User Manual

Balancing

Ver.: 2.0

Balancing

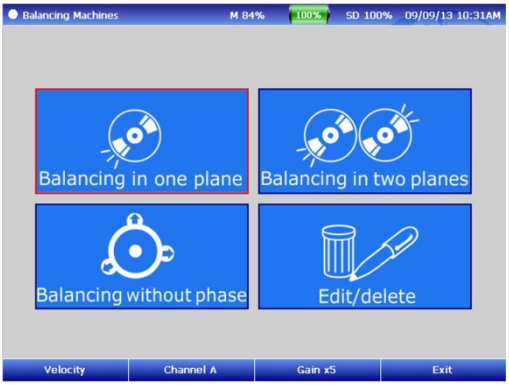
Balancing in one plane

Introduction:

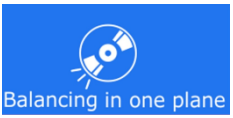
This procedure determines the value and angular position of the counterweight that balances the force that can produce rotating unbalancing.

The firmware is in option 4 of the DSP Logger Expert. It is selected using the navigation keys, or directly via key 4.

By entering this firmware, the different program options for balancing machines will appear on the display.



Select the icon in Balancing in one plane, using the navigation keys.



To balance in a plane carry out two measurements of amplitude and component phase, 1xRPM is produced by the unbalance.

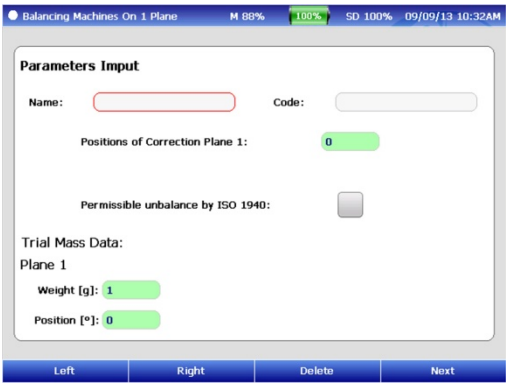
One of these measurements will be made in the original unbalanced condition, and the other will be made with the addition of an arbitrary test weight.

The system will give a correction factor by which to modify the test weight chosen, as well as a reset of the same angle to complete the balancing.

Procedure:

To perform this procedure, you must have two sensors: an accelerometer sensor connected to the input provided for this purpose (Channel A) and an optical sensor connected to input “Pick Up” and whose orientation coincides with the rotation step of a reflector mounted on the rotor shaft to support balance.

Once you have selected the type of balancing to be performed (one plane in this case), you will be shown a balancing configuration window where you have a number of editable fields:

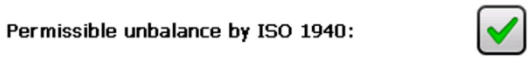


Name: the equipment to balance, which will appear later in the balancing report, which may also include some reference to the plant or the company.

IMPORTANT: These two fields are obligatory, since they are necessary to correctly input the information to the database of the DSP Logger Expert.

Correction Positions: complete this field when installing the test weight. It is limited to a definite number of blades or vanes, and the module will indicate how to distribute the weight between two consecutive positions.

Permissible unbalancing according to ISO 1940: balancing module to calculate the permissible residual unbalance according to the guidelines of ISO 1940. If you want to work under these conditions it is sufficient to confirm by selecting ENTER on the corresponding box.



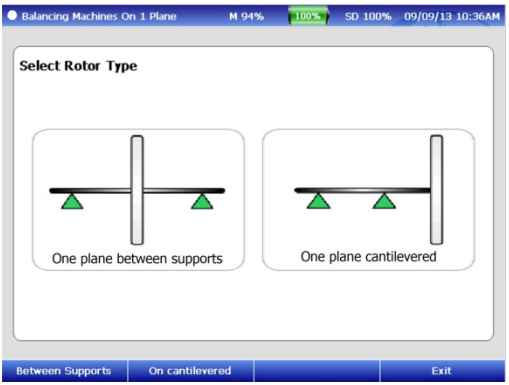
Test weight data:

Weight: you should add, in grams, the amount of test weight to be placed on the rotor; in this way the result will be directly expressed in grams. If you do not know or prefer not to enter the weight, the system will take a test weight value of 1, and the result will be a correction factor by which you must multiply the actual value of the test weight.

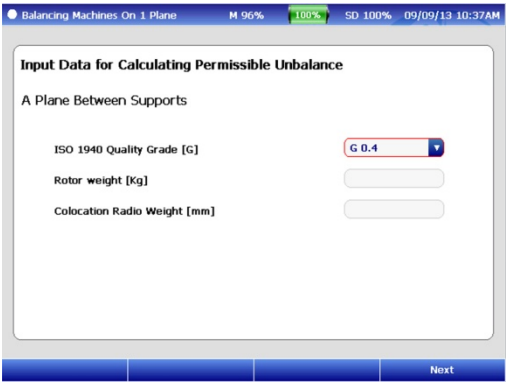
Position: complete this field when installing the test weight. It is limited to a definite number of blades or vanes, and the module will indicate how to distribute the weight between the two consecutive positions.
Is very important to note that the reference position of 0° is provided by the reflective tape. When the tape activates the LED indicator of the optical sensor, the shifting with respect to 0° is always positive and coincides with the rotational direction of the rotor.

