EMIC CORP.

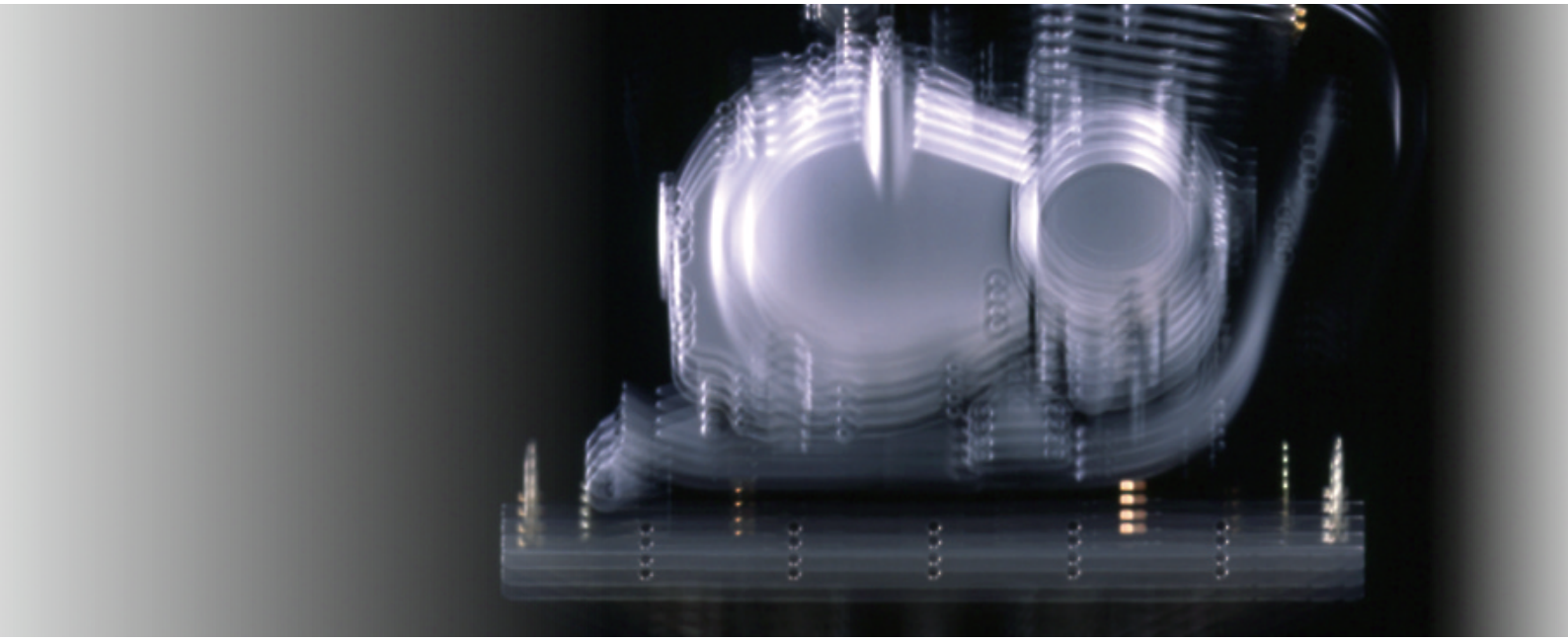
VIBRATION MEASURING INSTRUMENTS

The accurate measurement is necessary to obtain an effective test result.



Partner for Your Quality.

is the specialized manufacturer of vibration measuring instrument and test equipment.



To go for a more advanced measuring instrument

Since its foundation, EMIC CORPORATION has been consistently to this day involved in the business of developing and manufacturing the measuring instrument and test equipment used in the vibration and environmental area. During this time, we have strived as a specialized maker to amass the technical know-how while receiving warm instruction and encouragement from the customer. We desire to contribute to the progress in science and technology as much as possible by creating a state of the art measuring instrument and test equipment based on such a know how.

Quality Assurance

Measuring instrument, source of data analysis.
We keep the importance of quality assurance in mind and expend all possible means to it.
Our goal is to offer the product which can be satisfied with a customer by assuring its quality from product design and material procurement to after-sale service.

As all-round manufacturer of vibration products

We are proud of high quality of vibration and environmental test equipment and displacement meter as well as vibration meter. We would appreciate it very much if you could consider the purchase of them at the same time.



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Charge Amplifier Vibration Measuring Instrument

High Performance with Slim Body



Features:

- Matched to both piezoelectric accelerometer and accelerometer with built-in electronics.
- Enhanced filter according to JIS B 0907, 6 steps for both L.P.F and H.P.F.
- 36 mm width of slim body facilitates to configure multi-channel measurement system
- Optional AC power supply unit (USB communication feature) allows the PC to load measured data

Charge Amplifier 6001-AHD

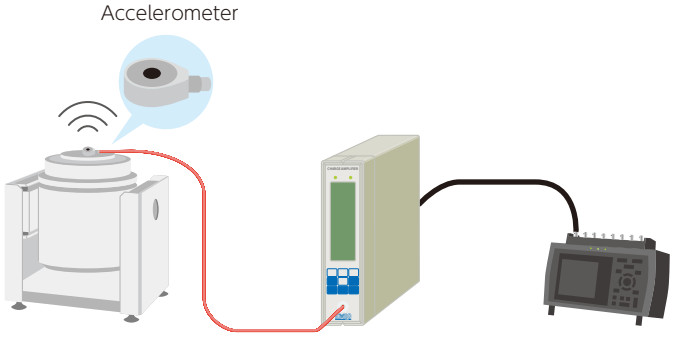


Front



Rear

- 3 measuring modes with integrating network: acceleration, velocity, and displacement
- Wide sensitivity range for setting accelerometer: 0.01000 pC/(m/s²) to 999.9 pC/(m/s²)
- Broadband frequency response (acceleration measurement): 0.5 Hz to 90 kHz



Charge Amplifier 6002-A

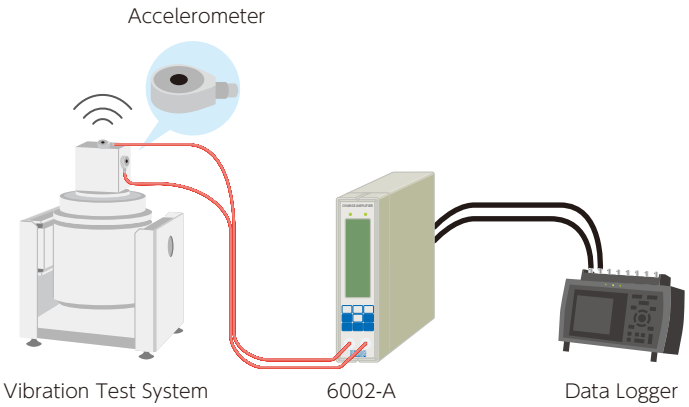


Front



Rear

- By saving the storing space to put away 2ch in one unit multi-channel measurement becomes possible.
- Broadband due to acceleration measurement from 0.5 Hz to 30 kHz



