Balancing

DEWESoft®

SOFTWARE USER MANUAL

Balancing V20-1

1. Table of contents

2. About this document

2.1. Legend

The following symbols and formats will be used throughout the document.

Important
It gives you important information about the subject.
Please read carefully!

Hint
It gives you a hint or provides additional information about a subject.

Example
Gives you an example of a specific subject.

3. Installation

3.1. Download

- DewesoftX® full installer: http://www.dewesoft.com/download
  The balancing Module is included in the full installer, you just need a license key to enable it.
- "Rotor Balancer" visual control instrument: http://www.dewesoft.com/download
  Download the latest version of the DewesoftX® plugin and then extract it to your DewesoftX® installation folder (e.g. D:\DewesoftX\Bin\Addons)

3.2. Compatibility

The plugin is compatible with Dewesoft X1, X2 and X3, DewesoftX

It has been tested on Windows 7 (32-bit and 64-bit).

3.3. Licensing

The plugin requires a valid DewesoftX® license.
An additional license for the plugin is needed, it can also be written into the DewesoftX® device.
To test the plugin you can use a 30-days-Evaluation license.

3.3.1. Requesting an Evaluation license

You can request an an Evaluation license from our homepage: http://www.dewesoft.com/registration

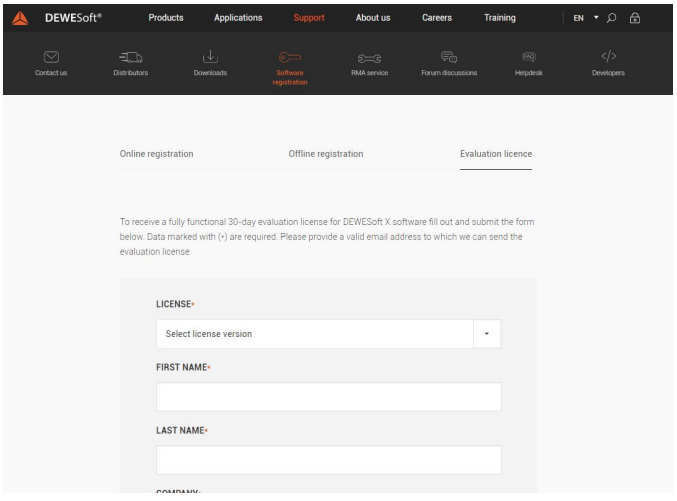


Illustration 1: Request Evaluation License

3.3.2. Activating the Evaluation license

When you have received your trial licence key, open DewesoftX®, go to Settings → Settings → Licensing.

Select “Create new license” and enter the license code. Click “ONLINE license registration”.	Then your new license key will show up in the list of Active licenses and should have the status TRIAL.

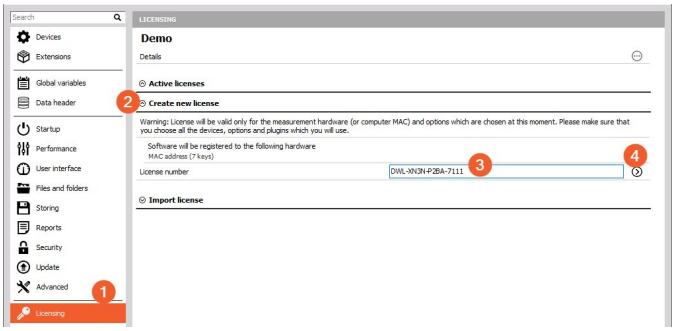
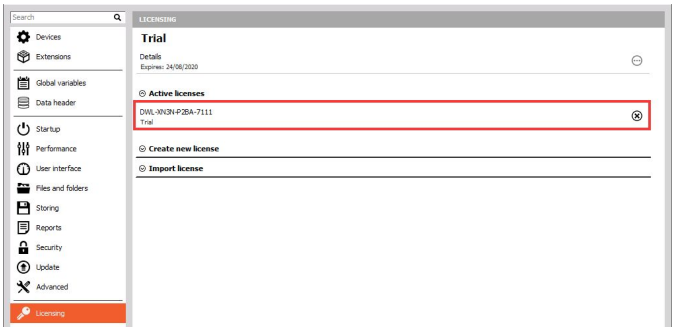

	

Illustration 2: Enter license key	*Illustration 3: Licensing*

3.4. Plug-in Installation

Please copy the latest version of the file “RotorBalancer.vc” into the Addons folder of your DewesoftX® installation. (e.g. D:\Dewesoft\Bin\Addons\), then start DewesoftX®.
The plugin can be found under Settings → Settings → Extensions -> Math applications. If the list is empty, you have to register the plugins first. This can be done according to the hint below.

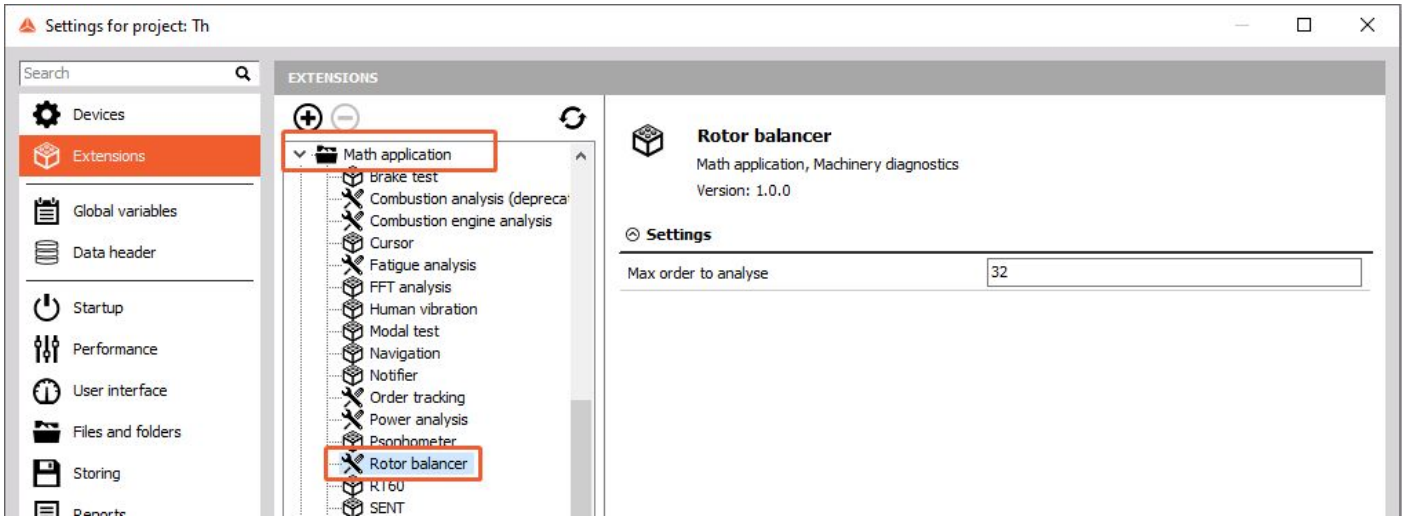


Illustration 4: Plugin in Settings

Hint

When you are using Windows® 7, then you must click the Register plugins button (the button with the two curved arrows) once and restart DewesoftX® before the plugin shows up in the list of Extensions. This usually requires admin rights.

4. Introduction

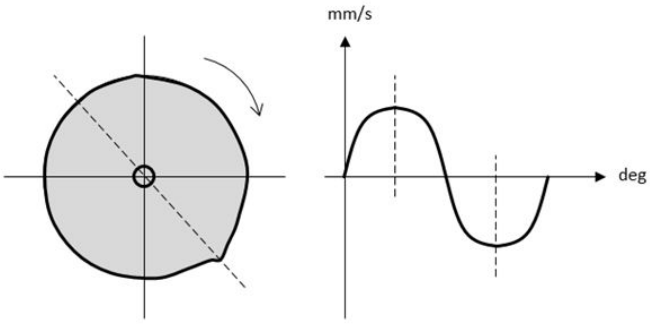
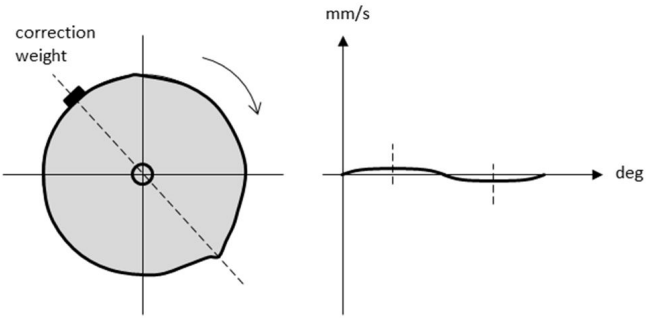
4.1. Balancing

Balanced rotors are essential for most kinds of rotating machinery. Unbalance will create high vibrations, reducing fatigue life, causing material defects. In most cases the rotor unbalance is the major problem of vibration, it is related to the first order (= rotational frequency).

We assume that we consider so-called “rigid rotors”, which is true for nearly all practical cases. That means the operating speed of the machine is below 70% of its first resonance frequency. The resonance frequency is the critical speed, where structural resonances cause heavy vibrations. At resonance the phase is turning quickly and it would be impossible to make a correct measurement.

The requirement in terms of sampling rate depends on the first order (e.g. 3000 RPM : 60 = 50 Hz → required sampling rate ≥ 3520 Hz). Furthermore, a good, precise vibration sensor signal is mandatory.

The goal of Balancing is to minimize vibrations related to the first order. Basically it works like that: We measure the initial state, then we add a trial weight of known mass, calculate the position and mass of a counterweight, remove the trial weight and put the calculated weight on the opposite side, to cancel out the imbalance.

When an unbalanced exists, the first order (rotational frequency) can be seen clearly. As shown in the example below, the rotor has an uneven distribution of mass.	A correction weight is added (or material is removed) on the opposite side, which cancels out the major part. This procedure can then be repeated until satisfaction.
 *Illustration 5: Before balancing*	 *Illustration 6: Added weight*

4.2. Single Plane, Dual Plane

Depending on the machinery, single or dual plane balancing is used. Dual plane is used, when the rotor shaft is long (balance both sides) or when also torque needs to be eliminated. The procedure will be

different, depending on which option is chosen (see next page). But basically following steps have to be taken:

- Initial run
- Trial run
- Correction run(s)

4.3. Needed equipment

- 1 (for single-plane) or 2 acceleration sensors (for dual-plane)
- 1 tacho sensor (for measuring RPM and absolute angular position, therefore the angle sensor used **MUST HAVE a zero-pulse**! e.g. rotary encoder with A,B,Z tracks / optical tacho probe with reflective sticker / inductive probe / CDM with zero / ...)

4.4. Step-by-step procedure

The procedure in DewesoftX® is guided by the visual control instrument. The flow charts below show the routines for single and dual plane balancing. Instead of adding correction weights you can also remove material on the opposite position (angle + 180°).

