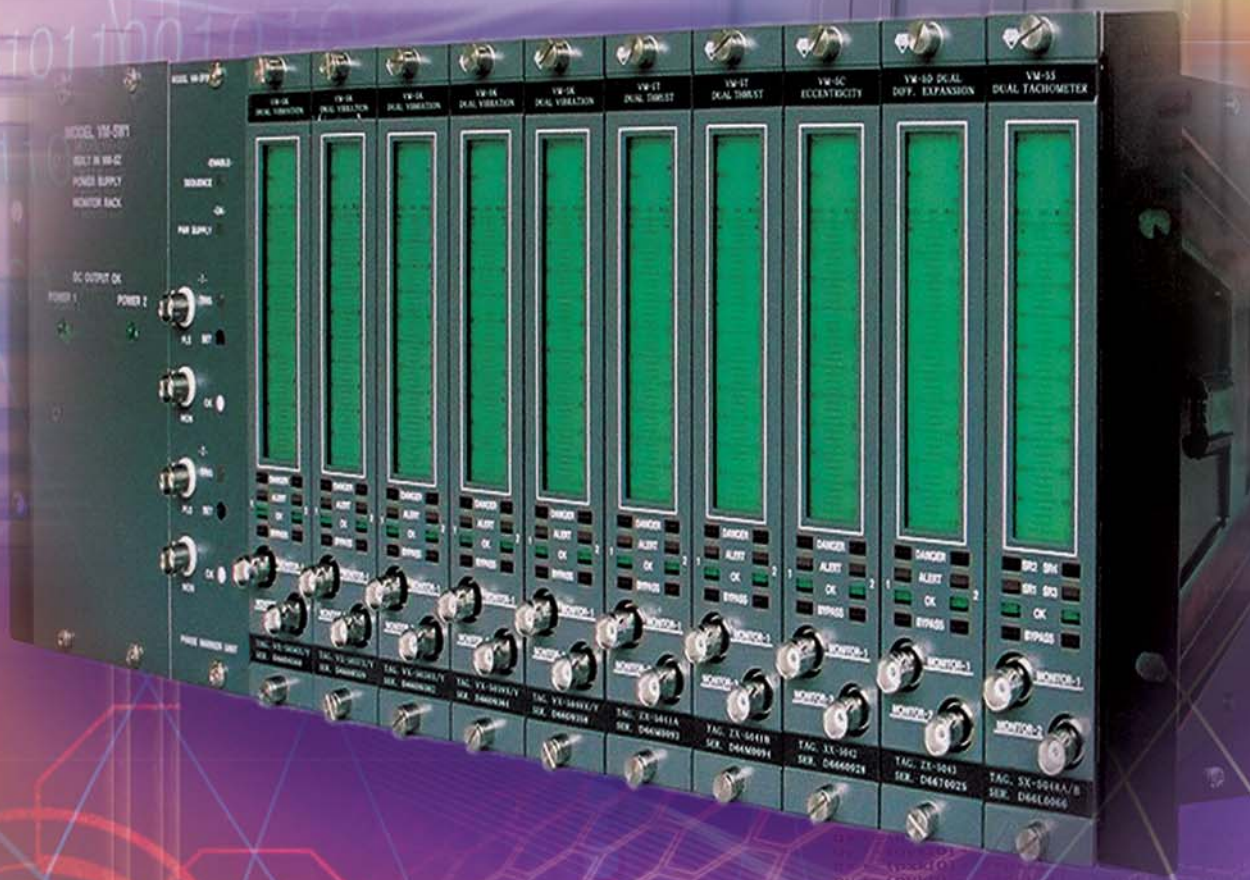
# VM-5 series

# MONITOR

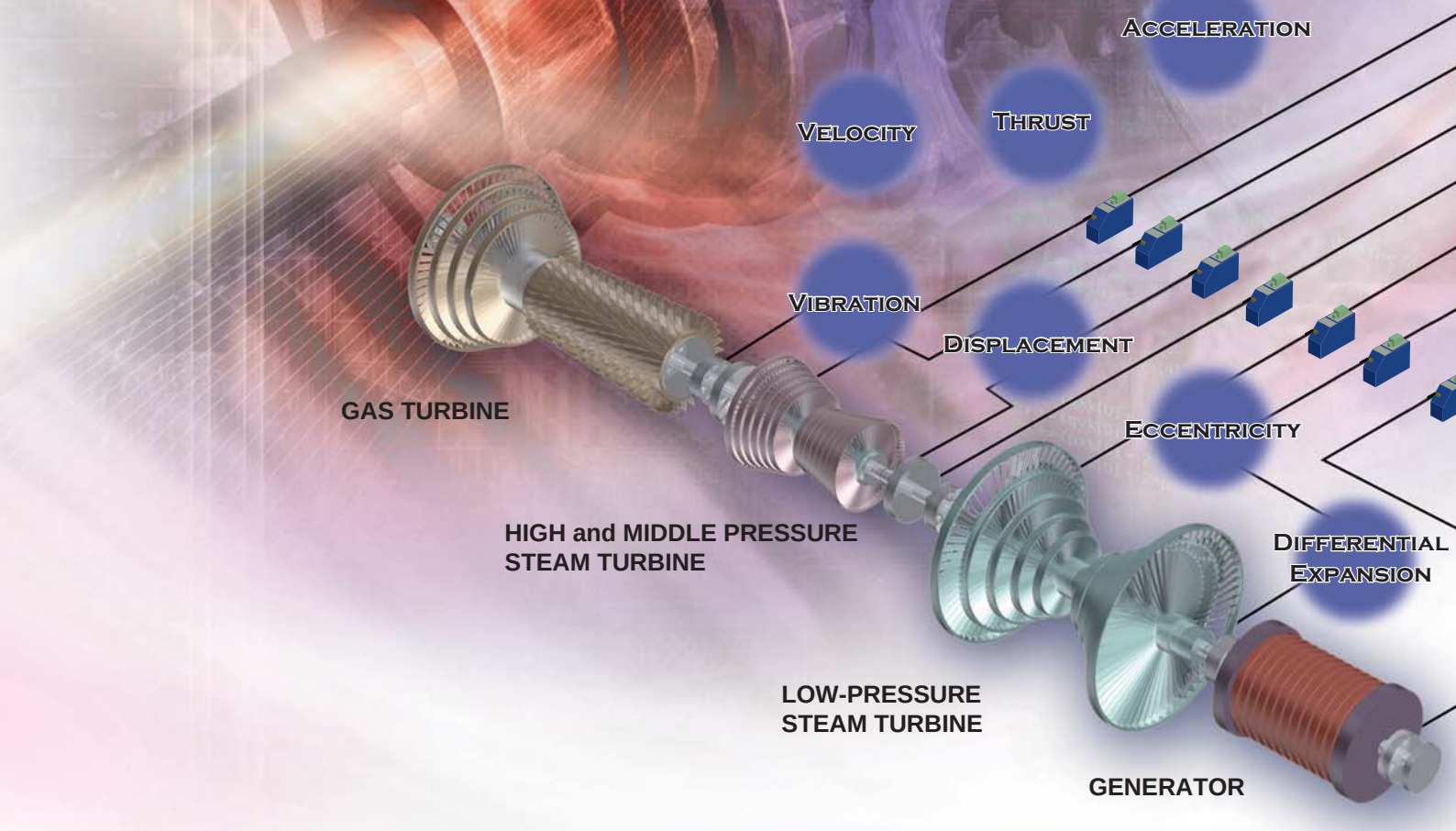


SHINKAWA Sensor Technology, Inc.

