107VF

Vibration Analyzer

User's Manual

2021

CONTENT

General

Safety Precautions

To prevent possible electrical shock, fire, personal injury or the device damage:

• Carefully read user's manual.

• Do not place sensor on the objects which exposed to high voltages. These voltages could cause personal injury or death.

• The Analyzer could not be used in potentially explosive environments.

• Take measures to prevent cables and straps become entangled by rotating part of machines at measurement site.

• Do not expose 107VF parts to heavy impacts, high humidity and extreme temperature.

• Do not try to open the display unit – this can damage the system, and your after-sales service warranty will come void

Vibration measurement and balancing involves measurement on rotating machines. Always keep a safe distance to rotating parts and secure transducers and transducer cables from rotating parts.

Balancing involves mounting of trial and balancing weights on the rotor. Always secure the start switch with a locker and also use the emergency switch for double safety before working with the rotor.

This is especially important when the machine is remote controlled.

ALVIB SISTEMAS SL, NPP KOHTECT cannot take responsibility for any accidents on people and machines.

Heed all warnings and recommendations to prevent data loss, data inaccuracy, damage to the instrument, or injury to yourself!

Overview

The 107VF Vibration Analyzer (Device, Analyzer) is a compact yet powerful, vibration analyzer designed to measure overall vibration parameters, FFT spectrum analysis of the rotating machinery, immediate evaluation against ISO 10816 standard, balancing of rotating machinery, condition monitoring by route-based measurements and data collection. Route files and data files exchange via email makes it ideal for data collection at remote sites. Simple in use, with free firmware upgrades, comes with data management and reporting software.

Kit Content

The 107VF kit includes:

- 107VF display unit;
- accelerometer, incl. cable 1.5m, magnet for curved surface mount;
- Optical probe, magnetic stand (-T, -T2, -B versions);
- USB wall charger;
- USB cable;
- ConSpect software and User's Manual on the device drive;
- Carry case.

Specifications

Inputs – IEPE or charge type accelerometers with known sensitivity, switchable. Optical RPM transducer with IR pyrometer sensor (optional)

AD conversion – 24 bits

Dynamic range – 106 dB

Frequency range – 1…10000 Hz

Vibration measurement range:

Acceleration – 200 m/s^2

Velocity – 200 mm/s

Displacement – 2000 uM

Accuracy – ±5%

Balancing program – up to 4 Planes, up to 8 Points

Temperature measurement range – -70°C to 380°C

Accuracy – ±0.5% (0…+60°C), ±1% (-40…+120°C), ±2% (-70…+180°C), ±4% (-70…+380°C)

Tachometer measurement range – 10…200,000 rpm

Accuracy – ±0.1% and ±1rpm

FFT spectrum resolution – 400, 800, 1600 lines

Data storage – 4GB micro SD card, built-in

PC interface – USB

Display – color, sunlight readable 128x160 dots

Battery – Li-Po rechargeable, up to 8 hrs continuous operation

Operating Temperature – 0°C to 50°C

Storage Temperature – -20°C to 60°C

Operating Humidity -

Dimensions – 132 x 70 x 33 mm

Weight – 150 g

Measurement functions

Vibration mode – analyzer measures overall level of vibration acceleration, velocity and displacement and FFT spectrum, route or off-route measurements.

Tachometer – analyzer measures speed of rotation by means of contactless optical sensor. The measurement result is displayed in RPM and Hz.

IR thermometer – contactless measurement of object temperature. The measurement result is displayed in °C and °F.

Balancing – measurements and calculation of correction masses for rotating machine balancing purposes.

Operation

Keyboard

– press and hold for 3 sec to turn device ON, short press to turn OFF

– Enter, confirm selection, start measurement

– navigation arrow keys

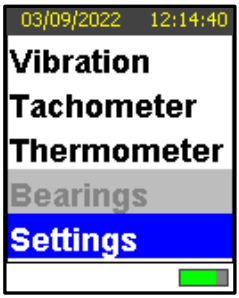
– Menu

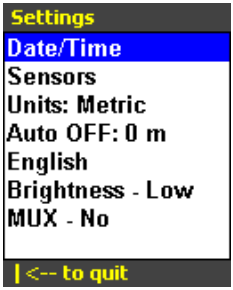
– backspace, quit

– option key

Settings

This menu is used to setup:





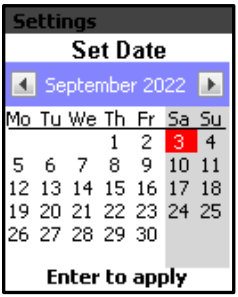
- **Date/Time**
- **Sensors** parameters
- **Units** Metric/Imperial units
- **Auto OFF** delay
- **English** interface language
- **Brightness** Low/Mid/High display brightness
- **MUX** input multiplexer to use triaxial sensors (optional)

Date/Time

Use arrow keys  to set date.

Hold  then press  or  for month decrement/increment.

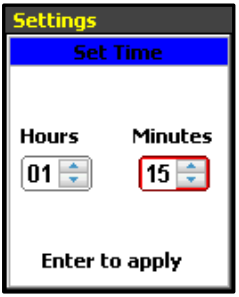
Confirm by  when correct date is set.



Use  keys to set minutes and hours.

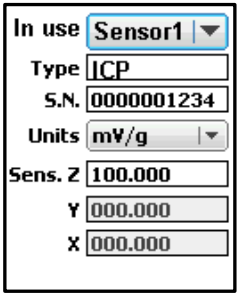
Use  key to switch focused field. Focused field is indicated by red frame.

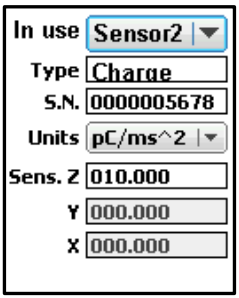
Confirm by  when correct time is set.



Sensors

Use  keys to choose sensor, which will be used for measurements. Drop down menu offers two types – IEPE or charge type sensors to choose from.





Confirm choice by  key.

Type, S.N. and **Sensitivity** fields are editable.

Use key to choose field to edit.

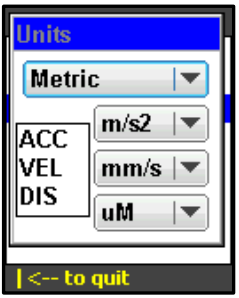
Then use arrow keys to edit the field value.

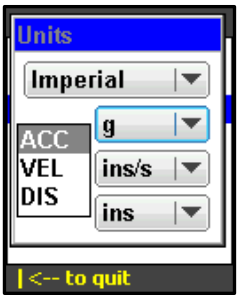
Units

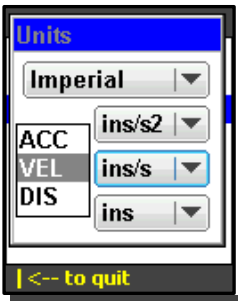
Metric/Imperial units setup

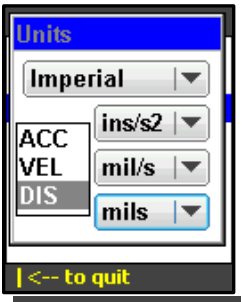
Use to switch between Metric/Imperial units.

