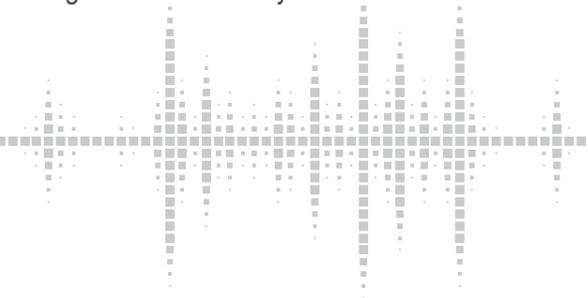




Predictive Maintenance

Condition Monitoring System

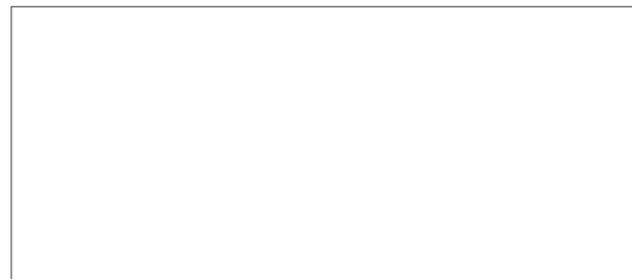
Monitoring machine status by vibration sensors



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Cat No.1911①0005CMS_E.

IMV CORPORATION

I should have done predictive maintenance ...

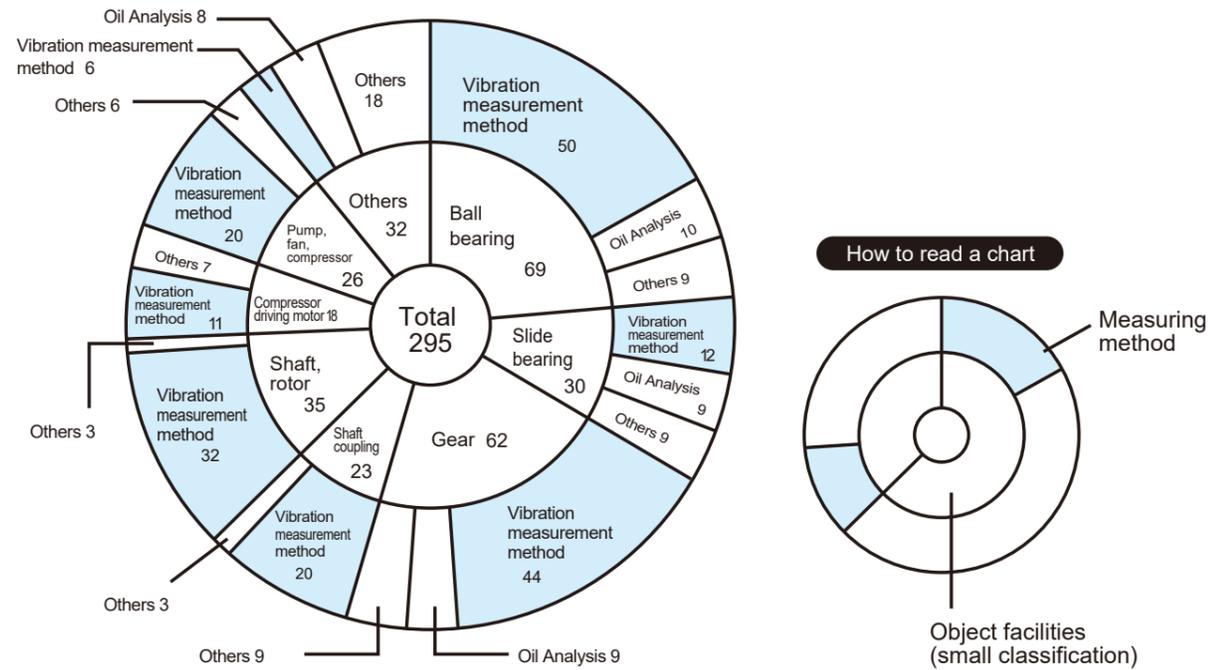
Vibration measurement for predictive maintenance	3-4
Application example	5-8
How to select vibration measuring / monitoring systems	9
Proposal for predictive maintenance of IoT devices	10
 DC4-20 mA Output accelerometer	11-12
 Accelerometer	13-14
 Cloud system	15-16
 Contact Sensor Type Vibration Monitoring System	17-18
 Vibration switch	19
 Vibration signal converter	20
 Lambda vibro	21-22
 CardVibro Air2	23-24
 SmartVibro	25-26
 etc. Broad motion sensor	27
 etc. Vibration level meter	28
 etc. Spin rotor kit	29
 etc. Data acquisition analysis aystem Wave Stocker	30
 etc. Low frequency vibration signal conditioner	30
 etc. Charge amplifier	30
 etc. Simple charge amplifier EzC	31
 etc. Digital charge-input vibrometer	31
 etc. Transport environment recorder Tough Logger	31
 etc. Integrating sound level meter	32
 etc. Vibrometer calibration system	32
 etc. Vibration switch	32
 Piezoelectric accelerometer	33
 Piezoelectric accelerometer related products	34
 Warranty and Maintenance	35
 About website/ Office information	36

Description of icon

 Remote monitoring using the sensor and external device	 Monitoring with professional specifications
 Patrol monitoring by human	 etc. Others
 Accelerometer	

Vibration measurement for predictive maintenance

Predictive maintenance is widely applied using various instruments. **Vibration measurement is the most popular method.**



Reference : ISO machine condition monitoring diagnosis (vibration category II) issued by Vibration Research Association(Shindo Gijyutu Kenkyukai)

You can enter the measured values into Excel and compare them with the past data. Daily predictive maintenance work is very easy.



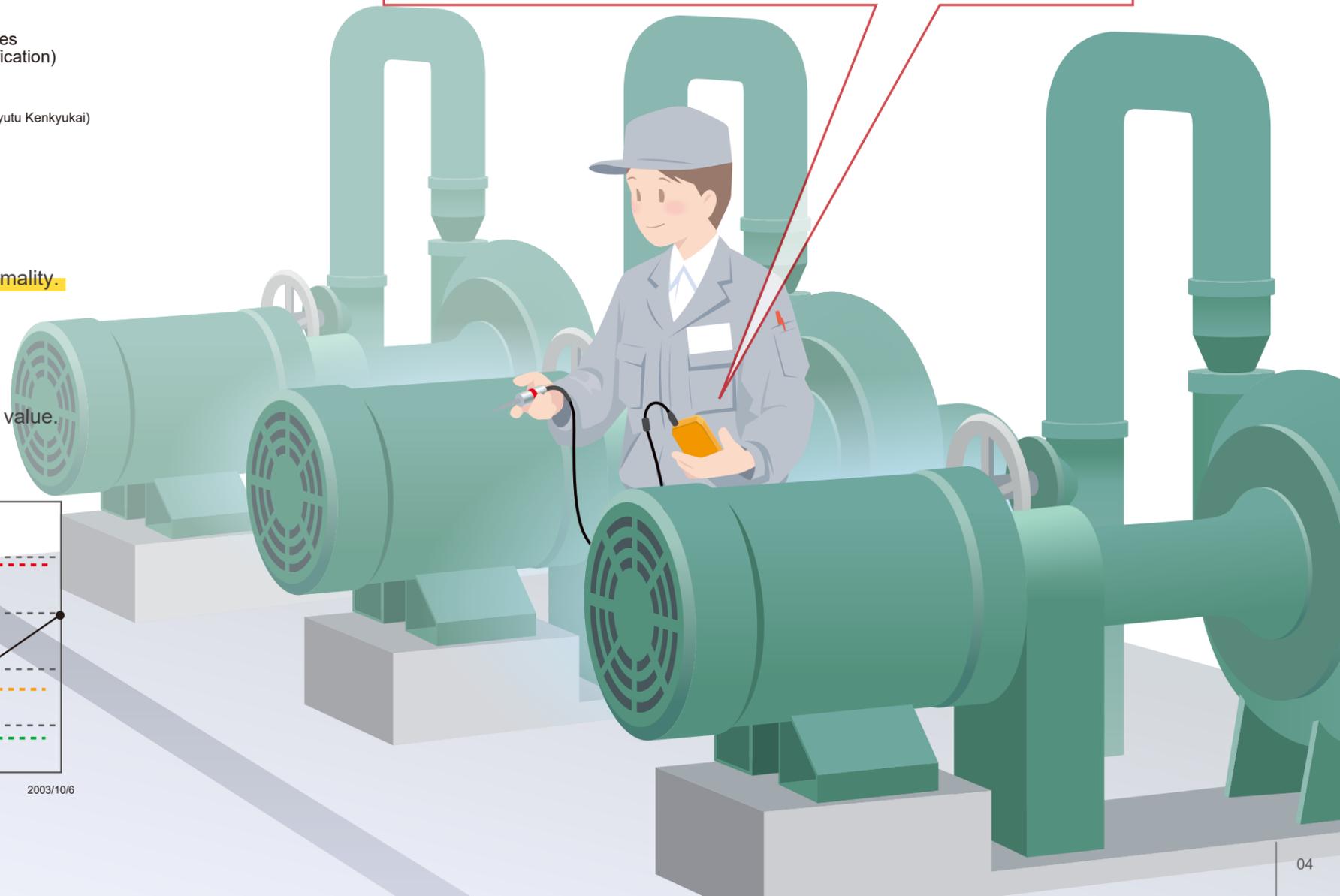
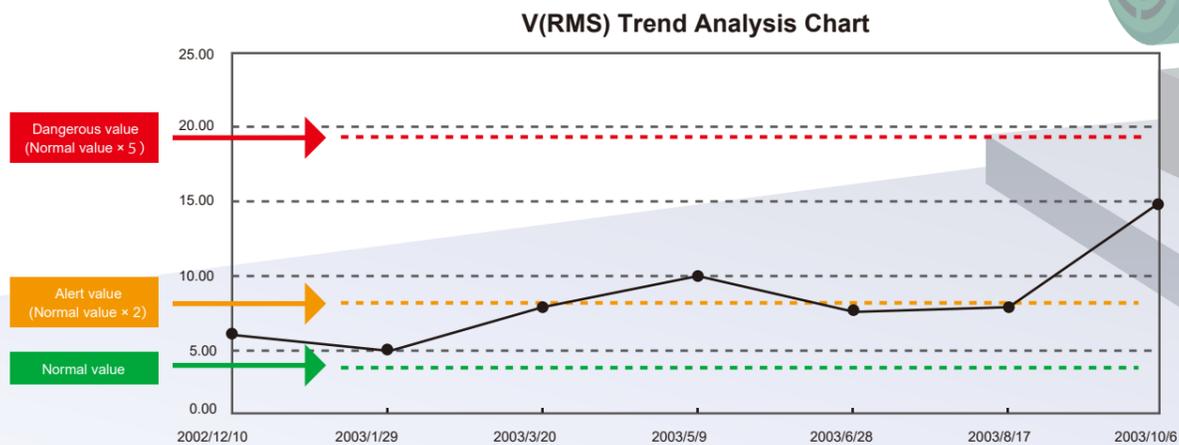
Relative value judgment

It is a method that if measured vibration exceed a normal level, it is diagnosed as abnormality.

Advantage Judgment by diagnosis standard is simplified.

