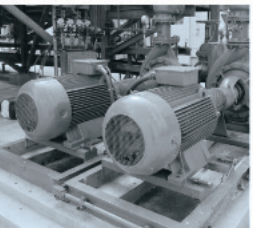
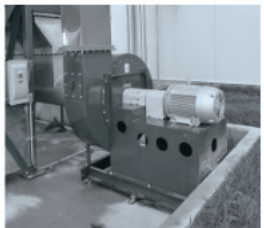
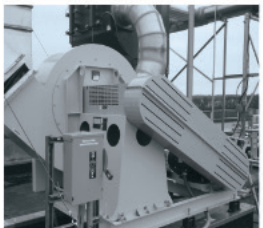
VSHOOTER+®

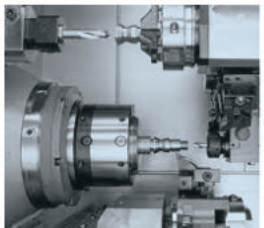
AUTO VIBRATION ANALYZER

www.synergys-technologies.com

VERSION 1.0 - 08/2022

USER MANUAL




SUMMARY

PRESENTATION

GENERAL SPECIFICATIONS :

- Developed and Manufactured by:

  SYNERGYS TECHNOLOGIES
  Quartier Plessier – 32, avenue du 8e Régiment des Hussards – Bâtiment 21
  68130 ALTKIRCH (France)
  www.synergys-technologies.com
- IP54
- Temperature of use: -5°C to +40°C for device, max +120°C for sensor on machine
- Battery: Typically 6 hours of use, recharged in 5 hours with provided charger
- Cε Certified (With EMC following standards EN61000 / 6-2 / 6-4 / 4-2)
- Charger: 230V-50/60 Hz > 12VDC/1.5A (VSHOOTER+® power consumption is about 9W)
- Size (case): 426 x 290 x 159 mm (16.77 x 11.41 x 6.26 inch), Weight (with case): 4.5 kg
- 2 years warranty for VSHOOTER+® device, 1 year warranty for its accessories (internal battery, charger and vibration sensor)

VIBRATION SENSOR:

- ROBUST ICP ACCELEROMETER WITH FLAT MAGNET
- SENSITIVITY OF 100 mV/g
- STRAIGHT CABLE 2M WITH BNC OUTPUT
- IP65
- F RESPONSE: 0,5-14.000 Hz (±3 dB)
- DYNAMIC RANGE: MAX 80g
- MAX T°: 120°C (CONTINUOUS)
- CALIBRATION CHECK: 5g@160 Hz

PACK DETAIL:

- 1X VSHOOTER+® DEVICE
- 1X UNIVERSAL POWER CHARGER 230 VAC 50 HZ/60 HZ > 12 VDC/1.5 A
- 1X USB CABLE FOR PC CONNECTION
- 1X ICP ACCELEROMETER 100 mV/g WITH STRAIGHT BNC CABLE
- 1X STRONG FLAT MAGNET FOR ACCELEROMETER
- 1X STRONG PLASTIC ABS CASE
- 1X 1X USER MANUAL (PDF FILE) ON USB MEMORY STICK
- CALIBRATION & MANUFACTURER CERTIFICATES

FRONT FACE

Touchscreen

On / Off button

Keyboard

REAR FACE

Thermal camera

Power charger plug input

Micro USB output

Jack sound output

ICP sensor input

LED Light

Visible camera

"MEASUREMENT" ICONS

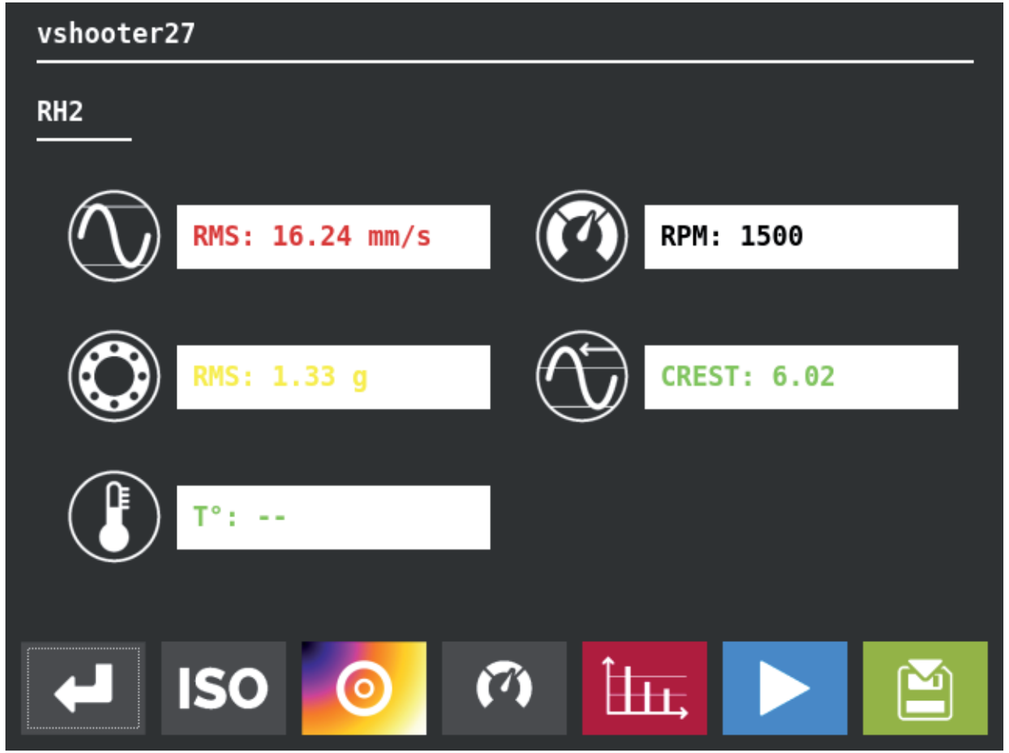
Vibration measurement (RMS-V(mm/s) with 2 or 10-1000 Hz filter

