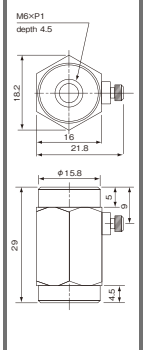
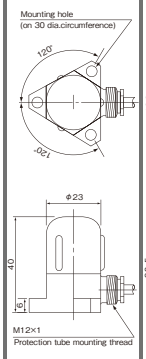
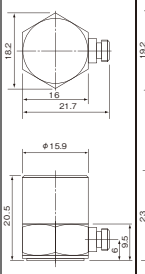
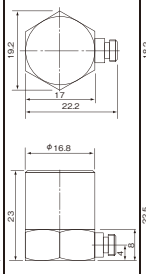
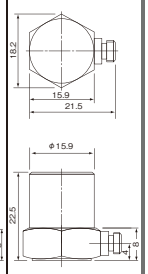
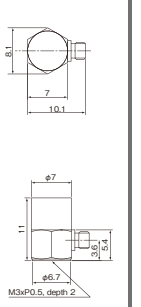
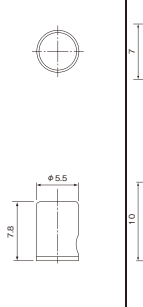
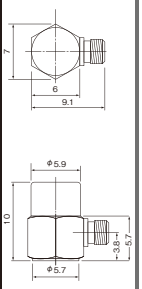
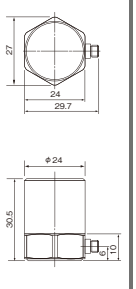
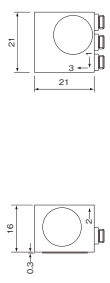
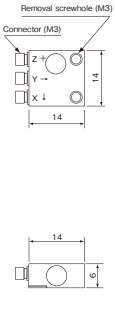
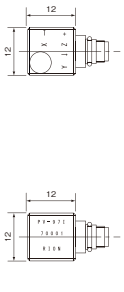
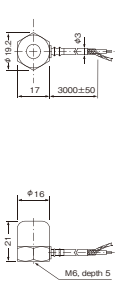
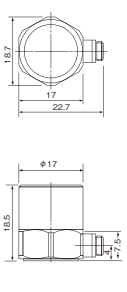
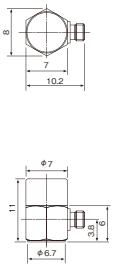
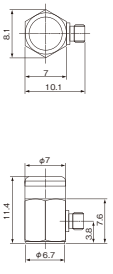
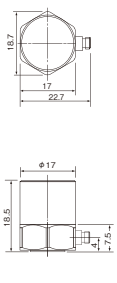
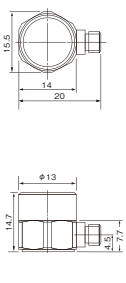
RION