Model	6001-AHD	6002-A
Matched accelerometer	Piezoelectric Accelerometer (Max. input: 100,000 pC) Accelerometer with Built-in Pre-amplifier (Constant-current drive: 24 V/4 mA)	
Max. input	1	2
Sensitivity setting range	0.01000 to 99.99 pC/(m/s²) 0.1000 to 999.9 mV/(m/s²)	0.100 to 99.9 pC/(m/s²) 0.100 to 99.9 mV/(m/s²)
Measuring mode	Acceleration : m/s² Velocity : mm/s Displacement : mm	Acceleration : m/s²
Max. measurable acceleration	10000 m/s²	10000 m/s²
Acceleration measuring range	0.1/0.3/1/3/10/30/100/300/1000/3000/10000 m/s²	
Max. measurable velocity	10000 mm/s	–
Velocity measuring range	0.1/0.3/1/3/10/30/100/300/1000/3000/10000 mm/s	–
Max. measurable displacement	1000 mm_{p-p}	–
Displacement measuring range	0.01/0.1/0.3/1/3/10/30/100/300/1000 mm	–
Frequency characteristics	Acceleration : 0.5 Hz to 90 kHz ±15% 1.0 Hz to 80 kHz ±5% Velocity : 3 Hz to 1 kHz ±5% Displacement : 3 Hz to 200 Hz ±10%	Acceleration : 0.5 Hz to 30 kHz ±10% 1.0 Hz to 20 kHz ±5%
AC output	Max. 1 V_{0-p} full scale	Max. 1 V_{0-p} full scale
DC output	Max. 1 V_{0-p} full scale	–
High-pass filter	Attenuation: -18 dB/oct Butterworth, OFF/3/10/20/50/100/300 Hz according to JIS B 0907-1989 Characteristic of Butterworth Filter (HPF: 10 Hz, LPF: 1 kHz)	
Low-pass filter	Attenuation: -18 dB/oct Butterworth, 100/300/1k/3k/5k/10k Hz according to JIS B 0907-1989 Characteristic of Butterworth Filter (HPF: 10 Hz, LPF: 1 kHz)	
Display value	Root mean square (rms) EQ PEAK(rms×√2) EQp-p(EQ PEAK×2)	
Noise level	0.05 pCrms (Less than 10 mV/rms)	
Quantity of connecting unit	Up to 12 units	
Communication function	USB2.0 (An AC power supply unit with USB communication function sold separately is necessary.) RS-232C	
Input power	DC 9 to 15 V	
Dimensions	36W×149H×240D mm	
Mass	1 kg or app.	
Ambient conditions	Temperature: -10 to +50℃, Humidity: 20 to 85%RH without dewdrop	

ACP-12 (AC Power Supply Unit with USB Communication Function)



Front Rear

Features:

Power supply up to 12 units : To connected charge amplifier units

Settings by PC via USB : Various settings of charge amplifier can be set remotely

Acceptance up to 24 channels : Up to 24 channels can be set remotely



Configuration Example: 6001-AHD, 6002-A, ACP-12

Specifications	
Input power	Wide input range of 100/200 V system, voltage: AC 85 to 265 V, frequency: 47 to 66 Hz
Output capacity	More than 4.0 A @ DC+12 V±5%, up to 12 units in mixed combination of 6001-A and 6002-A
Communication	External communication (See software specifications for isolated USB 2.0, full speed and communication specifications)

Option

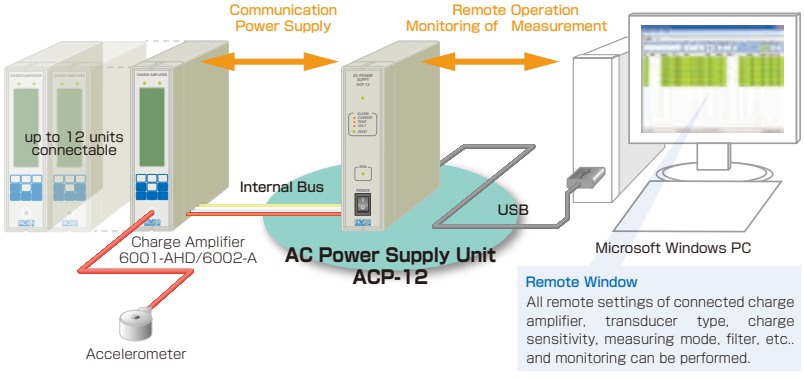
Description	Model	Remarks	
Power Supply	**Select a suitable model for your application from the followings.**		
Standard AC Adapter	ADP-03	for driving up to 3 units	Input voltage: AC 85 to 265 V
Medium AC Adapter	ADP-06	for driving up to 6 units	Input voltage: AC 85 to 265 V
Large AC Adapter	ADP-12	for driving up to 12 units	Input voltage: AC 85 to 265 V
AC Power Supply Unit with USB communication function	ACP-12	for driving up to 12 units	Input voltage: AC 85 to 265 V
Dry Battery Unit (Upcoming product)	DBP-03	for driving up to 3 units	Houses 8 size C batteries
Secondary Cell Unit (Upcoming product)	BAP-03	for driving up to 3 units	Charging type
Car Battery Adapter	CAP-01	for driving up to 3 units	–
Remote Software			
Independent Remote	SVM01	Compatible with 6001-A	
Remote for Plurality of Units	SVM02	Compatible with 6001-A and 6002-A	
Remote for Plurality of Units matched to AHD	SVM03	Compatible with 6001-A, 6002-A and 6001-AHD	
Connection Kit	**In connecting the unit the suitable connecting plate and cable for your application are required.**		
Connection Plate	CON-**	Fill in the quantity of unit for your application on "**".	
Connection Cable	COB-**	Example: For connecting 2 units, models are "CON-02" and "COB-02" respectively.	
Grip Kit	CAR-03	1 set of foot can be attached for every 3 units.	
Rubber Foot	–	1 set of foot can be attached for every 3 units.	
Rack-mount Kit			
Rack Mounting Board	RAC-01	Board for putting the unit in a rack	
Rack Mounting Bracket	RAF-01	Bracket for securing the mounting bracket to a rack	
Blank Panel	RAP-01	Blindfold board for insufficient quantity of the unit	
Accelerometer			
General-Purpose	731-B	Center stud mount type with side connector	
Small	710-D	Center stud mount type with side connector, most suitable for modal analysis	
General-Purpose Triaxial	712-B3	Small structure, high sensitivity, simultaneous measurement in three axes	
Small Triaxial	703-B3	Small structure, simultaneous measurement in three axes	
Ultrasamall Triaxial	702-B3	Ultrasmall, simultaneous measurement of lightweight specimen in three axes	

SVM Remote Software

This software makes it possible to remotely control settings on the panel of the 6001-A charge vibrometer and 6002-A 2ch charge amplifier through USB interface via ACP-12. Since the ACP-12 can connect up to 12 units (total quantity of 6001-A and 6002-A), measuring channel can be remotely controlled up to 24 channels.

