DIGITAL VIBRATION METER

OPERATION MANUAL

DIGITAL
VIBRATION METER

TABLE OF CONTENTS

1. FEATURES

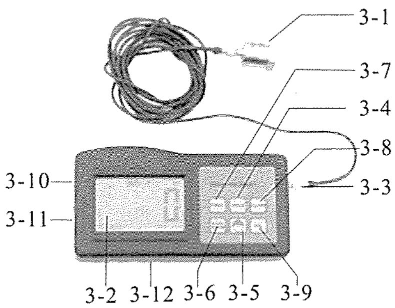
* In accordance with ISO 2954, used for periodic measurements, to detect out-of-balance, misalignment and other mechanical faults in rotating machines.
* specially designed for easy on site vibration measurement of all rotating machinery for quality control, commissioning, and predictive maintenance purposes.
* Individual high quality accelerometer for accurate and repeatable measurements
* Bearing condition monitoring function
* LCD digital display
* Lightweight and easy to use
* Wide frequency range (10Hz. To 10kHz.) in acceleration mode
* AC output socket for headphones and recording.
* Optional headphones for use as electronic stethoscope.
* Can communicate with PC computer for statistics and printing by the optional cable and the software for RS232C interface .

2 SPECIFICATIONS

Display 4 digits, 18 mm LCD
Measured values and makers
(units, 10,and battery symbol)
Transducer : Piezoelectric accelerometer
Parameters measured:
Velocity, Acceleration, and Displacement
RPM and Frequency
Measuring range :
Velocity : 0.01-40.00 cm/s true RMS
0.000-16.00 inch/s
Acceleration : 0.1-400.0m/s^2 equivalent peak
0.3-1312 ft/s^2

Displacement : 0.001-4.000mm
0.04-160.0 mil , equivalent pk-pk
RPM (r/min) : 60-99,990 r/min
Readings should be multiplied by 10
if the display show '10'.
Frequency: 1-20 kHz
Frequency range for measuring
Acceleration : 10Hz. to 1kHz. In '1' mode
10Hz. to 10kHz. In '10' mode for
bearing condition check
Velocity : 10Hz. to 1kHz.
Displacement : 10Hz. to 1kHz.
Accuracy: ± 5%+2 digits
Metric/ Imperial conversion
PC interface: RS232C
Output: AC output 2.0V peak full scale
(load resistance: above 10k)
Power supply: 4x1.5 AAA size (UM-4) batteries
Power off :
Manual off at any time
Operating conditions:
Temperature : 0-50
Humidity : below 90% RH
Dimensions: 124x62x30mm/4.9x2.4x1.2 inch
Weight: 120g (not including batteries)
Accessories included :
Powerful rare earth magnet............................1 pc.
Accelerometer..1 pc.
Stinger probe (Cone).......................................1 pc.
Stinger probe (Ball) ....1 pc.
Carrying case ....1 pc.
Operation manual..1 pc.
Optional accessories:
Headphones for use as electronic stethoscope
Cable and software for RS232C

3. FRONT PANEL DESCRIPTIONS



3-1 Accelerometer
3-2 Display
3-3 Input Connector
3-4 Hold key
3-5 Power Key
3-6 Metric/Imperial conversion key
3-7 Function key
3-8 Filter key
3-9 Sound key
3-10 Jack for the headphone
3-11 Jack for RS232C interface
3-12 Battery cover/compartment

4. MEASURING PROCEDURE

4.1 Connect the Accelerometer to the input connector and turn it until the connector locks in position.

4.2 Mount the accelerometer at the measurement point using the powerful magnet supplied, ensuring that the mounting surface is clean and flat, or use direct stud (M5) mounting if this is available.

4.3 Depress the power key and release to power on the meter.

4.4 Each time the Function key is depressed and released quickly, the meter will step to the next vibration measurement parameter with the corresponding unit

showing on the display.

4.5 Each time the Metric/Imperial key is depressed and released quickly, the measurement unit will be changed to the other measurement system.

4.6 When several machinery or bearings are used under the same operating conditions, evaluation can be carried out by listening to the audio signals to determine changes. This method will help to locate the defective machinery or bearing quickly. Measure all machines at the same points and compare the results. The sound volume can be adjusted by Sound key 3-9. There are 8 levels from 1 to 8. Every time depressing and releasing the sound key quickly, the sound level will increase 1. The larger the sound level number, the louder the listening sound.

5. CONSIDERATIONS

5.1 Which Parameters Should be Measured?

Acceleration, velocity, and displacement are the three tried and tested parameters, which give accurate and repeatable results.

Acceleration is normally measured in m/s^2 peak (meters per second squared) or ft/s^2, has excellent high frequency measurement capabilities, and is therefore very effective for determining faults in bearings or gearboxes.

Velocity is the most commonly used vibration parameter. It is used for vibration severity measurements in accordance with ISO 2372, BS 4675 or VDI 2056, which are guidelines for acceptable vibration levels of machinery in different power categories. These are presented as a table in section 4 of this manual. Velocity is typically measured in cm/s or inch/s RMS (centimeters or millimeters per second). *Note:* This instrument measures in cm/s. If you are more familiar with measurements in mm/s, or wish to compare your measured values directly with the vibration severity chart in section 4, multiply the displayed value by 10.

Displacement is typically used on low-speed machines because of its good low frequency response, and is relatively ineffective when monitoring bearings. Units are typically mil or mm equivalent peak-peak.