Once configuration is complete, select NEXT by pressing function key F4.

When you exit the setup screen, if balancing under ISO was determined, selection appears to balance rotor type.

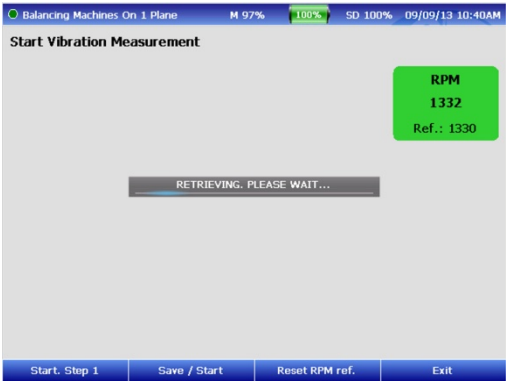


After choosing the type of rotor, a series of data (balance quality grade, weight of the rotor, counterweight radio, etc.) will appear on another screen. It must be supplemented to make the system work according to the rule; if you know any of this data cannot be balanced according to standard you should select "NO" in the field for "ISO 1940" configuration.



Once you have entered the parameters, you can begin the process of balancing in one plane by selecting F4 and NEXT.

Immediately after the equipment starts the data acquisition will go step by step, until the final correction of swing is achieved.



The first measurement acquired is the reference of the RPM. A box will show a live reading of the RPM and the reference that the system takes to follow the next steps.

This box changes color depending on the deviation or variation of RPM that the system may be suffering at the time of reading.

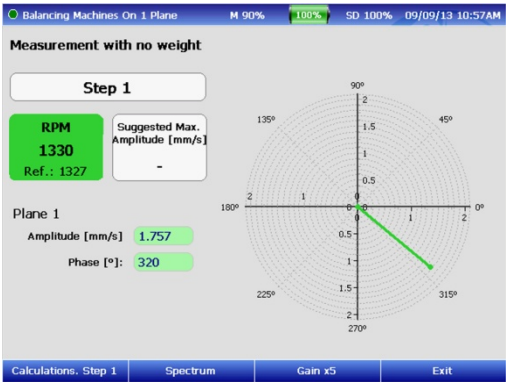
The tolerance value of the variation of RPM, by default, is 5% of the measured reference in the first instance. Any variation greater than this value will be reflected with yellow or red, depending on the level of deviation.

Presenting this variation is obligatory. Take the RPM again for the normalization, since the variation of the RPM during the balancing process will distort the results of vectorial calculation.

Do these by pressing function key F3.

Weightless Measurement: the measurement corresponds to the amplitude and phase of the vibration component 1xRPM of the machine in the original unbalancing condition.

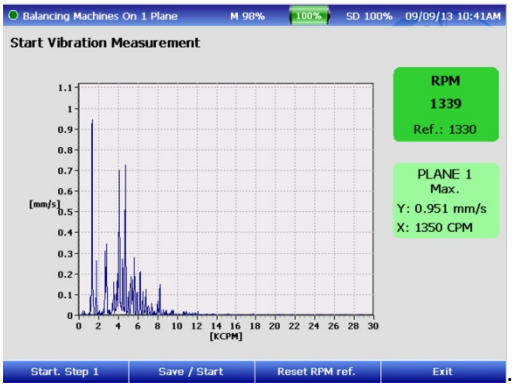
The display shows the RPM measures, the stored reference value, and the suggested maximum amplitude for unbalancing if ISO 1940 is not taken into account.
The amplitude values in mm / s and phase in degrees are continuously displayed to continue the measurement calculations.
Amplitude and the phase of the balancing process will be shown in a polar graphic.



When the operator considers the values stable and repetitive, you can start the balancing record calculations from step 1.
To do this, press the function key F1.

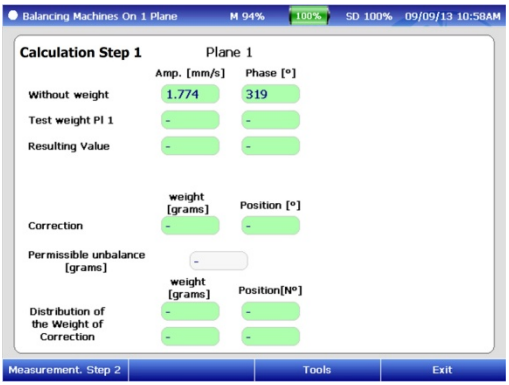
The measurement can also be seen at this stage of balancing by calling the spectrum using function key F2.

The component of unbalance and their frequency and amplitude can be seen in the spectrum.