Use key to choose units for Acceleration, Velocity, Displacement





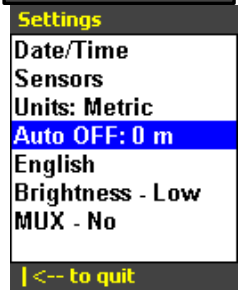


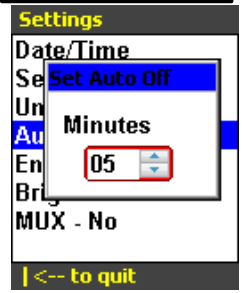


Auto OFF

Use keys to set auto OFF delay (minutes).

Press or key to confirm and quit menu.





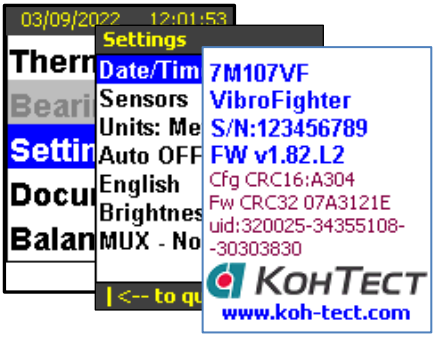
License key

To enable functionality, the license key need to be entered:

- Turn device ON
- Press sequentially 
- Use  to tick the functions for the provided license key
- Press  key
- Set the license key using 
- Press  to apply

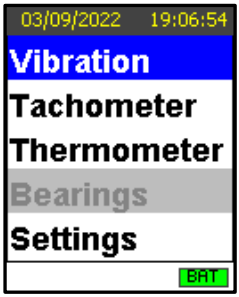
To request the license key:

- Turn the device ON
- Enter Settings menu, then press 
- Take a picture of the UID screen
- While the device in the UID screen – connect the device via USB cable to the PC and copy the **SysInfo.sys** file (it is a **system** file, make sure the option **Show hidden files** is enabled in the File explorer of your PC)
- Send picture of UID screen and SysInfo.sys file to the license key provider.



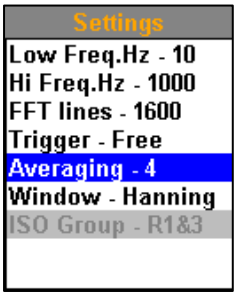
Vibration

Analyzer measures vibration **Acceleration, Velocity** and **Displacement**. In **ISO 10816** mode measurement result is compared to the built-in table of vibration severity grades according to ISO 10816-3.



Use keys to choose measurement mode.

Vibration measurement settings



Press key to enter Settings menu.

Use to choose parameter to setup.

Use to change parameter value.

Low Freq – lower frequency limit. Can be set to 1, 2, 10 Hz.

Hi Freq – upper frequency limit. Can be set:

- from 200 to 10000 Hz for Acceleration;

- from 200 to 5000 Hz for Velocity;

- from 200 to 800 Hz for Displacement;

FFT lines – FFT spectrum resolution. Can be set to 400, 800, 1600 lines.

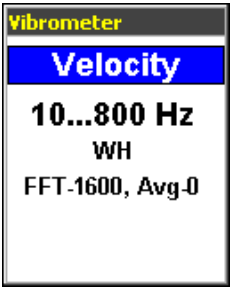
Trigger – *not implemented yet..*

Averaging – measurement averaging. Can be set in range of 0 to 64. Zero means that averaging is OFF.

Window – weighting function. Can be set to Hanning or Rectangular.

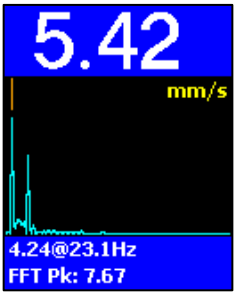
Taking measurements

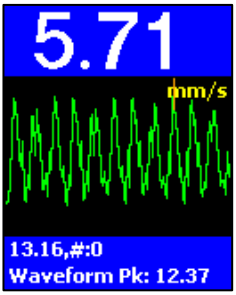
Choose vibration parameter e.g. **Velocity**, edit settings if needed, then press  key to start measurement.



While measurement is running:

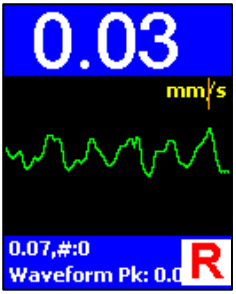
Use  key to toggle FFT spectrum / waveform display.





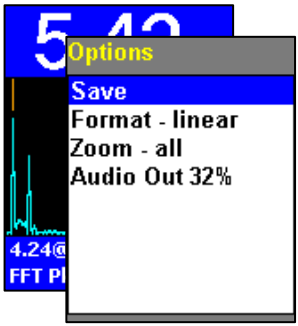
Press  key to stop/resume measurement.

Use  to start/stop WAV file recording of the measured waveform. Red R is flashing to indicate recording in progress.



When measurement is stopped:

Press key for **Options**:



Save.. – to save measurement data. Press key to proceed.

Format – Linear/Logarithmic amplitude display. Use to change parameter value.

Zoom – frequency axis display zoom change. Use to change parameter value

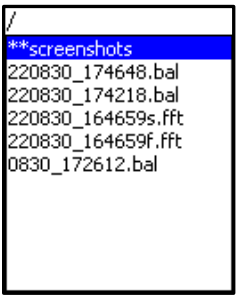
To save measurements

Press key to stop measurement

Press key for **Options**

Choose **Save..** and press key

Device will enter **My documents** menu



Browse to the destination folder, then press key to save measurement.

Device writes two files at a time – FFT spectrum file and waveform file.

Device remembers path to the last written files.

To create new folder – press F1 key. Date/time stamp is used as a default name for new folder.

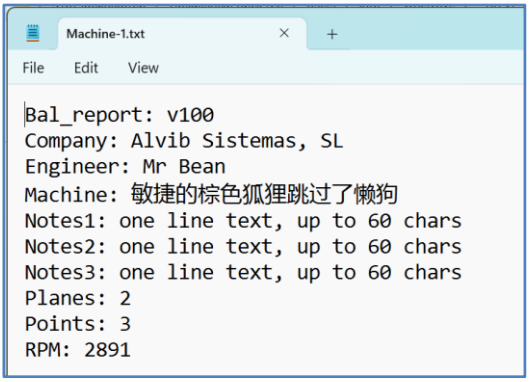
To create folders with meaningful names – connect device to the PC via USB as external flash drive, then create folders using PC keyboard.

