🕮 User's guide

Balancing Analyser
Adash 4201

Application:

- Diagnostics of bearings, lubrication and machine defects – unbalance, misalignment…
- Diagnostics of ventilators, pumps, gearboxes, engines, turbines, machine-tools…
- Diagnostics of low-speed machines – paper machines, mill trains, conveyers…
- Operating machine balancing
- Run-up and run-out measurements
- Outlet inspection of products
- Eex ib IIB T3 certificate

Characteristics:

- Possibility to connect
  - sensor of acceleration, velocity, displacement
  - light or laser tachoprobe, measuring transformer
- ICP feeding of a sensor, AC input for vibration measurements
- TTL trigger for a synchronization of measurements
- Machine speed measurement, *Crest* and *Kurtosis* factors
- Input for a bar code sensor to identify measurements points
- 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
  - LIN acceleration m/s^2 in the band 0.8 Hz - 16 kHz
  - 200 Hz acceleration m/s^2 in the band 0.8 - 200 Hz
  - HFE acceleration g (9.81 m/s^2) in the band 1.5 - 16 kHz
  - ENV envelope g (9.81 m/s^2) in the band 1.5 - 16 kHz
- FFT analysis from 101 to 801 lines, order analysis of 10 harmonics
- Time signal analysis
- Operating single or two plane balancing
- Run-up and run-out measurements, triggering by time or RPM
- Data collector – measured data storing, 512 KB of memory
- Analyser – user set up of parameters between measurements
- Backlighted graphics LCD display
- Supplied by 4 x AA batteries or alkaline cells
- RS232 user software communication interface
- User software A4000Download, DDS 2000, MDS5.00

Ref: 27072007 KM

ADASH Ltd., Ostrava, Czech Republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

Contents

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

Preface

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

Capabilities of 4201 Analysers

The performance of the analyser is determined by the firmware stored in the memory of your instrument. The firmware is solved on a modular basis, thus allowing the user to specify in the order the requested characteristics of the selected analyser and to determine the optimal ratio of ***performance : price.***

During the life cycle the ***performance of the analyser can be increased*** by simply adding other SW modules.

The firmware modularity of 4201 analysers may be schematized as follows:

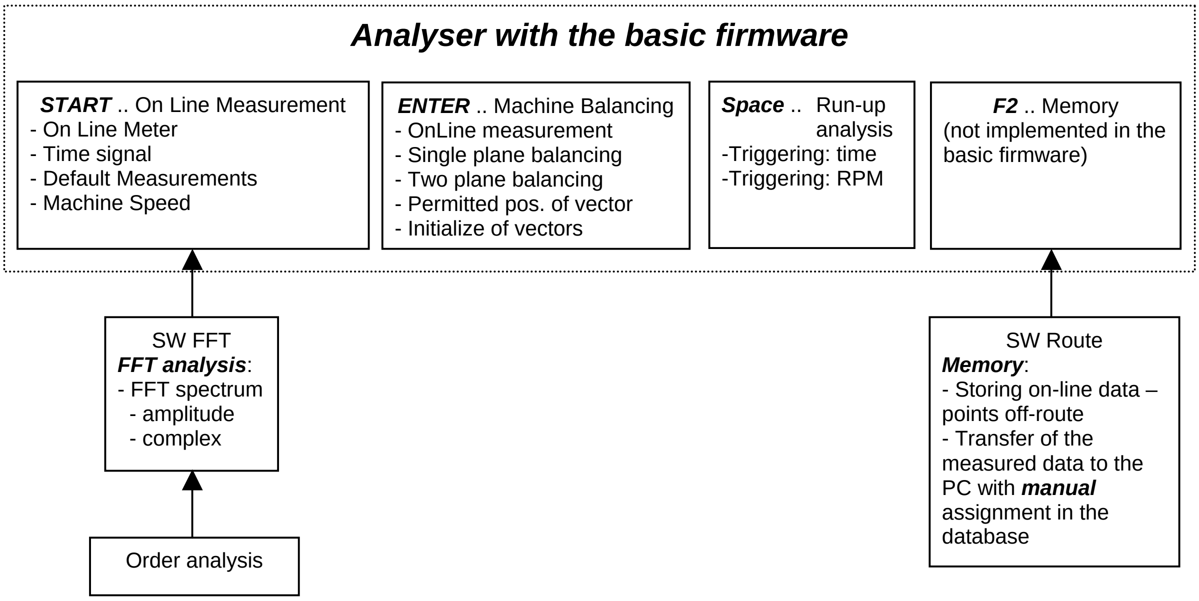
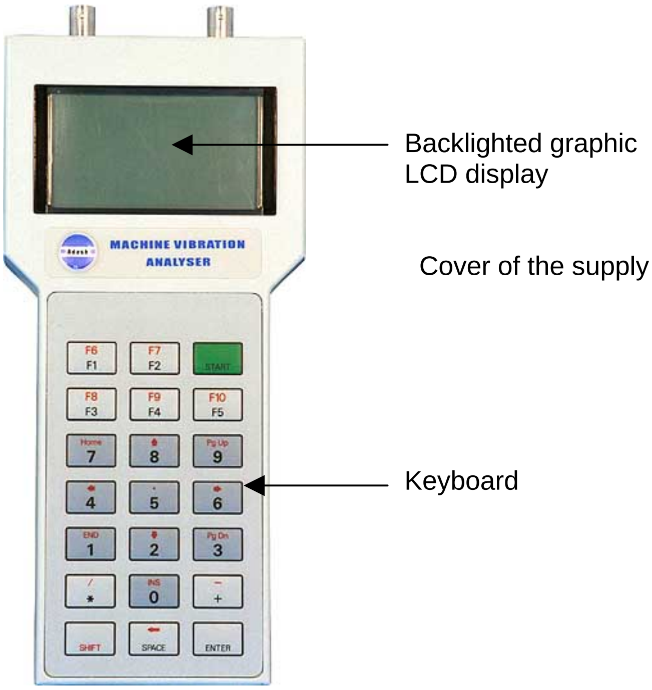


Fig. Schematic of the analyser firmware modularity

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

Appearance of 4200 Analysers

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



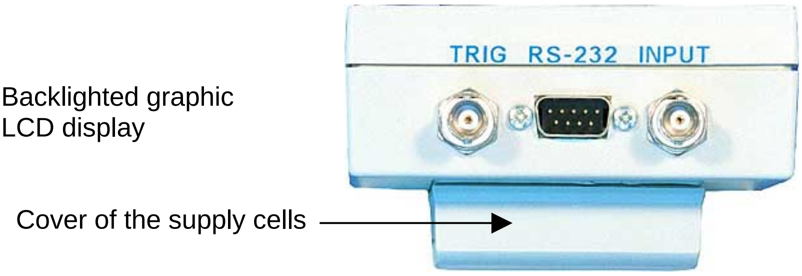
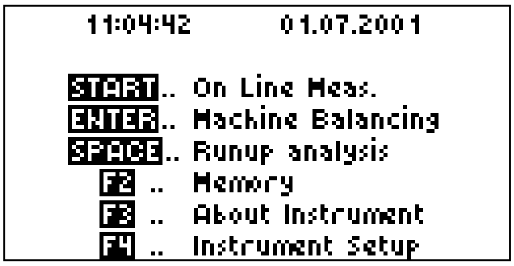


Fig. Upper side of the analyser

Fig. Front view of the analyser

Analyser Control, Important Keys

All the functions of the analyser are selected from menus.



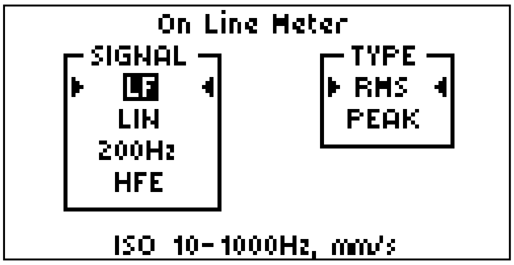


Fig. Main menu of the analyser

Fig. Selection menu (2 on one screen)

- 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.

- 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+F5	erasing the measured data memory,
- 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.

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 spectrum or 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 the Order or Run-up analysis, Machine Balancing
M ***Measurement***, data collection
C ***Calculation*** (e.g. FFT).

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***.

The same path label is used in all the device menus where the signal path is selected. The following table describes the characteristics of four signal paths used in the instruments of the Adash 4201 series.

LF	ISO standard, velocity signal in 10 – 1000 Hz band	[mm/s]
LIN	acceleration signal in 0.8 Hz – 16 kHz band	[m/s^2]
200Hz	acceleration signal in 0.8 – 200 Hz band	[m/s^2]
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 the special paths:

ENV	envelope-modulated acceleration signal in 1.5 – 16 kHz band for the measurement of ***ENV spectrum***	[g]
200 Hz	velocity signal in 0.8 – 200 Hz band for the measurement of ***order*** and ***run-up analysis*** and 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,*** FFT signal spectrum, order or run-up analysis, time signal 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 4 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

Indication of Data Transfer to the PC

The analyser can be connected to the PC using a RS232 serial interface cable for bi-directional data communication – see chapter ***Connectors***.

Via the serial interface the measured data are transferred from the analyser memory to the PC – see chapter ***On-line Data Storing***.

After connecting the PC to the analyser via a serial communication cable, message ***RS232:*** is displayed in the left lower corner of the screen - see the main menu of the analyser in chapter ***Switch On and Off***. The process of data communication is signalled by the display of current transfer conditions.

The user software starts a serial communication with the analyser only if the ***main menu*** is displayed on the screen. If the analyser is set in any other mode, any commucation attempts will fail. ***Warning!*** Don‘t press any key on the analyser keyboard if the data transfer is running.

User Software

To archive and evaluate the measured data by the analyser, the Adash user software has been designed, which is installed at the user‘s computer. Data communication of the user software with the analyser is carried out via the RS232 serial interface – see chapter ***Indication of Data Transfer to the PC***.

A4000DL A simple software for data transfer from the analyser to the PC. It enables to display and archive the measured data only in the text format for a further processing in a table editor.

DDS2000 A professional software for measured data archiving and evaluation.

Any references to the user software in the following text must be searched for in the ***User's manual*** of the above mentioned software products.

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

Cover of the supply cells →

Fig. Position of the cells

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

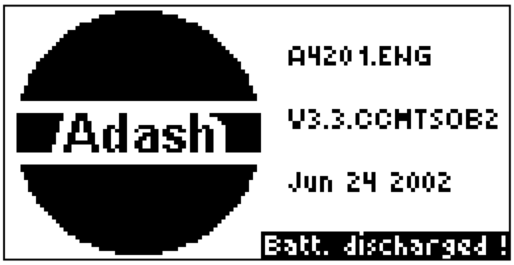


Fig. Signalling of discharged cells

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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

- 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.

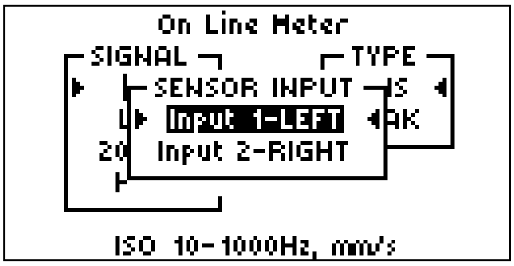


Fig. Selection of the measurement input

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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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 four + two various signal paths – see chapter ***Types of Signal Processing***:

LF	mm/s	via an integrator
LIN	m/s^2	directly
200 Hz	m/s^2	directly
HFE	g	directly
ENV	g	via an envelope modulator
200 Hz	mm/s	via an integrator.

.

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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

Fig. Introductory logo of the analyser

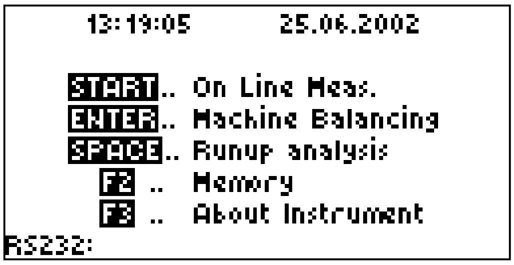


Fig. Main menu of the analyser

In the left lower corner is text ***RS232:*** and the information about actual transfer process, when the PC is connected – see chapters ***Indication of Data Transfer to the PC*** and ***User Software***.

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

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.