The process, which is divided into different steps, is started by selecting function key F1.

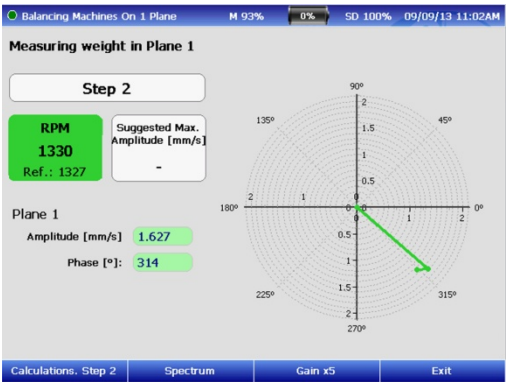
By starting with step 1 in the calculations, the data acquired in the beginning of the measurement will be recorded on the calculations screen, which will be completed to measure the progress of the balancing process.



After recording the first measurement data, place the weight of test:

Stop the rotor and add a test weight, taking care that both the weight and the test weight are in the position that was loaded into the configuration. Start the rotor again at the same velocity.

Press function key F1to go to the measurement screen in step 2.

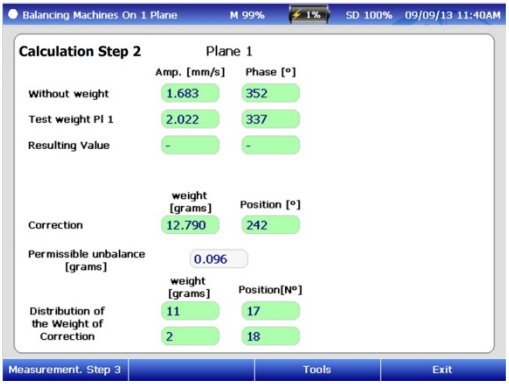


The amplitude values are in mm/s and phase in degrees, and they will continue the measurement in the calculations.

The amplitude and phase across the balancing process will appear in a polar graphic, including the measurement 1.

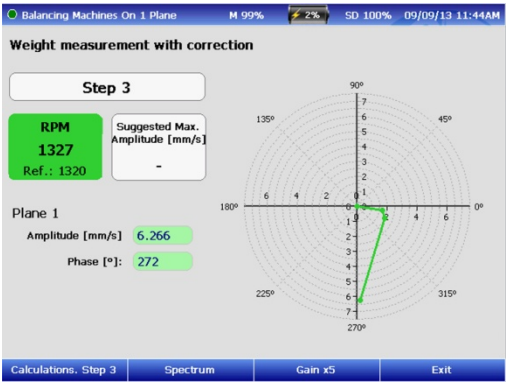
When the operator considers the values stable and repetitive, start the balancing record calculations from step 2.
To do this, press function key F1.

The data acquired in the beginning of the measurement will be recorded on the calculations screen, which will be completed as the balancing process advances.



The display shows the first correction to be made, with the option of the distribution of the correction weight.

You may need to perform more than one correction to achieve a proper balance by repeating the measurements as in the previous steps. In this case, the measurement is activated in step 3, with the function key F1.



The amplitude values will appear in mm/s and phase in degrees.

The amplitude and phase according to the rolling process, including measurement 3, will appear in a polar graphic.

When the operator considers the values stable and repetitive, the balancing record can be calculated by pressing function key F1.

The screen displays the new correction calculation in step 3, in grams and position in degrees.
The new indication for correction will show how mass was added to test weight and where you should place it on the original reference.

This step 3 measurement and calculation may be repeated as many times as necessary. It should be noted that multiple repetitions do not always guarantee value improvement achieved in previous steps, since it is possible that the values of the machine vibration are generated by other mechanical problems in addition to the unbalance. Therefore, measurements of phase behave in an unstable form, which will cause vector calculation errors.

Total correction:
After completing the balancing, you must press function key F2.

A screen will display with full correction data in a single weight.

The purpose of this information is to replace all the correction weights by one to create a neater balancing.

Balancing in two planes

Introduction:

The majority of the rotors are not discs, but distributed mass along an axis.
In these cases, in addition to appearing unbalanced, force can be broken, tending to rotate the axis around the center mass of the rotor.
The combined effect of this brake with the unbalancing force, called dynamic unbalancing, tends to tilt the axis of inertia with respect to the axis of rotation.

To balance this type of rotors, correction means putting counterweights in two planes so that the mass distribution tends to align the axis of inertia with the axis of rotation.

The procedure consists of making six measurements of amplitude and phase of the component 1xRPM at two points along the axis, corresponding to the original conditions of unbalancing, and adding the obtained weights in the two correction planes.
Once these measurements are made, the system automatically displays the correction factors of the chosen test counterweights for counterweight requirements.

To carry out this procedure it is necessary to have three sensors, including two sensor accelerometers connected to the two inputs provided for this purpose. You should pay special attention that the Channel A input is ready for measurements in plane 1 and that the Channel B input is ready for measurements in plane 2. An optical sensor must be connected to the input “Pick Up” whose direction coincides with the step of rotation of the reflective tape mounted on the rotor shaft to balance support.