※The multi-channel measuring system can be configured up to 24 channels with 24 6001-A units and two ACP-12 units, but it is acceptable even if one ACP-12 unit does not have the communication feature.
※Please contact us about the multi-channel configuration from 25 to 99 channels.

SVM Remote Control Measuring System using ACP-12



Remote Window
All remote settings of connected charge amplifier, transducer type, charge sensitivity, measuring mode, filter, etc.. and monitoring can be performed.

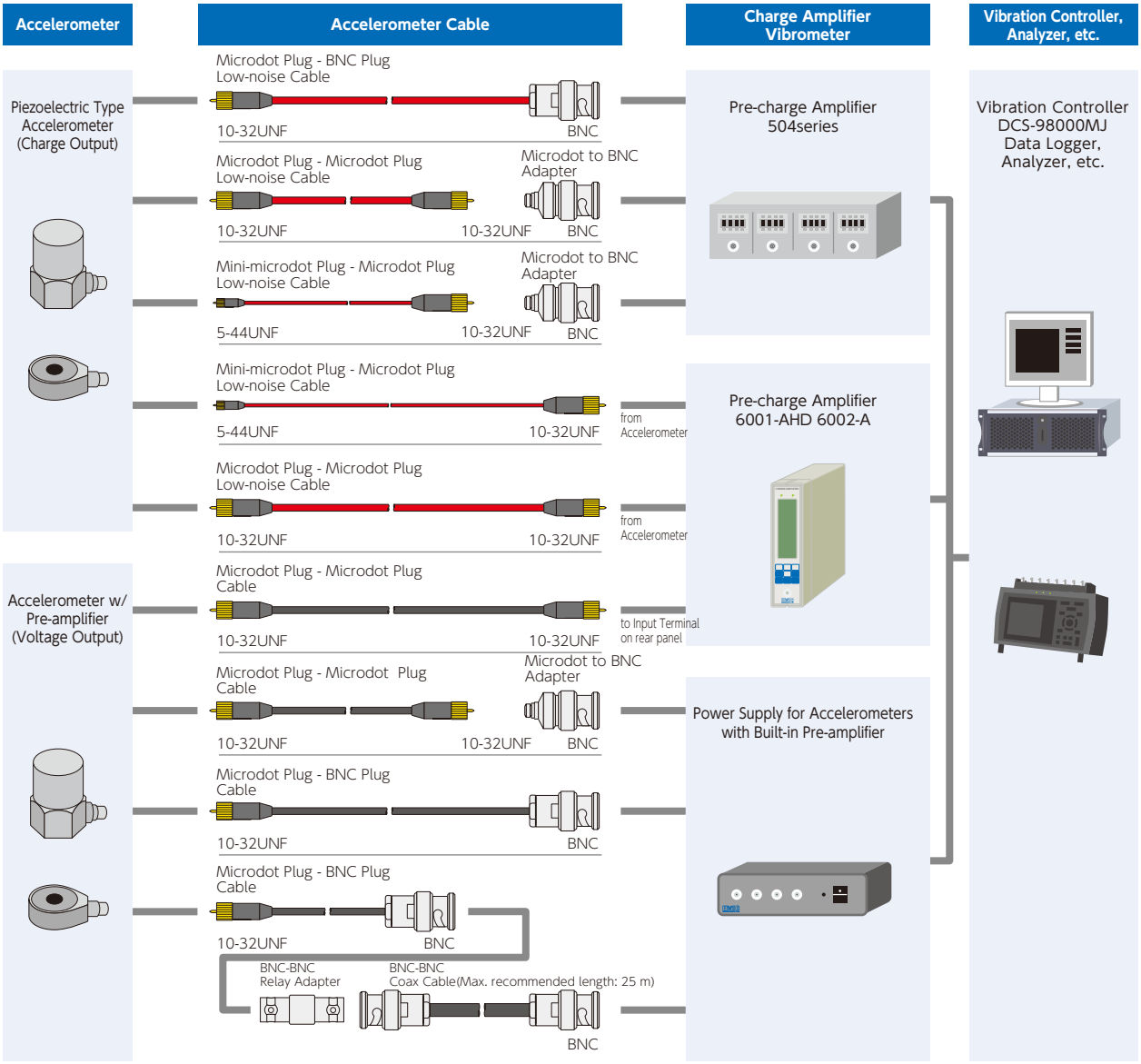
EM-995 Power Supply for Accelerometer with Built-in Pre-amplifier

4 Channel Constant Current Power Supply for Accelerometer with Built-in Pre-amplifier

The power supply unit for supplying power to the accelerometer with built-in pre-amplifier. The accelerometer cable can be extended using a coaxial cable because of low output impedance of the unit.



Specifications	
Model	PS-504
Input channels	4 channels
I/O Connector	BNC Receptacle
I/O Gain	× 1 (fixed)
Lower limit frequency	within -3 dB at 0.2 Hz, within -5% at 0.7 Hz
Upper limit frequency	Upper limit frequency of Accelerometer w/ built-in pre-amplifier
Max. voltage	DC 24 V
Output current	DC 4mA
Input power	AC100V±10%
Max. consumption	10 VA
Operating environments	Temperature: 0 to 50 ℃, Humidity:95%RH w/o dewdrop
Outer dimensions	200W×55H×140D mm
Mass	1.3 kg



505 & 509 Series Charge Amplifier Type Vibrometer

505-CBP
505-CB Unit

Charge Amplifier Type Vibrometer for measuring Acceleration, Velocity and Displacement.
Up to 6 channels can be combined in order to accommodate a request from the multi-channel measurement.

509-CBP
509-CB Unit

Charge Amplifier Type Vibrometer for measuring Acceleration, Velocity and Displacement.
Up to 6 channels can be combined in order to accommodate a request from the multi-channel measurement.



505-CBP



509-CBP



Integration of 505-CB Units

Features:

- Since the output voltage is not affected by the capacitance of an accelerometer cable, the cable length can be changed as you please.
- The vernier dial can readily calibrate the amplifier to a specific accelerometer sensitivity.
- Since there are four switching positions of cut-off frequency in both high-pass and low-pass filter, the analysis can be easily performed.
- Two output systems of AC and DC output can drive all the recorders.
- A recorder can be easily calibrated with an internal calibration signal.
- Two kinds of power supply, providing both AC(100 V) and DC(12 V) power and providing only AC(100 V) power are available.