# MONITORING SYSTEM FOR ALL ROTATI

# VM-5 SERIES MONITOR

**The VM-5 Series Monitors are designed in accordance with the American Petroleum Institute (API) Standard 670 for use on rotating machinery. The 8-slot and 10-slot Rack Mounting types, and the Single Unit type with a built-in power supply, are available so that these Monitors can flexibly respond to any system design from medium- and small-scale rotating machinery to TSI (Turbine Supervisory Instrumentation) for generator purpose large turbines. In addition, the designs are user-friendly so that all operations and checks can be performed from the Monitor fronts without stopping operation. They also include all functions necessary for monitoring various variables of rotating machinery from displacement and vibration to zero-speed, thereby enabling any system design corresponding to the machinery type and scale.**



# NG MACHINERY, FROM LARGE TO SMALL

## MONITOR FOR TSI, VM-5

The VM-5 Series provides 18 different Monitor units, including vibration, displacement and rotation. Several types of failure detection features are available. Especially for TSI (Turbine Supervisory Instrumentation) and other large rotating machinery, essential items, such as vibration, shaft position, eccentricity and differential expansion are precisely monitored.


VM-5 series Monitor

infiSYS RV-200 Vibration Analysis and Diagnostic System and/or Host PC.

**TRANSDUCERS**
(FK/VK series, CV/CA series, LVDT, RD series, MS series)

## FLEXIBLE CONFIGURATION

VM-5 consists of the Monitor unit, relay module, power supply unit and instrument rack. The instrument rack is available in Rack Mounting types (VM-5H3, VM-5W1) and Single Unit type (VM-5G). Flexible selection depends upon the size of the target.

## INPUT SENSOR

SHINKAWA transducer products for input for the VM-5 Series have an excellent reputation and high reliability. The specification of each sensor can fit all requests, and stable monitoring conditions are guaranteed.

TEMPERATURE

CASE EXPANSION

VALVE POSITION

ROTATION

REVERSE ROTATION

*TSI* *Turbine Supervisory Instrumentation*

## 1 DATA COMMUNICATION

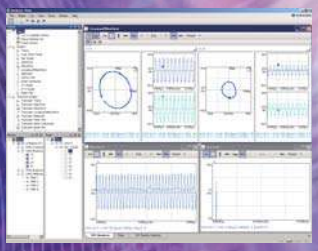
VM-5P Communication / Phase Marker Unit or VM-53 Dual Communication Unit, measurement data and status data can be output to PC. Additionally, alarm settings can be done from a PC.

## 2 RELIABLE HIGH QUALITY SYSTEM

The VM-5W1 Dual Power Supply Instrument Rack can hold two VM-5Z Power Supply Units. Therefore, in case one power supply fails, power is still provided.
The VM-5Z0 Power Supply Backup Module Unit supports system operation in case of power failure, for up to 0.2 sec., and occurs during maximum load conditions.

## 3 ANALYSIS, DIAGNOSIS SYSTEM

Using the infiSYS RV-200 Vibration Analysis and Diagnostic System, detailed diagnosis of rotating machinery failure is possible.
* For details on the infiSYS RV-200, visit our website.



# Flexible Configuration for All Rotating M

## 4 APPROVALS

For ease of operation in all applications, the VM-5 has acquired and declared various standards for inside and outside the country, such as Shipping Classification and CE Marking Standards.


Lloyd's Register of Shipping

DESIGN APPRAISAL DOCUMENT

LLOYD'S REGISTER'S TYPE APPROVAL SYSTEM, 1996

TYPE APPROVAL CERTIFICATE No. FV30858

### SHIPPING CLASSIFICATION STANDARD

The Shipping Classification Standard applies when using the VM-5 as an exclusive rotating machine surveillance meter. Approval must be authorized in each country in which the equipment is used.

[NK] = Japan
[KR] = South Korea
[LR] = England (Lloyd Standard)

### CE MARKING STANDARD

CE Marking is the mark upon which a pasting duty was imposed when circulating a product in the European market. The mark declares that the target product conforms to the European Community instruction demands.

achinery

## System Configuration

The VM-5 Series has two kinds of instrument racks – the Rack Mounting type, VM-5H3 (8-slot) and VM-5W1 (10-slot), and the Single Unit type (VM-5G) with a built-in power supply.

## Installation

With the Rack Mounting type, install Monitor units into the front panel, and related module units into the rear panel. The communication unit and power supply unit are also installed into the rear panel. The Single Unit rack (VM-5G) comes with a preinstalled relay module, so additional module unit installment is unnecessary.

**VM-5H3 Instrument Rack**
**VM-5W1 Dual Power Supply Instrument Rack**

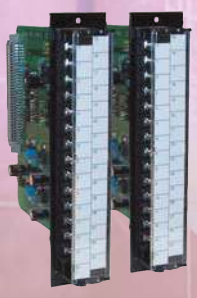
**VM-5G Single Unit Instrument Rack**

### MONITOR UNIT

| | |
|---|---|
| VM-5K | Dual Vibration Monitor |
| VM-55 | Vibration Monitor |
| VM-5U | Dual Seismic Monitor |
| VM-5B | Dual Acceleration Monitor |
| VM-5M | Dual Path Monitor |
| VM-5C | Eccentricity Monitor |
| VM-5T | Dual Thrust Monitor |
| VM-5D | Dual Differential Expansion Monitor |
| VM-5N | Ramp Differential Expansion Monitor |
| VM-5L | Complementary Input Differential Expansion Monitor |
| VM-5J | Case Expansion/Complementary Differential Expansion Monitor |
| VM-5E | Dual Case Expansion Monitor |
| VM-5A | Dual Valve Position Monitor |
| VM-5S | Dual Tachometer |
| VM-5Q | Reverse Rotation Monitor |
| VM-5R | Tachometer |
| VM-51 | Rod Drop Monitor |
| VM-52 | Bottom Hold Monitor |
| VM-5F | Dual Temperature Monitor (*Not applicable for VM-5G rack) |

### MODULE UNIT

* Module units cannot be installed in the VM-5G Rack.



| | |
|---|---|
| VM-5Y | Relay Module Unit |
| VM-5X | Interface Unit |
| VM-5P3 | Phase marker Unit |
| VM-53 | Dual Communication Unit |
| VM-5Z | Power Supply Unit |
| VM-5Z0 | Power Supply Backup Module Unit |

VM-5 SERIES

# MONITOR UNIT

VM-5 Series Monitor units are installed into the front panel of each instrument rack. The LCD display, each display light, and BNC output terminals neatly fit in the slim face panel. (Display styles vary.)
Bar graphs and digital measurement value indications are used on the display, and are easily readable. Bar graphs are also used to indicate DANGER and ALERT. These are also shown clearly. When the alarm occurs, each alarm LED is lit, providing easy visual confirmation.

