User Manual

Vibration Analyser
Adash 4300 - VA3
Balancing

FW 03.19

Ref: 13042007 RS

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Before Switching On the Analyser

Ignoring any recommendations mentioned below may cause failure of the instrument.
Operating with a power higher then 24 V can cause an accident.

1. Connect into the ICP input only:
- **ICP powered sensor**
- **AC voltage max. 12 V peak-peak**
- **DC voltage max. +/- 24 V.**

If you are not sure, contact your dealer or directly our website.

2. Never connect the analyser to a line voltage 230 V (110 V).

3. Only use batteries with a nominal voltage of max. 1.5 V.

Warning!
Be careful of battery orientation!

Indication of Weak Batteries (re-chargeable)

When you select the ***Instrument info*** from main menu, then information on the current condition of the batteries appears.
While the instrument is switched on, the battery condition is checked every 30 sec.

1. When a ***warning*** low battery level is detected (insufficient to enable correct and safe work with instrument), the yellow ERR light is on (on the top of keyboard). Finish your current measurement and then change the batteries.
2. When the ***alert*** low battery level is detected, all three lights on the top of the keyboard blink three times and instrument switches itself off. You have to change the batteries immediately. If the instrument switches itself off after switch-on, then you also have to change the batteries immediately.

Attention!
When the instrument is switched off for several minutes, weak batteries can be regenerated and for a limited time can seem to be in good condition. Do not try repeatedly switching on, when the instrument itself switches off immediately! You may cause instrument failure and data in memory can be corrupted.

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References

This user manual contains information on how to operate with FW module Balancer. It contains detailed description about this FW module.

References:
[1] Vibration Analyser Adash 4300-VA3, User manual
The basic manual is often mentioned in this one as ***see [1]***.

We recommend reading of introductory chapters ***References*** and ***Terminology*** in the basic user manual [1] at first.
This manual is registered in the list of references as the [5] item.

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Interpretation of Basic Terms

Speed Synchronisation

Every measurement of complex spectrum (required for balancing) requires the speed synchronisation by an external pulse.
This must be a once-per-revolution trigger. In the case of order analysis measurements, amplitude and phase measurements and all measurements in the balancing module the speed synchronisation is required.

Every measurement in balancing module requires connection of tacho probe. Balancing process requires stable speed of machine and all steps should be made at the same speed.

Order Analysis

A standard option of the Adash 4300-VA3 is order analysis. It is a special case of complex spectrum measurement. ***The first spectrum line is the speed frequency***, next lines are the harmonics. Description of order analysis measurement – see [1], chapter ***Dyn. Measur. – Setup Menu / Order Analysis item***

Stable phase is important for the balancing process. Please follow these directions:
- use as high a resolution setting (***RESOL*** parameter) as you can whist checking that the phase is stable,
- phase values are comparable only with the same set of ***RESOL*** and ***HARM-NMB*** parameters.

Amplitude and Phase Measurement

Adash 4300-VA3 instrument can measure amplitude and phase of the vibration. The basic is the order analysis, from which the first line is displayed. Measurement of amplitude and phase – see [1], chapter ***Analyser Menu / Ampl. & phase measur. Item***.

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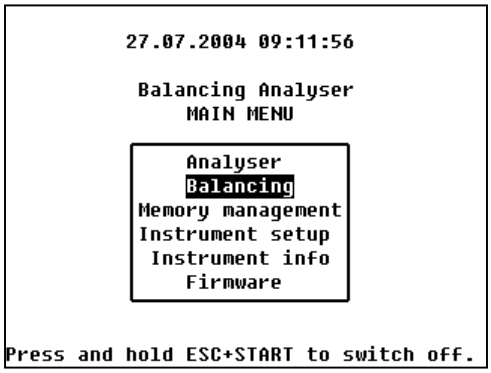
Main Menu

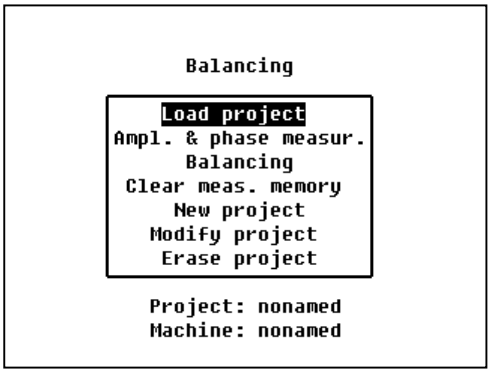
When the FW module Balancer is downloaded to the instrument, the ***Balancing*** item appears on the main menu. After selection of this item the balancing main menu appears – see next chapter. The base structure of balancing data is the ***balancing project.*** It includes all names, parameters, data …

Balancing Item

This menu item enables the creation and maintenance of a balancing project, memory management, project loading, on-line amplitude, phase and speed measurement, balancing process.