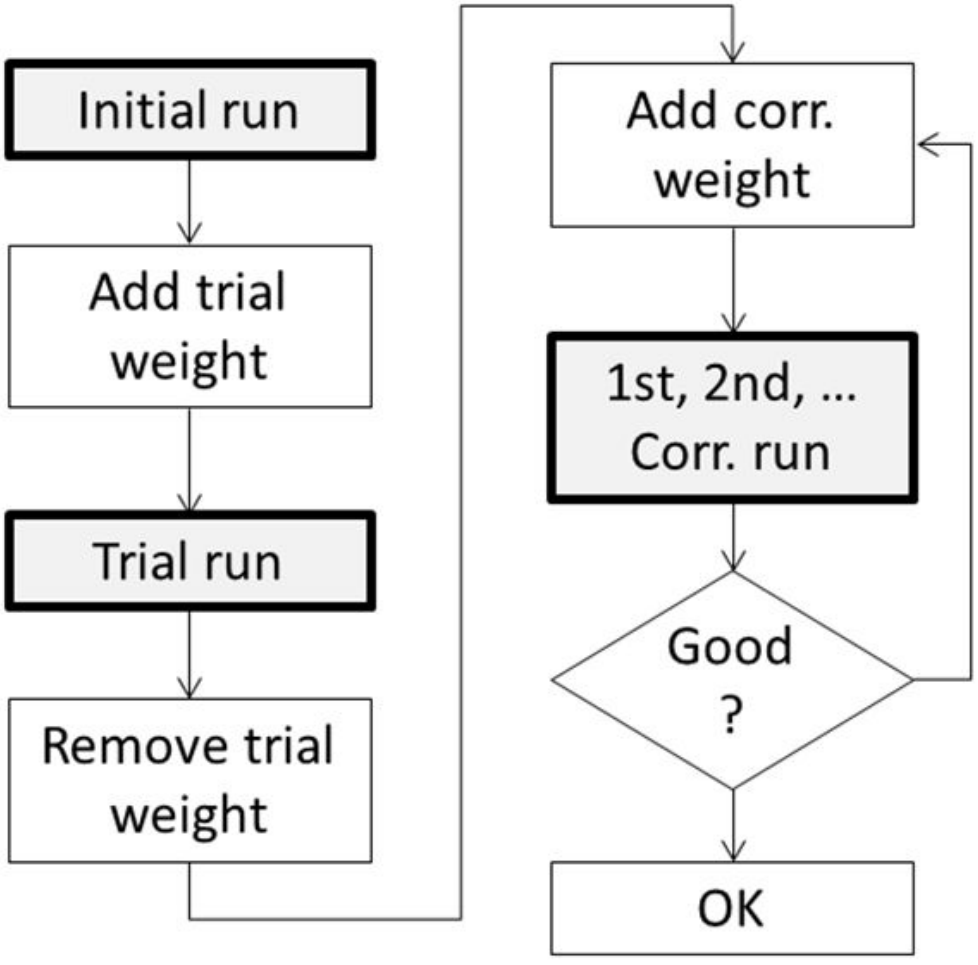


Illustration 7: SINGLE Plane balancing procedure

Dual plane: By adding the correction weights for both planes at the same time, we save one additional step.

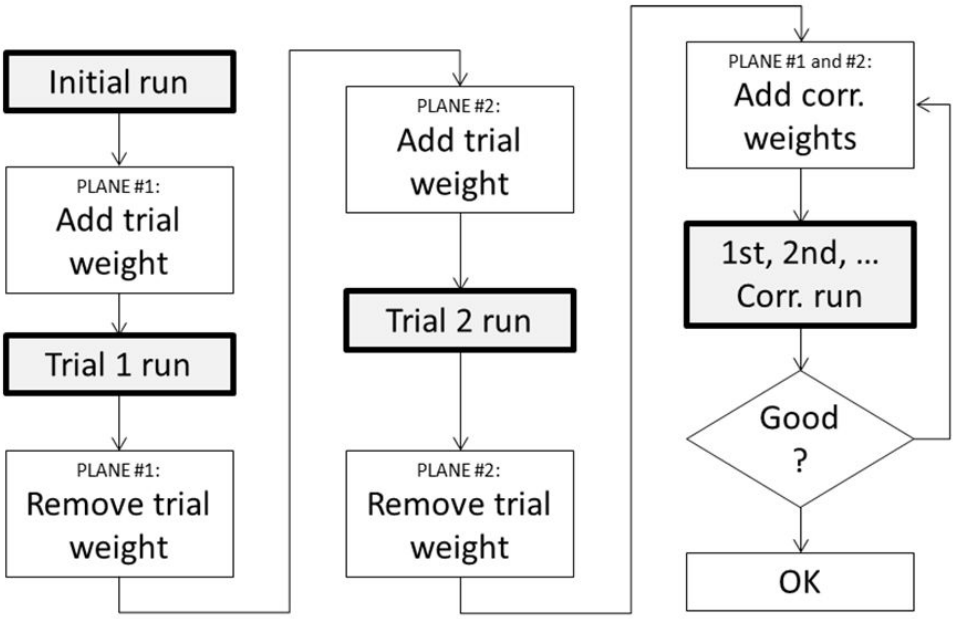


Illustration 8: DUAL Plane balancing procedure

5. Setup

5.1. Channel setup screen

The channel setup of the plugin in DewesoftX® is very simple now. The whole Order Tracking algorithm does not need to be set up separately any more, everything is done automatically in the background.

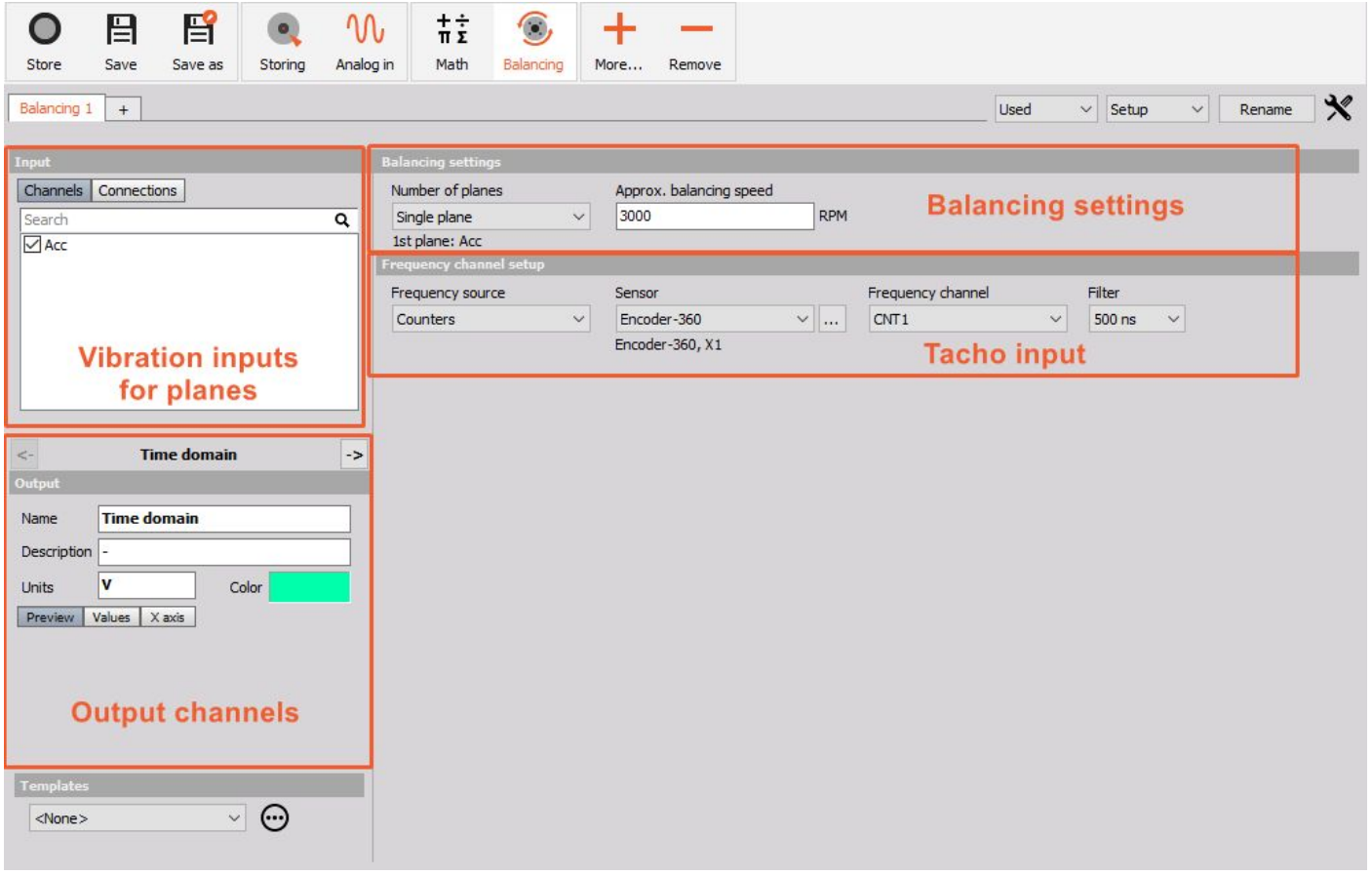


Illustration 9: Sections in Channel setup

The Plugin is split into following sections:

- Vibration inputs for planes:

Select your acceleration sensor(s) here. They should be mounted close to the shaft, e.g. on the bearing.

- Balancing settings:

Specify the method of balancing (single or dual plane) and the operating speed of the machine.

- Tacho input:

A speed sensor with a zero pulse is needed (e.g. Encoder, Tacho probe with 1 pulse/rev, CDM with zero...)

- Output channels:

Get a quick preview of the signals (time domain of the first order and speed), useful for checking if the tacho input is working correctly.

6. Measurement & Visualisation

6.1. Measurement screen

When you have setup the balancing module in channel setup, there is an automatically generated display called “Balancing” in Measure mode.