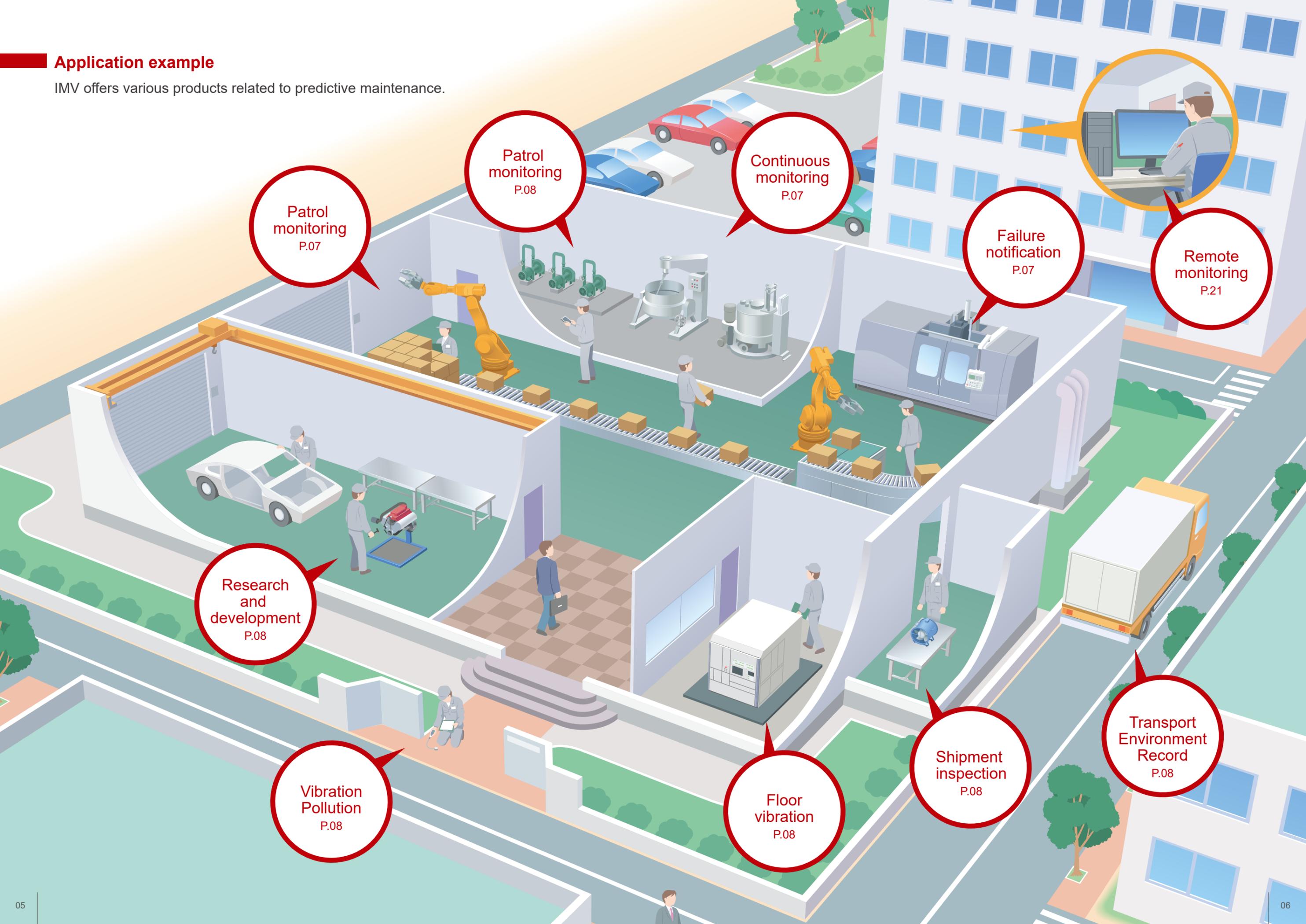
Disadvantage Judgment may change depending on types or parts of facilities and makers.

Judgement example This is a case which alert value is set to be two times as high as normal value. Dangerous value is set to be five times as high as normal value.



Application example

IMV offers various products related to predictive maintenance.



Patrol monitoring
P.07

Patrol monitoring
P.08

Continuous monitoring
P.07

Failure notification
P.07

Remote monitoring
P.21

Research and development
P.08

Vibration Pollution
P.08

Floor vibration
P.08

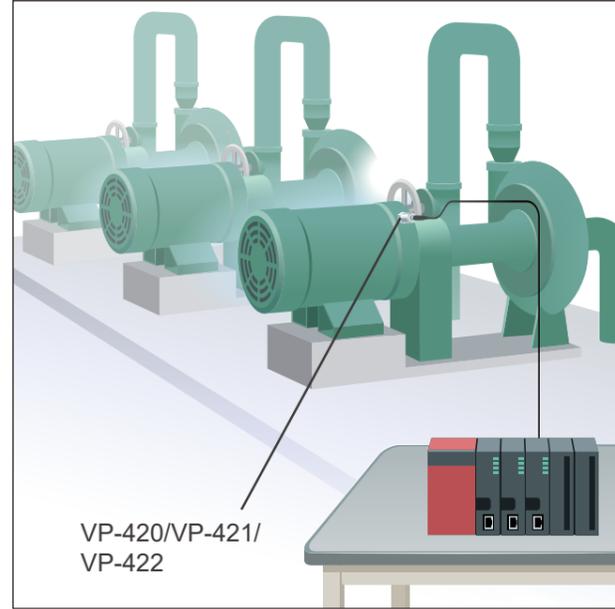
Shipment inspection
P.08

Transport Environment Record
P.08

Application example

IMV offers various products related to predictive maintenance.

Continuous monitoring



VP-420/VP-421/
VP-422

【Recommended products】
DC4-20 mA Output accelerometer→P.11

Failure notification



VM-90A

【Recommended products】
Vibration switch→P.19

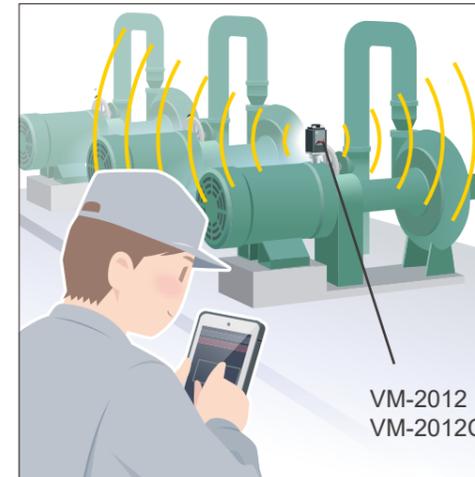
Patrol monitoring



VM-4424S/H
VM-3024H
VM-7024H

【Recommended products】
SmartVibro→P.25

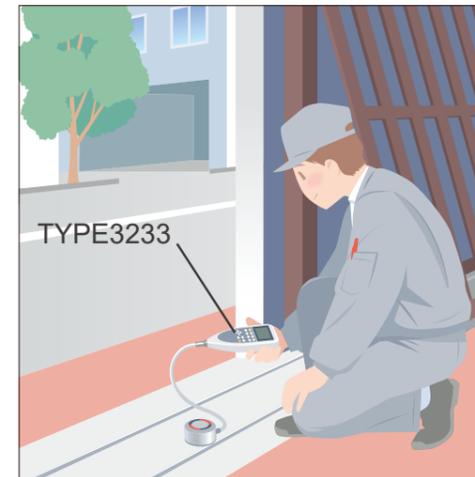
Patrol monitoring



VM-2012
VM-2012C

【Recommended products】CardVibro Air2→P.23

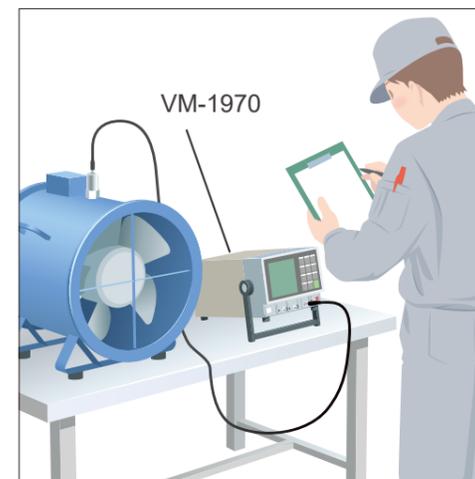
etc. Vibration Pollution



TYPE3233

【Recommended products】Vibration level meter→P.28

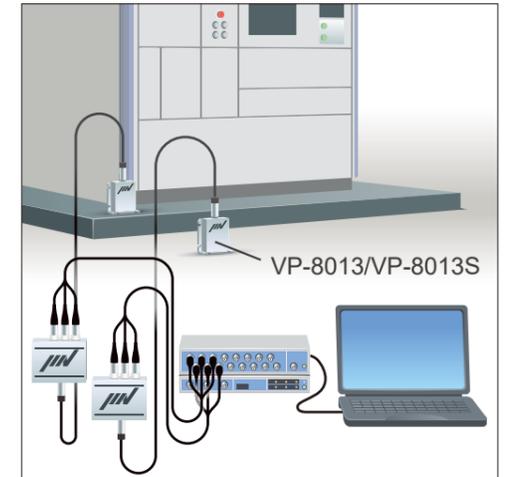
etc. Shipment inspection



VM-1970

【Recommended products】charge-input vibrometer→P.31

etc. Floor vibration



VP-8013/VP-8013S

【Recommended products】Broad motion sensor→P.27

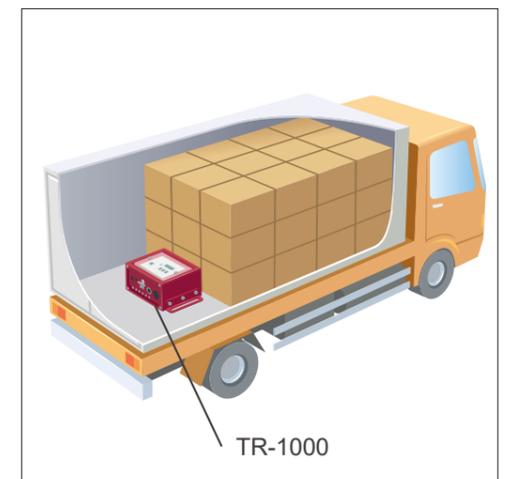
etc. Research and development



VM-0330/16

【Recommended products】Wave Stocker→P.30

etc. Transport Environment Record



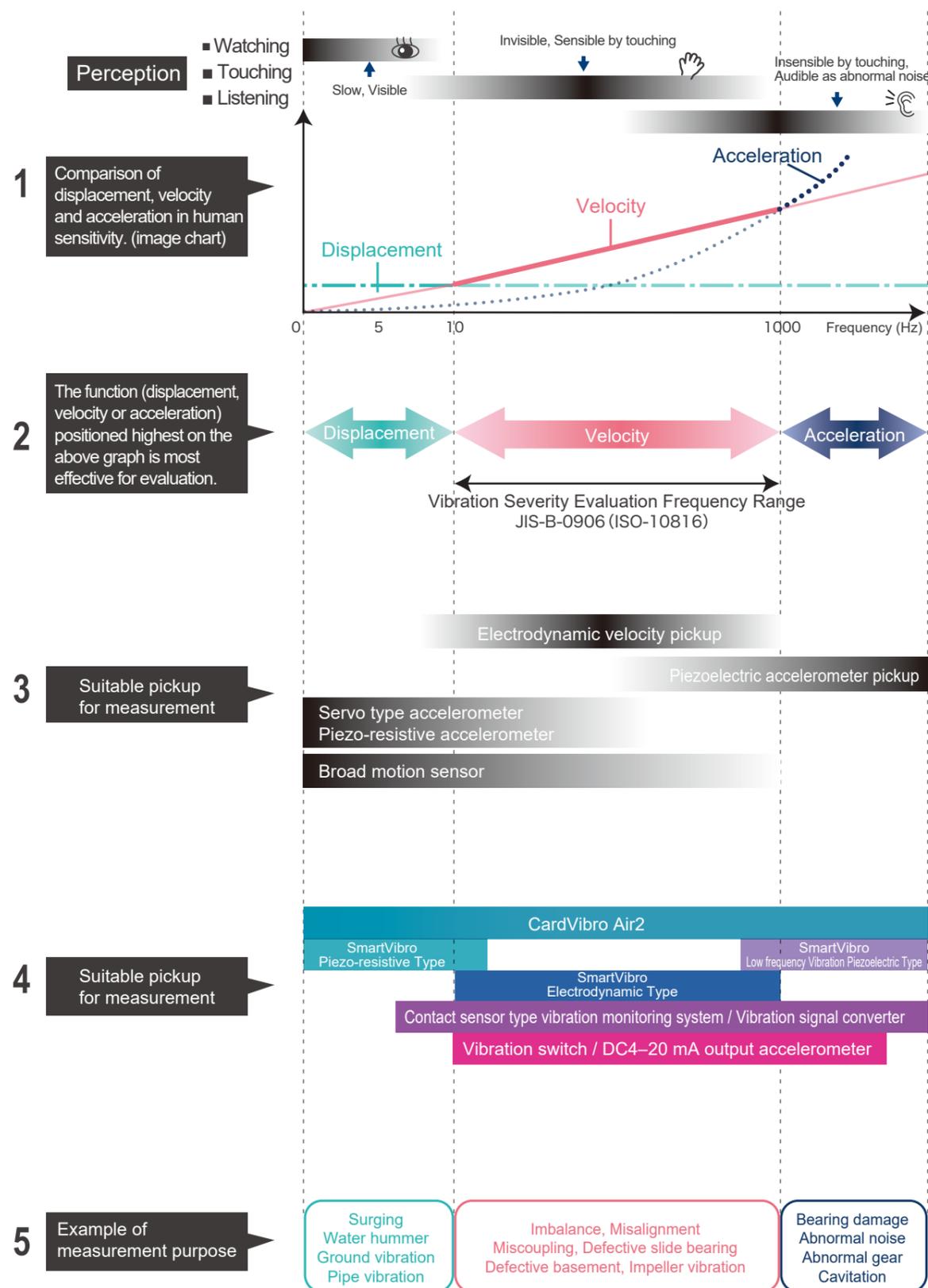
TR-1000

【Recommended products】Tough Logger→P.31

Description of icon  Remote monitoring using the sensor and external device  Monitoring with professional specifications  Patrol monitoring by human  etc. Others

How to select vibration measuring / monitoring systems

Selection of vibration measuring / monitoring systems depends on what kind of vibration you measure. The following is classification of vibration according to human perception.

