, from the *Windows -> Start -> Settings -> Control Panel* select:



Make sure that in Advanced tab, your language is selected.

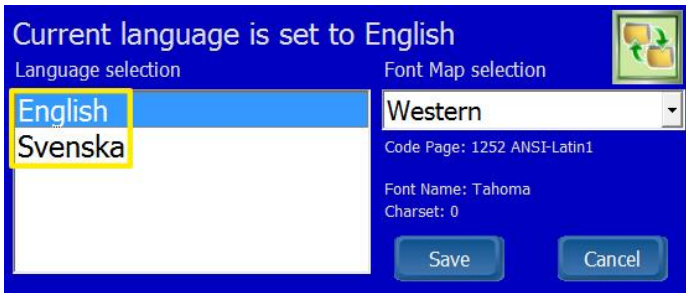


If you change this setting, the computer must be restarted!

Start the Software and select Program Setup menu:

Click on Set language button:





Your language will appear in the list. Just select the proper language and press **Save** button. Also the code page must be according with the language selection (e.g. for *Czech* language, select *Eastern Europe* code page)

Finally, restart the *software* and the change will take place.

MANUAL ENCODER Z FACTOR DETERMINATION

The X Balancer *software* calculates the encoder Z factor (transmission ratio between motor pulley diameter and rotor diameter) automatically. Sometime, because of the belt loose or due to some external electrical influence, the Z factor is calculated erroneous.

In such conditions, the Z factor can be manually determined.



The Z factor is always displayed in the Display area, when the actual RPM is lower than 60 RPM, as follows:

1. Press **F11** key (or if you have touch screen, click on **Set** area. The following window will appear:



2. Now, firmly turn the rotor several times. Each time when the reflective tape is in the photocell direction, the actual transmission factor will appear in the right side of the window. The factor must be almost the same on each turn. When the number displayed is OK, press again **F11**. From now on, this factor will be used to calculate the angle.

Note! After a manual calculation of the Z factor, this will remain unchanged (automatically determination will not overwrite the existing factor).

Note! This is an add-on feature that is not included in the default version of X Balancer.