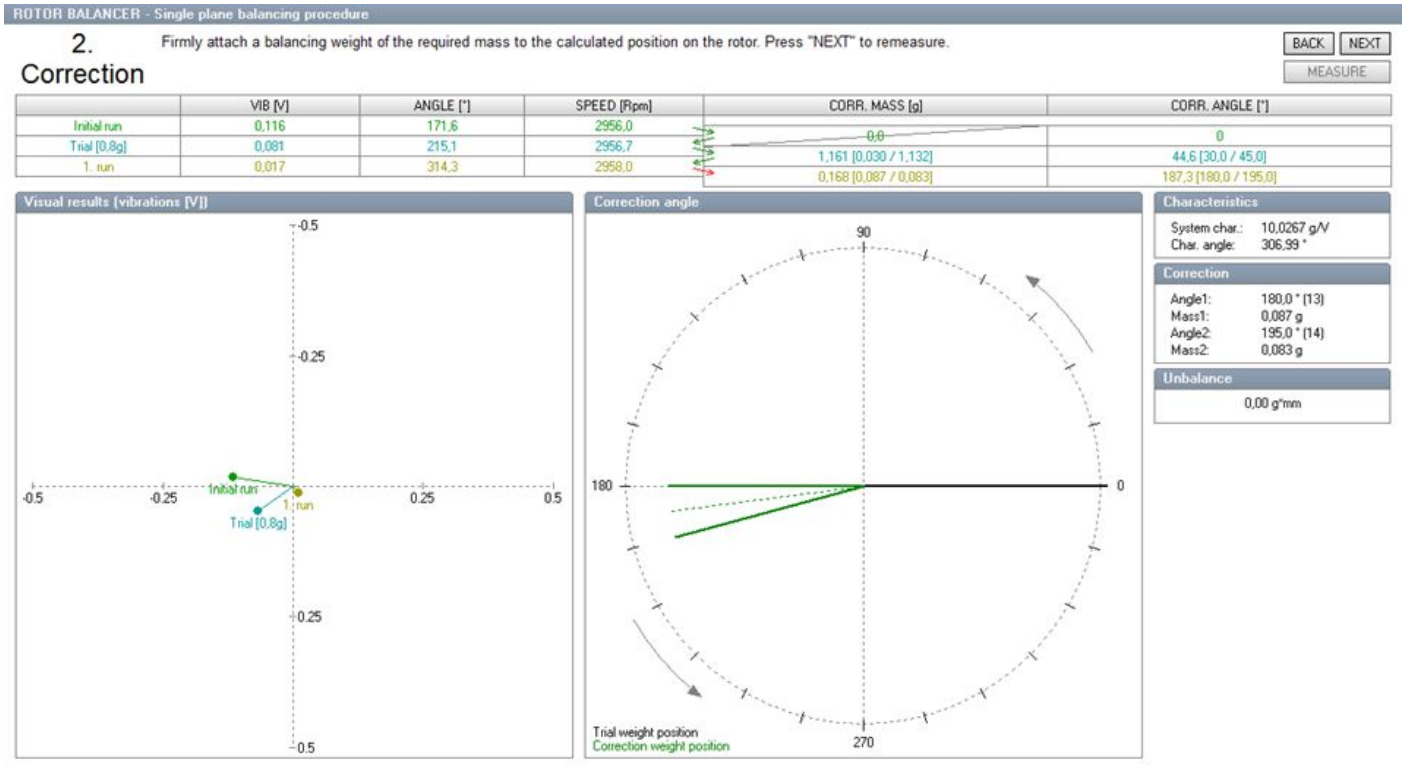


Illustration 10: Plugin sections in Channel setup

It is basically a visual control instrument (the RotorBalancer), which will guide you step-by-step through the procedure. On the top you see the current step, with explanation which action has to be taken, on the right there are the interactive buttons “Back”, “Next”, “Measure”.

The table below is empty at first and will fill with the results after each step. The polar plot on the left shows the vibration levels (amplitude and angle) of each run (the unit depends on the input, mm/s or mm/s² or g is usual).

The graph on the right helps when it comes to mounting the correction mass.

On the right column you can see system characteristics and the overall unbalance. The correction weight and angle is also displayed here.

6.2. Example dual-plane balancing

Better than all theory is of course a practical measurement, done on a machine. Here we will show a dual-plane balancing procedure on a grinding machine. The planes have been modified for demo purpose, so we can mount screws as unbalance/trial/correction weights.

A 360 pulses encoder is installed on one side, two acceleration sensors are mounted (one on left and one on right bearing; only one shown on photo) and connected to a SIRIUS measurement instrument.

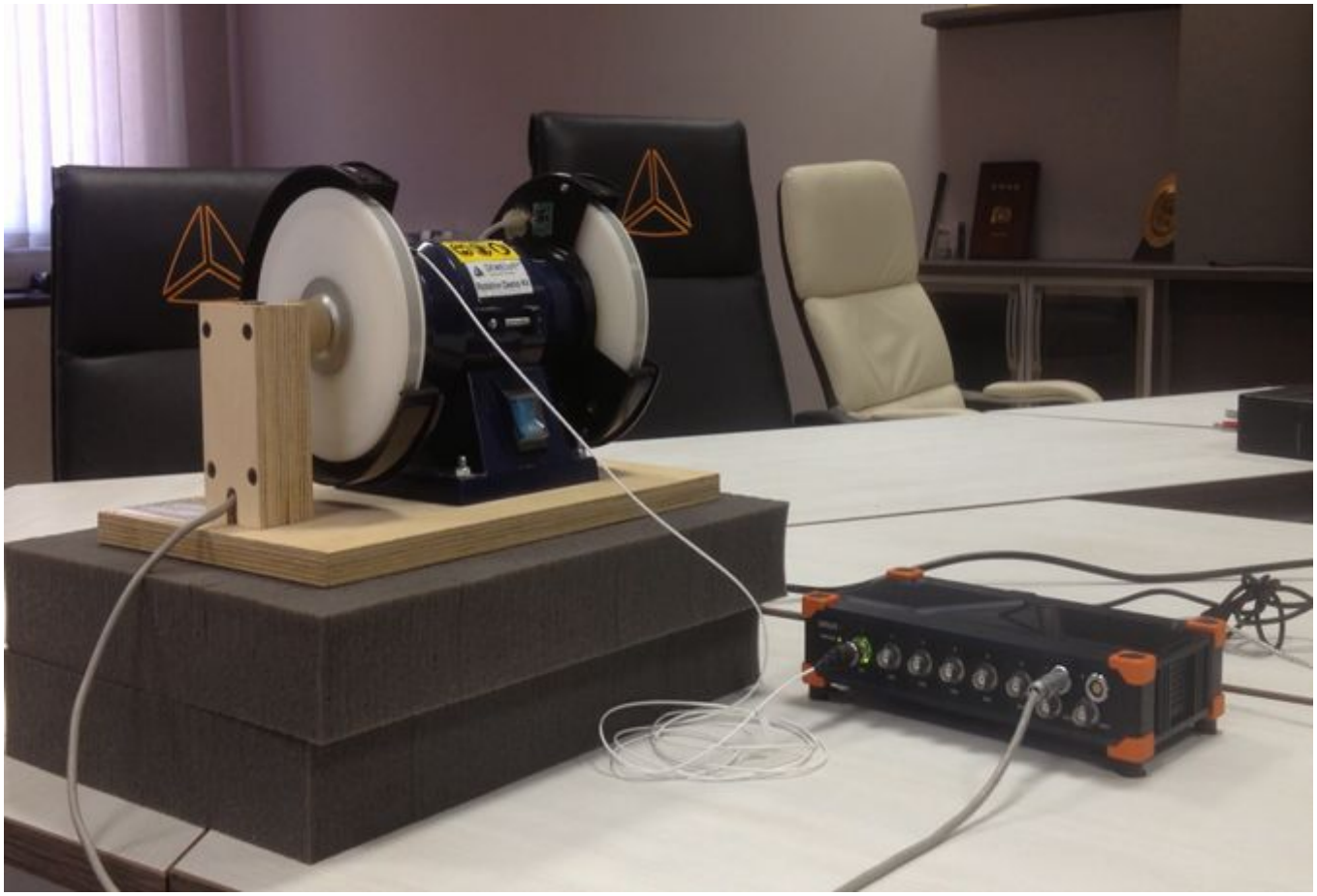


Illustration 11: Measurement on grinder

In the channel setup of the balancing plugin, we need to specify the acceleration sensors of both planes for input (plane1, plane2), as well as the “dual plane” procedure.

The machine is an asynchronous one, so it will run with approx. 3000 rpm.

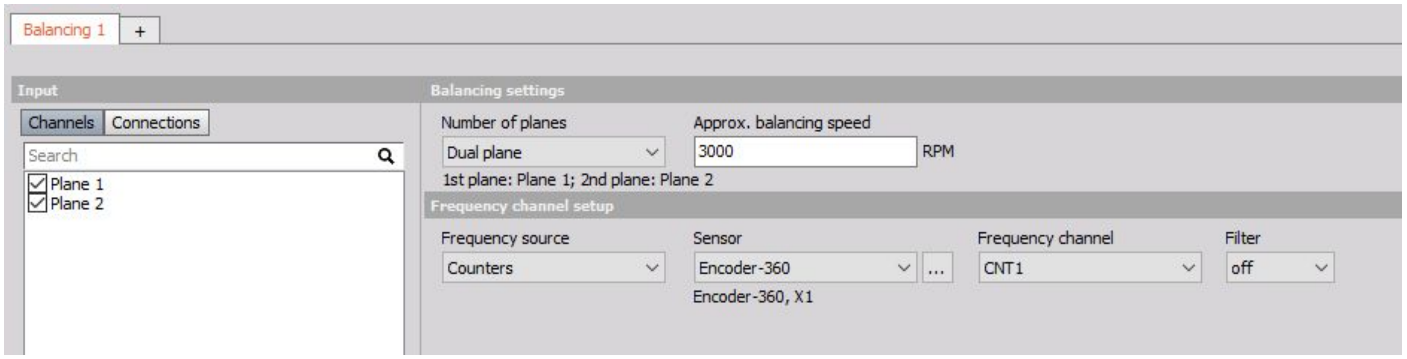


Illustration 12: Balancing channel setup

The procedure will be done according to the dual-plane picture shown in chapter Step-by-step procedure.

6.2.1. Initial run

Some weights have been mounted before at random angular positions to simulate a bigger unbalance. Besides that, we leave the machine unmodified and just start it. When we have reached operating speed, click on Measure.

The button will change to a stop button with running dots, showing that the measurement is in progress. After that, the button will change back to Measure again, meaning that you also can repeat the measurement if something was wrong.

Illustration 13: Measurement in progress

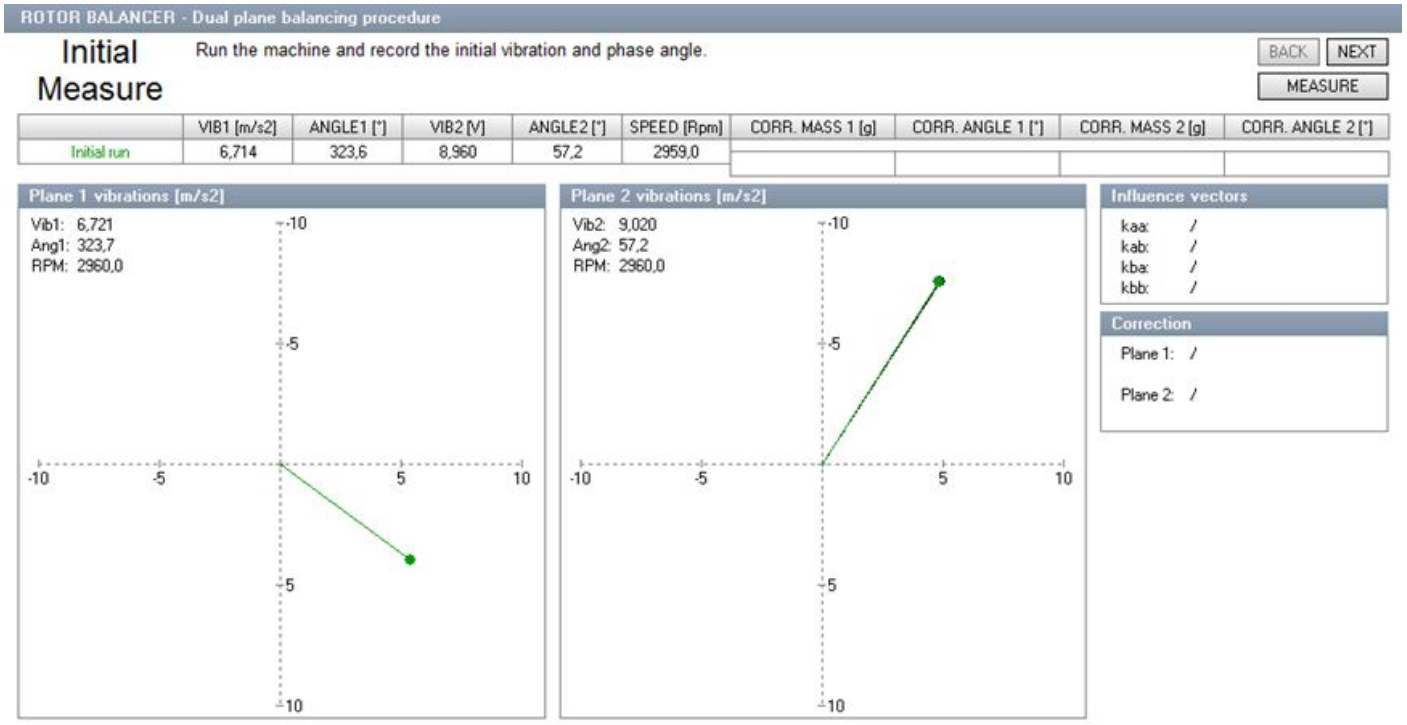


Illustration 14: Initial run

6.2.2. Trial 1

Now we have to mount trial weights sequentially, first for the Plane #1.