Model	505-CBP	505-CB-1A1	505-CB-3A3 505-CB-3B3 505-CB-3C3	505-CB-6B6 505-CB-6C6	509-CBP	509-CB-1A1	509-CB-3A3 509-CB-3B3 509-CB-3C3	509-CB-6B6 509-CB-6C6
Matched Accelerometer	Piezo-electric Type Acceleromter				Piezo-electric Type Acceleromter			
Max. number of inputs	1	1	3	6	1	1	3	6
Max. acceleration measurement	10000 m/s²				10000 m/s²			
Acceleration measuring range	0.3※1/3/10/100/300/1000/3000/10000 m/s²				0.3※1/3/10/100/300/1000/3000/10000 m/s²			
Max. velocity measurement	10000 cm/s(5 to 500 Hz) 100 cm/s(200 to 3k Hz)				—			
Velocity measuring range	0.3※1/1/3/10/30/100/300/1000/3000/10000 cm/s(5 to 500 Hz) 0.03/0.1/0.3/1/3/10/30/100 cm/s(200 to 3k Hz)				—			
Max. displacement measurement	1000 $mm_{p\text{-}p}$(5 to 100 Hz) 100 $mm_{p\text{-}p}$(50 to 1k Hz)				—			
Displacement measuring range	0.3/1/3/10/30/100/300/1000 $mm_{p\text{-}p}$(5 to 100 Hz) 0.03/0.1/0.3/1/3/10/30/100 $mm_{p\text{-}p}$(50 to 1000 Hz)				—			
Frequency response	Less than -1 dB (1 Hz to 30 kHz)				Less than -1 dB (1 Hz to 30 kHz)			
Noise level	0.01 pCrms+0.005 pCrms/1000 pF				0.01 pCrms+0.005 pCrms/1000 pF			
Max. charge input	±100,000 pC				±100,000 pC			
High-pass filter	5 Hz,20 Hz,50 Hz,200 Hz (Attenuation: -12 dB/oct)				5 Hz,20 Hz,50 Hz,200 Hz (Attenuation: -12 dB/oct)			
Low-pass filter	500 Hz,1000 Hz,5000 Hz,10000 Hz (Attenuation: -12 dB/oct)				500 Hz,1000 Hz,5000 Hz,10000 Hz (Attenuation: -12 dB/oct)			
AC output	Max. 1 $V_{0\text{-}p}$				Max. 1 $V_{0\text{-}p}$			
DC output	DC0 to 5 V				DC0 to 5 V			
AC power supply	AC100V 50/60Hz	AC100V 50/60Hz	AC100V 50/60Hz	AC100V 50/60Hz	AC100V 50/60Hz	AC100V 50/60Hz	AC100V 50/60Hz	AC100V 50/60Hz
DC power supply	DC12V 300 mA	DC12V 300 mA	DC12V 300 mA	DC12V 600 mA※2	DC12V 300 mA	DC12V 300 mA	DC12V 300 mA	DC12V 600 mA※2
Matched power supply unit	—	DMA-500	DMA-500 DMB-500 DMC-500※2	DMB-500 DMC-500※2	—	DMA-500	DMA-500 DMB-500 DMC-500※2	DMB-500 DMC-500※2
Dimensions	120W×180H×260D	180W×180H×260D	300W×180H×260D	480W×180H×260D	120W×180H×260D	180W×180H×260D	300W×180H×260D	480W×180H×260D
Housing model	—	CAC-501	CAC-503	CAC-506	—	CAC-501	CAC-503	CAC-506
Mass	3.5 kg	※3	※3	※3	2.0 kg	※3	※3	※3

※1 The measuring range is available only when the accelerometer sensitivity is from 1 to 10 pC(m/s²).
※2 The DMC-500 provides the AC power only and does not do the DC power supply.
※3 As for the details, contact us.

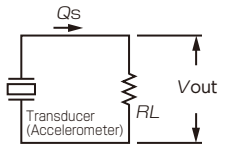
Technical Information of Charge Amplifier

● Theory of Operation

The charge amplifier converts the charge output from a piezoelectric accelerometer (vibration sensor) into a voltage signal and amplifies it.

Since the current is obtained by differentiating the electrical charge with respect to time (I = dQ/dt), the charge amplifier is suitable for conditioning a minute signal like the current amplifier (I/V converter). Let Vout, Qs, Cs be the output voltage, output charge from the accelerometer, accelerometer capacitance respectively, then, the simple equivalent circuit model among charge and voltage gives the following equation.

$$Vout = \frac{Qs}{Cs}$$

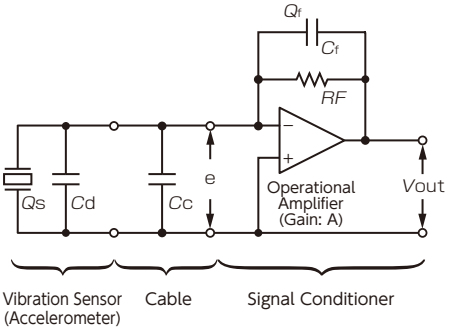


The cutoff frequency FH of a high-pass filter can be defined by a load resistance RL as follows;

$$FH = \frac{1}{2\pi \cdot Cs \cdot RL}$$

Since the resistance RL controls the low frequency response of the circuit, it shall be generally large. For this reason, an integration circuit using an operational amplifier is absolutely essential so that electric capacitance connected to the accelerometer does not have an influence on the charge sensitivity. The parallel connection of the accelerometer and cable capacitance, difference in electric capacitance between accelerometers and electric properties of cable such as material, structure, length worsen precision in the measurement.

Refer to the electric equivalent circuit model as shown in the right, where QS is the electric charge generated by the accelerometer, Q0 the electric charge accumulated in the accelerometer (Cd), Cf the feedback capacitance, Cd the capacitance of the accelerometer, e the open circuit voltage, RF the feedback resistance and A the gain of the operational amplifier, respectively. Then the relational expressions are established between these parameters as follows;



$$Vout = -Ae \qquad e = \frac{Q_0}{Cd + Cc} \qquad e - Vout = \frac{Q_f}{C_f}$$

$$Q_0 = +Q_f \frac{Cd + Cc}{C_f} \cdot \frac{1}{1 + A}$$

$$e = +\frac{Q_f}{C_f} \cdot \frac{1}{1 + A}$$

$$Vout = -\frac{Q_f}{C_f} \cdot \frac{A}{1 + A}$$

Since the gain of the operational amplifier is quite large, the above electrical charge and voltages can be approximated as follows;

$$Q_0 \fallingdotseq 0$$
$$e \fallingdotseq 0$$
$$Vout = -\frac{Q_f}{C_f}$$

The effect of varying input accelerometer or cable capacitance turns out to be insignificant.

● NOTES

How to handle:

In order to ensure reliable performance of the charge amplifier the user must be familiar with the type and characteristics of an accelerometer for use with it and select the most suitable accelerometer for the application. Two types of accelerometer are available, "piezoelectric accelerometer" and "accelerometer with built-in electronics".

※ As for the details of accelerometer, see "Application Note for Accelerometer" at pages 9 and10. Since the charge amplifier is precision equipment, please pay attention to the following points.

