

# Digital Pen Vibration Meter Operation Instruction

PCE-VT 1100



## I. Structural diagram:



## II. Main features:

- Its function is comprehensive. It can measure such three parameters as acceleration, speed and displacement.
- Its volume is not large. It is light and easy to carry.
- You can control the meter with two keys. The operation is simple.
- The meter has the function of automatic shutdown. It can save electricity consumption.

## III. Application principles:

When using the meter, you should point the sensor to the tested part vertically and try to maintain that the vibration pen is perpendicular to the tested surface. The sensor should tightly touch the surface of the tested object. The pressure is about 5~20N. Thus, vibration of the tested object is made to accurately transmit to the sensor. Bearing and bearing support should be selected as measure points. Other structural units response obviously to momentum and can demonstrate global vibration performance of the machine. Such structural units should also be selected as measure points to undertake measurement. This meter has no function of data memory. If you need keep test data, you need keep written records.

## IV. Application method:

1. Take out the battery door. lithium batteries of CR2032 are installed according to + pole. Then the door is fastened.
2. Press startup measurement key " $\frac{1}{2}$ " to start up. The meter is then in the state of measuring acceleration, as figure 1 demonstrates.



Fig. 1 Acceleration measurement

3. Point the sensor to the tested part vertically. You press the test key " $\frac{1}{2}$ ". The vibration pen starts to measure vibration acceleration. If you loosen the key, the measurement value before you loosen the key can be kept for about 20 seconds. It can be demonstrated in figure 2. It will automatically shut down with no operation in 30 seconds.



4. The measurement methods of speed and displacement are similar to that of acceleration. You just need to press "AVID" to select corresponding units, as displayed in figure 3 and figure 4.



Fig. 3 Speed measurement



Fig. 4 Displacement measurement

5. When the measured value is beyond the measurement range, LCD will demonstrate "OL" (overflow). It is demonstrated in figure 5.



Fig. 5

6. In dark measurement environment, you press "AVID" and "ON TEST" to start up. Backlight can be turned on, as figure 6.



Fig. 6

7. If the symbol " $\frac{1}{2}$ " occurs at upper right corner of LCD when the meter starts up, it demonstrates that the battery is on the verge of out of power. If " $\frac{1}{2}$ " occurs, as figure 7 displays, you need replace 2 new batteries, in case that numerical reading is inaccurate and that the meter cannot be switched on.

The power is insufficient and batteries need to be replaced.



Fig. 7

## V. Performance index:

1. Measurement parameters:
  - Acceleration.
  - Speed.
  - Displacement.
2. Measurement ranges:
  - Acceleration: 0.01~199.9m/s<sup>2</sup> (peak value)
  - Speed: 0.01~199.9mm/s (effective value)
  - Displacement: 0.001~1.999mm (peak~peak value)

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## 3. Frequency range:

- Acceleration: 10 Hz~1 kHz.
- Speed: 10 Hz~1 kHz.
- Displacement: 10 Hz~500Hz.

## 4. Relative error:

- Uncertainty of referred sensitivity  $\leq 3\%$
- Amplitude linear relative error  $\pm 5\% \pm 2$
- Relative error of frequency response:

When frequency is  $10\text{Hz} \leq f < 20\text{Hz}$ , relative error is  $+10\%/-20\%$ .

When frequency is  $20\text{Hz} \leq f \leq 1000\text{Hz}$ , relative error is  $\pm 5\%$ .

5. Display way: LCD display showing numbers from 0 to 9 and with the use of decimal point. Its display period is about 1S.

6. Power supply voltage: 2 button cells (CR2032).

7. Battery life: If the meter works nonstop, its life is about 5h; when it is standby, its life is about 1 year.

8. Working environment: The temperature ranges from 0°C to 40°C; relative humidity  $\leq 85\%$ .

9. Dimension: 154.5mm\*23.5mm\*18.7mm.

10. Weight of the meter: about 40g (including 2 cells).

## Appendix: vibration standards:

1. ISO/IS2373 is electromotor quality standard based upon vibration speed amplitude.

Value of vibration speed (mm/s)	Type I	Type II	Type III	Type IV
0.28	Good	Good	Good	Good
0.45				
0.71				
1.12	Satisfactory	Satisfactory	Satisfactory	Satisfactory
1.8				
2.8	Unsatisfactory	Unsatisfactory	Unsatisfactory	Unsatisfactory
4.5				
7.1				
11.2	Disallowed	Disallowed	Disallowed	Disallowed
18				
28				
45				

Note 1: Type I is a small-sized electromotor (electromotor <15kW); type II is a middle-sized machine (electromotor 15~75kW); type III is a large-scale prime mover (hard base); type IV is a large-scale prime (elastic base).  
Note 2: The efficient value of measured speed (RMS) should be in the three orthogonal directions of shell bearing.

2. The maximum permitted vibration of electromotor larger than 1 horsepower (NEMAMG -12.05)

Synchronous speed (RPM)	Displacement amplitude among peaks ( $\mu\text{m}$ )
3000-4000	25.4
1500-2999	38.1
1000-1499	50.8
999 & blow	63.6

Note: For AC electromotor, it uses the maximum synchronous speed; for DC electromotor, it uses the biggest power and speed; for series and multi-purpose electromotor, it uses working speed.

## 3. The maximum permitted vibration of large-scale induction machine (REMA MG -20.52).

Synchronous speed (RPM)	Displacement amplitude among peaks ( $\mu\text{m}$ )
3000-4000	25.4
1500-2999	38.1
1000-1499	50.8
999 & blow	63.6

The above two standards are made by National Electrical Manufacturers Association (REMA).

## 4. The maximum permitted vibration of preformed winding squirrel-cage induction motor (API STD541)

Synchronous Speed (RPM)	Displacement amplitude among peaks ( $\mu\text{m}$ )	
	Elastic support	Hard support
720-1499	50.8	63.6
1500-2999	38.1	50.8
3000 & above	25.4	25.4

This standard is made by American Petroleum Institute (API).

## 5. The vibration separation form of ISO2372 machine (NEM1A MG -12.05)

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Levels of quality	Speed (RPM)	Amplitudes of the maximum speed of axes with different height H (mm)		
		80<H<132	132<H<225	225<H<400
N (normal level)	600-3600	1.8	2.8	4.5
R (excellent level)	600-1800	0.71	1.12	1.80
	1800-3600	1.12	1.80	2.80
S (special level)	600-1800	0.45	0.71	1.12
	1800-3600	0.71	1.12	2.80

Note: The boundary value "N" that the table recommends is applicable to common electromotor. When required level of machine is higher than levels listed in the table, 1.6 and its multiples can be used to divide the boundary value "S". Thus, you get level boundary value of that machine. This standard offers different quality levels, different speeds, and recommended vibration limits of electromotor axes with different heights.

## VI. Maintenance:

- The pen vibration meter is a precise instrument. It should strictly avoid collision, moist, strong electromagnetic field, grease dirt and dust.
- When replacing battery, you should pay attention to that its positive pole should be upward.
- If the meter is not used for a long time, you should take the battery out, in case leakage may damage the meter.
- Please do not tear down the vibration pen at will, in case that internal circuit is damaged.
- Alcohol and diluents have a corrosive effect on the chassis especially the window. Thus, when cleaning it, you just use cotton silk to get a little clear water and to lightly scrub it.
- Should any problem happens, please consult local dealers and contact maintenance.

Non-guaranteed parts list: chassis, probes, battery, random accessory.

Note: Damage due to users' misuse is beyond the guarantee range.

