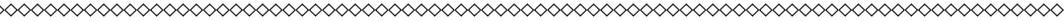




Compact Vibrometer 107B

Operating Instructions Manual

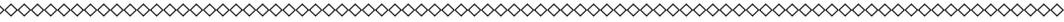
Vibrometer 107B



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Vibrometer 107B



Introduction

This manual is intended for the study of the Compact FFT Vibrometer -107B (hereinafter "Instrument"). The manual contains the description of the instrument, delivery set, operating principles and specification.

FFT Vibrometer - 107B is a compact, handheld, microprocessor based vibration-measuring instrument designed to measure vibration parameters of the rotating machine according to ISO 10816, as well as other international standards which have been set on the same level - vibration acceleration, RMS vibration velocity, vibration displacement and Vibration spectrum analysis in FFT. It allows to measure the dynamic signals followed up by the record it into the non-volatile memory, as well overview and analyze the spectrum.

1.0 Specification

1.1 Standard Conditions for Operation:

- ♦ Ambient temperature, -10 to 55°C, (± 5)°C;
- ♦ Relative humidity 80% at temperature 30°C;
- ♦ Atmospheric pressure, 84 to 106.7 KPa (630 - 800 mm Hg);
- ♦ Vibration frequency, not more than 30 Hz;
- ♦ Max acceleration, 10 m/s²;
- ♦ Pulses per minute, 10 - 50;
- ♦ Maximum acceleration in respect to shock, 50 m/s²;
- ♦ Pulse duration 10 - 12.5 msec;
- ♦ Total shock number 1000.

1.2 System Specification

1.2.1 Setting range of accelerometer conversion ratio (sensitivity), pC*s²/m - 0.1 to

Vibrometer 107B

500.

1.2.2 Maximum input charge value, pC - 2000.

1.2.3 Noise floor, not more than, pC, not more than - 0.03

1.2.4 The dynamic range measurement of the RMS (root-mean-square) values of vibration acceleration, vibration velocity and vibration displacement is limited by the maximum input charge value on the top and the level of noise floor of charge amplifier at the bottom and depends upon conversion ratio of the accelerometer (vibration transducer).

Table-1

Measurable Parameter	Frequency Range Hz	Dynamic Range RMS
Vibration Acceleration	2 - 10000	0.01 - 200 m/s ²
Vibration Velocity	2 - 16	0.8 - 1000 mm/s
	10 - 1000	0.1 - 79 mm/s
Vibration Displacement	2 - 16	0.05 - 50 mm
	10 - 100	0.003 - 1.2 mm
	10 - 1000	0.003 - 0.02 mm

1.2.5 The limits of relative error at the charge measurement, the error of accelerometer is not taken into account, in the frequency band, Hz:10 to 0.707 cut-off frequencies of low-pass filter $\pm 5\%$.

1.2.6 Damping at cut-off frequencies of low-pass filter, dB, not more than -3dB at cut-off frequency of low-pass filter, no more than -7.5%.

1.2.7 Frequency ranges of spectrum analysis: cut-off frequencies of low-pass filter, Hz - 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 9000, 10000: cut-off frequency of low-pass filter, Hz -10.

1.2.8 Spectrum resolution, lines - 800.

1.2.9 Weight function - Hanning function.

1.2.10 Calculating time of FFT spectrum, not more than: 20 sec.

1.2.11 Absolute error of sinusoidal signal frequency, not more than, $\pm 0.75 \cdot (F_B / 800)$, where F_B – upper frequency of band analysis.

1.2.12 The error of magnitude wave constituent, more than -1.5dB.

1.2.13 Operating mode setting, not more than -1min.

1.2.14 When measuring the signals with amplitude factor up to 5, the limits of complementary error of the instrument (without vibratory converter) do not exceed 0.5 of the basic error limits.

1.2.15 Display: graphical LCD, 64 x 98 points.

1.2.16 Power supply, 3.6V NiMH battery. Battery power control.

1.2.17 Continuous operation on batteries, not less than 8hours.

1.2.18 Current consumption 220V, 50 Hz AC, not more than 5VA.

1.2.19 Electric strength and insulation resistance of the instrument corresponds to the requirements of GOST 22261-94.

1.2.20 The limits of complementary error of the instrument at voltage changing from 3.6Volts to 2.8Volts.

1.2.21 The limits of complementary error of the instrument (without vibratory converter), caused by the change of climate and mechanical factors, within the range from standard values to the limit operating values, do not exceed 0.5 of the of basic error limits.

