

(VIBRATION, THRUST, REVOLUTION, LVDT)
SIGNAL CONDITIONER

VM-21

SERIES



VM-21

SIGNAL CONDITIONER

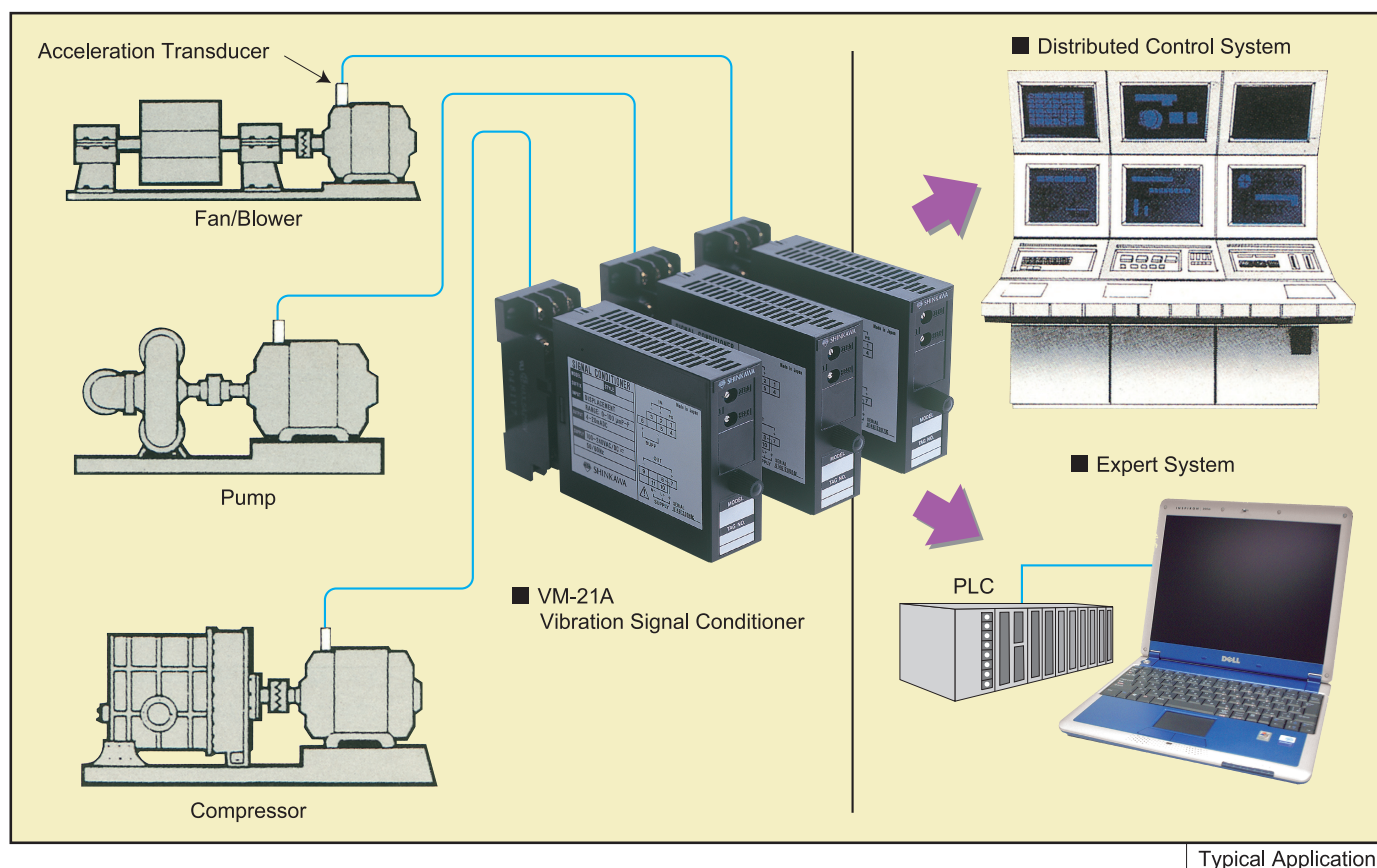
SHINKAWA Intelligent Conditioners. The Smart

The latest technology for maintaining safety in large industrial complexes. Up to now, plant maintenance was performed according to the TBM (Time Based Maintenance) system, that is, a preventive maintenance schedule was set up based on the MTBF (Mean Time Between Failures) obtained by analyzing the data of past failures.

However, examined from the aspect of cost, this method results in long maintenance cycles as well as reduced productivity and increased maintenance costs due to plant stoppages. And from the aspect of safety, the potential of an unforeseen breakdown touching off a major accident should be kept in mind. The CBM (Condition Based Maintenance) system is a new maintenance system that satisfies the difference requirements for plant safety and efficiency and has rapidly been gaining popularity in recent years.

In this system, trouble is detected early by continuous monitoring of the condition of the equipment, i. e., maintenance can be performed before trouble actually occurs. Other topical concepts aimed at unmanned maintenance and reduction of maintenance costs include centralized monitoring through continuous monitoring systems, DCS (Distributed Control System) and different means of data acquisition.

The VM-21 series, still more compact and fully geared to satisfy the requirements of engineers making the move toward continuous monitoring systems. A new trendsetter in plant maintenance.