Reminder: the actual balancing project is saved to the VA3 memory and is not cancelled after instrument switch off.





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Balancing Menu

Select the ***Balancing*** item from instrument main menu. Then the Main menu of balancing appears.

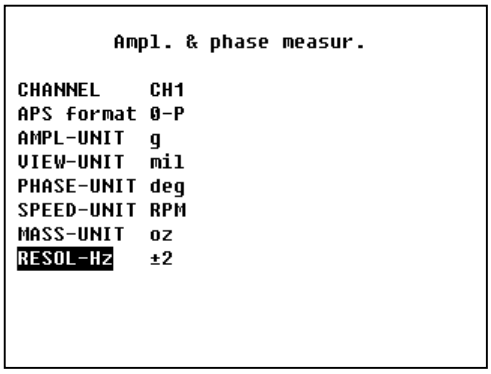
- by using ***up/down arrows*** select required item and then press ***right arrow, ENTER*** or START
- by using ***left arrow*** or ***ESC*** return to main menu.

Load project Item

A project is loaded from the data instrument memory (12MB) to the balancing instrument memory. Select required project name and confirm by ***ENTER***.

Ampl. & Phase measur. Item

It enables on-line measurement of amplitude, phase and machine speed. Description of these items – see [1], chapter ***Analyser Menu / Ampl. & phase measur. Item***. These measurements can be made before creation of a new project and before balancing procedure – see chapters ***New project Item, Balancing Item***.



Balancing Item

This is the main balancing process.

Before creation of a new balancing process or when you continue with process it is sensible to check whether the amplitude and phase is equal with initial condition.

- by ***right arrow, ENTER*** or START button the first measurement screen occurs. Screen is empty for new project without measurements.
- by using ***PdDn*** and ***PgUp*** you can display next or previous measurement screens.
- every measurement starts by ***START*** button.

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- if you press ***ENTER*** instead of ***START*** then you can manually enter the values from keypad (balancing calculator). ***Attention!*** You have to always enter the amplitude as RMS value. It will be immediately re-calculated (test it).

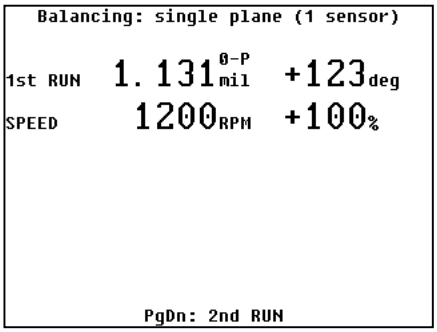
Two different screens exist for:
- single plane balancing,
- dual plane balancing.

Single plane balancing

Balancing process in the single plane consists of the following steps:
- **1st RUN** measurement
- entering of **TRIAL MASS** value and installation of trial mass to machine
- **2nd RUN** and **RESULT** calculation
- removing of trial mass and installation of result mass
- running **TEST MEAS**. and calculation **TRIM #1** result
- installation Trim #1 mass
- repeating of TEST MEASUREMENT and installation of next TRIM #2, #3 … masses.