To save balancing report file

To enable this feature:

Folders **Logo** and **Templates** must be copied to the **root** directory of the 107VF drive. These folders contain necessary files provided by the device supplier.

Replace **Logo.bmp** file with **Logo.bmp** file of your company logo. Keep the file name unchanged.



Text comments can be added to the report file. Due to lack of the alphanumeric keypad comments are added by means of text files. To add comments – edit the provided template file Machine-1.txt using Windows Notepad. The text lines tags terminated by the colon must be kept unchanged. As many as needed text files with machines information can be used.

Txt files can be located at any place of the 107VF drive, e.g. in the folder of corresponding to the machine measurement points. Keep the comments files extension *.**txt** unchanged, while names can be any.

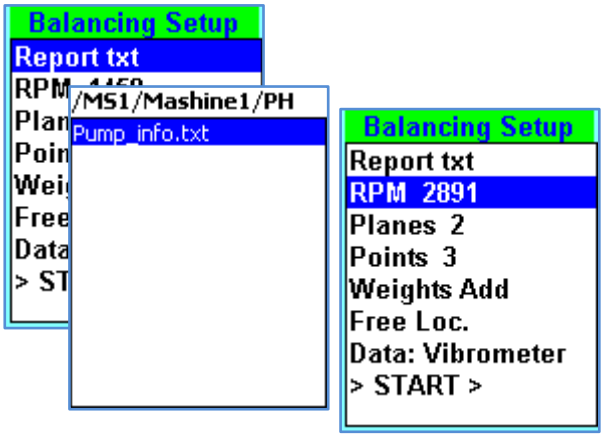
Procedure:

Position cursor at **Report txt**

Press  or 

Browse to the txt file location.

Press  key.



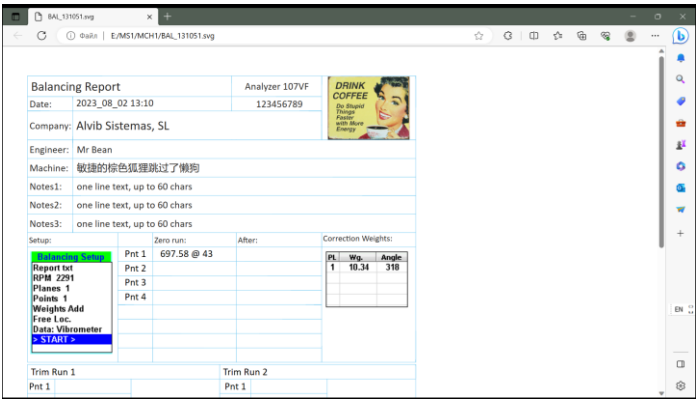
Proceed the Balancing procedure as usual.

PL	Wg.	Angle
1	3.09	47
2	1.49	272

In the result screen press  , browse to the destination folder, then press  key to save measurement report file.

Report file is saved in the **svg** format.

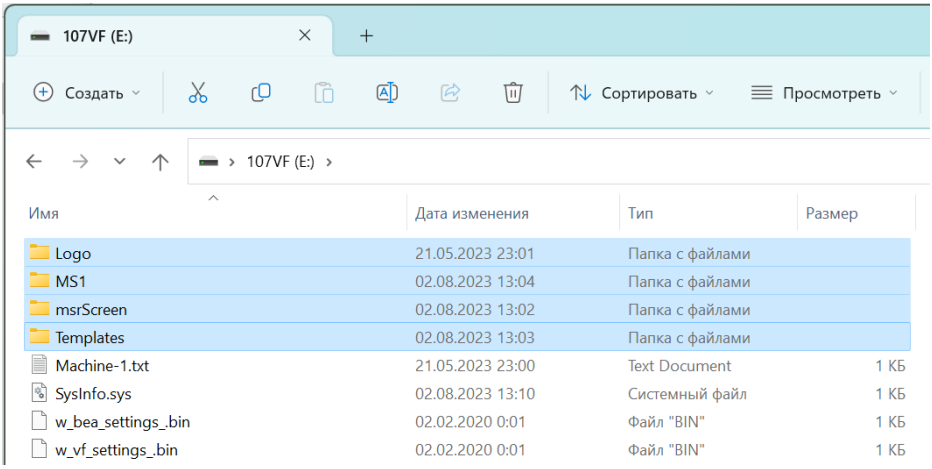
That files can be open by any web browser – e.g. Microsoft Edge.



Now the report file can be printed out or saved as pdf.

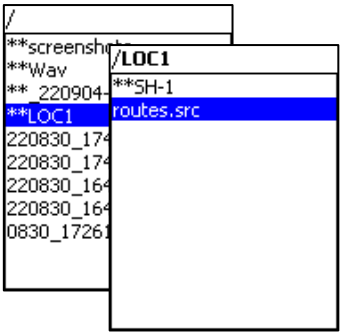
To copy reports from the device to PC drive:

- Create a folder **ReportsAV** on the PC drive. The folder name **ReportsAV** is mandatory.
- Copy all the folders from device to **ReportsAV** folder.



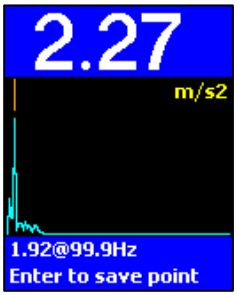
Route-based measurements

- Using ConSpect software create route file and download it to the device
- Go to **Documents** menu, move cursor to the route file **routes.src** and press  key



- Use  to browse route points

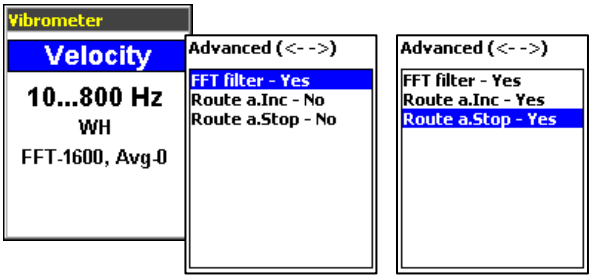
- Attach sensor at the measurement point and press  key. Device takes measurement with preset parameters and saves files to proper destination folder



Route points navigation can be preset to manual or autoincrement.

While in the Vibrometer menu:

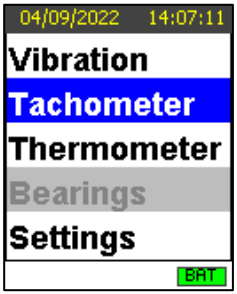
Press  key, then use  to set desired options.



Tachometer (-T, -T2, -B versions)

Connect optical probe to the device

Enter **Tachometer** menu



Aim optical probe to the rotating machine part with attached reflective tape.

Press  key to start/stop measurement.