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-90H**	**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	High Temperature resistance type Usable in high temperatures of up to 250 degrees	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	Shear
Mass g	38	120	29	28	26	2	0.7	1.2	115
Charge sensitivity pC/(m/s²) ※1	0.47	—	7.65	4.59	7.14	0.29	0.102	0.18	40
Voltage sensitivity mV/(m/s²) ※1	—	5.1	—	—	—	—	—	—	—
Vibration frequency range (±1dB)Hz ※2	20 to 1 000(±1%) ※Vibration frequency range where secondary calibration is possible	3 to 8 000	1 to 10 000	1 to 8 000	1 to 9 000	1 to 20 000(±10%)	1 to 25 000	1 to 25 000	1 to 3 000
Mounting resonance frequency kHz ※2	30	24	28	26	25	60	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	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	VP-53K M3 screws 0.5	Bond	VP-53K M3 screws 0.5	VP-53A M6 screws 3.5
Maximum measurable acceleration m/s²(peak)	5 000	500	4 000	4 000	4 000	10 000	10 000	10 000	400
Base distortion sensitivity (m/s²)/μstrain	0.002	0.1	0.04	0.01	0.01	0.05	0.3	0.01	0.008
Thermal transient response(m/s²)/°C	—	0.5	1	0.1	0.1	0.5	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 +250	−50 to +160	−50 to +160	−50 to +160
Capacitance pF	270	—	970	2 800	3 900	500	410	410	780
Case material	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Titanium	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	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)	7(Hex)×11(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 (5 m) (Without microdot connector fitted.)	2 VP-51B	5 VP-51I	2 VP-51B	9 VP-51LB	6 VP-51J	4 VP-51L	1 VP-51A
Supplied accessories 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 15 VP-55L 10 VP-53D	1 VP-52A 14 VP-56A 16 VP-56B	13 VP-53A 10 VP-53D 15 VP-55L	12 VP-53K ×2 9 VP-53W ● Single-head spanner(7 mm) ● Hex wrench1.5	19 VP-53V	12 VP-53K ×2 8 VP-53J ×2 ● Single-head spanner (6 mm) ● Hex wrench1.5 ● Dual-sided adhesive tape	13 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	
Photo									
Model	***PV-93***	***PV-97C***	***PV-97I***	***PV-40***	***PV-41***	***PV-90I***	***PV-90T***	***PV-85/86***	***PV-94/95***
Outline/purpose	General purpose triaxial accelerometer	Compact triaxial accelerometer	Compact triaxial accelerometer with integrated amplifier	Low price accelerometer with 3 m direct-mount cable	General purpose accelerometer with integrated amplifier	For measurement of lightweight structures and mode analysis	Compact, lightweight, TEDS applicable	General purpose standard accelerometer	Fairly compact general purpose standard accelerometer
Principle	Shear	Shear	Shear	Compression	Shear	Shear	Shear	Shear	Shear
Mass g	30	4.7	8	60	23	1.8	2	23	9
Charge sensitivity pC/(m/s²) ※1	0.831	0.12	—	—	—	—	—	6.42	0.714
Voltage sensitivity mV/(m/s²) ※1	—	—	1.1	5.1	1.02	0.44	0.5	—	—
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 12 000(±10 %)	1 to 7 000	1 to 10 000
Mounting resonance frequency kHz ※2	—	—	—	40	50	60	50	24/21	36
Transverse sensitivity	5 % or less	5 % or less	5 % or less	—	4 % or less	5 % 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-53K M3 screws 0.5	VP-53A M6 screws 3.5	VP-53A M6 screws 3.5
Maximum measurable acceleration m/s²(peak)	10 000	5 000	5 000	500	2 000	5 000	7 000	5 000	10 000
Base distortion sensitivity (m/s²)/μstrain	0.6	0.1	0.1	—	0.03	0.1	0.05	0.003	0.004
Thermal transient response(m/s²)/°C	15	1.0	1.0	—	0.01	10	1.0	0.1	3
Temperature range for use /°C	−50 to +160	−50 to +160	−20 to +125	−10 to +80	−20 to +100	−20 to +100	−20 to +100 (TEDS: −20 to +85)	−50 to +160	−50 to +160
Capacitance pF	410	420	—	—	—	—	—	720	360
Case material	Titanium	Titanium	Titanium	Stainless steel	Stainless steel	Titanium	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	2 mA to 4 mA regulated power supply	Charge amplifier	Charge amplifier
Dimensions mm									
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)	7(Hex)×11.4(H)	17(Hex)×18.5(H)	14(Hex)×14.7(H)
Supplied accessories: Cable	3 VP-51C	4 VP-51L ×3	3 VP-51W	● Direct-mount cable (3 m) (Without microdot connector fitted.)	1 VP-51A	4 VP-51L	10 VP-51LC	1 VP-51A	1 VP-51A
Supplied accessories: Screw attachment	13 VP-53A ×2 10 VP-53D	● M3 hex socket bolt ×2 (L20/SUS) ● Hex wrench 2.5	20 VP-57ES (option)	● M6 ×10 screw ● VP-57C	13 VP-53A	12 VP-53K ×2 9 VP-53W ×2 ● Single-head spanner(7 mm) ● Hex wrench1.5 ● Dual-sided adhesive tape	12 VP-53K ×2 9 VP-53W ● Single-head spanner(7 mm) ● Hex wrench1.5	13 VP-53A ×2 10 VP-53D	13 VP-53A ×2 10 VP-53D

※4 100 ℃ or less 1 000 m/s² 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.

