🕮 User's guide

Balancing Analyser Adash 4202

Application:

- Operating machine balancing
- Eex ib IIB T3 certificate

Characteristics:

- ICP feeding of a sensor, AC input for vibration measurements
- TTL trigger for a synchronization of measurements
- Machine speed measurement
- Averaging of static and dynamic data from 1 to 20
- Measurement of TRUE-RMS and TRUE-PEAK values
  - LF velocity mm/s in the band 10 - 1000 Hz
  - HFE acceleration g (9.81 m/s^2) in the band 1.5 - 16 kHz
- Time signal analysis
- 200 Hz / 400 lines balancing spectrum
- Operating single or two plane balancing
- Balancing memory for 4 balancing projects
- Analyser – user set up of parameters between measurements
- Backlighted graphics LCD display
- Supplied by 4 x AA batteries or alkaline cells

Ref: 31072007 KM

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Before Switching On of the Analyser

The violation of any mentioned below recommendations will cause failure of the instrument.

Unqualified operating with a power higher then 24 V can run a risk of accident.

1. **Never connect a different sensor than an integral electronic type into the ICP input. If you are not sure, contact your dealer.**
2. **Never connect the analyser to a line voltage 230 V (110 V).**
3. **Use only batteries with a nominal voltage of max. 1.5 V for feeding.**

Warning!
Be careful of battery orientation, the power source would be damaged!

Fig. Correct polarity of the supply cells

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Preface

This guide does not contain description of vibration diagnostics methods and balancing theory.

Appearance of 4200 Analysers

Connectors
INPUT TRIG … single-channel model
INPUT1 INPUT2 … double-channel model

Backlighted graphic LCD display

Keyboard

Cover of the supply cells

Fig. Upper side of the analyser

Fig. Front view of the analyser

Analyser Control, Important Keys

All the functions of the analyser are selected from menus.

- From the ***main menu*** of the analyser activate the requested operation by pressing the appropriate key.
- In the ***selection menu*** first select (activate) the requested item using the ***up/down arrows*** and validate by pressing ***ENTER*** or ***START***.
- If two selection menus are displayed on the screen simultaneously, use the ***left/right arrows*** to move between them. The selected item of the selection menu is always marked by arrows (indicators) on both the sides; in the active menu it is displayed inversely.

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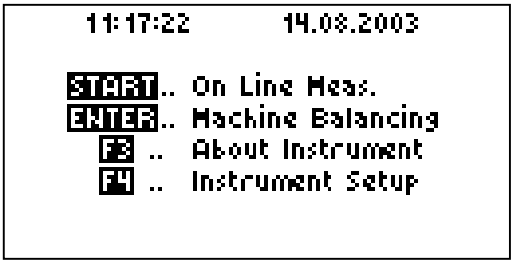

Fig. Main menu of the analyser

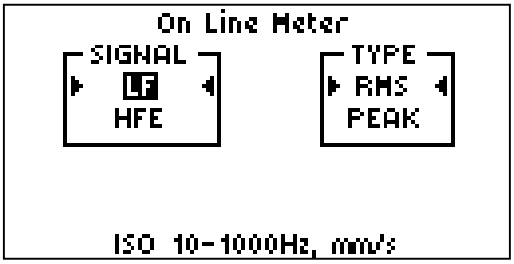

Fig. Selection menu (2 on one screen)

- In the instruments of the Adash 4200 series the ***F5*** key has the same function as the Esc (Escape) key on your PC. By pressing ***F5, return*** from menus and also from measurement modes.
- The ***SHIFT*** key pressed along with another key assigns to the key its alternative function, which is indicated in red above the basic function indicated in black.

Note. Since the control program of the analyser usually recognizes from the context whether the basic or alternative function would be used, the ***SHIFT*** key does not have to be pressed in the following cases:

- Home, End, PgUp, PgDn, left, right, up, down arrows.

On the contrary, the ***SHIFT*** key must be pressed for the following combinations:

- SHIFT+START switching off the device,
- SHIFT+5 inserting point to numeric data,
- SHIFT+SPACE erasing the last digit of inserted numeric data.

Calibration Certificate of the Analyser

Each analyser after the assembly is subject to a complex voltage calibration on the generator of sinusoidal signals and to measurement tests using a vibration sensor, all according to the manufacturer's internal regulations. The supplied analyser has the ***Sensor Setup – Sensor*** parameter activated at a nominal value of ***100 mV/g***.

If the analyser set includes also a vibration sensor, then the measurement tests are carried out using this sensor and the set is accompanied by a ***Calibration Certificate*** confirming the meter calibration in compliance with ISO 16063-21: 2004.

The Calibration Certificate remains valid for 12 months from its issue.

Calibration applies to the entire supplied ***set:*** analyser – connection cable – vibration sensor. In the calibration the ***Sensor Setup – Sensor*** parameter is activated for the user selection ***User***, which is set up for the effective sensitivity of the supplied sensor in compliance with the manufacturer's calibration sheet.

For more information refer to the ***Measurement Setup*** (Sensor Setup) chapter.

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Basic Points Description

Static and Dynamic Data

In the instruments of 4200 series there are two main types of measured data – static and dynamic.
Static data are represented by a single value (real or complex). An example is the result of wide-band vibration values measurement (for instance, ISO 2372) or measurement of RPM.
Dynamic data are represented by an array of measured values. An example is the result of time signal measurement.

Indication of ICP Power Supply On of the Vibration Sensor

After pressing the ***START*** key, prior to the vibration measurement, the following steps will be taken:

- The ICP supply of the vibration sensor switches ON if it is OFF (see chapter ***Instrument Setup*** – Time to ICP off) or if switching between the INPUT1 and INPUT2 measurement inputs for double-channel analysers.
- Checking of the vibration sensor connection to the measurement input; an unconnected or defective sensor displays an error in the ICP supply – see chapter ***Error Conditions***.

This pre-measurement preparation is indicated by a running bar graph on the bottom line of the display.

Measurement Process Indication

After starting the measurement, its process is always indicated in the upper right corner of the screen by means of the following letters:

A	***Auto-range*** calibration
W	***Waiting*** for the key to be pressed relative to the measurement parameter Trigger -> ***Key***
T	Calculation of RPM (***Trigger***) for Machine Balancing
M	***Measurement***, data collection
C	***Calculation***.

Types of Signal Processing

The input signal may be processed and modified in various methods; in relation to the measurement we always speak about selecting a ***signal path –*** see chapter ***Connection of the Vibration Sensor***.

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The same path label is used in all the device menus where the signal path is selected. The following table describes the characteristics of three signal paths used in the instruments of the Adash 4202 series.

LF	ISO standard, velocity signal in 10 – 1000 Hz band	[mm/s]
HFE	High Frequency Emission for bearings diagnostics, acceleration signal in 1.5 – 16 kHz band	[g]

Besides these standard signal paths, the analyser is also equipped with a special path:

BAL	velocity signal in 0.8 – 200 Hz band for ***balancing.***	[mm/s]

Measurement Averaging

Selection of the ***Averaging*** parameter – see chapter ***Measurement Setup***.

The set value of the ***Averaging*** parameter applies to individual types of measurement as follows:

- To measure ***dynamic data*** (time signal, spectrum and balancing), this parameter is used in the calculation.

> The time signal can be averaged only if external synchronization is used, e.g. tachoprobe – see chapters ***Machine Speed*** and ***Measurement Setup*** (Trigger - External).

- To measure ***Default Meas.***, this parameter is ignored. The calculation of the static value (***Default Meas.*** measurement) is averaged already in the basic mode and this setting ***cannot be changed.*** The total period of measurement for the calculation of static values for each of the 2 signal paths is ***1 sec*** and represents approximately ***43000*** signal samples.

- To measure ***static data in the On Line Meter mode,*** the averaging influences the number of evaluated samples of the measured signal and thus the time of each individual measurement in the following way:

Averaging	**Meas. Time [ms]**
None	400
2x	500
3x	600
5x	800
10x	1300
20x	2300

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Functions Description

Analyser Supply

The analyser is supplied by ***4*** supply cells of ***AA size*** with a nominal voltage of ***max. 1.5 V***.

1. To supply the analyser the following can be used:
   - ***batteries*** with a nominal voltage of ***1.2 V***
   - ***alkaline cells*** (not a different type) with a nominal voltage of ***1.5 V***.
2. Do not combine various types of supply cells; always ***mount four identical cells***.
3. ***Check the polarity*** of the mounted cells carefully:
   - By inversing polarity, the supply part of the analyser would be damaged.
   - By inversing polarity of one cell, the supply cells would be damaged.

Fig. Correct polarity of the cells

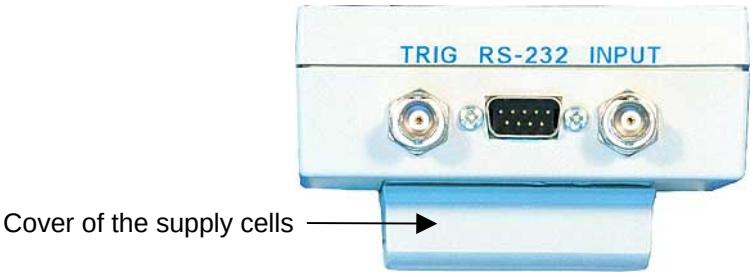

Fig. Position of the cells

Information on the supply cells condition can be obtained by pressing the ***F3*** key – see chapter ***About Instrument.***

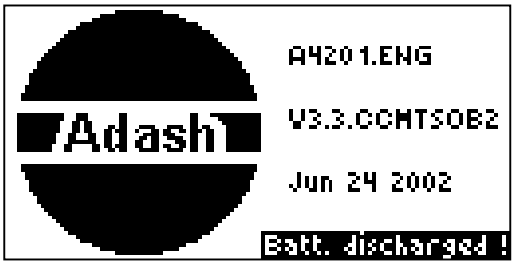

Fig. Signalling of discharged cells

If the supply cells in the analyser are already discharged, this condition is signalled on the lower line of the logo after switching on the instrument. The discharged cells cause a considerably reduced brightness of display backlighting, or its flashing. Switch off the analyser and install charged cells.

Procedure of Supply Cells Replacement

- Switch off the analyser by pressing the combination of the ***SHIFT+START*** keys.
- Release the screw of the supply cells cover.

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- Replace the discharged cells by charged ones; ***pay attention to the correct polarity of each cell***.
- Fix the cover and tighten the screw.
- Switch on the analyser by pressing the ***START*** key.
- By pressing the ***F3*** key, activate the info screen and check the condition of the installed supply cells – see chapter ***About Instrument***.

Connectors

The analyser has three connectors on its upper side to connect signal generators:

Type	***Designation***	***Description***
BNC	INPUT	Connection of the vibration sensor, ICP supply output.
BNC	TRIG	Connection of a trigger generator.
Canon	RS232	Connection of the tachoprobe or a serial communication cable.

Fig. Analyser connectors – single-channel model

Note. If it is a double-channel analyser, INPUT is marked INPUT1 and the ***TRIG input is marked INPUT2*** and serves also for the ***connection of the vibration sensor***. This type of analyser is not equipped with a BNC connector for the connection of a trigger generator, the external synchronization of measurement may only be carried out using a tachoprobe connected to the Canon connector marked RS232. The double-channel version is intended in particular for such users that often carry out two-plane machine balancing.