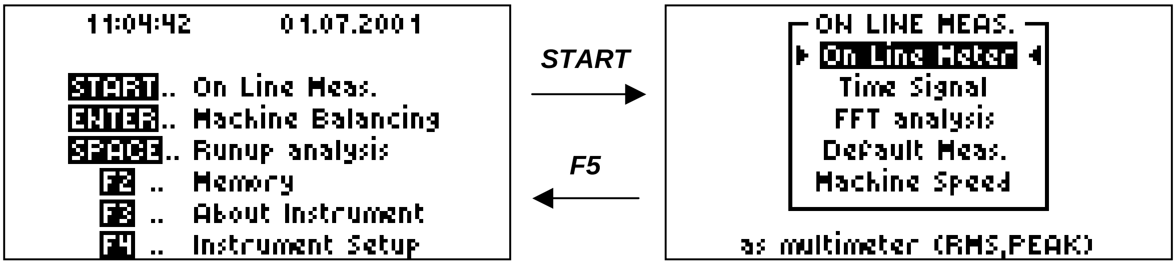


Fig. Main menu of the analyser

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
FFT signal spectrum and order analysis.
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.

Note: Instruments supplied in the basic version do not have to have all the indicated modes of measurement implemented – see chapter ***Capabilities of 4201 Analysers.***

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 four 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.

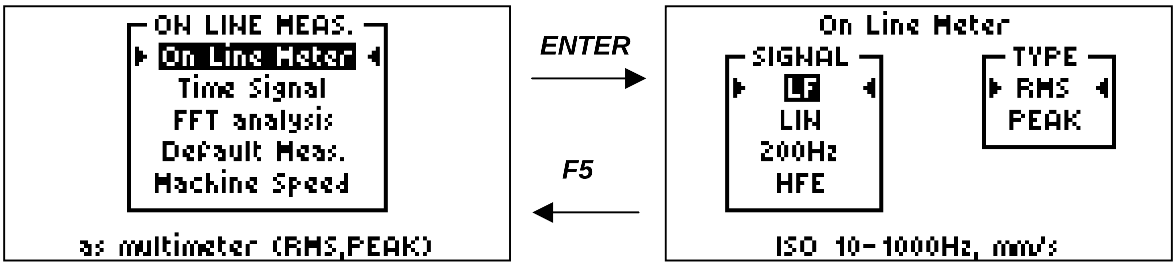


Fig. Activation of the On Line Meter

Fig. Selection of the signal path and measured value

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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***.

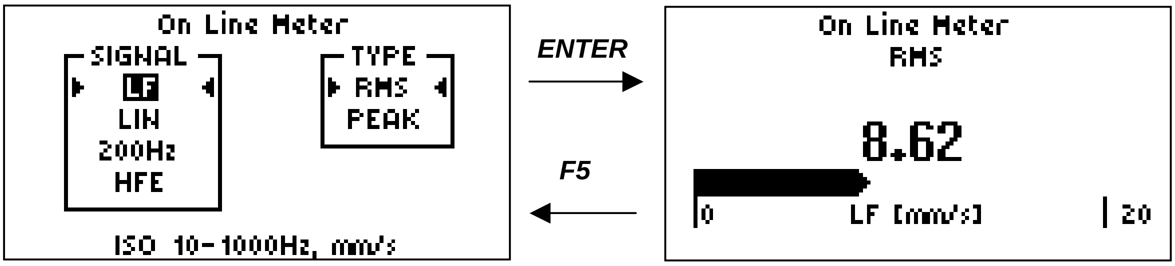


Fig. Selection of the signal path and measured value Fig. Display of the measurement result

F5 - escapes from this screen and stops the measurement.
F2 - saves value to the instrument memory (see chapter On-Line Data Storing).
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***).

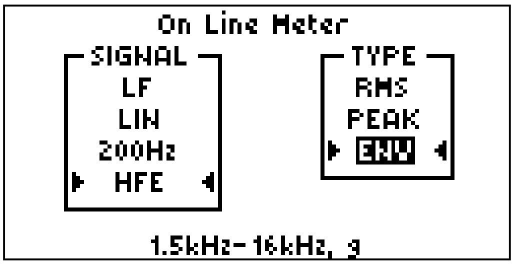


Fig. HFE envelope RMS value measurement

For the ***HFE*** signal path, the menu of RMS or PEAK values measurement is extended by the ***ENV*** item, which represents the measurement of ***TRUE RMS*** value of the signal loaded via the ***HFE*** signal path and also processed by the ***envelope modulator***.

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.

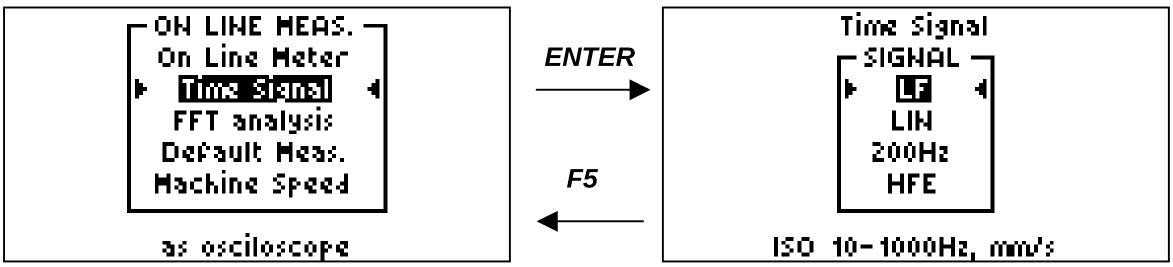


Fig. Activation of the Time Signal Fig. Selection of the signal path

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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

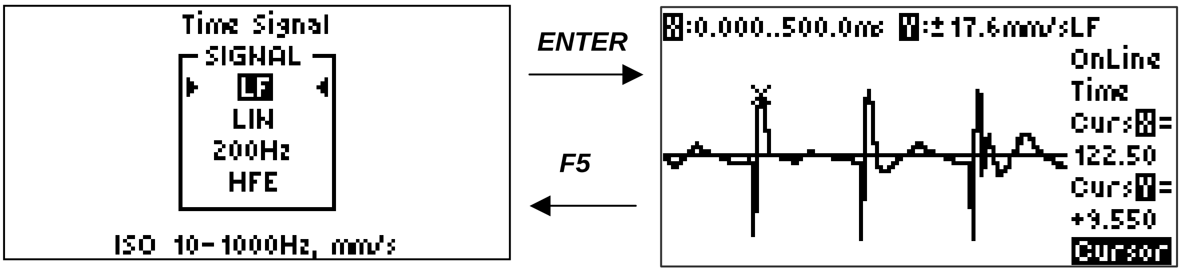


Fig. Selection of the signal path

Fig. Display of the time signal

X: axis range (time).
Y: axis range (amplitude).
LF (LIN, 200Hz, HFE) signal path label.
OnLine (Memory) on-line measurement or stored 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).
F2 – saves time signal to the instrument memory (see chapter ***On-Line Data Storing***).
F5 - escapes to the previous menu (signal path selection).

FFT Analysis

(For instrument with optional FFT software only.)

After activating the ***FFT analysis*** item in the ***ON LINE MEAS.*** selection window***,*** select whether you want to measure FFT ***Signal spectrum*** or to carry out the ***Order analysis***. This selection will be offered if your analyser is equipped with the Order analysis measurement – see chapter ***Capabilities of 4201 Analysers.*** Otherwise, this selection will be omitted and signal spectrum will be measured.

Signal Spectrum

Note: Instruments supplied in the basic version do not have to have the measurement implemented – see chapter ***Capabilities of 4201 Analysers.***

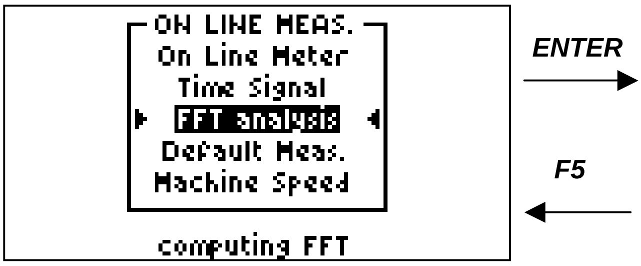


Fig. Activation of the FFT analysis

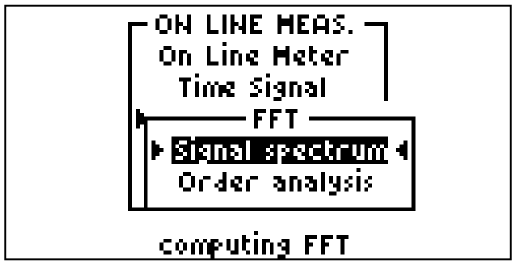


Fig. Activation of the Signal spectrum

In case of Signal spectrum select desired signal path in ***Signal spectrum*** window (see chapter ***Types of Signal Processing***). Confirm each selection by ***START*** or ***ENTER***. In the upper right screen corner see the process evaluation.

If measurement is externally synchronized, for instance using the tachoprobe (see chapter ***Machine Speed***), the result of measurement is a ***complex*** spectrum of amplitudes and phases of the measured signal; if measurement is not synchronized, the result is only the ***amplitude*** spectrum.

> If complex spectrum measurement is requested, ***Trigger -> External*** must be set up – see chapter ***Measurement Setup***. Only then the measurement will be synchronized.

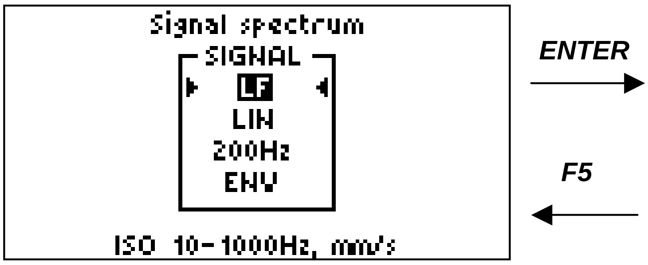


Fig. Selection of the signal path

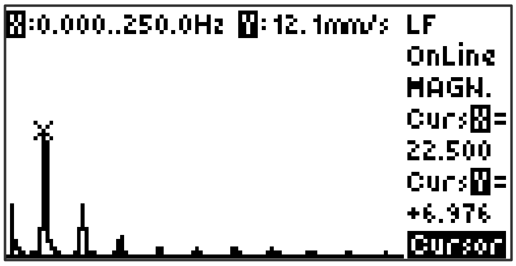


Fig. Display of the amplitude spectrum

X: axis range (frequency).
Y: axis range (amplitude or phase).
LF (LIN, 200Hz, ENV) signal path label.
OnLine (Memory) on-line measurement or stored data
MAGN. (PHASE) data type. The PHASE is available when the external trigger was used for measurement synchronization.
CursX cursor position on the X-axis (the cross on graph).
CursY signal amplitude (phase) 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 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 spectrum 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.

START - starts new measurement.
ENTER - escapes to the previous menu (signal path selection).
F2 – saves spectrum to the instrument memory (see chapter ***On-Line Data Storing***).
F5 - escapes to the previous menu (signal path selection).

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

If the evaluation of the ***HFE*** spectrum in frequency band 1.5 – 16 kHz is requested, then measurement must be carried out via the ***LIN*** signal path (0.8 Hz – 16 kHz) since the HFE signal path in the spectrum measurement is substituted by the ***ENV*** signal path with the 4200 analysers – see chapter ***Types of Signal Processing***.
WARNING! Measurement via the HFE signal path is performed in [g], via the LIN signal path in ***[m/s^2]***.

Order Analysis

Note: Instruments supplied in the basic version do not have to have the measurement implemented – see chapter ***Capabilities of 4201 Analysers.***

The order analysis makes accurate evaluation of amplitude and phase at machine speed frequency (rotation). It is based on synchronized sampling of time signal with machine speed.

The tachoprobe is need for the measurement – see chapter Machine Speed.

The measurement is very similar to the measurement of complex spectrum: the results of the measurement are amplitude and phase arrays at the machine speed frequency and its integer multiples. The signal path does not have to be selected as in case of spectrum measurement since the order analysis is carried out always via its own signal path ***[mm/s]***.

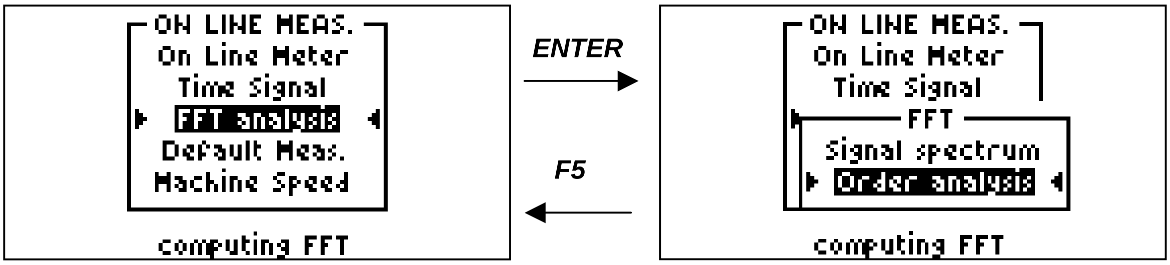


Fig. Activation of the FFT analysis

Fig. Activation of the Order analysis

Confirm each selection by ***START*** or ***ENTER***. In the upper right screen corner see the process evaluation.