5.2 **An Introduction To Vibration Measurement**

Vibration is a reliable indicator of the mechanical health or condition of a particular machine or product. An ideal machine will have very little or no vibration indicating that the motor, as well as peripheral devices such as gearboxes, fans, compressors, etc., are suitably balanced, aligned, and well installed.

In practice, a very high percentage of installations are far from ideal, the results of misalignment and imbalance exerting added strain on supporting components such as bearings. Eventually this lead to added stress and wear on critical components, resulting in inefficiency, heat generation and breakdowns. This often occurs at the most inconvenient or uneconomical times, causing costly production downtime. As parts of mechanical equipment wear and deteriorate, the equipment vibration increases.

Monitoring the vibration of healthy mechanical equipment on an ongoing basis, detects any deterioration long before it becomes a critical problem, allowing spares to be ordered in advance and maintenance to be planned only when necessary. In this way stocks of expensive and unnecessary spares can be reduced with obvious financial benefits.

Unscheduled breakdowns result in production losses and the faulty equipment is usually repaired hastily to get production going as quickly as possible. Under these stressful conditions staff are not always able to do repairs correctly regardless of how conscientious they are, resulting in a high probability of further early equipment failure.

By implementing a predictive maintenance program with regular measurements of critical factors like vibration, downtime can not only be reduced, but planned maintenance is more effective, resulting in improved product quality and greater productivity.

5.3 **What is a Trend?**

A trend is an indication of the way in which a monitored vibration parameter behaves over time. If regular vibration

Measurements are taken and plotted over a period of time, the resulting graph shows the progress or deterioration of a particular machine.

Typically this will have the general shape shown in the diagram below, regardless of the type of machine being considered. For a short time after installation, whether it is a new or a repaired machine, vibration levels may fall slightly as the machine is run in, followed by a long period of unchanging levels during the s'machine normal operating lifetime. Then comes a period of rising levels as machine parts wear out prior to failure. Such a trend enables the maintenance engineer to predict the time of failure and maximize use of the machine, while ordering spares and planning its maintenance for a time convenient to the production schedule.

6. BATTERY REPLACEMENT

6.1 When the battery symbol appears on the display, it is time to replace the battery.

6.2 Slide the Battery Cover (Fig. 1 , 3-12) away from the instrument and remove the battery..

6.3 Install batteries paying careful attention to polarity.

7. Appendix: Vibration standards

A. Rank of machine vibration (ISO 2372)

<table>
<tr><td>Vibratio amplitude</td><td colspan="4">Machine sort</td></tr>
<tr><td>Vibration velocity V rms (mm/s)</td><td>I</td><td>II</td><td>III</td><td>IV</td></tr>
<tr><td>0~0.28</td><td rowspan="3">A</td><td rowspan="4">A</td><td rowspan="5">A</td><td rowspan="6">A</td></tr>
<tr><td>0.28~0.45</td></tr>
<tr><td>0.45~0.71</td></tr>
<tr><td>0.71~1.12</td><td rowspan="2">B</td></tr>
<tr><td>1.12~1.8</td><td rowspan="2">B</td></tr>
<tr><td>1.8~2.8</td><td rowspan="2">C</td><td rowspan="2">B</td></tr>
<tr><td>2.8~4.5</td><td rowspan="2">C</td><td rowspan="2">B</td></tr>
<tr><td>4.5~7.1</td><td rowspan="6">D</td><td rowspan="2">C</td></tr>
<tr><td>7.1~11.2</td><td rowspan="5">D</td><td rowspan="2">C</td></tr>
<tr><td>11.2~18</td><td rowspan="4">D</td></tr>
<tr><td>18~28</td><td rowspan="3">D</td></tr>
<tr><td>28~45</td></tr>
<tr><td>>45</td></tr>
</table>

Note:

Class I is small motor (power less than 15 kw). Class II is medium motor (power between 15 ~75kw). Class III is power motor (hard base). Class Ⅳ is high power motor (stretch base)

. A,B,C,D are vibration Rank. 'A' means good, 'B' means satisfying, 'C' means not satisfying, 'D' means forbidden. Vibration velocity should be taken from the three perpendicular axes on the motor shell.

B.ISO/IS2373 Motor quality standard according as vibration velocity

Quanlity rank	Rev (rpm)	H: high of shaft (mm) Maximum vibration velocity (rms) (mm/s)		
		80<H<132	132<H<225	225<H<400
Normal (N)	600~3600	1.8	2.8	4.5
Good (R)	600~1800	0.71	1.12	1.8
	1800~3600	1.12	1.8	2.8
Excellent (S)	600~1800	0.45	0.71	1.12
	1800~3600	0.71	1.12	1.8

Limit of rank 'N' is suitable for common motor. When the request is higher than that in the table, limit can be gotten by dividing the limit of rank 'S' with 1.6 or multiples of 1.6.

C. Maximum vibration of motor that power larger than 1 horsepower (NEMA MG1-12.05)

Rev (rpm)	Displacement (P-P) (um)
3000~4000	25.4
1500~2999	38.1
1000~1499	50.8
≦ 999	63.6

* For AC motor, rev is maximum synchronous rev. For DC motor, it is maximum power rev. For motor in series, it is work rev.

D. Maximum vibration of high power induction drive motor (NEMA MG1-20.52)

Rev (rpm)	Displacement (P-P) (um)
≧ 3000	25.4
1500~2999	50.8
1000~1499	63.6
≦ 999	76.2

National Electric Manufacturers Association (NEMA) Establishes two standards above.