We apply a screw of known mass at a random position. Please remember to mark this position, as it will be the reference (= 0 deg) angle for the correction mass in future steps!

Then we enter the trial weight mass.

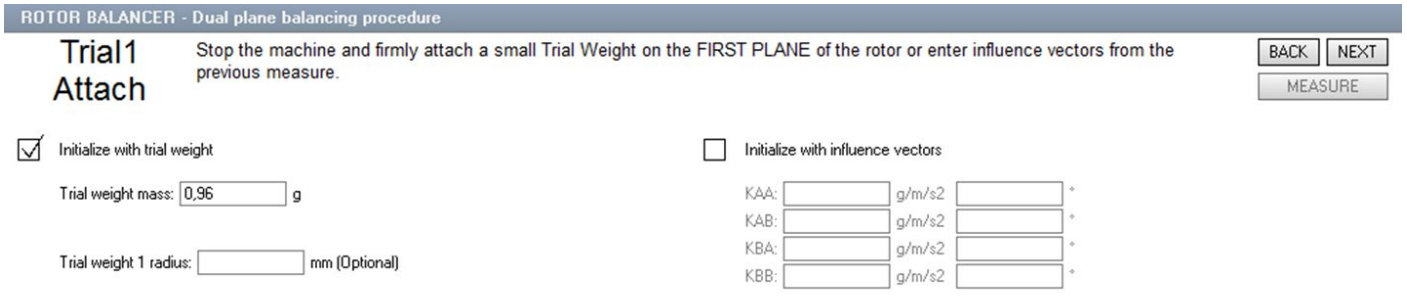


Illustration 15: Trial 1 Attach

Start the machine and perform the Trial 1 measurement.

Note the warning below in red, showing that a bigger trial weight will give a better result. So, the difference with/without trial weight is too small in our example and we need to mount a bigger trial mass.

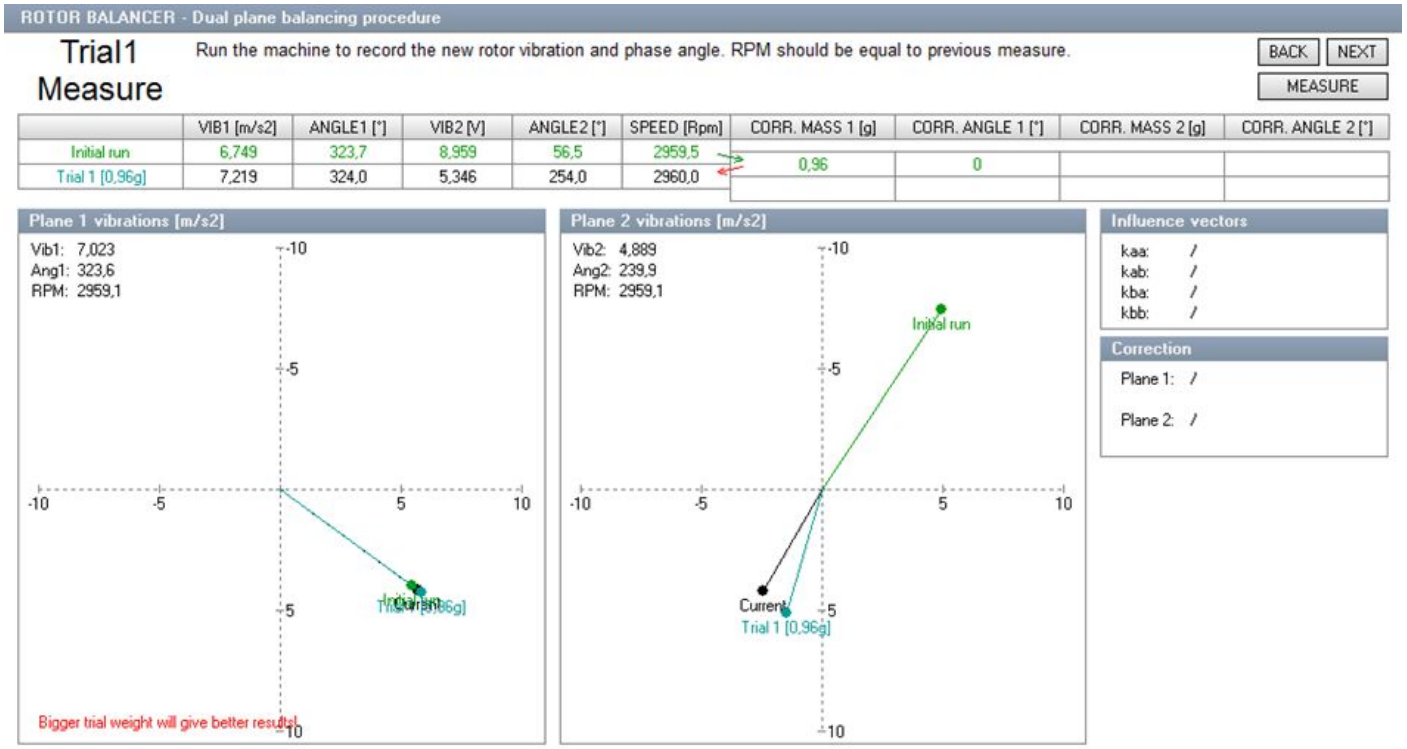


Illustration 16: Trial 1 Measure

6.2.3. Trial 2

Stop the machine, remove trial weight #1, and mount a known trial weight on plane #2. Then enter the mass in the plugin.

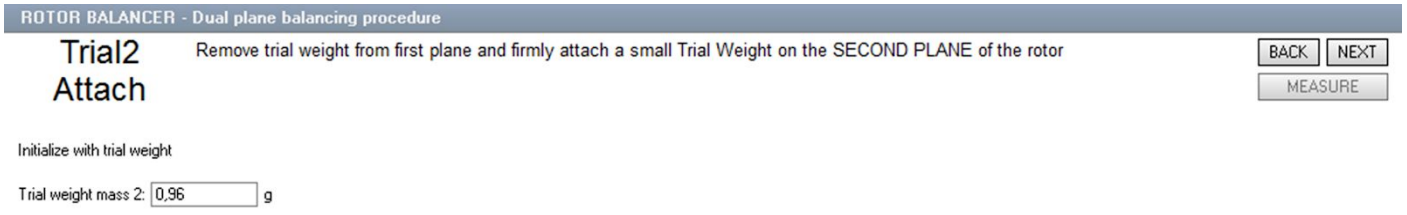


Illustration 17: Trial 2 Attach

Then run the machine again and collect the data.

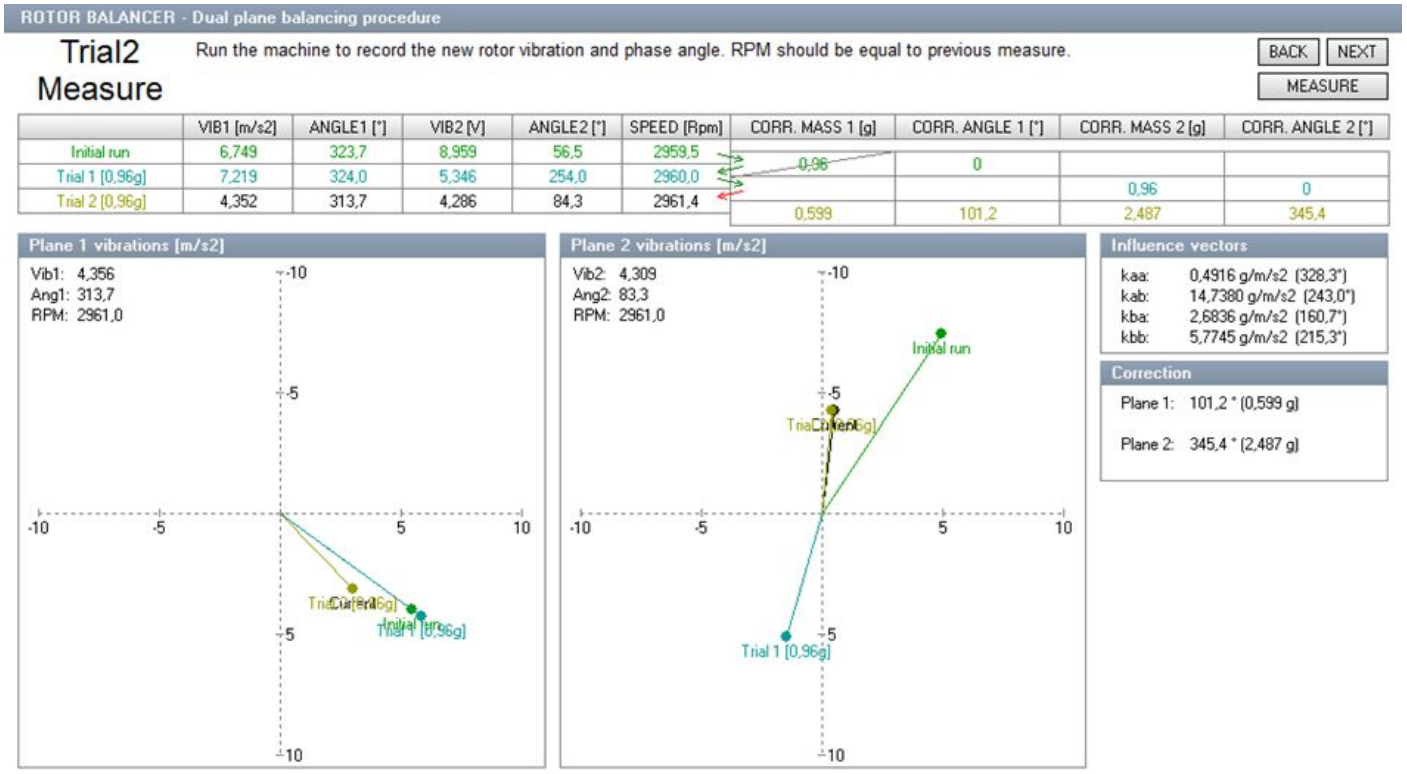


Illustration 18: Trial 2 Measure

After the measurement we can already see the calculated correction weights on the right side:

- Plane 1: 0,599 g at 101,2 °
- Plane 2: 2,487 g at 345,4 °

When you click on Next, you will see a draft of the correction weight positions. **Trial weight position is 0° and the angle is positive in direction of movement**.