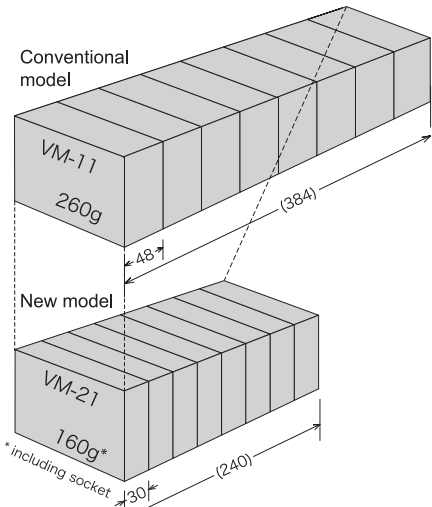


Choice For Continuous Monitoring Predictive Maintenance

(Small and light-weight)

With the use of VM-21G stand-alone sockets, the VM-21 signal conditioners require the space of mere 30mm width for mounting. VM-21 only weights 100g, and it has achieved the total minimization.

[Example of 8 module mounting]



Mounting density : Down to 5/8
Weight ratio : Down to 8/13

(Selectable mounting types)

Both the wall-mounting and DIN-Rail-mounting are available with VM-21G stand-alone socket for an easy mounting design.

(Waveform output for machine diagnostics)

VM-21 has buffered output of raw waveform signal available for diagnostics of rotating machinery. The signal can be sent to analysis and diagnostics equipment for spectral and vector analysis.

(Wide module lineup to meet various vibration sensors)

VM-21 product lineup caters for various vibration sensors of displacement, velocity and acceleration.

(Power supply options)

A variety of power supplies are available: 100 to 240VAC, 100 to 24VDC and 24VDC.

(Burn-down function)

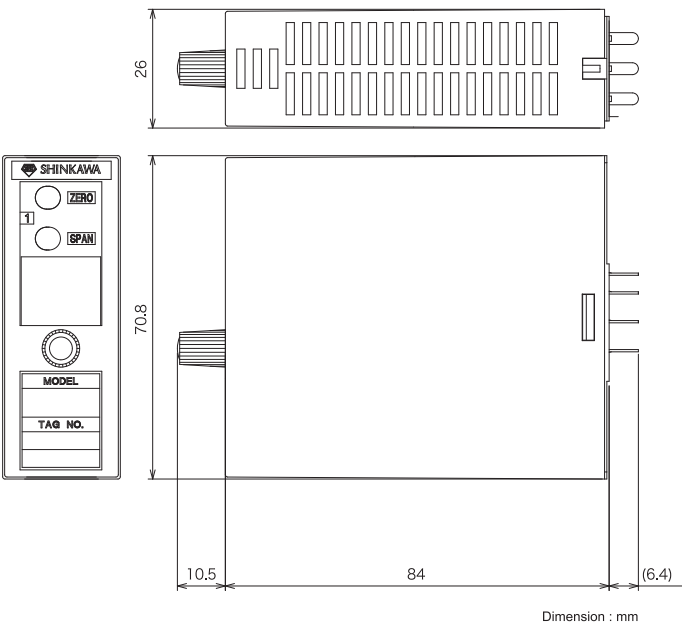
Each of VM-21 module has an input abnormal detecting function, which sends out burn-down output (less than 0.8mADC or 0.2VDC) as soon as input abnormality, such as sensor breaking, occurs. This special feature can be a great contribution to the reliability of a plant operation.

(Isolated output signal)

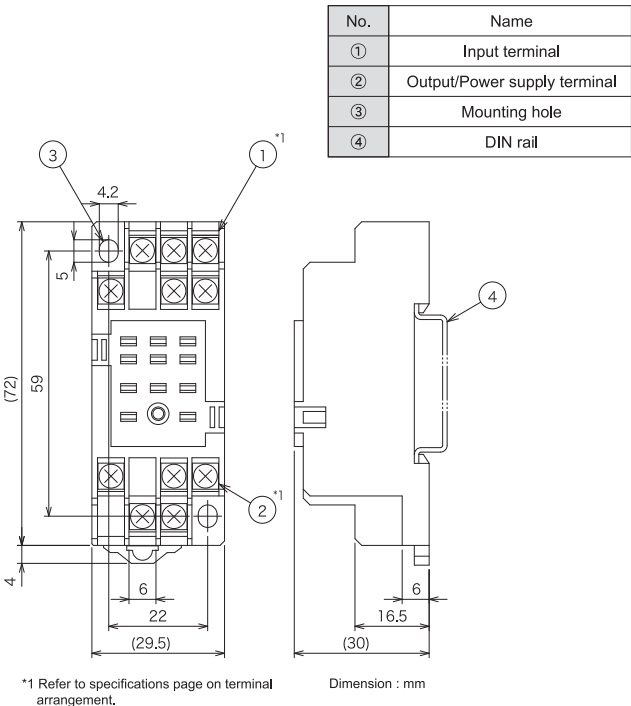
Each module of VM-21 has isolation circuit. This prevents such trouble as unstable output from signal cross-talking, often found in the instrumentation field.

