SHOWA

SHOWA SOKKI - VIBRATION MEASURING INSTRUMENTS GENERAL CATALOG

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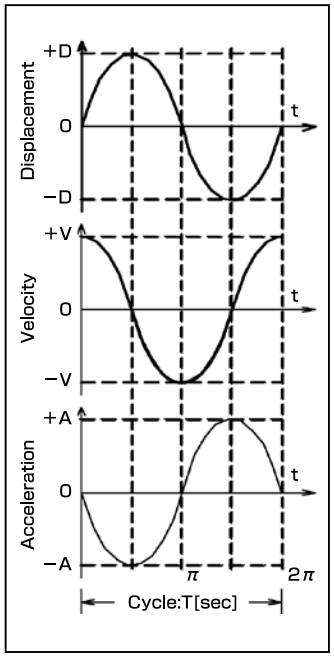
Vibration Application and Theory

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

$f = 1/T$ [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^2]" 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^2] 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^2], V: velocity [m/s],

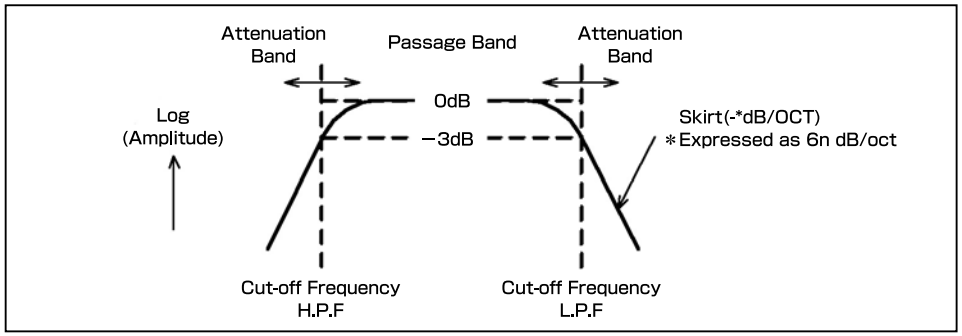
and D: displacement (m).

Specification of Filter

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

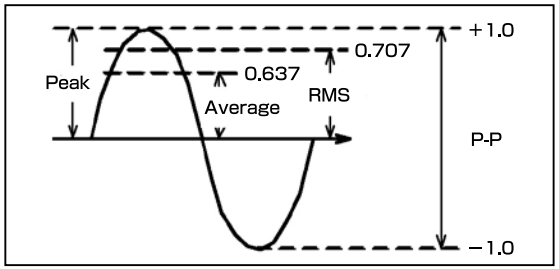
Band Pass Filter (B.P.F.): Band sphere passing

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.

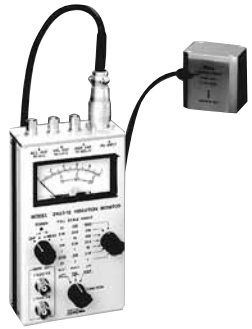
Detection / Indication	Indicated Values		
	Sine	Triangular	Rectangular
AVE / Peak	1.00	0.785	1.57
AVE / RMS	1.00	0.962	1.11
RMS / Peak	1.00	0.816	1.41