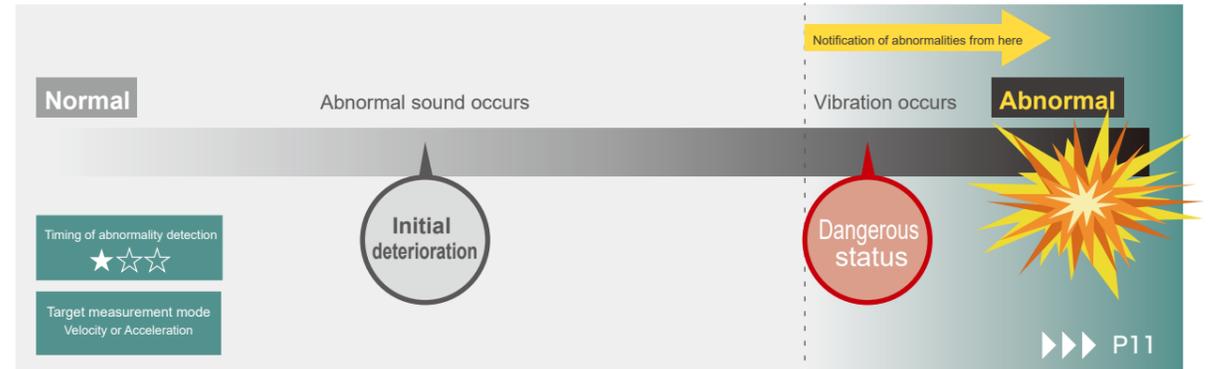


Proposal for predictive maintenance of IoT devices

IMV offers the following three plans for predictive maintenance using IoT devices.

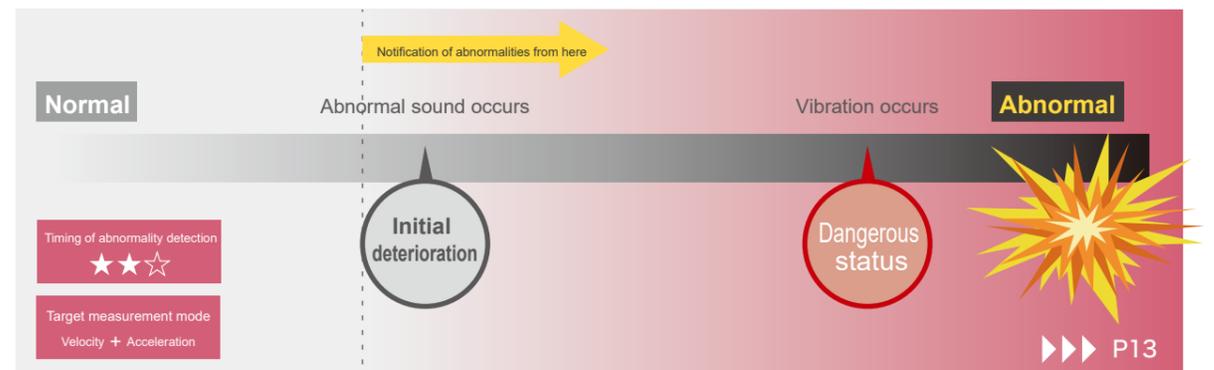
Plan 1 Standard Detecting bearing imbalance => Knowing the abnormality right before the failure

Use your existing equipment such as PLC



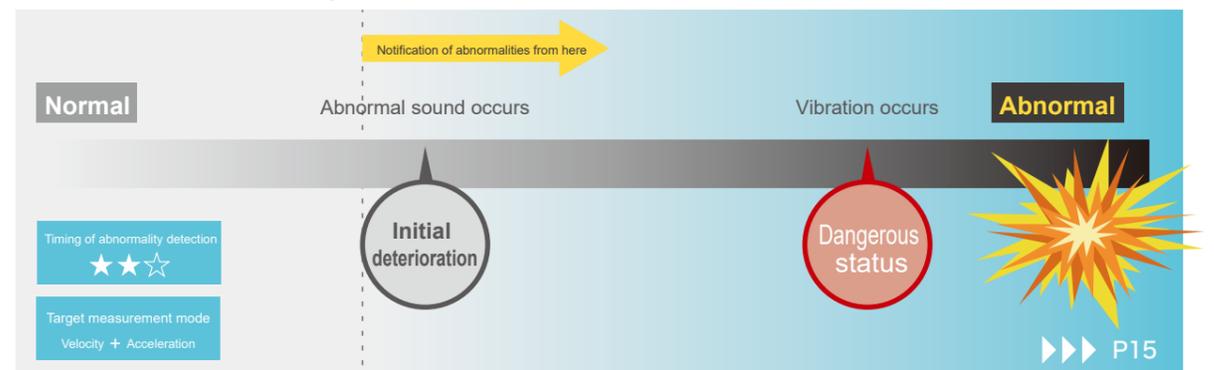
Plan 2 Advance Detecting bearing damage => Knowing abnormalities at an early stage

Use your existing equipment such as PLC



Plan 3 Premium Detecting bearing damage + Cloud monitoring => Knowing abnormalities at an early stage

Install a new recommended cloud system



* This is a failure example of a device with a rotational speed of approximately 600-3600 rpm.



Upgrade existing system!

>>> Optimal system for bearing monitoring!

Plan 1 Standard
VP-420 / VP-421 / VP-422

Suddenly the device broke down and the production line stopped ...

We don't have enough budget for system reconfiguration ... Huge changes seems troublesome ...

I don't know well about the extensive system...

Mr. A who has trouble deciding what to do for vibration monitoring

If you have a DC4 – 20mA direct output vibration pickup ...

- 1. Failure details that can be identified by **abnormal speed values**
Imbalance, Misalignment, Miscoupling, Defective slide bearing, Defective basement, Impeller vibration
- or
- 2. Failure details that can be identified by **abnormal acceleration values**
Bearing damage, Abnormal noise, Abnormal gear, Cavitation

You can discover **either 1 or 2.**

Output one of the signals!

Either velocity or acceleration can be monitored.

~~Velocity~~

~~Acceleration~~

If you have any DCS / PLC, you can use it as is.
* Limited to devices that can input 4-20mA signal.

External devices can be used as they are

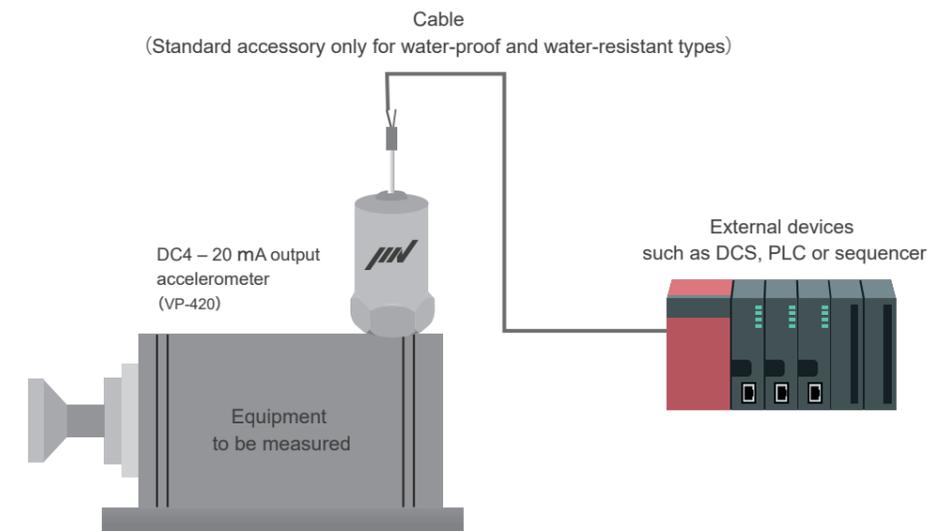
Simple system composition

A general vibration sensor usually requires a signal converter, but there is no need to install a separate converter because it has a signal conversion function inside.

Application example



System Composition



Specification

▶ DC4 – 20 mA output accelerometer

Item	Velocity (current output) VP-420	Velocity (current output) + Acceleration waveform (voltage output) VP-421	Acceleration (current output) VP-422
Frequency range	10 Hz to 1 kHz, ±5 % (ISO10816)	10 Hz to 1 kHz, ±5 % (ISO10816)	10 Hz to 5 kHz, ±3 dB
Measurement range	10, 20, 25, 50, 100 mm/s rms	10, 20, 25, 50, 100 mm/s rms	9.8, 19.6, 49, 98, 980 m/s ² rms
Output sensitivity	4 – 20 mA / 0 – full scale	4 – 20 mA / 0 – full scale Acceleration waveform : 5 mV / (m/s ²), 10.2 mV / (m/s ²)	4 – 20 mA / 0 – full scale
Voltage supply	DC15 to 30 V, 30mA or more		
Warm-up time	Approx. 2 seconds		
Output impedance	DC24 V, maximum 600 Ω		
Insulation resistance	DC500 V, 100 MΩ or less		
Operating temperature range	-25 to 90 °C		
Cable length	Standard 5m (1,000 m)		
Mass	Approx. 150 g (Cable is not included)		
Protection structure	Drop-proof direct connection cable type : IP65 (dust-proof, drop-proof) Waterproof connector type : IP67 (dust-proof, waterproof) Water resistant type : IP68 (dust-proof, perfect waterproof : water depth 100 m, 10 bar)		

Please inform us requested full scale value and cable length. Acceleration output + acceleration waveform output type is also available.



* Please check our homepage for details.



Upgrade existing system!

>>> Optimal system for bearing monitoring!

Plan2 Advance VP-100

Suddenly the device broke down and the production line stopped ...

We don't have enough budget for system reconfiguration ... Huge changes seems troublesome ...

I don't know well about the extensive system...

Mrs. B who has trouble deciding what to do for vibration monitoring

If you have a accelerometer (VP-100)...

- 1. Failure details that can be identified by **abnormal speed values**: Imbalance, Misalignment, Miscoupling, Defective slide bearing, Defective basement, Impeller vibration
- 2. Failure details that can be identified by **abnormal acceleration values**: Bearing damage, Abnormal noise, Abnormal gear, Cavitation

You can discover **both 1 and 2.**

Output two signals!

Velocity

Acceleration

Since two signals of velocity and envelope acceleration can be monitored, various abnormal phenomena of the machinery can be detected at an early stage, and accurate equipment maintenance is possible.

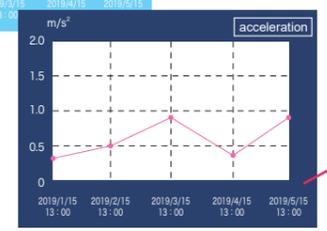


If you have any DCS / PLC, you can use it as is.
* Limited to devices that can input 4-20mA signal.

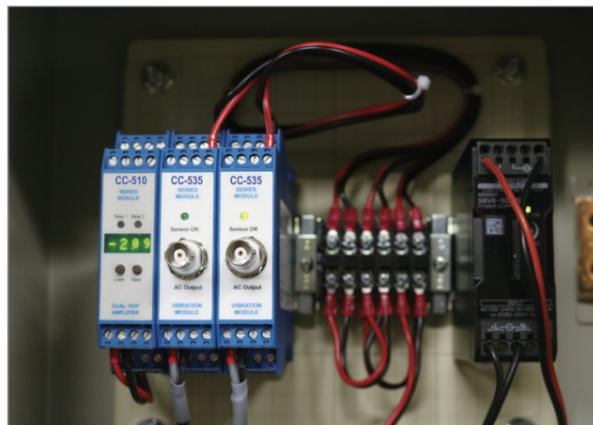
External devices can be used as they are

By monitoring multiple parameters of velocity and envelope acceleration, it is possible to detect abnormal phenomena at an early stage with higher accuracy.

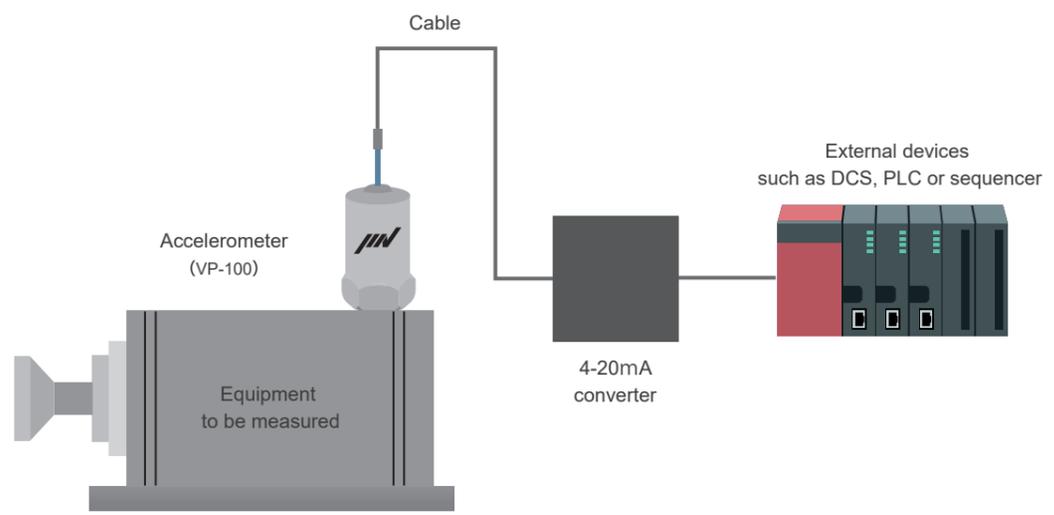
Monitor both with one unit!