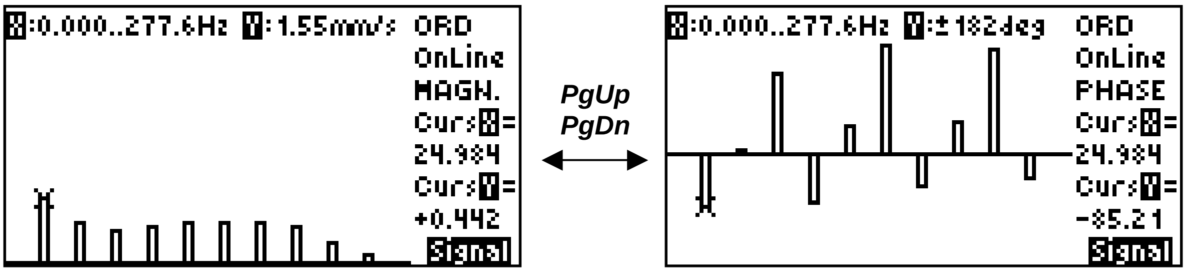


Fig. Display of the amplitude array

Fig. Display of the phase array

Two screens contain measurement results. You switch between them by using ***PgUp*** and ***PgDn***.
Amplitude values (**MAGN)** of first ten harmonics (1st harmonic component equals the machine speed frequency, Nth harmonic component is N x machine speed frequency, N = 1, 2, 3, ...) are on the first screen. The phase values (**PHASE**) are on the second screen. Some phase values may be missed, it means that the phase synchronization is not stable and the calculation was not made.

If the analyser is used to measure the ***Machine Deflection Shapes*** (MDS), another screen is added for the measurement of the order analysis. Such screen shows a table of measured values for fast measurement reading and recording. This table is displayed as the first one after completing the measurement. By pressing the ***PgUp, PgDn*** keys, activate the above described screens.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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 all the four signal paths (see chapter ***Types of Signal Processing***) and also the ***Crest and Kurtosis factors*** are calculated. If necessary, this measurement may be stored to the instrument memory by pressing the ***F2*** key – see chapter ***On-line Data Storing***.
From the ***ON LINE MEAS.*** screen select ***Default Meas.,*** press the ***START*** or ***ENTER*** keys and start the entire series of measurement.

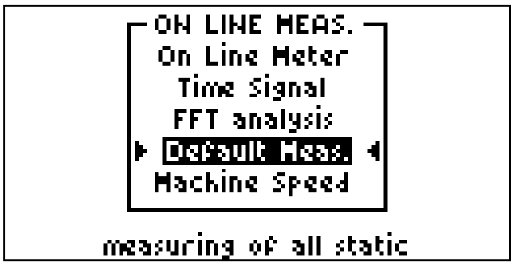


Fig. Activation of the Default Meas.

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

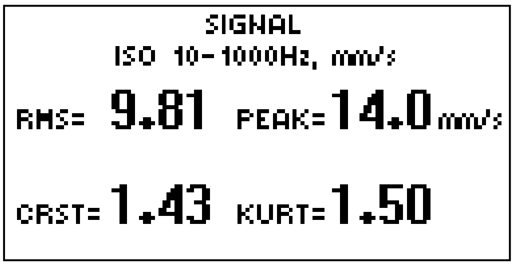


Fig. Display of the Default Meas. – LF

PgUp
PgDn

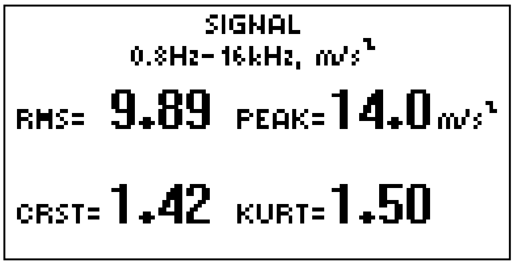


Fig. Display of the Default Meas. - LIN

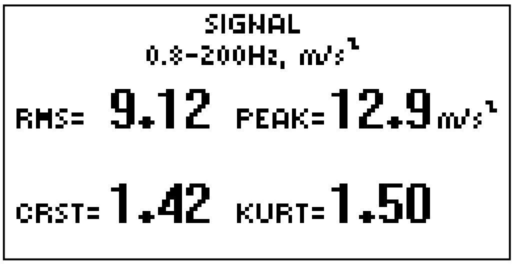


Fig. Display of the Default Meas. – 200 Hz

PgUp
PgDn

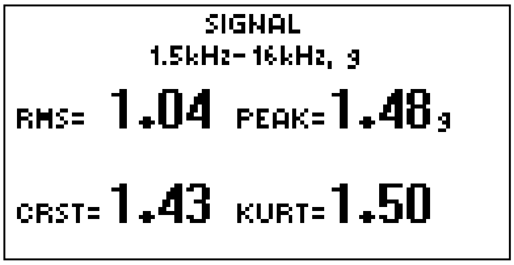


Fig. Display of the Default Meas. - HFE

START - starts new measurement.
ENTER - starts new measurement.
F2 – saves all data to the instrument memory (see chapter ***On-Line Data Storing***).
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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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

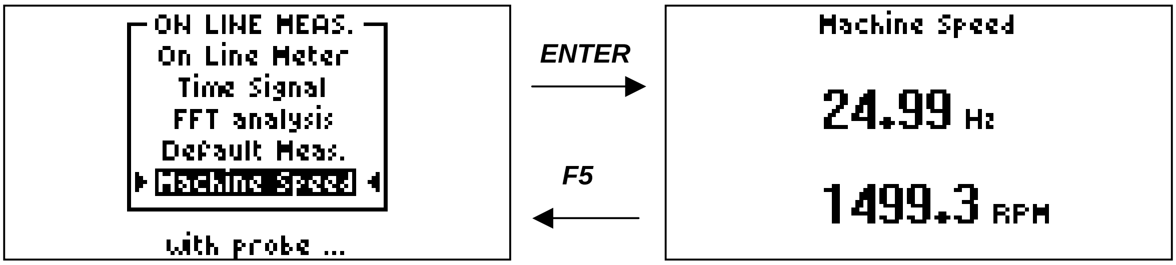


Fig. Activation of the Machine Speed Fig. Display of the Machine Speed

F2 – saves data to the instrument memory (see chapter ***On-Line Data Storing***).
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.

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.

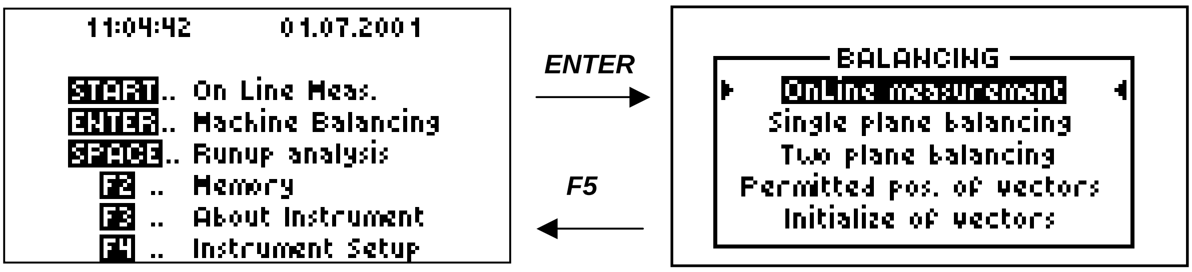


Fig. Main menu of the analyser

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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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.

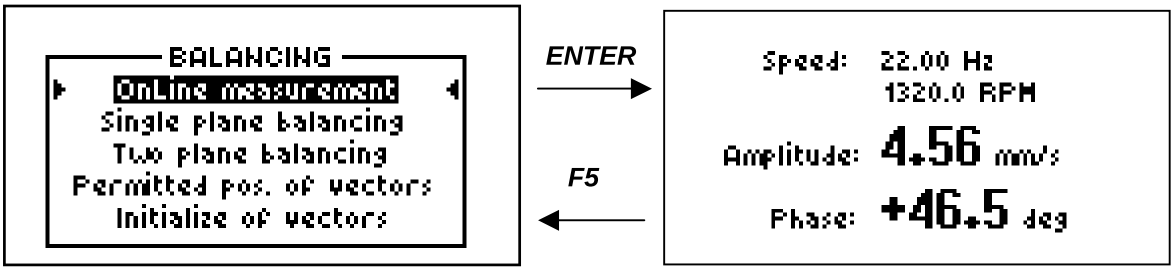


Fig. Activation of the OnLine measurement
Fig. Display of the OnLine measurement

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.

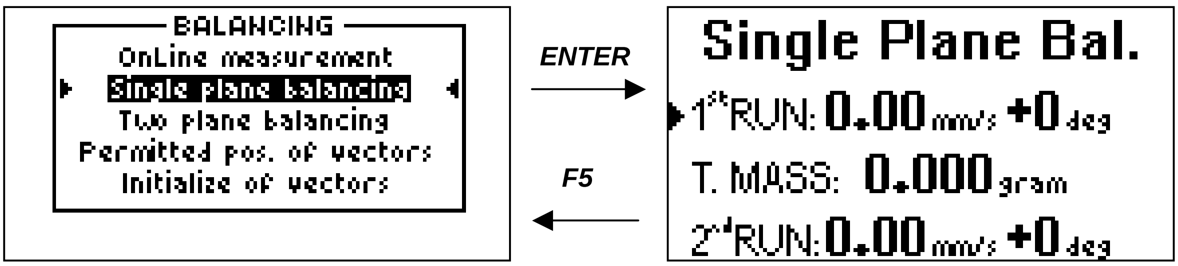
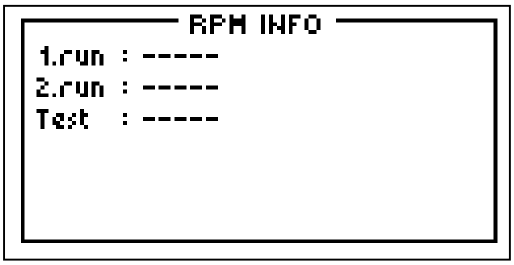


Fig. Activation of the Single plane balancing
Fig. Three steps of the balancing

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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

By pressing the START key the measurement is started.
By pressing ***ENTER*** the amplitude and phase have to be 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 ***1^{st} 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 ***2^{nd} 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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

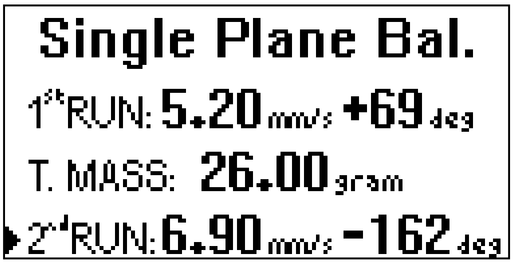


Fig. Three steps performed

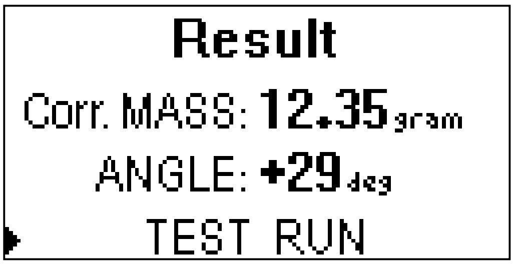


Fig. Display of the calculated results, TEST RUN is ready

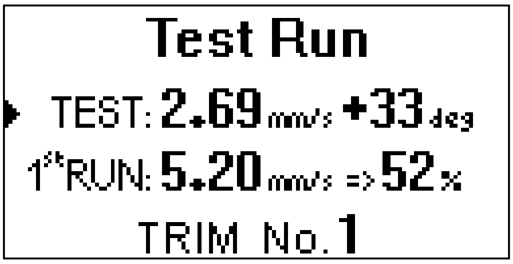


Fig. ***TEST RUN*** step performed

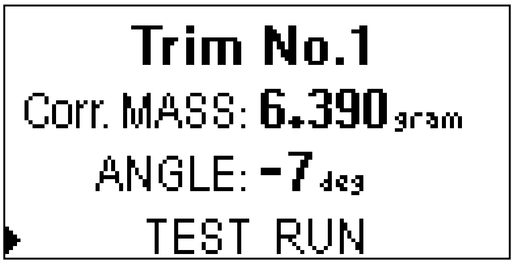


Fig. Calculation of the first „TRIM“

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***.