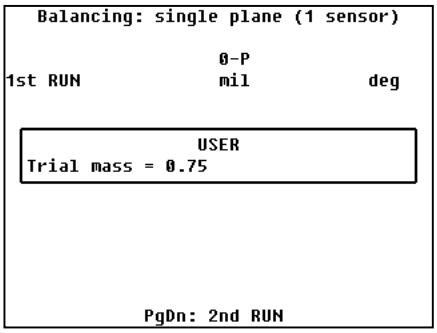
1st RUN

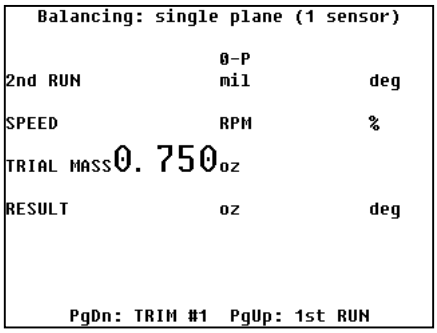
Push ***START*** button. The result is amplitude/phase of unbalanced machine. The example measured amplitude 1.131 mil 0-P represents 100% amplitude for next balancing process. Measurement was made at 1200 RPM. This speed also represents 100% of next balancing process.



TRIAL MASS

Push ***PgDn*** button. A trial mass input dialog box will appear. Enter trial mass value and push **ENTER** button. Install trial mass on the machine. You can install it to any angle you want.
The example trial mass is 0.75 oz.





2nd RUN

The second run screen appears after the trial mass value has been entered. Use ***START*** button and run the measurement. If the trial mass is installed in the wrong place (the measured phase is almost the same as in the first run) then you are informed about it. Remove the trial mass and install it again in different place (90° change is recommended) or enlarge its weight. Repeat the measurement.

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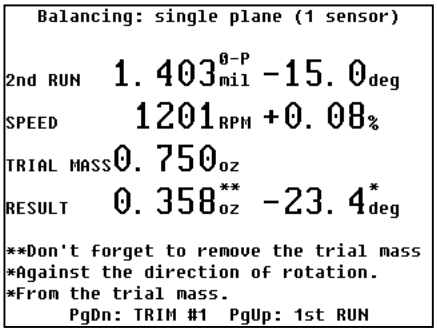
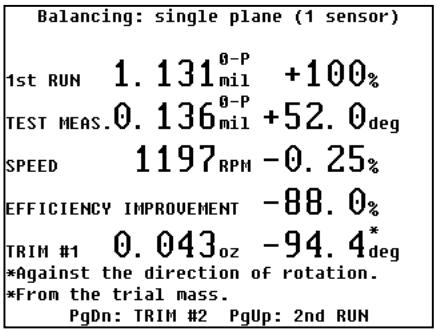
Notice: Push **Setup** button to recall the trial mass input dialog box and change trial mass value if necessary.
The result amplitude/phase measurement is displayed.
Remove trial mass and mark its position (it represents 0 degrees). From this position will be calculated the result balancing mass. A positive angle is orientated in the rotation direction.
In the result field read the balancing mass solution value and angle value for its installation. Install this mass to required position.



The 1.403 mil 0-P amplitude was measured at 1201 RPM (it is 0.08% higher speed then in 1st RUN).
The result mass is 0.358 oz and the position is 23.4 deg from trial mass position in opposite rotation direction.

TEST MEAS.
Push ***PgDn*** and test. meas screen appears. Press ***START*** and run the test measurement. The result is the vibration amplitude after balancing. If this value is sufficient then the balancing process is finished. If the value is still high then in the ***TRIM #1*** field the next balancing mass and angle is displayed. Install TRIM #1 mass and repeat test measurement in next screen ***(PgDn)*** as ***TRIM #2, #3*** …
Notice: Don't remove any formerly installed weights now!



The 0.136 mil 0-P is an amplitude reduction of –88%. It means machine condition is much better then before balancing. If this result is not acceptable then install next TRIM #1 mass (0.043 oz/-94.4 deg). The angle is related always to trial mass position.

Dual Plane balancing

In two planes you can balance with one or two vibration sensors. In case of one sensor you will need to move the sensor from one plane to the other. The balancing process takes more time.

Recommendation: If you balance with two sensors, it is recommended in project definition to enter ***Channel*** parameter equal ***CH2*.** This channel will be assigned to the left plane. When you select CH2

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then it is optically equal with the position of ***CH2*** input on the left side of instrument. Generally you can select both channels.