## Common Specification

| | |
|---|---|
| RECORDER OUTPUT | Voltage or current output proportional to monitor range.<br>1 to 5VDC (Output impedance: 250Ω)<br>4 to 20mADC (Max. load resistance: 500Ω)<br>Option: 0 to -10VDC, 0 to 10VDC, 0 to -5VDC,<br>0 to 5VDC (Output impedance: 100Ω)<br>Output point : 2 points |
| MONITOR OUTPUT<br>(FROM FRONT, REAR PANEL) | Input signal is output via a buffer amplifier.<br>Output impedance: Approx. 100Ω |
| OPERATING TEMPERATURE | 0 to 65°C |

### VM-5 SYSTEM MONITOR UNITS

| | | |
|---|---|---|
| **Vibration** | VM-5K | Dual Vibration Monitor |
| | VM-55 | Vibration Monitor |
| | VM-5U | Dual Seismic Monitor |
| | VM-5B | Dual Acceleration Monitor |
| | VM-5M | Dual Path Monitor |
| | VM-5C | Eccentricity Monitor |
| **Eccentricity Displacement** | VM-5T | Dual Thrust Monitor |
| | VM-5D | Dual Differential Expansion Monitor |
| **Differential Expansion** | VM-5N | Ramp Differential Expansion Monitor |
| | VM-5L | Complementary Input Differential Expansion Monitor |
| | VM-5J | Case Expansion/Complementary Differential Expansion Monitor |
| | VM-5E | Dual Case Expansion Monitor |
| | VM-5A | Dual Valve Position Monitor |
| | VM-5S | Dual Tachometer |
| **Rotation** | VM-5Q | Reverse Rotation Monitor |
| | VM-5R | Tachometer |
| **Temperature** | VM-5F | Dual Temperature Monitor |
| **Others** | VM-51 | Rod Drop Monitor |
| | VM-52 | Bottom Hold Monitor |


## VM-5K Dual Vibration Monitor

Inputs signals from the FK/VK Series Vibration Transducers corresponding to 2 channels. Simultaneously provides 2 points of shaft vibration monitoring within one unit.

## VM-55 Vibration Monitor

Simultaneously monitors both relative and absolute vibrations or relative and seismic vibrations.

## VM-5B Dual Acceleration Monitor

Inputs signals form the CA Series Acceleration Transducer corresponding to 2 channels.

## VM-5U Dual Seismic Monitor

Inputs signals from the CV Series Velocity Transducer corresponding to 2 channels.

## VM-5M Dual Path Monitor

Simultaneously monitors the velocity/acceleration and displacement/velocity vibration of rotating machinery detected by CV Series Velocity Transducer or CA Series Acceleration Transducer. Detects machine failures early on and informs the operator of these failures.

| | VM-5K Dual Vibration Monitor | VM-55 Vibration Monitor | VM-5U Dual Seismic Monitor | VM-5B Dual Acceleration Monitor | VM-5M Dual Path Monitor |
|---|---|---|---|---|---|
| INPUT TRANSDUCER | FK/VK series, VC series | FK/VK series, CV series | CV series | CA series | CV series, CA series |
| INPUT POINT | 2 points | | | | 1 point |
| MONITOR RANGE | 0 to 500 μm pk-pk<br>(0 to15 mils pk-pk) | 0 to 800 μm pk-pk<br>(0 to15 mils pk-pk) | 0 to 500 μm pk-pk<br>(0 to 20 mils pk-pk)<br>or<br>0 to 50 mm/s pk<br>(0 to 2 in/s pk)<br>or<br>0 to 50 mm/s rms<br>(0 to 2 in/s rms) | 0 to 200 m/s² pk<br>(0 to 20 G pk)<br>or<br>0 to 100 mm/s pk<br>(0 to 2 in/s pk)<br>or<br>0 to 200 m/s² rms<br>(0 to 20 G rms)<br>or<br>0 to 100 mm/s rms<br>(0 to 2 in/s rms) | 0 to 200 m/s²<br><br>(0 to 20 G) pk or rms<br>or<br>0 to 50 mm/s<br>(0 to 2in/s ) pk or rms<br>or<br>0 to 100 mm/s<br>(0 to 2in/s) pk or rms<br>or<br>0 to 500 μm pk-pk<br>(0 to 20 mils pk-pk) |
| RECORDER OUTPUT CONVERSION ACCURACY | +/- 0.5% of F.S. at 100Hz at 25 °C<br>+/- 2.0% of F.S. at 100Hz at 0 to 65°C | +/- 3.0% of F.S. at 100Hz at 25°C<br>+/- 5.0% of F.S. at 100Hz at 0 to 65°C | +/- 0.5% of F.S. at calibration frequency at 25°C<br>+/- 2.0% of F.S. at calibration frequency at 0 to 65°C | | |
| ALARM SET POINT | 4 points (DANGER1, ALERT1, DANGER2, ALERT2) | | | | |


## VM-5C Eccentricity Monitor

Monitors the shaft deflection (eccentricity pk-pk) of the turbine rotor at machine start-up and turning.

## VM-5T Dual Thrust Monitor

Monitors the shaft position of rotating machinery. Inputs thrust displacement signals from the FK/VK Series Transducers and monitors shaft position.

| | VM-5C Eccentricity Monitor | VM-5T Dual Thrust Monitor |
|---|---|---|
| INPUT TRANSDUCER | FK/VK series, RD series, MS series, VC series | FK/VK series, VC series |
| INPUT POINT | 2 points | |
| MONITOR RANGE | Monitor range pk-pk :<br>0 to 1,000 μm pk-pk(0 to 50 mils pk-pk)<br>Monitor range direct :<br>-500 to 0 to +500 μm(- 25 to 0 to +25 mils) | -2.0 to 0 to +2.0 mm(-80 to 0 to +80 mils) |
| RECORDER OUTPUT CONVERSION ACCURACY | +/- 1.0% of F.S. at 25°C<br>+/- 2.0% of F.S. at 0 to 65°C | +/- 0.5% of F.S. at 25°C<br>+/- 2.0% of F.S. at 0 to 65°C |
| ALARM SET POINT | Eccentricity pk-pk : 2 points (DANGER1, ALERT1)<br>Direct : 4 points<br>(H-DANGER2, H-ALERT2, L-ALERT2, L-DANGER2) | 8 points (H-DANGER1, H-ALERT1, L-ALERT1,<br>L -DANGER1, H-DANGER2, H-ALERT2,<br>L -ALERT2, L-DANGER2) |


# Differential Expansion

## VM-5D Dual Differential Expansion Monitor

Measures the differential expansion caused by thermal expansion of the rotor and casing. Inputs the expansion of the rotor away from the thrust bearing detected with the VK Series Transducer to measure the differential expansion.