■ Outline Drawing

● VM-21 □ Signal Conditioner



● VM-21G Signal Conditioner Socket



Model Code No. (Ordering Information)

Standard

VM-21K Displacement Input Vibration

VM-21K - B 1 -

Power supply		Measuring range		Input transducer	Frequency response	Output		Conditioner socket	
1	24VDC	21	0 to 100 μ m pk-pk	B FK-202F VK-202A (787mV/100 μ m)	1 5Hz to 4kHz (-3dB)	1	1 to 5VDC	0	Without
2	100 to 240VAC/DC	22	0 to 125 μ m pk-pk			2	4 to 20mADC	1	Include
		23	0 to 200 μ m pk-pk						

VM-21A Vibration

VM-21A --

Power supply		Measuring range*1				Input transducer	Frequency response		Wave Output*3		Output		Conditioner socket	
1	24VDC	11	0 to 100 μm pk	61	0 to 2g pk	A CA Series (100mV/9.8m/s² pk)	0	10Hz to 2kHz(-3dB)	1	Velocity	1	1 to 5VDC	0	Without
2	100 to 240VAC/DC	12	0 to 200 μm pk	62	0 to 5g pk		1	5Hz to 1kHz(-3dB)	2	Acceleration	2	4 to 20mADC	1	Include
		21	0 to 25mm/s pk	63	0 to 10g pk	V CV-86 or CV-88 (3.94mV/mm/s pk)	2	5Hz to 10kHz(-3dB)	3	Displacement				
		22	0 to 50mm/s pk	64	0 to 20g pk		3	10Hz to 1kHz(-3dB)						
		23	0 to 100mm/s pk	71	0 to 20m/s² pk		4	10Hz to 5kHz(-3dB)						
				72	0 to 50m/s² pk		5	1kHz to 10kHz(-3dB)						
				73	0 to 100m/s² pk									
				74	0 to 200m/s² pk									

*1 Input transducer is A : Can not select 11 and 12 of measuring range.
Input transducer is V : Can not select 61 and 64, 71 and 74 of measuring range.

*1 Input transducer is A : Can not select 11 and 12 of measuring range.

Input transducer is V : Can not select 61 and 64, 71 and 74 of measuring range.

*2 When the input transducer V, frequency response code 0 (standard), 3 or 4 is highly recommended.

When the frequency response code 1 or 2 is selected, an excessive vibration output may result at low-frequency.

*3 Input transducer is A : Can not select 3 of waveform output.

Input transducer is V : Can not select 2 of waveform output.