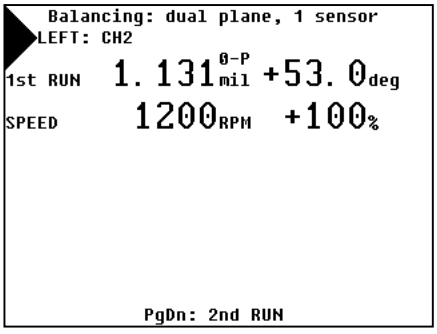
Balancing process in the dual plane consists from next steps:
- **1st RUN** measurement – left plane
- **1st RUN** measurement – right plane
- entering of **TRIAL MASS** value – left plane
- installation of trial mass to machine – ***left*** plane
- **2nd RUN** measurement – left plane with trial mass in left plane
- **2nd RUN** measurement – right plane with trial mass in left plane
- **removing of trial mass**
- entering of **TRIAL MASS** value – right plane
- installation of trial mass to machine – ***right*** plane
- **3rd RUN** measurement – left plane with trial mass in right plane
- **3rd RUN** measurement – right plane with trial mass in right plane
- **removing of trial mass** and installation of result masses to right and left plane
- running **TEST MEAS**. – left plane
- running **TEST MEAS**. – right plane and calculation **TRIM #1** results
- installation TRIM #1 masses
- repeating of test measurements and installation of next **TRIM #2, #3 …** masses

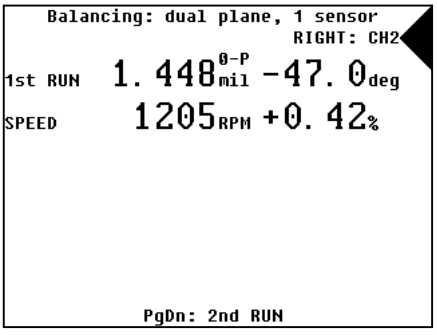
Attention! The order of measurements in left and right plane is not important. Results are calculated after measurements in both planes. What you have to keep is:
- 2nd RUN
- trial mass in **left plane**
- 3rd RUN
- trial mass in **right plane**

To the next balancing step you are able to go after measurement in both planes.

When you measure with two sensors, then the button ***START*** takes both measurements (left + right plane) automatically. ***Right / left arrows*** are used especially for results readings in both planes. The next example shows measurement with one sensor, where after one plane measurement you have to switch to the second plane and repeat the measurement.

1st RUN
Install sensor to the left plane. Push ***START*** and vibration values for the left plane is taken. Move the sensor to the second plane, by ***right arrow*** switch to second plane and repeat the measurement. Now you have both values. The sense of speed and speed change (%) is the same as in single plane balancing.





TRIAL MASS
Push ***PgDn*** button. A trial mass input dialog box will appear. Enter trial mass value for left plane and push **ENTER** button. Install the left plane trial mass on the machine. You can install it to any angle you want.
The example trial mass is 0.50 oz.

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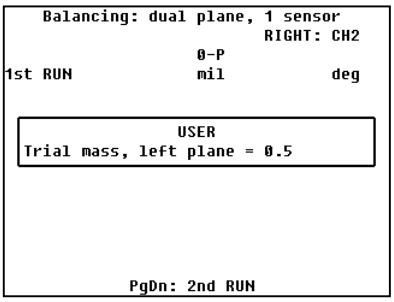
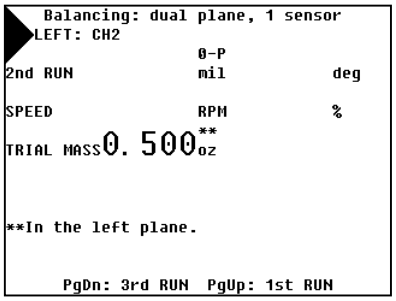
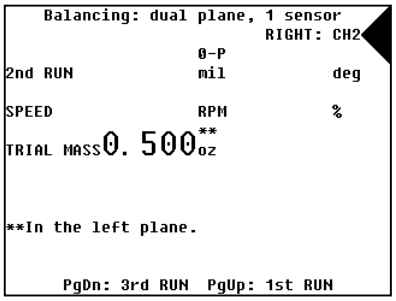