Bearing condition measurement (RMS-A(g) 1000-14000 Hz

Crest-A (w/o unit) 1000-14000 Hz)

Rotation speed measurement ((Rpm & Hz), with manual data input

Temperature measurement (T° Celsius or T° Fahrenheit, using INTERNAL THERMAL CAMERA)



ISO SETTINGS (CLASS + FILTER + ALARM activation or deactivation (V, A, T))

Thermal camera mode activation

FFT spectrum data + time signal

START for measurements

STORE DATA IN MEMORY (for each measurement point)

FFT AUTO DIAGNOSE

Check on your machine if there is more Axial or Radial vibration at x1RPM, to confirm if it is more an unbalance or more a misalignment problem.

Possible Unbalance detected (often radially) **(H1;x1RPM)**

Possible Offset misalignment detected (often radially) **(H2;x2RPM)**

Possible Angular misalignment detected (often axially) **(H1;x1RPM)**

Any ordinary frequency (F1-F2-F3), ≠ Harmonics

Possible Looseness detected **(H3 to H8;x3RPM to x8RPM)**

Possible Bearing problem detected (L for possible lubrication problem and S for possible shock problem)

GENERAL ICONS

ADD NEW MEASUREMENT POINT to be placed on the MCP (Machine Condition Picture): It places the measurement point on the picture with the touchscreen aim. Maximum is 12 points for one MCP.

FFT AUTO DIAGNOSE results: It gives detailed information regarding the machine defaults. Available in WITH and in WITHOUT MCP modes.

TREND VIEW: It shows the trend evolutions of V(RMS)-A(RMS & CREST)-T.

MEASUREMENT RESULTS DETAIL: It shows all measurement values in a table (if with only one date) and with TRENDS (if with several dates). You also have access to FFT AUTO DIAGNOSE.

FILE DELETION: It allows to delete a selected file in memory.

GENERAL ICONS

ICONE 1: Vibration analysis program

BALISHOOTER: Unbalance & Misalignment auto detection

VALIDATION: It validates the settings you have made in a page.

GO BACK TO MCP VIEW: It allows to go back to MPC view when you are on RESULTS DETAILS page.

DATA REPORT EDITION: It is used to edit a report (.rpt) from an existing project (.prj). You can download this report file on your PC (via USB) to edit/store/print it (HTML file) or to open/edit it in WORD to make your own report.

GENERAL SETTINGS

AUTO Power off settings

UNITS, BRIGTHNESS, CLOCK settings

USB MODE: It allows to connect VSHOOTER+® to PC with USB cable (REPORTING, DATA SAVING).

HEADPHONES SOUND LEVEL setting, SENSOR SENSITIVITY setting.

COLOR CONDITION

ALERT/ALARM WITH ISO 10816-3 and ISO 10816-7

ISO

ISO GROUP DETAIL: 10816-3 for Motor/ Screw compressor/Blower/Fan and 10816-7 for Pump

ISO 10816-3 (for Motor, Screw compressor, Blower, Fan):

- **Group1** = Large machine with power > 300 KW and < 50 MW (With foundation r=rigid, f=flexible)
- **Group2** = Medium machine with power < 300 KW (With foundation r=rigid, f=flexible)

ISO 10816-7 (for Pump):

- **Cat1** = Critical rotodynamic pumps (With power L < 200 KW , H > 200KW)
- **Cat2** = Less critical rotodynamic pumps (With power L < 200KW, H > 200KW)

For speed > 600 RPM use 10 - 1000 Hz filter.

For speed > 120 RPM use 2 - 1000 Hz filter (with V-RMS).

ISO (V(mm/s) - RMS):

On 2 or 10 - 1000 Hz filter

GROUP 1 & 2	OK	ACCEPTABLE	ALERT	ALARM
RIGID R1	2.3	4.5	7.1	> 7.1
FLEXIBLE F1	3.5	7.1	11.0	> 11.0
RIGID R2	1.4	2.8	4.5	> 4.5
FLEXIBLE F2	2.3	4.5	7.1	> 7.1

CAT. 1 & 2	OK	ACCEPTABLE	ALERT	ALARM
CAT1L < 200 kw	2.5	4.0	6.5	> 6.5
CAT1H > 200 kw	3.5	5.0	7.6	> 7.6
CAT2L < 200 kw	3.2	5.1	8.5	> 8.5
CAT2H > 200 kw	4.2	6.1	9.5	> 9.5

ALERT/ALARM Bearing condition

Bearing condition (A(g) - RMS)

On 1000 - 14000 Hz filter

RPM	OK	ACCEPTABLE	ALERT	ALARM
< 499	0 to 0.2	0.21 to 0.5	0.51 to 1.7	> 1.71
500 to 749	0 to 0.35	0.36 to 0.7	0.71 to 2.1	> 2.10
750 to 999	0 to 0.5	0.51 to 1.0	1.1 to 3.5	> 3.50
1000 to 1249	0 to 0.6	0.61 to 1.1	1.2 to 4.5	> 4.50
1250 to 1499	0 to 0.8	0.81 to 1.3	1.31 to 5.1	> 5.10
1500 to 1749	0 to 0.9	0.91 to 1.5	1.51 to 6.0	> 6.00
1750 to 1999	0 to 1.0	1.1 to 1.7	1.71 to 7.0	> 7.00
2000 to 2499	0 to 1.0	1.1 to 1.8	1.81 to 7.5	> 7.50
2500 to 2999	0 to 1.2	1.21 to 2.0	2.1 to 8.0	> 8.00
3000 to 3499	0 to 1.35	1.36 to 2.2	2.3 to 10.0	> 10.00
3500 to 3999	0 to 1.5	1.51 to 3.0	3.1 to 11.0	> 11.00
4000 to 4999	0 to 2.0	2.1 to 4.0	4.1 to 14.0	> 14.00
5000 to 7499	0 to 3.0	3.1 to 6.5	6.6 to 20	> 20.00
7500 to 9999	0 to 4.5	4.6 to 8.0	8.1 to 26.0	> 26.00
> 10000	0 to 4.5	4.6 to 8.0	8.1 to 26.0	> 26.00