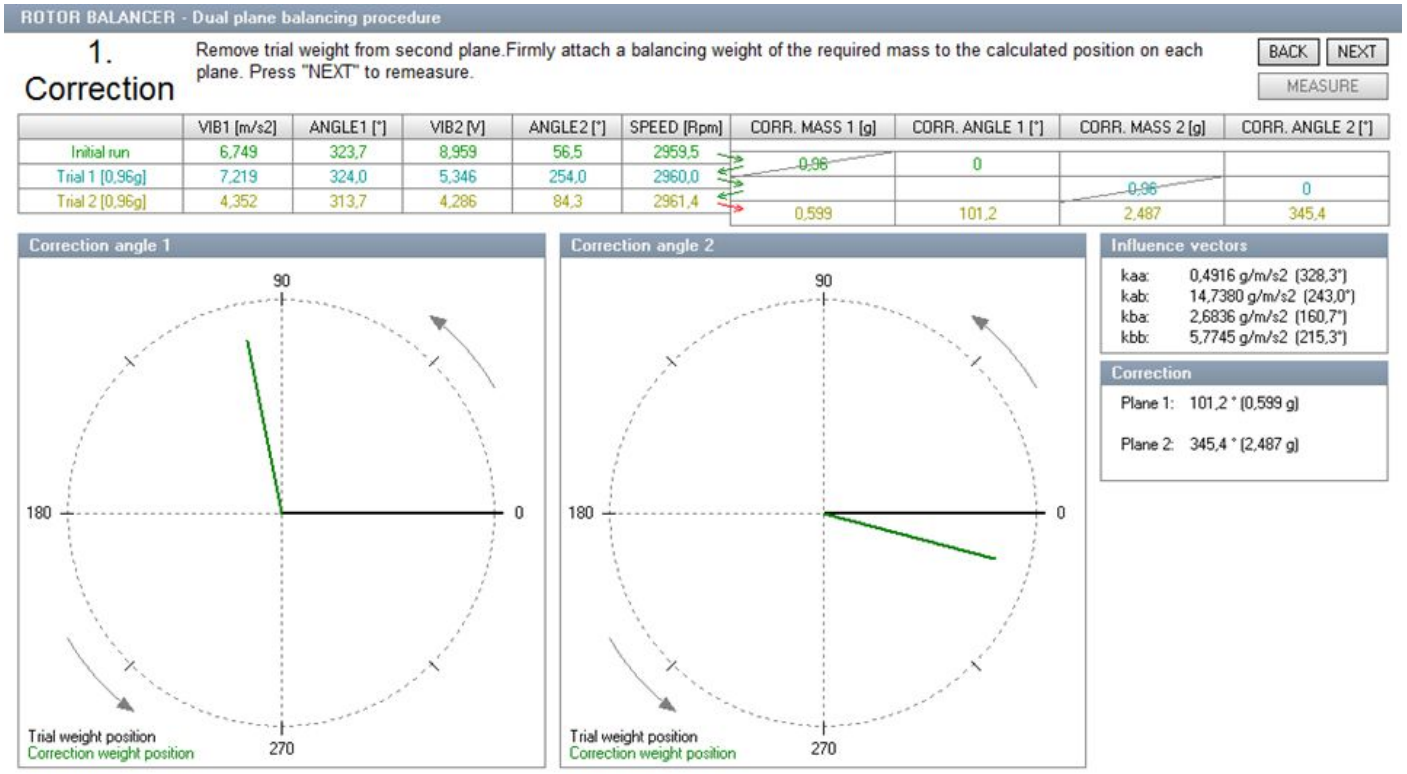


Illustration 19: Correction weights and angles

6.2.4. Correction run

Now remove the trial weight #2, before you continue.

Then mount the correction weights and start the measurement.

In our example the result for both planes has been improved, the “1.run” vector has smaller amplitude than the “Initial run” vector. Actually it worked better for the first plane, so we would have to go for a second corrective run.

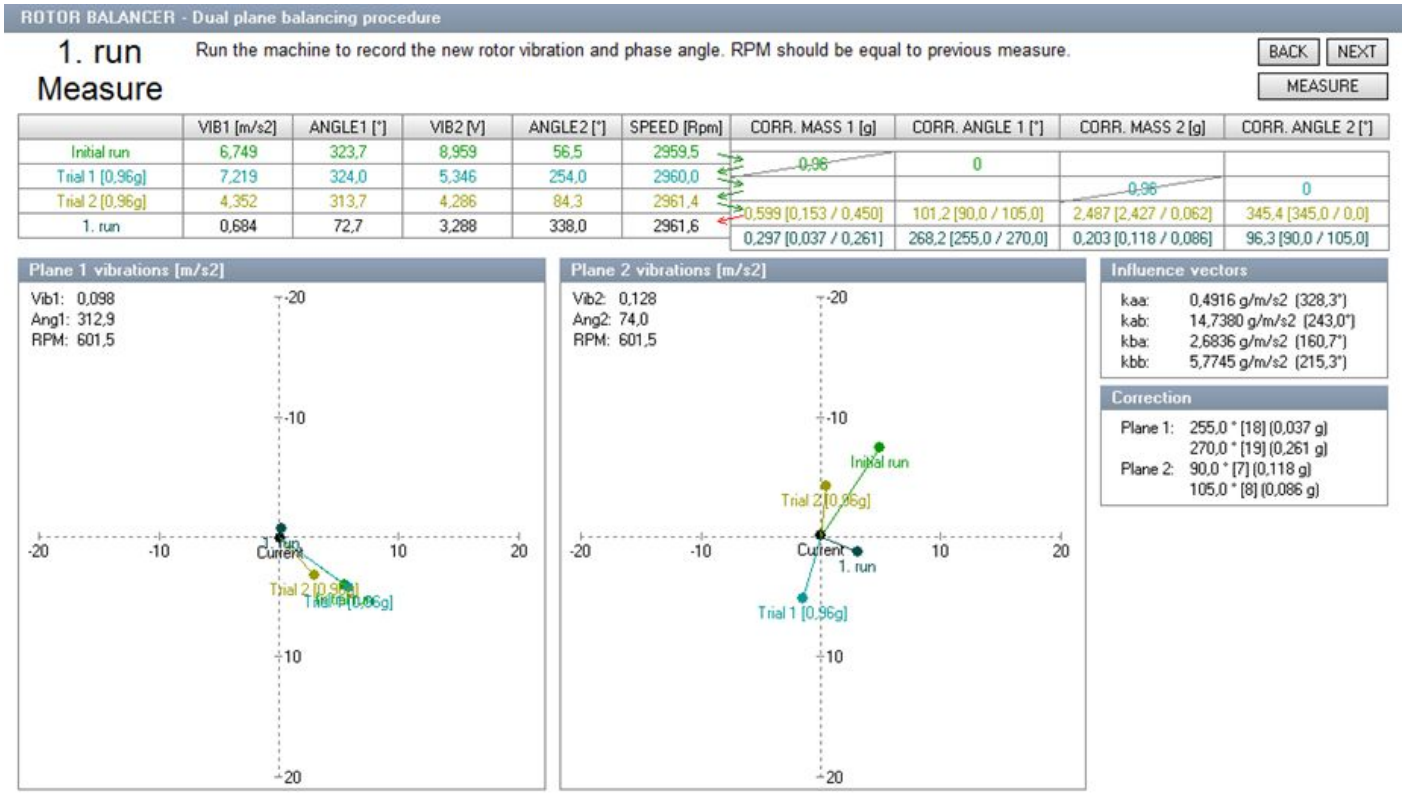


Illustration 20: first correction run

The weights for the next run are already suggested. As you can see, the mass is already significantly lower. It should decrease further with each following run.

6.3. Options

6.3.1. View options

The "**Show names in graph**" option – as seen in previous screenshots – adds the names to the vectors of each run, e.g. Initial run, Trial, 1.run, Current...

To check if amplitude and phase are stable at the operational speed, it may be helpful to trace the current vector over the change of RPM, this can be done by selecting "**Trace current measure**".

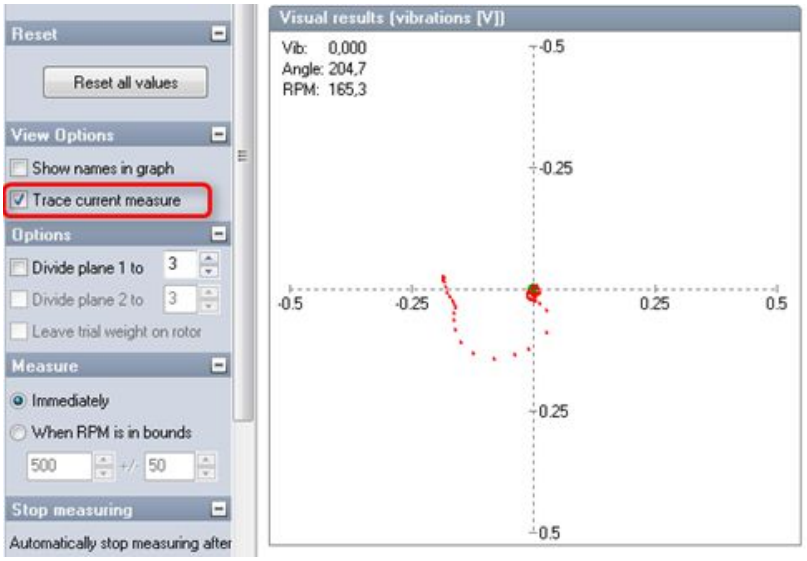


Illustration 21: Trace vector

6.3.2. Weight splitting

When you have a rotor/plane with a certain number of slots/blades/holes, where the weights can be mounted, it would be much easier to know the position number and weight value instead of the absolute angle.

This can be done by selecting "**Divide plane xx to xx**" from the properties. In our example we have a plane with 24 holes, so we mount weights in positions 3 and 4.

After adding the trial weight, and before adding the correction weight, there is a possibility to check the option "**Leave trial weight on rotor**". This is a nice feature for any situation, where removing the trial weight is a big effort.

