

# ACCELEROMETER



# PV Series

Piezoelectric Accelerometers

Standard piezoelectric type

Waterproof insulation type

Heat resistant type

Compact, lightweight type

High-output type

Photo

Model



**PV-03**



**PV-10B**



**PV-44A**



**PV-63**



**PV-65**



**PV-08A**



**PV-90B**



**PV-87**

Outline/purpose	Standard accelerometer for secondary calibration	Accelerometer with integrated amplifier, JIS C 0920 compliant protection class 8, waterproof to 2 at	For measurement of machinery vibrations at high temperatures	For nuclear reactor installations	For measurement of machinery vibrations at high temperatures	For measurement of lightweight structures and mode analysis	For measurement of lightweight structures and mode analysis	High sensitivity accelerometer for measurement of large structures	
Principle	Compression	Compression	Compression	Shear	Shear	Shear	Shear	Shear	
Mass g	38	120	29	28	26	0.7	1.2	115	
Charge sensitivity pC/(m/s <sup>2</sup> ) *1	0.47	—	7.65	4.59	7.14	0.102	0.18	40	
Voltage sensitivity mV/(m/s <sup>2</sup> ) *1	—	5.1	—	—	—	—	—	—	
Vibration frequency range (±1dB)Hz *2	20 to 1 000(±1%) <small>*Vibration frequency range where secondary calibration is possible</small>	3 to 8 000	1 to 10 000	1 to 8 000	1 to 9 000	1 to 25 000	1 to 25 000	1 to 3 000	
Mounting resonance frequency kHz *2	30	24	28	26	25	52	70	9	
Transverse sensitivity	3 % or less	5 % or less	5 % or less	5 % or less	5 % or less	5 % or less	5 % or less	5 % or less	
Standard mounting method Screw torque N·m *3	VP-56A M6 screws 2.0	M4 screws 1.5	VP-55K 2	VP-56A M6 screws 3.5	VP-56A M6 screws 3.5	Bond	VP-53K M3 screws 0.5	VP-53A M6 screws 3.5	
Maximum measurable acceleration m/s <sup>2</sup> (peak)	5 000	500	4 000	4 000	4 000	10 000	10 000	400	
Base distortion sensitivity (m/s <sup>2</sup> )/μstrain	0.002	0.1	0.04	0.01	0.01	0.3	0.01	0.008	
Thermal transient response (m/s <sup>2</sup> )/°C	—	0.5	1	0.1	0.1	17	10	0.05	
Temperature range for use /°C	-50 to +200	-20 to +100	-50 to +260	-20 to +300	-50 to +260	-50 to +160	-50 to +160	-50 to +160	
Capacitance pF	270	—	970	2 800	3 900	410	410	780	
Case material	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Titanium	Titanium	Stainless steel	
Connecting equipment	Charge amplifier	2 mA regulated power supply	Charge amplifier	Charge amplifier	Charge amplifier	Charge amplifier	Charge amplifier	Charge amplifier	
Dimensions mm									
Dimensions mm	15.8(Hex)×29(H)	23(φ)×40(H)	16(Hex)×20.5(H)	17(Hex)×23(H)	15.9(Hex)×22.5(H)	5.5(φ)×7.8(H)	6(Hex)×10(H)	24(Hex)×30.5(H)	
Supplied accessories	Cable	1 VP-51A	● Direct-mount cable(5m)	2 VP-51B	5 VP-51I	2 VP-51B	6 VP-51J	4 VP-51L	1 VP-51A
	Screw attachment	14 VP-56A 16 VP-56B ×2	● M4 hex socket bolt ×3 (L10/SUS) ● 2L-4 flat head spring ×3	17 VP-55K 13 VP-55L 10 VP-53D	1 VP-52A 14 VP-56A 16 VP-56B	18 VP-53A 10 VP-53D 15 VP-55L	19 VP-53V	12 VP-53K ×2 13 VP-53J ×2 ● Single-head spanner (6 mm) ● Hex wrench 1.5 ● Dual-sided adhesive tape	18 VP-53A ×2 10 VP-53D

**Notes**

\*1 Representative value; actual value is noted on calibration sheet supplied with accelerometer.

\*2 Representative value when mounted on flat surface according to standard mounting method(\*3).