Bearing condition (A-CREST):

On 1000 - 14000 Hz filter

(CREST = O-PEAK/RMS)

1 TO 2,5	OK	≈ Lubrication
2.6 TO 3.9	ACCEPTABLE	
4.0 TO 5.9	ALERT	≈ Shock
> 6	ALARM	

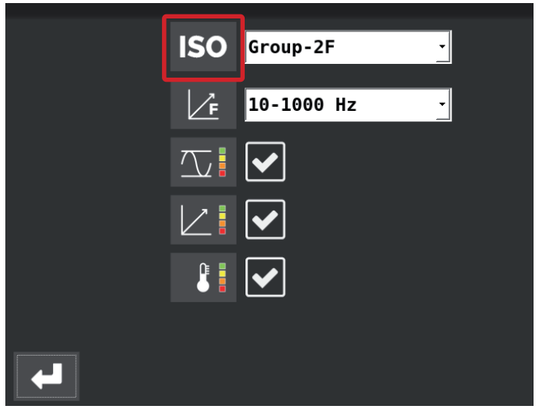
Temperature (°C ε = 1)

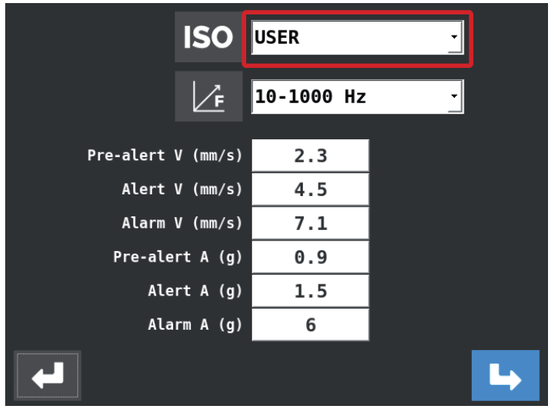
On « bearing housing »

< 35	OK
36 to 46	ACCEPTABLE
47 to 67	ALERT
> 68	ALARM

USER ALERT/ALARM

Select **ISO** and select **USER** to create your own tresholds.





HOME

MEASURE ICON

Switch ON with , wait about 8 seconds.

Start a new project (*) with or without MCP (Machine Condition Picture) by selecting the icon .

You can also see, in the up & right corner, the battery status in %. “Load” information if in charge.

COUPLING OR NOT COUPLING ?

MEASURE COUPLING

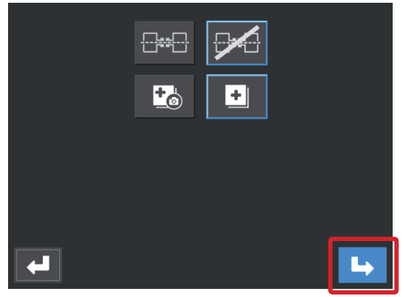
Your machine has a direct coupling.

MEASURE WITHOUT COUPLING

Your machine has no direct coupling (belt transmission or else).

This will help to valid or not the presence of MISALIGNMENT in the AUTODIAGNOSE.

Then, valid with...



MEASURE WITHOUT MCP

MEASURE WITHOUT MCP

You can measure all data, without Machine Condition Picture (MCP).

Here, it is not possible to store data in memory. It is a only special MULTIMETER MODE for a fast checking.

Auto Diagnose FFT is made (please inform your RPM machine speed (± 30 RPM)).

WHAT CAN YOU MEASURE ?

- ISO V-RMS vibration (mm/s)
- RPM (Manual input)
- A-RMS bearing (g)
- A-CREST bearing (no unit)
- T°(infrared camera)
- FFT : V & A

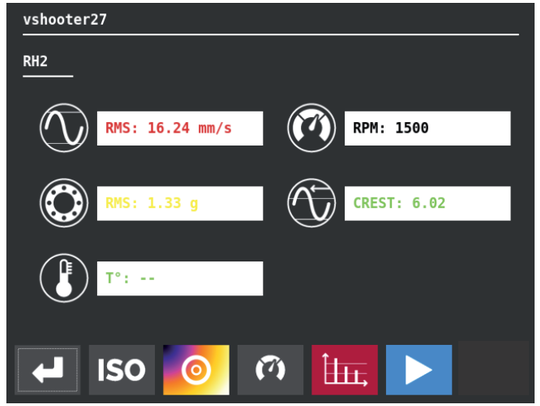
HOW DOES IT WORKS?

ISO SETTINGS

ISO settings* ISO RPM** is also important to be checked if you want a right AUTO DIAGNOSE RESULT .

You can also take the temperature T° .

(*) Standard ISO is Group2F with 10-1000 Hz filter.
(**) Standard RPM value is 1500.

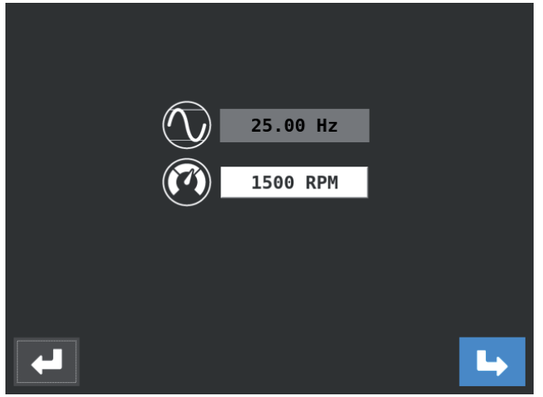


HOW DOES IT WORKS ?