- Since a dirty connector or cable may have a bad effect on measurement accuracy, please clean them.
- Please take care of handling the connector so that static electricity will not apply to it because there may be a possibility of being failure or damaged.
- It is impossible to disconnect the accelerometer with built-in electronics under the condition that the power is supplied through the charge amplifier.
- In measuring the velocity and displacement please set the cutoff frequency of the high-pass filter to 3 Hz to remove the fluctuation of meter indication in the low frequency range. The indicated value will become stable.
- Please check the sensitivity, measuring range, and settings of the filter before commencing the measurement.
- Please use the accelerometer whose mass is 1/50 of a measuring object. If the accelerometer is heavy, there is a possibility of changing its dynamical characteristics. Depending on the configuration its vibration level may reach 100 times of excitation level due to resonance. As such is the case, please select the suitable accelerometer whose shock limit meets the requirement for your application. If failed to select a proper accelerometer, the accelerometer may be damaged or charge amplifier failure.

Application Note for Accelerometer

● Introduction

Accelerometer

The accelerometer is used for measuring acceleration of an object. Gravity, vibration/motion, and shock can be measured as three prominent types of kinematic measurable amount. The positional change of the mass caused by acceleration and low acceleration can be measured with some accelerometers; therefore, static acceleration (response at 0 Hz) and gravity can be detected. Other type of accelerometer has high frequency characteristics enabling to measure vibrations up to 20 kHz. They are generally referred to as acceleration pickup, acceleration sensor, and accelerometer.

Accelerometer Type ··· The commonly used accelerometers are described as below.

① Piezoelectric Type Accelerometer

The accelerometer having a piezoelectric element generates the charge being proportional to the acceleration to which the accelerometer is subjected. The output charge will be converted into the voltage output with the charge amplifier to measure acceleration. The output charge is very low in the order of picocoulomb, thereby being electrostatically affected by bending or twisting of a cable giving a false output signal. For this reason, the low noise cable is essentially used.

☑Features of Piezoelectric Accelerometer

● High sensitivity·Small ● Broadband (measurable from low to high frequency) ● Large measuring range (from very weak vibration to high acceleration) ● High mechanical strength ● Superior environment immunity ● Power supply is unnecessary except for accelerometer with built-in electronics ● Wide temperature range (extreme cold, high temperature)

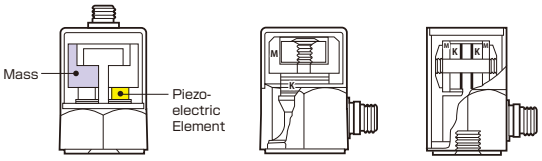
② Accelerometer with Built-in Electronics

It says the piezoelectric accelerometer which has a built-in charge to voltage converter.

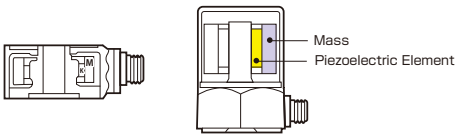
☑Features of Piezoelectric Accelerometer with Built-in Electronics

● High sensitivity despite small size because of built-in charge to voltage converter ● Built-in filter defines any frequency response ● Other types of instrument cable than low noise cable are acceptable ● Sensitivity deterioration and noise due to cable length are small ● Immune to humidity because of low impedance

Structure of Piezoelectric Type Accelerometer



Structure of Shear-type Accelerometer



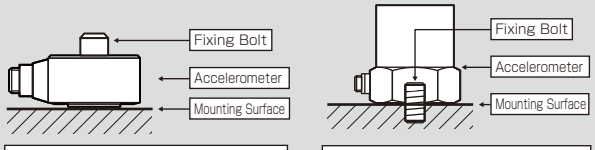
● NOTES

How to handle:

In order to measure vibrations accurately please mount the accelerometer with enough care. When it is not mounted and fixed properly, its high frequency response and dynamic range will be limited not to provide reliable measurement of vibrations. In mounting and fixing the accelerometer the mounting stiffness between accelerometer and vibrating body shall be increased.

◆ Fastening with Bolt

The mounting method with the bolt is the best solution. If this method is acceptable to your application, we recommend it to all the applications. The mounting surface shall be flattened out not so as to form any clearance and tip the accelerometer, then, please securely fasten the accelerometer with the bolt. If the mounting surface is not quite smooth, the high frequency response may be improved by applying a thin layer of silicon grease to the surface.

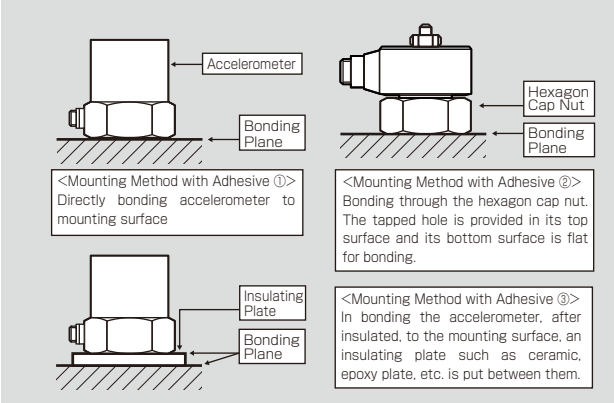


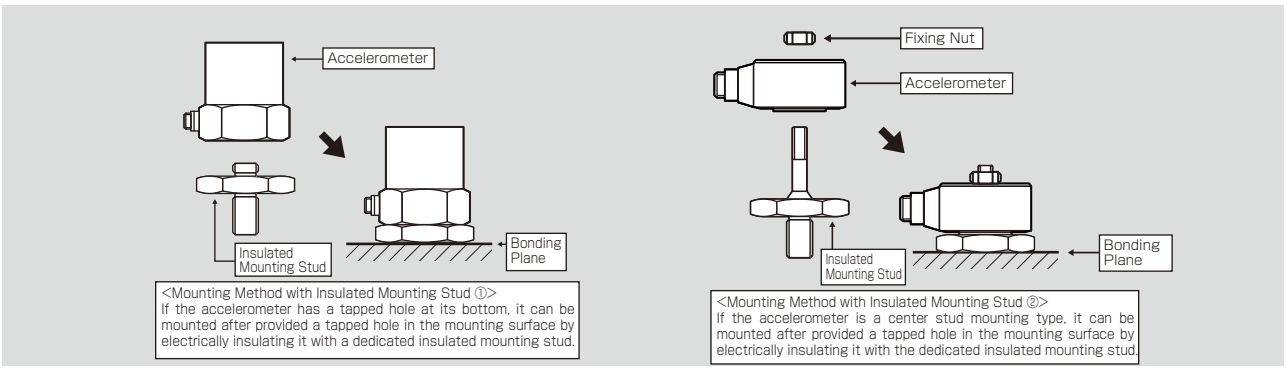
<Mounting with Bolt ①>
If the accelerometer is the center stud mount type, please provide a tapped hole in the mounting surface to fix it with the fixing bolt.