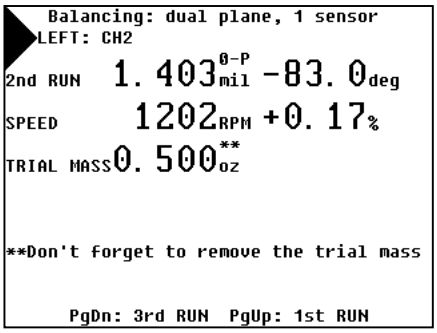
2nd RUN

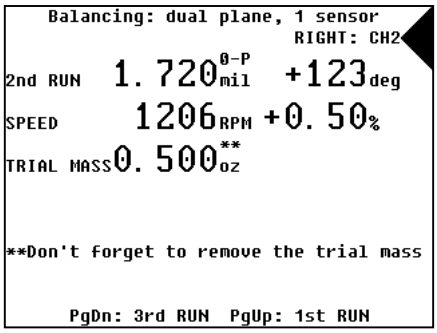
The second run screen appears after the trial mass value has been entered. Use ***START*** and measurement will be taken. When the trial mass is installed in wrong place, move it to the different position and repeat the measurement.

Notice: Push **Setup** button to recall the trial mass input dialog box and change trial mass value for left plane if necessary.

By ***right/left arrow*** switch the measurement to the second plane and repeat the measurement.

Remove trial mass from left plane and mark its position as 0° for left plane.

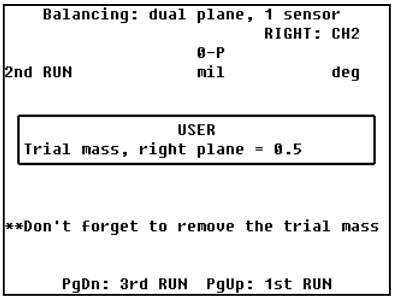


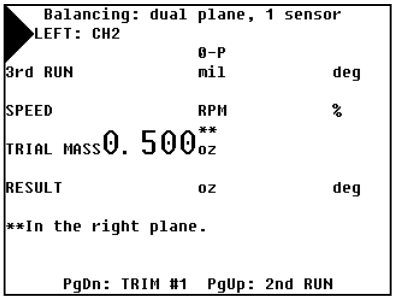


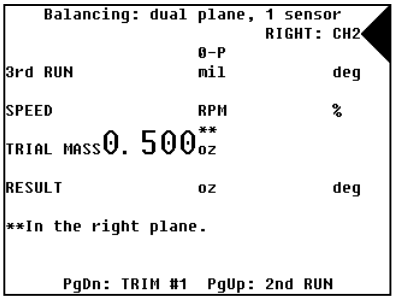
TRIAL MASS

Push ***PgDn*** button. A trial mass input dialog box will appear. Enter trial mass value for right plane and push **ENTER** button. Install the right plane trial mass on the machine. You can install it to any angle you want.

The example trial mass is 0.50 oz.







3rd RUN

The third run screen appears after the trial mass value has been entered. Press ***START*** and measurement will be taken. When the trial mass is installed in wrong place, move it to the different position and repeat the measurement.

Notice: Push **Setup** button to recall the trial mass input dialog box and change trial mass value for right plane if necessary.

By ***right/left arrows*** switch the measurement to the opposite plane and repeat the measurement.

Remove trial mass from right plane and mark its position as 0° for right plane.

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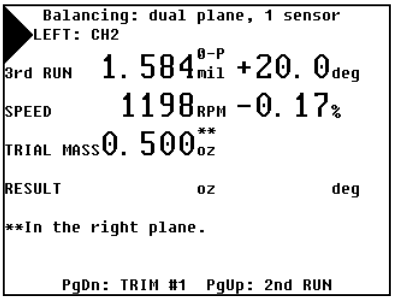
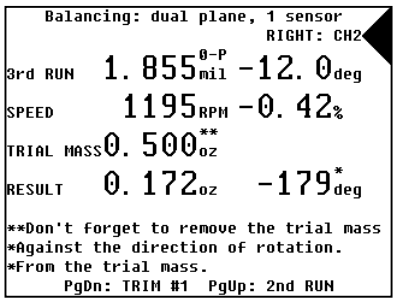
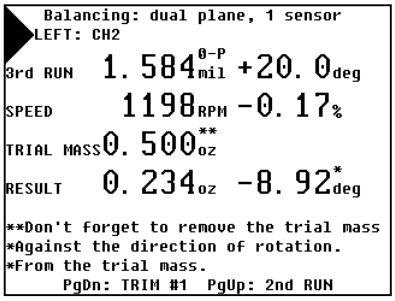
Both balancing masses/angles are displayed in result field. Use ***right/left arrow*** to look at it. Install these masses to required position.



