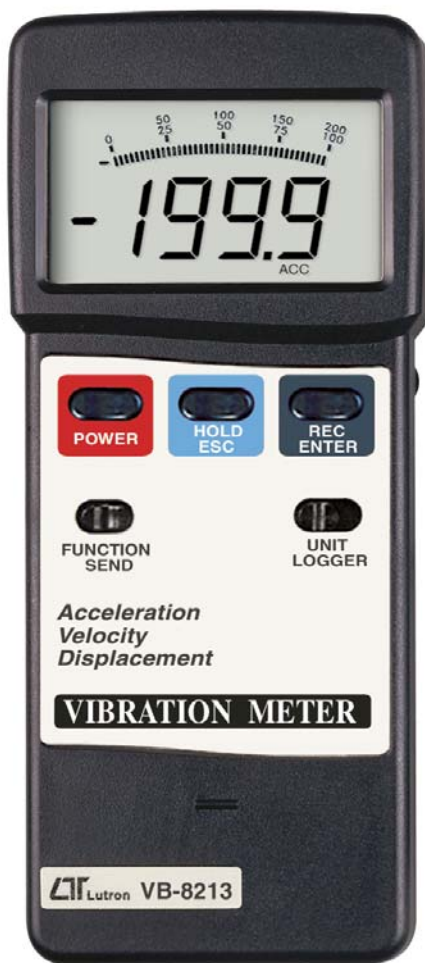*Acceleration/Velocity/Displacement*
RMS/Peak/Max. Hold, Metric & Imperial unit

VIBRATION METER

Model : VB-8213

Your purchase of this VIBRATION METER marks a step forward for you into the field of precision measurement. Although this METER is a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed. Please read the following instructions carefully and always keep this manual within easy reach.

OPERATION MANUAL

TABLE OF CONTENTS

1. FEATURES

* Applications for industrial vibration monitoring :
  All industrial machinery vibrates. The level of vibration is
  a useful guide to machine condition. Poor balance,
  misalignment & looseness of the structure will cause the
  vibration level increase, it is a sure sign that the
  maintenance is needed.
* Frequency range 10 Hz - 1 kHz, sensitivity relative meet
  ISO 2954.
* Professional vibration meter supply with vibration sensor
  & magnetic base, full set.
* Metric & Imperial display unit
* Acceleration, Velocity, Displacement measurement.
* RMS, Peak value, Max. hold measurement.
* Wide frequency range.
* Data hold button to freeze the desired reading.
* Memory function to record maximum and minimum
  reading with recall.
* Separate vibration probe with magnetic base,
  easy operation.
* RS 232 computer interface.
* Data Logger.
* Optional data acquisition software.
* Optional data logger (data collection) software.
* Super large LCD display with bar graph indicator.
* Microcomputer circuit, high performance.
* Auto shut off saves battery life.
* Built-in low battery indicator.
* Heavy duty & compact housing case.
* Complete set with the hard carrying case.

2. SPECIFICATIONS

2-1 General Specifications

Display	52 mm x 38 mm, LCD display. 16 mm (0.63") digit size. With bar graph indicator.	
Measurement	Velocity, Acceleration, Displacement	
Function	*Main*	RMS, Peak, Max. Hold.
	Others	Data hold, Max. & Min. value, Data logger.

Frequency range	10 Hz to 1 KHz
	* *Sensitivity relative during the*
	  the frequency range meet ISO 2954
	  Refer to table 1, page 21.	

Circuit	Exclusive microcomputer circuit.	
Data hold	Freeze the desired reading.	
Peak measurement	To measure the peak value.	
Max. hold measurement	To measure and update the max. peak value.	
Memory	Maximum & Minimum value.	
Power off	Auto shut off, saves battery life, or manual off by push button.	
Sampling time	Approx. 1 second.	
Sampling Time of Data Logger	0, 1, 2, 10, 30, 60, 600, 1800, 3600 sec. * *0 second : Manual data logger.* * *Other sampling time beyond 0* *second : Auto data logger.*	
Data Logger No.	500 no. max.	

Data output	RS 232 serial output, isolate.
Operating temperature	0 to 50 ℃ (32 to 122 ℉).
Operating humidity	Less than 80% RH.
Power supply	Alkaline or heavy duty type, DC 9V battery, 006P, MN1604 (PP3) or equivalent.
Power consumption	Approx. DC 13 mA.