Device displays measurement result in **RPM** and **Hz**

To save measurement:

- Stop measurement then press  key
- Browse to the destination folder, then press  key to save the file

To save measurement

- press  key to stop measurement
- press  key
- browse to a destination folder
- press  key to save measurement file
- press  key one more time to return to measurement menu

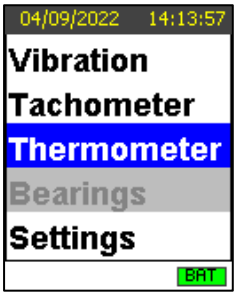
Thermometer (-T2 version)

Connect optical probe to the device

Enter **Thermometer** menu

Aim optical probe to the machine.

Press key to start/stop measurement.



Device displays measurement result in °**C** and °**F**

To save measurement:

- Stop measurement, then press key
- Browse to the destination folder, then press key to save the file

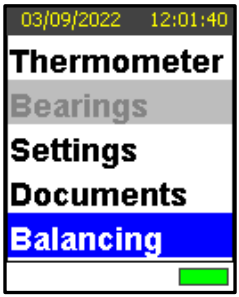
To save measurement

- press key to stop measurement
- press F1 key
- browse to a destination folder
- press key to save measurement file
- press key one more time to return to measurement menu

Balancing

Setup Balancing parameters

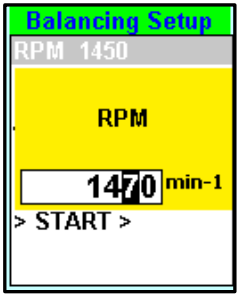
Enter Balancing function.



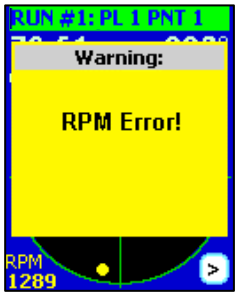
Use  to choose parameter to setup.

Use  to change parameter value.

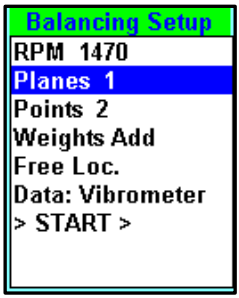
Set **RPM** of the machine at which balancing will be conducted.

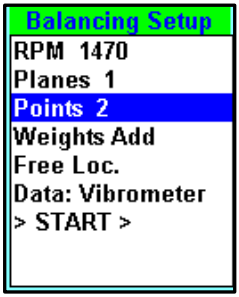


If actual RPM and balancing RPM differs by more than 5% device will display error message while measurement is in progress

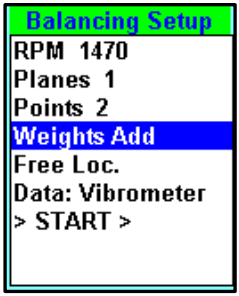


Set number of **Planes** (where correction weights will be attached) and number of **Points** (where the accelerometer will be measuring the vibration levels).

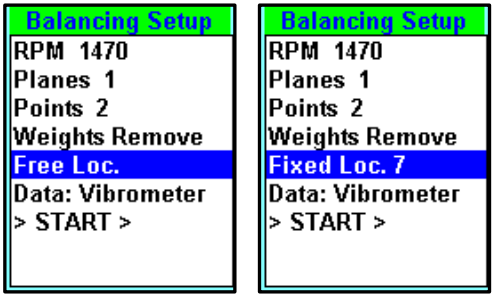




Balancing weights can be preset to **Add** or **Remove**.



Correction weights can be attached at any angular position - **Free Loc.** Or at **Fixed Locations** (e.g., at the fan blades). Number of Fixed locations can be set in the range of 3 to 18 locations.



*Balancing program assumes that angles (and fixed location numbering) are aways calculated **counter wise** machine rotation direction!*

Press  to start measurements.

Balancing in one plane

One-Plane Balancing Procedure Overview

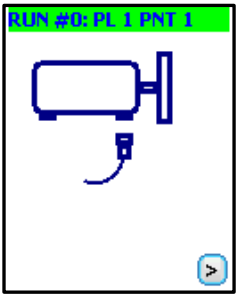
- Run 0 - the initial vibration (unbalance) measurement
- Run 1 – vibration measurement with trial weight attached in plane A
- Stop the machine, attach calculated correction weight at the specified angle on balance planes A.
- Trim run 1… – Start the machine and measure residual vibration level. Once measurement stopped device will calculate trim weight, to further reduce the vibration. If residual vibration is higher than target value – attach trim weight and perform another trim run. Repeat trim runs until required vibration level is achieved.

Example: Balancing procedure flow (one plane, one point)

Set Balancing parameters.

Press 

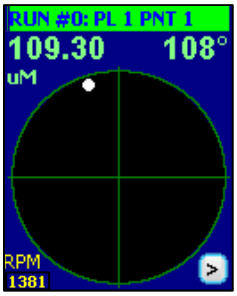
Place accelerometer at measurement point



Press 

Wait reading to stabilize.

Press 

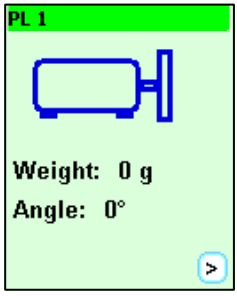


Confirm reading is accepted.

Press 

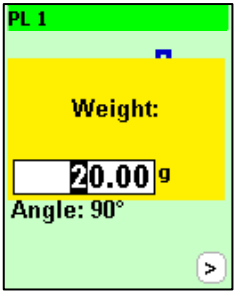
Stop the machine.

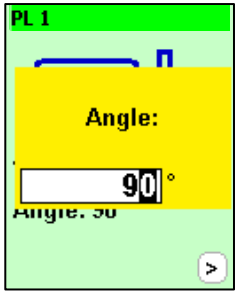
Attach the trial weight.



Press  to enter trial weight and angle, at which it is attached

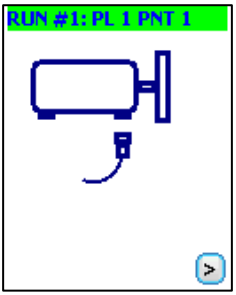
Press 





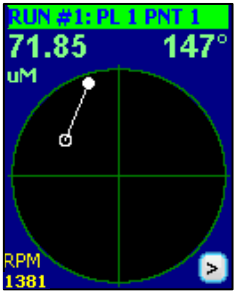
Start the machine.

Press  to start measurement.



Wait reading to stabilize.

Press 



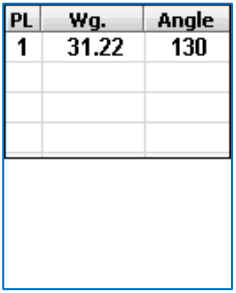
Confirm reading is accepted.

Press 

Stop the machine.

Device displays calculated correction weight to be attached to eliminate disbalance.