Triaxial type

Integrated amplifier type

General type



Model	<b>PV-93</b>	<b>PV-97C</b>	<b>PV-97I</b>	<b>PV-40</b>	<b>PV-41</b>	<b>PV-90I</b>	<b>PV-85/86</b>	<b>PV-94/95</b>
Outline/purpose	General purpose triaxial accelerometer	Compact triaxial accelerometer	Compact triaxial accelerometer with integrated amplifier	Low price accelerometer with 3m direct-mount cable	General purpose accelerometer with integrated amplifier	For measurement of lightweight structures and mode analysis	General purpose standard accelerometer	Fairly compact general purpose standard accelerometer
Principle	Shear	Shear	Shear	Compression	Shear	Shear	Shear	Shear
Mass g	30	4.7	8	60	23	1.8	23	9
Charge sensitivity pC/(m/s <sup>2</sup> ) *1	0.831	0.12	—	—	—	—	6.42	0.714
Voltage sensitivity mV/(m/s <sup>2</sup> ) *1	—	—	1.1	5.1	1.02	0.44	—	—
Vibration frequency range (±1dB)Hz *2	1 to 8 000(2-axis) 1 to 4 000(1-3)	1 to 15 000(Z) 1 to 10 000(X-Y)	1 to 7 000(Z) *4 1 to 5 000(X-Y)(±10%)	10 to 6 000	3 to 10 000	3 to 20 000	1 to 7 000	1 to 10 000
Mounting resonance frequency kHz *2	—	—	—	40	50	60	24/21	36
Transverse sensitivity	5 % or less	5 % or less	5 % or less	—	4 % or less	5 % or less	4 % or less	4 % or less
Standard mounting method Screw torque N·m *3	VP-53A M6 screws 3.5	Bond	Bond	M6 screws 3.5	VP-53A M6 screws 3.5	VP-53K M3 screws 0.5	VP-53A M6 screws 3.5	VP-53A M6 screws 3.5
Maximum measurable acceleration m/s <sup>2</sup> (peak)	10 000	5 000	5 000	500	2 000	5 000	5 000	10 000
Base distortion sensitivity (m/s <sup>2</sup> )/μstrain	0.6	0.1	0.1	—	0.03	0.1	0.003	0.004
Thermal transient response(m/s <sup>2</sup> )/°C	15	1.0	1.0	—	0.01	10	0.1	3
Temperature range for use /°C	-50 to +160	-50 to +160	-20 to +125	-10~+80	-20 to +100	-20 to +100	-50 to +160	-50 to +160
Capacitance pF	410	420	—	—	—	—	720	360
Case material	Titanium	Titanium	Titanium	Stainless steel	Stainless steel	Titanium	Titanium	Titanium
Connecting equipment	Charge amplifier	Charge amplifier	2 mA to 4 mA regulated power supply	2 mA regulated power supply	2 mA regulated power supply	2 mA regulated power supply	Charge amplifier	Charge amplifier
Dimensions mm		 Removal screwhole(M3) Connector(M3)		 φ19.2±0.1 17 3000±50	 18.7 17 22.7	 8 7 10.2	 18.7 17 22.7	 18.5 14 19.7
Dimensions mm	16(H)×21(W)×21(D)	6(H)×14(W)×14(D)	12(H)×12(W)×12(D)	17(Hex)×21(H)	17(Hex)×18.5(H)	7(Hex)×11(H)	17(Hex)×18.5(H)	14(Hex)×14.7(H)
Supplied accessories	Cable	3 VP-51C	4 VP-51L x3	3 VP-51W	4 Direct-mount cable(3m) (Without microdot connector fitted.) 1 VP-51A	4 VP-51L	1 VP-51A	1 VP-51A
	Screw attachment	13 VP-53A x2 10 VP-53D	● M3 hex socket bolt x2 (L20/SUS) ● Hex wrench 2.5	20 VP-57ES (option)	● M6 x10 screw ● VP-57C 18 VP-53A	12 VP-53K x2 9 VP-53W x2 ● Single-head spanner (7 mm) ● Hex wrench 1.5 ● Dual-sided adhesive tape	13 VP-53A x2 10 VP-53D	18 VP-53A x2 10 VP-53D

\*4 100 °C or less 1 000 m/s<sup>2</sup> or less

● Please take care not to drop accelerometers and carefully handle them with attachments. There is likely to be trouble of piezoelectric accelerometers by (giving) excessive shock. The excessive shock carries some damages onto piezoelectric ceramic element.