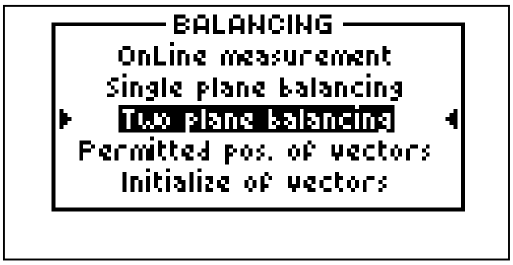


Fig. Activation of the Two plane balancing

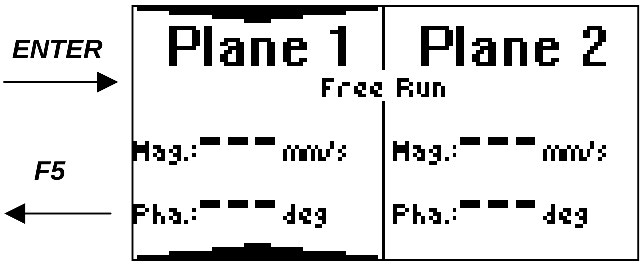


Fig. The first screen of the balancing

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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

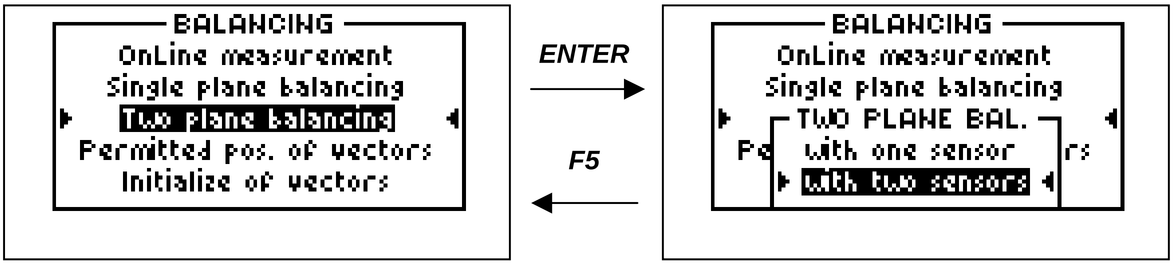
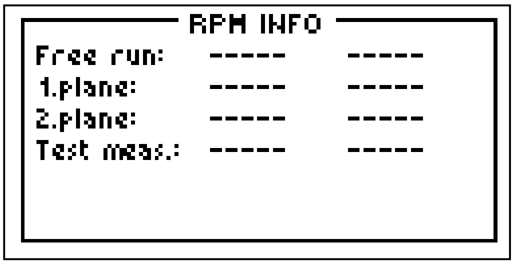


Fig. Activation of the Two Plane Balancing menu Fig. Balancing with two sensors

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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

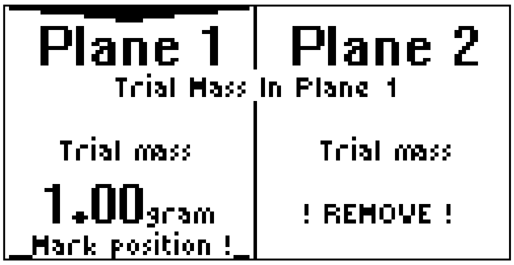


Fig. The positioning of the trial mass in plane 1

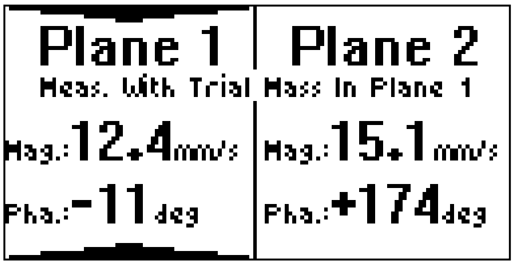


Fig. Measurement with the trial mass in plane 1

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

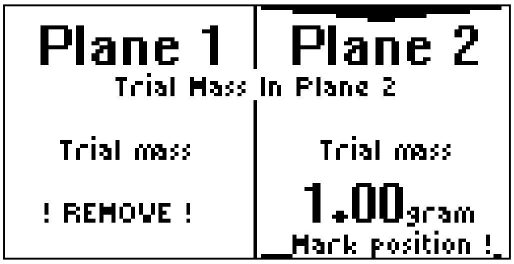


Fig. The positioning of the trial mass in plane 2

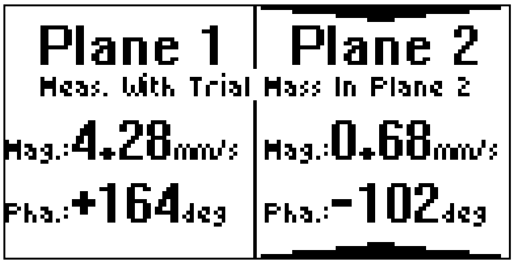


Fig. Measurement with the trial mass in plane 2

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.

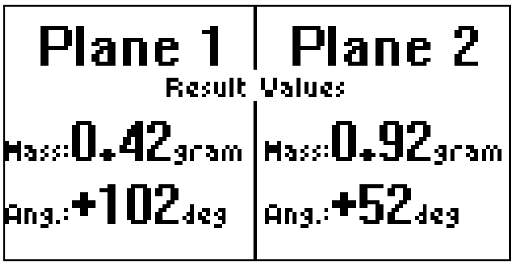


Fig. The calculated measurement results

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.

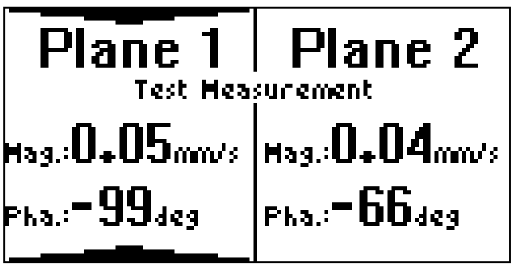


Fig. Results of the test measurement

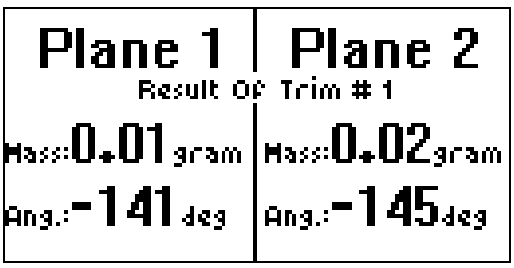


Fig. Results of the Trim #1

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.

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.

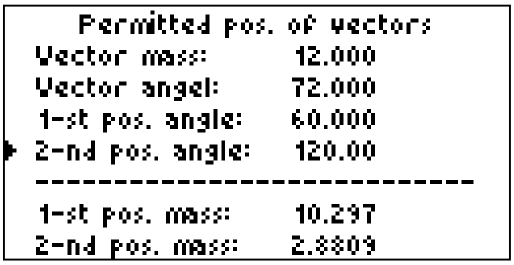


Fig. Result of the vector distribution

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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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.

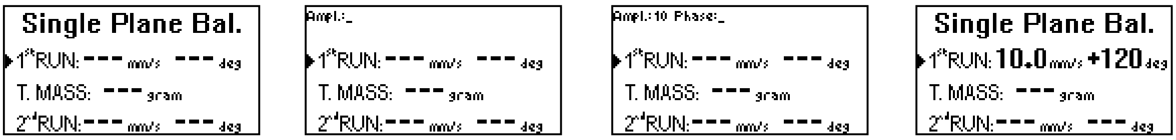


Fig. Entry of amplitude and phase of the first run of single plane balancing from the analyser keyboard

Run-up Analysis (SPACE)

The Run-up Analysis measurement serves to record the process of change in RPM, amplitudes and phases during the machine run-up and run-down. Amplitudes and phases are measured in a similar way as in the machine speed frequency balancing. The measurement results are the RPM, amplitude and phase patterns, which can be displayed as a graph on three screens.

The measurement requests the connection of a tachoprobe.
Results of a maximum of 400 individual measurements can be measured and stored.

The standard 4200 instruments are intended for measurement of the run-up characteristics of machines with a speed ***from 180 to 12,000 RPM***. The measured characteristics may be stored in the analyser measurement memory – see chapter ***On-line Data Storing***.

By pressing the ***SPACE*** key from the main analyser menu, activate the run-up analysis screen:

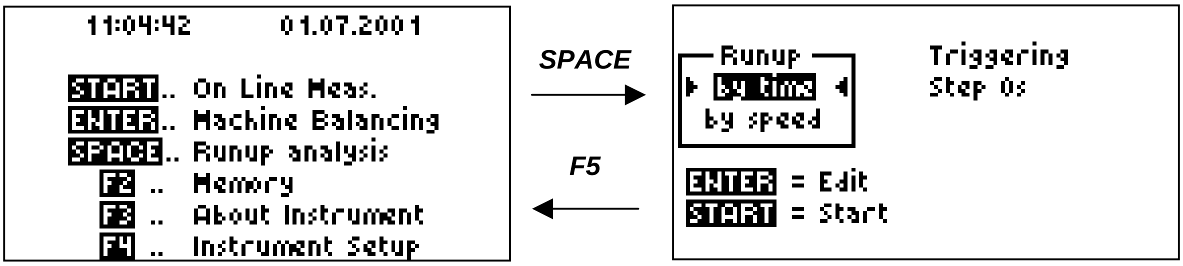


Fig. Main analyser menu Fig. Run-up analysis screen

In the Run-up menu select, using the ***up/down arrows,*** whether the individual measurements should be started after the expiration of a certain time period or upon the change in the machine speed by the requested step. Validate by pressing ***ENTER*** or ***START***.
WARNING! The time of individual measurements is influenced (see chapter ***Measurement Parameters Setup***):

- by the set value of the Frequency resolution parameter
- by the set value of the Averaging parameter.

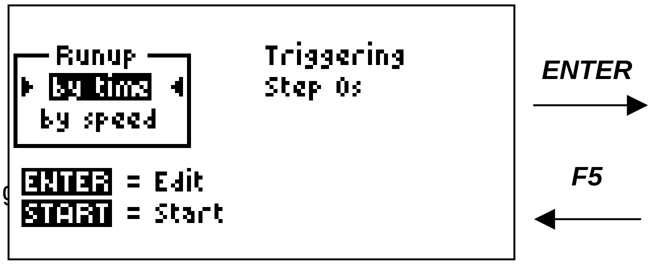
If you set the period of measurement starting shorter than the time of individual measurements, the requested period will not be respected and measurement will start at the highest possible speed that the analyser is able to achieve with the set measurement parameters – see chapter ***Verification of the Time of Individual Measurements***.

The measurement averaging is advisable only if machine run-up/run-down is under the user's control. Otherwise, important phenomena of the run-up characteristics do not have to be duly (or even at all) drawn due to the ***time extension*** of the individual measurements.

Measurements Started by Time

By pressing ***START,*** start the run-up analysis measurement; by pressing ***ENTER***, activate the prompt to set the step (period) of measurement in the upper line of the screen.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz



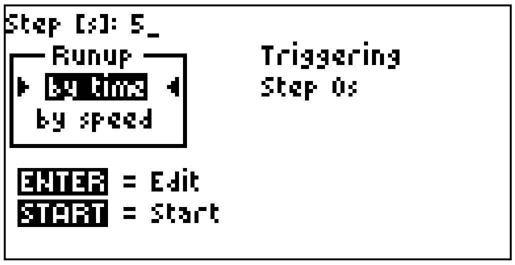


Fig. Screen of the run-up analysis by time

Fig. Measurement step (period) setup

Set the requested measurement period in ***seconds*** in the upper line and validate by pressing ***ENTER*** (by pressing ***F5,*** cancel your request to change the measurement period). Individual measurements will be started after the expiration of this set period ***unless it is shorter than the time of individual measurements***.

Measurements Started by Speed (RPM)

By pressing ***START,*** start the run-up analysis measurement; by pressing ***ENTER,*** activate the prompt to set the RPM change step for measurement starting in the upper line of the screen.

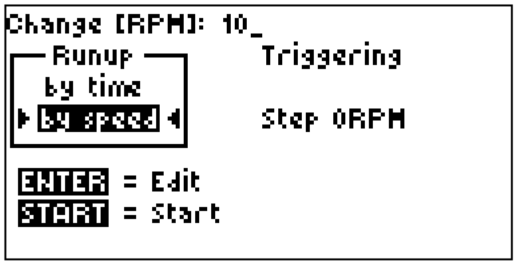


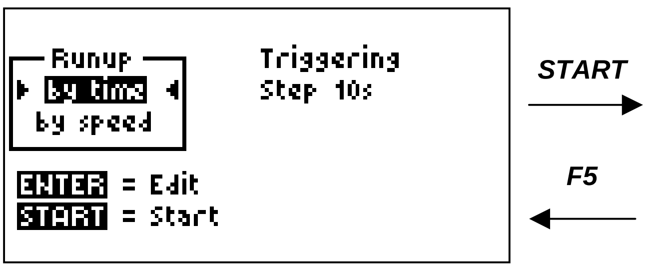
Fig. Screen of the run-up analysis by Speed

Fig. Setup of the RPM change step

In the upper line set the requested RPM change step in ***RPM*** that starts further measurement and validate by pressing ***ENTER*** (by pressing ***F5,*** cancel your request to change the step). Individual measurements will be started after the verification of the change in RPM at least by the entered step, ***unless such change occurs in a shorter time than is the time of individual measurements***.