<Mounting with Bolt ②>
If the accelerometer has a tapped hole at its bottom, please provide a tapped hole in the mounting surface to fix it with the fixing bolt.

◆ Sticking Accelerometer with Adhesive Cement

If drilling a tapped hole for directly mounting the accelerometer to vibrating body is not available, we recommend fixing with an epoxy-based or alpha-cyanoacrylate (instant) adhesive after cleaned the joint area to remove dirt, liquid, oil etc.. Proper mounting using an adhesive can provide the same frequency response as a bolt. An optional hexagon cap nut may prevent the mounting surface or tapped hole from being damaged in disconnecting the stuck accelerometer. It has a tapped hole for attaching the accelerometer at one side, while the other side is flat to attach to a vibrating object; furthermore, additional machining to the flat surface is also available. We do not recommend the soft adhesive because its high frequency response becomes worse. Since the mounting stiffness with the adhesive may, beyond its rated temperature, be drastically reduced or the stuck accelerometer may break away, please take care of the performance guarantee temperature condition of adhesives.





◆ Electrical Insulation

The accelerometer shall be isolated from a measuring object when the noise comes to be mixed in due to the difference in electric potential between measuring object and instrument or due to ground loop formed by direct mounting of the accelerometer. To mount the accelerometer by isolating from the measuring object the insulated mounting stud (option) or screw/washer shall be employed. Joining with an adhesive through ceramic or epoxy insulator is also acceptable. Direct mounting method using an adhesive may break down the electric insulation due to thickness of bonding layer or surrounding moisture. In trying to isolate and mount the accelerometer, please use the dedicated insulated mounting stud or joint it through the insulator.

◆ Fixing with Wax

When the same accelerometer should be used at many measuring points, wax makes it easier to attach and remove that. Its operating temperature range, however, should be limited to lower than 40℃ or app. because the stiffness of wax decreases at higher temperature. It is limited to the application using a light accelerometer or measuring relative low acceleration.

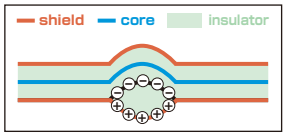
◆ Mounting with Magnet Holder

If the mounting surface of the measuring object is ferromagnetic material, the accelerometer can be mounted with a magnet holder. Its mounting stiffness depends on the condition of the mounting surface, total mass of the accelerometer and magnet holder, and magnetic force.

<Connection Treatment of Low-noise Cable>

When accelerometer cable bends or becomes deformed mechanically, the noise signal due to static electricity is generated because the output impedance of the piezoelectric accelerometer is very high. When the coaxial cable is mechanically distorted or twisted, small separations between the shield and insulator layer will occur as shown in Figure-1 and a capacitor will be formed locally. This part becomes electrically charged through friction. If the charge amplifier receives this charge, it generates errors because it cannot be separated from the correct measurement charge. This phenomenon is known as the so-called triboelectric effect. To reduce this effect as much as possible the surface of an insulator in a special low-noise cable is processed with a conductive film (carbon layer). As this is the case, the capacitor cannot be formed in the low-noise cable even if the insulator moves away from the shield conductor to drastically reduce the charge due to the triboelectric effect. The low-noise cable is most widely used with piezoelectric accelerometers. Commonly used instrument coaxial cables are not suitable for this application. Even if the low-noise cable is used, it shall be clamped as firmly as possible to the vibrating specimen so that it may not be subjected to any mechanical force or may not whip. The accelerometer with built-in electronics does not always have to use the low-noise cable because its output impedance is low.

Figure 1



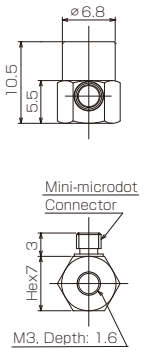
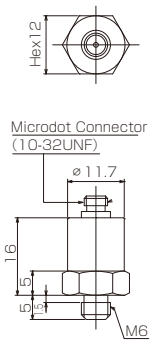
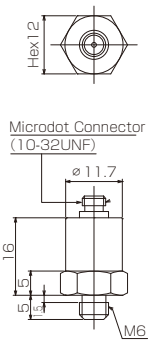
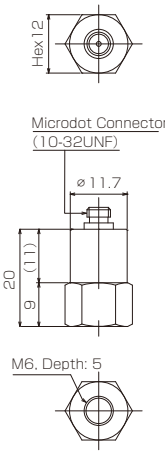
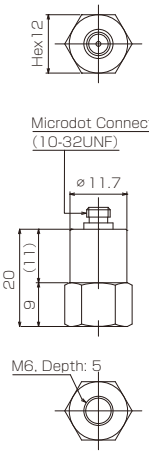
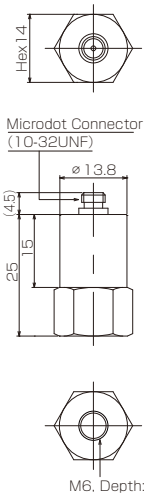
<Instructions on Handling Accelerometers>

In particular, if failed to follow the ground rules in the below, the accelerometer would be failure or damaged. Please handle it with enough care.

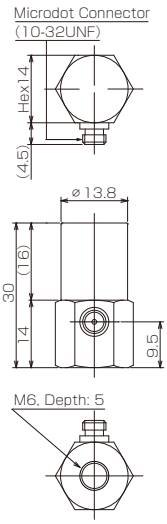
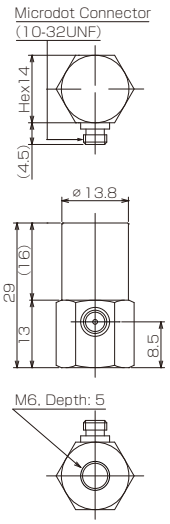
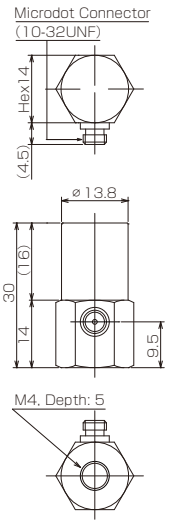
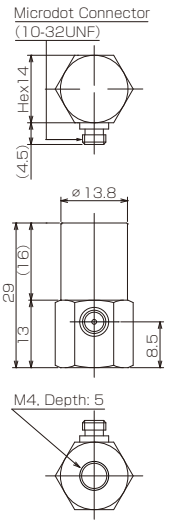
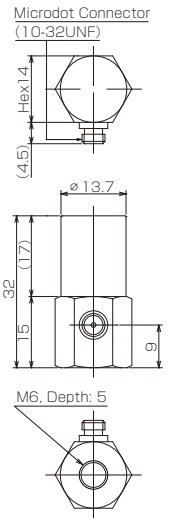
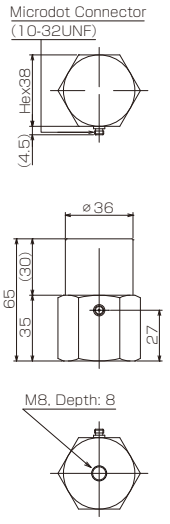
※Do not use it beyond its operating temperature range. ※Do not use the general-purpose accelerometer in water, oil, and other liquid. However, a waterproof type is also available. Please contact us. ※When it is dropped or struck it will be subjected to higher acceleration than its shock limit. Take extra care not so as to apply the excessive shock force to it. ※Firmly fix the accelerometer not so as to be loosened. And tighten the connector not so as to be loosened. ※Do not apply the acceleration of more than its rated vibration limit. Even low acceleration whose frequency is close to the resonance frequency of the accelerometer may cause it to be failure or damaged. Take extra care. ※Take care not to intrude moisture, oil content, adhesive, solvent into the inside of a connector. ※Clamp the cable to the measuring object because it may generate noise or break when excessive force or vibration is applied to the cable. ※The sensitive axis of the accelerometer is uniaxial except for triaxial type. And the mounting or joining surface of the accelerometer cannot be changed, therefore, mount it to take the sensitive direction. ※When the accelerometer is mounted using an alpha-cyanoacrylate (instant) adhesive, use a solvent such as acetone solution or special depleting agent to disconnect it. ※Do not use the accelerometer with built-in electronics beyond its rated voltage range. ※Contact us or our representative in advance if your application shall be performed in unusual environments.