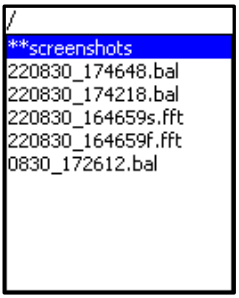
Balancing report can be saved from the result screen.



PL	Wg.	Angle
1	31.22	130

Press enter **My documents** menu

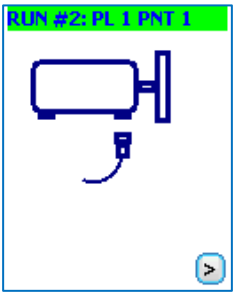
Browse to the destination folder, then press key save measurement.



Residual vibration can be measured now.

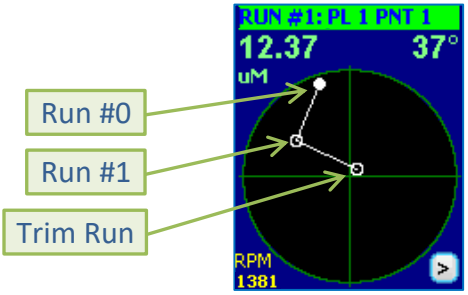
Start the machine.

Press to start measurement.



Wait reading to stabilize.

Press

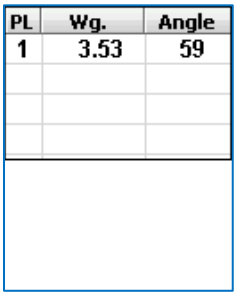


Confirm reading is accepted.

Press

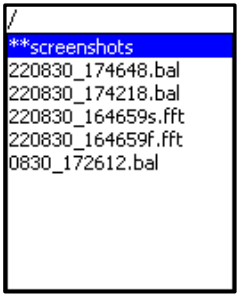
Stop the machine.

Device displays calculated trim weight to be attached to further eliminate disbalance.



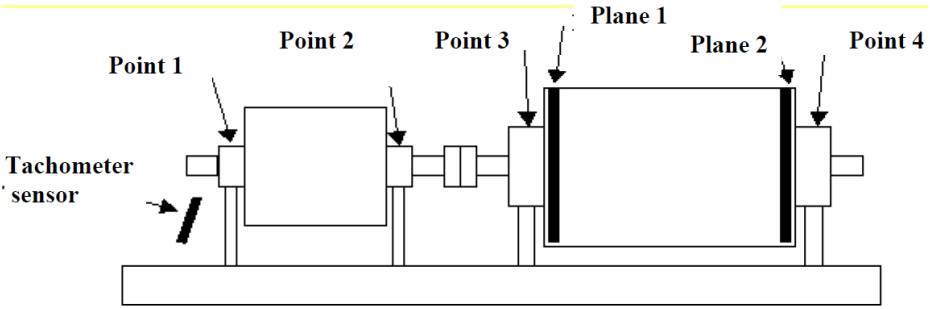
Press  to enter **My documents** menu

Browse to the destination folder, then press  key save measurement.



Example: Balancing procedure flow (two planes, four points)

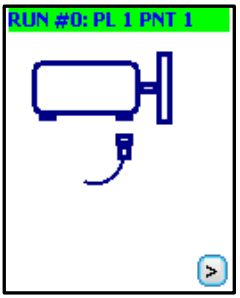
There are two planes were the correction weights to be attached, and four points at which vibration levels will be measured.



Set Balancing parameters.

Press 

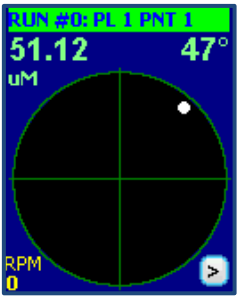
Place accelerometer at measurement point #1



Press 

Wait reading to stabilize.

Press 

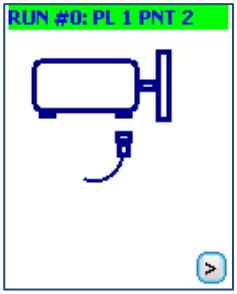


Confirm reading is accepted.

Press 

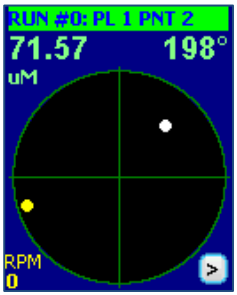
Place accelerometer at measurement point #2

Press 



Wait reading to stabilize.

Press 

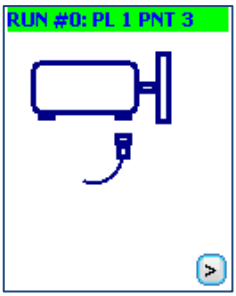


Confirm reading is accepted.

Press 

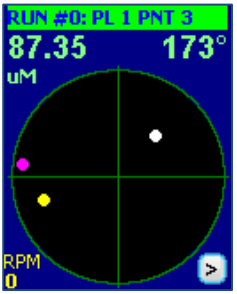
Place accelerometer at measurement point #3

Press 



Wait reading to stabilize.

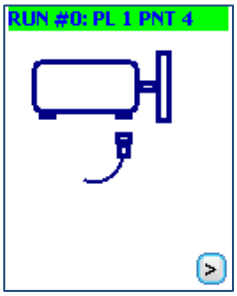
Press 



Confirm reading is accepted.

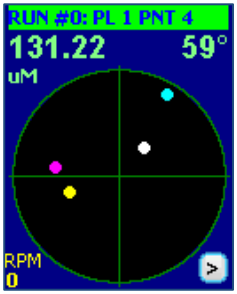
Press 

Place accelerometer at measurement point #4



Press 

Wait reading to stabilize.



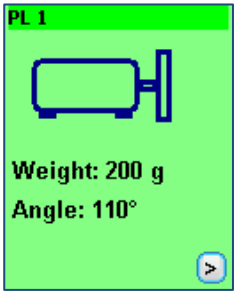
Press 

Confirm reading is accepted.

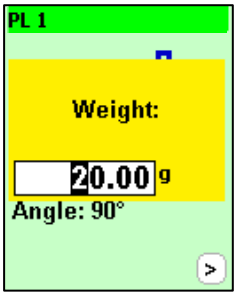
Press 

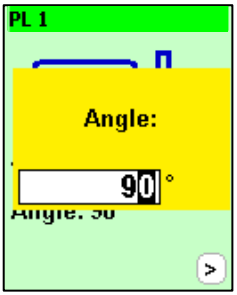
Stop the machine.

Attach the trial weight.