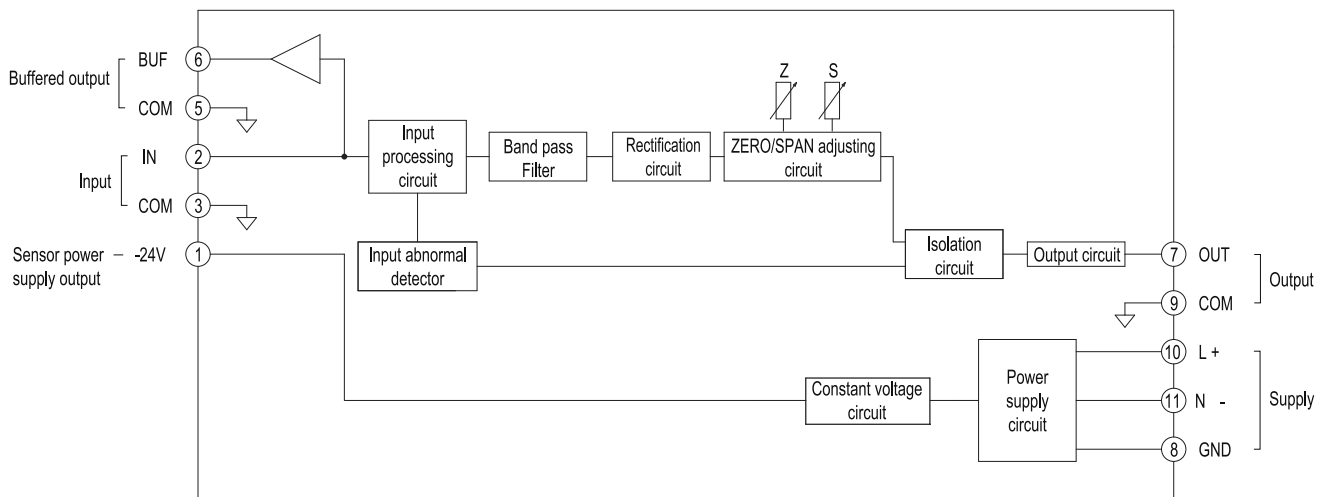
Specification

Model	VM-21K Displacement Input Vibration	VM-21A Vibration
Input Transducer	FK-202F, VK-202A	CA-302, CA-721, CA-722 or CV-86, CV-88
Input Sensitivity	787mV/100 μ m	3.94mV/mm/s pk 100mV/9.8m/s ² pk (100mV/g pk REF.)
Input Resistance	50k Ω	
Measuring Range	See Model Code above	
Output (isolated)	1 to 5VDC (output resistance : 250 Ω) or 4 to 20mADC (permissible load resistance : 600 Ω or less)	
I/O Conversion	$\pm 1\%$ of F.S. at 25 $^{\circ}$ C, $\pm 2\%$ of F.S. at 0 to 50 $^{\circ}$ C	
Response Speed	$\tau = 500\text{ms}$, 63% response	
Frequency Response	5Hz to 4kHz (-3dB)	5Hz to 1kHz (-3dB), 10Hz to 2kHz (-3dB) 5Hz to 10kHz (-3dB), 10Hz to 1kHz (-3dB) 10Hz to 5kHz (-3dB), 1kHz to 10kHz (-3dB)
Burn-down Function	Detects transducer failure and causes the 4 to 20mADC (1 to 5VDC) output to go to less than 0.8mADC (0.2VDC).	
Buffered Output	Input signal is outputted via a buffer amplifier. Signal level : -2 to -22VDC Output impedance : 100 Ω	Input signal is outputted via a buffer amplifier. Signal level : 2 to 22VDC Output impedance : 100 Ω
Wave Output	5Vpk-pk at F.S. (Sine wave)	
Power Supply Output	-24VDC (30mA with short-circuit protection)	24VDC (4mA constant current)
Supply Permissible Voltage	24VDC $\pm 10\%$ or 85 to 264VAC/DC (50/60Hz)	
Power Consumption	24VDC : 3.5W, 110VDC : 3.5W, 100-240VAC : 10VA	
Insulation Resistance	100M Ω minimum at 500VDC between input—output—power—GND mutually.	
Withstanding Voltage	2,000VAC for one minute between input—output—power—GND mutually. (with VM-21H : 1,000VAC between output—GND.)	
Operating Temperature	0 to 50 $^{\circ}$ C (32 to 122 F REF.)	
Relative Humidity	10 to 90%RH (no condensation)	
Casing Material	Modified polyphenylene oxide (black)	
Weight	Approx. 110g (0.24lb)	
CE Marking	Only as for 24VDC power supply specifications.	

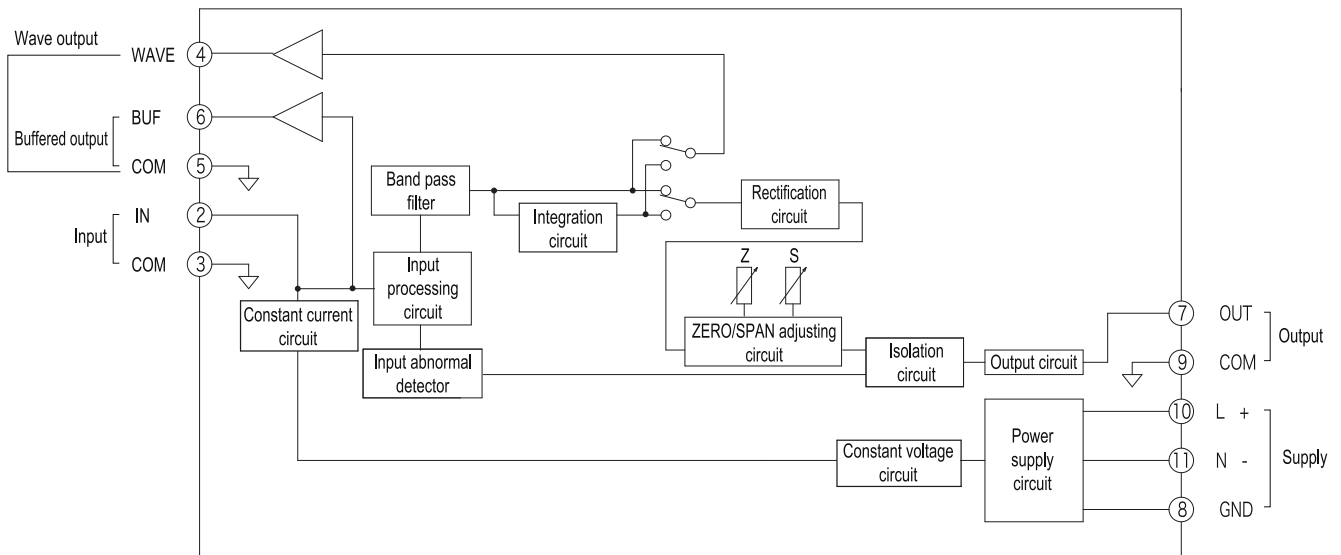
※ Specifications, outline drawings and other written information can be changed without notice.

■Block Diagram

●VM-21K Displacement Input Vibration



●VM-21A Vibration



Model Code No. (Ordering Information)

Standard

VM-21T Thrust

VM-21T											
Power supply		Measuring range ^{*1*2}		Input transducer		Intrinsically safe		Polarity ^{*3}		Output	
1	24VDC	21	0 to 2mm	B	FK-202F VK-202A (787mV/100μm)	0	Non-intrinsically safe spec.	0	Direct	1	1 to 5VDC
2	100-240VAC/DC	22	0 to 4mm	C	FK-452F VK-452A (394mV/100μm)	1	Intrinsically safe spec.	1	Reverse	2	4 to 20mADC
										0	Without
										1	Include

Note)*1 In the case of Intrinsic safety specification, measuring range decrease as below,
0 to 1.8mm (Input transducer : B),
0 to 3.6mm (Input transducer : C).