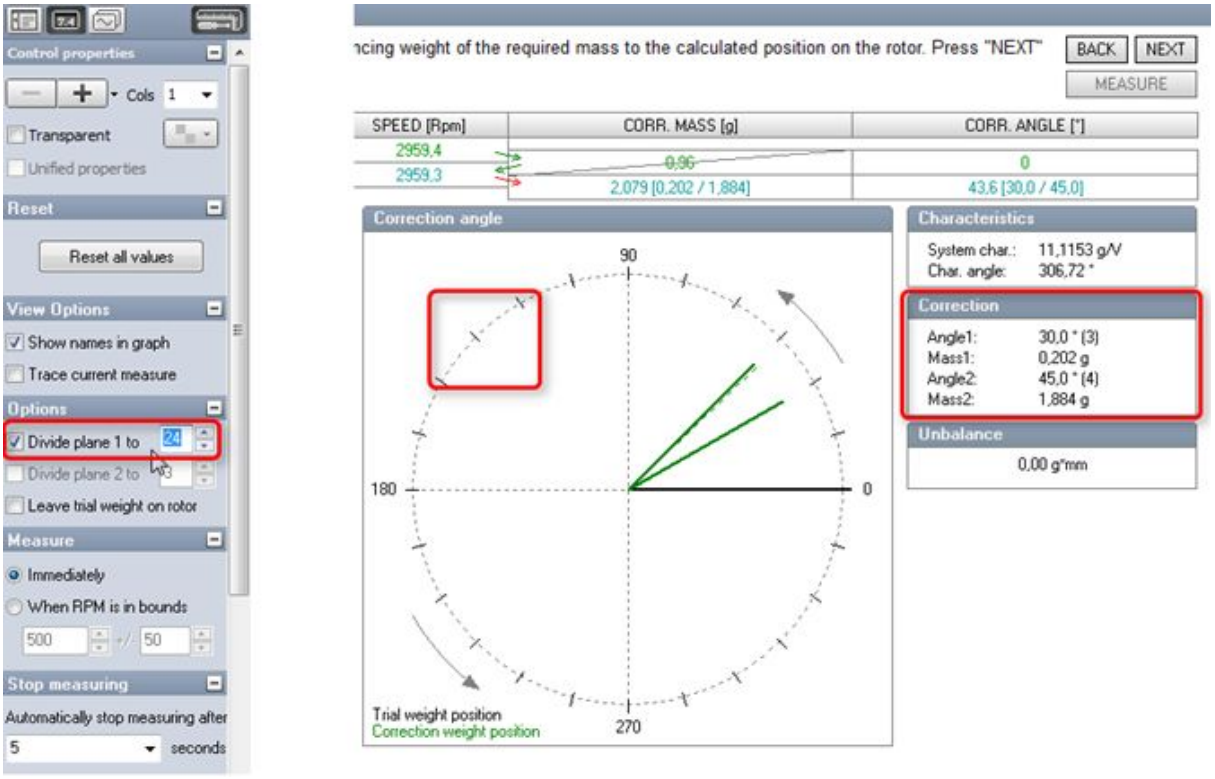


Illustration 22: Weight splitting

6.3.3. Measure options

During the procedure, when you click the Measure button, the data is averaged over the time shown below (**Automatically stop measuring after xx seconds**).

To ensure the measurement is performed always at the same RPM, you can additionally set a target value and boundary.

Illustration 23: Measure options

6.3.4. Link multiple instances

Sometimes – when amplitude and phase of the signal are not stable – you have to find a different location for mounting the sensor, to get a better signal.

To save time, you can mount multiple sensors and measure them at once, and then decide which signal to take. The whole procedure is the same, but you only need to operate one VC (visual control), all the other instruments will follow, of course providing different results.

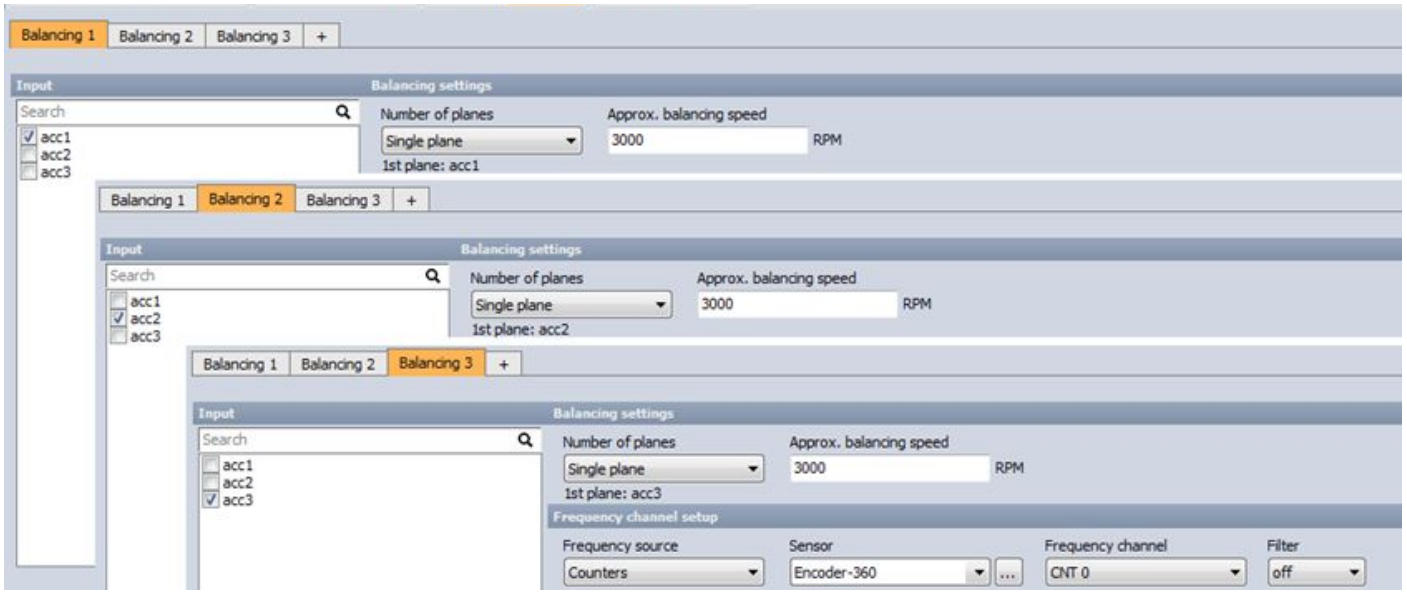


Illustration 24: Creating multiple instances in channel setup

Therefore, in Measure mode please check the “Link options” (left lower part).

The Rotor Balancer visual control can be picked from the instrument toolbar in Design mode. The channels “Speed” and “xxx/Time domain harm” have to be assigned to it.

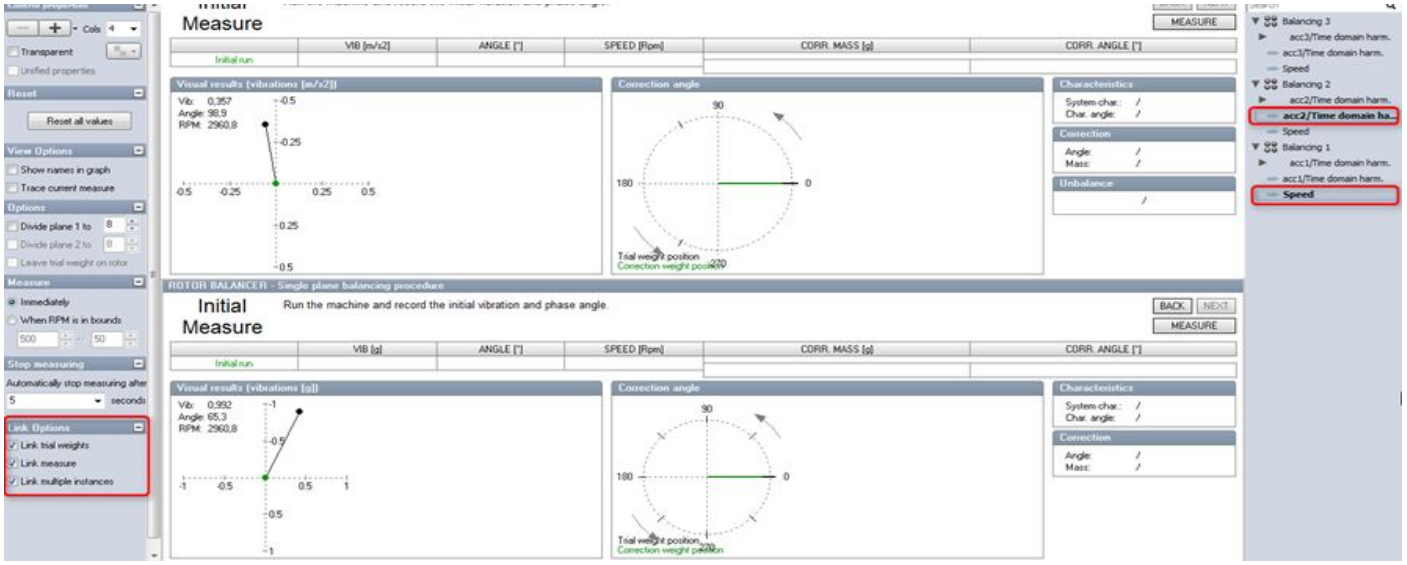


Illustration 25: Multiple instances in Measure mode

Which of the results should now be chosen for the correction?

- The one where amplitude and phase is stable.
- The one with the smallest influence vector.

The influence vector describes the relation between the vibration pattern change on specific mass change.

1g/mm/s tells us that 1g will change the vibration level of first order for 1mm/s.

If the influence vector is 0,5g/mm/s we only have 0,5g to get the same vibration change.

So we should carry on balancing where a small trial mass will give us a high vibration signal.

So unbalance is clearly seen on structure and not damped. So, we should carry on where the influence vector is 0,5g/mm/s!

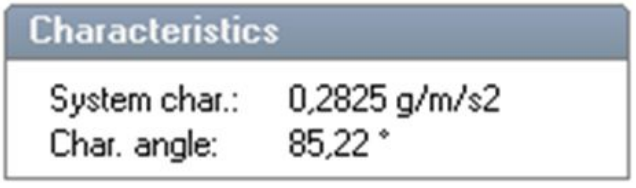


Illustration 26: Influence vector

6.3.5. Initialize with system characteristics

If Balancing was already done on a particular shaft, and the system characteristic is known, a trial weight run is not necessary once again; the system characteristics parameters can be entered manually instead, to get the correction mass calculated immediately.

This could be used if a shaft is balanced multiple times in a certain interval.

The system characteristics describe the relation between mass and vibration.

If a previous setup was stored, and loaded again, the system characteristic was stored in the balancing visual control, too. Now it could be entered manually or RESET ALL VALUES could be pressed.

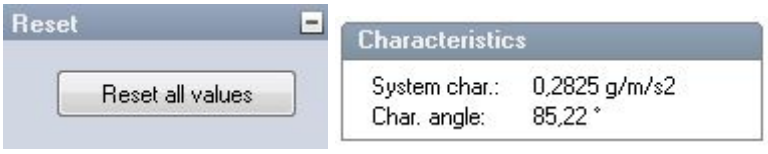


Illustration 27: Get values from previous measurement

After that is done, the procedure will start on “Enter Sys.Char.”. After the Initial run (chapter 4.2.1), instead of a trial mass, the VC will automatically overtake the previous system characteristics.

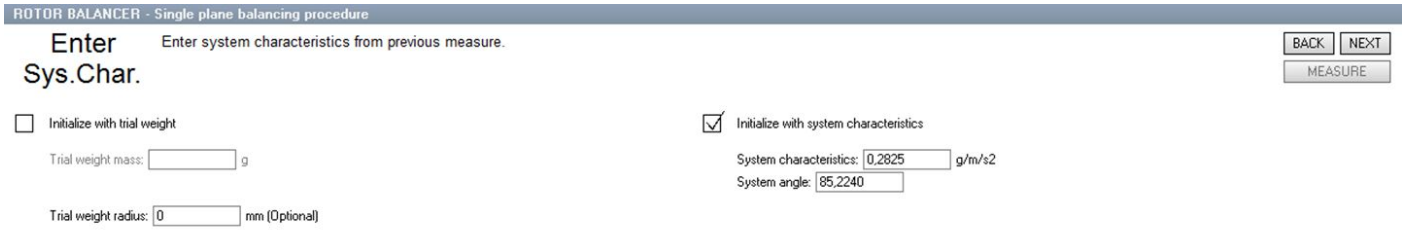


Illustration 28: Enter system characteristics

Hint

To rebalance a system with the use of the previous system characteristic values, following requirements have to be met:

- rotor was previously balanced with trial mass
- rotor characteristics were not changed
- position of the first trial mass must be known (mark on shaft/disc)
- if optical tacho probe was used: the reflective sticker (trigger zero signal) must stay at the same position
- optical tacho probe and vibration sensor must have the same angle relative to each other
- same balancing speed (RPM)

6.3.6. Acceleration to velocity calculation

With DewesoftX®, it is possible to directly integrate from acceleration to velocity in the channel setup. Just activate the checkbox, and set the according filter (recommendation 4th order, 4 Hz). Due to the mathematical integration, there is a constant added to the result, which must be filtered out. If the filter order is too high and the Low frequency is too low, you can see a slow-moving offset, even if there is no

signal at the input! - In this case please adjust the filter properly, use an FFT to check for your lowest interesting frequency.