Application example



System Composition



Specification

VP-100

Item	Specifications
Frequency range	2 Hz to 10k Hz ±5 %
Voltage sensitivity	100 mV/g
Voltage supply	DC18 to 30 V, 0.5 to 8 mA
Output impedance	Maximum 200 Ω
Insulation resistance	DC500 V, more than 100 MΩ
Operating temperature range	-55 to 140 °C
Cable length	Standard 5 m (Maximum 200 m)
Mass	Approx. 125 g
Protection structure	P65 (dust-proof, waterproof)



Easy management using cloud system!

>>> Optimal system for bearing monitoring!

Plan3 Premium

Suddenly the device broke down and the production line stopped ...

We don't have enough budget for system reconfiguration ... Huge changes seems troublesome ...

I don't know well about the extensive system...

Mr. C who has trouble deciding what to do for vibration monitoring

If you build cloud system ...

- 1. Failure details that can be identified by **abnormal speed values**: Imbalance, Misalignment, Miscoupling, Defective slide bearing, Defective basament, Impeller vibration
- 2. Failure details that can be identified by **abnormal acceleration values**: Bearing damage, Abnormal noise, Abnormal gear, Cavitation

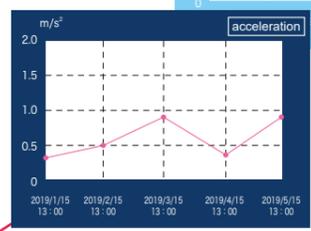
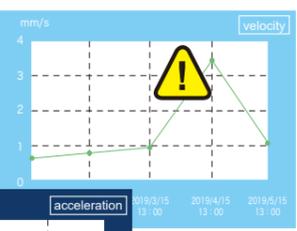
You can discover **both 1 and 2.**

Output two signals!

Velocity

Acceleration

Since two signals of velocity and envelope acceleration can be monitored, various abnormal phenomena of the machinery can be detected at an early stage, and accurate equipment maintenance is possible.



Monitor both with one unit!

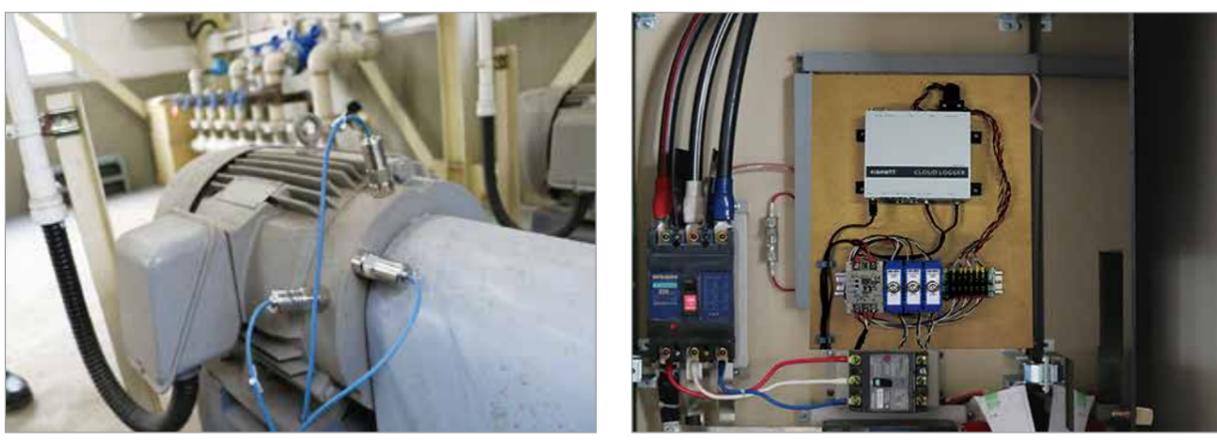
By monitoring multiple parameters of velocity and envelope acceleration, it is possible to detect abnormal phenomena at an early stage with higher accuracy.

Manage using cloud!

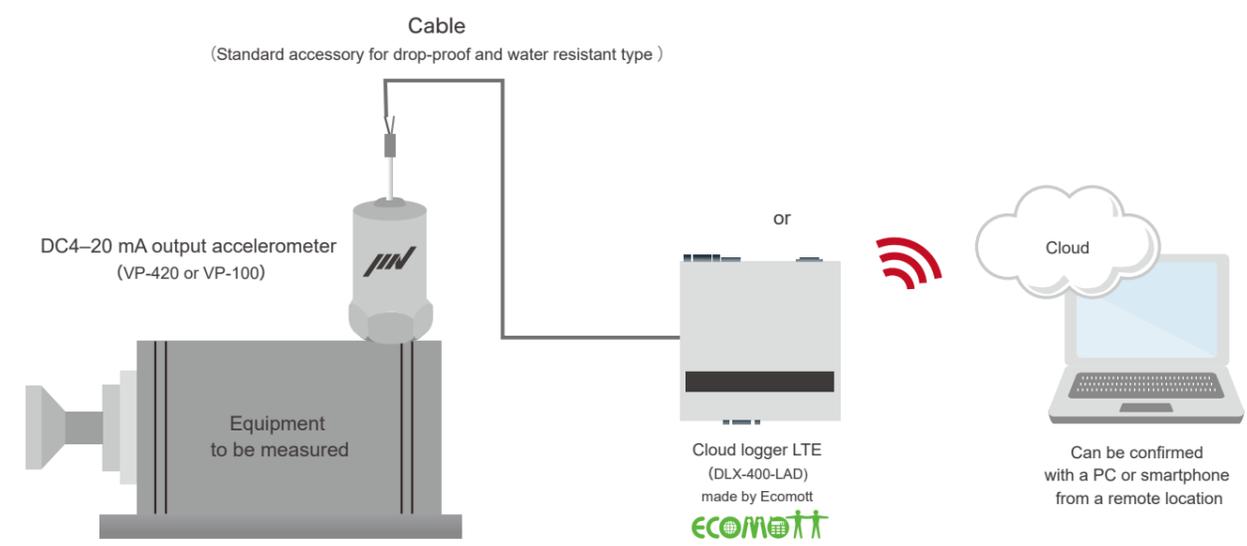
Data can be saved on the cloud and confirmed on a PC or tablet. You can know the details of the site even from a remote location.



Application example



System Composition



Specification

▶ Cloud logger (DLX-400-LAD) made by Ecomott

Item	Specifications
Power supply voltage	DC12 V
Operating temperature / humidity range	-10 to 50 °C 10 to 90 % (non-condensing)
No-voltage contact input	8 points common
Input voltage	DC24 V, Photocoupler insulation method
Analog input	4 points common
Relay output	4 points independence
Periodic data collection time for devices	Select from 1, 5, 10, 30, 60 minutes
Periodic data transmission time from terminal to server	Select from 5, 10, 30, 60 min., 2, 6, 12, 24 hrs.
Mail function	E-mail transmission (report message) from the terminal can be sent to up to 5 locations per e-mail





For vibration monitoring of permanent equipment! >>>

Contact Sensor Type Vibration Monitoring System

VM-9301 series

Monitoring system suitable for multi-channel measurement.
Frequency range, measurement range or output signal can be customized.

Features

- Mixed implementation with the conventional system "VM-9201" is possible
- A wide variety of pickups
- Available for multi-channel system



Compatible with conventional systems



VM-9101→VM-9301

- 1 Can be replaced with half size (indicator).
- 2 Can be redesigned for use in a power station. (adding insulated analog output / arrester / cable disconnection detection function)
- 3 Sensors used with VM-9101 can be diverted.*
- 4 Cables used with VM-9101 can be diverted.*



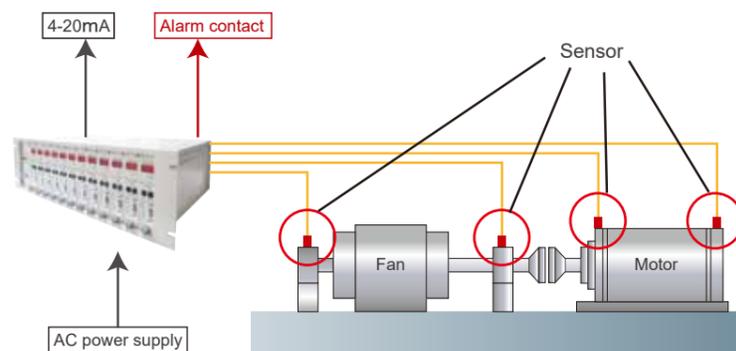
VM-9201→VM-9301

- 1 Size is exactly same, so any shape modification is unnecessary.
- 2 Renewal of internal circuit parts enables stable supply.
- 3 Sensors used with VM-9201 can be diverted.*
- 4 Cables used with VM-9201 can be diverted.*

*Please contact us if you have aged pickups or cables.

Application examples

Cables are laid out between sensors located on a large sized motor of home power generator and a monitoring system housed in a control panel. Monitoring systems can monitor vibration values and output the alarm in an emergency.



Suitable sensors

Selectable from electrodynamic velocity sensor or piezoelectric accelerometer.

Electrodynamic velocity sensor Specialized in medium frequency (up to 1,000 Hz) vibration detection. Suitable to velocity monitoring.

Type	VP-3144 C/D	VP-3354 A	VP-3364 A	VP-3134 AEX	VP-3213 AC/AD	VP-3133 HV
Sensitivity	10 mV / (mm/s)	10 mV / (mm/s)	10 mV / (mm/s)	10 mV / (mm/s)	17.5 mV / (mm/s)	17.5 mV / (mm/s)
Natural frequency	14 Hz	14 Hz	14 Hz	14 Hz	4.5 Hz	4.5 Hz
Operating temperature range	-20 to +80 °C	-20 to +80 °C	-20 to +80 °C	-20 to +80 °C	-20 to +70 °C	-20 to +70 °C
Structure	Drip-proof (Equivalent to IP32)	Water-proof (Equivalent to IP66)	Water-proof (Equivalent to IP66)	Flame-proof (Ex d II BT4 Gb)	Drip-proof (Equivalent to IP32)	Flame-proof (Ex d II BT4 Gb)
Outward appearance						
Notes	High sensitivity / medium frequency	Medium frequency / 2-axis	Medium frequency / 3-axis	Medium frequency	Low frequency / horizontal only	Low frequency / H (horizontal only), V (vertical only)

Piezoelectric accelerometer Specialized in high frequency (over 1,000 Hz) vibration detection. Suitable to acceleration monitoring.

Type	VP-A51 IW	VP-4135	HS-100 I
Sensitivity	5 mV / (m/s ²)	5 mV / (m/s ²)	50mV/G
Natural frequency	30,000 Hz	8,000 Hz	24,000 Hz
Operating temperature range	-30 to +110 °C	-10 to +60 °C	-20 to +80 °C
Structure	Water-proof (Equivalent to IP54)	Flame-proof (d2G4)	Safe and explosion proof (Ex ia II C T4 Ga)
Outward appearance			
Notes	Insulated	—	Insulated

*Other sensors for high temperature or waterproof are also available. Please ask IMV or your local distributor.