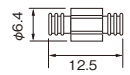
Low-noise coaxial cables

	Name	Model	Diameter × length	Connector screw thread	Capacitance	Max. temperature	Sheath material/color
1	Standard cable	***VP-51A***	φ2.1 mm × 2 m	10-32UNF	180 pF	105 ℃	PVC·black
2	Heat-resistant cable	***VP-51B***	φ2.1 mm × 2 m	10-32UNF	220 pF	260 ℃	PTFE·red
3	Triaxial standard cable	***VP-51C***	φ2.1 mm × 2 m	10-32UNF	180 pF	105 ℃	PVC·black/white/red
4	Ultra-compact accelerometer cable	***VP-51L***	φ1.2 mm × 2 m	M3 × 0.5 10-32UNF	260 pF	160 ℃	FEP·black
5	Heat-resistant cable	***VP-51I***	φ2 mm × 1 m	10-32UNF	150 pF	300 ℃	Stainless steel plated
6	PV-08 standard cable	***VP-51J***	φ1.2 mm × 380 mm	M2 × 0.25 10-32UNF	60 pF	160 ℃	FEP·black
7	PV-97B cable	***VP-51LL***	φ1.2 mm × 2 m	M3×0.4 10-32UNF	260 pF	160 ℃	FEP·black
8	Triaxial cable for PV-97I	***VP-51W***	φ2.4 mm × 3 m	M5.5	—	105 ℃	PVC·gray
9	250 ℃ low-noise cable	***VP-51LB***	φ1.35 mm × 2 m	M3×0.5 10-32UNF	220 pF	250 ℃	PTFE·red
10	Cable with 10-32 UNF connectors and ferrite core	***VP-51LC***	φ1.2 mm × 2 m	M3×0.5 10-32UNF	260 pF	160 ℃	FEP·black

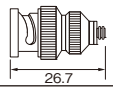
Screws, attachments, other accessories

Unit : (mm)

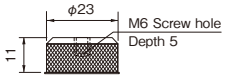
1 Link connector VP-52A



2 BNC adapter VP-52C

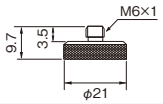


3 Magnet attachment VP-55A



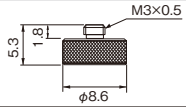
30 g

4 Magnet attachment VP-53S ※5



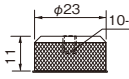
16 g

5 Magnet attachment VP-53T ※5



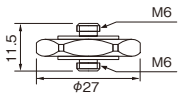
1.6 g

6 Magnet attachment VP-55C



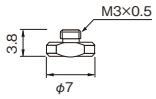
30 g

7 Insulation attachment VP-53C ※5



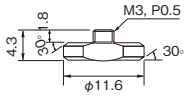
16 g

8 Insulation attachment VP-53J



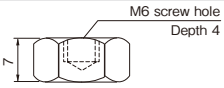
0.2 g

9 Insulation attachment VP-53W



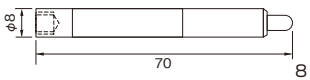
0.7 g

10 Flat hex attachment VP-53D



8 g

11 Round rod attachment VP-53E

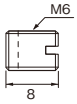


8 g

12 M3 screw VP-53K

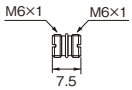
0.2 g

13 M6 screw VP-53A



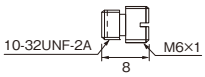
1.1 g

14 M6 barrel screw VP-56A



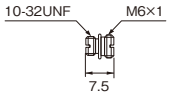
1.2 g

15 M6UNF screw VP-55L



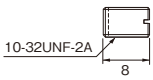
1.0 g

16 M6UNF barrel screw VP-56B



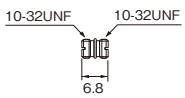
1.0 g

17 10-32 UNF screw VP-55K



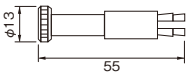
0.8 g

18 UNF barrel screw VP-56E



0.7 g

19 PV-08 mounting/removal tool VP-53V



20 Mounting kit VP-57ES (For PV-97I)

(Comes with a block used to remove the sensor) 2.8 g

※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.

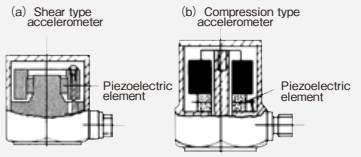


Fig. 1 Construction of piezoelectric accelerometers

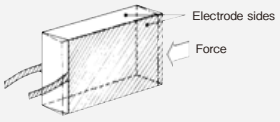


Fig. 2 Principle of shear type accelerometer

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 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.

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∗ Specifications subject to change without notice.

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