540 Series Piezoelectric Type Accelerometers

Charge output being proportional to acceleration with the piezoelectric element in the accelerometers.
Correspondence about small size, lightweight, high sensitivity, wide frequency range, and acceleration from ultra-low level to high-level is possible.
Available for various vibration measurements including the sophisticated vibration/shock measurement and test control.

Category	Small/ Light/ High Frequency	Small/ Light/ High Frequency		Small/ Light/ Female Screw		Standard Top Connector
Model	540-E	540-DA	540-DS	540-DAF	540-DSF	541-DT
Outline						
Overall Size (mm)						
Dimensions	HEX7×10.5mm	HEX12×16mm	HEX12×16mm	HEX12×20mm	HEX12×20mm	HEX14×25mm
Construction & Application	Titan case, small, light, most suitable for light object	Aluminum case, small, light, male screw	Stainless case, small, male screw	Aluminum case, small, light, female screw	Stainless case, small, female screw	Stainless case, small, female screw
Sinusoidal Vibration Limit	49000m/s²	49000m/s²				16300m/s²
Shock Limit	50000m/s²	50000m/s²				16000m/s²
Mass	2g	5g	10g	6.5g	13g	32g
Frequency Response	20k Hz※1	10k Hz※1				8k Hz※1
Charge Sensitivity pC/(m/s²)	0.3±20%	1.0±15%				5.0±15%
Mounted Resonance	about 70 kHz	about 60 kHz				about 40 kHz
Upper Limit Temperature (from -20℃)	+150 ℃	+140 ℃				
Mode Design	Shear	Compression				
Capacitance	900pF	500pF				1000pF
Transverse Sensitivity	Less than 5 %					
Piezoelectric Material	Pb(Z·Ti)O₃					
Case Material	Titan	Aluminum	Stainless	Aluminum	Stainless	
Mounting Method	Female M3D 1.6	Male M6P1L5		Female M6P1D5		
Accessory Cable & Adapter (Microdot-BNC)	AC7020-BM BLM-001	AC8020-AB				

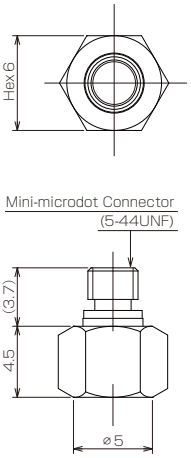
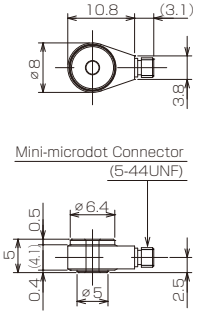
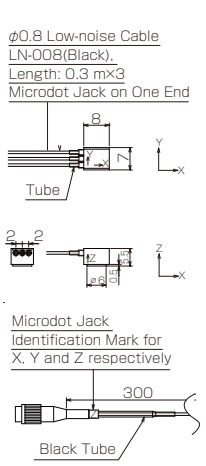
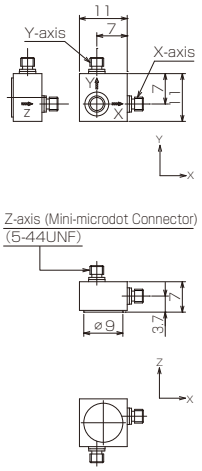
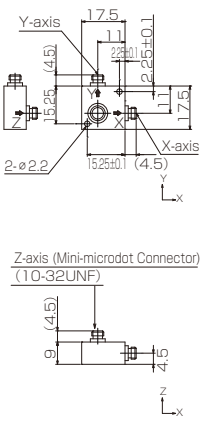
※1 Lower limit of frequency response depends on an available charge amplifier.

Category	Standard Side Connector	Standard Side Connector	Standard	Standard High Temperature	Standard High Sensitivity	Super-High Sensitivity
Model	541-DS	541-DSH	541-D4S	541-D4SH	541-ES	546-D
Outline						
Overall Size (mm)						
Dimensions	HEX14×30mm	HEX14×29mm	HEX14×30mm	HEX14×29mm	HEX14×32mm	HEX38×65mm
Construction & Application	Stainless case, standard, female screw, high acceleration	Stainless case, standard, female screw, high temperature	Stainless case, standard, female screw	Stainless case, standard, female screw, high acceleration, high temperature	Stainless case, standard, female screw, high sensitivity	Stainless case, female screw, ultra-high sensitivity
Sinusoidal Vibration Limit	16300m/s²		9800m/s²	16300m/s²	9800m/s²	980 m/s²
Shock Limit	16000m/s²				10000m/s²	1000m/s²
Mass	35g				43g	500g
Frequency Response	7k Hz※1	5k Hz※1				2k Hz※1
Charge Sensitivity pC/(m/s²)	5.0±15%	5.0±20%	5.0±15%	5.0±20%	10±15%	500±15%
Mounted Resonance	about 30 kHz	about 25 kHz			about 23 kHz	about 7 kHz
Upper Limit Temperature (from -20℃)	+140 ℃	+250 ℃	+140 ℃	+250 ℃	+140 ℃	+80 ℃
Mode Design	Compression					
Capacitance	1000pF					10000pF
Transverse Sensitivity	Less than 5 %					
Piezoelectric Material	$Pb(Z{\cdot}Ti)O_3$					
Case Material	Stainless					
Mounting Method	Female M6P1D5		Female M4P0.7D5		Female M6P1D5	Female M8P1.25D8
Accessory Cable & Adapter (Microdot-BNC)	AC8020-AB	AC8020-AB(H) for High Temperature	AC8020-AB	AC8020-AB(H) for High Temperature	AC8020-AB	

※1 Lower limit of frequency response depends on an available charge amplifier.