Select “Balancing in two planes” with the navigation keys.

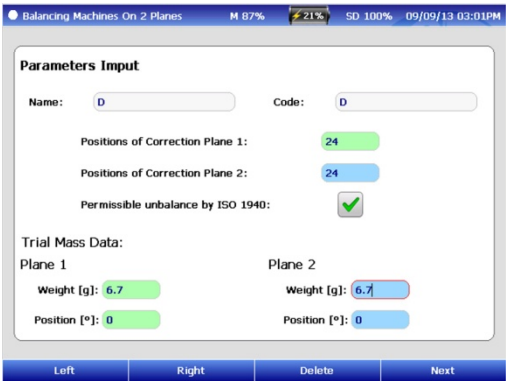
To perform balancing in two planes, carry out two measurements of amplitude and phase of the component1xRPM produced by the unbalancing.

One of these measurements will be made in the original condition of unbalancing and the other with the addition of an arbitrary test weight in both planes.

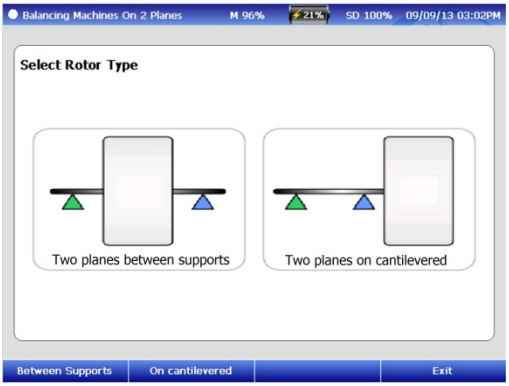
Later the system will give a correction factor by which to modify the chosen test weight as well as a reset of the same angle to complete the balancing.

Procedure:

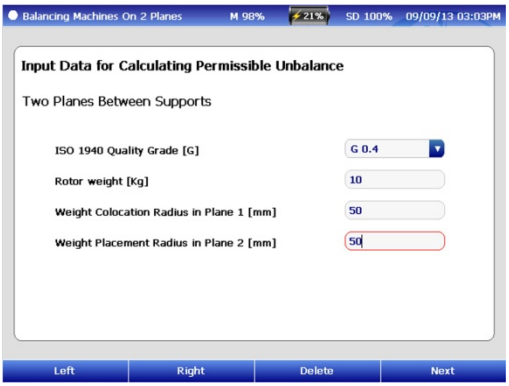
Sign in option, two main menu plans balancing module and configure settings in the same way as in option: a Plane, except that it will be necessary to complete the test weight data also for plane 2.



If you choose to balance under ISO there are the same considerations as in the 1-plane balancing; that is, the system will prompt you to select the type of rotor balancing and input data for the chosen rotor.



The rotor parameters are logged once selected.

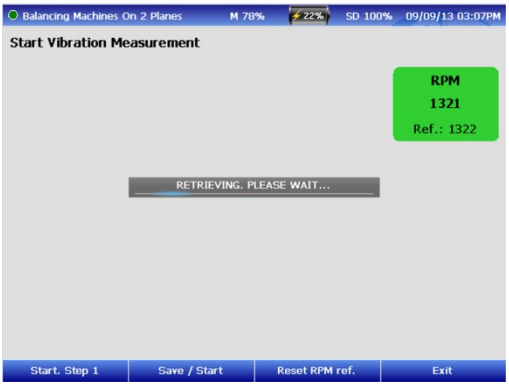


You can begin the process of balancing in one plane, with the function key F1 and START.

The machine will start the data acquisition. Begin the process step by step until the end of the balancing correction.

The first measurement acquired is the reference of the RPM. It will show the reading of the RPM and the reference that the system takes to follow the next steps in a box.

This box changes color depending on the deviation or variation of RPM that the system may suffer at the time of the reading.

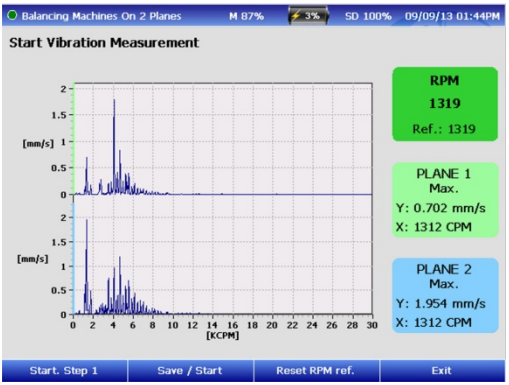


As the tolerance value of the variation of RPM, the default is 5% of the measured reference in the first instance, any variation greater than this value will be reflected with yellow or red colour, depending on the level of deviation.