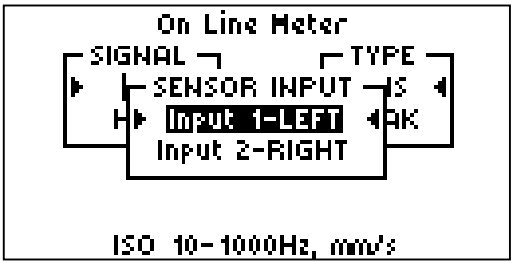

Fig. Selection of the measurement input

With double-channel analysers, before starting any ***new*** measurement, you will be prompted to select the measurement input where measurement should be performed. In case of a ***repeated*** measurement, such prompt is not displayed: measurement is performed at the last selected measurement input.

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Connection of the Vibration Sensor, ICP Supply

The analyser has a ***BNC*** connector on its upper side (see figure in chapter ***Connectors***) marked ***INPUT*** for the connection of the ***acceleration sensor*** (accelerometer, measurement units [m/s^2] or [g]) with the ***ICP supply***. The analyser has its own ICP power supply unit to supply the sensor. The sensitivity of the used sensor and the ICP power ON/OFF can be set up within the configuration – see chapter ***Measurement Setup*** *(*Sensor Setup).

The acceleration sensor enables measurement via 2 + 1 various signal paths – see chapter ***Types of Signal Processing***:

LF	mm/s	via an integrator
HFE	g	directly
BAL	mm/s	via an integrator (balancing).

.

If the sensor is not connected to the external ICP supply unit, ***the internal supply unit of the analyser must be ON.*** Otherwise, an error message will appear on the screen when starting measurement.

In this case interrupt measurement and switch on the internal ICP supply unit – see chapter Measurement Setup.

Overloading of the Analogue Part by the Measured Signal

If a measured signal is carried to the analyser ***INPUT*** (INPUT1 and INPUT2 for the double channel version of the instrument) whose peak exceeds +3 V or –3 V, then the instrument ***is not able to process such signal*** since its input analogue part is overexcited. Measurement is interrupted and the display shows an error message ***OVERLOAD*** – see chapter ***Error Conditions***.

WARNING! It is not overloading signal path that has just been set but overloading input part of the analyser by the supplied signal that cannot be processed on any signal path. The only solution is the use of a ***lower sensitivity vibration sensor***, for instance a sensor with a sensitivity of 100 mV/g can be substituted by another type with a sensitivity of 50 mV/g, or measurement may be carried out using such a measuring instrument that processes a higher amplitude peak range of the input signal.

Switch On and Off

Push the ***START*** button and the analyser ***switches on***. The Adash logo and the base analyser information appear. The battery condition is checked too. The ***main menu*** appears in several seconds.

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Fig. Introductory logo of the analyser

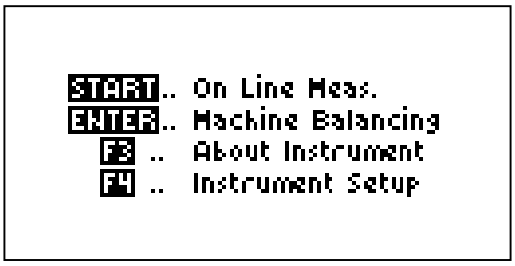

Fig. Main menu of the analyser

Push the ***SHIFT+START*** buttons and the analyser ***switches off***.

New FW Version

From 08/2007 a new FW version is implemented in A4202 instruments. It offers two useful features:

- Via the ***FFT analysis*** item you can measure a balancing spectrum of mm/s and 400 lines in 0-200 Hz frequency band.
- A balancing memory is added and via a new ***Select project*** item you can hold as many as 4 unfinished respectively finished balancing projects at a time.

Fig. New FW version logo

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On Line Measurement (START)

Push the ***START*** button in the main menu and the next ***ON LINE MEAS.*** menu appears. From this menu select desired measurement type.

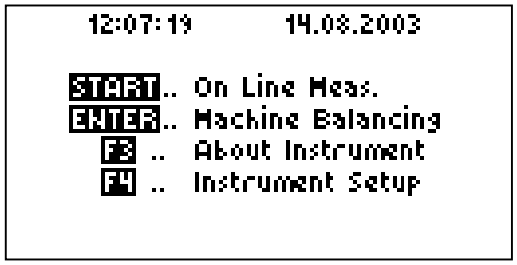

Fig. Main menu of the analyser

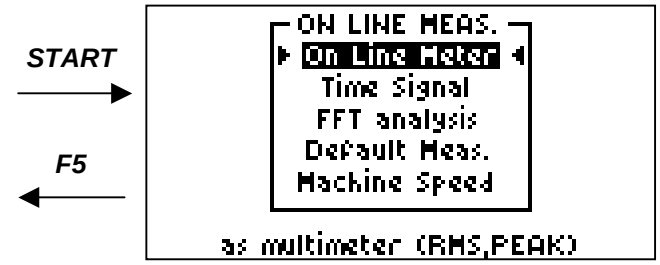

Fig. ON LINE MEAS. menu

On Line Meter
Static value measurement and its display in a numerical and graphical form. The measurement is realized in the highest possible speed.
Time Signal
Measurement and display of time signal.
FFT analysis
Measurement and display of balancing spectrum (mm/s, 400 lines in the 0-200 Hz frequency band).
Default Meas.
The typical set of static measurements will be realized.
Machine Speed
Machine speed measurement with an external probe (e.g. laser tachoprobe).

Use the arrow keys for selection and the ***ENTER*** or ***START*** keys for confirmation. By means of the ***F5*** key you return to the main menu.

On Line Meter

This item is determined for on-line measurement of static value (see chapter ***Static and Dynamic Data***) in real time. From the On Line Meter selection window select, using the ***up/down arrows,*** the requested type of measurement. You can choose from two signal paths (see chapter ***Types of Signal Processing***) and for each signal path the ***TRUE RMS*** or ***TRUE PEAK*** values can be measured. Using the ***right/left arrows,*** move between the ***SIGNAL*** and ***TYPE*** selections. The requested item in the currently active menu is displayed inversely. In the bottom part of the screen the description of the selected type of measurement is always displayed.

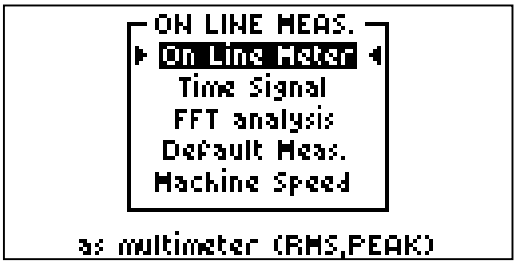

Fig. Activation of the On Line Meter

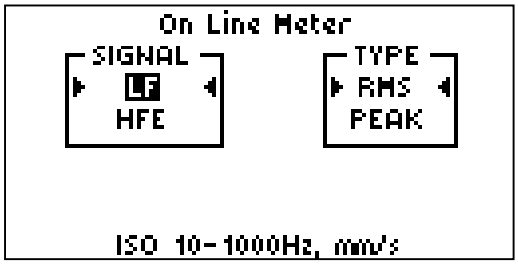

Fig. Selection of the signal path and measured value

Press the ***ENTER*** or ***START*** key to start the measurement. The actual measured value appears in numerical and graphical (bar graph) form. Set the bar graph range in ***Measurement Setup / On-line Bar Range***.

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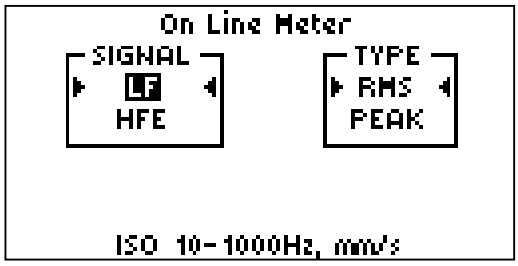


ENTER

F5

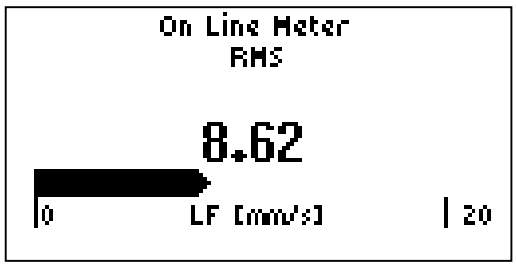


Fig. Selection of the signal path and measured value

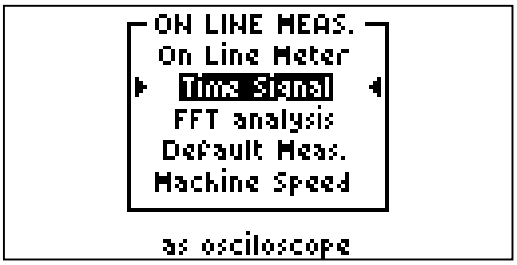
Fig. Display of the measurement result

F5 - escapes from this screen and stops the measurement.
SPACE - starts auto-range.
Note: There is need to push the keys for a longer time, because you must break the measurement, which represents the main analyser task.

One of the following texts may appear over the measured value:
AUTORANGE
Auto-range in process.
RANGE UP
Increasing of input range.
UNDER RANGE
Weak signal amplitude (less the 20% of input range), make auto-range (***SPACE***).

Time Signal

After activating the ***Time Signal*** item in the ***ON LINE MEAS.*** selection window and after selecting a signal path (see chapter ***Types of Signal Processing***), the time signal will be recording.



ENTER

F5

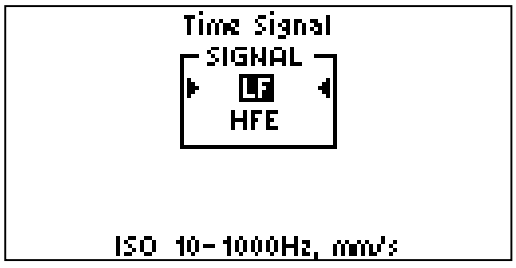
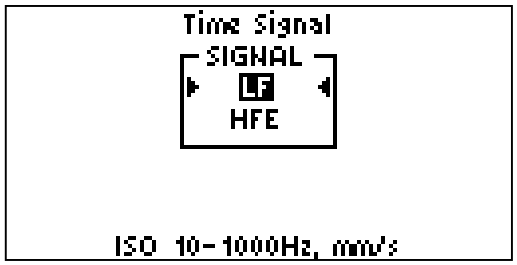


Fig. Activation of the Time Signal

Fig. Selection of the signal path

After validating the signal path by pressing ***START*** or ***ENTER,*** measurement will be started and the measured time record will be displayed.