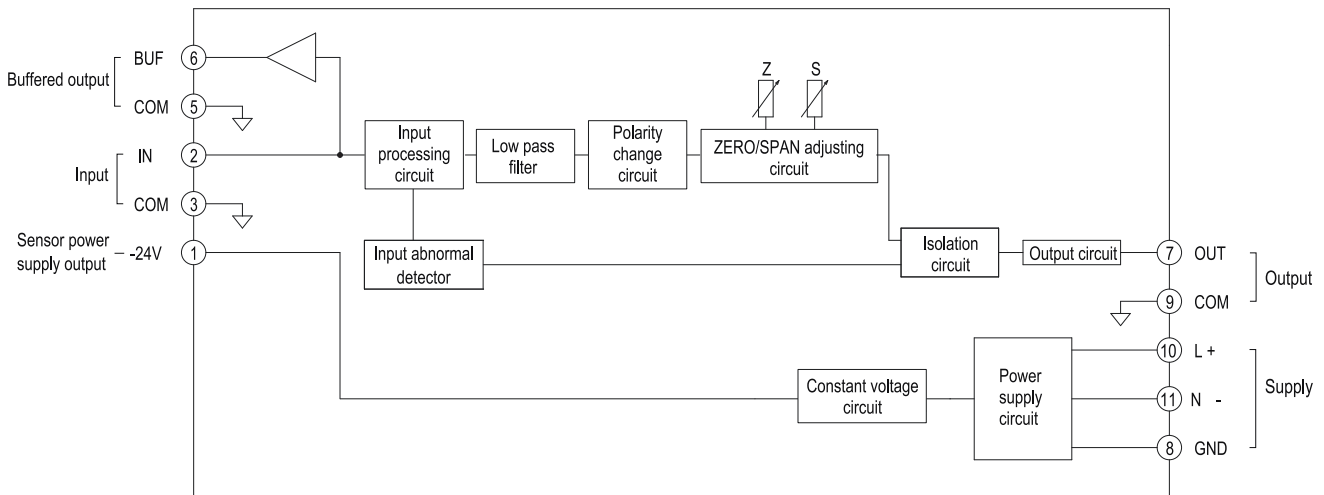
*2 Input transducer is B : Don't select 22 of measuring range.
Input transducer is C : Don't select 21 of measuring range.

Note)*3 Polarity

Polarity	Display and recorder output	
	In the direction toward the sensor	In the direction away from the sensor
Direct	Increase	Decrease
Reverse	Decrease	Increase

Brock Diagram

VM-21T Thrust



Specification

Model	VM-21T Thrust
Input Transducer	FK-202F, VK-202A, FK-452F, VK-452A
Input Sensitivity	787mV/100μm (FK-202F, VK-202A), 394mV/100μm (FK-452F, VK-452A)
Input Resistance	50kΩ
Measuring Range	See Model Code No. above
Output (isolated)	1 to 5VDC (output resistance: 250Ω) or 4 to 20mADC (permissible load resistance: 600Ω or less)
I/O Conversion Accuracy	±1% of F.S. at 25°C, ±2% of F.S. at 0 to 50°C
Response Speed	τ = 50ms 63% response (input change 10 to 90%)
Burn-down Function	Detects transducer failure and causes the 4 to 20mADC (1 to 5VDC) output to go to less than 0.8mADC (0.2VDC).
Buffered Output	Input signal is outputted via a buffer amplifier. Signal level : -2 to -22VDC Output impedance : 100Ω
Power Supply Output	-24VDC (30mA with short-circuit protection)
Zero-shift	-20% (±5%) to 0 to +20% (±5%) of F.S.
Supply Permissible Voltage	24VDC ±10% or 85 to 264VAC/DC (50/60Hz)
Power Consumption	24VDC: 3.5W, 100-240VDC: 3.5W, 100-240VAC: 10VA
Insulation Resistance	100MΩ minimum at 500VDC between input—output—power—GND mutually.
Withstanding Voltage	2,000VAC for one minute between input—output—power—GND mutually. (with VM-21H : 1,000VAC between output—GND.)
Operating Temperature	0 to 50°C (32 to 122°F REF.)
Relative Humidity	10 to 90%RH (no condensation)
Casing Material (color)	Modified polyphenylene oxide (black)
Weight	Approx. 110g (0.24lb)
CE Marking	Only as for 24VDC power supply specifications.

※ Specifications, outline drawings and other written information can be changed without notice.

Model Code No. (Ordering Information)

Standard

VM-21R Revolution

VM-21R

Power supply	Measuring range	No. of input P/R	Input transducer	Output	Conditioner socket
1 24VDC	21 0 to 5,000rpm	ex.1) 120P/R 1 2 0	D RD Tacho Driver FK Driver VK Driver *1	1 1 to 5VDC	0 Without
2 100-240VAC/DC	22 0 to 10,000rpm	ex.2) When specifying without an integral numbers. Z Z Z	J MS Magnetic Pickup	2 4 to 20mADC	1 Include
	23 0 to 15,000rpm	Specify No. of input P/R for the shaft observed by sensor.			
	24 0 to 20,000rpm				
	25 0 to 50,000rpm				
	26 0 to 100,000rpm	P/R			

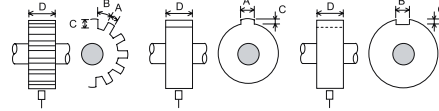
Note) Normal operating range is,

$$10\text{Hz} \leq \frac{\text{Max. rotor speed (rpm)} \times \text{No. of P/R}}{60} \leq 10\text{kHz}$$

WARNING

This signal conditioner is designed for monitoring but not for controlling the rotor speed.
 • Use the conditioner output only for data recording.
 • Do not use this signal for zero-speed monitoring.