RPM

Put the value of the RPM speed (± 30 RPM) with touchscreen.

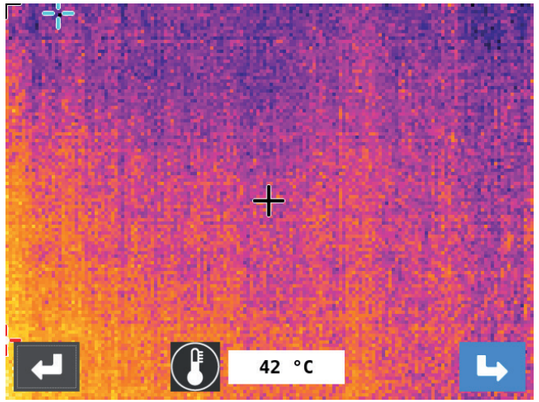
When it is ok for you, valid it with touchscreen.



HOW DOES IT WORKS ?

TEMPERATURE

Thermal camera activation for T° measurement (Emissivity ε is 0,9).

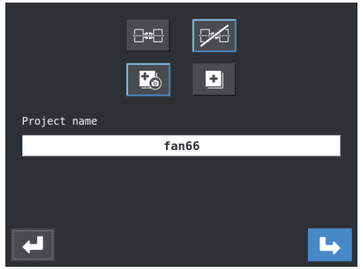


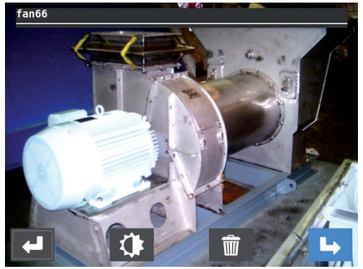
You can save central T° value.

Click on touch screen to save .

MEASURE WITH MCP

1. Give a name to the machine file, .
2. Take the machine picture with camera icon, , check and again.
3. Click on to add measurement points (RV or RH or AX using your finger/touchscreen), with a maximum of 12x points, .
4. Select 1x point to start measurements.





REPEAT OR FINISH

Repeat the procedure for each point (12 maximum).

RPM will be automatically updated for each point.

When MCP is finished, click with on the green SAVE to save the MCP in memory.

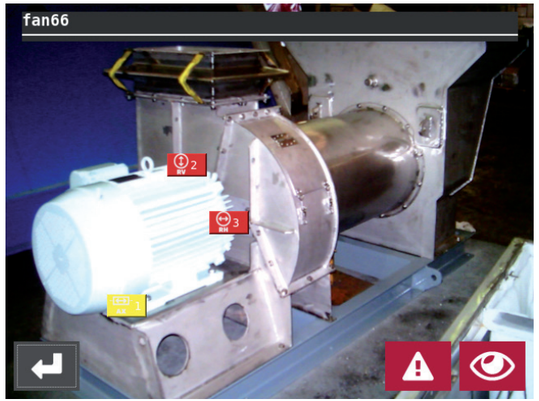
CAREFUL !

You can not add new measurement point when MCP is finished and saved. Only new measurements can be done (TRENDING) on saved measurement points.

DEFAULTS AND DATA

Then, you will see the final MCP with 2 icons: the EYE icon to see results details and the CAREFUL icon to see defaults details, calculated from AUTO DIAGNOSE FFT.

Of course, if you want to stop the job on this machine, you can escape to main menu .

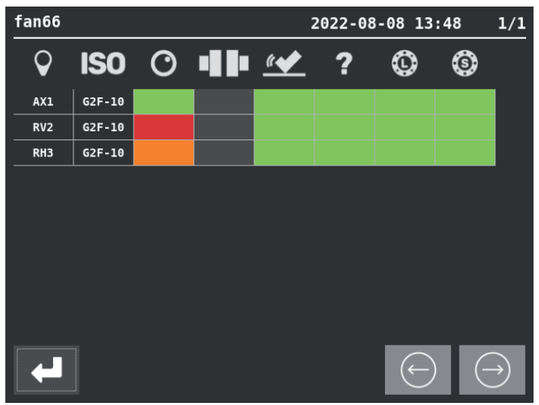


DEFAULTS DETAIL

If you click on the CAREFUL , you will see a table with the point names and default details (Imbalance, Misaligngment, Looseness, Other, Bearing Lubrication, Bearing Shocks, calculated from AUTO DIAGNOSE FFT).

Alert is **orange**, Alarm is **red**.

If you click on the EYE , you will see all overall value measurement data.

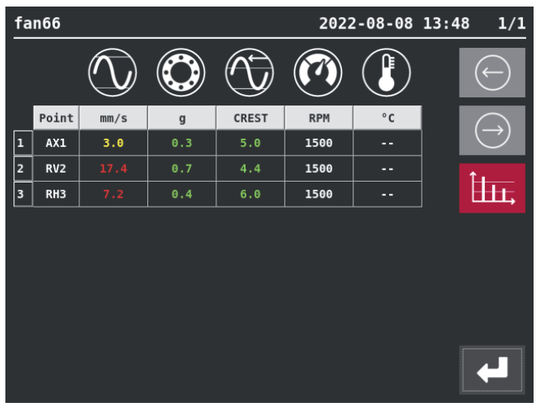


DATA DETAIL

If you have “multidate” data, you can also see trends by clicking on TREND icon .

If you need to see AUTO DIAGNOSE FFT for a selected measurement point, click on FFT icon .

Go back to the MCP with icon.



FFT DATA DETAIL

Only the last FFT is stored in memory.

2x FFT spectrums are taken: V-Velocity (mm/s) on 2-400 Hz & A-Acceleration (g) on 2-14000 Hz.

MAX5 DATA DETAIL (mm/s)

Only the 5 highest amplitude frequencies are presented (Max3) in the V-FFT *.