ENTER

F5

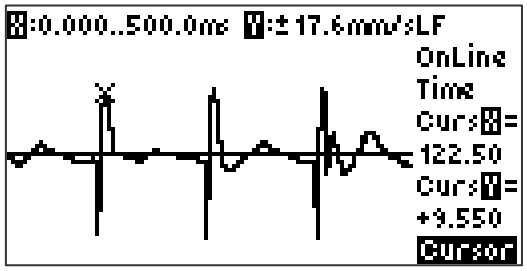


Fig. Selection of the signal path

Fig. Display of the time signal

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X:	axis range (time).
Y:	axis range (amplitude).
LF (HFE)	signal path label.
OnLine	on-line measurement data.
Time	type signal label (Time signal).
CursX	cursor position on the X-axis (the cross on graph).
CursY	signal amplitude of the cursor position sample.
Cursor (Signal)	using the ***SPACE*** key (down in the centre), the functions of the arrows on the keyboard can be changed over. If the ***Cursor*** mode is set, then the arrows move the cursor. If ***Signal*** is displayed, then the ***right/left arrows*** serve to stretch/pack the signal and the ***up/down arrows*** serve to reduce/increase the range on the Y-axis. If the signal is stretched (i.e. you cannot see the entire signal on the screen), then the combinations of ***SHIFT + right arrow*** or ***SHIFT + left arrow*** enable to move the signal on the screen. By pressing ***HOME,*** the cursor moves to the beginning of the signal displayed on the screen. By pressing ***END,*** the cursor moves to the end of the signal displayed on the screen.

START - starts new measurement.
ENTER - escapes to the previous menu (signal path selection).
F5 - escapes to the previous menu (signal path selection).

FFT analysis

After activating the ***FFT analysis*** item in the ***ON LINE MEAS.*** the balancing spectrum will be measured (mm/s, 400 lines in 0-200 Hz frequency band). Try to balance if only one dominant line appears in the spectrum and it is found at machine speed frequency.

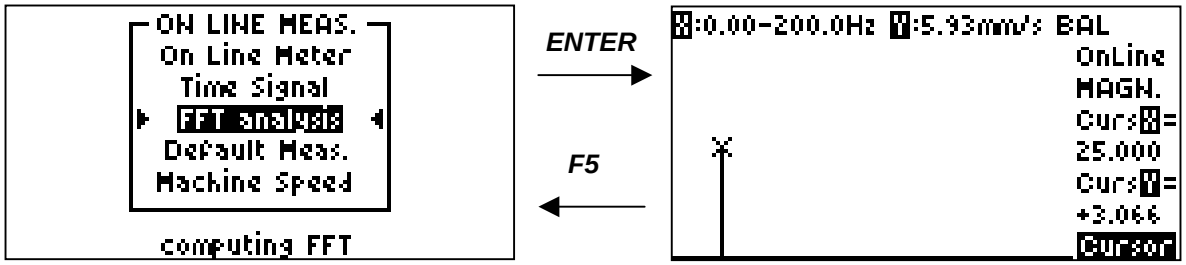

Fig. Activation of the FFT analysis

Fig. Display of a typical balancing spectrum

X:	axis range (frequency).
Y:	axis range (amplitude).
BAL	signal path label.
OnLine	on-line measurement data.
MAGN.	type signal label (magnitude spectrum).
CursX	cursor position on the X-axis (the cross on graph).
CursY	spectrum magnitude of the cursor position line.
Cursor (Signal)	using the ***SPACE*** key (down in the centre), the functions of the arrows on the keyboard can be changed over. If the ***Cursor*** mode is set, then the arrows move the cursor. If ***Signal*** is displayed, then the ***right/left arrows*** serve to stretch/pack the spectrum and the ***up/down arrows*** serve to reduce/increase the range on the Y-axis. If the spectrum is stretched (i.e. you cannot see the entire sspectrum on the screen), then the combinations of ***SHIFT + right arrow*** or ***SHIFT + left arrow*** enable to move the spectrum on the screen. By pressing ***HOME,*** the cursor moves to the beginning of the spectrum displayed on the screen. By pressing ***END,*** the cursor moves to the end of the spectrum displayed on the screen.

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START - starts new measurement.
ENTER - escapes to the previous menu (ON LINE MEAS.).
F5 - escapes to the previous menu (ON LINE MEAS.).

Default Measurements

This type of measurement serves to provide the basic evaluation of static parameters of the measured signal. The ***TRUE RMS*** and ***TRUE PEAK*** values are measured for both signal paths (see chapter ***Types of Signal Processing***) and also the ***Crest factor*** is calculated. From the ***ON LINE MEAS.*** screen select ***Default Meas.,*** press the ***START*** or ***ENTER*** keys and start the entire series of measurement.

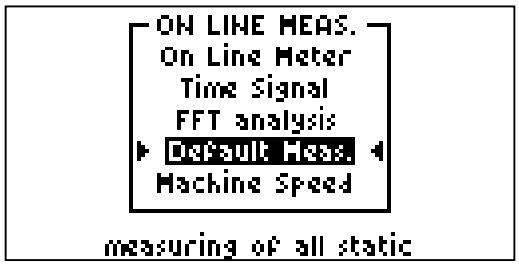

Fig. Activation of the Default Meas.

Results are displayed on two screens. Switch by the ***PgUp/ PgDn*** buttons.

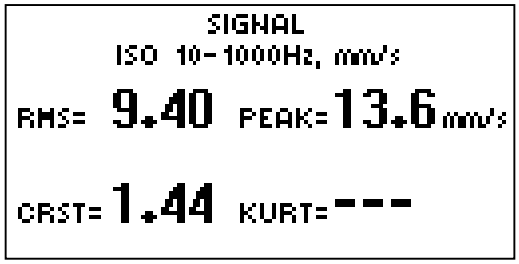

Fig. Display of the Default Meas. – LF

PgUp
PgDn

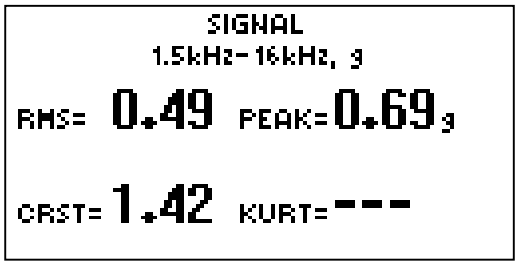

Fig. Display of the Default Meas. - HFE

START - starts new measurement.
ENTER - starts new measurement.
F5 - escapes to the previous menu.

Machine Speed

This item is used for measurement of RPM and CPS.

The tachoprobe is need for the measurement.

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Select ***Machine Speed*** item and real time RPM (or Hz) value appears.

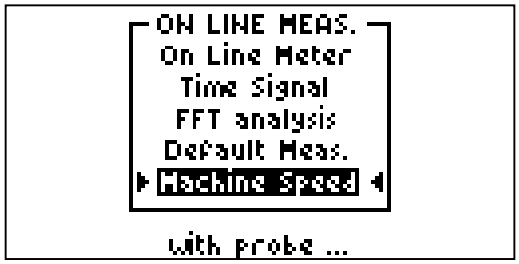

Fig. Activation of the Machine Speed

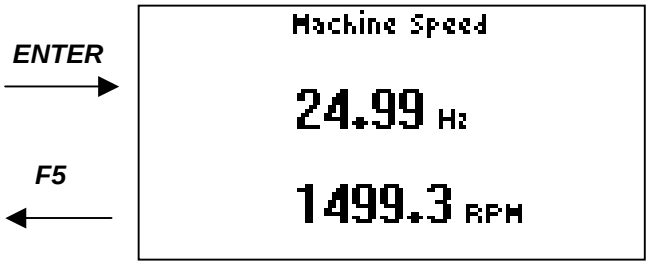

Fig. Display of the Machine Speed

START, ENTER, F5 - escapes to the previous menu.

Connection of the Tachoprobe

The analyser has a ***BNC*** connector on its upper side (see chapter ***Connectors***) marked ***TRIG*** and a ***Canon*** connector marked ***RS232*** to connect the trigger or the tachoprobe – see chapter ***Measurement Setup*** (Trigger - External).

- The ***BNC*** connector (***TRIG***) serves to connect the trigger generator to the TTL level (generally to a minimum level of 0.7 V). They can be pulses synchronizing the beginning of measurement to a certain state of technological process or pulses from the tachoprobe for the machine speed synchronization of measurement.
- The tachoprobe, light or laser, can be connected to the ***Canon*** connector (marked ***RS232***) for the measurement of RPM and for the machine speed synchronization of measurement.

The analyser is equipped with an internal supply unit for both the optical and laser probe, carrying the supply voltage automatically to the RS232 connector ***upon starting*** the selected measurement.

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Machine Balancing (ENTER)

If your instrument includes software for field balancing, then you have powerful tool. In simply way you can keep your machines in good condition. We suppose in next text, what the machine problem, which causes vibrations is unbalance.

If you try to remove vibrations by balancing and the machine problem is nor unbalance, you will not be successful.

The theory of balancing is not described in this manual. Use another publications to study this branch. Request the application note on balancing from your supplier or directly from the manufacturer Adash CZ.

The process of balancing is based on the order analysis measurement and the following rules apply:
- The signal path does not have to be selected (see chapter ***Types of Signal Processing***), all amplitude measurements when balancing are performed in ***mm/s*** via a special filter (signal path).
- The measured phases are displayed in angle degrees [deg].
- The calculated weight masses are displayed in grams; enter the mass of the trial weight in the same unit.

All the measurements in the balancing module require the tachoprobe to be connected – see chapter Machine Speed. Use a sensor with the sensitivity of 500 mV/g for balancing on any speed under 10 Hz (600 RPM). The standard accelerometer (100mV/g) has too low sensitivity on these frequencies.

The standard instrument of 4200 series is intended for the balancing of machines with speed from ***180 to 12,000 RPM***. The process of balancing can be carried out in several steps since the balancing data are stored in the memory and the instrument can be switched off during the balancing process after completing any step.

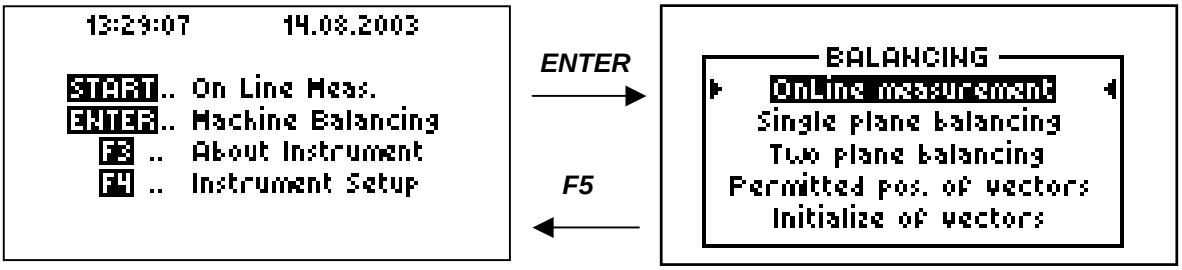

Fig. Main menu of the analyser

Fig. BALANCING menu

Push the ***ENTER*** key in the main menu and select desired type of process.

OnLine measurement	real time amplitude and phase measurement at machine speed frequency.
Single plane balancing	balancing in one plane only.
Two plane balancing	balancing in two planes.
Permitted pos. of vectors	dividing the correction mass into two components on desired angle positions.
Initialize of vectors	clear whole balancing memory.

Prior to activating the Machine Balancing menu, set a suitable frequency resolution in respect of the balanced machine speed – see chapter Measurement Parameters Setup. Consider whether it is necessary to average measurements and set the minimum value of the Averaging parameter – see chapter Measurement Parameters Setup.

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OnLine Measurement

It enables real time amplitude and phase measurement at machine speed frequency. The beep labels every new measurement.