Dimension of Target (Model FK, VK, RD)



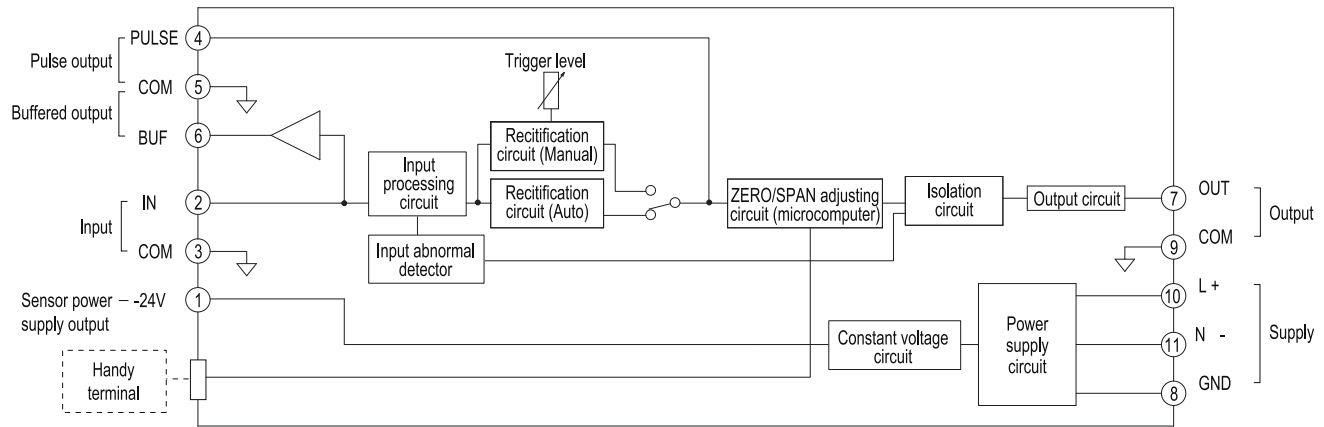
Note) To detect projection (gear), provide surface A of projection with a concentric curve. Do not make it flat.

A= mm
B= mm
C= mm
D= mm

	Input	FK-202F VK-202A RD-05A	FK-452F VK-452A	VK-302P	VK-602P
Dimension of target [recommended] (mm)	A	≥6	≥16	≥8	≥18
	B	≥7	≥20	≥8	≥20
	C	≥2.5	≥4.5	≥2.5	≥5.0
Set gap [recommended] (mm)	D	≥16	≥36	≥20	≥40
		1.0 to 1.5	2.5 to 3.5	1.0 to 1.5	2.5 to 3.5

Block Diagram

VM-21R Revolution



Specification

Model	VM-21R Revolution
Input Transducer	RD series, FK series, VK series, MS series
Input Resistance	50kΩ (Model Code No. of input transducer "D"), 5kΩ (Model Code No. of input transducer "J")
Input Frequency	Min. Input frequency : 0.01Hz, Max. Input frequency : 10kHz, Min Pulse width : 50μs
Minimum Input Voltage	2Vp-p
Hysteresis	1Vp-p, 5Vp-p
Output (isolated)	1 to 5VDC (output resistance : 250Ω) or 4 to 20mADC (permissible load resistance : 600Ω or less)
Measuring Range	See Model Code No. above
I/O Conversion Accuracy	±1% of F.S. at 25°C, ±2% of F.S. at 0 to 50°C
Buffered Output	Model Code No. of input transducer "D" : Approx. -2 to -22VDC, Model Code No. of input transducer "J" : Approx. -10 to 10VDC
Pulse Output	V _L : -1 to +1V, V _H : 4 to 6V
Trigger Level Setting *2	Automatic (trigger level is adjustable by internal trigger level V.R.)
Power Supply Output	-24VDC, approx. 30mA (for Model Code No. of input transducer "D")
Burn-down Function	Detects transducer failure and causes the 4 to 20mADC (1 to 5VDC) output to go to less than 0.8mADC (0.2VDC).
Supply Permissible Voltage	24VDC ±10% or 85 to 264VAC/DC (50/60Hz)
Power Consumption	24VDC: 6.0W, 100-240VDC: 6.0W, 100-240VAC: 10VA
Insulation Resistance	100MΩ minimum at 500VDC between input—output—power—GND mutually
Withstanding Voltage	2,000VAC for one minute between input—output—power—GND mutually. (with VM-21H : 1,000VAC between output—GND)
Operating Temperature	0 to 50°C (32 to 122°F REF.)
Relative Humidity	10 to 90%RH (no condensation)
Casing Material (color)	Modified polyphenylene oxide (black)
Weight	Approx. 110g (0.24lb)
CE Marking	Only as for 24VDC power supply specifications.

* 2 Measuring by manual trigger is recommended in case that duty ratio of input signal is without 10 to 90% or input frequency is measured under 1 to 10Hz.

※ Specifications, outline drawings and other written information can be changed without notice.

Model Code No. (Ordering Information)

Standard

VM-21P 3-Wire LVDT (LS Series)

VM-21P - S -

Power supply		Measuring range		Input LVDT		Full range of input LVDT		Output		Conditioner socket	
1	24VDC	20	25mm	S	LS Series	050	50mm	1	1 to 5VDC	0	Without
2	100 to 240VAC/DC	21	50mm			100	100mm	2	4 to 20mADC	1	Include
		22	75mm			150	150mm				
		23	100mm			200	200mm				
		24	150mm			250	250mm				
		25	200mm			300	300mm				
		26	250mm			350	350mm				
		27	300mm			400	400mm				
		28	350mm			450	450mm				
		30	400mm								
		31	450mm								

Note) •Standard specifications, when measuring range and full range of input LVDT are the same.