Portable Vibration Meter -1

Classification		Portable Digital Display Vibration Meter			
					
Outline		Normal	Measurement Range is 10 Times.	Resolution is 10 Times	Light Detector (1g)
Model		1332B	1332B-01H	1332B-01L	1332B-00F
Detector		MODEL-2304A	MODEL-2304A	MODEL-2369	MODEL-2302B
Measurement Range	Acceleration	0.01 to 199.9m/s^2_{Peak}	0.1 to 1999m/s^2_{Peak}	0.001 to 19.99m/s^2_{Peak}	0.01 to 199.9m/s^2_{Peak}
	Velocity	0.01 to 199.9mm/s_{RMS}	0.1 to 1999mm/s_{RMS}	0.001 to 19.99mm/s_{RMS}	0.01 to 199.9mm/s_{RMS}
	Displacement	0.001 to 19.99mm_{P-P}	0.001 to 19.99mm_{P-P}	0.1 to 1999μm_{P-P}	0.001 to 19.99mm_{P-P}
Frequency Range	Acceleration	5 to 5,000Hz (± 1dB)	5 to 5,000Hz (± 1dB)	5 to 5,000Hz (± 1dB)	5 to 1,000Hz (± 3dB)
	Velocity	10 to 1,000Hz (*2)	10 to 1,000Hz (*2)	10 to 1,000Hz (*2)	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 (± 3dB)
Accuracy (*1)	Acceleration	± 3% ± 1digit of Reading	± 3% ± 1digit of Reading	± 3% ± 1digit of Reading	± 3% ± 1digit of Reading
	Velocity	± 3% ± 5digit of Reading	± 3% ± 5digit of Reading	± 3% ± 5digit of Reading	± 3% ± 5digit of Reading
	Displacement				
Analog Output		± 2V (Full Scale)			
Power		6F22 (9V)			
Size (Dimension : mm)		W75 × H130 × D24			
Weight		Approx. 230g			

(*1)80Hz, F.S./2, at 20 ± 5 deg. C. (*2) Complies with ISO2954-Requirements for instruments for measuring vibration severity

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
					
Model		MODEL-1340A	MODEL-1022A	MODEL-1422A	MODEL-2403-12
Detector		MODEL-2304A	MODEL-2008	MODEL-2400A	MODEL-2403
Measurement Range	Acceleration	1 to 1999m/s^2_{Peak}	0.3 to 30m/s^2_{Peak} (*4)	0.3 to 30m/s^2_{Peak} (*4)	0.01 to 10m/s^2_{Peak} (*4)
	Velocity	-	1 to 100mm/s_{RMS} (*4)	0.1 to 10cm/s_{Peak} (*4)	0.1 to 100mm/s_{Peak} (*4)
	Displacement	-	10 to 1,000μm_{P-P} (*4)	0.1 to 10mm_{P-P} (*4)	1 to 1,000μm_{Peak} (*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% ± 1digit of Reading (*1)	± 3% (*2)	± 3% (*3)	± 3% (*5)
	Velocity	-			
	Displacement	-			
Analog Output	Acceleration	1mV/(m/s^2)	± 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/s2 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^2 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^2_{Peak}	-	-	-	-
	Velocity	-	50mm/s_{RMS}	-	-	-
	Displacement	-	-	200μm_{P-P}	2mm_{P-P}	-
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% ± 1digit (*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-4035-50	MODEL-9400-4	MODEL-8100
Detector		1.00 to 99.9pC/G or 1.00 to 99.9mV		Charge/Built-in AMP	(*7)	-
Measurement Range	Acceleration 1	0.03 to 3,000G_{Peak} (*1)		0.1 to 100m/s^2_{Peak} (*1)	-	0 to 199.9m/s^2 (*11)
	Acceleration 2	0.3 to 30,000m/s^2_{Peak} (*1)				
	Velocity	0.3 to 30,000cm/s_{Peak} (*1)		-	-	-
	Displacement 1	0.1 to 10,000mm_{Peak} (*1)		-	-	0 to 1.999mm_{P-P}
	Displacement 2	0.01 to 1,000mm_{Peak} (*1)				
Frequency Range	Acceleration 1	1 to 50,000Hz (± 1dB)		0.5 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)	W34.5 × D152 × H99	W132 × D180 × H40	W120 × D200 × H200
Weight		Approx. 2kg	Approx. 750g/CH	Approx. 320g	-	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,or AC adapter 100 to 240V AC

(*11) Vibration exciting force: 9.8N Max., amplitude: 5mm_{P-P} max. (*12) 5 to 2,000Hz by external exciter (*13) At 80Hz, 10m/s^2 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^2_{Peak} (*1)
	Velocity	-		-	1 to 100mm/s_{Peak} (*1)
	Displacement	10 to 1,000μm_{P-P} (*1)	0.1 to 3.16mm_{P-P} (*1)	3.16 to 1,000μm_{P-P} (*1)	1 to 100 (× 1/100mm_{P-P}) (*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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