These Max5 frequencies can be or any ordinary F.

Any ordinary ? will be detailed with F1-F2-F3 (Hz) and their amplitude (mm/s) values.

You can also see RMS overall values.

DATA AND FFT INFORMATION

CAREFUL !

You can have an overall vibration level V-RMS in ORANGE or RED, but with GREEN or YELLOW standard defaults (imbalance, misalignment, looseness), because the major default may also be different than x1, x2, x3, x8 harmonics.

Of course, in this case, you will see the value of its amplitude and its frequency in the ALARM FFT SPECTRUM information icon .

So, a measurement point on the MCP can be **ORANGE** (RMS-V overall ISO value), with YELLOW Imbalance default for example

Do not forget RMS-V is calculated on 10-1000 Hz, so several YELLOW defaults can result in a ORANGE RMS-V value.

MEMORY ACCESS

Review a stored file or update a stored file (trending). File deletion is also possible.

You can store about 500 projects.

MEMORY DELETION

You have selected a file in the list, you can click on .

You need to confirm DELETION with or .

MEMORY DETAIL

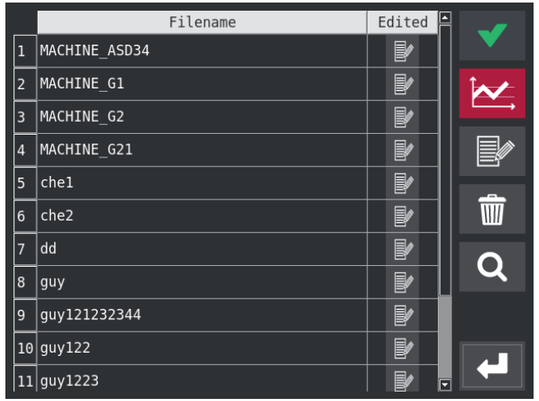
TO OPEN A SELECTED FILE FOR DATA VIEWING

FOR PROJECT FILE DELETION

TO OPEN A PROJECT FILE FOR TRENDING

FOR REPORT EDITION (for one selected file)

TO SEARCH A FILE NAME



NEW MEASURE - TRENDING

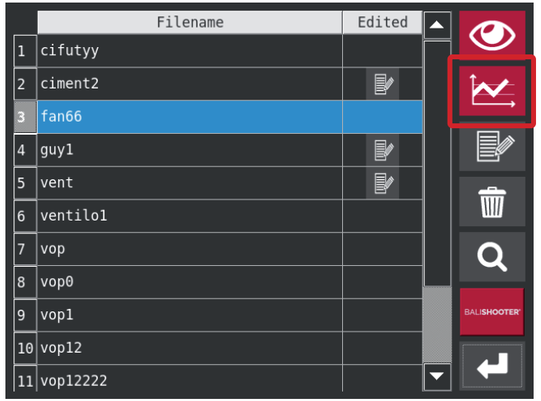
You are ready to start new TRENDING measure .

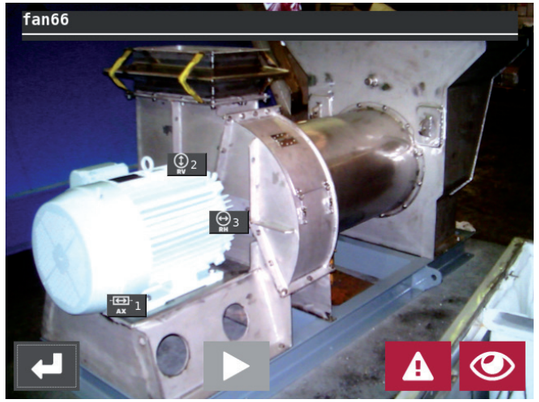
Now, you have to click on TREND icon to select a point (in any order) and start new measurements.

All location points will be firstly grey and will become colorized when measurement will be done.

At the end of all measurements, everything is automatically saved.

Trend curves will be updated in the memory (see in DATA).





SETTINGS ICON

You can access here to all device settings.

Select this icon.

DETAIL

mV/g Setting of sensor SENSITIVITY
(Please do not change it! For calibration check)

USB MODE for PC connection

Screen BRIGHTNESS

CLOCK/DATE

UNITS (mm-°C or inch-°F)

HEADPHONES LEVEL

AUTO OFF AUTO Power Off Settings

USB PC CONNECTION

Connect VSHOOTER+® to your PC via USB.

Click on PC USB MODE icon and wait WINDOWS connection.

It can take some seconds depending of WINDOWS version. If VSHOOTER+® reboot, please do it again.

After data/report pc download, **securely** disconnect your USB cable from your pc, VSHOOTER+®.

REPORTING ON PC

Do not forget to transform your Project file (.prj) into Report file (.rpt) with before downloading the report to your PC.

If your USB connection is OK, you can view all your data on your PC.

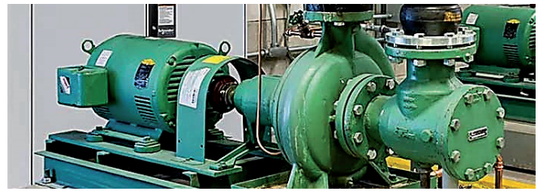
Copy & Paste the project files you want to print or save (REPORT directory). You can view each report by clicking on the .html (you can also edit it in WORD, if you want to modify or personalize the report).

You can also save your project for data security saving (PROJECT directory).

VIBRATION - BALISHOOTER® MODE

UNBALANCE IS CRITICAL IN FAN INSTALLATIONS (DIRECT COUPLED or WITH BELT PULLEY TRANSMISSION).