## VM-5N Ramp Differential Expansion Monitor

Measures the differential expansion caused by the thermal expansion of the rotor and casing. Inputs the expansion of the rotor detected by the VK Series Transducers installed on the rotor ramp away from the thrust bearing, then outputs the computed differential expansion, thereby eliminating the measurement error resulting from rotor lifting caused by oil film, etc.

## VM-5L Complementary Input Differential Expansion Monitor

Measures the differential expansion caused by the thermal expansion of the rotor and casing. Receives input from two sensors installed in a complementary arrangement and can measure the differential expansion to twice the sensor range.

## VM-5J Case Expansion / Complementary Differential Expansion Monitor

Measures differential thermal expansion between the rotor and case of rotating machinery. Accepts the output of the VM-5L Complementary Input Differential Expansion Monitor and the case expansion signal from the LVDT, performs compensation, and computes the differential expansion value.

## VM-5E Dual Case Expansion Monitor

Inputs the casing expansion signal from the LS Series LVDT Linear Variable Differential Transformer and displays them on LCDs.

## VM-5A Dual Valve Position Monitor

Inputs the valve position signal from the LS Series LVDT linear Variable Differential Transformer and displays them on LCDs.

| | VM-5D Dual Differential Expansion Monitor | VM-5N Ramp Differential Expansion Monitor | VM-5L Complementary Input Differential Expansion Monitor |
|---|---|---|---|
| INPUT TRANSDUCER | VK-143P, VK-263P, VC series | | |
| INPUT POINT | 2 points | | |
| MONITOR RANGE | -10 to 0 to +10mm<br>(-0.5 to 0 to +0.5inch ) or<br>0 to 20mm(0 to 1.0inch) | -25 to 0 to +25mm<br>(-1.0 to 0 to +1.0inch ) or<br>0 to 50mm(0 to 2.0inch) | 0 to 75mm (0 to 2.0inch) or<br>-25 to 0 to +25mm<br>(-1.0 to 0 to +1.0inch ) |
| RECORDER OUTPUT CONVERSION ACCURACY | +/- 0.5% of F.S. at 25°C<br>+/- 2.0% of F.S. at 0 to 65°C | | |
| ALARM SET POINT | 8 points (H-DANGER1, H-ALERT1, L-ALERT1, L-DANGER1, H-DANGER2, H-ALERT2, L-ALERT2, L-DANGER2) | 4 points (H-DANGER, H-ALERT, L-ALERT, L-DANGER) | |

| | VM-5J Case Expansion / Complementary Differential Expansion Monitor | VM-5E Dual Case Differential Monitor | VM-5A Dual Valve Position Monitor |
|---|---|---|---|
| INPUT TRANSDUCER | CH1:1 to 5V CH2:-10 to 0 to +10V | VM-11P | |
| INPUT point | 2 points | | |
| MONITOR RANGE | CH1:-7 to 0 to +12mm<br>CH2:0 to +50mm | 0 to 100mm (0 to 4.0inch) | 0 to 300mm |
| RECORDER OUTPUT CONVERSION ACCURACY | CH1: +/- 1.0% of F.S. at 25°C<br>+/- 2.0% of F.S. at 0 to 65°C<br>CH2: +/- 0.5% of F.S. at 25°C<br>+/- 2.0% of F.S. at 0 to 65°C | +/- 0.5% of F.S. at 25°C<br>+/- 2.0% of F.S. at 0 to 65°C | |
| ALARM SET POINT | 4 points (H-DANGER, H-ALERT, L-ALERT, L-DANGER) | 8 points (H-DANGER1, H-ALERT1, L-ALERT1, L-DANGER1, H-DANGER2, H-ALERT2, L-ALERT2, L-DANGER2)<br>In case of differential operation, 4 points (H-DANGER, H-ALERT, L-ALERT, L-DANGER) | 8 points (H-DANGER1, H-ALERT1, L-ALERT1, L-DANGER1, H-DANGER2, H-ALERT2, L-ALERT2, L-DANGER2) |


## VM-5S Dual Tachometer

Monitors the rotor speed of the shaft and zero-speed.

## VM-5R Tachometer

Monitors the rotor speed and rotor acceleration of the shaft, and can set speed comparison values to the rotor velocity or rotor acceleration independently.

## VM-5Q Reverse Rotation Monitor

Provides detection of reverse revolutions, indicating peak reverse speed values that have occurred.

| | VM-5S Dual Tachometer | VM-5Q Reverse Rotation Monitor | VM-5R Tachometer |
|---|---|---|---|
| INPUT TRANSDUCER | FK series, RD series, MS series, VE series, VC series | FK series, RD series, VE series, VC series | FK series, RD series, MS series, VE series, VC series |
| INPUT POINT | 2 points | | 1 point |
| MONITOR RANGE | Up to 99,999rpm | Forward or Reverse, Up to 20,000rpm | Velocity : Up to 20,000rpm<br>Acceleration : -9,999 to +9,999rpm/min |
| RECORDER OUTPUT CONVERSION ACCURACY | +/- 0.5% of F.S. at 25°C<br>+/- 2.0% of F.S. at 0 to 65°C | | Velocity :<br>+/- 0.5% of F.S. at 25°C<br>+/- 2.0% of F.S. at 0 to 65°C<br>Acceleration :<br>+/- (20rpm/F.S.) x100 +/- 0.5% of F.S. at 25°C<br>+/- (20rpm/F.S.) x100 +/- 2.0% of F.S. at 0 to 60°C |
| SPEED RELAY SET POINT | 4 points (SR1, SR2, SR3, SR4) | Forward (SR1, SR2)<br>Reverse (SR3, SR4) | 4 points (SR1, SR2, SR3, SR4) |


## VM-5F Dual Temperature Monitor

This monitor is designed to monitor the temperature of rotating machinery. It inputs signals from grounded/non-grounded thermocouples, or 3-wire/4-wire RTDs and displays them on LCDs.

| | VM-5F Dual Temperature Monitor |
|---|---|
| INPUT TRANSDUCER | Thermocouple or RTD |
| INPUT POINT | 2 points |
| MONITOR RANGE | 0 to 1,000°C ( 0 to 2,000°F ) |
| RECORDER OUTPUT CONVERSION ACCURACY | <=500°C (1,000°F) of monitor range : +/- 1.0°C (1.8°F) +/- 0.5% of F.S.<br>>500°C (1,000°F) and <= 1,000°C (2,000°F) of monitor range :<br>+/- 2.0°C (3.6°F) +/- 0.5% of F.S. |
| ALARM RELAY SET POINT | 8 points (H-DANGER1, H-ALERT1, L-ALERT1, L-DANGER1, H-DANGER2, H-ALERT2, L-ALERT2, L-DANGER2) |


## VM-51 Rod Drop Monitor

Monitors the gap between the piston rod set as the target and the sensing surface of the sensor for rod drop measurement (FK/VK) so as to synchronize with the phase marker, and then converts the gap thus measured to the amount of rider ring abrasion.