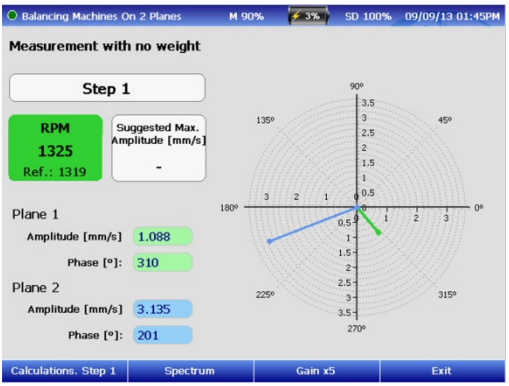
By presenting this variation is required retake the RPM, for the normalization, since the variation of the RPM during the balancing process will distort the results of vectorial calculation.

To do this, you must press the function key: F3.

After taking the reference of RPM will display the spectrum of both channels for balancing in two planes.



Activate the function key F1 to start, or press function key F2 to start and save the measured spectrum at the beginning.



Weightless Measurement: the measurement corresponds to the amplitude and phase of vibration 1xRPM component of the machine in the original conditions of unbalancing.

The display shows the RPM measured, the stored reference value, and the suggested maximum amplitude for unbalancing, if grade balancing ISO 1940 is not taken into account.

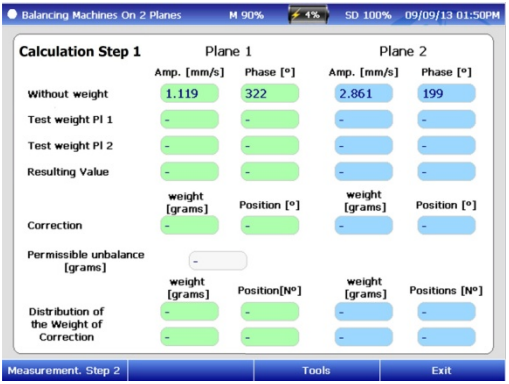
The amplitude values in mm / s and phase in degrees are continuously displayed to continue the measurement in the calculations.
The amplitude and phase of the whole balancing process will show in a polar graphic.

When the operator considers the values stable and repetitive, the balancing record calculations can be started from step 1.
To do this, press function key F1.

The measurement can also be seen at this stage of balancing by calling the spectrum via the function key F2.

The unbalanced component and its frequency and amplitude can clearly be seen in the spectrum.

The process, which is divided into different steps, is started with function key F1.

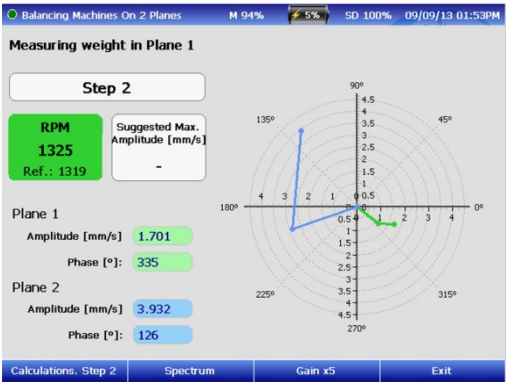


By starting with step 1 in the calculations, the data acquired in the beginning of the measurement will be recorded on the calculations screen, which will be completed to measure the progress of the balancing process.

After recording the weightless measurement of both channels, place the test weight in both planes one at a time.

Stop the rotor and add a test weight, taking caution that both the weight and the test weight position are those that were loaded into the configuration. Start the rotor again at the same velocity.
Press the function key F1 to go to the measurement screen in step 2.

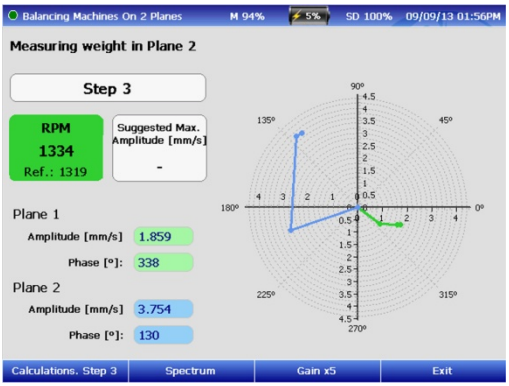
The amplitude values will be shown in mm/s and phase in degrees and will be continuously displayed.



A polar graphic will display the amplitude and phase across the balancing process.
When the operator considers the values stable and repetitive, you can start the balancing record calculations from step 2.
To do this, press the function key F1.

Once the amplitude and phase measurement of weight in plane 1 are recorded, stop the rotor, remove the test weight of plane 1, and add a test weight on the plane 2, taking caution that the test weight position is the same as the one loaded into the configuration,. Start the rotor again at the same velocity.

Press function key F1 to go to the measurement screen in step 3.