Specifications

Type	VM-9301 series	VM-9301A series																																																																			
Pickup	Electrodynamic velocity pickup	Piezoelectric accelerometer																																																																			
Amplifier unit type	Type 1 line : VA-9301(1-1) Select velocity or displacement Type 2 line : VA-9301(2-1) Simultaneous measurement of velocity and displacement	Type 1 line : VA-9301A(1-1) Select acceleration, velocity or displacement Type 2 line : VA-9301A(2-1) Simultaneous measurement of any two of acceleration, velocity or displacement																																																																			
Frequency range	Low : 5 to 500 Hz (-11 to +6 %) Medium : 10 to 500 Hz (-11 to +6 %) Filter selectable (pass band) High-pass filter : 5, 10, 15, 20, 50, 100 Hz Low-pass filter : 20, 50, 100, 200, 500 Hz	5 to 10 kHz (-30 to +6 %) Filter selectable (pass band) High-pass filter : 5, 10, 20, 50, 100 Hz Low-pass filter : 100, 200, 500, 1k, 5k, 10 kHz (High-pass filter : 20 Hz in case of displacement or velocity Low-pass filter : 500 Hz in case of displacement, -1 kHz in case of velocity)																																																																			
Measurement range	Displacement : 50, 100, 150, 200, 300, 500, 999 (1000) $\mu\text{mP-P}$ Velocity : 10, 15, 20, 30, 50 mm/s Acceleration : —	100, 150, 200, 300, 500, 999 (1000) $\mu\text{mP-P}$ 10, 15, 20, 30, 50 mm/s 10, 15, 20, 30, 50, 100, 150, 200, 300, 500 m/s^2																																																																			
Equipment failure	Indication lamp : Orange LED located on the upper part of amplifier front panel (FAT) Secondary power is lit at abnormal condition. Alarm contact : 1a contact (open at normal condition) operate under fuse melting, power switch shut off and primary / secondary power failure Alarm reset : Select from automatic or manual recovery	Indication lamp : Green LED located on the upper part of amplifier front panel (PU) Lights-out when wire is broken (lights-on at normal condition) (When pickup connected with charge amplifier is used, this function is not valid.) Alarm contact : Standard : 1a contact *available 1b or 1c (open at normal condition, closed when wire is broken) operate when pickup cable is broken. Alarm reset : Select from automatic or manual reset																																																																			
Pickup cable break alarm	Alarm step : Type 1 line : upper limit 2 steps Alarm (ALM) / Trip (TRP) Type 2 line : upper limit 1 step Alarm1 (ALM1, 1line), Alarm2 (ALM2, 2line) Delay timer : Select from 0 to 15 sec. by the slide switch inside of the amplifier unit (0 sec. if not specified.) Setting range : 5.0 to 99.9 % (can be set at 0.1 % step) (When alarm function is not used 99.9 % is set. Indication lamp and contact is on at over fullscale value)	Alarm step : Type 1 line : Orange LED [ALM], red LED [TRP] Type 2 line : Orange LED [ALM1], red LED [ALM2] Alarm contact : Select from "ALM / ALM1 circuit : 2a contact TRP / ALM2 circuit 2a contact" or "ALM / ALM1 circuit : 1b/1a contact TRP / ALM2 circuit 1a/1b contact" Contact capacity : AC110 V 2 A (DSP Relay made by Panasonic) DC30 V 0.2 A Alarm reset : Select from automatic (Hysteresis 3 %) or manual reset																																																																			
Rectified level output	DC output 1 : Select from DC4-20 mA (insulation output), Loading 500 Ω or less or DC1-5 V (insulation output), Loading 100 k Ω or more DC output 2 : Select from DC4-20 mA (insulation output), Loading 500 Ω or less or DC1-5 V (insulation output), Loading 100 k Ω or more	DC output 1 : AC \pm 5 mV/(m/s ²), Loading 100 k Ω or more DC output 2 : AC \pm 5 mV/(m/s ²), Loading 100 k Ω or more (Depending on specifications of pickup)																																																																			
Waveform output	Pickup waveform output : AC \pm 10 mV / (mm/s) or AC \pm 17.5 mV / (mm/s), Loading 100 k Ω or more Waveform output : AC \pm 5 V (at the full-scale), Loading 100 k Ω or more	Panel meter : Red LED three-digit indication, [9.9.9] is displayed at over 120 % of full-scale Operating temperature range : 0 to 50 °C, 20 to 95 %RH, wet bulb temperature is 35 °C (non-condensing)																																																																			
Power supply	Available range AC85 to 264 V, 47 to 66 Hz	Power consumption : 20 VA or less (1 CH), 30 VA or less (3 CH), 45 VA or less (6 CH), 60 VA or less (9 CH), 75 VA or less (12 CH) At AC100V (Depends on the number of amplifier or power supply)																																																																			
Painting color	Munsell 5Y7/1, half matted	Mass : Approx. 2.0 kg (1 CH), approx. 3.9 kg (3CH), approx. 5.9 kg (6CH), approx. 8.2 kg (9CH), approx. 10.2kg (12CH)																																																																			
Outward dimension																																																																					
Dimension	<table border="1"> <thead> <tr> <th>Channel</th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> <th>G</th> <th>H</th> <th>I</th> </tr> </thead> <tbody> <tr> <td>Type 1 channel</td> <td>90</td> <td>170</td> <td>300</td> <td>88</td> <td>132</td> <td>90</td> <td>148</td> <td>162</td> <td>50</td> </tr> <tr> <td>Type 3 channel</td> <td>210</td> <td>149</td> <td>300</td> <td>160</td> <td>132</td> <td>180</td> <td>143</td> <td>100</td> <td>195</td> </tr> <tr> <td>Type 6 channel</td> <td>300</td> <td>149</td> <td>300</td> <td>250</td> <td>132</td> <td>270</td> <td>143</td> <td>100</td> <td>285</td> </tr> <tr> <td>Type 9 channel</td> <td>390</td> <td>149</td> <td>300</td> <td>340</td> <td>132</td> <td>360</td> <td>143</td> <td>100</td> <td>375</td> </tr> <tr> <td>Type 12 channel</td> <td>480</td> <td>149</td> <td>300</td> <td>430</td> <td>132</td> <td>450</td> <td>143</td> <td>100</td> <td>465</td> </tr> </tbody> </table>									Channel	A	B	C	D	E	F	G	H	I	Type 1 channel	90	170	300	88	132	90	148	162	50	Type 3 channel	210	149	300	160	132	180	143	100	195	Type 6 channel	300	149	300	250	132	270	143	100	285	Type 9 channel	390	149	300	340	132	360	143	100	375	Type 12 channel	480	149	300	430	132	450	143	100	465
Channel	A	B	C	D	E	F	G	H	I																																																												
Type 1 channel	90	170	300	88	132	90	148	162	50																																																												
Type 3 channel	210	149	300	160	132	180	143	100	195																																																												
Type 6 channel	300	149	300	250	132	270	143	100	285																																																												
Type 9 channel	390	149	300	340	132	360	143	100	375																																																												
Type 12 channel	480	149	300	430	132	450	143	100	465																																																												

Unit : mm

* Please check our homepage for details.





Compact popular type!

>>> Vibration Switch

VM-90A

A popular vibration monitor specialized in low cost and control function. It is suitable for automatic control when abnormal vibration occurs.

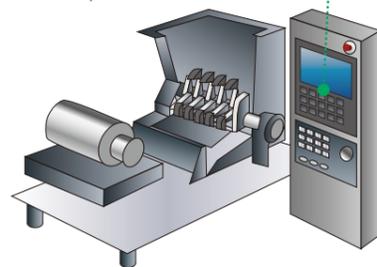
Features

- Low cost
- Changeover type for measurement mode and range
- Two step alarm setting, level outputs available
- Applicable with intrinsic safety proof pickups

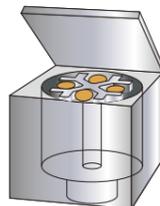


Application example

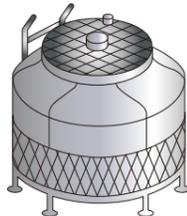
Machine tool, crusher etc.



Centrifugal separator



Cooling tower



Stop operation in case of abnormality installed on or inside machine tools or crushers etc.

Specifications

Item	Specification
Frequency range	Acceleration 8 Hz to 8 kHz, -3 dB (10 Hz to 5 kHz, ±1dB)
	Velocity 10 Hz to 1 kHz, ±1.5 dB
	Displacement 10 Hz to 300 Hz, ±1.5 dB
Measurement range	Acceleration 10, 100 m/s ²
	Velocity 10, 100 mm/s rms
	Displacement 100, 1,000 μm-p
Alarm output	Individual level setting (upper 2 steps) : 10 to 100 % Individual 1c contact : maximum capacity DC30 V, 1A Delay time setting : 1 to 10 seconds Automatic reset
	Level output DC4 – 20 mA (maximum load resistance 300 Ω)
Monitor output	AC3 VP-P full scale DC2 V full scale
Power supply	AC100 V±10 V, 47 to 63 Hz
Power consumption	5VA or smaller
Operating temperature / humidity range	0 to +50 °C, 35 to 95 %RH (non-condensing)
Mass / Size	74 (W) X 72 (D) X 90 (H) mm / approx. 250 g

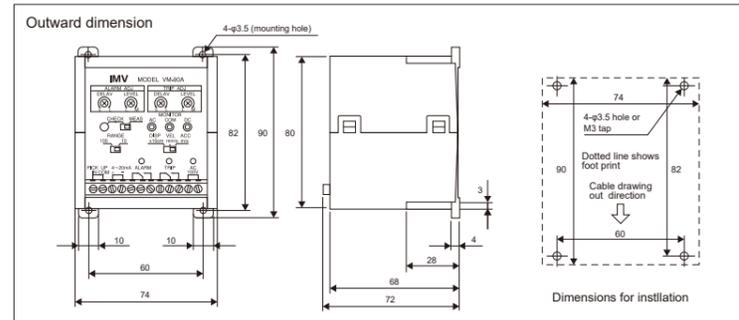
Standard composition

Item	Notes
Pickup (VP-A51W)	Piezoelectric accelerometer (see page 18)
Pickup cable	5 m long cable with a pick up connector and waterproof cap
Standard accessories	<ul style="list-style-type: none"> • screw for pickup attachment M6, hexagonal hole • hex key wrench • sers screw for main body installation • instruction manual (with test certification)

Other lengths available on request. (Maximum length is 200m) Please refer to page 25 about the cable length.

Option

Item	Notes
Mechanical filter (MCF-6)	Prevention of incorrect operation on displacement / velocity measurement. Elimination of high frequency component.



* Please check our homepage for details.



Entry level model for vibration monitoring!

>>> Vibration Signal Converter

VM-90D series

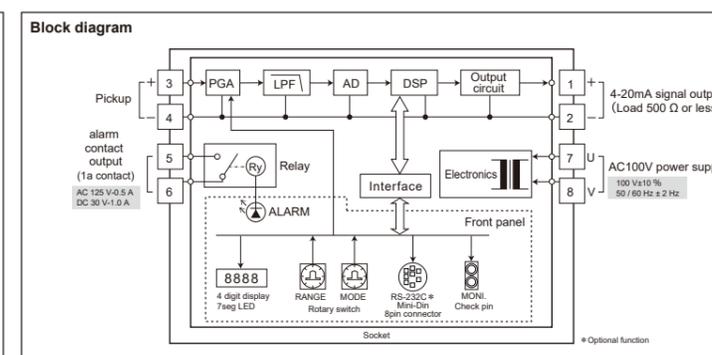
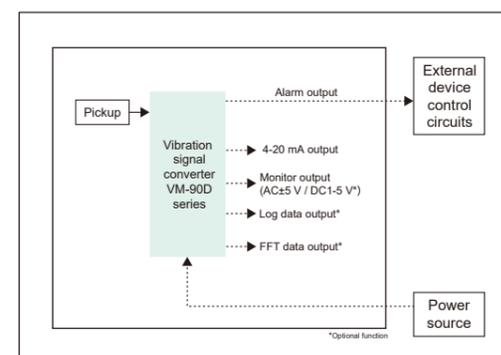
A standard monitoring device which has the standard functions, such as indication of vibration value, signal output and alarm contact output.

Features

- Low price
- Compact size
- Changeover type for measurement mode and range



System composition



Specifications

Item	Specification
Signal output	Conversion output DC4-20 mA, 1 output (response time 3 seconds) ^{*1}
	Monitor output AC ±5 V, FS ± 5 % (For quick check) ^{*3} DC 1 to 5 V, FS ± 5 % (Option)
Alarm output	Alarm contact 1 step 1a contact, AC 125 V to 0.5 A, DC 30 V to 1A (resistive load)
	Alarm setting range 0 to 100% of full scale arbitrary setting (in 1 % step) ^{*2}
	Alarm action Operation that activates when time passes alarm delay time after vibration level exceeds alarm set level. (automatic reset) Initial alarm delay time setting 5 sec. (3 - 99 sec. : 1 sec. step)
Indication function	Main body Red 7 segment LED (4 digit indication)
	Indicator Vibration value : 5-step switching indication depends on the setting mode Blink for 120 % over range full scale Alarm setting value (%) : 0 to 100 for full scale ^{*2} Pickup sensitivity value (%) : 80 to 120 for standard sensitivity
Operating temperature range	-5 to + 55 °C 30 to 90 %RH (Non-condensing)
Power supply	AC100 V ± 10 % 50 / 60 Hz ± 2 Hz
Power consumption	Less than 10 VA
Mounting	On the wall or Din rail (Din rail connector is detachable)
Terminal board	M3.5 screw on the back panel
Material	Plastic
Size / Mass	50 (W) x 127 (D) x 80 (H) mm / Approx. 300 g

*1 Can be changed by the customized software *2 Setting at 0% disable a alarm function *3 Only for quick check of waveform

VM-90DA (Applicable to pre-amplifier build-in type pickup)

(VP-A51W, VP-A4345)

Measurement mode	Item	Specifications
Acceleration ^{*5}	Measurement range	10, 20, 50, 100, 200 (m/s ² rms)
	Frequency range	10 to 4 kHz ± 1 dB, 10 to 10 kHz, +1 dB, -3 dB
Velocity ^{*5}	Measurement range	5, 10, 20, 50, 100, (mm/s rms)
	Frequency range	10 to 1 kHz ± 1 dB, -2 dB
H function ^{*5}	Measurement range	10, 20, 50, 100, 200 (m/s ² rms)
	Frequency range	DC to 1 kHz (Envelope detection of 2 kHz to 15 kHz)
H function CF ^{*5}	Measurement range	5, 10, 20, 50, 100
	Frequency range	DC to 1 kHz (for peak / rms of H function)

VM-90DV (Applicable to medium frequency pickup)

(VP-90VC, VP-90VD)

Measurement mode	Item	Specifications
Velocity ^{*5}	Measurement range	5, 10, 20, 50, 100 (mm/s rms)
	Frequency range	10 to 1 kHz ± 1 dB
Displacement ^{*5}	Measurement range	50, 100, 200, 500, 1,000 (μm-p)
	Frequency range	10 to 500 Hz ± 1 dB

VM-90DVL (Applicable to low frequency pickup)

(VP-91VC, VP-91VD, VP-92VC, VP-92VD)

Measurement mode	Item	Specifications
Velocity ^{*5}	Measurement range	5, 10, 20, 50, 100 (mm/s rms)
	Frequency range	5 to 500 Hz ± 1 dB
Displacement ^{*5}	Measurement range	50, 100, 200, 500, 1,000 (μm-p)
	Frequency range	5 to 500 Hz ± 1 dB

*5 Measurement mode is switchable by the switch on the front panel. Measurable up to 20 % of range over. Error is 1 % or less.