## Low-noise coaxial cables

	Name	Model	Diameter × length	Connector screw thread	Capacitance	Max. temperature	Sheath material/color
1	Standard cable	<b>VP-51A</b>	φ2.1 mm × 2 m	10-32UNF	180 pF	105 °C	PVC-black
2	Heat-resistant cable	<b>VP-51B</b>	φ2.1 mm × 2 m	10-32UNF	220 pF	260 °C	PTFE-red
3	Triaxial standard cable	<b>VP-51C</b>	φ2.1 mm × 2 m	10-32UNF	180 pF	105 °C	PVC-black/white/red
4	Ultra-compact accelerometer cable	<b>VP-51L</b>	φ1.2 mm × 2 m	M3 × 0.5 10-32UNF	260 pF	160 °C	FEP-black
5	Heat-resistant cable	<b>VP-51I</b>	φ2 mm × 1 m	10-32UNF	150 pF	300 °C	Stainless steel plated
6	PV-08 standard cable	<b>VP-51J</b>	φ1.2 mm × 380 mm	M2 × 0.25 10-32UNF	60 pF	160 °C	FEP-black
7	PV-97B cable	<b>VP-51LL</b>	φ1.2 mm × 2 m	M2 × 0.4 10-32UNF	260 pF	160 °C	FEP-black
8	Triaxial cable for PV-97I	<b>VP-51W</b>	φ2.4 mm × 3 m	M5.5	—	105 °C	PVC-gray

## Screws, attachments, other accessories

Unit : (mm)

1	Link connector VP-52A	6	Magnet attachment VP-55C	11	Round rod attachment VP-53E	16	M6UNF barrel screw VP-56B
2	BNC adapter VP-52C	7	Insulation attachment VP-53C <sup>※5</sup>	12	M3 screw VP-53K	17	10-32 UNF screw VP-55K
3	Magnet attachment VP-55A	8	Insulation attachment VP-53J	13	M6 screw VP-53A	18	UNF barrel screw VP-56E
4	Magnet attachment VP-53S <sup>※5</sup>	9	Insulation attachment VP-53W	14	M6 barrel screw VP-56A	19	PV-08 mounting/removal tool VP-53V
5	Magnet attachment VP-53T <sup>※5</sup>	10	Flat hex attachment VP-53D	15	M6UNF screw VP-55L	20	Mounting kit VP-57ES (For PV-97I)

※5 The adhesive is used in attachments VP-53S, VP-53T and VP-53C. Please take caution, the operation temperature is -50 to 160 degrees C. If the temperature exceeds 160 degrees C, it could destroy its adhesiveness.

## Piezoelectric Accelerometer

When an external force is applied to certain crystals, they create an electrical charge that is proportional to the amount of force exerted on their surface.

This phenomenon is called the piezoelectric effect.

A piezoelectric accelerometer is constructed with a piezoelectric element that makes use of this effect. Piezoelectric accelerometers are small and lightweight, which allows them to cover a wide range of vibration acceleration values and vibration frequencies. Further advantages are high precision and high reliability. Currently, piezoelectric accelerometers are standard devices widely used for acceleration measurements.

As shown in Figure 1, there are two basic accelerometer types, which differ in the way the piezoelectric element is used.

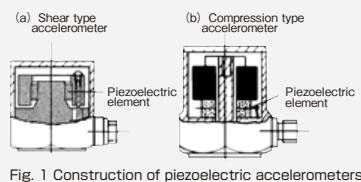


Fig. 1 Construction of piezoelectric accelerometers

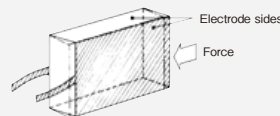


Fig. 2 Principle of shear type accelerometer

### Shear type accelerometer

In this type of accelerometer, the piezoelectric element is subject to a shear force, which yields high sensitivity and allows compact dimensions. Noise caused by temperature changes (the so-called pyroelectric output which is a characteristic of piezoelectric accelerometers) is low, which is advantageous for measurements in the low frequency range. Shear-type accelerometers are suitable for measuring and monitoring low-level, low-frequency vibrations such as occur in machinery, in buildings and other structures, as well as during seismic activity.

### Compression type accelerometer

In this type of accelerometer, the piezoelectric element is subject to a force that compresses it from the top. Construction is simple and high mechanical strength can be achieved, which makes such accelerometers suitable for high acceleration and shock measurements.

\* Specifications subject to change without notice.

Distributed by:

 **RION CO., LTD.**  
http://www.rion.co.jp/english/

3-20-41, Higashimotomachi, Kokubunji, Tokyo 185-8533, Japan  
Tel: +81-42-359-7888 Fax: +81-42-359-7442