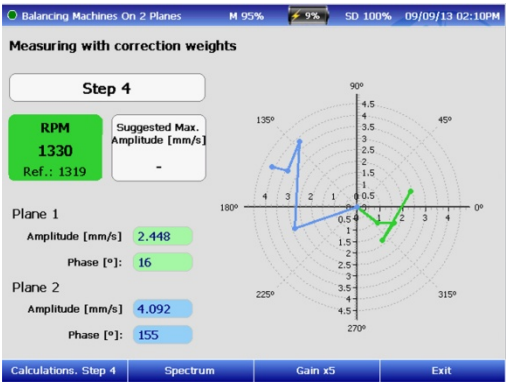
A polar graphic will display the amplitude and phase, across the rolling process, including measurement 2.
When the operator considers the values stable and repetitive, you can start the balancing record calculations from step 3.

To do this, press function key F1.

Data will be recorded for the amplitude and phase of the weight measurement in plane 2.

The display shows the first correction to be made, with the option of the correction weight distribution in both planes. Before adding the correction weights, you must remove the test weight placed on plane 2.

More than one correction may be necessary to achieve a proper balance. You can repeat the measurements in the previous steps, in this case step 4 via function key F1.



The amplitude values in mm/s and phase in degrees are continuously displayed to continue the measurement in the calculations.
A polar graphic will display the amplitude and phase of the whole process of balancing, including all measurements.

When the operator considers the values stable and repetitive, you can start the balancing record calculations from step 4.
To do this, press function key F1.

The screen displays the new correction calculation in step 4 in grams and position in degrees in both planes.

The new indication for correction will show how mass was added to test weight and where it should be placed on the original reference.

Step 3 of measurement and calculation can be repeated as many times as necessary. It should be noted that multiple repetitions will not always guarantee the value improvement achieved in previous steps, since it is possible that the values of the machine vibration are generated by other mechanical problems in addition to the unbalance and consequently behave phase measurement is unstable, which will cause vector calculation errors.

This display will also show the measurement result according to ISO 1940 values.

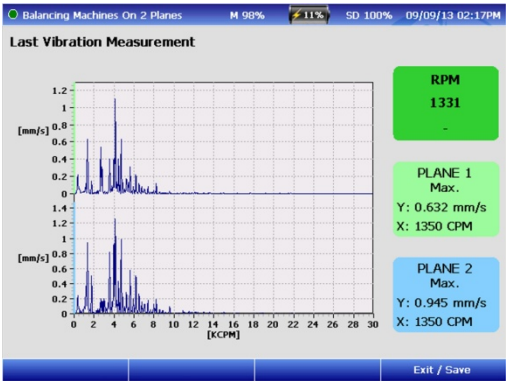
Total correction:
After completing the balancing, press the function key F2.

You will see a screen with full correction data in a single weight.

The purpose of this information is to replace all the correction weights by one to create a neater balancing.

Once the final correction to the weights in the indicated grades has been made, press function key F1.

You will be shown the end spectrum of the process.



Balancing without phase

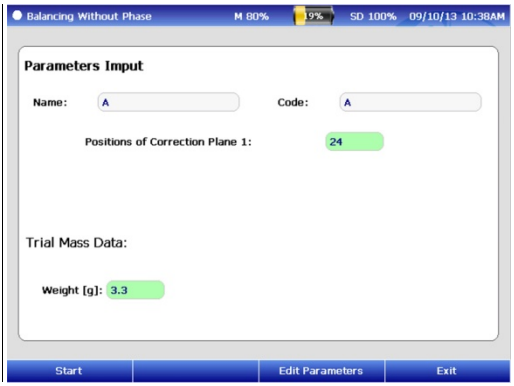
When a rotor behaves linearly, always responds the same way to the added mass, the influence coefficient method is the simplest way to solve an unbalancing. Unfortunately, the rotors do not always behave in a linear form, either by random internal deformation, by an element of the structure that is close to its resonance, or for other reasons. The rotors do not exhibit the linear behavior of the traditional rolling methods, which often prove inadequate to achieve acceptable levels of reduction of the original unbalancing.

In these cases, it will be necessary to proceed without phase balancing. You must make 4 measures, one without added weight and another 3 with a known weight at 0°, 120°, and 240° degrees.

First score three points in the rotor to define the position of 0 °, then dial to 120 ° and finally to 240 °, maintaining at all times the direction adopted.

To operate this method, select the icon rolling options.

Once selected you must enter the main parameters.



Name: to balance the equipment to appear in the report, you can also include some reference to the plant or the company.

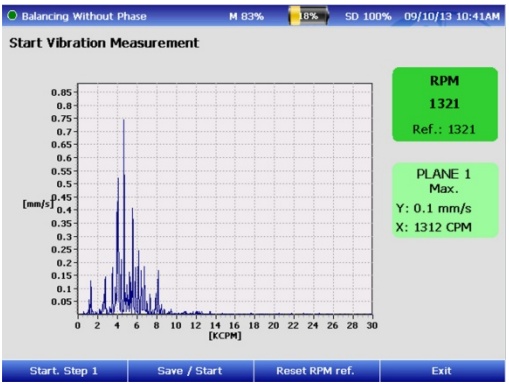
IMPORTANT: These two fields must be entered, as they are necessary for the correct input of information to the database of the DSP Logger Expert.