Starting and Termination of Measurements

Start measurement by pressing ***START*** from the run-up analysis screen.



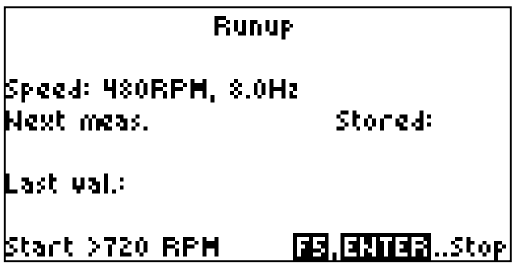


Fig. Run-up analysis screen

Fig. Measurement starting

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

In the bottom line on the left the ***minimum machine speed*** [RPM] is indicated at which measurement will start (in case of run-up) or terminate (in case of run-down). The minimum speed of the measured machine is determined by the selected frequency resolution – see chapter ***Measurement Parameters Setup***. The displayed value of 720 RPM (12 Hz) corresponds to the frequency resolution set at ±2 Hz. The first line of the measured data displays the current value of the machine speed. If the machine speed is ***higher*** than the minimum requested speed, measurement will start immediately. Otherwise, only the measured machine speed will be continuously displayed and measurement will start only after the measured speed exceeds the requested value. The figure shows a condition when the measured machine speed of 480 RPM does not meet the requirement of at least 720 RPM.

After measurement is started, its course can be followed in the right upper corner of the screen where individual phases of measurement are gradually signalled by letters T, M and C – see chapter ***Measurement Course Indication***. The second line shows the order of measurements within averaging – see chapter ***Measurement Parameters Setup***. The displayed value AVG:2-2 signals that the second measurement (the first digit) of the requested two measurements (the second digit) has just been performed..

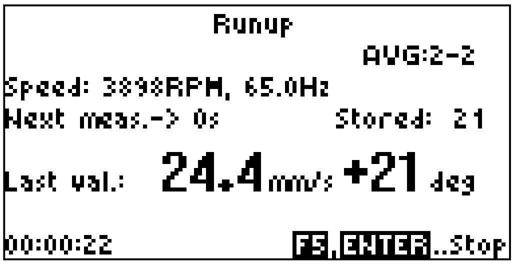


Fig. Result of individual measurement

Machine speed (3,898 RPM, 65 Hz), amplitude (24.4 mm/s) and phase (21°) can be determined from the screen. A total of 21 measurements are stored with ordinal numbers from 0 to 21. 22 seconds have elapsed since the beginning of measurement.

Measurement terminates:

- By pressing ***F5*** or ***ENTER***.
  WARNING! The key must be hold pressed until the ongoing measurement is terminated, which in case of the averaged measurement with a narrow tachoprobe may last also several seconds or tens of seconds.
- By measuring and storing the results of ***400*** individual measurements.
- ***By reducing RPM*** under the requested minimum limit, measurement is ***suspended***.

If 400 individual measurements are stored, the cycle is terminated and the measured data are displayed.
If the machine speed drops under the requested minimum value, the measurement cycle is suspended and in the bottom line on the left an error message appears instead of the time data – see fig. If the machine speed is increased above the minimum value, the measurement cycle automatically continues.

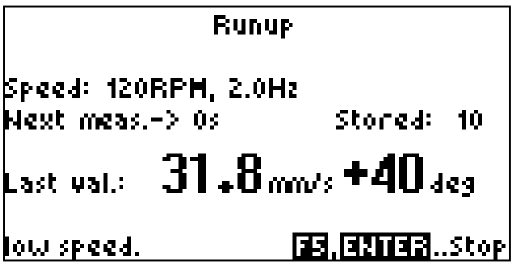


Fig. Measurement suspended – low machine speed

Verification of the Time of Individual Measurements

The time of performance of individual measurements is mainly determined by the set frequency resolution and by the set number of measurement averaging – see chapter ***Measurement Parameters Setup***. Further, it is influenced by the actual machine speed. It is important to know the time of performance of individual measurements in order to select correctly the Step parameter in seconds or in RPM for run-up analysis measurement – see above.

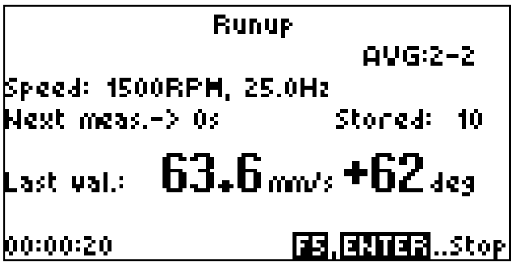


Fig. Time at the 10th measurement is 12 seconds

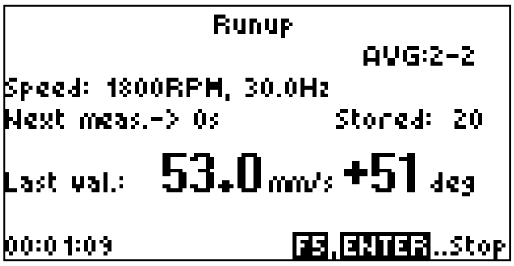


Fig. Time at the 20th measurement is 39 seconds

The time of performance of individual measurements can be verified in the following way:

- Set the requested ***Frequency resolution*** and ***Averaging*** parameters – see chapter ***Measurement Parameters Setup***. Select the lowest possible value of the averaging parameter that suits your requirements. Select the highest possible value of the frequency resolution that ensures stability of the measured phase and sufficiently low minimum machine speed.
- Start the Run-up Analysis measurement, select ***by time*** and set the ***Step*** parameter to 0 seconds. Measurement will be performed at the maximum possible speed for the set parameters.
- Start measurement and monitor the time information relative to the duration of measurement since its beginning in the left lower corner. ***Its change corresponds to the duration of the measurement that has just been performed in seconds.*** To measure with a time under 1 second, the change in time of several consecutive measurements must be measured, for instance ten. The above figure shows an example when 10 consecutive measurements lasted 69 – 20 = 49 seconds; the time of individual measurements can thus be estimated at 5 seconds. If you select the ***Step by Time*** parameter lower than 5 seconds or the ***Step by RPM*** parameter so low that it will be exceeded within a time of less than 5 seconds, then the entered ***Step*** parameter will not be respected and measurement will be performed at the highest possible speed for the particular parameters, i.e. approx. 5 seconds.

Display of the Measurement Results

After terminating measurement, the measured courses of RPM, amplitudes and phases are displayed as a graph on three screens between which you move using ***PgDn*** and ***PgUp***. By pressing ***F1*** from any screen with the graph, a screen appears with the numerical display of results of individual measurements on the current position of the cursor in the graph.

PgDn ***PgUp***

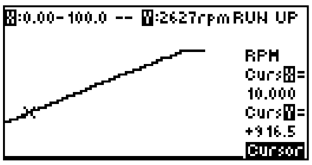


Fig. Course of RPM

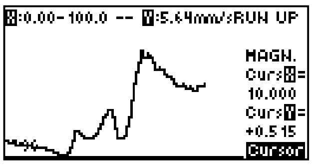


Fig. Course of amplitudes

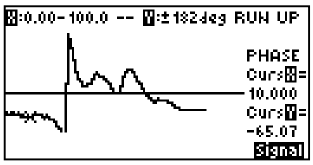


Fig. Course of phases

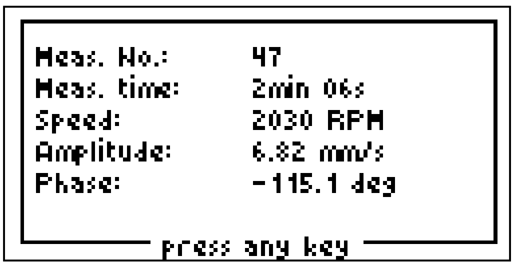


Fig. Numerical display of results of a selected measurement (***F1***)

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

WARNING! Unlike the display of time signal or spectrum, when after activating the screen with the course of measurement results, the ***Signal*** arrows mode is set - it is supposed that first an adequate display range is set and only then the cursor will be reset - after activating the 1st screen with the run-up analysis results, it is exactly the opposite: more often the cursor is reset than display range is changed. The first screen signals, in the right lower corner, the arrow mode on the keyboard ***Cursor*** – see description below. By pressing the ***SPACE*** key, switch this mode to ***Signal:*** using the arrows, you can set an adequate display range. After pressing ***PgUp / PgDn*** or ***F1,*** switch to the next screen: the cursor position ***remains unchanged*** at the selected measurement. The arrow mode is switched back to ***Cursor*** since it is supposed that on the new screen the cursor position will be reset again.

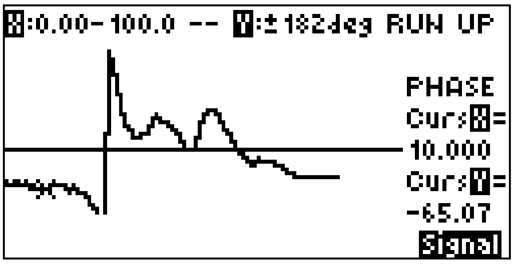


Fig. Signal mode set

PgUp

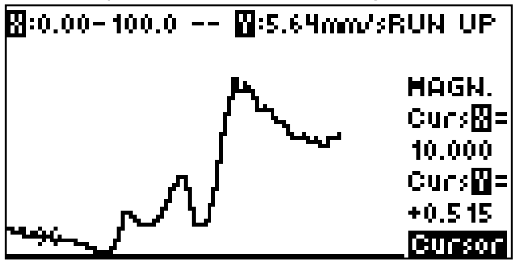


Fig. By switching the screen, changed to Cursor

X:	index (number) range of the displayed measurements (X-axis).
Y:	RPM / amplitude / phase range of the screen surface (Y-axis).
RUN UP	Run-up analysis measurement type.
RPM (MAGN., PHASE	indication of the displayed measurement course (RPM / amplitude / phase).
CursX	position of the cursor on the X-axis (the cursor is marked by a cross) – elected measurement index.
CursY	RPM / amplitude / phase of the selected measurement in the cursor position.
Cursor (Signal)	using the ***SPACE*** key (down in the middle), the function of the keyboard arrows can be switched. If the ***Cursor*** mode is set, then the arrows move the cursor. If ***Signal*** is displayed, then the ***right/left arrows*** serve to expand / pack the displayed course and the ***up/down arrows*** serve to reduce / increase the range on the Y-axis. If the graph is expanded (i.e. it is not fully displayed on the screen), then the combination of ***SHIFT + right arrow*** or ***SHIFT + left arrow*** enables to move the graph on the screen. By pressing ***HOME,*** the cursor is placed at the beginning of the displayed course on the screen. By pressing ***END,*** the cursor is placed at the end of the displayed graph on the screen.

The instrument can measure and store a maximum of ***400*** individual measurements within one run-up analysis signal. The measured course of each measured variable can be displayed as a single graph but resolution can be increased and results can be displayed on several screens:

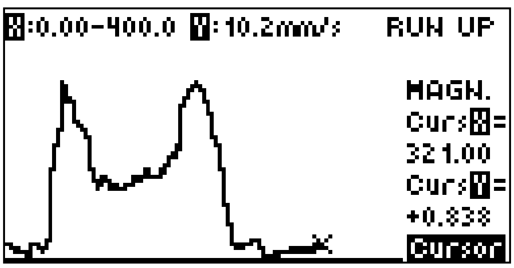


Fig. Complete display of the amplitude course

The run-up analysis signal consists of 321 individual measurements – see cursor position at the end of the signal CursX=321.
The X-axis range for a full display of all measurements is 0 to 400 – see X:0.00-400.0. The other amplitude peak is around 193. The requested measurement viewing is 180 to 200.

By pressing ***SPACE,*** the arrow mode switches to ***Signal*** and by double clicking ***the right arrow,*** the highest resolution of X-axis 0-100 is set. If the combination of ***SHIFT + right arrow*** is repeatedly pressed***,*** the course is shifted to the X-axis range 100-200. By pressing the ***SPACE*** key, the arrow mode ***Cursor*** is set and by moving the cursor, you can view the requested measurements.