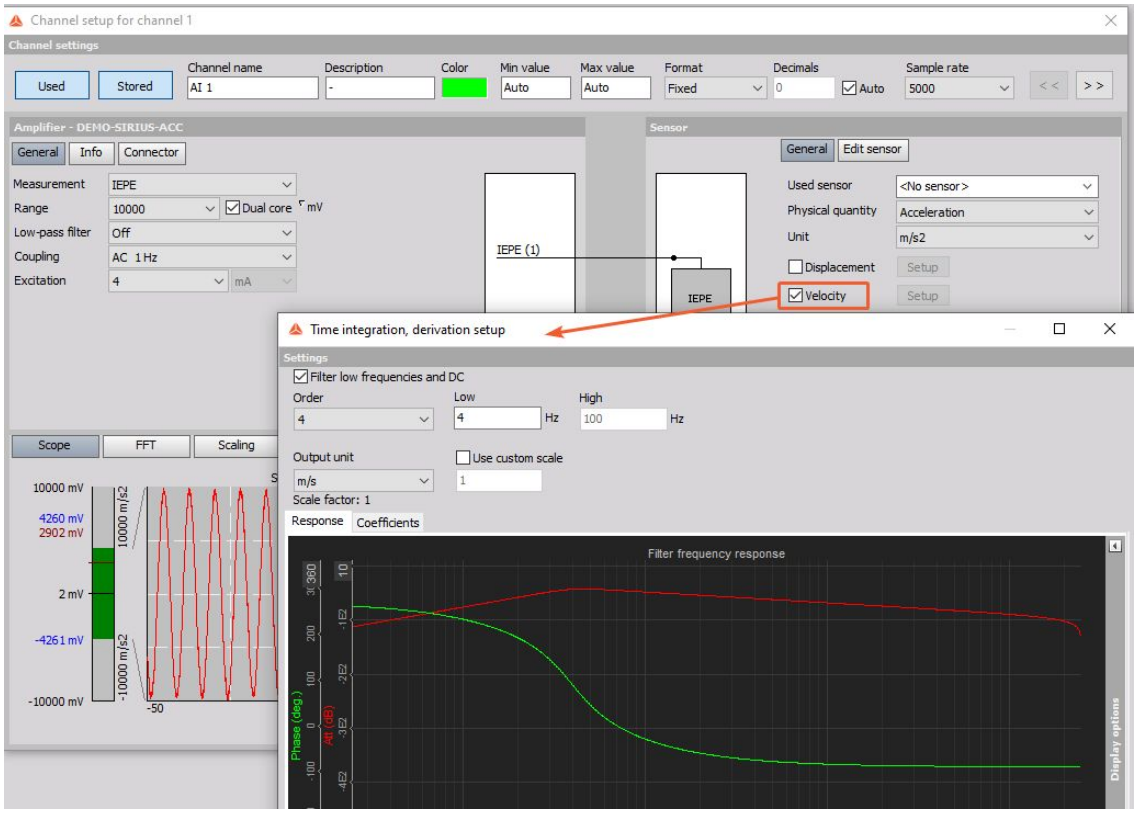


Illustration 29: Velocity calculation in channel setup

6.3.7. Removing mass

At any time, mass can be removed from the rotor (e.g. by grinding) instead of adding. Therefore please just apply it on the opposite side (+ 180°).

7. Analyse

During the whole process all raw data is stored, see below the green curve in the overview instrument. Additionally, when we reload the data file in Analyse mode we will have angle and mass data of all runs (initial, trial, correction).

As expected, the last run has the smallest amplitude (=less vibrations), which means our rotor has been balanced successfully.

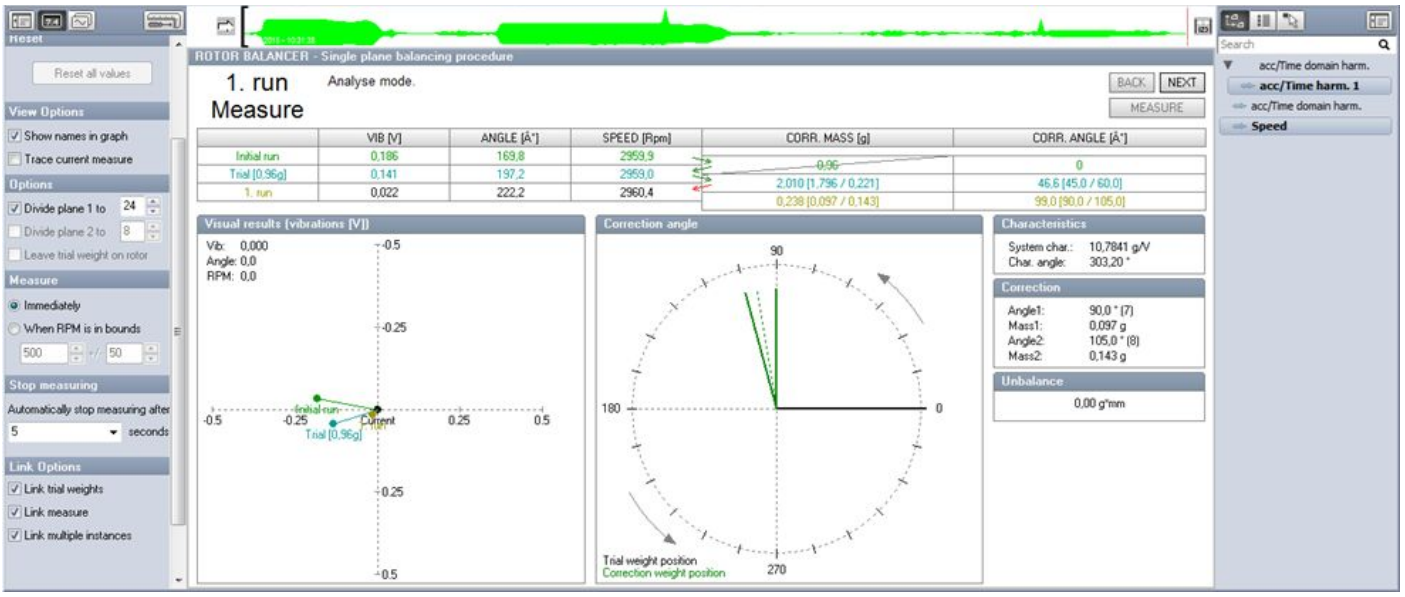


Illustration 30: Analyse screen with raw data and results

The RotorBalancer visual control shows the polar plot with the vectors of each run, in the table you can see the correction masses and angles for each run.

How to export these, is shown in the next section.

Important
Balancing is only working “live” in Measure mode!

8. Export

As shown in the previous chapter, when we have successfully balanced a rotor and collected the data, you can export the data of all runs.

Therefore click on the RotorBalancer visual control element to be active, then select Edit → Copy data to clipboard. Then you can paste the data e.g. to Excel, as shown below.

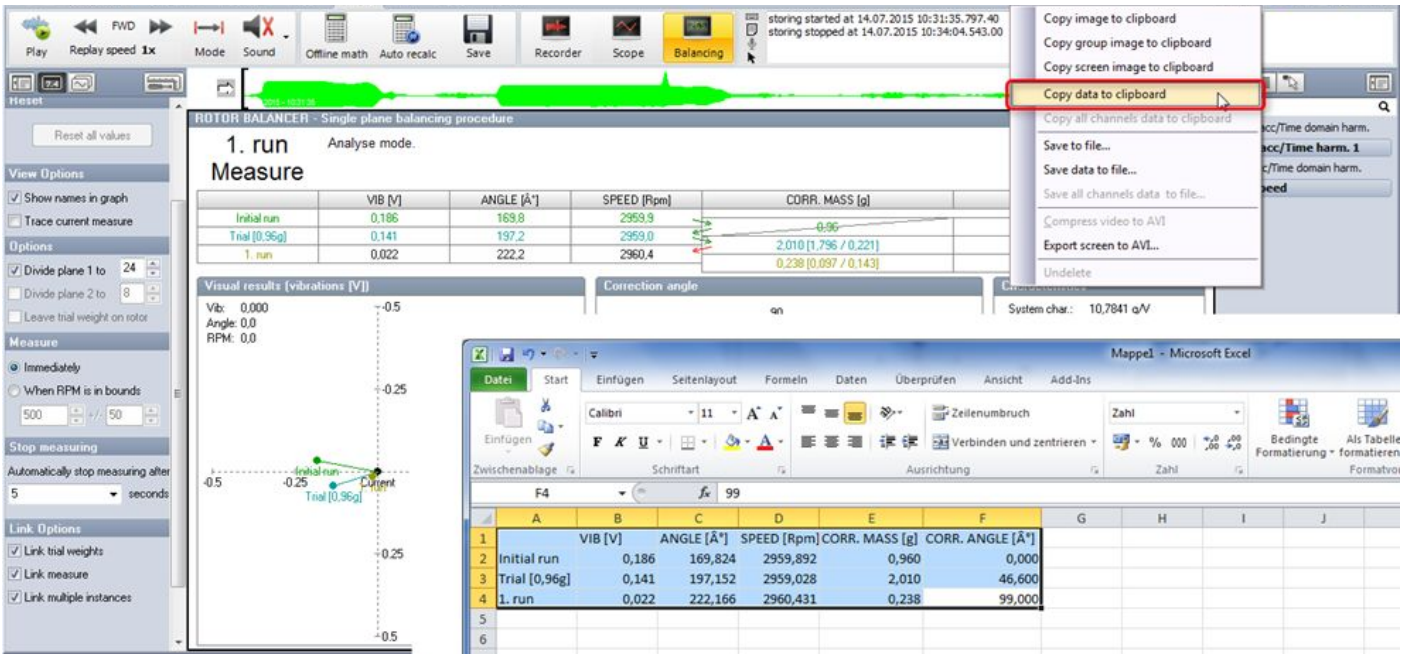


Illustration 31: Export data of VC

9. FAQ

This section should help to find quick solutions for known problems.

9.1. Amplitude and Phase not stable

The amplitude and phase must be stable to get a reliable result. For verification you can use the option “Trace current measure” as described on page 14, chapter 4.3.3 Measure options. The curve must be stable and not jump at the operational speed. If it does jump, there can be several reasons.

- Vibration signal is too small / noisy.

Please mount the accelerometer at a different position.

- RPM signal is not stable.

Check tacho signal and readjust trigger level.