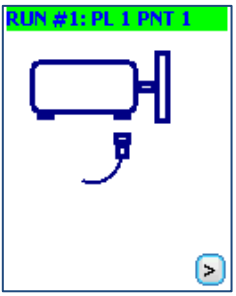
Press *to enter trial weight and angle, at which it will be attached*





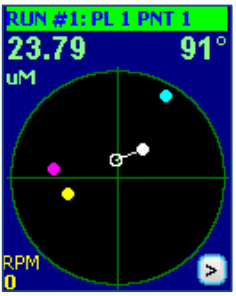
Press

Run the machine and take measure vibration levels at all four points when trial weight is attached at the Plane #1.



Place accelerometer at measurement point #1

Press



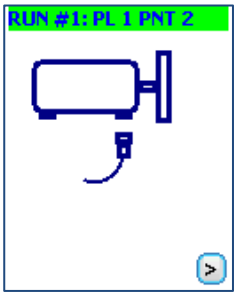
Wait reading to stabilize.

Press

Confirm reading is accepted.

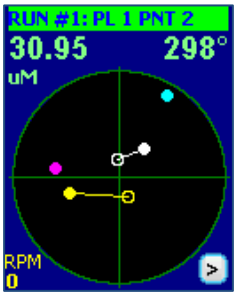
Press

Place accelerometer at measurement point #2



Press

Wait reading to stabilize.

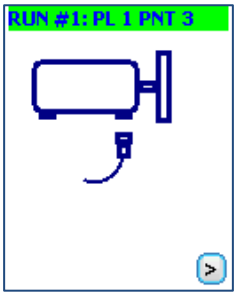


Press

Confirm reading is accepted.

Press

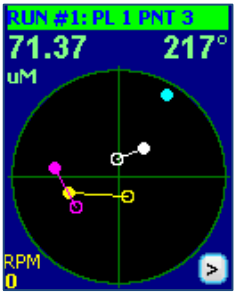
Place accelerometer at measurement point #3



Press

Wait reading to stabilize.

Press

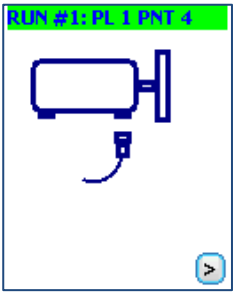


Confirm reading is accepted.

Press

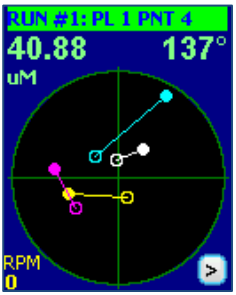
Place accelerometer at measurement point #4

Press



Wait reading to stabilize.

Press



Confirm reading is accepted.

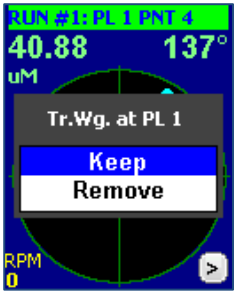
Press 

Stop the machine as measurements at all points is finished.

Now one needs to decide whether to keep or remove the trial weight from Plane #1.

E.g. trial weight can remain attached if vibration levels decreased.

Chose option and press 

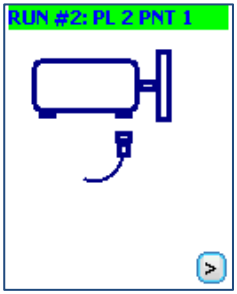


Now attach the trial weight at the Plane #2

Enter trial weight and angle, at which it will be attached.

Run the machine and take measure vibration levels at all four points when trial weight is attached at the Plane #2.

Place accelerometer at measurement point #1



Press 

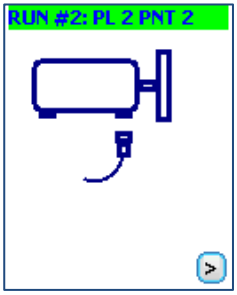
Wait reading to stabilize.

Press 

Confirm reading is accepted.

Press 

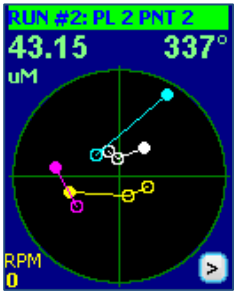
Place accelerometer at measurement point #2



Press 

Wait reading to stabilize.

Press 

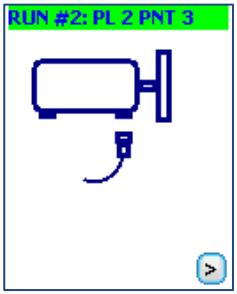


Confirm reading is accepted.

Press 

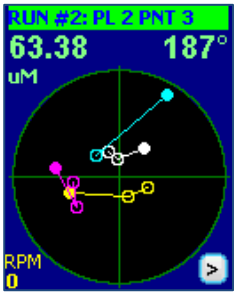
Place accelerometer at measurement point #3

Press 



Wait reading to stabilize.

Press 

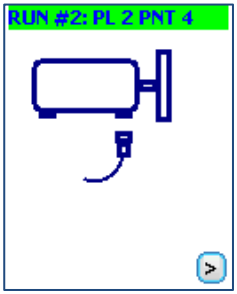


Confirm reading is accepted.

Press

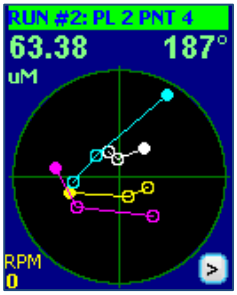
Place accelerometer at measurement point #4

Press



Wait reading to stabilize.

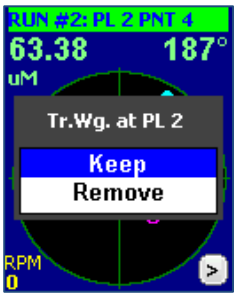
Press



Confirm reading is accepted.

Press

Stop the machine. Choose to keep or remove the trial weight at the Plane #2



Press 

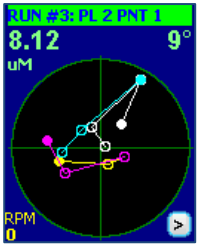
Device displays calculated correction weights to be attached at Planes #1 and #2 to eliminate disbalance.

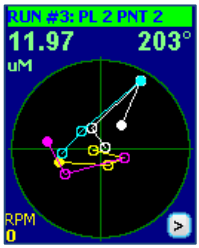
Balancing report can be saved from the result screen.

PL	Wg.	Angle
1	56.93	241
2	98.04	187

Residual vibration can be measured now.

Run the machine and take measurement of residual vibration levels at all four points.





Stop the machine.

When residual vibration measurement is finished, the device calculates trim weights, which need to be attached to further reduce vibration of the machine.

Balancing work can be stopped as acceptable levels are reached.

PL	Wg.	Angle
1	10.00	30
2	14.12	72

Bearings tester function

Bearings tester function is based on shock pulse measurement and Kurtosis measurement.

Shock Pulse measurement

The most favorable conditions for the operation of bearings occur when their components are separated by a film of lubricant that prevents collisions. However, manufacturing defects, in-service damage, contamination, lack or absence of lubrication create conditions for collisions of bearing elements, resulting in acoustic vibrations in a wide range of frequencies in the bearing body – so called shock pulses.