By measuring, find the point and direction where vibrations at the machine speed frequency are the strongest. Position the vibration sensor(s) for the process of balancing at such point.

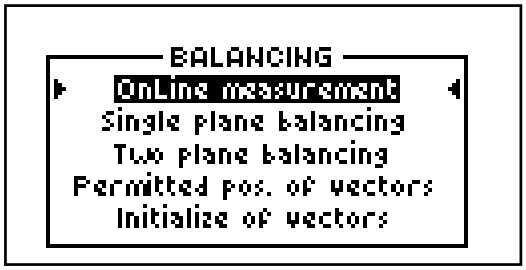

Fig. Activation of the OnLine measurement

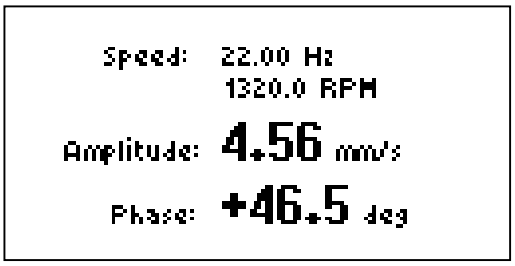

Fig. Display of the OnLine measurement

Prior to any balancing, it is advisable to perform on-line measurement and check the measured values stability. An unstable phase also with the narrowest possible set frequency resolution indicates that the vibration problem is probably not due to unbalance.

Single Plane Balancing

Prior to balancing, initiate vectors and on-line measurement – see chapters ***OnLine Measurement*** and ***Initialization of Vectors***.

The single plane balancing is carried out in three steps:

1st RUN	measurement on the rotor in the initial, i.e. expected unbalanced condition
T. MASS	adding a trial weight with a defined mass
2nd RUN	measurement with the trial mass.

Having carried out these three steps, the balance algorithm calculates the correction of mass and position of the final correction weight. The last step ***TEST*** is the control measurement of balancing success.

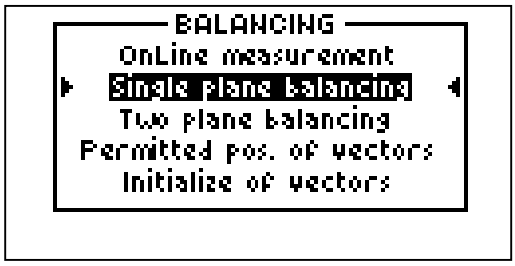

Fig. Activation of the Single plane balancing

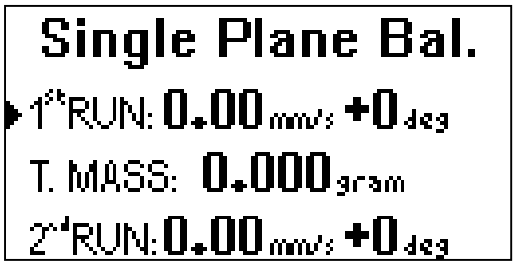

Fig. Three steps of the balancing

The instrument control in the balancing is very simple. From the ***BALANCING*** menu select ***Single plane balancing*** and press the ***ENTER*** key. The first screen will offer the measurement options in three steps, the second screen will show the calculated corrections and results of the test run. The screens are changed over using the ***PgUp / PgDn*** keys. The individual steps are selected using the ***up / down arrows,*** which set the indicator (on the left of the screen) to the requested step.

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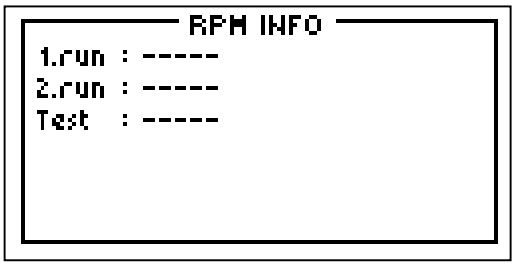
By pressing the START key, measurement or calculation is started.
By pressing ***ENTER,*** the measured amplitude and phase are entered manually as if these were measured by an instrument in the relative step of balancing – see chapter ***Balancing Calculator.***



The entire process of balancing should run at ***stable RPM*** of the balanced machine. By pressing ***F1,*** after performing any step of balancing, activate the screen displaying information at what real time machine speed the individual steps of the balancing process were running.

Fig. Information on the machine speed during the balancing (***F1***)

The analyser can be switched off any time during the process of balancing after completing any of the above steps. After the analyser is switched on again, all the measurement and calculation results from the previous steps are maintained.

A special section in the memory is allocated to the balancing data, which continuously stores the last measured and calculated data.

Procedure of the Single Plane Balancing

1. Mount the vibration sensor to the bearing housing in the direction where vibrations are strongest (at the machine speed frequency) and connect the tachoprobe.
2. Switch on the analyser and in the main menu press ***ENTER – Machine Balancing***.
3. If the balancing is to be started, initiate vectors – see chapter ***Initialization of Vectors***.
4. Activate the OnLine measurement function and check the stability of the measured values – see chapter ***OnLine Measurement***.
5. Activate the ***Single plane balancing*** function – activate the first balancing screen with three steps.
6. Using the ***up/down arrows***, set the indicator (arrow) on the left of the screen to the ***1st RUN*** and run by pressing ***START***.
7. Mount the trial weight to the rotor and enter its mass in gr. in the ***T. MASS*** step (set the indicator to the correct point, press ***ENTER*** and you will be prompted to enter the trial mass, enter the value and validate by pressing ***ENTER***).
8. Set the indicator to the ***2nd RUN*** and perform the measurement with the trial mass.
9. The second screen will display the calculated corrections of weight and angle.The angle is expressed in relation ***to the position of the trial mass***. For instance, the value of +29° means that the final weight must be placed by 29° ***further*** than the trial mass. ***The + sign used with the angle value always indicates the movement in the direction of the rotor rotation.***
10. ***Mark the position of the trial mass as 0° and remove the trial mass!***
11. Position the calculated weight to the calculated position (angle).
12. Verify your success performing a test measurement in the ***TEST RUN*** step.
13. If the success rate is too low, run the „TRIM“ measurement in which the program will calculate ***another*** correction weight and the angle of its position based on the test measurement. All the data are related to the original position of the trial mass. ***Previously positioned weights are not removed now!***
14. Repeat steps 12 and 13 until the complete balance is reached.

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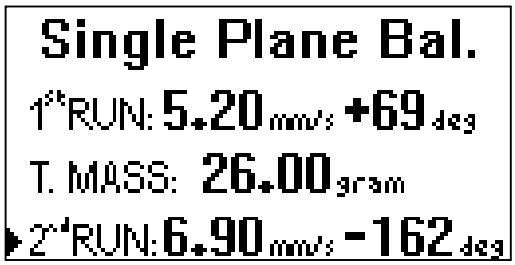

Fig. Three steps performed

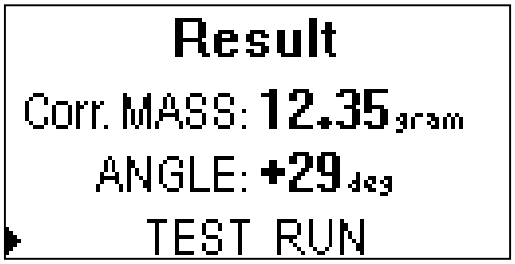

Fig. Display of the calculated results, TEST RUN is ready

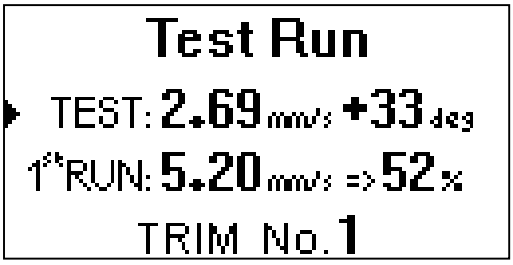

Fig. ***TEST RUN*** step performed

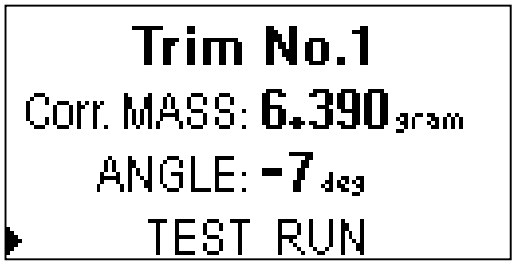

Fig. Calculation of the first „TRIM“

Several Basic Recommendations in Case of a Low Success Rate

- Check the connection and the correct function of the vibration sensor and tachoprobe.
- Perform OnLine Measurement in the balancing mode and check the amplitude and phase stability.
- If no improvement is reached by repeated balancing, then the problem is usually not in the unbalance and your efforts are vain.
- Pay attention to the amount of total additional mass you are adding to the rotor because this may itself cause problems.

Two Plane Balancing

Prior to balancing, initiate vectors and on-line measurement – see chaptors ***OnLine Measurement*** and ***Initialization of Vectors***.

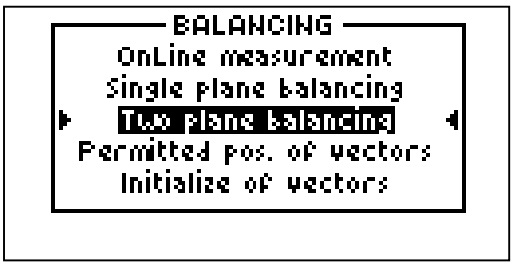

Fig. Activation of the Two plane balancing

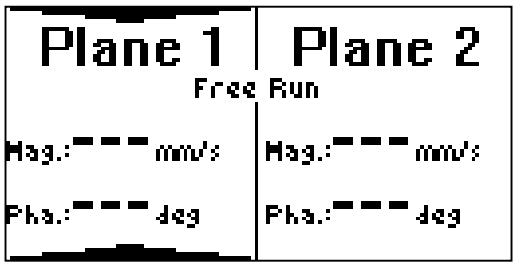

Fig. The first screen of the balancing

If you have a ***double-channel*** instrument**,** after activating the Two Plane Balancing menu, you can select whether you will balance using one or both the input channels of the analyser. In case of two plane balancing with a single vibration sensor, remount the sensor during the process of balancing according to the plane in which you are measuring. When balancing using two sensors, the process of two plane balancing becomes considerably faster.