* Please check our homepage for details.



To record valuable vibration data!

Lambda vibro

VM-8018

Generates vibration diagnosis and analysis results that require know-how in CSV format files. Supports the construction of a full-fledged status monitoring system using IoT.

Features

- Vibration analysis by edge computing
- Simultaneous measurement and recording of waveforms, FFT, and OA (trend) at any cycle
- Compatible with various sensor inputs
- Vibration measurement by external trigger / Vibration measurement by time reservation



A-Vibro

Product Outline

Compatible with various sensors

In addition to the general accelerometer (VP-100M) for rotating machinery, VP-8013 for low-speed rotating machinery and voltage input can also be used to capture parameters other than vibration.

Data storage suitable for diagnosis

Periodically save Peak / rms values for acceleration, velocity, displacement, and envelope acceleration in a batch file. The FFT and acceleration waveforms also record fine data at a maximum sampling rate of 51.2 kHz.

Easy data access

Windows®10 IoT Core is used. You can access folders and files in Lambda Vibro from the same network. Since the file is in CSV format, you can check the data directly.

Measurement file structure in Lambda Vibro



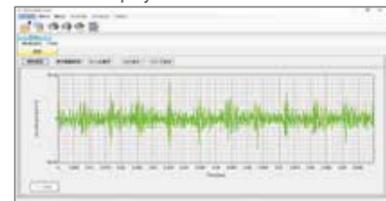
Folder	File
OA	VM8018_20171207_044207_05000_05000.csv
FFT	VM8018_20171207_044207_05000_05000.csv
Waveform	VM8018_20171207_044207_05000_05000.csv

Model	Save date	System	Format
VM8018_20171207_071000_05000	2017/12/07 17:10	System	CSV
VM8018_20171207_071000_05000	2017/12/07 17:10	System	CSV

Option Waveform display software MD-8018

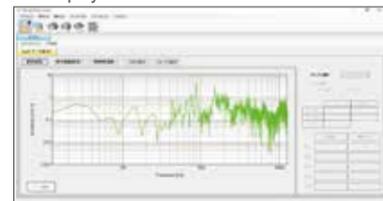
Displays a graph of Lambda Vibro files

Waveform display



Based on the acceleration waveform data, it can be converted into a velocity / displacement waveform and BFP settings can be made.

FFTdisplay



Makes a graph of the FFT data. It is possible to collate with the dominant frequency component for each failure cause.

Analysis option function ... In addition to basic functions, useful functions for equipment diagnosis can be added.

- Tripartite : Display correlation of acceleration, velocity, displacement and frequency based on FFT results
- FFT : Flexible FFT analysis based on Lambda Vibro acceleration waveform data
- Lissajous : Planar locus diagram created based on two orthogonal vibration data
- Pipe vibration evaluation : Equipped with SwRI standards for evaluating deterioration of piping clamps

PC requirements	
OS	: Windows7, Windows10
CPU	: Core i5 or more
Memory	: 8 GB or more
HDD	: 128 GB or more

Saved data format

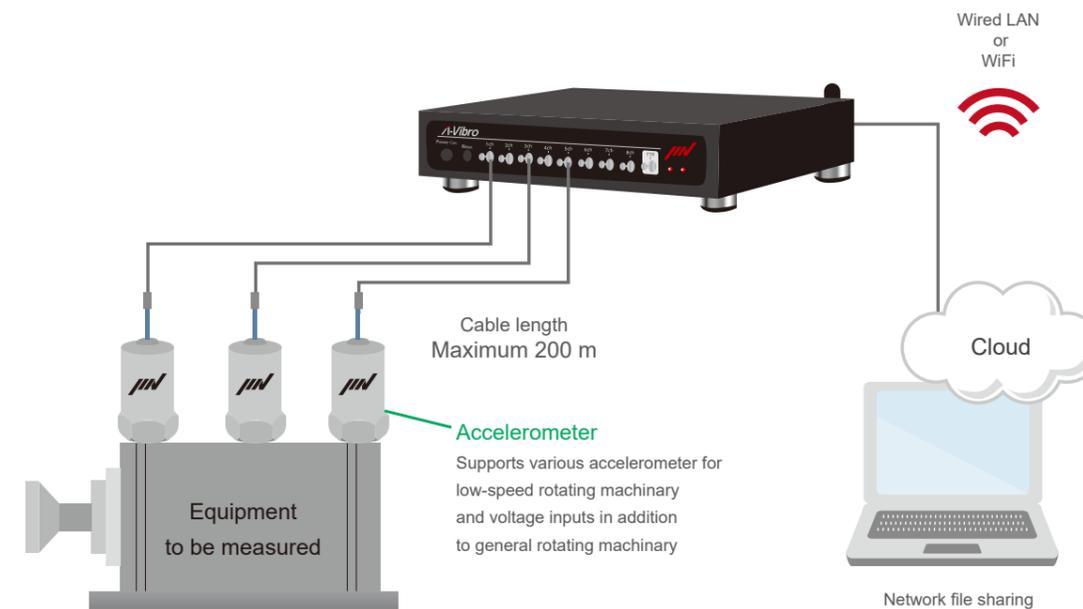
The following three types of data are automatically saved in Lambda Vibro's internal memory. Since both are CSV format files, you can check the contents directly and use them in various systems.

OA(Vibration level) extension : imvov

FFT data example extension : imvff

Waveform data example extension : imvfw

System Composition



Specification

Basic specification		Measurement specification	
Item	Specification	Item	Specification
Analog channel	8 ch (Maximum ± 15 V)	Measurement target	Acceleration : m/s ² , gal (1.00a or later), g (1.0.0 or later) Velocity (Calculated value) : mm/s, Displacement (Calculated value) : μm, Voltage : V, mV, μV
Sampling resolution	16 Bit (Sequential type)	Sampling rate	51200sps, 25600sps, 12800sps, 10240sps, 6400sps, 5120sps, 3200sps, 2560sps, 2048sps, 16000sps, 1280sps, 1024sps, 800sps, 640sps, 512sps, 400sps
Sampling frequency	51.2 kHz (Supports simultaneous channel sampling)	Voltage range	±2.56V, ±5.12V, ±10.24V, ±20.48V
Connection accelerometer	VP-100M, VP-8013, VP-8013S, CA-3021	Measurement time	0.1s to 10.0s
ICP output	3.5 mA / 24 V	Trigger	Start measurement with external trigger and reserved trigger
Read TEDS	With		
Trigger channel	1ch (input) Maximum 24 V		
Channel terminal shape	HD-BNC (MicroBNC)		
Function port	USB2.0 typeB (Host mode) Wire LAN (File sharing)		
Wireless connection	WLAN 802.11b/g/n (File sharing)		
OS	Windows®10 IoT Core		
Indication LED	Red and green, orange and blue (2LED)		
Power supply	AC100 to 240 V (AC adpater)		
Size / Mass	63 (H) x 250 (W) x 210 (D) mm / 2.5 kg (excluding connectors etc.)		
Operating temperature range	-10 to 60 °C		
Storage capacity	32 GB (standard), 64 GB (option), 128 GB (option)		





Equipment for Good/Bad judgement!

>>> CardVibro Air2

VM-2012 / VM-2012C

I'm scared of measuring at high and dangerous places ...

I don't understand the meaning of vibration values ...

Data entry after work is cumbersome ...

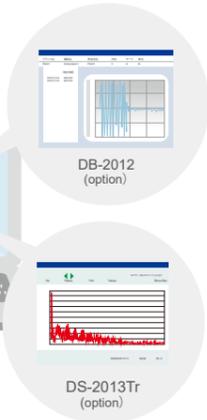
Mr. D who has trouble deciding what to do for vibration measuring

If you have a CardVibro Air2 ...

Wireless safety measurement

Even in scenes where measurement is difficult with wire (such as high places, narrow places, and partitioned places), You can safely measure from a distance.

Data can be checked immediately on-site from a tablet or smartphone, and data can be easily transferred to a PC. Graphing of measurement data is also possible with optional software.



No input work required!

Equipped with vibration severity of ISO-10816 [JIS-B-0906] standard and original judgment value function for bearings. Good / Bad judgment can be made immediately after measurement.

Immediate diagnosis on the site!

Judgement

- Good
- Fair
- Caution



Application Example



Standard Composition



Dedicated software "CardVibro Air2" and "CardVibro Air2 Light" are available downloaded from Google Play.

*Please prepare your own Tablet PC.

- 1 Open Google Play
- 2 Input "Air2" and search
- 3 Select "Card Vibro Air2" or "Card Vibro Air2 Light" If you scan the QR code below, you will find the download page.

Download the dedicated software here

*Tablet PC is needed for measurement. (Not included in the standard composition)

Specification

▶ Standard Type (Sensor is built-in) VM-2012



▶ Connector Type (Sensor is external attachment) VM-2012C



Item	Specification
Acceleration frequency range	10 to 10000 Hz
Velocity frequency range	10 to 1000 Hz
Displacement frequency range	10 to 150 Hz
Maximum measurement acceleration	500 m/s ²
Mass	Approx. 145 g
Size	40.5(W) × 41.5(D) × 88.6(H) mm
Sensor	Piezoelectric accelerometer

*Connector type needs to connect with an optional pickup.

Item	Specification
Mass	Approx. 130 g (excluding a sensor)
Size	40.5(W) × 41.5(D) × 88(H) mm
Connecting sensor	Voltage output sensor, ICP sensor
Voltage output port	-5 V, +5 V
ICP port	+24 V (2 mA)
Voltage input port	±2.5 V
Sensor input IF	HR10A (round type pin 6)

* Please check our homepage for details.





Try first!

SmartVibro

VM-4424S-H / VM-3024H / VM-7024H

Permanent vibration measurement system is expensive and can't be passed the request for approval...

I'm not sure what to start with ...

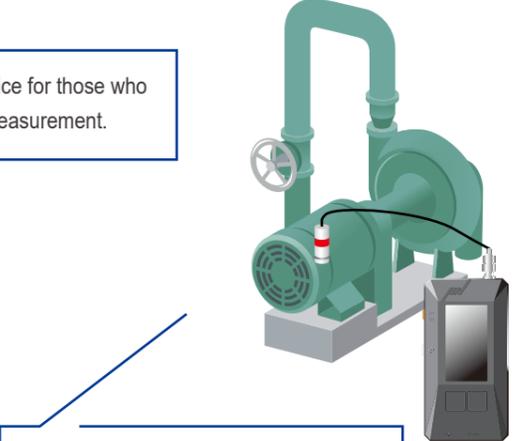
Skilled workers decreases and newcomers still can't find anomalies...

Mr. E who has trouble deciding what to do for vibration measuring

If you have a SmartVibro ...

Reasonable!

This is an affordable price for those who are starting vibration measurement.



With this one, vibration measurement (predictive diagnosis) is possible.

Start measurement with this one!

Easy judgement!

Velocity

Acceleration

Displacement

With the function that can measure "acceleration", "velocity" and "displacement" at the same time, it prevents measurement forgetting.



Application Example



Measurement scene with pump



Measurement scene with compressor

Standard Composition

Main unit

VP-3024 (Electrodynamic type)

VP-4316 (Piezoelectric type)

VP-7000L (Piezo-resistive type)

Sensor (One of them)

For VP-3024

For VP-4316

Probe (One of them)

Output cable

AA alkaline batteries

SD card * Only for high-end model

Specification

Model	VM-4424S		VM-4424H	VM-3024H	VM-7024H
	Standard	High-end	High-end	High-end	High-end
Frequency range	Acceleration	5 Hz to 10 kHz		10 Hz to 1kHz	0.3 Hz to 100 Hz
	Velocity	10 Hz to 1kHz		10 Hz to 1kHz	3 Hz to 100 Hz
	Displacement	10 Hz to 150 Hz		10 Hz to 1kHz	3 Hz to 100 Hz
Full scale	Acceleration	300 m/s ² (RMS, EQP, PEAK)		100 m/s ² (RMS, EQP, PEAK)	20 m/s ² (RMS, EQP, PEAK)
	Velocity	1000 mm/s (RMS, EQP, PEAK)		200 mm/s (RMS, EQP, PEAK)	100 mm/s (RMS, EQP, PEAK)
	Displacement	10 mmp-p (EQP, PEAK)		1,000 μmp-p (EQP, PEAK)	10 mmp-p (EQP, PEAK)
Power supply	battery : AA×2pcs. (continuous approx. 20hours)		battery : AA×2pcs. (continuous approx. 20hours)	battery : AA×2pcs. (continuous approx. 20hours)	battery : AA×2pcs. (continuous approx. 20hours)
Mass	approx.230 g (including battery)		approx.230 g (including battery)	approx.230 g (including battery)	approx.230 g (including battery)
Size	74 (W) × 32.5 (D) × 154 (H) mm		74 (W) × 32.5 (D) × 150 (H) mm	74 (W) × 32.5 (D) × 154 (H) mm	74 (W) × 32.5 (D) × 154 (H) mm
Size / Mass of pickup	Piezoelectric accelerometer (VP-4316) φ19 × 42 (L) mm 40 g (accelerometer) φ 6 × 195 (L) mm 70 g (probe) *including screw part		Electrodynamic type (VP-3024) φ 25 × 50 (L) mm 140 g (accelerometer) φ 10 × 50 (L) mm 20 g (probe)	Piezo-resistive type (VP-7024H) 45 (W) × 45 (D) × 45 (H) mm 200 g (probe)	

* Please check our homepage for details.