Weight	Meter	230 g/0.50 LB
	Probe with cable and magnetic base	38 g/0.09 LB

Dimension	Meter : 180 x 72 x 32 mm (7.1 x 2.8 x1.3 inch).
	Vibration sensor probe: Round 19 mm Dia. x 21 mm.
Accessories included	Instruction manual.................. 1 PC. Vibration sensor with cable...... 1 PC. Magnetic base........................ 1 PC. Carrying Case........................ 1 PC.
Optional accessories	* RS232 cable, UPCB-01 * USB cable, USB-01 * Data Acquisition software, SW-801-WIN * Data Logger (data collection) software, DL-2005.

2-2 Electrical Specifications

Acceleration (RMS, Peak, Max Hold)

Unit	m/s^2
Range	0.5 to 199.9 m/s^2
Resolution	0.1 m/s^2
Accuracy	± (5 % + 2 d) reading @ 160 Hz, 80 Hz, 23 ± 5 ℃
Calibration Point	50 m/s^2 (160 Hz)

Unit	G @ 1 G = 9.8 m/s^2
Range	0.05 to 20.39 G
Resolution	0.01 G
Accuracy	± (5 % + 2 d) reading @ 160 Hz, 80 Hz, 23 ± 5 ℃
Calibration Point	50 m/s^2 (160 Hz)

Unit	ft/s^2
Range	2 to 656 ft/s^2
Resolution	1 ft/s^2
Accuracy	± (5 % + 2 d) reading @ 160 Hz, 80 Hz, 23 ± 5 ℃
Calibration Point	50 m/s^2 (160 Hz)

Velocity (RMS, Peak, Max Hold)

Unit	mm/s
Range	0.5 to 199.9 mm/s
Resolution	0. 1 mm/s
Accuracy	± (5 % + 2 d) reading *@ 160 Hz, 80 Hz, 23 ± 5 ℃*
Calibration Point	50 mm/s (160 Hz)

Unit	cm/s
Range	0.05 to 19.99 cm/s
Resolution	0. 01 cm/s
Accuracy	± (5 % + 2 d) reading *@ 160 Hz, 80 Hz, 23 ± 5 ℃*
Calibration Point	50 mm/s (160 Hz)

Unit	inch/s
Range	0.02 to 7.87 inch/s
Resolution	0.01 inch/s
Accuracy	± (5 % + 2 d) reading *@ 160 Hz, 80 Hz, 23 ± 5 ℃*
Calibration Point	50 mm/s (160 Hz)

Displacement p-p (RMS, Max Hold)

Unit	mm
Range	1.999 mm
Resolution	0.001 mm
Accuracy	± (5 % + 2 d) reading *@ 160 Hz, 80 Hz, 23 ± 5 ℃*
Calibration Point	0.141 mm (160 Hz)

Unit	inch
Range	0.078 inch
Resolution	0.001 inch
Accuracy	± (5 % + 2 d) reading *@ 160 Hz, 80 Hz, 23 ± 5 ℃*
Calibration Point	0.141 mm (160 Hz)