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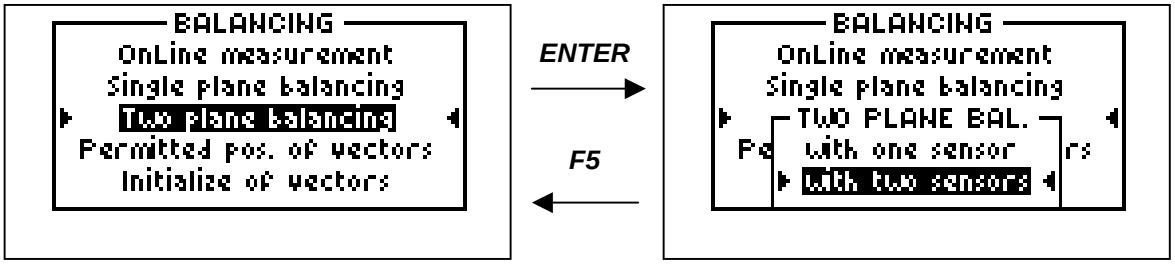
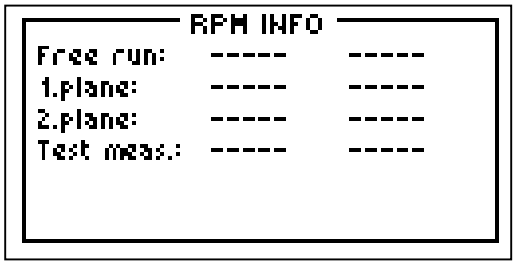


Fig. Activation of the Two Plane Balancing menu Fig. Balancing with two sensors

The procedure of two plane balancing is very similar to the single plane balancing; only more measurements must be performed. Select measurement locations as near each plane as it is possible and mount the sensor(s). For the measurement in plane 1 and 2 usually select bearing housings closest to the individual planes. The whole process of balancing is controlled by the instrument using several screens, whose content will be described later. Each screen is divided into two parts. The left part contains data from plane one, the right part is for plane two. On the screen under the plane number there is always the description of the step that is being performed. The measurement is run by pressing the ***START*** key. By pressing ***ENTER,*** the measured amplitude and phase are entered manually as if these were measured by an instrument in the relative step of balancing – see chapter ***Balancing Calculator.***
The arrow (indicator) showing the active plane is changed by pressing the ***left/right arrows***. Move between the screens by pressing the ***PgUp/PgDn*** keys.



The entire process of balancing should run at ***stable RPM*** of the balanced machine. By pressing ***F1,*** after performing any step of balancing, activate the screen displaying information at what real time machine speed the individual steps of the balancing process were running.

Fig. Information on the machine speed during the balancing (***F1***)

The process of balancing may be terminated after completing either step by pressing the ***F5*** key or by switching off the instrument. Until the ***Initialization of Vectors*** command is executed, the measured and calculated data remain in the instrument and can be recalled any time.

The first screen displays the measurement results of the ***Free Run*** (in original machine condition) in both the planes without any trial mass.

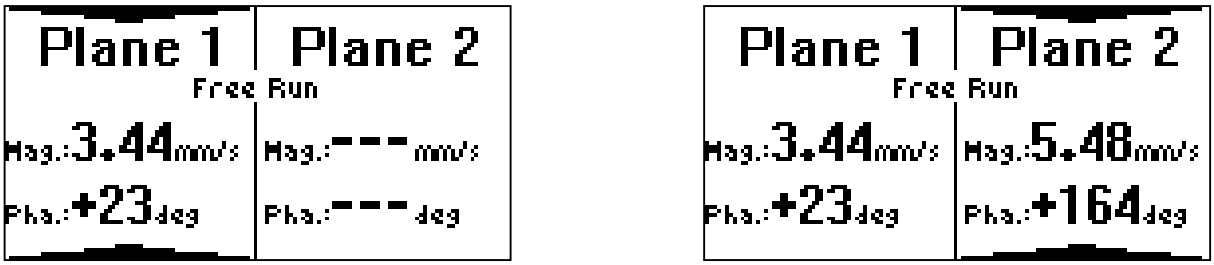


Fig. The measurement without any trial mass

The next step is the positioning of the ***trial mass in plane 1 and the designation of its positon as 0°*** since the results of further measurements are related to this original position of the trial mass.
Then the measurement is done with a trial mass in plane 1. There are two measurements to make: one measurement in plane 1 and another in plane 2. The results are displayed on the following screen.

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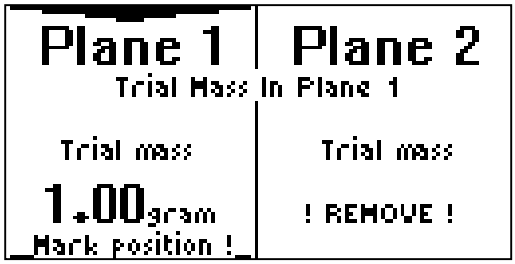

Fig. The positioning of the trial mass in plane 1

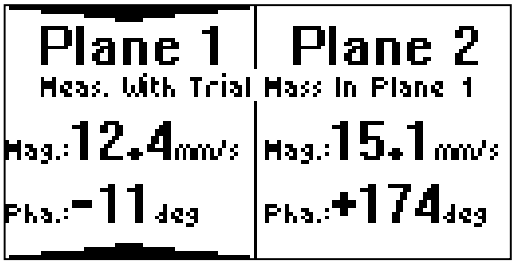

Fig. Measurement with the trial mass in plane 1

Remove the trial mass from plane 1 and in the same way perform measurement with the trial mass in plane 2.

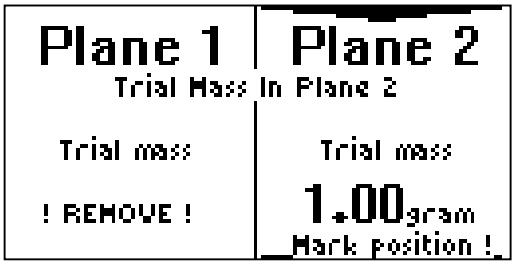

Fig. The positioning of the trial mass in plane 2

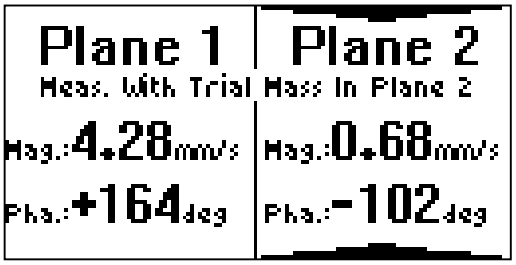

Fig. Measurement with the trial mass in plane 2

Now the calculated measurement results are displayed for the position of the correction weights for both the planes. The sense is the same as in single plane balancing; the angles are calculated from the marked positions of trial masses. Positive angles are in the direction of rotation, negative angles are contrary to the direction of rotation.

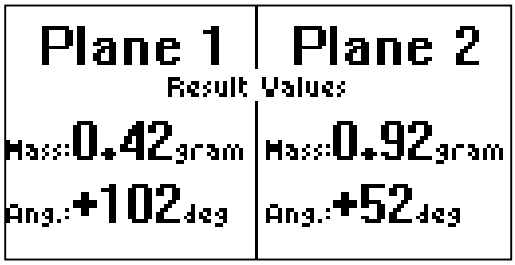

Fig. The calculated measurement results

Remove the trial mass and place the correction weights to the correct positions.
Having performed the calculated balancing, test measurements can be carried out and, based on the measured results, „TRIM“ measurement can be run to achieve the requested values of balance.

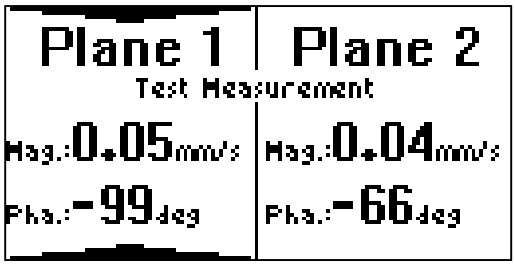

Fig. Results of the test measurement

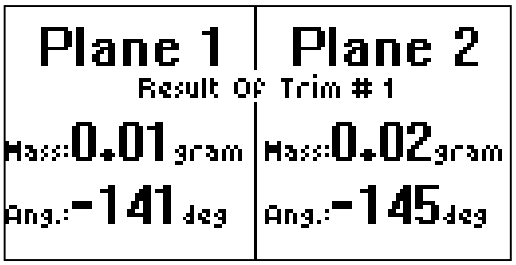

Fig. Results of the Trim #1

Plane 1 - the 1st RUN 3.44 mm/s, test measurement 0.05 mm/s
Plane 2 - the 1st RUN 5.48 mm/s, test measurement 0.04 mm/s

Attach the correction masses according to the same sign convention as before.
Note: The angle is with respect to the original positions of the trial masses and ***NOT*** with respect to the location of the correction masses.

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Once you have added the additional correction masses (do not remove the original correction mass or masses), press ***PgDn*** and ***START*** to make an additional trim test run. The trim program is now in a loop. You may repeat this trim a total of 40 times in order to achieve the success you require.

Permitted Position of Vectors

If the weight cannot be positioned to the requested angle, its mass must be divided in two parts and such parts must be positioned wherever possible. A practical example is the balancing of a ventilator where the weight can only be positioned on its rotor blades.

After activating this function, enter the requested weight mass (press ***ENTER***, enter the weight mass in gr., press ***ENTER***). Using the ***up/down arrows,*** set the indicator on the left of the screen to the next requested item and in the same way enter the angle in degrees and further the angles of two planes between which the requested position is located. In the lower part of the screen the final masses will be calculated immediately.

Note*:* The angles are entered in the absolute value, thus the 0° position ***does not have*** to necessarily correspond to the position of the trial mass but ***it can be selected,*** for instance, according to the dimensioning in the balanced rotor drawing.

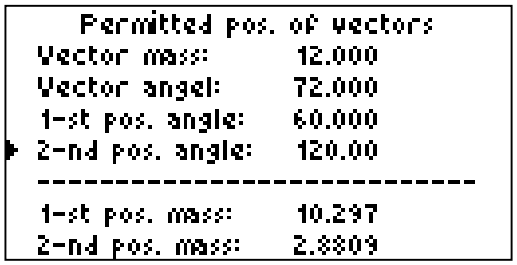

Fig. Result of the vector distribution

Initialization of Vectors

By activating this function, all the measured data in the balance memory (for planes 1 and 2) will be erased. This operation should always precede any ***new*** balancing.

Until the function is activated, the measured and calculated data remain in the analyser memory, also after switching off the analyser. After switching on the analyser again, you can continue the already started process of balancing from the point where it had been interrupted.

Balancing Calculator

After activating the Single Plane or Two Plane Balancing menus, the analyser can work in three modes:

- balancing analyser;
- balancing calculator;
- combination of both the modes during a single process of balancing.

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The instrument works in the default balancing analyser mode, as described in the previous chapters, when individual measurements during the process of balancing are started by pressing ***START***. Once you start the process of balancing by pressing ***ENTER***, measurement will not be started but you will be prompted to enter the values of amplitude and phase from the analyser keyboard. The data you enter will be included in the process of balancing as if measured by the analyser. The whole process of balancing, including the calculation of correction masses, can be simulated without starting any single real time measurement.

The balancing calculator mode is intended for advanced users who are confident about the theory of the balancing process. If the response of the balanced machine in certain balancing conditions is known for the defined trial weight, then the whole process of balancing can be shortened by entering appropriate data from the analyser keyboard without performing a real time measurement at the machine, performing only the necessary measurements.

After pressing ***ENTER,*** you will be prompted to enter the amplitude value. After entering the value, press ***ENTER*** and you will be prompted to enter the phase size. After entering the phase size, press ***ENTER*** again and both the values will be accepted and included in the calculation of balancing.