Number of Blades: complete this field when installing the test weight. It is limited to a defined number of blades or vanes, and the module will indicate how to distribute the weight between two consecutive positions.

Test weight data:
Weight: you should add, in grams, the amount of test weight to be placed on the rotor. The result will be directly expressed in grams.

If you do not know or prefer not to enter the weight to be placed, the system will take as test weight a value of 1, and the result is a correction factor by which you must multiply the actual value of the test weight to obtain the sought result.

When beginning the measurement process, a screen with the initial condition will appear.



Once the measurements are accepted, begin step 1 by pressing function key F1.

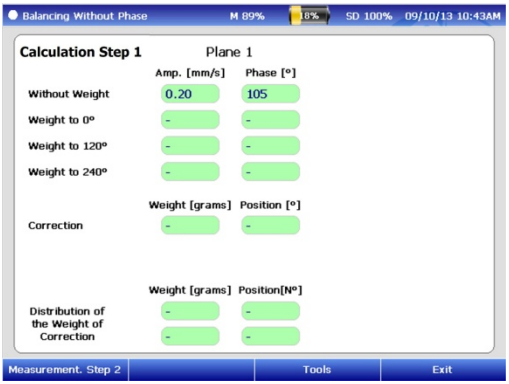
Measuring will start without weight, which is equivalent to the initial condition of the rotor.

The display will show the value suggested by the RPM range, the measured value of the RPM in the form on line, and amplitude in mm/s.

Weightless measurement:

The spectral measurement of this step can be seen with the function key F2.

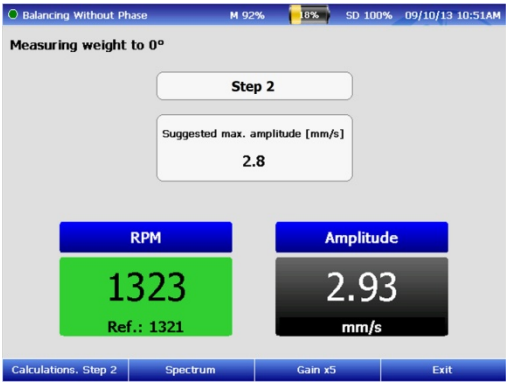
Once you are satisfied that the RPM and amplitude values are stable, press the function key F1.



The weightless measurement values will be entered by the system in the calculation screen.

Measurement with weight at 0°:

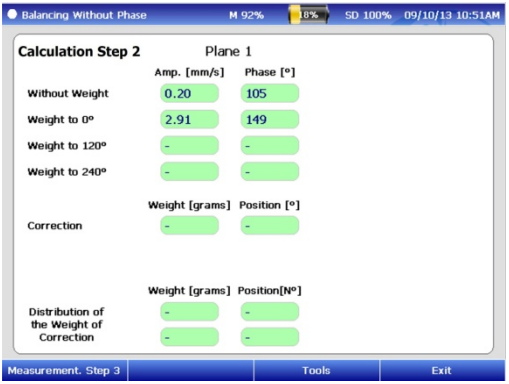
Stop the rotor and color test the weight before the parameters determined in the 0° position.



The spectral measurement of this step can be seen with the function key F2.

Once satisfied that the RPM and amplitude values are stable, press the function key F1.

The measurement values are weighted at 0° and will be entered by the system in the calculation screen.



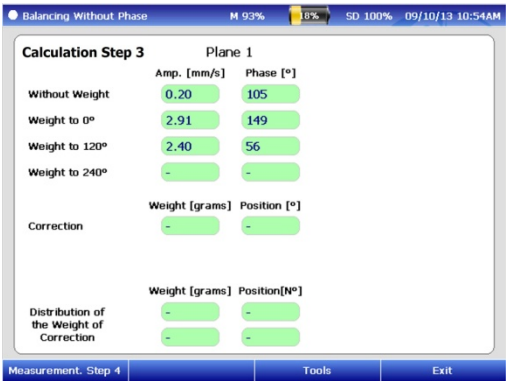
Measurement with weight at 120°:

Stop the rotor and place of the test weight at 120°.

The spectral measurement of this step can be seen via function key F2.

Once satisfied that the RPM and amplitude values are stable, press function key F1.

The measurement values are weighted by 120° and will be entered by the system in the calculation screen.



Measurement with weight at 240°:

Stop the rotor and place the weight at 240°.

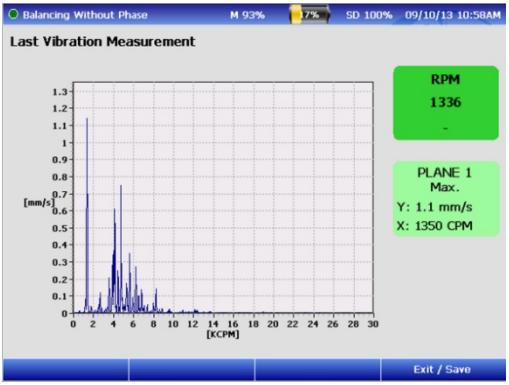
The spectral measurement of this step can be seen with function key F2.