## VM-52 Bottom Hold Monitor

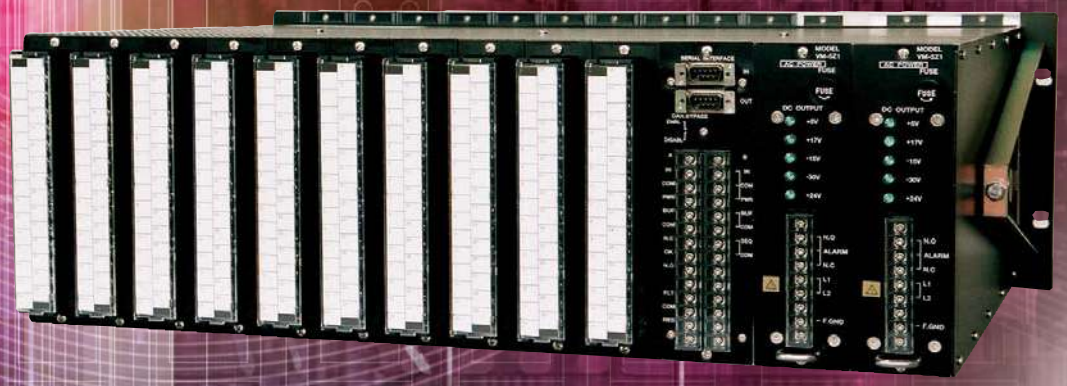
Monitors the gap between the piston set as the target and the sensing surface of the sensor for rider ring abrasion measurement to obtain the amount of abrasion.

| | VM-51 Rod Drop Monitor | VM-52 Bottom Hold Monitor |
|---|---|---|
| INPUT TRANSDUCER | FK/VK series | FK-452F, VK-452A |
| INPUT POINT | 2 points | |
| MONITOR RANGE | 0 to 10.0mm | 0 to 4.5mm |
| RECORDER OUTPUT CONVERSION ACCURACY | +/- 1.0% of F.S. at 25°C<br>+/- 2.0% of F.S. at 0 to 65°C | |
| ALARM RELAY SET POINT | 8 points (H-DANGER1, H-ALERT1, L-ALERT1, L-DANGER1, H-DANGER2, H-ALERT2, L-ALERT2, L-DANGER2) | |

VM-5 SERIES

# MODULE UNIT

This unit is available in several different styles - Relay, Interface, Communication, Phase Marker, Power Supply unit, etc., and provides high functioning and reliability. To use, install into the front or rear panel of the instrument rack (VM-5H3 Instrument Rack or VM-5W1 Dual Power Supply Instrument Rack).



| VM-5 SYSTEM COMBINATION | | | | VM-5G SINGLE UNIT INSTRUMENT RACK | VM-5H3 INSTRUMENT RACK | VM-5W1 DUAL POWER SUPPLY INSTRUMENT RACK |
|---|---|---|---|---|---|---|
| **MONITOR** | VIBRATION | **VM-5K** | Vibration | ○ | ○ | ○ |
| | | **VM-55** | Vibration | ○ | ○ | ○ |
| | | **VM-5U** | Velocity Vibration | ○ | ○ | ○ |
| | | **VM-5B** | Acceleration Velocity | ○ | ○ | ○ |
| | | **VM-5M** | Velocity Acceleration | ○ | ○ | ○ |
| | DISPLACEMENT | **VM-5C** | Eccentricity | ○ | ○ | ○ |
| | | **VM-5T** | Thrust | ○ | ○ | ○ |
| | DIFFERENTIAL EXPANSION | **VM-5D** | Differential Expansion | ○ | ○ | ○ |
| | | **VM-5N** | Differential Expansion | ○ | ○ | ○ |
| | | **VM-5L** | Differential Expansion | ○ | ○ | ○ |
| | | **VM-5J** | Differential Expansion | ○ | ○ | ○ |
| | | **VM-5E** | Expansion | ○ | ○ | ○ |
| | | **VM-5A** | Valve Position | ○ | ○ | ○ |
| | ROTATION | **VM-5S** | Rotation | ○ | ○ | ○ |
| | | **VM-5Q** | Reverse Rotation | ○ | ○ | ○ |
| | | **VM-5R** | Rotation | ○ | ○ | ○ |
| | TEMPERATURE | **VM-5F** | Temperature | | ○ | ○ |
| | OTHERS | **VM-51** | Rod Drop | ○ | ○ | ○ |
| | | **VM-52** | Bottom Hold | ○ | ○ | ○ |
| **RELAY** | | **VM-5Y** | | | ○ | ○ |
| **INTERFACE** | | **VM-5X** | | | ○ | ○ |
| **PHASE MARKER** | | **VM-5P** | | | ○ | ○ |
| **COMMUNICATION** | | **VM-53** | | | ○ | ○ |
| **POWER SUPPLY** | | **VM-5Z** | | | ○ | ○ |
| | | **VM-5Z0** | | | ○ | ○ |

# VM-5Y1,2,3 Relay Module Unit

These units are designed for use with VM-5 Series Monitors. Mounted on the rear panel of the VM-5H3 or VM-5W1 Instrument Rack, they output contact signals such as input abnormal, alert and danger alarms for sequence control. Using 10mm-pitch two column large-sized terminal block, there is no complicated wiring involved.

### STANDARD SPECIFICATION

| | |
|---|---|
| RELAY POINT | 4 points (DANGER1, ALERT1, DANGER2, ALERT2)<br>2 points (DANGER, ALERT)<br>6 points (DANGER1, ALERT1, DANGER2, ALERT2, OK1, OK2) |
| POWER OUTPUT FOR TRANSDUCER | 4mA, 24VDC (Input code : 1)<br>-24VDC, 40mA (Input code 2) |
| CONTACT RATING (Load resistance) | 250VAC, 5A 30VDC, 5A |

| | |
|---|---|
| CONTACT LIFE | 100,000 times or more (rated load) |
| PROTECTIVE CONSTRUCTION | Plastic Seal |
| TEMPERATURE RANGE | Operating Temperature : 0 to 65°C<br>Storage Temperature : -30 to +85°C<br>Relative Humidity : 20 to 95%RH (non-condensing) |
| MASS | Max. 0.4kg |

# VM-5Y4,5,6 Relay Module Unit

These units are the connector type Relay Module. Mounted on the rear panel of the VM-5H3 or VM-5W1 Instrument Rack, VM-5Y4 and 6 can output the recorder output and alarm output signal, and VM-5Y5 can output the buffer output and alarm output signal through the D-sub connector. They also output contact signals of the sequence control for input abnormal, alert and danger alarms from the terminal block. An arc suppressor (optional) absorbs the arc discharge between contacts to prevent damage to the internal circuits.