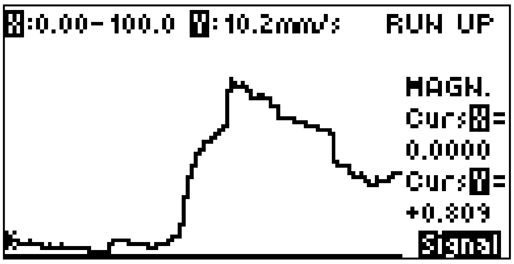


Fig. Highest resolution of X-axis 0-100

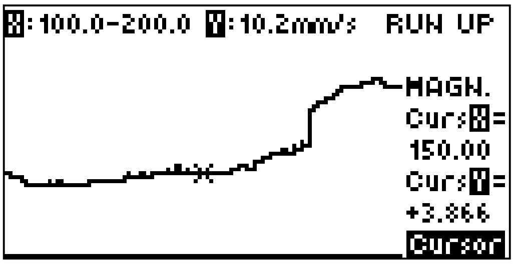


Fig. X-axis range 100-200

ENTER – to return to the analyser main menu.
F2 – to store the run-up analysis signal – see chapter ***On-line Data Storing***.
F5 – to return to the analyser main menu.

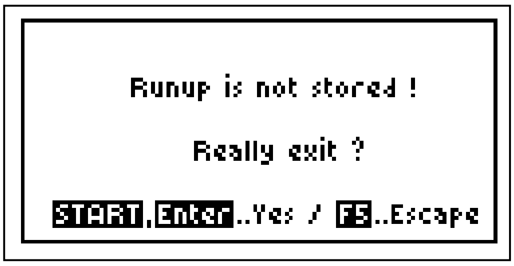


Fig. Warning of a possible signal loss

If you return to the analyser main menu without storing the run-up analysis signal to the measurement memory, this signal will be irretrievably lost. Since the acquisition of a new signal can last a relatively long time, you will always be prompted to confirm your request to return to the analyser main menu without storing the signal to the measurement memory.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

On-Line Data Storing (F2)

(For instrument with optional Route software only.)

Note: Instruments supplied in the basic version only do not have to have this function implemented – see chapter ***Capabilities of 4201 Analysers***.

If the on-line measurement results are being displayed on the screen, the measured data can be stored in the analyser memory by pressing ***F2*** and via the RS232 serial interface transferred to the PC for further processing – see chapter ***Indication of Data Transfer to the PC***. Both the types of data measured by the analyser can be stored – see chapter ***Static and Dynamic Data***. These on-line data stored in the analyser memory can be downloaded from the analyser, viewed and archived; they must only be ***manually assigned*** to the corresponding database cells in the data export in the DDS environment – see chapter ***User Software.***

Data Storing

If no measured data are stored in the analyser memory, this information will be displayed after pressing ***F2*** in the main menu of the analyser.

Fig. Memory of the measured data is erased

After pressing ***F2*** from the screen with the results of the measured data, you will be prompted to enter ***the measurement identification number,*** which can have from 1 to 15 digits and is entered on the upper line of the display after being prompted ***Enter number:*** _.

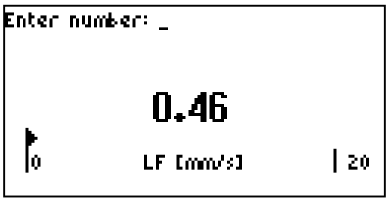


Fig. On Line Meter measurement

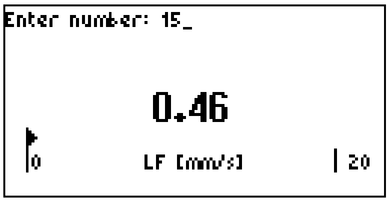


Fig. Identification number 15 entered

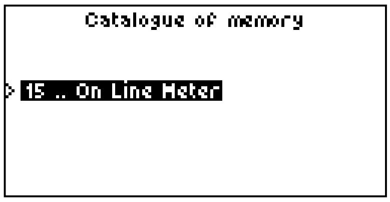


Fig. Memory contents

The identification number serves only for your orientation in the analyser memory. A different identification number can be assigned to each measurement, however also several different measurements may be stored under the same identification number (for instance, all the measurements from one measurement point). Data are stored to the analyser memory by entering the identification number and pressing ***ENTER***. By pressing ***F5*** when entering the identification number, you cancel your request to store the data to the analyser memory.

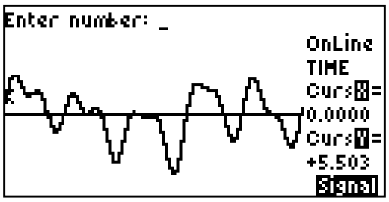


Fig. Time signal measurement

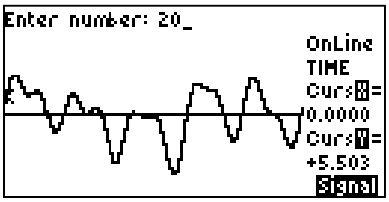


Fig. Identification number 20 entered

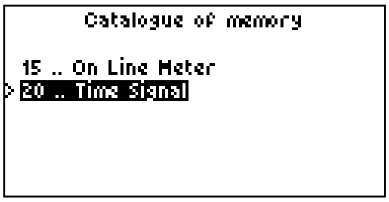


Fig. Memory contents

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

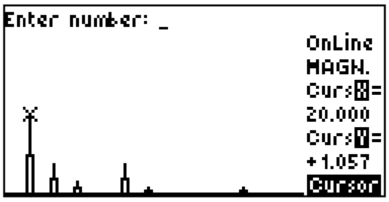


Fig. Signal spect. measurement

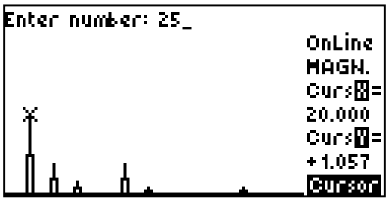


Fig. Identification number 25 entered

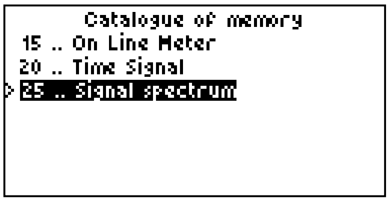


Fig. Memory contents

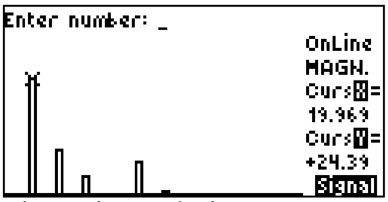


Fig. Order analysis measurement

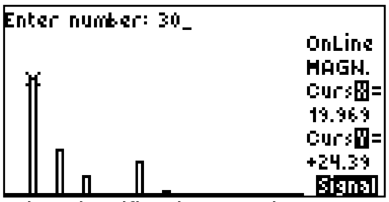


Fig. Identification number 30 entered

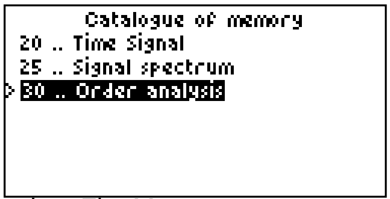


Fig. Memory contents

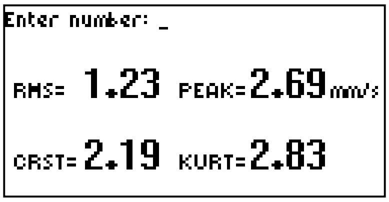


Fig. Default Measurements

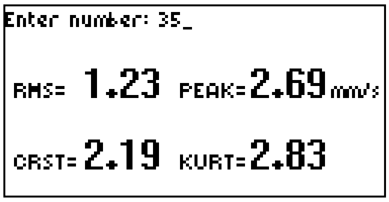


Fig. Identification number 35 entered

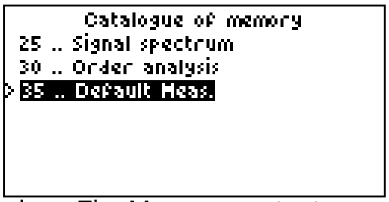


Fig. Memory contents

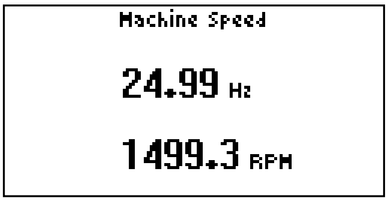


Fig. Machine Speed

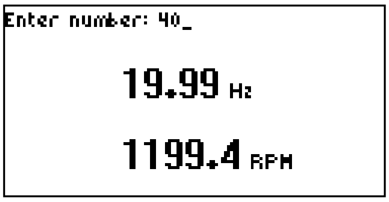


Fig. Identification number 40 entered

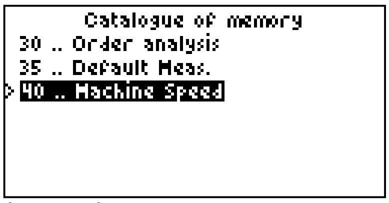


Fig. Memory contents

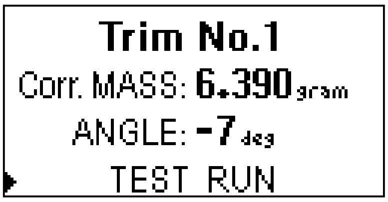


Fig. Single plane balancing

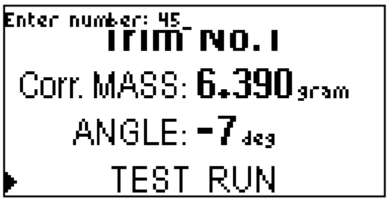


Fig. Identification number 45 entered

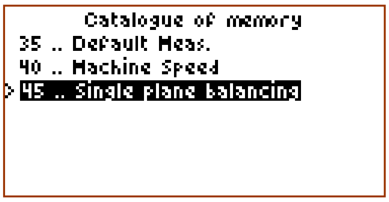


Fig. Memory contents

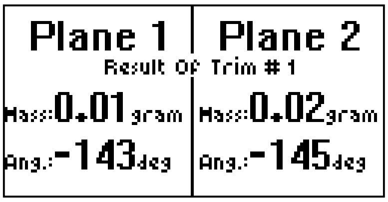


Fig. Two plane balancing

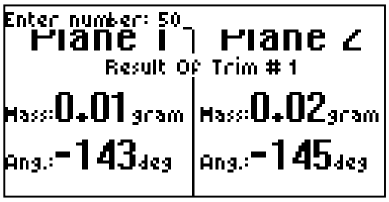


Fig. Identification number 50 entered

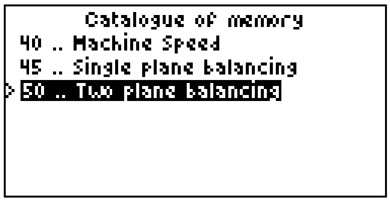


Fig. Memory contents

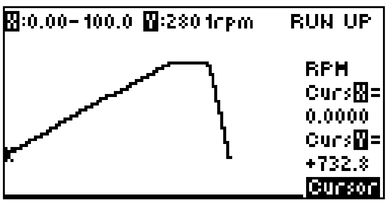


Fig. Run-up analysis

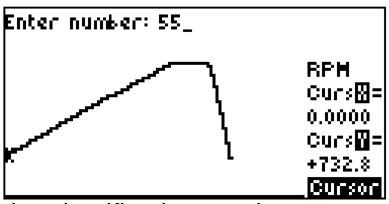


Fig. Identification number 55 entered

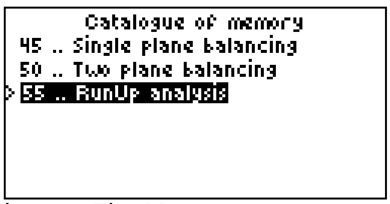


Fig. Memory contents

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

Display of Measured Data

After pressing ***F2*** in the analyser main menu, a list of all the stored measurements will appear:

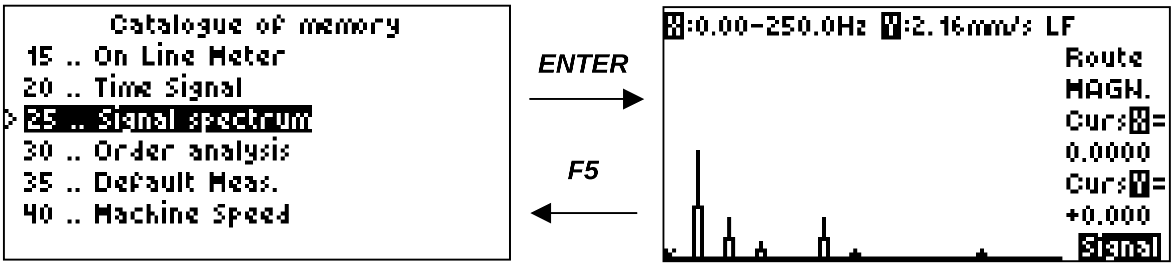


Fig. List of stored measurements

Fig. Result of the selected meas.