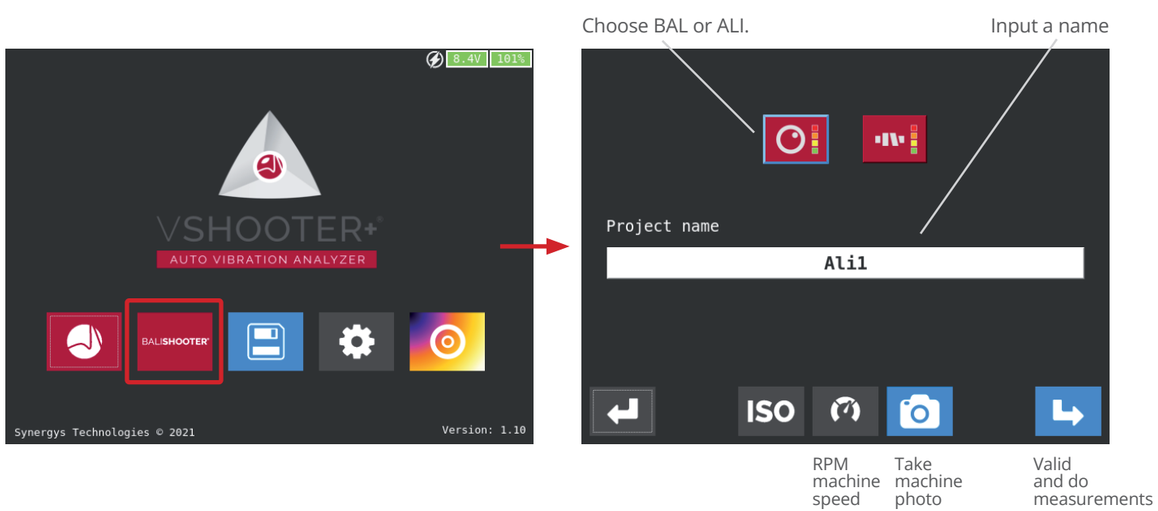
MISALIGNMENT IS CRITICAL IN DIRECT COUPLED MACHINES (with COUPLING).

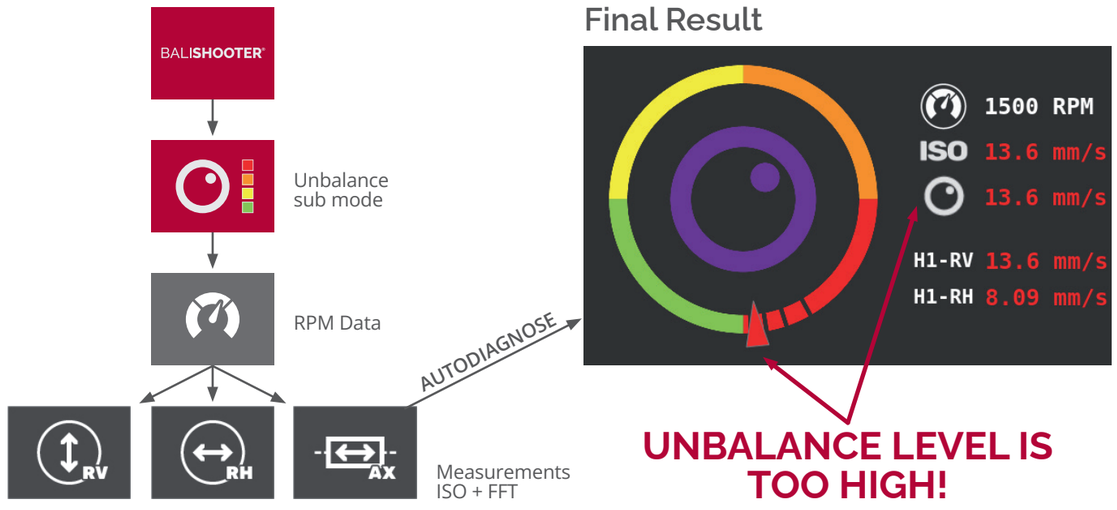


Neglecting UNBALANCE & MISALIGNMENT can be catastrophic: BREAKAGE - MTBF DECREASE – BEARING FAILURE – PRODUCTION LOSS – SEAL WEAR...

- **UNBALANCE and MISALIGNMENT** (direct coupling) represent about **70% of vibration problems** on a rotating machine like electrical motor, pump, fan (blower)...
- UNBALANCE and MISALIGNMENT (direct coupling) defaults can easily be repaired (Balancing job and Alignment job).
- BALI**SHOOTER**® algorithm program has been made to be an Auto Vibration Analyzer (V (mm/s) FFT spectrum), exclusively for UNBALANCE (also BENT SHAFT) or MISALIGNMENT default detection and severity check.
- **UNBALANCE** sub mode will automatically detect **RMS MAX value** of 1x spectral line (fundamental) on both **RH** and **RV** measurements made on a bearing housing (Radial). If BENT SHAFT is present in **AX** with 1x spectral line, it will not be possible to detect UNBALANCE properly. Correct first BENT SHAFT problem.
- **MISALIGNMENT** sub mode will automatically detect **RMS MAX value of 1x spectral line** (fundamental) on **AX** measurement and of **2x spectral line** on both **RH** and **RV** measurements made on a bearing housing (Radial). Acceleration (g) for shock/friction detection like in Bearing, Cavitation.

Of course, you need to know the shaft speed (RPM). **This new function is useful for machine manufacturer or maintenance teams who easily need to be careful about UNBALANCE and MISALIGNMENT vibration levels**.