### STANDARD SPECIFICATION

| | |
|---|---|
| RELAY POINT | 5 points (DANGER1, ALERT1, DANGER2, ALERT2, OK) |
| POWER OUTPUT FOR TRANSDUCER (VM-5Y4.5) | Input code 1 : 2-wire constant current power supply : 4mA, 24VDC<br>Input code 2 : -24VDC, 40mA |
| POWER OUTPUT FOR PICKUP (VM-5Y6) | +12VDC, 40mA |
| CONTACT RATING (Load resistance) | 250VAC, 5A 30VDC, 5A |
| CONTACT LIFE | 100,000 times or more (rated load) |
| PROTECTIVE CONSTRUCTION | Plastic Seal |
| TEMPERATURE RANGE | Operating Temperature : 0 to 65°C<br>Storage Temperature : -30 to +85°C<br>Relative Humidity : 20 to 95%RH (non-condensing) |
| MASS | Max.0.4 kg |

| | |
|---|---|
| INPUT/OUTPUT CONNECTOR TERMINAL BLOCK (VM-5Y4.6) | D-Sub 9P connector 1 pc<br>CN1 : Recorder output 2CH<br>Alarm output L : -1 to +1V H : 4V to 6V<br>OK, ALERT, DANGER 2 points each<br>Terminal block 16pc<br>Input transducer : 2CH<br>Contact output (OR state of CH1 and 2)<br>ALERT, DANGER 2 points each |
| (VM-5Y5) | D-Sub 9P connector 1pc<br>CN1 : Buffer output 1CH<br>Alarm output L : -1 to +1V H : 4V to 6V<br>OK 1point, ALERT, DANGER 2 points each<br>Terminal block 16P<br>Input transducer : 1CH<br>Contact output : OK1 point,<br>ALERT, DANGER 2 points each<br>Recorder output : 1CH |

* That module units can not correspond to isolation recorder output specification.

# VM-5Y7 Relay Module Unit

Designed for use with the VM-5F Dual Temperature Monitor. Mounted on the rear panel of the VM-5H3 or VM-5W1 Instrument Rack, it outputs a contact signal of sequence control for alert and danger alarms.

### STANDARD SPECIFICATION

| | |
|---|---|
| RELAY POINT | 4 points (DANGER1, ALERT1, DANGER2, ALERT2) |
| CONTACT RATING (Load resistance) | 250VAC, 5A 30VDC, 5A |
| CONTACT LIFE | 100,000 times or more (rated load) |
| PROTECTIVE CONSTRUCTION | Plastic Seal |

| | |
|---|---|
| TEMPERATURE RANGE | Operating Temperature : 0 to 65°C<br>Storage Temperature : -30 to +85°C<br>Relative Humidity : 20 to 95%RH (non-condensing) |
| MASS | Max. 0.4kg |

# VM-5X1,2,3 Interface Unit

Distribute and output the recorder output from the VM-5 Series Monitor Units. They also output analog signals distributed from the VM-5X2,3 Interface Unit I/O module mounted on the rear panel of the VM-5H3 or VM-5W1 Instrument Rack. Using a 10mm-pitch two column large-sized terminal block, there is no complicated wiring (VM-5X2). The VM-5X3 Interface Unit I/O Module (connector type) outputs recorder output from the D-sub connector.

### STANDARD SPECIFICATION (VM-5X1)

| | |
|---|---|
| INPUT | 1 to 5VDC or 4 to 20mADC<br>Input point : 2 points |
| INPUT IMPEDANCE | 1 to 5VDC : Approx. 1MΩ<br>4 to 20mADC : Approx. 250Ω |
| OUTPUT | Voltage or current output proportional to input<br>1 to 5VDC (Output impedance 250Ω)<br>4 to 20mADC (Max. load resistance : 500Ω)<br>Output point : 8 points<br>(4 output points per 1 input point) |
| OUTPUT CONVERSION ACCURACY | +/- 0.5% of F.S. at 25°C<br>+/- 2.0% of F.S. at 0 to 65°C |
| TEMPERATURE RANGE | Operating temperature : 0 to 65°C<br>Storage temperature : -30 to +85°C<br>Relative humidity range : 20 to 95%RH (non-condensing) |
| MATERIAL & FINISH | Face plate : Aluminum Munsell N-4.0 (equiv.) |
| MASS | Max. 0.5kg |

### (VM-5X2)

| | |
|---|---|
| TEMPERATURE RANGE | Operating temperature : 0 to 65°C<br>Storage temperature : -30 to +85°C<br>Relative humidity : 20 to 95%RH (non-condensing) |
| MASS | Max. 0.4kg |

### (VM-5X3)

| | |
|---|---|
| INPUT/OUTPUT CONNECTOR TERMINAL BLOCK | D-Sub 9P connector 1pc<br>CN1 : Recorder output 2 CH x 1 point<br>Terminal block 16pc<br>Input : 2CH<br>Recorder output 2 CH x 3 points |
| TEMPERATURE RANGE | Operating temperature : 0 to 65°C<br>Storage temperature : -30 to +85°C<br>Relative humidity : 20 to 95%RH (non-condensing) |
| MASS | Max. 0.4kg |

# VM-5P3 Phase Marker Unit

Accommodated in a VM-5H3 or VM-5W1 Instrument Rack, these units process phase marker signals, and provide OK alarm contact output and internal power supply voltage failure detection.

### STANDARD SPECIFICATION

| | |
|---|---|
| POWER SUPPLY | Supplied from instrument rack (VM-5H3 or VM-5W1) |
| INPUT TRANSDUCER | FK, RD series |
| SIGNAL | Phase marker 2ch Max.<br>Output impedance : Approx. 10kΩ |
| INPUT VOLTAGE RANGE | 0 to 25VDC (VM-5P3) |
| BUFFER OUTPUT | Phase marker signal : 2ch<br>Output impedance : 50Ω |
| PULSE OUTPUT | Shaped pulse signal is output via a buffer amplifier.<br>Signal level : -1 to +1V ($P_L$), 4 to 6V ($P_H$) |
| TRANSDUCER POWER SUPPLY | -24VDC+/- 1V, 20mA |

| | |
|---|---|
| TEMPERATURE RANGE | Operating temperature : 0 to 65°C<br>Storage temperature : -30 to +85°C<br>Relative humidity : 20 to 95%RH (non-condensing) |
| MATERIAL AND FINISH | Face plate : Aluminum Munsell N-4.0 (equiv.) |
| MASS | Unit : Max. 0.6kg |

# VM-53 Dual Communication Unit

This unit has two independent serial ports. While inserted in a relay module slot of the VM-5H3 or VM-5W1 Instrument Rack, it collects static data in the rack by the Modbus protocol and then sends it to an external host computer. In addition, as this unit can be daisy chain-connected, it enables data collection from two or more racks.