Covers a wide range of vibrations!

>>> Broad motion sensor

VP-8013 / VP-8013S

Broad motion sensor, VP-8013, with the use of an original sensor module developed by IMV is enabled to measure and monitor vibration in wide frequency range which was not covered by single sensor of any conventional types.

Features

- Covers from ultra low acceleration (0.04 Hz)* up to high frequency mechanical vibration (1,000 Hz)
- Shock durability 10,000 m/s²

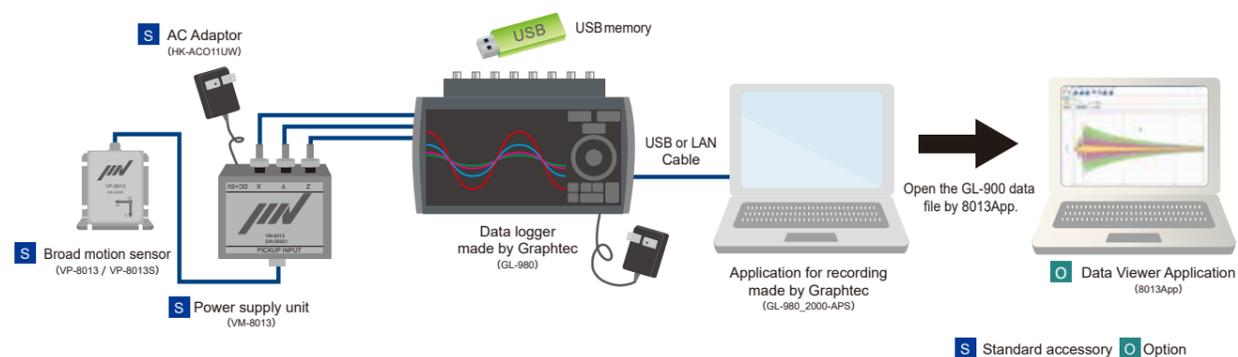
*Actually the output starts from DC, performance confirmed range is from 0.04 Hz.



Application Example



System Composition



Specification

Item	VP-8013	VP-8013S
Measurement direction	3 axis	
Measurement frequency range	0.04 to 1000 Hz	
Maximum acceleration	±58.8 m/s ²	±19.6 m/s ²
Tilt resolution	0.05 degree	
Sensitivity	44.9 mV / (m/s ²)	134.6 mV / (m/s ²)
Sensitivity error	±10 % *	
Lateral sensitivity	Less than ±2 % *	
Output noise	X Y : 0.00294 (m/s ²) / √Hz level, Z : 0.0049 (m/s ²) / √Hz level	
Shock durability	10,000 m/s ²	
Protection rating	IP67	
Operating temperature range	-10 °C to +60 °C (non-condensing)	
Mass	Approx. 230 g	



* Please check our homepage for details.

Vibration measurement for pollution!

>>> Vibration level meter

TYPE 3233 (Product of Aco Co., Ltd)

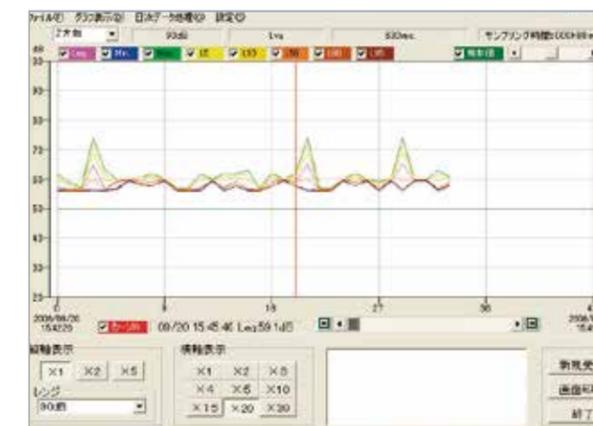
Suitable for measurement of construction vibration, traffic vibration to follow the vibration regulation act or to solve environmental problems.

Features

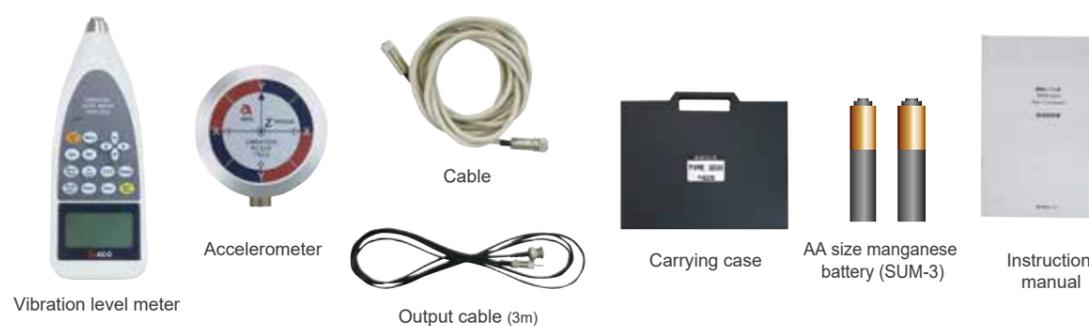
- Awarded model approval as a "VIBRATION LEVEL METER" according Japanese Industrial Standard JIS C 1510-1995 by Measurement Act (Model approval No. W033)
- Vibration level, vibration acceleration level, power average are figured out in three directions simultaneously.



Application Example



Standard Composition



Specification

Item	仕様
Applicable act	Measurement Act JIS C 1510-1995
Measurement range	30 to 110 dB
Frequency range	1 to 80 Hz
Measurement item	Vibration level (LV), Vibration acceleration level (Lva), Power average (Leq) Maximum (Lmax), Minimum (Lmin), Time rate vibration level (Lx) [5 values]
Memory function	Calculated results are saved in a memory (approx. 500 data)
Calibration signal	Calibration by the signal from the build in oscillator (31.5 Hz sinusoidal wave)
AC output	Output voltage : 316 mVrms (F.S), Output resistance : 600 Ω, Load resistance : 100 kΩ or higher
DC output	Output voltage : 2.5 V (F.S) 0.25 V / 10 dB, Output resistance : 50 Ω, Load resistance : 100 kΩ or higher
Power supply	AA battery 4pcs. or AC adapter
Operating temperature range	-10 to +50 °C
Operating humidity range	30 to 90 %RH (non-condensing)
Main unit size / Mass	85(W)x46(D)x220(H) mm / Approx. 380 g (including battery)



* Please check our homepage for details.

Reproduce the failure state!
For studying diagnostic techniques!

>>> Spin rotor kit

VM-101/VM-111

The normal and abnormal states are made artificially to compare each condition.

Features

- Reproduce the failure state (imbalance, bearing damage) of rotating machinery
- VM-101 can reproduce misalignment and gear abnormalities



VM-101

VM-111

Application Example



Reproducible failure state

Failure state		VM-101	VM-111
Imbalance	An arbitrary weight (built-in bolt) is attached to the rotating disk to create an unbalanced state.	○	○
Loosening of tightening bolts (backlash)	An unbalanced weight (bolt) is attached to the rotating disk to create an unbalanced state and a loose state.	○	—
misalignment	It has a structure that causes misalignment of the driven rotation axis from the drive axis.	○	—
Missing gear	A normal gear and a worn gear can be easily switched by tightening and loosening one bolt.	○	—
Bearing defect	Use a unit with a damaged outer ring as needed.	○	○

Specifications

Item	VM-101	VM-111
Number of rotations	0 to 1410 rpm	100 to 3000 rpm
Power supply	AC100 V 50 / 60 Hz	AC100 V 50 / 60 Hz
Size	265(W) x 350(L) x 275(H) mm	250(W) x 149(L) x 100(H) mm
Mass	Approx. 20 kg	Approx. 3.9 kg

▶ Bearing specifications

Model	1302 (NSK)
Rolling element diameter	6.35 mm
Number of rolling elements	10 pcs.
Pitch diameter	27.6 mm
Contact angle	9°00'

▶ Gear specifications

Gear A	Number of cogs 56 (normal, fixed)
Gear B	Number of cogs 90 (missing cogs)
Gear C	Number of cogs 56 (normal)

For waveform data acquisition and analysis

Data Acquisition Analysis System Wave Stocker

VM-0330/16

By simultaneous sampling measurement of up to 16 channels, data collection and judgement is possible. It can be widely used for site measurement, monitoring and developmental study.



Features

- Compact and light weight
- Data transfer by USB 2.0



* Please check our homepage for details.

A compact signal amplifier to make optimal signal processing

Low Frequency Vibration Signal Conditioner

VM-5123/6

It is used for vibration acceleration measurement, waveform observation and various analysis. In addition, vibration data can be output to instruments like recorders.



Features

- Compact and light weight (920g)
- 6 channels (vibration signal inputs) + 2 channels (voltage signal inputs)



* Please check our homepage for details.

Compact 3 signal route charge amplifier

Charge amplifier

VM-1980/3

By connecting with piezoelectric accelerometer, it can output acceleration waveform in voltage.



Features

- Compact and light weight
- Desk top or portable use



* Please check our homepage for details.

Low-cost 1ch charge amplifier

Simple charge amplifier EzC

CA-3021

Connect output of charge piezoelectric accelerometer to the logger or oscilloscope.

Features

- Stable charge conversion characteristics
- Power supply with microUSB
- Ultra-small in size and light weight
- Simple design without setting



* Please check our homepage for details.

Covers from 1 Hz up to 100 kHz

Digital Charge-input Vibrometer

VM-1970

Conversion of the measured value or change of unit are automatic.
No need for complicated operations and easy to read indication.

Features

- H function is measurable
- Level alarm function
- Vibration severity calculation according to ISO-10816 is available.



* Please check our homepage for details.

For investigation and evaluation of the transportation route

Transport Environment Recorder Tough Logger

TR-1000

For further investigation of the cause of defects by shock, fall, temperature or humidity. For evaluation of vibration durability. For research & development of the most suitable package.

Features

- Built in 3-axis vibration pickup and thermo hygrometer
- All channel are of simultaneous sampling
- Data are easily transferred by USB
- Continuous measurement time is maximum 30 days *depends on the condition

* Extendable depending on battery / memory card capacity



* Please check our homepage for details.

Suitable for environmental noise measurements

Integrating sound level meter

TYPE6226[Standard] / TYPE6224[Precision] (Product of Aco Co., Ltd)

Equipped with the function of equivalent continuous SPL (Leq), single event sound exposure level (LAe) and percentile SPL (Lx).

Features

- Wide range of fine linearity throughout 100dB
- Data storage up to 10,000
- Measuring data is saved into PC in real time



* Please check our homepage for details.

A wide frequency range electrodynamic vibration generator for vibrometer calibration.

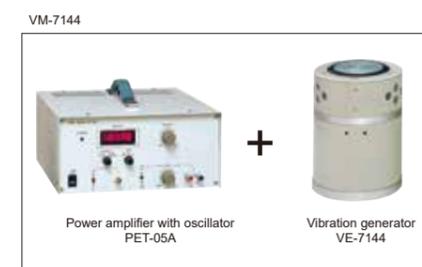
Vibrometer calibration system

VM-7144 & VM-1970

Accurate calibration in the wide frequency range down from 2 Hz up to 20 kHz is available. It is suitable for calibration of electrodynamic, piezoelectric, non-contact vibration detectors being used at thermal, nuclear, hydraulic power stations.

Features

- Large specimen mounting table (φ82)
- A reference detector is built in the vibration generator VE-7144.
- Modification of the table to mount a detector is customizable.
- Horizontal table (PET-03H) is also usable.



+



Vibrometer for reference
VM-1970

Analog type which has lots of achieved hazard prevention

Vibration Switch

VM-90M series

Widely used and long-selling device.

