



SHOWA SOKKI - VIBRATION MEASURING INSTRUMENTS GENERAL CATALOG



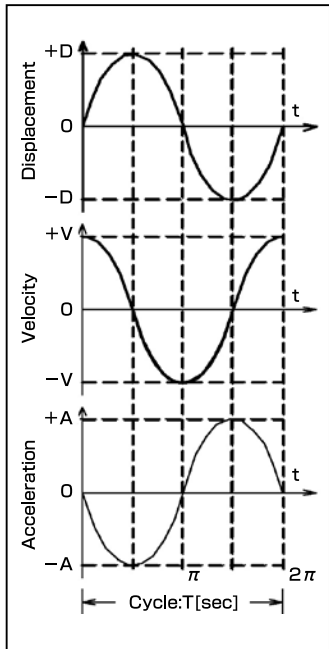
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# Vibration Application and Theory

## Dimensions and Units Representing Vibrations



Relations between the frequency of sine wave vibrations and displacement, velocity and acceleration.

The frequency is expressed with the equation of

$$f = 1/T \text{ [Hz]}$$

if the cycle is indicated to be T [sec] and an instantaneous value of the displacement can be expressed with the equation of

$$d = D \sin (2\pi f t)$$

and at the same time, an instantaneous value of the velocity of "v [m/s]" can be expressed with the equation of

$$v = V \cos (2\pi f t)$$

and further at the same time, an instantaneous value of the acceleration of "a [m/s<sup>2</sup>]" can be expressed with the equation of

$$a = A \sin (2\pi f t)$$

Note that the Unit [G] heretofore been used is being changed to read 9.8 [m/s<sup>2</sup>] in the new SI Unit regulations.

## Conversion Formula of Sine Wave Vibration

The following conversion formulae may come into existence in regard to sine wave vibrations.

**Velocity:  $V = 2\pi f D$ , Acceleration:  $A = D(2\pi f)^2$**

as f: frequency [Hz], A: acceleration [m/s<sup>2</sup>], V: velocity [m/s],

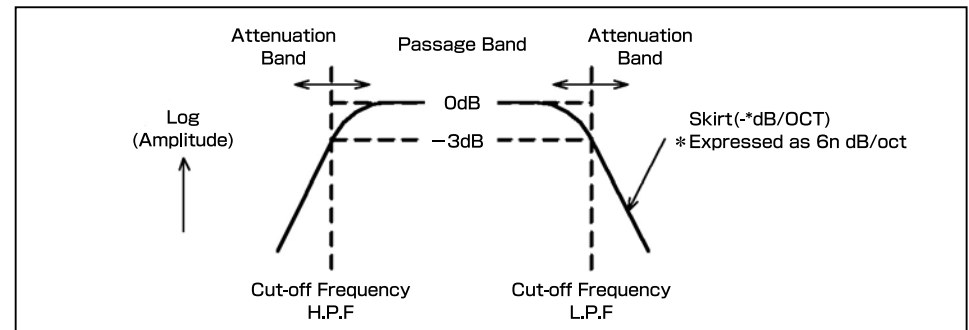
and D: displacement (m).

## Specification of Filter

High Pass Filter (H.P.F.): High sphere passing

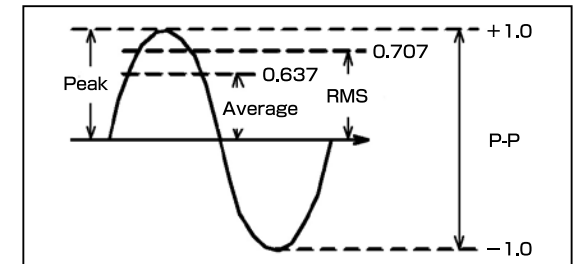
Band Pass Filter (B.P.F.): Band sphere passing

Low Pass Filter (L.P.F.): Low sphere passing



## Methods of Expressing Vibrating Amount


Expressions in vibration meters will be as shown in the sketch with peak value (one-way amplitude), P-P value (two-ways amplitude), RMS value (effective value), AVE value (averaged value) and so on.



The relations between waveform detection systems and kinds of indications are shown in the following table.