No result is known now.





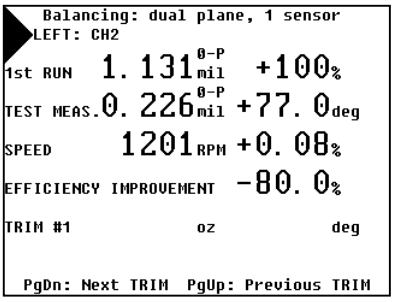
In the moment results for both planes are known.

Test measurement

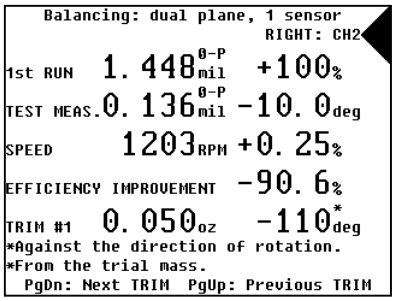
Use ***PgDn*** and switch to test meas. screen. Press **START** and run test measurement in one plane. Then switch to opposite plane and repeat the measurement. When vibration levels are acceptable then the balancing process is finished. When the amplitudes are still high then use the TRIM #1, #2 … for next development.

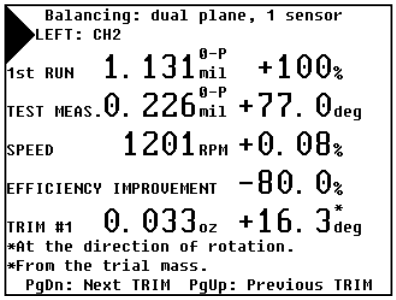
When you are not satisfied, then in this moment both TRIMs #1 are calculated. Install these masses and repeat test measurement on next screen.

Notice: Don't remove any formerly installed weights now!



No TRIM is known now.





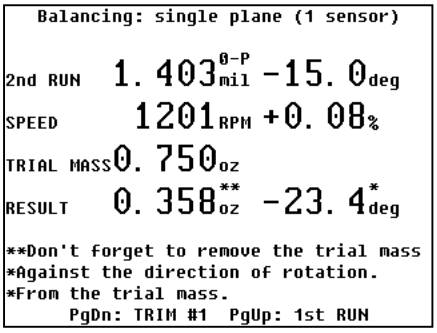
In the moment TRIM for both planes is known.

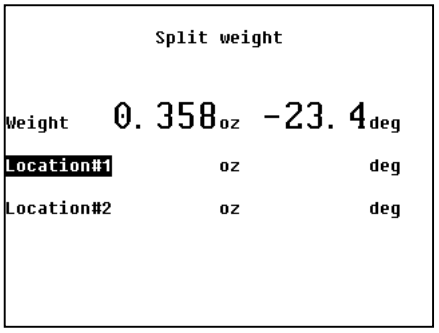
Weight splitting

It is often the case, for example on a fan, that the balance solution requires the location of a mass in an impossible position – in between two blades for example. To resolve this problem you will need to use the weight splitting function.

When you press ***Info*** button on any screen, then the **weight splitting** screen appears. When you do this from a screen which displays a balance solution, then this result is copied automatically to the weight splitting screen. By using ***up/down arrows*** and **ENTER** button set the directions (deg) for both locations. Weight splitting is calculating.

When the ***Info*** button is pressed, the **result** (0.358 oz/-23.4 deg) values are displayed on **weight splitting** screen.





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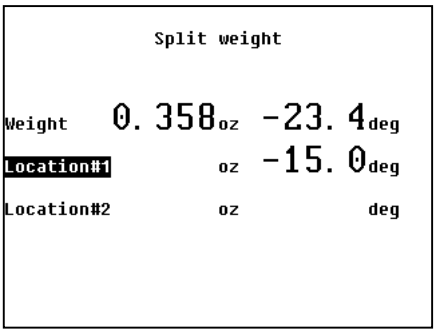
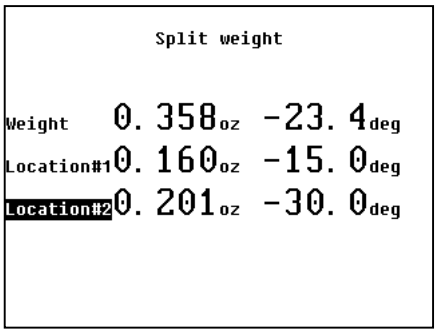
For instance we have a fan with the blades difference 15 deg. It means we can install mass to the position 0 deg, ± 15 deg, ± 30 deg, ± 45 deg, … Required position lies between -15 deg and -30 deg. We enter these values to split weight screen. After both angles definitions the result masses are calculated.