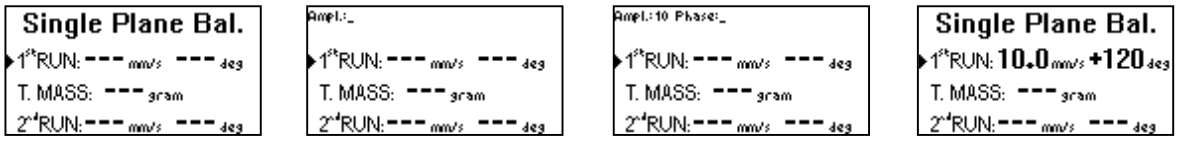

Fig. Entry of amplitude and phase of the first run of single plane balancing from the analyser keyboard

Select project

If ***Select project*** item appears in the BALANCING menu, the balancing memory has been added in your instrument and you can hold a number of unfinished respectively finished balancing projects at a time. A standard instrument of Adash 4100 or 4200 series does not offer the feature and holds only one balancing project in its balancing memory (that is both data of one two plane balancing and data of one single plane balancing).
Now A4202 instrument offers the feature and it holds as many as 4 unfinished respectively finished balancing projects at a time (that is as many as 4 two plane balancing and 4 single plane balancing).

If you use a number of balancing project do not forget to check a correct project number after the BALANCING menu is entered. The project number is displayed on the top line. Use ***Select project*** item to change the number. If the instrument is turned on it use the last used project number.

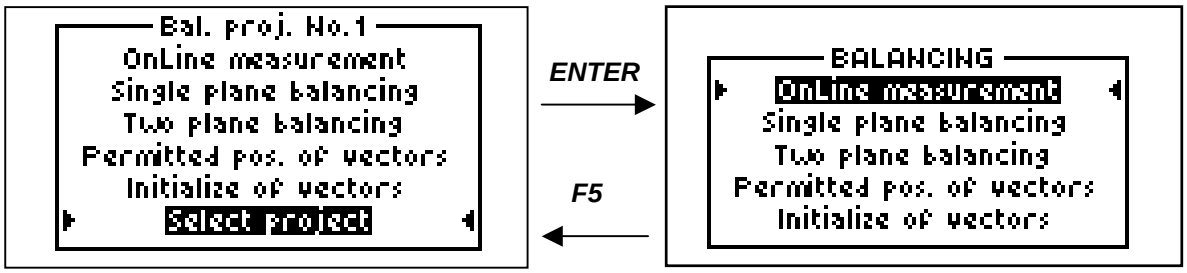

Fig. ***Select project*** item is offered

Fig. Instrument holds only one project

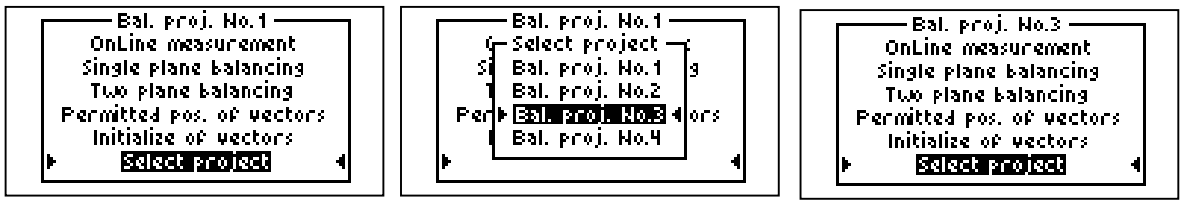

Fig. Change of balancing project number

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About Instrument (F3)

The ***F3*** key (About Instrument) may be pressed any time. A screen will appear containing the most important data on the current condition of the instrument.

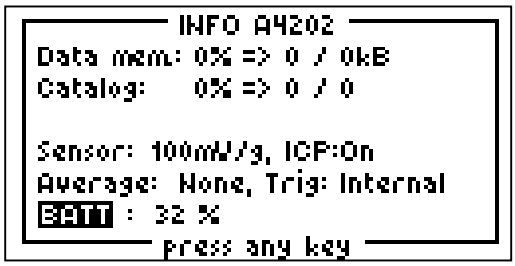

Fig. About instrument (***F3***)

Data mem - Current fill of the measurement memory. The Adash 4202 instrument is not equipped with any memory for measured data.
Catalog - Current fill of the memory for the measurements.
Sensor - Set sensitivity of the sensor for measurement – see chapter ***Measurement Setup***.
ICP - Condition of the sensor supply – see chapter ***Measurement Setup.***
Average - Set number of averages – see chapter ***Measurement Setup.***
Trig - Set type of measurement triggering – see chapter ***Measurement Setup***.
BATT - Condition of batteries (100 % means fully charged cells, 0% signals completely discharged cells).

By pressing ***any key,*** return to the screen from which you pressed ***F3***.

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Instrument Setup (F4)

By activating the ***F4 key - Instrument Setup*** item in the main menu, a menu ***CONFIG*** will appear from which you can set the basic characteristics of the instrument setup.

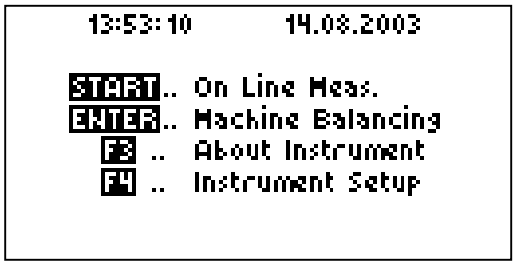

Fig. Main menu of the analyser

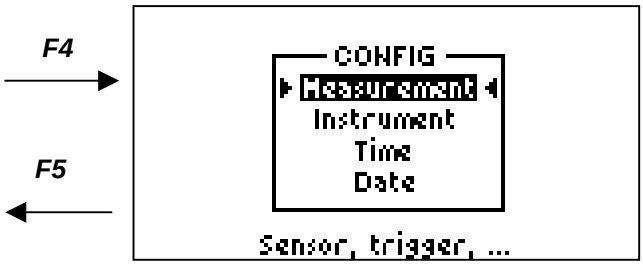

Fig. CONFIG menu

Measurement Setup

By activating the ***Measurement*** item in the CONFIG setup menu the ***MEASUR. SETUP*** menu will appear.

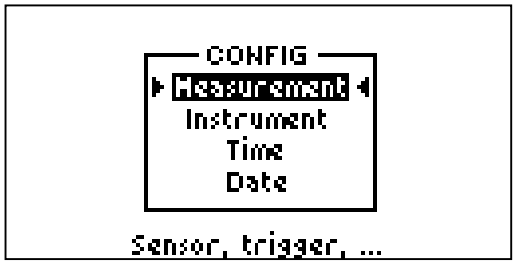

Fig. Measurement setup

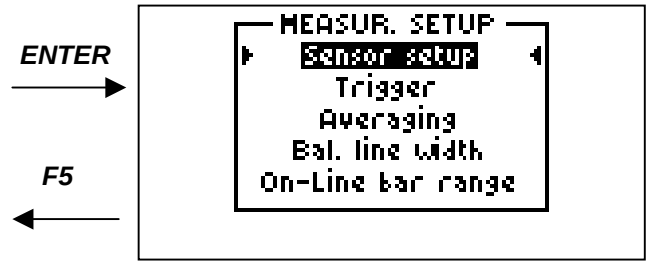

Fig. List of measurement parameters

Sensor Setup

Setting of the sensor sensitivity and its ICP powering.

For a common vibration measurement with the ICP supplied sensor, the ICP supply must be ON.

Each parameter can be selected using the ***up/down arrows;*** by pressing ***ENTER***, move to the setting screen, set the parameter to the requested value and validate by pressing ***ENTER***. By pressing ***F5,*** leave the setting screen without validating any changes.

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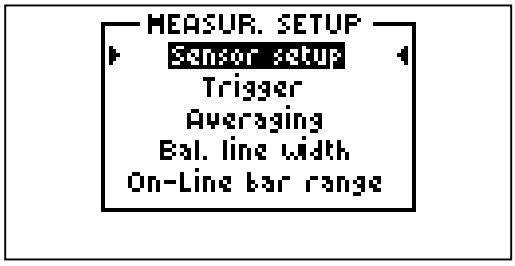


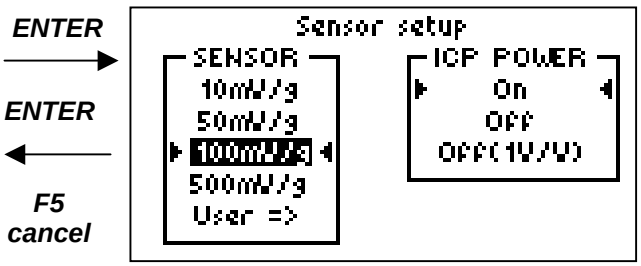


Fig. Sensor setup

Fig. Setting of the sensor sensitivity and its ICP powering

If you analyze the voltage signal (without any sensor), activate the ***Off (1V/1V)*** item.

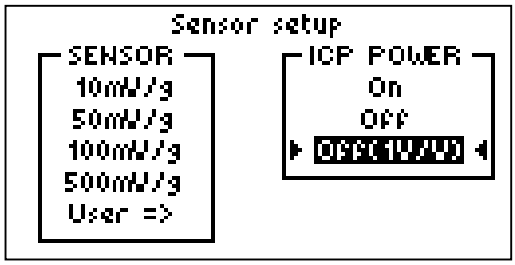


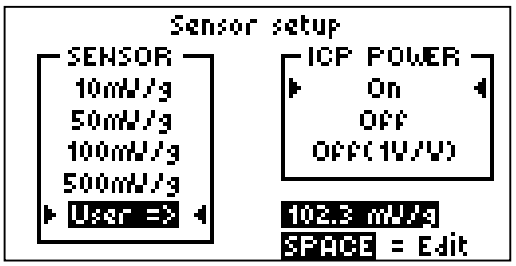
Fig. Voltage signal analysis setting

If the ***analysis of a voltage signal from the generator*** is requested (***without the connected vibration sensor)***, then switch off the ICP power. If Off (1V/1V) is active, the set sensitivity of the sensor will be ignored and all the measurement results will be displayed and stored in volts.

After finishing this measurement, do not forget to switch the ICP power ON!

User Selection of the Sensor Sensitivity

If the vibration sensor is connected to the analyser and accompanied by a calibration certificate from the manufacturer, then it is advisable to introduce this sensitivity value to the ***User*** (selection) item and set this item as active. If, for instance, a sensor having a nominal sensitivity of 100 mV/g with an effective sensitivity of 102.3 mV/g is used, then the following setting can be performed (see fig.):



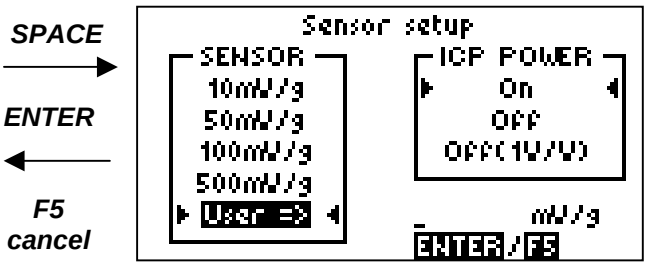


Fig. User selection of the sensor sensitivity

Fig. Editing of the User selection item

Trigger

The trigger source may be set as:

- ***Internal*** (by pushing the ***START*** key).
- ***Key*** (the 1st pushing of the ***START*** key starts the set of measurement condition, the 2nd pushing of the ***START*** key starts the measurement).
- ***External*** (e.g. tachoprobe pulses).

This setting has no impact on the measurements that require external triggering (e.g. machine balancing).