•Satisfy the following when using LS Series LVDT :

$$1 \leq \frac{\text{Full range of input LVDT}}{\text{Measuring range}} \leq 2$$

•Satisfy the following when using single coil type LVDT except LS Series LVDT :

- Impedance (between A and C)

At 50% (Null point)	500 to 700Ω
Within LVDT stroke	More than 400Ω
Core comes out	Less than 250Ω

- $4.33 \times \text{LVDT sensitivity (mV/mm/V)} \times \text{Measuring range (mm)} \geq 1,000$

•This signal conditioner does not support the zero shift function, so the null point is always the center position of measurement.

VM-21D 6-Wire LVDT (LF Series)

VM-21D - F

Power supply		Measuring range		Input LVDT		Full range of input LVDT		Output	
1	24VDC	21	50mm	F	LF Series	100	100mm	1	1 to 5VDC
2	100 to 240VAC/DC	23	100mm			250	250mm	2	4 to 20mADC
		24	150mm			300	300mm		
		25	200mm			400	400mm		
		26	250mm						
		27	300mm						
		30	400mm						

Note) •Standard specifications, when measuring range and full range of input LVDT are the same.

•Satisfy the following when using LF Series LVDT :

$$1 \leq \frac{\text{Full range of input LVDT}}{\text{Measuring range}} \leq 2$$

•This signal conditioner does not support the zero shift function, so the null point is always the center position of measurement.

Specification

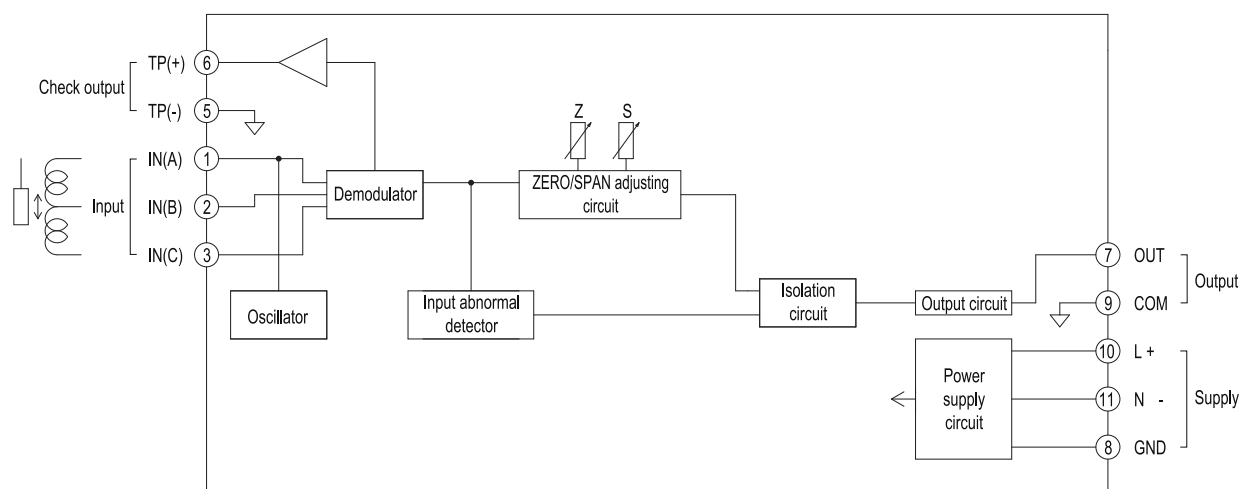
Model	VM-21P 3-Wire LVDT	VM-21D 6-Wire LVDT
Input LVDT	LS Series	LF Series
Measuring Range	See Model Code above	
Output (isolated)	1 to 5VDC (output resistance : 250Ω) or 4 to 20mADC (permissible load resistance : 600Ω or less)	
I/O Conversion Accuracy	±1% of F.S. at 25°C, ±2% of F.S. at 0 to 50°C Deviation from an ideal linear output of voltage or current in combination with LS Series LVDT. However, when measuring range and full range of input LVDT are the same.	±1.5% of F.S. at 25°C, ±3% of F.S. at 0 to 50°C Deviation from an ideal linear output of voltage or current in combination with LF Series LVDT. However, when measuring range and full range of input LVDT are the same.
Response Speed	$\tau = 45\text{ms}$, 90% response	
Polarity	Can be changed by wiring	
Burn-down Function*1	Detects transducer failure and causes the 4 to 20mADC (1 to 5VDC) output to go to less than 0.8mADC (0.2VDC)	
T.P. Output (test point output for confirmation null point)	Output 0V when core position is on Null point. Output impedance : 100Ω	Output 0V when core position is on Null point. Output impedance : 1kΩ
Output for LVDT Excitation	Voltage : 5Vrms, Frequency : 3kHz, Max. current : 50mA, Sine wave	Voltage : 7Vrms, Frequency : 1kHz, Max. current : 35mA, Sine wave
Supply Permissible Voltage	24VDC±10% or 85 to 264VAC/DC (50/60Hz)	
Power Consumption	24VDC:3.5W, 110VDC:3.5W, 100-240VAC:10VA	24VDC:6.0W, 110VDC:6.0W, 100-240VAC:10VA
Insulation Resistance	100MΩ minimum at 500VDC between input—output—power—GND mutually.	
Withstanding Voltage	2000VAC for one minute between input—output—power—GND mutually. (with VM-21H : 1,000VAC between output—GND.)	
Operating Temperature	0 to 50°C (32 to 122°F REF.)	
Relative Humidity	10 to 90%RH (no condensation)	
Casing Material (color)	Modified polyphenylene oxide (black)	
Weight	Approx. 110g (0.24lb)	
CE Marking	Only as for 24VDC power supply specifications.	