Once satisfied that the RPM and amplitude values are stable, press function key F1.

The measurement values are weighted by 240° and will be entered by the system in the calculation screen.

By completing this last step, the screen will show the correction to be made, with the choice of the distribution of the correction weight. Press F2.

The final spectrum of the vibrations measurements will appear.

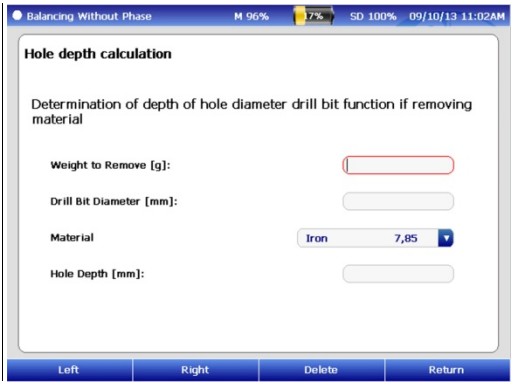


Tools:

In any calculation screen, pressing F3 will give you several options.
Tools: this option presents three alternative calculations that can be useful in certain cases.

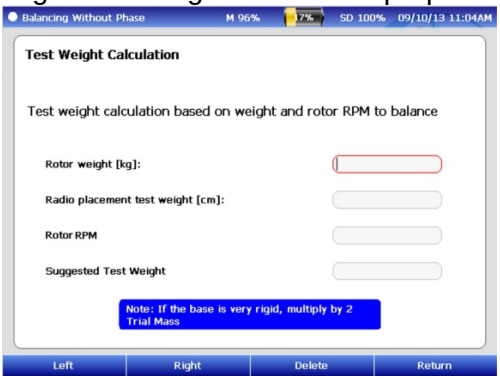
Depth of Hole:

In the event that you are not able to add weight to a rotor, you must remove a weight equivalent to a correction at 180 ° from the original position. This option lets you calculate the hole depth that is needed depending on the diameter of the wick and the material of the rotor.



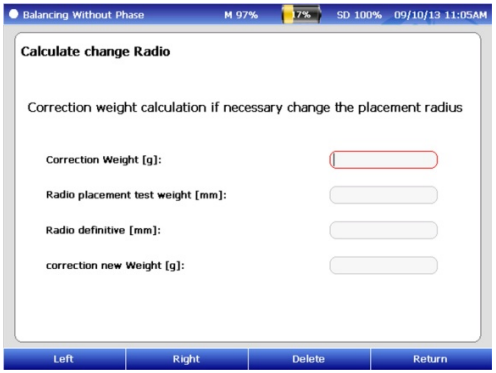
Test weight calculation:

When in doubt regarding how much weight to place to generate enough impact on the rotor, this option allows you to calculate certain parameters depending on the weight of the rotor proper test.



Change calculation Radio:

In the event that the final weight of correction cannot be placed on the same radius used during the rolling process, this form allows the correction weight to be recalculated depending on the final placement radius.



Gain Control:

At various stages of unbalancing, you can select the input gain of the signal. This change is recommended when vibration amplitudes before or after unbalancing are very high or very low.

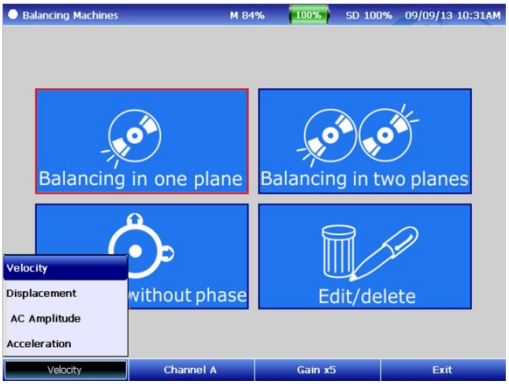
By default DSP Logger Expert X5 operates with a gain; you should to note that the incorrect gain setting will affect the stability of the amplitude And the phase.

Recommendation table:

<0,8 mm/s	x100
>25 mm/s	x1

Variables change function:

The balancing process is usually performed with variable speed, but, as an alternative to other types of measurements, this function allows use of other variable vibrations.



The variables of speed, displacement, and acceleration are the signal from Channel inputs A and Channel B in channels 1 and 2 of accelerometers.

The variable amplitude AC, is the empowerment of AC auxiliary inputs for entries: Channel A and Channel B, in channels 1 and 2 of AC.

SEMAPI provides technical information on the Internet for assistance:
www.dsplogger.com has technical manuals, a database with frequently asked questions, and application notes.
You can also find instructional videos Firmware for the DSP Logger Expert at:
https://www.youtube.com/user/semapicorp