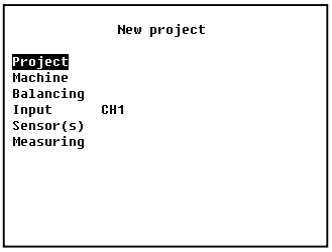
Clear meas. memory Item

This item will remove all measurements results and to begin balancing process again, it means from **1st RUN**.
The balancing process can be interrupted in any step. It is possible to return (***PgUp***) back to any measurement screen and by using ***START*** button run the measurement and continue balancing from this position.
When you need to start the process again it is possible:
- run the measurement on the **1st RUN** screen
- select Clear meas. memory item.

The ***Clear meas. memory*** removes only results of measurement. Information saved in the project is not removed. When you need to remove current balancing project, you need to use ***Erase project***.

New project Item

When you select this item then all data of the balancing memory will be erased. In the data memory there is saved always a copy of balancing project, it means there is no danger of losing data. On the next screen you have to set the parameters of new balancing project. Select individually items by ***up/down arrows*** and confirm by ***right arrow, ENTER*** or ***START*** button. By using **Save** button you can save the analyser setup to the setup memory of instrument.



Before definition of new project there is suitable to make several measurements in ***Analyser*** mode, which help you to set parameters well:
- measure the machine speed in the condition which will be used for balancing.

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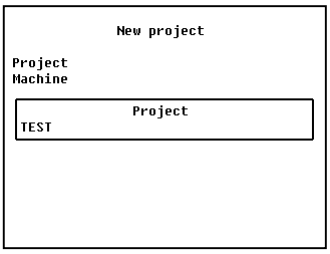
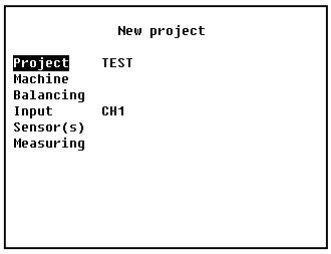
- choose suitable vibration sensor and set its parameters. For low speed machines there is better to use a velocity sensor. For standard speed machines there is accelerometer acceptable.
- choose the amplitude unit for balancing. Obviously it is better to set the velocity, if the sensor is accelerometer. Then set the VIEW-UNIT parameter, this unit will be displayed on the screen during whole balancing process (assure, that you understand what is the differences between SENSOR-UNIT, AMPL-UNIT, VIEW-UNIT)
- when the SENSOR-UNIT is acceleration and AMPL-UNIT is velocity, then set the integrator frequency (10 Hz or 1 Hz, it is 600 CPM or 60 CPM) – see [1], chapter ***Instrument Setup Menu / Meas. Param. Item / HP Integ. Parameter***.
- check the signal shape by time signal measurement. Set the frequency range ten times higher then speed frequency. Measured signal should be similar to a pure sine.
- measure the spectrum in the same frequency range. This spectrum should have only one significant line on speed frequency.
- when the spectrum includes more significant lines then more problems exist in the machine. The balancing process probably will not be successful.
- measure on-line ampl/phase and check whether the phase is stable. If not, set different Resol parameter. If you are not able to measure stable phase, then again the balancing process probably will not be successful.
- now set all project parameters.

Project Parameter

Use ***right arrow*** or ***ENTER*** and enter the name of project. Until the name is defined, it is not possible to enter next items.





Machine Parameter

Use ***right arrow*** or ***ENTER*** and enter the name of machine. Until the name is defined, it is not possible to enter next items.

Balancing Parameter

Use ***right arrow*** or ***ENTER*** and select one from three possible balancing methods:
- single plane,
- dual plane with one sensor,
- dual plane with two sensors.

Input Parameter

In the case of using only one sensor set the channel to which the sensor will be connected. When you use two sensors, then this input channel means the left plane. It is suitable to set **CH2**, because this **CH2** input is on the left side of the instrument. The second input will be used for right plane.