* Remark :
p-p = Peak to Peak

3. FRONT PANEL & LAYOUT DESCRIPTION
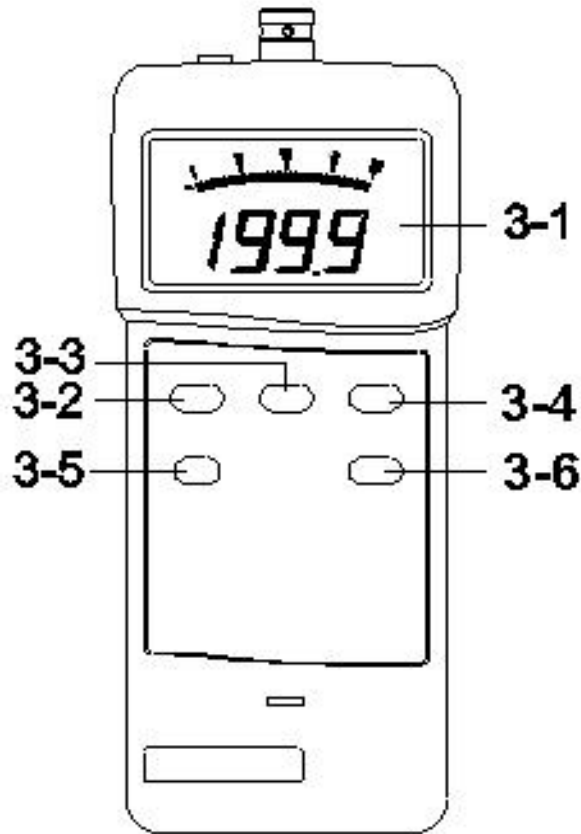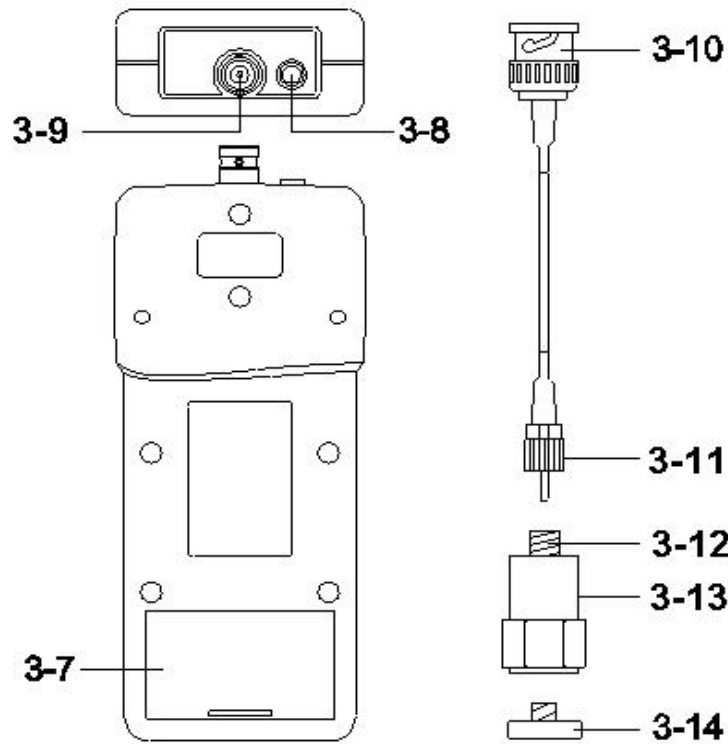

Fig. 1

Fig. 2

3-1 Display
3-2 Power Button
3-3 Hold/ESC Button
3-4 REC/ENTER Button
3-5 FUNCTION/SEND Button
3-6 UNIT/LOGGER Button
3-7 Battery Cover/Compartment
3-8 RS232 Output terminal
3-9 BNC socket of meter
3-10 BNC plug of cable
3-11 Mini plug of cable
3-12 Input socket of vibration sensor
3-13 Vibration sensor
3-14 Magnetic base

4. MEASURING PROCEDURE

1) Plug in the " BNC plug of cable " (3-10, Fig. 2) to the " BNC socket of meter " (3-9, Fig. 1).
2) Plug in the " Mini plug of cable " (3-11, Fig. 2) to the " Input socket of vibration sensor " (3-12, Fig. 2).
3) Power on the meter by press the " Power Button " (3-2, Fig. 1) once a while.
4) * If the surface material of measuring article is not the ferrous material, hold the vibration sensor by hand & touch the sensor to the surface of the measuring article,
    * If the surface material of measuring article is the ferrous material, connect " Vibration sensor " (3-13, Fig. 2) with the " Magnetic base " (3-14, Fig. 2). Put the whole unit (Vibration sensor & Magnetic base) to the surface of measuring article.
5) FUNCTION SELECTION :
   Select the desired function (RMS, PEAK, MAX-HOLD) by pressing the " FUNCTION Button " (3-5, Fig. 1).

   Remarks :
   a. **For general applications of industrial vibration monitoring, select " RMS " typically.**
   b. *PEAK measurement is intend to measure the peak vibration value.*
   c. *MAX HOLD measurement is intend to measure and update the max. peak value.*
   d. *For the " Displacement " measurement only can select the ' RMS " and " MAX HOLD " function only.*

9

5) UNIT SELECTION :
   Select the desired display unit by pressing the " UNIT
   Button " (3-6, Fig. 1).
   The unit can be selected as :

Measurement	Metric unit	Imperial unit
Acceleration	m/s^2 , G	ft/s^2
Velocity	mm/s, cm/s	inch/s
Displacement	mm	inch

   Remarks :
   **For general applications of industrial vibration
   monitoring, select " Velocity " or " Acceleration "
   typically.**

   **How to change the Metric unit to Imperial
   unit each other**

   If press the " UNIT Button" (3-6, Fig. 1)

   continuously at least 5 seconds, then will

   change the Metric unit (m/s^2 G, mm/s, cm/s, mm) to

   Imperial unit (ft/s^2 , inch/s, inch) each other.