1.2.22 The instrument operates normally when affected by acoustic noise with acoustic pressure 100 dB in the frequency band from 125 to 8000 Hz. Acoustic noise factor is not more than 0.03 %/dB.

1.2.23 The instrument stands the impact of external magnetic field 80 A/m , 50 Hz, influence coefficient of the magnetic field, however, is not more than 0.05 %/A•m-1.

1.2.24 Probability of no-failure operation, not less than 0.92 per 2000 hrs.

1.2.25 The average instrument life, not less than 10 years.

1.2.26 Failure time, 1000 hours. The average failure time is set for standard conditions for operation.

1.2.27 Dimensions, not more than 55 x 118 x 28 (mm).

1.2.28 Weight, not more than 210 gram.

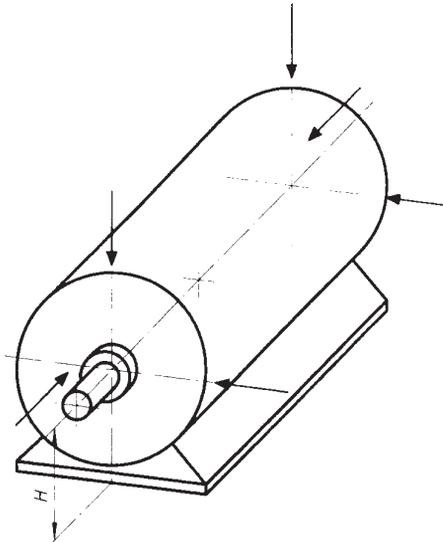
1.3. Reference ISO 10816-3

Guide for Vibration Severity Zone - ISO 10816-3

								11	0.44	Velocity 15,000 Hz - 1000 Hz 2,000 Hz - 100 Hz rms/rms rms					
								7.1	0.28						
								4.5	0.18						
								3.5	0.11						
								2.8	0.07						
								2.3	0.04						
								1.4	0.03						
								0.71	0.02						
								11	0.43						
								11	0.43						
Group 4								Group 3		Group 2		Group 1		<<< Classification	
								140	5.51	Displacement 3,000 Hz - 100 Hz rms/rms rms					
								113	4.45						
								90	3.54						
								71	2.80						
								56	2.20						
								45	1.77						
								36	1.42						
								28	1.10						
								22	0.87						
								18	0.71						
								11	0.43						
								11	0.43						
rigid								flexible		rigid		flexible		<<< Foundation	
Pumps > 15 kW radial, axial, mixed flow				Medium sized machines 15 kW < P ≤ 300 kW				Large machines 300 kW < P ≤ 50 MW				<<< Machine Type			
integrated driver		external driver		motors 160 mm ≤ H < 315 mm				motors 315 mm ≤ H				<<< Classification			
Group 4		Group 3		Group 2		Group 1		<<< Classification							

A Newly commissioned
B No restriction for long-term operation

C Restricted for long-term operation
D Vibration and others causes damage



Measuring points for horizontal machine set

2.0 107B Instrument Description and Function

General view of the instrument and piezoelectric accelerometer with cable is shows in Fig-1.

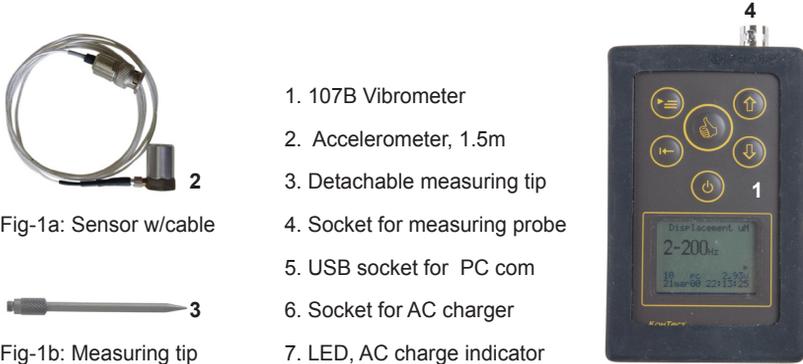


Fig-1c: 107B Vibrometer

2.1 Getting to know the Instrument and its Accessories

The instrument is built from a light and strong alloy casing protected by silicon sleeve with the rechargeable internal battery power supply, socket for the measuring probe and USB port for file upload to PC for data management, see Fig-2a. The socket to connect the instrument to the accelerometer, external power source and USB port are located in the upper side panel of the instrument. The only six push button keypad and LCD are located on the front panel. One LED indicators placed in standing end indicate device connected to the external AC power source, Fig-2b.