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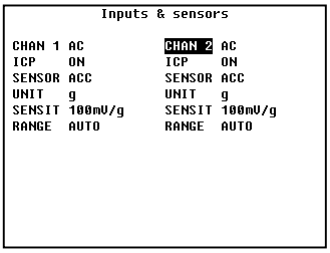
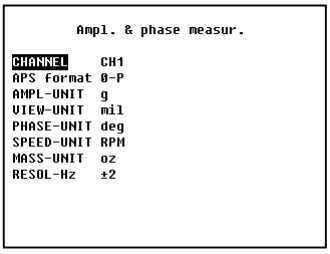
Sensor Parameter

Use ***right arrow*** or ***ENTER*** and the **Inputs & sensors** screen occurs. Now set all parameters for CH1 and CH2 (if it is used). The description of all parameters – see [1], chapter ***Analyser Menu / Inputs and Sensors Item***.
If you use two sensors, then both sensors have to have the same unit.



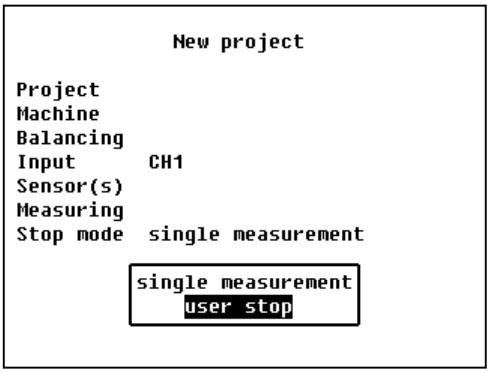
Measurement Parameter

Use ***right arrow*** or ***ENTER*** and on the next screen define next balancing parameters. These parameters are equal with parameters from **Ampl. & phase measur.** setup - see [1], chapter ***Analyser Menu / Ampl. & phase measur. Item***.
Additional parameter there is **MASS-UNIT** parameter, which defines unit of trial mass and of result balancing masses. When you use the relative trial mass (it means equal 1) then this mass unit is only formal.
The mass values are always positive. When you want removed the mass then you have to do it on the opposite side of rotor.



Stop mode Parameter

For the 03.14 FW version and later.
Use ***right arrow*** or ***ENTER*** and from the next menu select a desired mode of a balancing measurement stopping.



- ***single measurement***: Only a single measurement of the amplitude, phase and speed is performed. Its result is stored as the balancing measurement result.
- ***user stop***: The amplitude, phase and speed on-line measurement cycle is run. Watch the measured phase and speed values within the measurement cycle. If a correct balancing speed value is reached and the phase value is stable, then break the measurement cycle by pressing of ***ESC*** key on the instrument keypad. The last measurement result is stored as the balancing measurement result.

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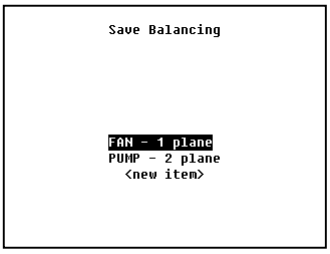
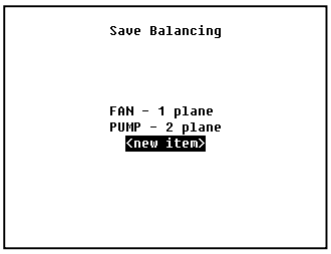
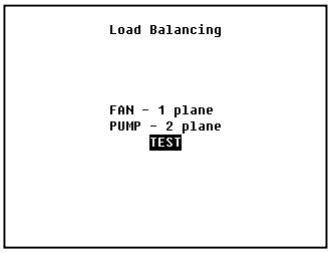
Finishing of project definition

Press ***ESC*** or ***left arrow*** on the parameters screen. The list of existing projects appears. Set the pointer to the **<new item>** and press ***ENTER*** or ***START***.
When you select the existed project, it will be rewritten by new project and all data will be lost.







Modify project Item

This item allows you to modify the project parameters of an existing project. It is the same process as for new project definition. When you change some important parameters, then some measured values which are not longer compatible, will be removed.

Erase project Item

It enables deleting of an existing project.

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User notes

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