Detection / Indication	Indicated Values		
	Sine	Triangular	Rectangular
AVE / Peak	1.00	0.785	1.57
AVE / RMS	1.00	0.962	1.11
RMS / Peak	1.00	0.816	1.41

# Portable Vibration Meter -1

Classification		Portable Digital Display Vibration Meter				
						
Outline		Normal	Measurement Range is 10 Times.	Displacement Range is 20mm <sub>p-p</sub>	Resolution is 10 Times	Light Detector (1g)
Model		<b>1332A</b>	<b>1332A-01H</b>	<b>1332A-02H</b>	<b>1332-01L</b>	<b>1332A-00F</b>
Detector		<b>MODEL-2304A</b>	<b>MODEL-2304A</b>	<b>MODEL-2304A</b>	<b>MODEL-2369</b>	<b>MODEL-2302B</b>
Measurement Range	Acceleration	0.1 to 199.9m/s <sup>2</sup> <sub>Peak</sub>	1 to 1999m/s <sup>2</sup> <sub>Peak</sub>	0.1 to 199.9m/s <sup>2</sup> <sub>Peak</sub>	0.01 to 19.99m/s <sup>2</sup> <sub>Peak</sub>	0.1 to 199.9m/s <sup>2</sup> <sub>Peak</sub>
	Velocity	0.1 to 199.9mm/s <sub>RMS</sub>	1 to 1999mm/s <sub>RMS</sub>	0.1 to 199.9mm/s <sub>RMS</sub>	0.01 to 19.99mm/s <sub>RMS</sub>	0.1 to 199.9mm/s <sub>RMS</sub>
	Displacement	0.001 to 1.999mm <sub>p-p</sub>	0.01 to 19.99mm <sub>p-p</sub>	0.01 to 19.99mm <sub>p-p</sub>	0.1 to 199.9μm <sub>p-p</sub>	0.001 to 1.999mm <sub>p-p</sub>
Frequency Range	Acceleration	5 to 5,000Hz (±1dB)	5 to 5,000Hz (±1dB)	5 to 5,000Hz (±1dB)	5 to 5,000Hz (±1dB)	5 to 5,000Hz (±3dB)
	Velocity	10 to 1,000Hz (±1dB)	10 to 1,000Hz (±1dB)	10 to 1,000Hz (±1dB)	10 to 1,000Hz (±1dB)	10 to 1,000Hz (±3dB)
	Displacement	10 to 1,000Hz (±1dB)	10 to 1,000Hz (±1dB)	10 to 1,000Hz (±1dB)	10 to 1,000Hz (±1dB)	10 to 1,000Hz (±3dB)
Accuracy (*1)	Acceleration	(*2)	(*2)	(*2)	(*2)	(*2)
	Velocity	(*3)	(*3)	(*3)	(*3)	(*3)
	Displacement					
Analog Output	Acceleration	10mV/(m/s <sup>2</sup> ) (*4)	1mV/(m/s <sup>2</sup> ) (*4)	10mV/(m/s <sup>2</sup> ) (*4)	100mV/(m/s <sup>2</sup> ) (*4)	10mV/(m/s <sup>2</sup> ) (*4)
	Velocity	10mV/(mm/s) (*4)	1mV/(mm/s) (*4)	10mV/(mm/s) (*4)	100mV/(mm/s) (*4)	10mV/(mm/s) (*4)
	Displacement	2V/mm (*4)	200mV/mm (*4)	200mV/mm (*4)	2V/100μm (*4)	2V/mm (*4)
Display		LCD 3(1/2) digits, Sample rate about 3times/sec				
Power		6F22 (9V)				
Size (Dimension : mm)		W75×H130×D24				
Weight		Approx. 250g				

(\*1) 80Hz, F.S./2, at 20 deg. C. ±5 deg. C. (\*2) ±3% ±1digit of Reading (\*3) ±5% ±1digit of Reading (\*4) ±2V max.



# Portable Vibration Meter -2

Classification		Peak Hold Type Portable Digital Acceleration Meter	Portable Vibration Meter with Frequency Analyzing Unit	Portable Vibration Meter with Low Frequency Analyzing Unit	Portable Low Frequency Vibration Meter
					