### STANDARD SPECIFICATION

| | |
|---|---|
| COMMUNICATION DATA | Measurement value, set gap voltage, OK state, ALERT state, DANGER state, DANGER bypass state, CH bypass state |
| INPUT/OUTPUT CONNECTOR | D-Sub 9P 4 pc (CN1 to CN4) |
| SERIAL INTERFACE | RS-232 or RS-485<br>(can be changed by internal switch) |
| BAUD RATE | 1200,2400,4800,9600,19200 bps (RS-232)<br>1200,2400,4800,9600,19200,38400 bps (RS-485) |
| DATA LENGTH | 7 bit or 8 bit (can be changed with connected PC) |
| PARITY | ODD (odd number), EVEN (even number), NONE (none)<br>(can be changed with connected PC) |
| STOP BIT | 1 bit or 2 bit<br>(can be changed with connected PC) |
| FLOW CONTROL | None |

| | |
|---|---|
| PROTOCOL | Modbus® AEG Modicon PI-MBUS-300<br>Reference Manual Uses Remote Terminal Unit (RTU)<br>Transmission mode.<br>Modbus is a registered trademark of Modicon,Inc. |
| ID SETTING | Set range 1 to 10<br>(can be changed with connected PC) |
| TERMINAL SETTING | ON or OFF<br>(can be changed by internal switch) |
| PHASE MARKER OK STATUS | TB (Valid) or FIX (Invalid)<br>(can be changed by internal switch) |
| TEMPERATURE RANGE | Operating temperature : 0 to 65°C (without battery)<br>/ 0 to 50°C (with battery)<br>Storage temperature : -30 to +85°C (without battery)<br>/ -20 to +55°C (with battery)<br>Relative humidity : 20 to 95%RH (non-condensing) |
| MASS | Max. 0.4kg |

# VM-5Z1,2,3,4 Power Supply Unit

Provides DC power to each VM-5 Series unit mounted in the same instrument rack. A fault in the power supply is indicated by lighting of the power supply OK lamp and alarm contact output.

### STANDARD SPECIFICATION

| | |
|---|---|
| ALARM CONTACT OUTPUT | Function : OK<br>Contact capacity (load resistance) : 250VAC, 5A 30VDC, 5A<br>Contact type : C contact / Dry contact |
| RELAY MODE | Normally energized |
| CONTACT LIFE | 100,000 times or more (rated load) |
| PROTECTIVE CONSTRUCTION | Plastic sealed |
| INSULATION RESISTANCE | Between power supply and GND : 100MΩ or more at 500VDC<br>Between power supply and alarm contact : 100MΩ or more at 500VDC (VM-5Z1, 2, 4)<br>Between GND and alarm contact : 100MΩ or more at 500VDC (VM-5Z1, 2, 4) |

| | |
|---|---|
| DIELECTRIC STRENGTH | Between power supply and GND : 2000VAC, one minute (VM-5Z1,2,4)<br>Between power supply and GND : 1500VAC, one minute (VM-5Z3) |
| POWER CONSUMPTION | VM-5Z1 : 265VA or less<br>VM-5Z2 : 135W or less<br>VM-5Z3 : 170W or less<br>VM-5Z4 : 265VA or less |
| TEMPERATURE RANGE | Operating temperature : 0 to 65°C (VM-5Z1,2,4)<br>0 to 50°C (VM-5Z3)<br>Storage temperature : -30 to +85°C<br>Relative humidity : 20 to 95%RH (non-condensing) |
| MATERIAL AND FINISH | Panel : Aluminum Munsell N-1.0 (equiv.) |
| MASS | Max. 2.2kg (VM-5Z1, 4) ,Max. 3.0kg (VM-5Z2, 3) |

# VM-5Z0 Power Supply Backup Module Unit

Backs up the DC power supplied to each VM-5 Series units mounted in the VM-5H3 or VM-5W1 Instrument Rack, at the time of an instantaneous electric power failure.

### STANDARD SPECIFICATION

| | |
|---|---|
| INSTALLABLE UNIT | This module unit takes up the same space in the VM-5H3 or VM-5W1 instrument rack as two monitor units. |
| BACKUP TIME | 0.2 sec. at Max. load |

| | |
|---|---|
| TEMPERATURE RANGE | Operating temperature : 0 to 50°C<br>Storage temperature : -30 to +85°C<br>Relative humidity : 20 to 95%RH (non-condensing) |
| MASS | Max.0.6kg (Face panel excluded) |

# VM-5 SERIES
# INSTRUMENT RACK

The VM-5 Series Instrument Rack is available in 2 different types, the Mounting type and Single Unit type. The Mounting type also has two versions available, the VM-5H3 (Max. 8 monitor units) and the dual power supply VM-5W1 (Max. 10 monitor units).


| VM-5 SYSTEM COMBINATION | | | | VM-5G SINGLE UNIT INSTRUMENT RACK | VM-5H3 INSTRUMENT RACK | VM-5W1 DUAL POWER SUPPLY INSTRUMENT RACK |
|---|---|---|---|---|---|---|
| **MONITOR** | VIBRATION | **VM-5K** | Vibration | ○ | ○ | ○ |
| | | **VM-55** | Vibration | ○ | ○ | ○ |
| | | **VM-5U** | Velocity Vibration | ○ | ○ | ○ |
| | | **VM-5B** | Acceleration Velocity | ○ | ○ | ○ |
| | | **VM-5M** | Velocity Acceleration | ○ | ○ | ○ |
| | DISPLACEMENT | **VM-5C** | Eccentricity | ○ | ○ | ○ |
| | | **VM-5T** | Thrust | ○ | ○ | ○ |
| | DIFFERENTIAL EXPANSION | **VM-5D** | Differential Expansion | ○ | ○ | ○ |
| | | **VM-5N** | Differential Expansion | ○ | ○ | ○ |
| | | **VM-5L** | Differential Expansion | ○ | ○ | ○ |
| | | **VM-5J** | Differential Expansion | ○ | ○ | ○ |
| | | **VM-5E** | Expansion | ○ | ○ | ○ |
| | | **VM-5A** | Valve Position | ○ | ○ | ○ |
| | ROTATION | **VM-5S** | Rotation | ○ | ○ | ○ |
| | | **VM-5Q** | Reverse Rotation | ○ | ○ | ○ |
| | | **VM-5R** | Rotation | ○ | ○ | ○ |
| | TEMPERATURE | **VM-5F** | Temperature | | ○ | ○ |
| | OTHERS | **VM-51** | Rod Drop | ○ | ○ | ○ |
| | | **VM-52** | Bottom Hold | ○ | ○ | ○ |
| **RELAY** | | **VM-5Y** | | | ○ | ○ |
| **INTERFACE** | | **VM-5X** | | | ○ | ○ |
| **PHASE MARKER** | | **VM-5P3** | | | ○ | ○ |
| **COMMUNICATION** | | **VM-53** | | | ○ | ○ |
| **POWER SUPPLY** | | **VM-5Z** | | | ○ | ○ |
| | | **VM-5Z0** | | | ○ | ○ |