6) Data Hold :
   During the measurement, push the " Hold button "
   (3-3, Fig. 1) will hold the measured value &
    the LCD will indicate " H " symbol.
   Push the " Data hold button " again to release the
   data hold function.

7) Data Record (Max., Min. reading)
The DATA RECORD function displays the maximum, and minimum readings.
  a. Get into RECORD mode by momentarily pressing " REC Button " (3-4, Fig. 1) once. REC icon will be ON.
  b. Get out RECORD mode by pressing and hold " REC Button " (3-4, Fig. 1) for 2 seconds. REC icon will be OFF.
  c. During RECORD mode (REC icon ON), momentarily pressing " REC Button " to get into Max/Min mode, MAX (both MAX and REC icons ON) and MIN (both MIN and REC icons ON) cycling. Momentarily pressing " HOLD Button " (3-3, Fig, 1) to leave Max/Min mode and execute the RECORD function continuously.

5. ZERO ADJUSTMENT PROCEDURE

Due to drift of environment temperature value, battery power change or, meter used for a long time or other reasons. The display value may exist not zero value (few digits) in case of no signal into the " Vibration Sensor ". General speaking those not zero value will not effect the measurement typically. However if intend to make the precision measurement, the following zero adjustment procedures should be executed as :
  1) Plug in the " BNC plug of cable " (3-10, Fig. 2) to the " BNC socket of meter " (3-9, Fig. 2).
  2) Plug in the " Mini plug of cable " (3-11, Fig. 1) to the " Input socket of vibration sensor " (3-12, Fig. 2).
  3) Power on the meter by press the " Power Button " (3-2, Fig. 1) once a while.

4) Set the function and the unit to " ACC, RMS " .
5) Keep the vibration sensor motionless, no signal into the vibration sensor.
6) Press the " HOLD Button " (3-3, Fig. 1) continuously at least 2 seconds will let the display reach zero value.
7) The zero adjustment can be execute only the display value show the no. less than 10 digits.

6. POWER MANAGEMENT

The meter is built the " Auto power shut off " to saves battery life. If not any function button be pushed within approx. 10 minutes, the power will be off automatically.

If the user intend to disable the " Auto Power off " function, it should take the following procedures :

During the measurement, push the " Record Button " (3-4, Fig. 1) to execute the memory record function.

7. Data Logger

The data logger function can save max. 500 measuring data.
The data logger procedures are as following :

Auto data logger

If the data sampling time already set to
1, 2, 10, 30, 60, 600, 1800 or 3600 second,
then the meter can be executed the auto data logger
function. The procedures that to set the data logger
sampling time, please refer page 14.

1. Press the " REC Button " (3-4, Fig. 1) once to
   start the Data Record function and there will be a
   " REC " symbol on the display.
2. Press the " LOGGER Button " (3-6, Fig. 1) once to start
   the Auto Data Logger function. The upper display will
   show the sampling time in seconds (For example, 1, 2,
   10, 30, 60, 600, 1800, 3600) once a while then revert
   to the normal display screen. In the same the " REC "
   indicator will be flash per the sampling time, in the
   same time, the beeper will sound a while.
   Now the data Logger function is executed and the
   measuring data will save into the memory per
   the sampling time.
3. During the Data Logger function is executed, press the
   " LOGGER Button " (3-6, Fig. 1) once will stop to
   execute the data logger function, then the " REC "
   indicator will stop to flash.
   Pressing the " REC Button " (3-4, Fig. 1) at least
   two seconds, then the " REC " indicator will be
   disaapeared.

Manual data logger

If the data sampling time already set to 0 second,
then the meter can be executed the manual data logger
function. The procedures that to set the data logger
sampling time, please refer page 14.
1. Press the " REC Button " (3-4, Fig. 1) once to
   start the Data Record function and there will be a
   " REC " symbol on the display.
2. Press the " LOGGER Button " (3-6, Fig. 1) once to start the
   Manual Data Logger function. The upper display will
   show " 0 " (0 second sampling time) once a while then
   revert to the normal display screen.
   Press the " LOGGER Button " (3-6, Fig. 1) once again
   will save one measuring data into the memory,
   indicator will be flash per the sampling time, in the
   same time, the beeper will sound a while.
3. If intend exit the Manual Data Logger function, just
   pressing the " REC Button " (3-4, Fig. 1) at least
   two seconds, then the " REC " indicator will be
   disaapeared.