<b>Model</b>		<b>MODEL-1340A</b>	<b>MODEL-1022A</b>	<b>MODEL-1422A</b>	<b>MODEL-2403-12</b>
<b>Detector</b>		<b>MODEL-2304A</b>	<b>MODEL-2008</b>	<b>MODEL-2400A</b>	<b>MODEL-2403</b>
Measurement Range	Acceleration	1 to 1999m/s <sup>2</sup> <sub>Peak</sub>	0.3 to 30m/s <sup>2</sup> <sub>Peak</sub> (*4)	0.3 to 30m/s <sup>2</sup> <sub>Peak</sub> (*4)	0.01 to 10m/s <sup>2</sup> <sub>Peak</sub> (*4)
	Velocity	-	1 to 100mm/s <sub>RMS</sub> (*4)	0.1 to 10cm/s <sub>Peak</sub> (*4)	0.1 to 100mm/s <sub>Peak</sub> (*4)
	Displacement	-	10 to 1,000μm <sub>P-P</sub> (*4)	0.1 to 10mm <sub>P-P</sub> (*4)	1 to 1,000μm <sub>Peak</sub> (*4)
Frequency Range	Acceleration	5 to 5,000Hz (±5%)	10 to 1,000Hz	1 to 100Hz	0.2 to 150Hz (+0.5dB, -3dB)
	Velocity	-			0.7 to 150Hz (+0.5dB, -3dB)
	Displacement	-			0.85 to 150Hz (+0.5dB, -3dB)
Accuracy (*1)	Acceleration	±3% ±1 digit of Reading (*1)	±3% (*2)	±3% (*3)	±3% (*5)
	Velocity	-			
	Displacement	-			
Analog Output	Acceleration	1mV/(m/s <sup>2</sup> )	±1V/F.S.	±1V/F.S.	±1V/F.S., DC1V/F.S.
	Velocity	-			
	Displacement	-			
Display		LCD 3(1/2) digits, Sampling rate about 3 times/sec	Analog Meter	Analog Meter	Analog Meter
Power		6F22 (9V)	6F22 (9V)	6F22(9V)	6F22(9V) 2 pcs.
Size (Dimension: mm)		W75×H130×D24	W85×H190×D55	W85×H190×D55	W96×H155×D48
Weight		Approx. 220g	Approx. 750g	Approx. 750g	Approx. 700g

(\*1) 80Hz 100m/s<sup>2</sup> at 23 deg. C. ±3 deg. C. (\*2) 80Hz 100μmP-P at 23 deg. C. ±3 deg. C. (\*3) 16Hz 1mmP-P at 23 deg. C. ±3 deg. C. (\*4) Switchable per 10dB step (\*5) 16Hz 1m/s<sup>2</sup> at 25 deg. C.

# Low Cost Vibration Observation Meter






/ Digital Meter for Measuring Vibration

Classification		Low Cost Vibration Observation Meter.				Digital Meter for Measuring Vibration
						
Outline		Measuring Acceleration	Measuring Velocity	Measuring Displacement		Digital Meter
Model		MODEL-2502-01	MODEL-2502-02	MODEL-2502-03	MODEL-2502-03H	MODEL-2590B
Detector		-		-	-	MODEL-2502 series
Measurement Range	Acceleration	100m/s <sup>2</sup> <sub>Peak</sub>	-	-	-	-
	Velocity	-	50mm/s <sub>RMS</sub>	-	-	-
	Displacement	-	-	200μm <sub>p-p</sub>	2mm <sub>p-p</sub>	-
Frequency Range	Acceleration	5 to 1,000Hz (-3dB)	-	-	-	-
	Velocity	-	10 to 1,000Hz (-3dB)	-	-	-
	Displacement	-	-	10 to 500Hz (-3dB)	10 to 500Hz (-3dB)	-
Accuracy		±5% (*1)				±0.3% ±1 digit (*2)
Output		4 to 20mA DC				Various option having
Display		-				LED 5 digits
Power		9 to 28V DC				85 to 264V AC
Size (Dimension : mm)		φ 45×H45				W96×D92×H48
Weight		Approx. 105g (Without Cable)				Approx. 300g

(\*1) 80Hz F.S./2 at 20 deg. C. (\*2) 23 deg. C. ± 5deg. C.