- Balancing is done close to or on structural resonance frequency. The operating speed is close to the resonance frequency of the structure. Therefore the phase is changing for 180deg. If first order falls on such a resonance, a small frequency change (rpm change) will create a big phase change.

Below a modal test has been done on a structure. The machine is operated at 50 Hz (3000 RPM), where amplitude and phase are stable, you will get a good result. Please compare to the region of around 300 Hz. There is a big phase jump, where it would be impossible to get a stable initial run vector.

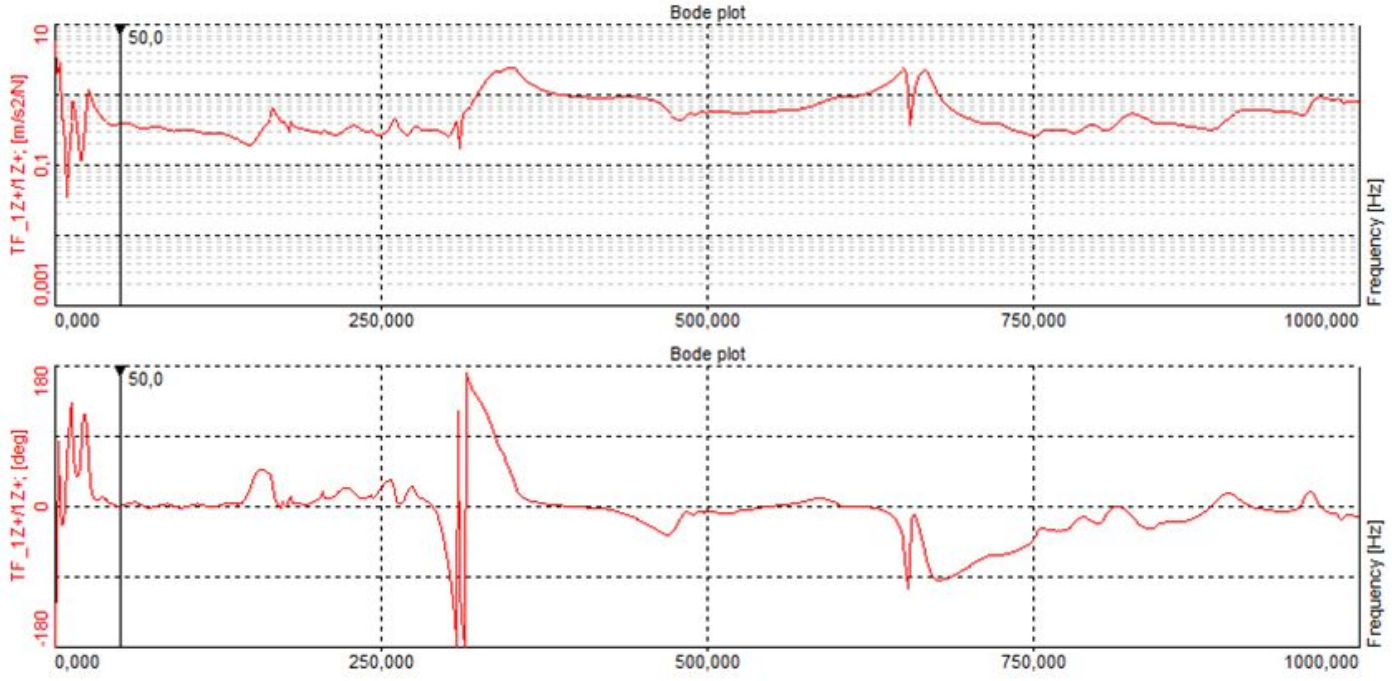


Illustration 32: Modal analysis

9.2. RotorBalancer Visual Control not found

- The visual control called “RotorBalancer.vc” has to be located in the Addons folder of your DewesoftX® installation (e.g. D:\DewesoftX\Bin\Addons). If it's not there, please restart the

DewesoftX® Fullinstaller, select “Modify” and activate at least the Plug-ins and Visual controls of the Add-ons section.

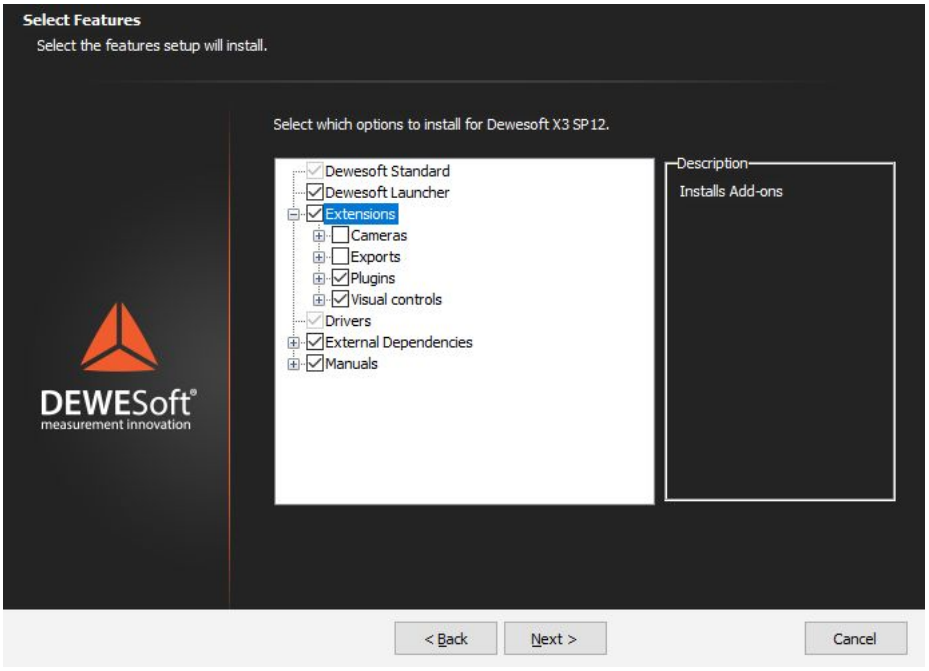


Illustration 33: Modify DewesoftX® installation

- After you have ensured, the plugin exists in the correct folder, please check under Settings and do the “Register plugins”, as described on page 2, chapter 1.4 Plug-in Installation

10. Warranty information

Notice
The information contained in this document is subject to change without notice.

Note:
Dewesoft d.o.o. shall not be liable for any errors contained in this document. Dewesoft MAKES NO WARRANTIES OF ANY KIND WITH REGARD TO THIS DOCUMENT, WHETHER EXPRESS OR IMPLIED. DEWESOFT SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Dewesoft shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory, in connection with the furnishing of this document or the use of the information in this document.

The copy of the specific warranty terms applicable to your Dewesoft product and replacement parts can be obtained from your local sales and service office. To find a local dealer for your country, please visit https://dewesoft.com/support/distributors.

10.1. Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

10.2 Support

Dewesoft has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or Dewesoft directly.

Dewesoft d.o.o.
Gabrsko 11a
1420 Trbovlje Slovenia

Europe Tel.: +386 356 25 300
Web: http://www.dewesoft.com
Email: Support@dewesoft.com
The telephone hotline is available Monday to Friday from 07:00 to 16:00 CET (GMT +1:00)

10.3. Service/repair

The team of Dewesoft also performs any kinds of repairs to your system to assure a safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly on https://dewesoft.com/support/rma-service.

10.4. Restricted Rights

Use Slovenian law for duplication or disclosure. Dewesoft d.o.o. Gabrsko 11a, 1420 Trbovlje, Slovenia / Europe.

10.5. Printing History

Version 2.0.0, Revision 217 Released 2015 Last changed: 23. July 2018 at 16:54.

10.6. Copyright

10.7. Trademarks

We take pride in our products and we take care that all key products and technologies are registered as trademarks all over the world. The Dewesoft name is a registered trademark. Product families (KRYPTON, SIRIUS, DSI, DS-NET) and technologies (DualCoreADC, SuperCounter, GrandView) are registered trademarks as well. When used as the logo or as part of any graphic material, the registered trademark sign is used as a part of the logo. When used in text representing the company, product or technology name, the ® sign is not used. The Dewesoft triangle logo is a registered trademark but the ® sign is not used in the visual representation of the triangle logo.

11. Safety instructions

Your safety is our primary concern! Please be safe!

11.1. Safety symbols in the manual

Warning
Calls attention to a procedure, practice, or condition that could cause the body injury or death

Caution
Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

11.2. General Safety Instructions

Warning

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Dewesoft GmbH assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as an option and will not be shipped as standard parts.

11.2.1. Environmental Considerations

Information about the environmental impact of the product.

11.2.2. Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

11.2.3. System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid unnecessary pollution of the environment and to keep natural resources.

This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further information about recycling on the Dewesoft web site www.dewesoft.com

Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment and is outside the scope of the 2002/95/EC RoHS Directive. However, we take care of our environment and the product is lead-free.

11.2.4. General safety and hazard warnings for all Dewesoft systems

Safety of the operator and the unit depend on following these rules.

- Use this system under the terms of the specifications only to avoid any possible danger.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- You may not connect higher voltages than rated to any connectors.
- The power cable and connector serve as Power-Breaker. The cable must not exceed 3 meters, the disconnect function must be possible without tools.
- Maintenance must be executed by qualified staff only.
- During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advice for using the system.
- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- Ground the equipment: For Safety Class 1 equipment (equipment having a protective earth terminal), a non-interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals.
- Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.
- The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.
- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorized personnel only.
- Adverse environmental conditions are Moisture or high humidity Dust, flammable gases, fumes or dissolver Thunderstorm or thunderstorm conditions (except assembly PNA) Electrostatic fields, etc.
- The measurement category can be adjusted depending on module configuration.
- Any other use than described above may damage your system and is attended with dangers like short-circuiting, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until the safe operation can be verified by service-trained personnel. If necessary, return the product to Dewesoft sales and service office for service and repair to ensure that safety features are maintained.
- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more

riskless operation is not possible anymore if the system is damaged obviously or causes strange noises. The system does not work anymore. The system has been exposed to long storage in adverse environments. The system has been exposed to heavy shipment strain.

- Warranty void if damages caused by disregarding this manual. For consequential damages, NO liability will be assumed!
- Warranty void if damage to property or persons caused by improper use or disregarding the safety instructions.
- Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE).
- Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
- Prevent using metal bare wires! Risk of short circuit and fire hazard!
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
- Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
- DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
- Avoid operation in the immediate vicinity of high magnetic or electromagnetic fields, transmitting antennas or high-frequency generators, for exact values please refer to enclosed specifications.
- Use measurement leads or measurement accessories aligned with the specification of the system only. Fire hazard in case of overload!
- Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatise the system unpowered to room temperature.
- Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.
- The electrical installations and equipment in industrial facilities must be observed by the security regulations and insurance institutions.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use in humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already- lower level may damage your system.
- Please also consider the detailed technical reference manual as well as the security advice of the connected systems.
- This product has left the factory in safety-related flawlessness and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advice and warnings in this manual.

EN 61326-3-1:2008

IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1.

Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally well-tried”, are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for the protection of buildings, are excluded from the scope of IEC 61326-3-1.

12. Documentation version history

Version	Date	Notes
Plugin Version 3.0	26.03.15	RotorBalancer 3.0 visual control instrument
Doc Version 1.0	20.07.15	initial revision for plugin version 3.0
Doc Version V20-1	10.8.2020	New template