By pressing the ***ENTER*** key from the display with the ***list of measurements***, the measured values of the selected measurement will appear. For the appearance of the screens with the measured data see corresponding measurements in chapter ***On Line Measurement.***

If there are more measured data, they can be gradually displayed by pressing the ***PgUp***, ***PgDn*** keys. This case is typical when displaying the result of the ***Default Measurements***, represented by four measurement results via 4 signal paths – see chapter ***Types of Signal Processing***.

Return to the screen with the list of measurements by pressing the ***F5*** key.

Erasing the Memory (SHIFT+F5)

By pressing the combination of the ***SHIFT+F5*** keys, erase the entire measured data memory. Be careful, it is an irreversible operation.

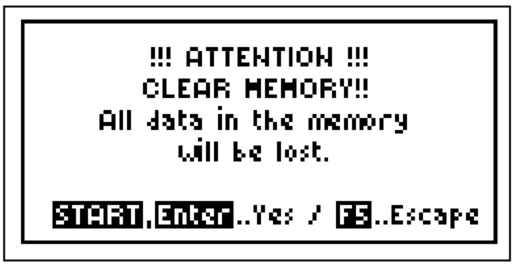


Fig. Warning after pressing ***SHIFT+F5***

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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.

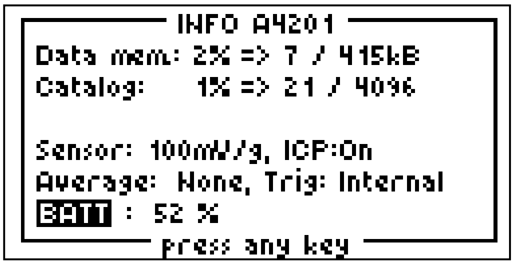


Fig. About instrument (***F3***)

Data mem	- Current fill of the measurement memory. The displayed information says that out of a total of 415 KB of the memory, 7 KB are occupied, which means less than 2%.
Catalog	- Current fill of the memory for the measurements. The displayed information says that out of a total capacity of 4,096 items, 21 items are occupied, which means less than 1%.
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***.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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.

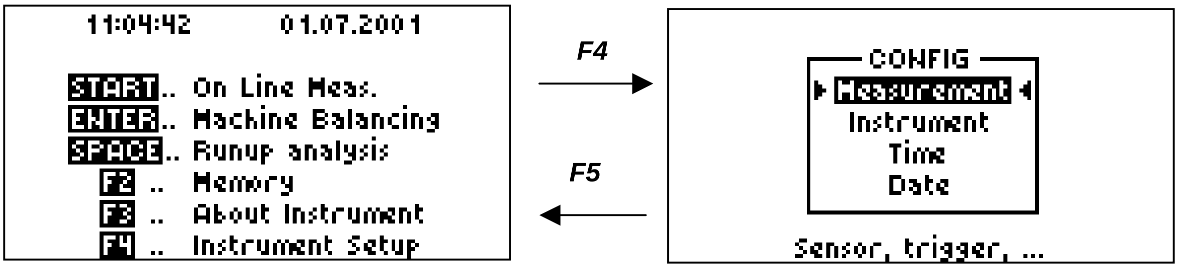


Fig. Main menu of the analyser

Fig. CONFIG menu

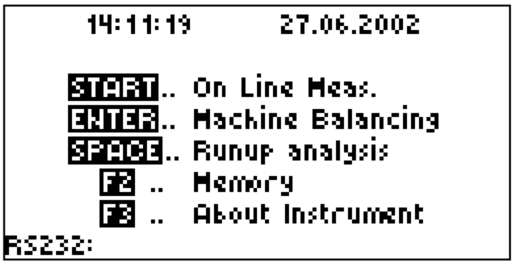


Fig. Choice ***F4 – Instrument Setup*** is not displayed

Attention! If the RS232 communication cable is connected to the instrument, the line ***F4 – Instrument Setup*** is not displayed in the analyser main menu. Choice ***F4 – Instrument Setup*** is functional!

Measurement Setup

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

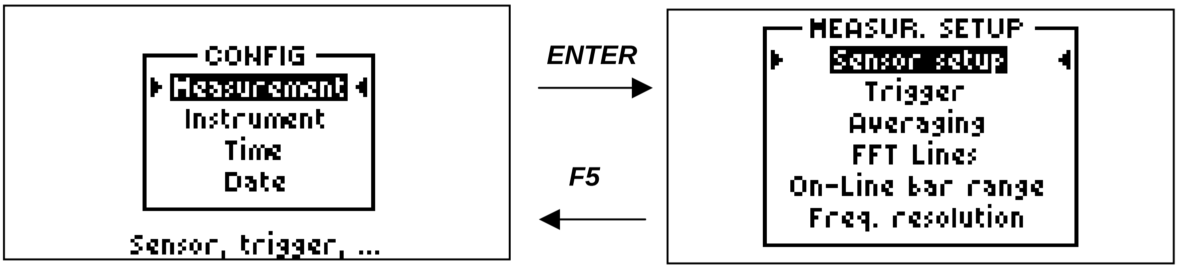


Fig. Measurement setup

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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

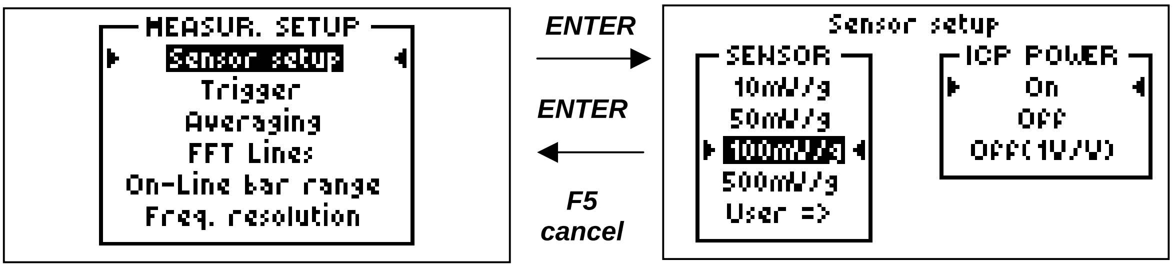


Fig. Sensor setup

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.

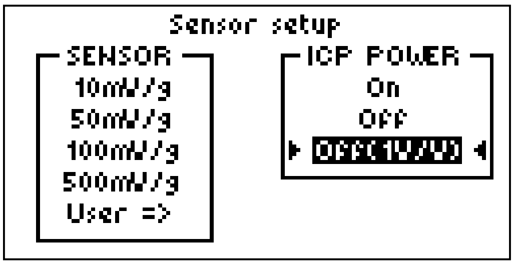


Fig. Voltage signal analysis setting

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.):

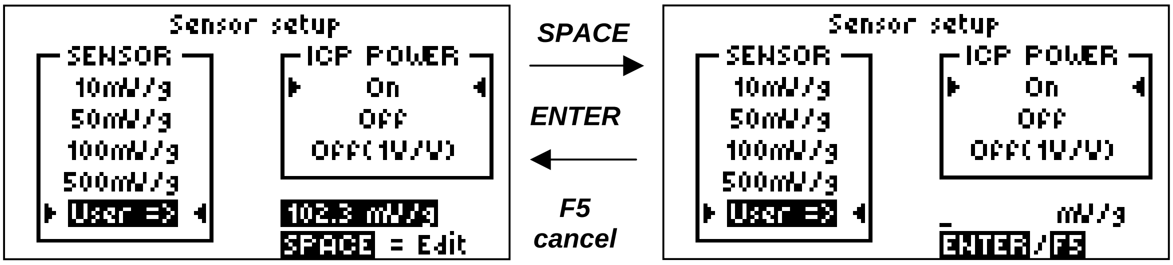


Fig. User selection of the sensor sensitivity

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. order analysis, machine balancing, run-up analysis).

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.

Retrig is used if time signal or FFT are 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.

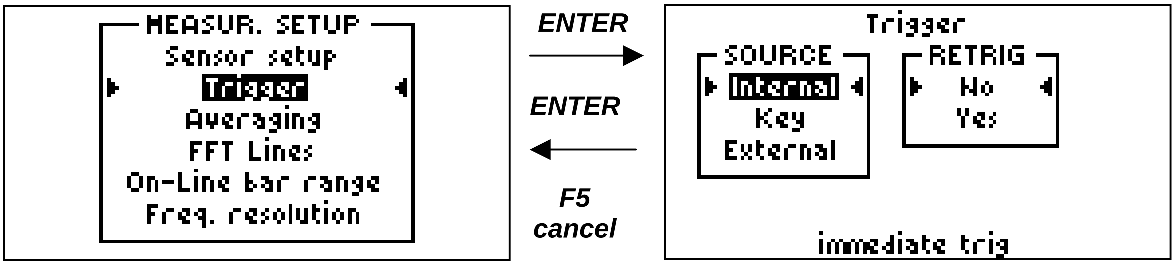


Fig. Activation of the Trigger

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).

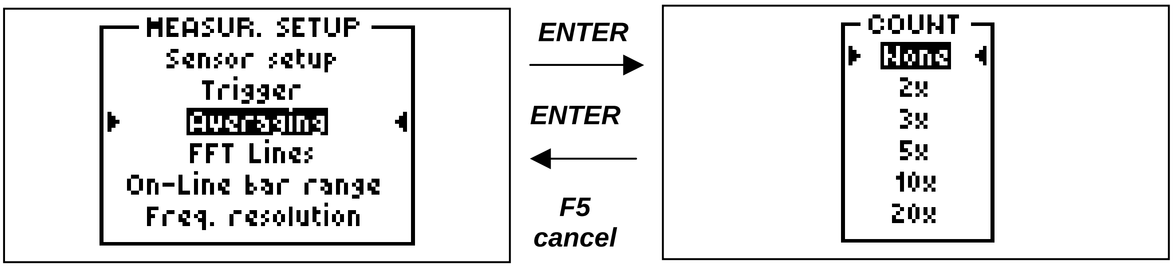


Fig. Activation of the Averaging

Fig. Selection of the number

FFT Lines Number

Note: Instruments supplied only in the basic version do not have to have this function implemented – see chapter ***Capabilities of 4201 Analysers***.

According to the requirement for step size on the frequency axis, the appropriate number of FFT spectrum lines can be set up.

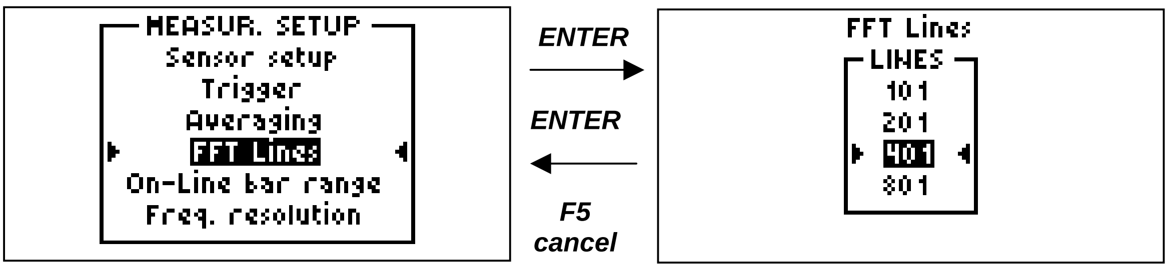


Fig. Activation of the FFT Lines

Fig. Selection of the number

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.

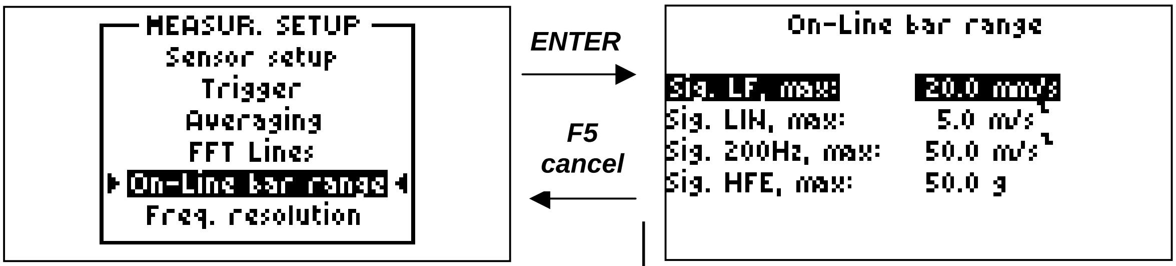
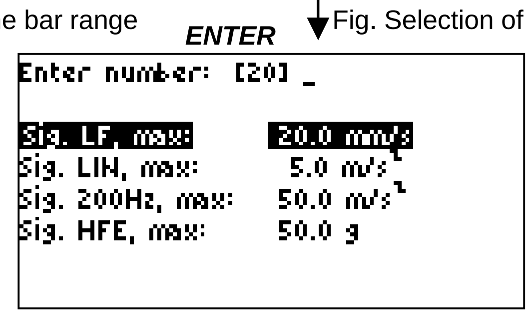


Fig. Activation of the On-Line bar range

Fig. Selection of the signal path



Frequency Resolution

The parameter serves to set frequency resolution in the Order Analysis, Balancing and Run-up Analysis measurements.