Change the data logger sampling time

1. Power off the meter.
2. Use the two fingers to press the " HOLD Button " (3-3,
   Fig, 1) and the " REC Button " (3-4, Fig. 1) at the same
   time and not release those fingers, use another finger
   to push the " POWER Button " (3-2, Fig, 1) once, then
   until the display show the existing sampling time (for
   example 1, 2...), then release the two fingers at the
   same time.

14

3. Press the " UNIT Button " (3-6, Fig. 1) once a while
   will change the sampling time (1, 2, 5, 10, 30, 60,
   600, 1800, 3600 seconds). After the desired sampling
   be selected, then press the " REC Button " (3-4, Fig. 1)
   to save.
4 Press the " ESC Button " (3-3, Fig. 1) once will return
   the normal measuring screen.

Clear the memory (clear the existing save data)

1. Power off the meter.
2. Use the two fingers to press the " HOLD Button " (3-3,
   Fig, 1) and the " REC Button " (3-4, Fig. 1) at the same
   time and not release those fingers, use another finger
   to push the " POWER Button " (3-2, Fig, 1) once, then
   until the display show the existing sampling time (for
   example 1, 2...), then release the two fingers at the
   same time.
3. Press the " REC Button " (3-4, Fig. 1) continuously
   at least 5 seconds, then display will show " 0 ".
   Now the memory already be cleared.

Check the existing data that save into the memory

1. Power off the meter.
2. Use the two fingers to press the " HOLD Button " (3-3,
   Fig, 1) and the " REC Button " (3-4, Fig. 1) at the same
   time and not release those fingers, use another finger
   to push the " POWER Button " (3-2, Fig, 1) once, then
   until the display show the existing sampling time (for
   example 1, 2...), then release the two fingers at the
   same time.

3. Press the " HOLD Button " (3-3, Fig, 1) or the
   FUNCTION Button " (3-5, Fig. 1) will search the
   the data that already save into the memory.
    * " HOLD Button " - Increase the data no.
    * " FUNCTION Button " - Decrease the data no.

Memory full

During execute the data logger function, if the meter's
Beeper generate the " Long beeper sound along a short
stop " continuously. It means that the Memory is full.

8. HOW TO SEND THE DATA OUT
FROM the METER

If intend to send the data out from the meter, it should
cancel the " Hold function " and the " Record function "
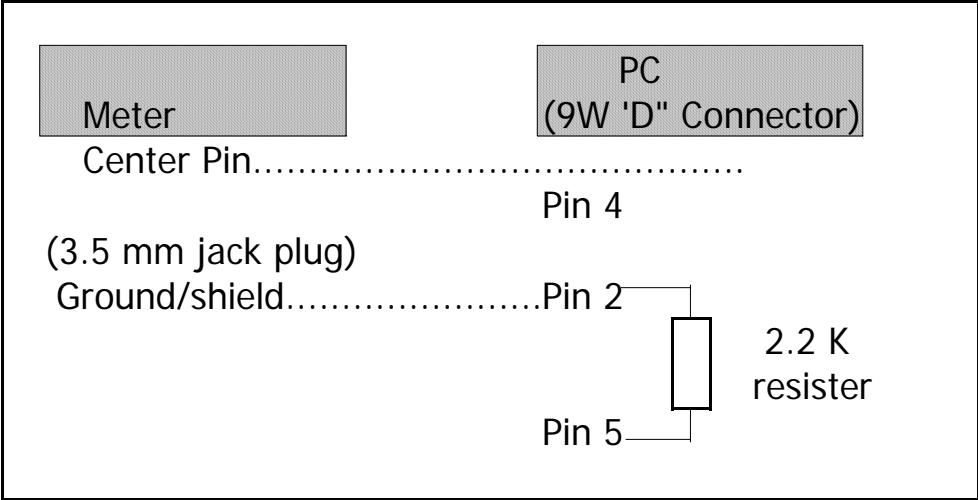first. The display will not show the " HOLD " and the "
REC " marker.
1) Press the " Send Button " (3-5, Fig. 1) at least 2
   seconds until the display show " 232 " (flashing),
   release the button.
2) Push the " Send Button " (3-5, Fig. 1) once again,
   the display will show the saved data no, then decrease
   to " 1 " and the display will present " 232 " again, now
   all the memory data already send out from the meter
   via the " RS-232 Output Terminal " (3-8, Fig. 2).
3) If intend up load the data to the computer, then should
   connect the RS232 cable (optional, model : UPCB-02)
   or USB cabke (optional, model : USB-01) and apply
   the Data Logger software (optional, Model : DL-2005).