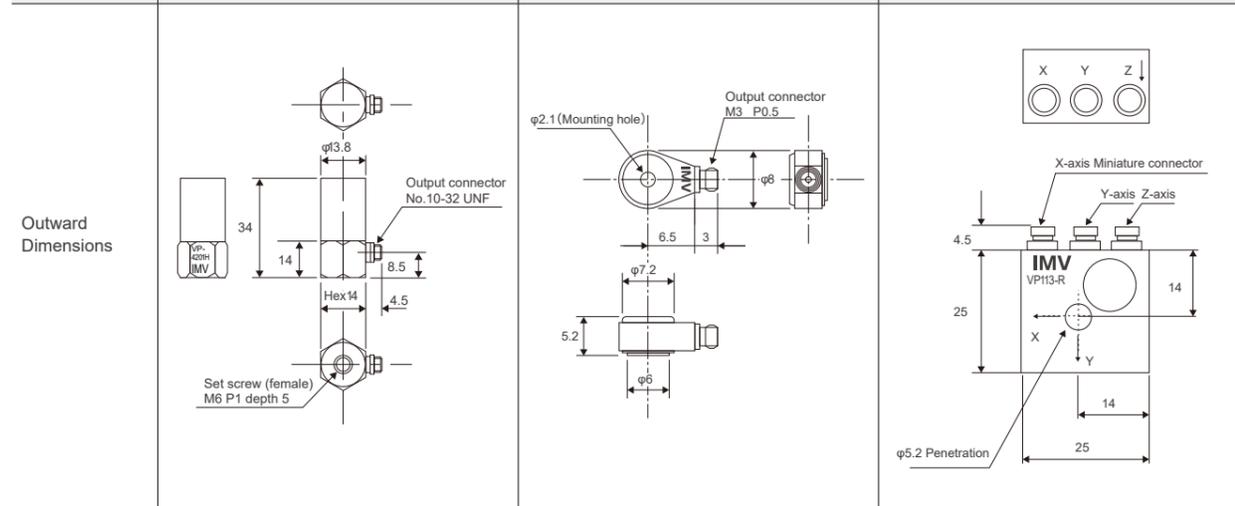
Features

- Corresponds to all kind of pickup
- Easy installation : stationary, panel housed or wall-mounted
- Customizable power supply, alarm delay time and so on

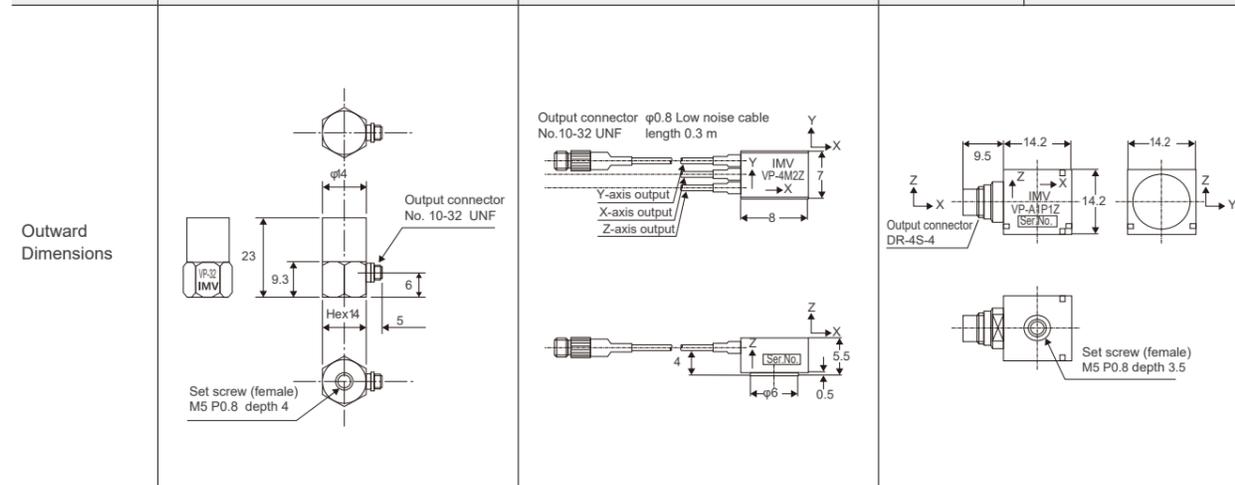


* Please check our homepage for details.

Model	VP-4201H	VP-02S	VP-113R
Image			
Frequency range	fc* to 5,000 Hz ±1dB	fc* to 13,000 Hz	fc* to 7,000 Hz ±1dB
Charge sensitivity	5.0 pC/(m/s ²) ±20 %	0.22 pC/(m/s ²) ±20 %	1.5 pC/(m/s ²) ±10 %
Maximum allowable acceleration	16,000 m/s ²	10,000 m/s ²	5,000 m/s ²
Operating temperature range	- 20 to +250 °C	- 20 to +150 °C	- 20 to +150 °C
Mass	42 g	1.2 g	40 g



Model	VP-32	VP-4M2Z	VP-A1P1Z
Image			
Frequency range	fc* to 10,000 Hz ±1dB	fc* to 10,000 Hz	Frequency range 3 to 5,000 Hz
Charge sensitivity	3.0 pC/(m/s ²) ±10 %	0.04 pC/(m/s ²) ±20 %	Voltage sensitivity 10 mV/(m/s ²) ±10 %
Maximum allowable acceleration	9,800 m/s ²	50,000 m/s ²	Maximum measurable acceleration 500 m/s ²
Operating temperature range	- 40 to +160 °C	- 50 to +160 °C	Operating temperature range -50 to +110°C (5mA) -50 to +70°C (10mA)
Mass	24 g	1.2 g	Mass 11 g



* fc: The value is defined by the time constant of amplifier

Cable for piezoelectric accelerometer

Accelerometer	Connector	Cable	Connector on equipment side	Code name
VP-12 VP-113R VP-32 VP-4200 VP-4200I VP-101 VP-301 VP-A1P1 VP-15	10-32 screw plug (MTS)	HB-2C (200°C)	BNC plug or 10-32 screw plug (MTS)	HB-2C/ □/MB HB-2C/ □/MM
VP-4201H	10-32 screw plug (heat resistant)	HR-2C (260°C)	BNC plug or 10-32 screw plug (MTS)	HR-2C/ □/MB HR-2C/ □/MM
VP-02S VP-4132 VP-2M1ZR VP-A1P0	M3 screw plug	HB-1.2C (200°C)	BNC plug or 10-32 screw plug (MTS)	HB-1.2C/ □/SB HB-1.2C/ □/SM
VP-421W	TNC screw plug	HB-3C (200°C)	BNC plug	HB-3C/ □/TB
VP-A1P1Z	DP-4S-1 screw socket	FEP (180°C)	BNC plug x 3	C-A1P1Z-3.3

* The length of cable varies according to settings and monitoring conditions. Please contact us for details.

Mounting adaptor for piezoelectric accelerometer

 Small size strong magnet MH-201R Isolated type with strong magnetic force	 Small size strong magnet (for spherical surface) MH-203R	 Magnet (Standard type) KM-025C	 Isolating spacer IS-6 Cuts noise comming from object	 Gluing spacer AS-6 Glue for accelerometer to be fixed	 Mechanical filter MCF-6H Cuts excessive high frequency components
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Interconnection conversion connector

 BNC-P-C25J-A Converts MTS to BNC	 BNC-P-C25J-A	 ZR-ZR Converts MTS to MTS	 ZR-ZR
 BNC323-BA · BNC-PA-JJ Setting BNC connector on panel	 BNC-323-BA	 BNC-PA-JJ	

* For other accelerometer, please check the product website.

Warranty and Maintenance

Warranty

All IMV products are shipped after passing the strict quality control inspection, but if you find any failure, please inform us the details.

Warranty period

The warranty period is one or two years. (It depends on the product. Please contact us the further information.)

Warranty coverage

- (1) If the failure happens in the above mentioned period due to the fault of IMV, repair will be made free of charge. However, the following cases are excepted.
 1. Damage caused during transportation / transfer at your side by handling mistake.
 2. Damage caused by natural disaster such as fire, earthquake, flood and lightning or abnormal voltage.
 3. Damage caused by use with another product.
 4. Damage caused by disassembling, repair or remodel by others who is not our personnel.
- (2) Limit of coverage is the extent described in (1). Any secondary damages (failure of other equipments, opportunity loss, lost profit etc.) caused by failure of IMV products at the customers are exempted from the coverage.

Maintenance

■Inspection at our factory

- Details
 - ・Inspection / calibration / operation check / comprehensive dynamic calibration after operation verification
 - ・Submission of reports and test results
 - ・Traceability chart / calibration certificate are issued on request.
- *An official quotation will be provided if repair or replacement of consumable goods are needed.

Contact / Delivery address

IMV CORPORATION MES Business Division
 2-6-10 Takejima, Nishiyodogawa-ku, Osaka, 555-0011, Japan
 TEL : +81-6-6471-3155
 FAX : +81-6-6471-3158

About website

Please check the product details on the website. Please also use the inquiry and estimate.

<http://www.imv.co.jp/e/>



Top page



Contact page

Contact our distributor

If you would like to contact our distributor in your area, please see "distributor list".

Inquiry About Product

* It is an indispensable input item.

Company *	<input type="text"/>
Division name	<input type="text"/>
Name *	First <input type="text"/> Last <input type="text"/>
Country name *	<input type="text"/>
Address	<input type="text"/>
Phone number	<input type="text"/>
E-mail address *	<input type="text"/>

Office information

Osaka



Please contact the head office for product details.
 Tel +81 6 6471 3155

Tokyo



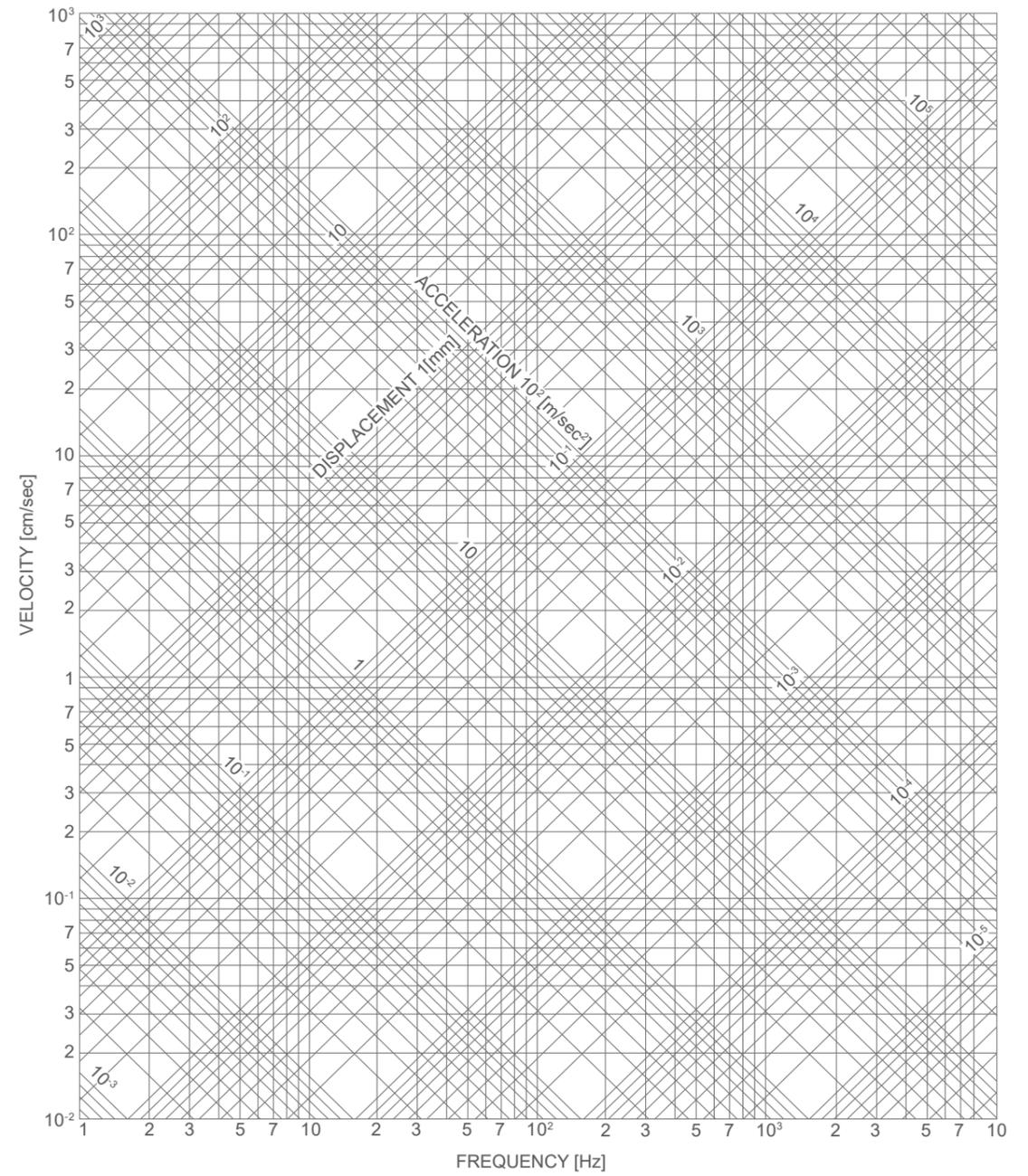
Nagoya



Sagamihara



Relationship between frequency, displacement, velocity and acceleration in sine vibration testing



Displacement $D=d$ [mm]

Velocity $V = \frac{2\pi f d}{10}$ [cm/sec]

Acceleration $A = \frac{(2\pi f)^2}{1000} d$ [m/sec²]

f : Frequency [Hz]

Note: D, V and A are in single amplitude

How to use the chart

Ex1) $f=50$ Hz, $D=1$ mm
 $V=31$ cm/sec, $A=99$ m/sec²

Ex2) $f=100$ Hz, $V=100$ cm/sec
 $D=1.6$ mm, $A=630$ m/sec²

Ex3) $f=600$ Hz, $A=60$ m/sec²
 $D=0.0042$ mm (4.2 μ m), $V=1.6$ cm/sec