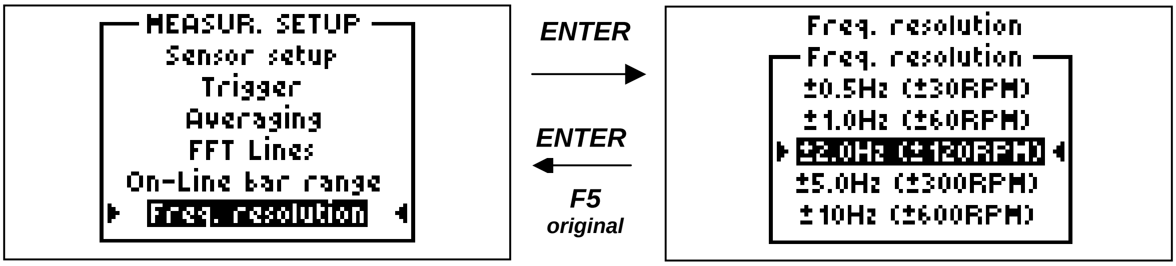


Fig. Activation of the Freq. resolution menu

Fig. Frequency resolution Setup

Balancing

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

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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

Run-up Analysis

For a faster run-up (run-down) machine, the highest possible speed of measurement is requested; therefore a wider machine speed frequency line must be selected with all the resulting consequences – see the above description of balancing.

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).

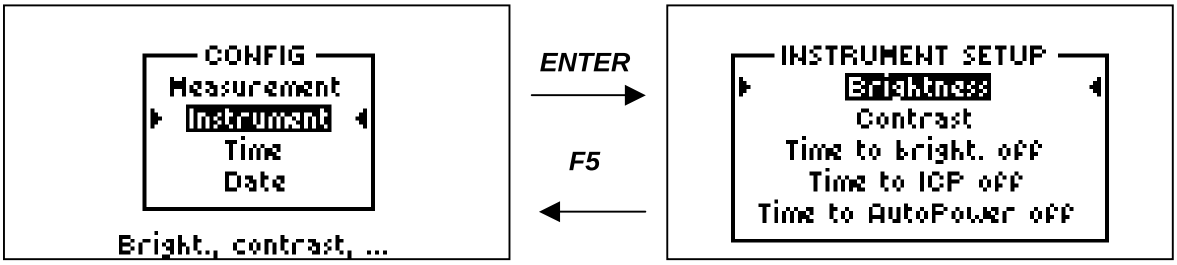


Fig. Instrument setup

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 dispalyed 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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

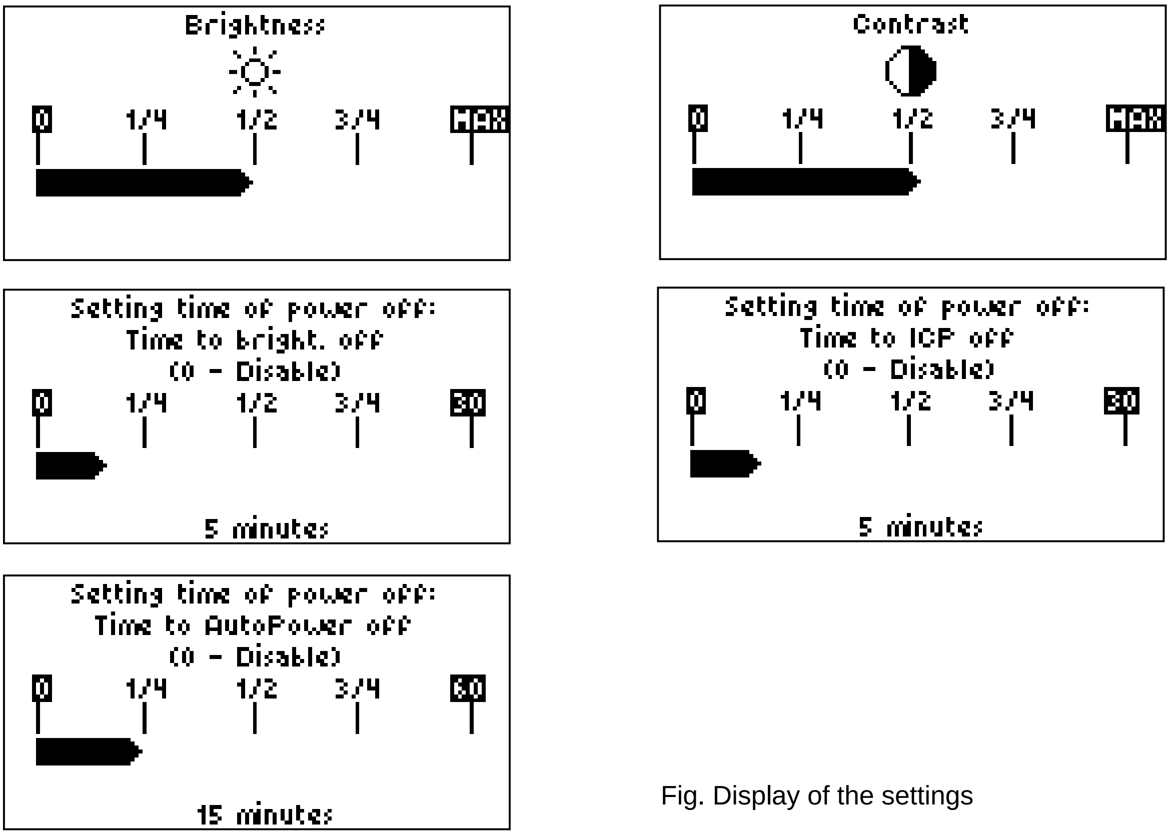
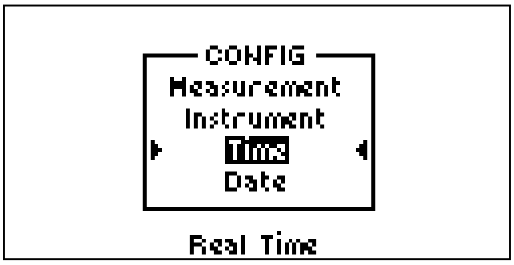


Fig. Display of the settings

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.



ENTER →

ENTER ←

F5 cancel

Fig. Activation of the Time

Fig. Time setup

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz

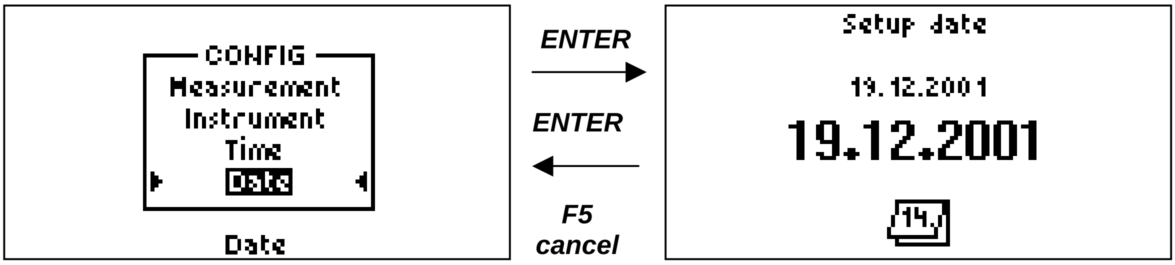


Fig. Activation of the Date

Fig. Date setup

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).

Not Implemented!

This message shows that you are attempting to run a type of measurement in the On Line Meas. mode that is not implemented in the software of your analyser, e.g. Time signal, FFT analysis, Machine Speed – see chapters ***Capabilities of 4201 Analysers*** and ***On Line Measurement***.

If FFT analysis is not implemented in your analyser, then the error message appears also if attempting to set up the FFT Lines parameter – see chapter ***Measurement Setup***.

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.

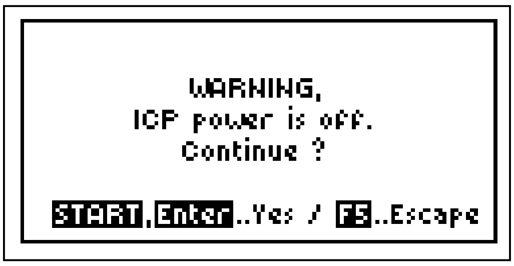


Fig. ICP power is off warning

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.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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.

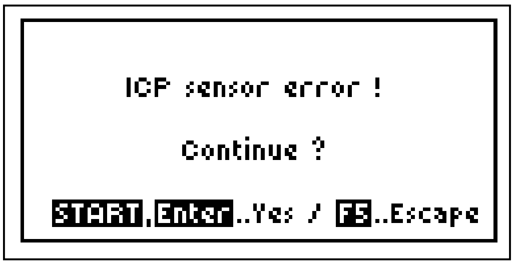


Fig. ICP sensor error

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

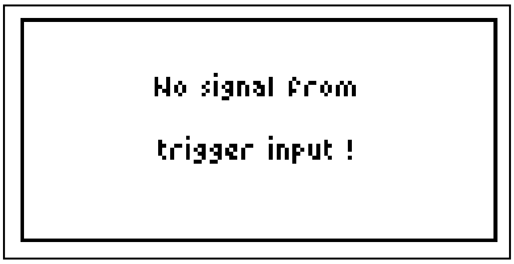


Fig. Trigger pulse timeout

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:

- order analysis
- 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:

- complex spectrum
- 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:

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***.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

Select ***Trigger,*** press ***ENTER***, select ***Internal*** and press ***ENTER*** – see chapter ***Measurement Setup.***

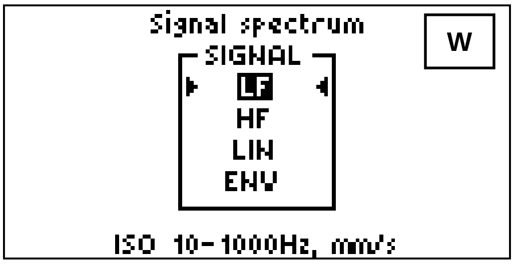


Fig. Measurement failed

Measurement in the Balancing Mode Failed

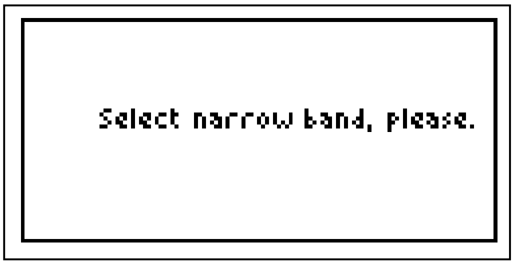


Fig. Low machine speed in the balancing

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 (Frequency Resolution)***.

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

Overload!

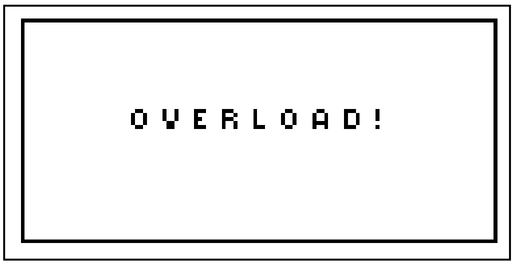


Fig. Too strong signal from the vibration sensor

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***.

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

Technical Specification of Adash 4201

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 or datacollector
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 – 3000 m/s^2 (sensor 10 mV/g) - AC +/- 3 V peak
Data acqusition:	- measurement of TRUE RMS and TRUE PEAK values of vibration in LF, LIN, HF and ENV signal paths - wide-band gHFE and envelope analysis of bearing condition - evaluation of Crest factor value of vibration in LF, LIN, HF and ENV signal paths - evaluation of Kurtosis factor value of vibration in LF, LIN, HF and ENV signal paths - time domain analysis - FFT analysis (amplitude and complex spectrum) - order analysis - 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
FFT:	- frequency band: 200 Hz (100 Hz), 1 kHz, 16 kHz - FFT lines: max. 801 - Hanning window
Averaging:	- max. 64
Time signal:	- 2001 samples
Signal conditioning:	- integration - envelope analysis
Filters:	- LF, LIN and HF, 200 Hz (100 Hz)
Accuracy:	- 5%
Memory:	- 512 kB
Display:	- LCD with LED backlight
Interface:	- RS232

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz

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 - 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
- datacollector: measurement results are stored in the analyser memory – see chapter ***User Software***.
LF, LIN, HF and ENV signal paths – see chapter ***Types of Signal Processing***.

User Notes

ADASH Ltd., Czech republic, tel.: +420 596 232 670, fax: +420 596 232 671, email: info@adash.cz
For next technical and contact information visit www.adash.net, www.adash.cz