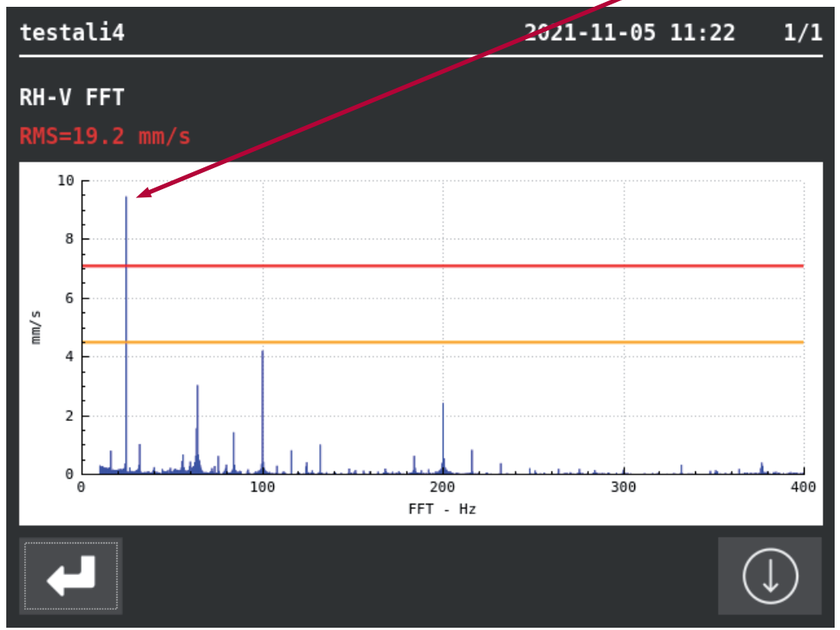


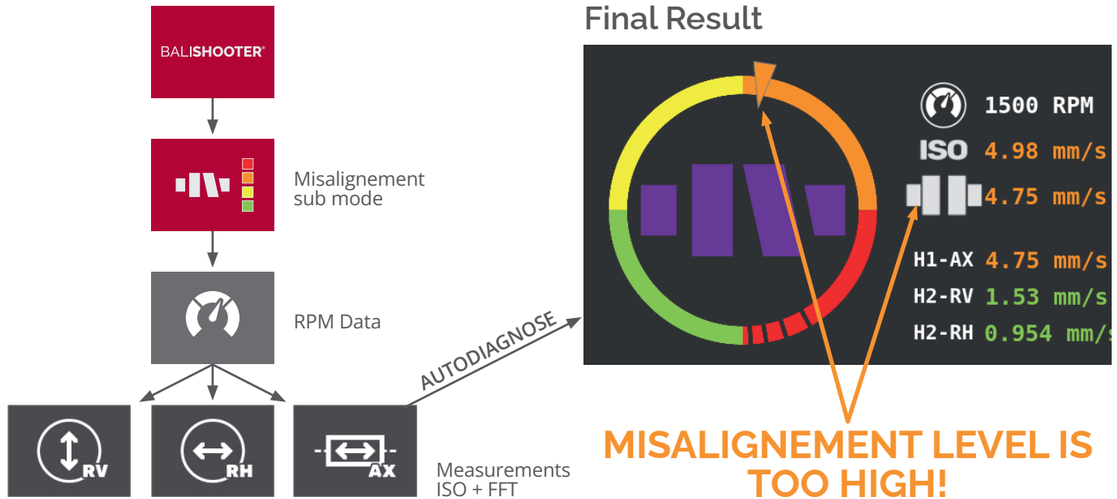


CAREFUL: If AX detect BENT SHAFT presence, it will not be possible to conclude for UNBALANCE detection.

You will need to eliminate or repair your BENT SHAFT problem first.

FFT 0-400 Hz (V(mm/s)) is also available for BAL & ALI checks





CAREFUL: Be sure in this mode, not to have any looseness on the machine. It can perturbate alignment detection.

INTRODUCTION

VIBRATION ANALYSIS

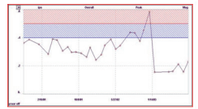
Predictive maintenance with vibration measurements for rotating machine can be taken following measurements:

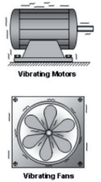
- Velocity (mm/s) for Free Body Vibration detection like Unbalance, Misalignment, Looseness, Resonance
  We use for that, low frequency filters like 2 or 10 -1000 Hz (ISO 10816)
- Acceleration (g) for shock/friction detection like in Bearing, Cavitation
  We use for that, high frequency filters like 1000-10000 Hz

We can follow machine condition in time with LEVEL 1 measurements (TRENDING-OVERALL VALUES).

When LEVEL1 measurements are excessive, you can analyze machine condition with LEVEL 2 measurements (FFT SPECTRUM or else).

75% of vibration problems on standard machineries are coming from Unbalance, Misalignment, Looseness and Bearing condition.





STANDARD DEFAULTS

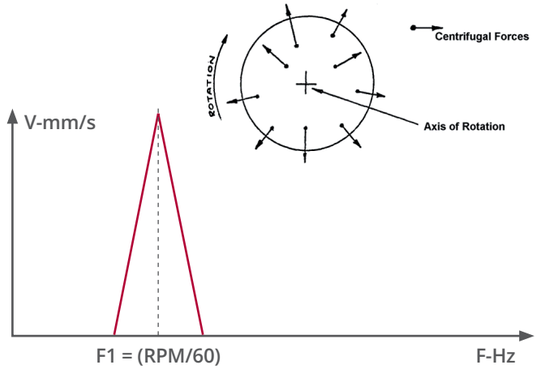
UNBALANCE

A rotor is unbalanced when the mass center is different than the rotation center.

Unbalance is the most common cause of rotating shaft failure or mechanical breakdown.

It appears in **radial direction** and it is often dominant in horizontal plan.

Value of Unbalance vibration frequency is at x1 (RPM/60), also called Fundamental.



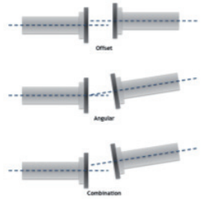
MISALIGNMENT

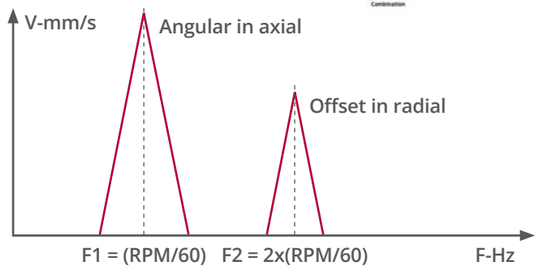
Misalignment is a combination of horizontal and vertical Offset and Angular gaps you can have between 2 machine rotation axes.