Fig-2a. Top view of 107B



Fig-2b: LED at standing side

Processor unit is the main component of the instrument; it provides control over the measurement circuit, data measurement, signal analysis and data display. Using the

keypad, the user can operate the instrument.

The initial state of the instrument displayed on the screen shows the last measurement mode with setting, see Fig-2.1a, Fig-2.1b or Fig-2.1c depend last end mode.



Fig-2.1a

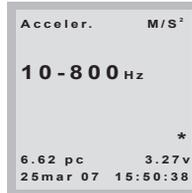


Fig-2.1b

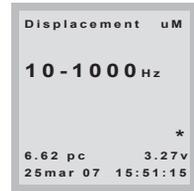


Fig-2.1c

2.1.1 Operation key

Six buttons of the keypad perform several functions.

-  Turn ON key
-  Setup menu / Hold down + forward /back key
-  OK / Start
-  Return / back to earlier step key / OFF (press and hold)
-  Adjust up
-  Adjust down

3.0 Taking Measurement with the Instrument

Before using the instrument, it is a good practices to check proper mechanical functioning of the controls, connectors and power state when switch on.

Note the device automatically switches off after 150 seconds when no further operation.

3.1 Instrument Display and Measurement Mode

Press  button to turn on your instrument.

The instrument will display prompt self-test prompt as Fig-3a, when completed screen display to last measurement mode, Fig-3a, 3b, 3c or 3d.



Fig-3a

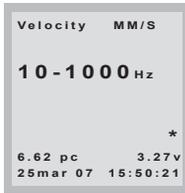


Fig-3b

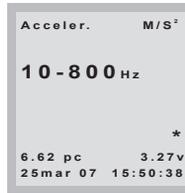


Fig-3c

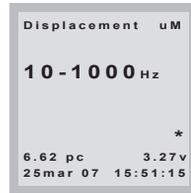


Fig-3d

The upper screen line shows the measurement modes. The next line displays the frequency band in which the RMS value is measured. The other two lines indicate respectively the conversion ratio value of piezoelectric accelerometer with respect to charge pC X S²/m and battery voltage, date and real time information.

3.1.1 Initial setup of accelerometer sensitivity factor and frequency band

- To start measuring, set the conversion ratio of piezoelectric accelerometer with respect to charge by pressing follow by key to display Fig-3.1, the using as either or key to input accelerometer sensitivity value provide by the OEM and follow by key.



Fig-3.1

- To set the value of upper limit of frequency band in which the measurement will be conducted. Press and using or key to change the cut-off frequency of LF (low filters) follow press again for change of cut-off of HPF (high pass filter) and same using or key to change the new input value.
- To confirm the input values, press to accept. The device will automatically switch display to last mode selected to ready for taking new vibration measurement.

Note: The instrument memorizes the cut-off frequency of low-pass filter per each measurement mode A, V and S even after auto-off.

3.1.2 Setting the system real time and date

- At any operation mode display, press  three times to enter date / time menu follow by  to see set items.
- Press  and  to set desire date and time and follow  to confirm correct input setting.
- When all date and time settings are correctly input, press  twice to return operation mode display to begin new task.

3.1.3 Setting up LCD back light

- At any operation mode display, press  four times to turn back light ON/OFF. To exit, press .

3.2 Selection of Measurement Mode

After turn on the device and input all initial setting, 107B display the default velocity measurement mode shows in Fig-3b. To select other mode, just press  or  button to get to desire display measurement mode or other operation.