Even a new bearing is a source of shock pulses from the moment it is commissioned, for which the amplitude of the shock acceleration is denoted by dBi.

The dBi value indicates the condition of a new, properly installed and lubricated bearing.

As defects in the bearing develop, the amplitude of shock pulses increases. Value exceeding the dBi characterizes the damage and is used to assess the condition of the bearing:

0..20 - good condition

20..35 – satisfactory condition

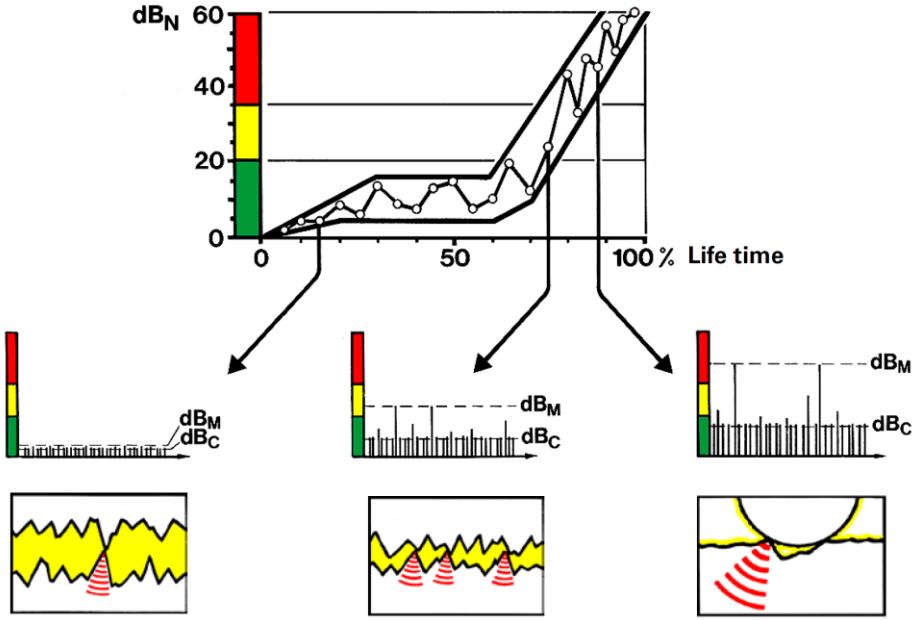
>35.. - Poor condition, risk of failure

Depending on the type of damage in the bearing, the nature of the forced oscillations recorded by the device also changes.

When measured, device allows you to distinguish and measure two characteristic values of the shock pulse amplitude – the carpet value - dBc, and the maximum - dBm values.

The carpet value dBc corresponds to frequent collisions of bearing elements and characterizes the state of lubrication. For example, when measuring the impact acceleration amplitude of a well-lubricated and properly mounted bearing, the dBm value will be slightly greater than dBc.

If we measure the amplitude of the impact acceleration of a damaged bearing, they are detected by the maximum values - dBm, while the value of dBc depends on the state of lubrication and can increase greatly with a lack of lubrication, accompanied by frequent metal-to-metal contacts. An example of a change in the values of these values is shown in Fig.



An increase in the carpet dBc value can be caused not only by deterioration in the condition of the lubricant, but also by other causes, such as misalignment of the shafts in the coupling of the drive. It is quite easy to distinguish between these phenomena: if the shafts are skewed, the same pattern will be observed for the bearings on both sides of the coupling.

When measuring the amplitude of the shock acceleration of gearbox bearings, the result obtained may be affected by shocks occurring in the gearing, which can be transmitted to the bearings. However, in most cases, the noise of the gears is so low that it does not affect the measurement results.

In the case of impacts resulting from gear defects, the maximum value of dBm increases dramatically on both sides of the gear at the same time.

The greatest effect of monitoring the technical condition of bearings is achieved when recording the measurement results with the construction of a graphical dependence in time. At the same time, it becomes possible to predict the technical condition. An example of processing measurement results is given in Table 1 (page 14).

Measurement results can be stored in the device memory.

Kurtosis

In the case of a serviceable bearing, the probability density of stationary random vibrations that occur in a serviceable bearing due to frictional forces can be considered to be in accordance with the normal law. The appearance of defects accompanied by impacts between the bearing bodies and raceways leads to a change in the shape of the probability density curve **p(x)** and, accordingly, to a change in the numerical value of the kurtosis coefficient **E**. Moreover, the more developed the defect, the sharper the density curve becomes.

Based on the results of the analysis of a large sample of defective and non-defective bearings, the following threshold values of the kurtosis coefficient were established:

Ku < 3 – corresponds to the good condition of the bearing;

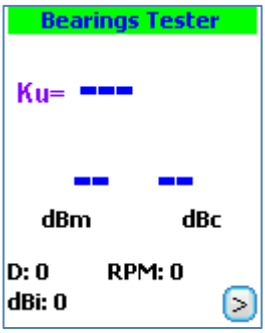
Ku > 3 – the bearing can be operated until the next replacement;

Ku > 5 – the bearing is not allowed to be used.

The statistic index Kurtosis is insensitive to changes in rotational speed and load and does not require knowledge of the bearing size to be diagnosed and repeated measurements. The kurtosis coefficient is sensitive to the lubrication condition of the bearing, so it can also be used to diagnose plain bearings. The Kurtosis measurement cannot identify a defect, so it is recommended to use it at the stage of preliminary assessment of the technical condition of bearings, and to identify and localize defects, use more accurate methods of vibration diagnostics.

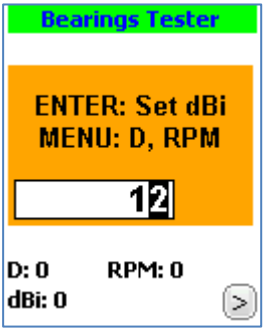
Operation

- Enter **Bearings** menu:



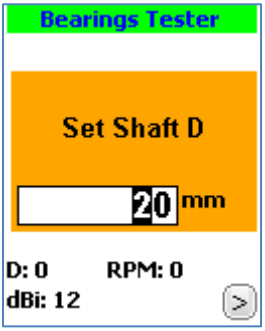
To set dBi

- press key
- Use keys to set dBi value
- Confirm by key



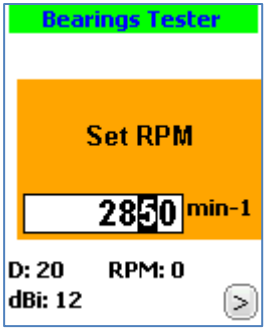
If dbi value is unknown just enter the bearings shaft diameter and RPM and device will calculate the dBi value:

- Press key
- Use keys to set the shaft diameter
- Confirm by key



then

- Use keys to set the RPM
- Confirm by key

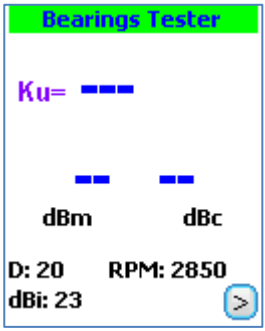


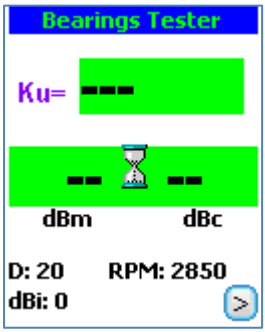
Measurement

- connect P77 probe to the device socket
- press the probe tip against the measuring point with a pressure force of about 1 kg

- press key

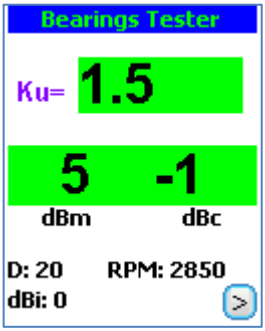
Header color will change to blue when measurement is active.

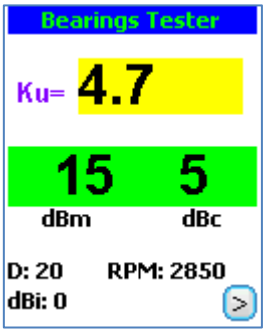


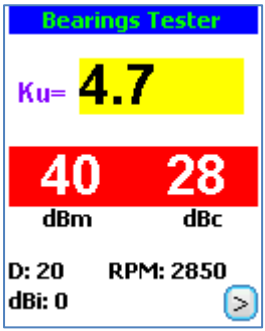


Measured data is continuously updated until the next press of the  key which will terminate measurement.

To facilitate evaluation of the result, the device displays data on a colored background of green, yellow, or red.







Green – corresponds to the good condition of the bearing;

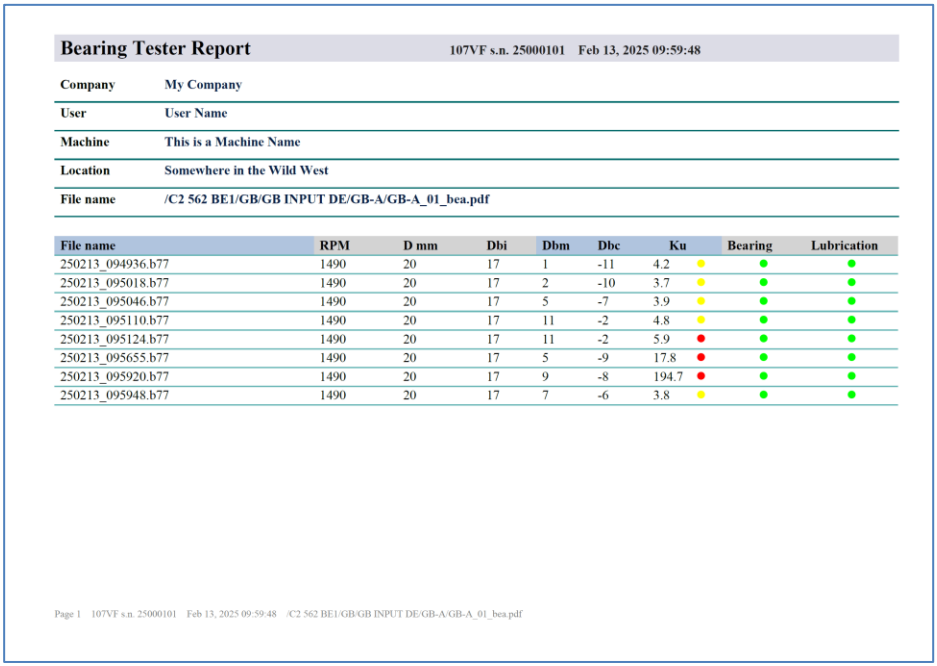
Yellow – the bearing can be operated until the next replacement;

Red – the bearing is not allowed to be used.

To save measurement

- press  key to stop measurement
- press  key
- browse to a destination folder
- press  key to save measurement file
- press  key one more time to return to measurement menu

Each individual measurement record is also added to a PDF report that includes all measurements from this folder (measurement location):



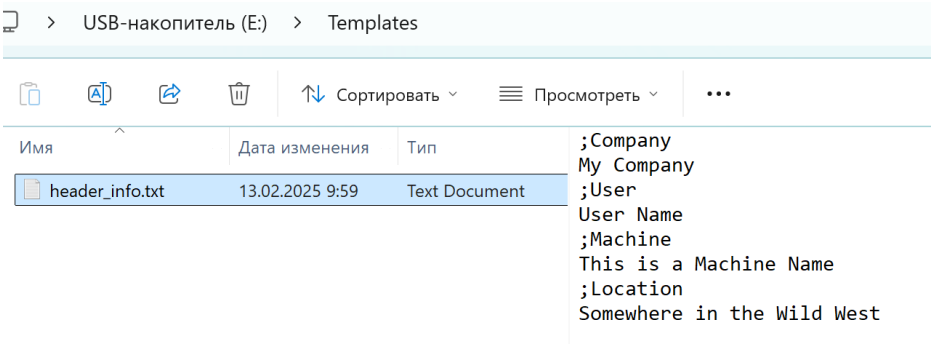
Bearing Tester Report 107VF s.n. 25000101 Feb 13, 2025 09:59:48

Company	My Company
User	User Name
Machine	This is a Machine Name
Location	Somewhere in the Wild West
File name	/C2 562 BE1/GB/GB INPUT DE/GB-A/GB-A_01_bea.pdf

File name	RPM	D mm	Dbi	Dbm	Dbc	Ku	Bearing	Lubrication
250213_094936.b77	1490	20	17	1	-11	4.2		
250213_095018.b77	1490	20	17	2	-10	3.7		
250213_095046.b77	1490	20	17	5	-7	3.9		
250213_095110.b77	1490	20	17	11	-2	4.8		
250213_095124.b77	1490	20	17	11	-2	5.9		
250213_095655.b77	1490	20	17	5	-9	17.8		
250213_095920.b77	1490	20	17	9	-8	194.7		
250213_095948.b77	1490	20	17	7	-6	3.8		

Page 1 107VF s.n. 25000101 Feb 13, 2025 09:59:48 /C2 562 BE1/GB/GB INPUT DE/GB-A/GB-A_01_bea.pdf

To change the PDF report header text edit **header_info.txt** file located in a **Templates** folder of the device drive:



Do not change lines with a leading semicolon. Only Latin text is supported.

header_info.txt is a plain text file without formatting or styling. It can only be edited using applications like Notepad or similar. MS Word cannot be used!

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