Misalignment creates large forces to the bearings.

It appears in **radial direction (OFFSET at x2 RPM)** and in **axial direction (ANGULAR at x1 RPM).**

Values of Misalignment vibration frequencies are at x1 (RPM/60), also called Fundamental and at x2 (RPM/60) called Harmonic 2.





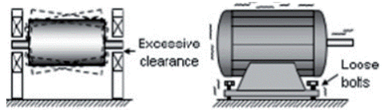
LOOSENESS

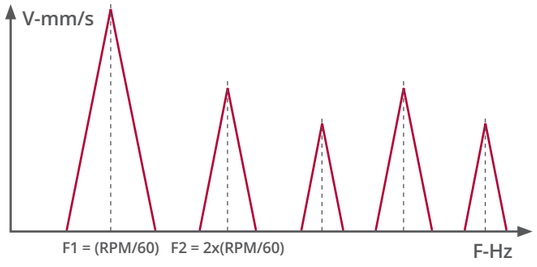
Looseness is coming from a mechanical loose foot, a foundation fixation problem, when rotation components do not fit correctly.

Looseness can create large vibration on all machine. Check on bearing and on fixation.

It appears in **radial direction** with a special high level of harmonics frequencies (x2x3x4x5x6x7x8).

Values of Looseness vibration frequencies are at x1 (RPM/60), 2x (RPM/60), 3x (RPM/60)





BEARING CONDITION (SHOCK AND LUBRICATION)

Bearing condition can be measured on a rotating machine with overall acceleration value (A-RMS in g).

RMS value with a high frequency filter (ex: 1000-10000 Hz) will give a global condition of it.

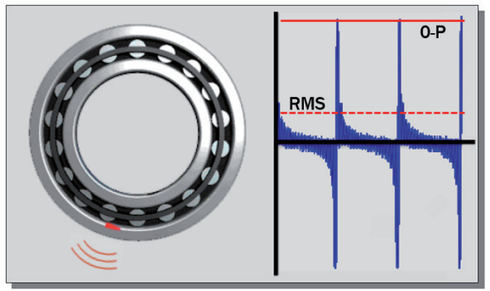
0-PEAK or CREST values can help to check if there is more lubrication or shocks problems in it.

For bearing condition, we will only follow the LEVEL1 (TRENDING) in RMS and CREST.

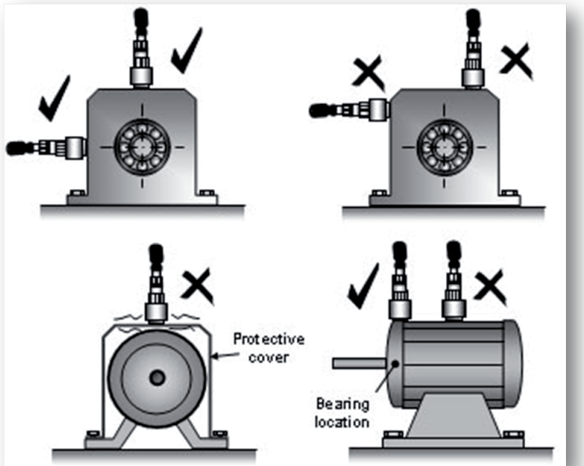
T° trending curve can also help you to take a decision before to repair.

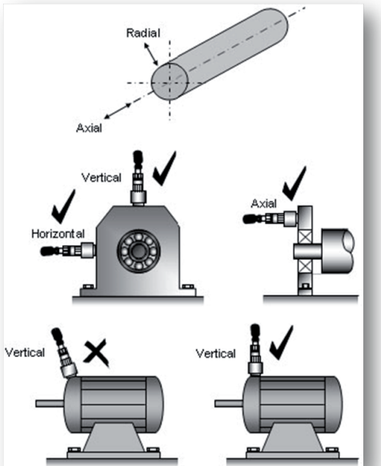
For a good bearing analysis, please be careful about your contact point quality.

Impulses from a damaged bearing



BE CAREFUL ABOUT SENSOR POSITION !





LEAKSHOOTER®

LKS1000-V2+

Synergys Technologies is also the inventor of the ultrasonic compressed air, gaz and vacuum leak detector with camera LEAKSHOOTER®.

Film, view and photograph the precise spot where compressed air, steam, pressurised gas and vacuums are leaking using the LEAKSHOOTER® LKS1000-V2+.

Extremely sensitive, it is capable of finding all leaks, even the smallest, including those no bigger than the size of a syringe needle, at a distance of 15 metres.

The LEAKSHOOTER® LKS1000-V2+ is used like a camera. When it comes near a leak, a dynamic yellow target appears on the large colour screen.

It is then possible to photograph and save the precise location of the leak. Each photo is numbered, dated and timed and shows the dB RMS level of the leak. The photos can be uploaded directly onto a PC via a USB cable.

Various accessories are available for the LEAKSHOOTER® LKS1000-V2+ enabling it to be used for other applications as well as leak detection.

SYNERGYS TECHNOLOGIES has been established in 1996 in France, to offer innovative and professional solutions for preventive and predictive maintenance.

SYNERGYS TECHNOLOGIES is the inventor of the ultrasonic visualization concept with the LEAKSHOOTER® and of the MCP (Machine Condition Picture) concept with the VSHOOTER+®.

We are present worldwide with professional and trained distributors.

SYNERGYS TECHNOLOGIES

VSHOOTER® a SYNERGYS TECHNOLOGIES innovation

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