3.3 Measurement Procedure

3.3.1 Accelerometer mounting

The following mounting methods are recommended for the accelerometer: stud bolt M5, magnetic base (magnet retention force: pulling 50...70 H; shift 15...20 H) and handheld probe. Mounting method defines the upper limit of operating frequency performance: stud bolt with metallic silicone adhesive – up to 20 kHz, magnet – up to 3 kHz, handheld probe up to 900 Hz.

3.3.2 Taking vibration measurements

- After selected the desire measurement display, (e.g. Fig 3.2, press  to start vibration measurement (107B automatic adjustment of the internal amplifier and measuring - the number of averaging is set automatically depending upon the upper frequency).
- Measurement process terminates automatically after measurement and result calculation to display the measured overall vibration reading and waveform, see Fig-3.3.
- Measurement process can be interrupted by pressing the turn “ON” key.

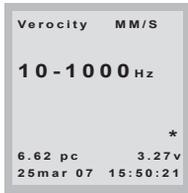


Fig-3.2

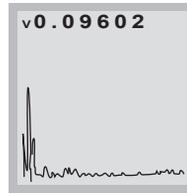


Fig-3.3

Velocity measuring mode Result is RMS value & waveform

3.3.3 Make new directory / save / read / delete files

To save vibration reading with spectrum in the instrument as Fig-3.3:

- Press  key follow by choosing the desired directory to save
- OR.
- Press  to return main display to go to “My documents” mode, Fig-3.4 and press  to enter main directory as Fig-3.5 to save.

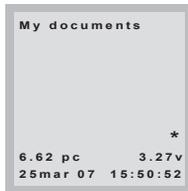


Fig-3.4

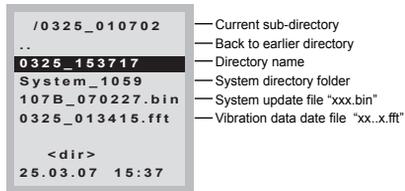


Fig-3.5

Note: 107B will self generated directory or file names in term of date and time ("0325" mean 25 March and "103415" mean 10hrs, 34 mins, 15 sec). File name that follow by ".fft" extension format representing data file, see Fig-3.5

- By pressing  each time, the display right lower section will change from selection to make new directory, save, read or delete folder/file.
- Press  or  to move to desired directory (directory line are shows with series of numeric without ".xxx.fft" extension) to be saved.
- Press  to confirm data saved.

Note: sub-directory created are only allow max. 10 data files to be saved.

3.3.4 Vibration result and spectrum overview

When the FFT spectrum measurements has recorded and displayed the result, you may view the spectrum of the waveform, using the following keys obtain required information:

- To view desired spectrum detail info, go to "Documents" display mode and press  then using  or  key to look for deired data file and press  to read measurement data.
- Press and hold  to display, Fig- 3.6a. The display will show the peak value for specific frequency in the velocity measured mode, while peak - to - peak value in the displacement mode.
- To switch horizontal compression scale, press  while still hold down on  key.

Note: (Horizontal compression scale: x8 - all 800 lines at the display (98 points across), x1 – spectrum fragment out of 98 lines at the display).



Fig-3.6a



Fig-3.6b

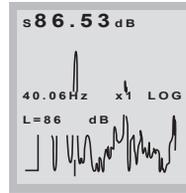


Fig-3.6c

- To switch spectrum between “LIN”/ “LOG” reading or view the vibration shock energy in dB, press to toggle while still holding down on key, see Fig-3.6c.
- To exit and review last spectrum measured, press to toggle.
- To move the cursor (over the frequency peaks), press key and review the spectrum by press again. Fig-3.7a (10.02Hz) Fig-3.7b (57.59Hz)



Fig-3.7a

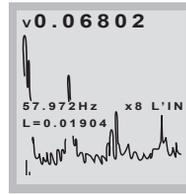


Fig-3.7b

4.0 Delivery Set

S/No:	Description	Qty	Note
1	107B, Vibrometer w/chargeable battery builtin	1	
2	Vibration accelerometer w/1.5m cable attached	1	
3	Magnetic adaptor for accelerometer	1	
4	External measuring tip for accelerometer	1	
5	AC batter charger,220-230 Volts	1	
6	Carrying case with form-inserted	1	
7	Operating instruction manual in CD-ROM	1	
8	CD-ROM PC software	1	
9	USB PC Communication cable	1	
10	Maker Calibration Certificate	1	

Table-4.0



Контест