# High Performance Vibration Meter

/ AMP for Detector / Power Supply for Detector / Portable Vibration Calibrator

Classification	High Performance Vibration Meter		AMP for Detector	Power Supply for Detector	Portable Vibration Calibrator
					
Outline	A Single Unit of AMP	Multi Channel AMP	AMP for Detector	Power Supply for Detector	Portable Vibration Calibrator
Model	MODEL-1607	MODEL-1607A	MODEL-4034B	MODEL-9400-4	MODEL-8100
Detector	1.00 to 99.9pC/G or 1.00 to 99.9mV		(*7)	(*7)	-
Measurement Range	Acceleration 1	0.03 to 3,000G <sub>Peak</sub> (*1)	0.1 to 100m/s <sup>2</sup> <sub>Peak</sub> (*1)	-	0 to 199.9m/s <sup>2</sup> (*11)
	Acceleration 2	0.3 to 30,000m/s <sup>2</sup> <sub>Peak</sub> (*1)			
	Velocity	0.3 to 30,000cm/s <sub>Peak</sub> (*1)			
	Displacement 1	0.1 to 10,000mm <sub>Peak</sub> (*1)			
	Displacement 2	0.01 to 1,000mm <sub>Peak</sub> (*1)			
Frequency Range	Acceleration 1	1 to 50,000Hz (±1dB)	1 to 100,000Hz (+1dB -3dB)	1Hz to Limit of Detector	80Hz or 500Hz (*12)
	Acceleration 2				
	Velocity	3 to 1,000Hz (±0.5dB)	-	-	-
	Displacement 1	3 to 500Hz (±0.5dB)	-	-	80Hz or 500Hz (*12)
	Displacement 2	10 to 500Hz (±0.5dB)			
Accuracy	±3% (*2)		±1.5% (*8)	-	±3% (*13)
Output	±1V/F.S. and DC1V/F.S.		±1V/F.S.	-	±2V/F.S.
Display	Analog Meter	(*4)	(*9)	-	LED 3(1/2) digits
Power	(*3)	(*5)	(*10)	85 to 132V AC	90 to 110V AC
Size (Dimension : mm)	W90×H177×D230	W35×H177×D230 (*6)	W306×D255×H99 (*6)	W132×D180×H40	W120×D200×H200
Weight	Approx. 2kg	Approx. 750g/CH	Approx. 3.5kg	-	Approx. 6.5kg





(\*1) Switchable per 10dB step (\*2) At time of input 80Hz, 100pC (\*3) With 4 ea UM 3 single type dry battery or on 100V AC (\*4) Analog meter display through MODEL-1607A-10M

(\*5) Supply from MODEL-1607A-10M, which is operating on 100V AC (\*6) A single unit of AMP (\*7) Acceleration detector with built-in AMP

(\*8) 1,000Hz 25 deg. C. (\*9) Analog meter display through MODEL-4035-10M (\*10) Supply from MODEL-4035-10M, which is operating on 100V AC

(\*11) Vibration exciting force: 9.8N Max., amplitude: 5mm<sub>p-p</sub> max. (\*12) 5 to 2,000Hz by external exciter (\*13) At 80Hz, 10m/s<sup>2</sup> 25 deg. C.

# Portable Balancer

Classification		Portable Balancing Meter (Strobe)	Portable Balancing Meter for Low Frequency (Key Phaser)	Portable Balancing Meter (Key Phaser)	Portable Balancing Meter with built-in Frequency Analyze
					
Model		MODEL-7102A	MODEL-7130	MODEL-7135	MODEL-7200A
Detector		MODEL-2008	MODEL-SSC-7510	MODEL-2007	MODEL-2009
Measurement Range	Acceleration	-	-	-	1 to 100m/s <sup>2</sup> <sub>Peak</sub> (*1)
	Velocity	-	-	-	1 to 100mm/s <sub>Peak</sub> (*1)
	Displacement	10 to 1,000μm <sub>P-P</sub> (*1)	0.1 to 3.16mm <sub>P-P</sub> (*1)	3.16 to 1,000μm <sub>P-P</sub> (*1)	1 to 100 (x1/100mm <sub>P-P</sub> ) (*1)
Frequency Range	Acceleration	-	-	-	15 to 200Hz (-3dB)
	Velocity	-	-	-	
	Displacement	10 to 500Hz	1 to 100Hz (±0.5dB)	15 to 500Hz (-3dB)	
Accuracy		-	-	-	-
Output		±1V/F.S.	±5V/F.S.	±5V/F.S. and DC5V/F.S.	±2V/F.S.
Display		Analog Meter	Analog Meter	Digital Meter	Analog and Digital Meter
Power		100V AC	100V AC	100V AC	100V AC
Size (Dimension: mm)		W240×D150×H120	W300×D149×H149	W260×D180×H100	W300×D230×H123
Weight		Approx. 2.5kg	-	Approx. 2.3kg	Approx. 4.5kg

(\*1) Switchable per 10dB step



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