9. RS232 PC SERIAL INTERFACE

The instrument has RS232 PC serial interface via a 3.5 mm terminal (3-8, Fig. 2).

The data output is a 16 digit stream which can be utilized for user's specific application.

A RS232 lead with the following connection will be required to link the instrument with the PC serial port.

Meter	PC (9W 'D" Connector)

Center Pin..
                                       Pin 4

(3.5 mm jack plug)
Ground/shield.....................Pin 2

2.2 K resister

Pin 5

The 16 digits data stream will be displayed in the following format :

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0

Each digit indicates the following status :

D0	End Word

D1 & D8	Display reading, D1 = LSD, D8 = MSD
	For example :
	   If the display reading is 1234, then D8 to
	   D1 is : 00001234

D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP
D10	Polarity 0 = Positive 1 = Negative
D11 & D12	Annunciator for Display | m/s^2 = 92	ft/s^2 = 97	
mm/s = 93	cm/s = 95	inch/s = 98
mm = 94	inch = 96	g = 57	
D13	When send the upper display data = 1 When send the lower display data = 2
D14	4
D15	Start Word

RS232 setting

Baud rate	9600
Parity	No parity
Data bit no.	8 Data bits
Stop bit	1 Stop bit

10. BATTERY REPLACEMENT

1) When the left up corner of LCD show " " indicator, it is necessary to replace the battery. However, in-spec measurement may still be made for several hours after low battery indicator appears before the instrument become inaccurate.

2) Open the " Battery Cover " (3-7, Fig. 2) away from the instrument and remove the battery.

3) Install a 9 V battery (Alkaline or heavy duty) and replace the cover.

11. OPTIONAL ACCESSORIES

RS-232 cable, **Model : UPCB-01**	Interface cable used for connecting the vibration meter & the computer (COM port).
USB cable, **Model : USB-01**	Interface cable used for connecting the vibration meter & the computer (USB port).
Data Acquisition software, **SW-801-WIN**	After setup whole hardware Vibration meter + RS-232 cable + Computer + software (SW-U801-WIN) whole system can execute as a data logger, data recorder.... record data can be retrieved for EXCEL, LOTUS-123.....
Data Logger **(data collection)** **software,** **DL-2005**	Vibration meter + RS-232 cable (or USB cable) + Computer + software (DL-2005) It can down load the MEMORY data out from the meter to the computer.

12. CLASSIFICATION RANGES

For the valuation of machines and equipment in the ISO 2372 and VDI 2056, four different kinds of machine groups with four classification ranges and their limits for vibration severity (mm/s) are determined.

The classifications for each machine group are specified as follows :

Small machines, especially production electrical motors of up to 15 KW (Group K)

Good	0 to 0.71 mm/s
Acceptable	0.72 to 1.80 mm/s
Still permissible	1.81 to 4.5 mm/s
Dangerous	> 4.5 mm/s

Medium sized machines, especially electrical motors with 15 up to 75 KW output, without special foundations (Group M)

Good	0 to 1.12 mm/s
Acceptable	1.13 to 2.80 mm/s
Still permissible	2.81 to 7.1 mm/s
Dangerous	> 7.1 mm/s

Large machines on heavy foundations (Group G)

Good	0 to 1.80 mm/s
Acceptable	1.81 to 4.50 mm/s
Still permissible	4.51 to 11.2 mm/s
Dangerous	> 11.2 mm/s

Largest machines and turbo machines with a special foundations (Group T).

Good	0 to 2.80 mm/s
Acceptable	2.81 to 7.10 mm/s
Still permissible	7.11 to 18.0 mm/s
Dangerous	> 18 mm/s

13. SENSITIVITY RELATIVE to the reference sensitivity at 80 Hz , according ISO 2954

Frequency	Normal value	Relative sensitivity	
		Minimum value	Maximum value
10 Hz	1.0	0.8	1.1
2 Hz Hz	1.0	0.9	1.1
40 Hz	1.0	0.9	1.1
80 Hz	1.0	1.0	1.0
160 Hz	1.0	0.9	1.1
500 Hz	1.0	0.9	1.1
1000 Hz	1.0	0.8	1.1

Table 1

0702-VB8213