Each measurement can be externally synchronized as follows:
- from the trigger generator, connected to the ***TRIG*** input
- from the tachoprobe, connected to the ***RS232*** input.

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Retrig is used if time signal is measured on-line. In that case, selecting ***Yes,*** it is not necessary to retrig new measurements by pressing the ***START*** key. After completing the measurement and after displaying the result, another measurement is triggered automatically.

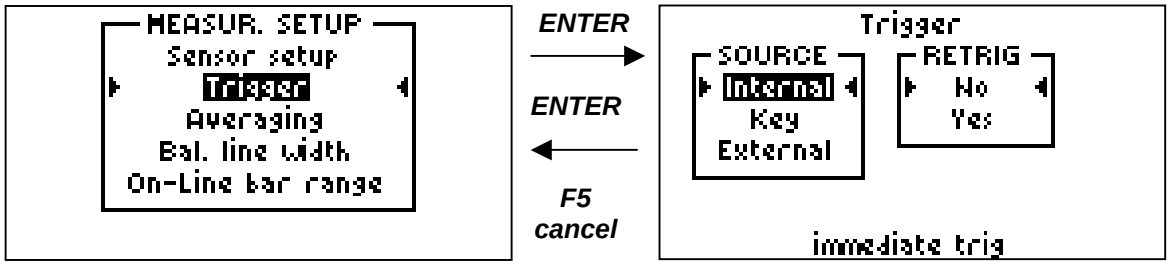

Fig. Activation of the Trigger

Fig. Selection of the Trigger

Averaging

Setting of a number of the averages. This setting affects all the measurements (with the exception of Default Meas. - see chapter Default Measurements).

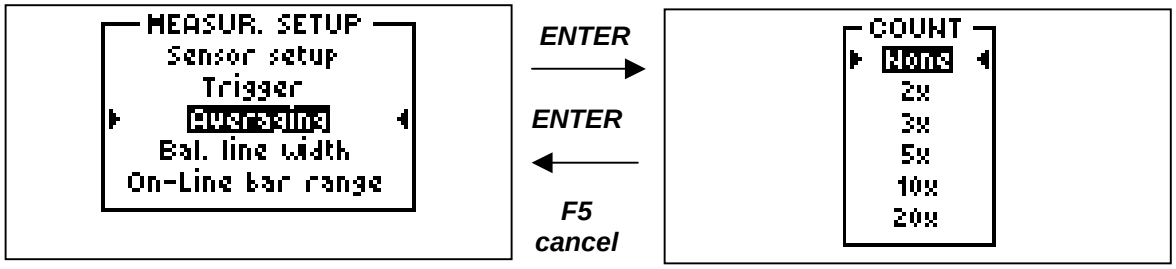

Fig. Activation of the Averaging

Fig. Selection of the number

Balancing Line Width

The parameter serves to set frequency resolution in balancing.

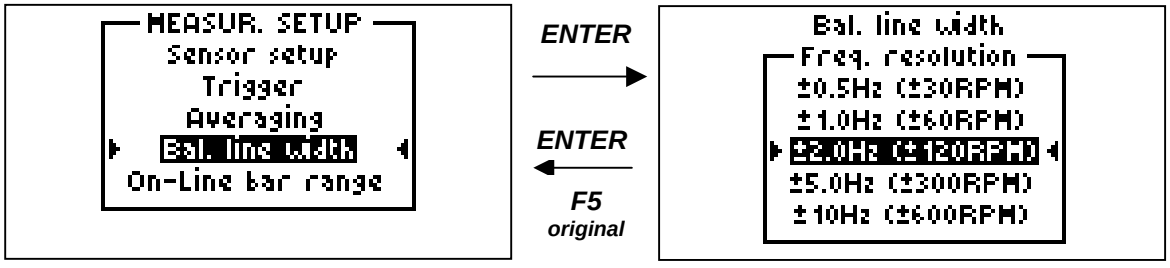

Fig. Activation of the Bal. line width

Fig. Frequency resolution Setup

If balancing is performed at a set whose individual parts rotate in ***irregular but close*** RPM, it is necessary to set a ***sufficiently low*** frequency resolution of measurement so that the influence of both close speed frequencies can be clearly separated and correct results are achieved.

If you select an insufficient frequency resolution, measurement will be unnecessarily long. If the measured phase is unstable, frequency resolution must be restrict.

A reduction in the frequency resolution will cause:

- stability of the measured phase, which is an unnecessary condition to start the balancing of the measured machine

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- reduction in the requested value of the minimum machine speed at which balancing is still possible
- extension of time of each balancing measurement.

Frequency resolution		***Minimum machine speed***	
[Hz]	***[RPM]***	***[Hz]***	***[RPM]***
±0.5	±30	3	180
±1	±60	6	360
±2	±120	12	720
±5	±300	30	1800
±10	±600	60	3600

On-Line Bar Range

When measuring static values in the On-Line Meter mode, the measurement result is displayed numerically and graphically. The graphical display has the character of a bar graph, whose length corresponds to the measured value. The range (maximum) of the bar graph of each signal path can be set up individually.

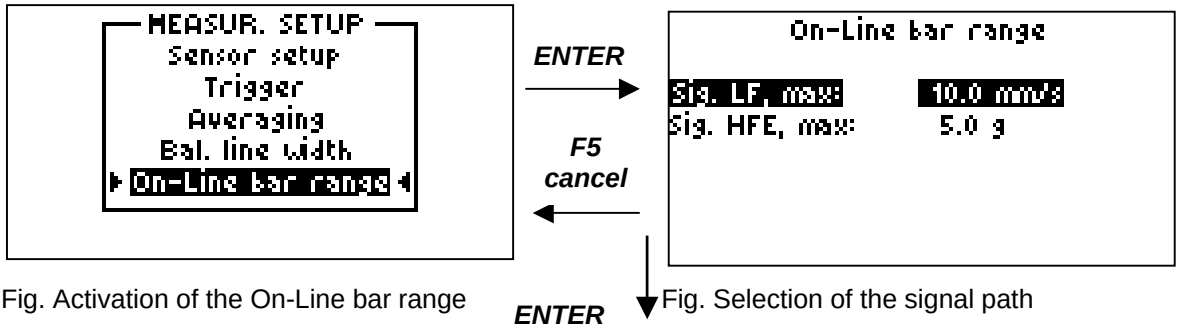

Fig. Activation of the On-Line bar range

Fig. Selection of the signal path

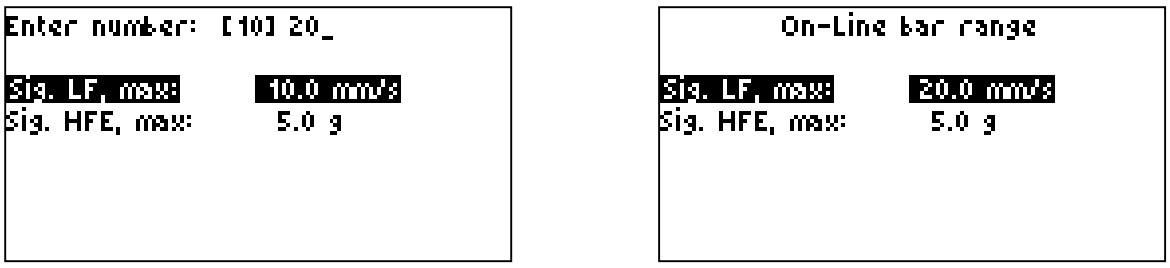

Fig. New range limit input

Instrument Setup

By activating the ***Instrument*** item in the ***CONFIG*** menu and by pressing the ***ENTER*** key, a menu will appear from which you can set the basic characteristics of the display and the function of auto power off (see the note below).

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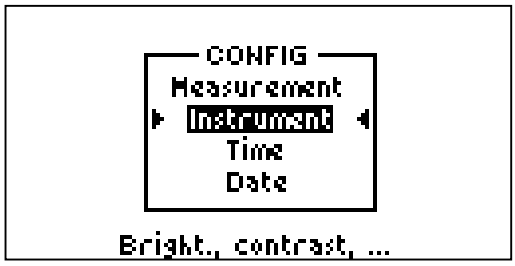


Fig. Instrument setup

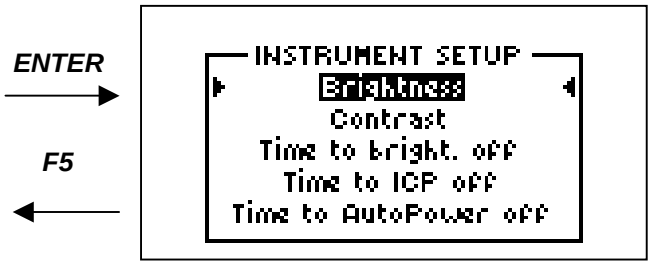
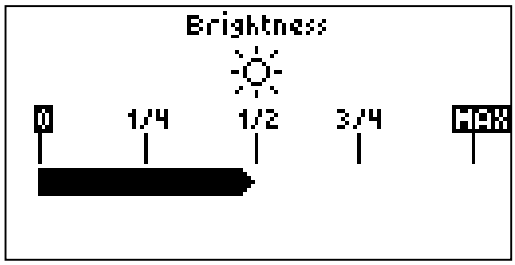


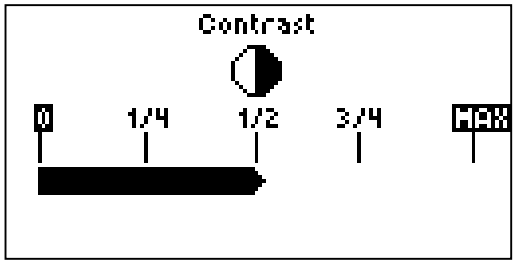
Fig. List of instrument parameters

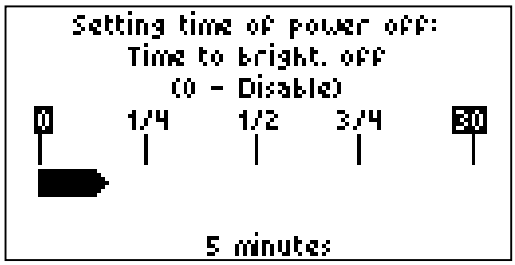
Each parameter can be selected using the ***up/down arrows;*** by pressing ***ENTER***, move to the setting screen. From the setting screen, using the ***left/right arrows,*** set the displayed bar graph to the requested value and validate by pressing ***ENTER***. By pressing ***F5,*** leave the setting screen without validating any changes.

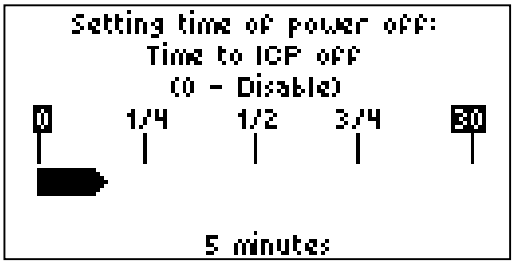
Brightness	- sets display brightness.
Contrast	- sets display contrast.
Time to brightness off	- sets a period of time from the last use of the keyboard after which the backlighting switches off.
Time to ICP off	- sets a period of time for the sensor ICP power off from the last measurement.
Time to AutoPower off	- sets a period of time for the instrument power off from the last use of keyboard.