*1 Abnormal condition

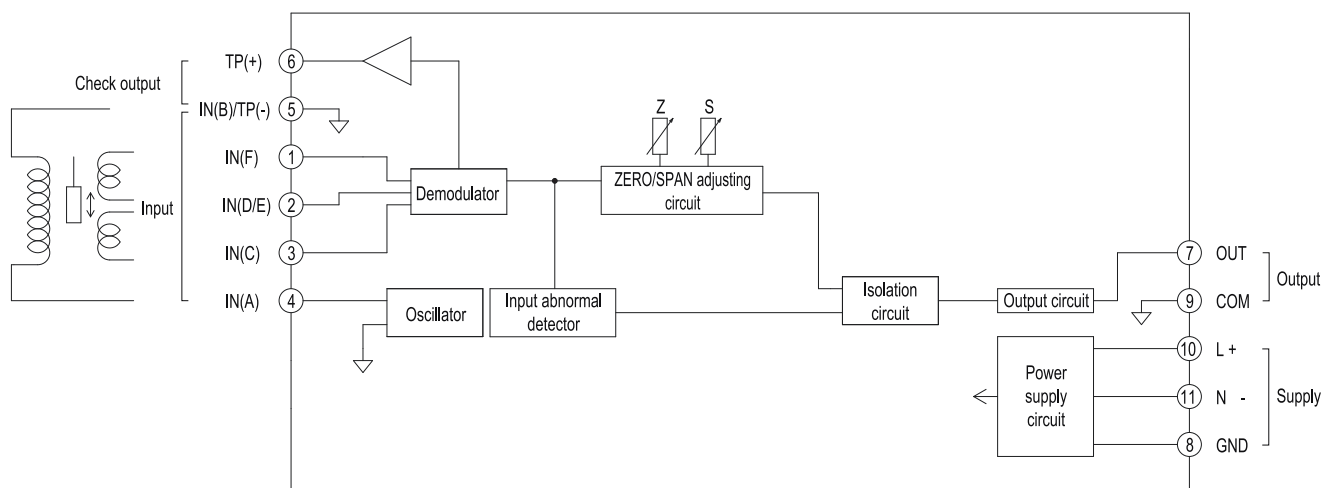
- When there is an abnormality in the LVDT or signal cable (breaking in LVDT wiring, breaking or short circuit in signal cable). However, VM-21D may be some instances where these conditions will not be detected.
- When there is an abnormality in LVDT excitation output (oscillation has stopped).

■ Block Diagram

● VM-21P 3-Wire LVDT (LS Series)



● VM-21D 6-Wire LVDT (LF Series)



Model Code No.

VM-21G Signal Conditioner Socket VM-21G

Specification

Model	VM-21G Signal Conditioner Socket
Terminal Screw Size	M3
Number of Mountable Signal Conditioners	1
Operating Temperature	0 to 50°C (32 to 122°F REF.)
Relative Humidity	10 to 90%RH (no condensation)
Installation	DIN rail, wall-mounted
External Dimensions	W29.5 × H72 × D30 (mm)
Casing Material (color)	Polyphenylene oxide (black)
Weight	Approx. 50g (0.11lb)
CE Marking	Only as for 24VDC power supply specifications

Terminal Arrangement

	③	②	①
⑥		⑤	④
⑨		⑧	⑦
	⑪	⑩	

Terminal No.	VM-21K	VM-21A	VM-21T	VM-21R		VM-21P	VM-21D
				FK input	MS input		
1	– 24V		– 24V	– 24V		IN (A)	IN (F)
2	IN	IN	IN	IN	IN	IN (B)	IN (D/E)
3	COM	COM	COM	COM	COM	IN (C)	IN (C)
4		WAVE		PULSE	PULSE		IN (A)
5	COM	COM	COM	COM	COM	TP (–)	IN (B) / TP (–)
6	BUF	BUF	BUF	BUF	BUF	TP (+)	TP (+)
7	OUT						
8	GND						
9	COM						
10	L+						
11	N–						

This is also recommended

Easily integrated into existing process control systems

4-20mA loop powerd velocity transducer CV-420



Feature

- It provide a 4-20mA output proportional to velocity vibration.
- Easily integrated into existing process control systems.
- Dust / water resistance (IP67)

■ Specifications

Full Scale : 0.5ips(12.8mm/s), 1.0ips(25.4mm/s), 2.0ips(50.8mm/s)
Output : 4-20mA
Frequency Response : 10Hz ~ 1kHz \pm 10%, 3.5Hz ~ 2kHz \pm 3dB
Temperature : -40 ~ +105°C

A digital, compact and versatile BOP monitor

Small condition monitor VM-25



Feature

- Easily connenct to your PLC or DCS via Modbus/TCP.
- It can monitor Displacement/Velocity/Acceleration vibration.
- It's small footprint only requires minimal space, measuring W160mm, H100mm, D113mm.

■ Specifications

Input Transducer : FK-202F, CV-86, CV-87, CA-302, Voltage signal
Input Points : 2ch /slot, Up to 8ch(4 slots)
Output : 4-20mA or 1-5V
Relay Output Points : 4ch/slot

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