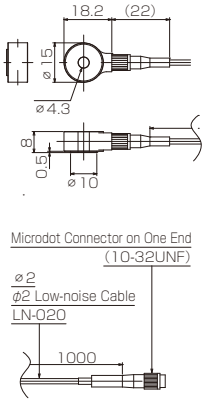
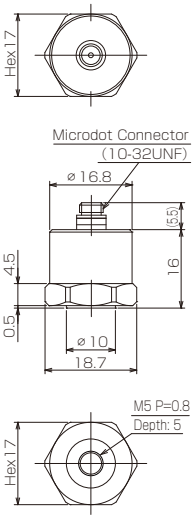
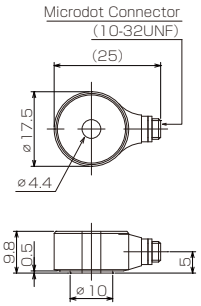
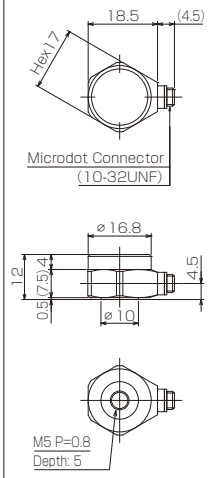
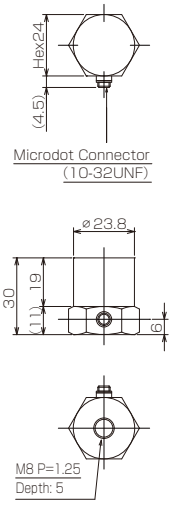
700 Series Piezoelectric Type Accelerometers

The piezoelectric accelerometer is used in combination with the charge amplifier. The 700 Series Accelerometers employ the shear mode construction for the piezoelectric sensing element, the shear mode which provides a stable output against environments of rapid temperature change. This stable characteristic is suitable for a wide range of application, in particular, for measuring the vibration mode of small and lightweight material, and low acceleration of a building.

Category	Small/Light		Triaxial		
Model	701-B	710-D	702-B3	703-B3	712-B3
Outline					
Overall Size (mm)					
Dimensions	6HEX×8.2mm	ϕ8×5mm	8×7×5.5mm	11×11×7mm	17.5×17.5×9mm
Construction & Application	Ultrasmall, light, most suitable for light measuring object	Center stud mounting, side connector, suitable for modal analysis	Ultrasmall, simultaneous triaxial measurement of lightweight material	Ultrasmall, simultaneous triaxial measurement	Small, high sensitivity, simultaneous triaxial measurement
Sinusoidal Vibration Limit	5000m/s²				
Shock Limit	10k m/s²				
Mass	0.7g	1.9g	1.2g	3.7g	14g
Frequency Response	up to 10k Hz±1dB※1	up to 20k Hz±3dB※1	up to 20k Hz±3dB※1	up to 12k Hz±3dB※1	up to 8k Hz±1dB※1
Charge Sensitivity pC/(m/s²)	0.061±20%	0.2±15%	0.04±25%	0.061±20%	0.347±20%
Mounted Resonance	about 60 kHz			about 35 kHz	about 25 kHz
Upper Limit Temperature (from -20℃)	-50 to +160 ℃				
Mode Design	Shear	Annular Shear	Shear		
Capacitance	650pF±25%	1200pF±20%	250pF±25%	650pF±25%	750pF±25%
Transverse Sensitivity	Less than 5 %				
Piezoelectric Material	Pb(Zr·Ti)O₃				
Case Material	Titan	Stainless	Titan		
Mounting Method	Adhesive	Thru for M2, adhesive	Adhesive		Thru for M2, adhesive
Accessory Cable & Adapter (Microdot-BNC)	AC-7020-BM(BLM-001)		AC-8030-AB×3	AC-7020-BM(BLM-001)×3	AC-8030-AB×3

※1 Lower limit of frequency response depends on an available charge amplifier.

Description	Model	Length	Outline View
Accelerometer Cable	AC-8030-AB	3m	Microdot Plug - BNC Plug Low-noise Cable 10-32UNF — BNC
	AC-8030-AM	3m	Microdot Plug - Microdot Plug Low-noise Cable 10-32UNF — 10-32UNF
	AC-7020-BM	2m	Mini-microdot Plug - Microdot Plug Low-noise Cable 5-44UNF — 10-32UNF
Extension Cable	AC-8030-CB	3m	Microdot Jack - BNC Plug Low-noise Cable 10-32UNF female — BNC
	AC-8030-CM	3m	Microdot Jack - Microdot Plug Low-noise Cable 10-32UNF female — 10-32UNF

Category	Water-proof	General Purpose			Large Output
Model	720-BW	730-B	731-B	740-B	760-B
Outline					
Overall Size (mm)					
Dimensions	φ15×8mm	17HEX×21.7mm	φ17.5×9.8mm	17HEX×12mm	24HEX×30mm
Construction & Application	Center stud mounting, for small place, waterproof of more than 10 kg/cm2 at room temperature	Top connector type, most suitable for multi-point measurement	Center stud mounting, side connector, easy cabling	Side connector, for small place	For measuring low acceleration of building and structural object
Sinusoidal Vibration Limit	5000m/s²				1250m/s²
Shock Limit	10k m/s²		15k m/s²	10k m/s²	2.5k m/s²
Mass	11g	13.8g	13.5g	15.2g	96.6g
Frequency Response	up to 8k Hz±1dB※1	up to 7k Hz±1dB※1			up to 3.5k Hz±1dB※1
Charge Sensitivity pC/(m/s²)	1.33±20%	2.04±20%	3.67±20%	4.28±20%	35±20%
Mounted Resonance	about 26 kHz	about 37k Hz	about 38k Hz±5	about 25k Hz±4	about 13.5k Hz±4
Upper Limit Temperature (from -20℃)	-20 to +120 ℃		-50 to +160 ℃		-20 to +120 ℃
Mode Design	Annular Shear	Shear	Annular Shear	Shear	
Capacitance	1200pF±25%	900pF	1600pF±25%	900pF±25%	1500pF±25%
Transverse Sensitivity	Less than 5 %				
Piezoelectric Material	$Pb(Zr{\cdot}Ti)O_3$				
Case Material	Stainless	Titan			Stainless
Mounting Method	M4 thru	M5 Screw	M4 thru	M5 Screw	M8 Screw
Accessory Cable & Adapter (Microdot-BNC)	Integral: 10 m w/BNC Plug	AC-8030-AB			

※1 Lower limit of frequency response depends on an available charge amplifier.

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