Note: The periods are indicated in minutes and are only indicative. The display backlighting, ICP supply and entire device power off when no measurement is being carried out, saves the supply cells.









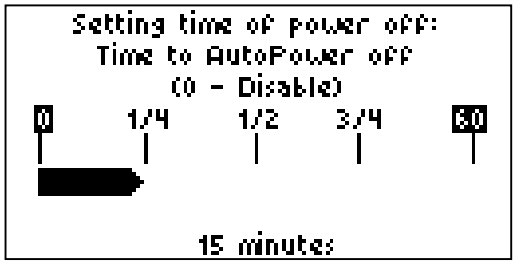


Fig. Display of the settings

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Time and Date Setup

The last two items of the menu are intended for a correct time and date setting. The instrument is equipped with its own clock and each route measurement is assigned its time, which is stored in the database along with the measurement results after uploading the measured data to the PC.

The setting is very simple. After activating the relative functions using the ***up/down arrows*** and after pressing ***ENTER,*** the current date or time appear on the display. Using the ***left/right arrows,*** move to the individual date digits on the line, which can be changed to the requested value by pressing the corresponding numerical key. Validate the setting of the entire line by pressing ***ENTER***. By pressing ***F5***, leave the setting screen without changing any parameter.

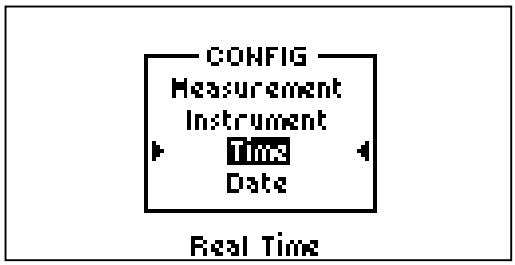

Fig. Activation of the Time

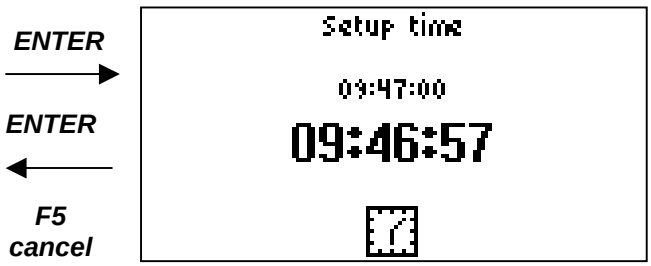

Fig. Time setup

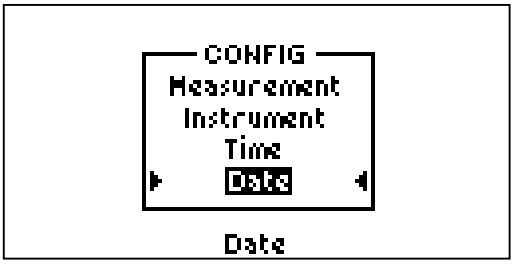

Fig. Activation of the Date

Fig. Date setup

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Error Conditions

If an unexpected situation occurs during the work with the analyser, refer to this chapter.

Weak Display Backlighting

By pressing the ***F3*** key**,** activate the Info screen (see chapter ***About Instrument***) and check the condition of the supply cells. Value BATT: 100% signals fully charged cells, value BATT: 0% means fully discharged cells.

- If the cells are discharged, replace them – see chapter ***Analyser Supply***.
- If the cells are not discharged, increase the intensity of display backlighting – see chapter ***Instrument Setup*** (Brightness, Contrast).

ICP Supply Errors

The internal ICP supply unit of the analyser should be ON during measurement – see chapters ***Connection of the Vibration Sensor, ICP Supply*** and ***Measurement Setup***.

ICP Power is Off Warning

If the *ICP power is off* message appears on the display, do not continue measuring. By repeated pressing of ***F5***, return to the main menu of the analyser. Continue measuring only if analysing voltage signal from the generator without any sensor – see chapter ***Measurement Setup*** – Sensor setup.

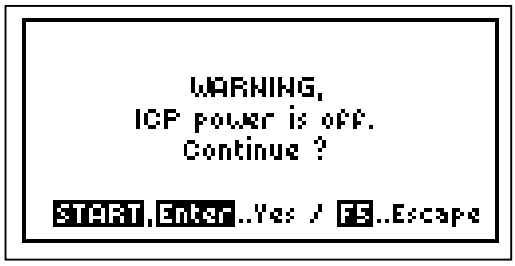

Fig. ICP power is off warning

By pressing the ***F4*** key from the main menu of the analyser, activate the ***CONFIG*** menu – see chapter ***Measurement Setup.*** Select ***Sensor setup*** and check whether the ICP power is ON.

ICP Sensor Error

If the ICP sensor error appears on the display, do not continue measuring. Check whether the vibration sensor is correctly connected to the input connector marked ***INPUT***. Check the connection cable (interrupted or short-circuited), try to connect another sensor.

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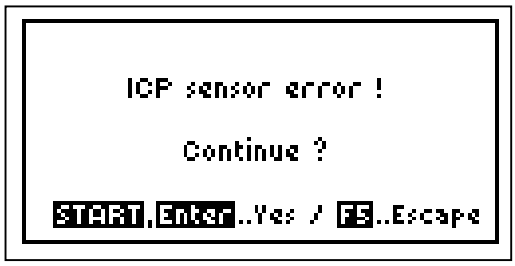

Fig. ICP sensor error

The error usually signals:

- The sensor is not connected or the connection cable is interrupted.
- The connection cable is short-circuited.
- Defective sensor.
- Analyser error.

No Signal from Trigger Input

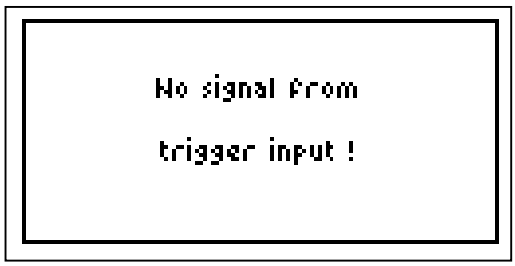

Fig. Trigger pulse timeout

Check the following points:

1. A trigger generator is connected to the BNC connector marked ***TRIG*** or a tachoprobe is connected to the Canon connector marked ***RS232.***
2. Sync. pulses are present on the analyser input.
3. If you do not require synchronization, cancel the selection Trigger, ***SOURCE -> External*** – see chapter ***Measurement Setup***.

The following measurements require external synchronization via tachoprobe:
- all the measurements from the balancing module.

For these measurements you ***have to connect the tachoprobe;*** the setting of the ***Trigger*** parameter is not important.

The following measurements require external synchronization:
- averaged time signal.

For these measurements, you ***have to connect the trigger*** and to set the ***Trigger*** parameter to ***SOURCE -> External***.

Measurement Failed

Check the following points:

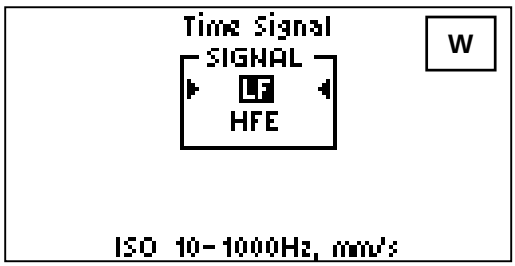

Fig. Measurement failed

1. There is the ***W*** sign in the upper right corner of the screen, which means that the Trigger parameter is set: ***SOURCE -> Key.***
2. By pressing any key, start measurement.
3. If you do not require the manual starting of measurements, then press the ***F4*** key from the main analyser menu, select the ***Measurement*** parameters and validate by pressing ***ENTER***. Select ***Trigger,*** press ***ENTER***, select ***Internal*** and press ***ENTER*** – see chapter ***Measurement Setup.***

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Measurement in the Balancing Mode Failed

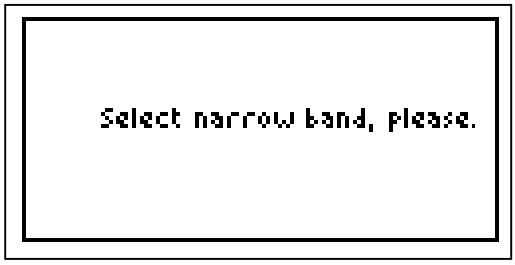

Fig. Low machine speed in the balancing

The minimum RPM in the machine balancing are defined by a multiple of the frequency resolution in the measured spectrum – see chapter ***Measurement Parameters Setup (Bal. Line Width)***.

At the minimum set frequency resolution of ±0.5 Hz, the machine can be balanced at the minimum speed of approx. 3 Hz.

Overload!

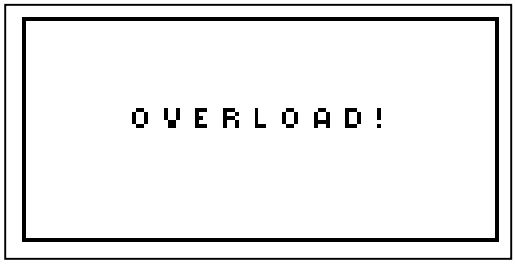

Fig. Too strong signal from the vibration sensor

A signal with such a high amplitude peak range (over ±3 V) is carried to the analyser input from the vibration sensor that it cannot be processed in the analogue part of the analyser.

Use a lower sensitivity vibration sensor – see chapter ***Overloading of the analogue part by the measured signal***.

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Technical Specification of Adash 4202

Input channels:	- 1 or 2 for vibration sensor (ICP powered or AC) - 1 for external trigger (e.g. tachoprobe)
Construction type:	- standard or Eex ib IIB T3
Measurement types:	- analyser
Vibration sensors:	- piezoelectric accelerometers with integrated ICP supplied preamplifier or any AC signal
Input ranges:	- 0.01 - 300 m/s^2 (sensor 100 mV/g) - 0.1 – 3,000 m/s^2 (sensor 10 mV/g) - AC +/- 3 V peak
Data acquisition:	- measurement of TRUE RMS and TRUE PEAK values of vibration in LF and HFE signal paths - time domain analysis - balancing spectrum (mm/s, 400 lines in frequency band to 200 Hz) - single plane balancing and two plane balancing in band 3 to 200 Hz (180 to 12,000 RPM) - machine speed measurement
Trigger:	- auto, manual or external (tachoprobe)
External trigger:	- TTL signal or impulses >0.7 V
Averaging:	- max. 20
Time signal:	- 2001 samples
Spectrum	- 400 lines in frequency band to 200 Hz
Signal conditioning:	- integration
Filters:	- LF, HFE and BAL
Accuracy:	- 5%
Display:	- LCD with LED backlight
Software:	- A4000DL, DDS2000, MDS 5.00
Mechanical construction:	- IP55
Temperature range:	- -20 °C až +70 °C
Supplying:	- 4 x AA 1.5 V or 4 x ACU 1.2 V
Dimensions:	- 223 x 105 x 40 mm
Weight:	- aprox. 500 g
Accessories:	- accelerometers, magnets and cables from catalogue

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- optical or laser tachoprobe
- aluminium carrying case
- leather cover
- battery charger
- scales (for balancing measurements only)

Notes.
Mode - analyser: on-line measurement, measurement results are displayed immediately

LF, HFE and BAL signal paths – see chapter ***Types of Signal Processing***.

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User Notes

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