# VM-5W1 Dual Power Supply Instrument Rack

Designed to accommodate the VM-5Z Power Supply Unit. The VM-5 Series Monitor and VM-5Y Relay Module Unit mounts on a standard panel. This rack can accommodate one (1) VM-5P Communication/Phase Marker Unit, and up to ten (10) VM-5 Series Monitors with a VM-5Y Relay Module for each unit.
A duplexes power supply is obtained by mounting two VM-5Z power Supply Unit.

- **API STANDARD 670 COMPLIANT**
- **ALERT AND DANGER ALARM CONTACT OUTPUT**
- **DUAL POWER SUPPLY**
- **OK CONTACT OUTPUT**

### STANDARD SPECIFICATION

| | |
|---|---|
| INPUT FOR OPERATION | Alarm reset (normally open)<br>Sequence (normally open)<br>Filter enable (normally open)<br>Contact type : Dry contact |
| CONTACT LIFE | 100,000 times or more (rated load) |
| PROTECTIVE CONSTRUCTION | Plastic sealed |

| | |
|---|---|
| ALARM CONTACT OUTPUT | Function : System OK (common to all channels)<br>Contact capacity : Load resistance : 250VAC, 5A 30VDC, 5A<br>Contact type : C contact, Dry contact |
| TEMPERATURE RANGE | Operating Temperature : 0 to 65°C<br>Relative Humidity : 20 to 95%RH (non-condensing) |
| MASS | Max. 10kg |

# VM-5H3 Instrument Rack

Accommodates the VM-5P Communication/Phase Marker Unit and VM-5 Series monitors. This rack can accommodate one (1) VM-5P, and up to eight (8) VM-5 Series Monitors with VM-5Y Relay Module Unit and VM-5Z Power Supply Unit for every unit accommodated.

- **API STANDARD 670 COMPLIANT**
- **ALERT AND DANGER ALARM CONTACT OUTPUT**
- **OK CONTACT OUTPUT**

### STANDARD SPECIFICATION

| | |
|---|---|
| INPUT FOR OPERATION | Alarm reset (normally open)<br>Sequence (normally open)<br>Filter enable (normally open)<br>Contact type : Dry contact |
| CONTACT LIFE | 100,000 times or more (rated load) |
| PROTECTIVE CONSTRUCTION | Plastic sealed |

| | |
|---|---|
| ALARM CONTACT OUTPUT | Function : System OK (common to all channels)<br>Contact capacity : Load resistance : 250VAC, 5A<br>30VDC, 5A<br>Contact type : C contact, Dry contact |
| TEMPERATURE RANGE | Operating Temperature : 0 to 65°C<br>Relative Humidity : 20 to 95%RH (non-condensing) |
| MASS | Max. 9kg |

# VM-5G0,1,2 Single Unit Instrument Rack

This type of instrument rack consists of a power supply for each VM-5 Series Monitor (except the VM-5 Communication/Phase Marker Unit and VM-5F Temperature Monitor Unit), SPDT (DAN. 1, DAN. 2, ALE. 1, ALE. 2) four (4) point relay and OK relay.

- **API STANDARD 670 COMPLIANT**
- **ALERT AND DANGER ALARM CONTACT OUTPUT**
- **OK CONTACT OUTPUT**
- **POWER OUTPUT (85 to 264VAC/48 to 64Hz)**
- **STAND ALONE TYPE RACK**

### STANDARD SPECIFICATION

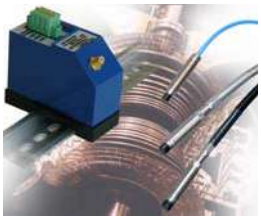
| | |
|---|---|
| RELAY POINT | 5 points (DANGER1, ALERT1, DANGER2, ALERT2, OK) |
| CONTACT RATING (Load resistance) | 250VAC, 0.2A 30VDC, 2A |
| CONTACT LIFE | 100,000 times or more (rated load) |
| CONTACT METHOD | SPDT (DAN1, DAN2, ALE1, ALE2, OK ) 5 points relay |
| PROTECTIVE CONSTRUCTION | Plastic sealed |
| POWER OUTPUT FOR TRANSDUCER | 4mA, 24VDC (Input code : 1)<br>-24VDC, 20mA (Input code : 2)<br>1CH : -24VDC, 40mA 2CH : -24VDC, 20mA (Input code : 3) |
| INPUT FOR OPERATION | Contact for alarm reset (normally open)<br>Contact for sequence (normally open)<br>Contact type : Dry contact |

| | |
|---|---|
| INSULATION RESISTANCE | Between power supply and GND : 100MΩ or more at 500 VDC<br>Between GND and alarm contact : 100MΩ or more at 500 VDC |
| DIELECTRIC STRENGTH | Between power supply and GND : 1,500VAC, one minute |
| POWER CONSUMPTION | VM-5G0 : 40VA or less<br>VM-5G1 : 30W or less<br>VM-5G2 : 40W or less |
| TEMPERATURE RANGE | Operating Temperature : 0 to 65°C<br>Storage Temperature : -30 to +85°C<br>Relative Humidity : 20 to 95%RH (non-condensing) |
| MASS | Rack : Max.1.6 kg<br>Bezel : Max.0.2 kg |

# VM-5 SERIES OPTIONS

Functions can be upgrade by specifying the following options :

| | | |
|---|---|---|
| **RMS RECTIFIER** | Able to measure true effective value. | VM-5K, VM-5U, VM-5B, VM-5M |
| **INSULATE OUTPUT CARD** | Insulate from other circuits. | VM-5 series all monitor units |
| **RECORDER OPTION OUTPUT CARD** | Applications where an other-than-standard recorder output is required. | VM-5 series all monitor units |
| **TROPICAL SPECIFICATION** | Improve durability against humidity. | All VM-5 series |
| **SHIPPING STANDARD NK, KR, LR** | Applies when products are used for shipping rotating machinery monitors. | VM-5K, VM-5U, VM-5B, VM-5M, VM-5C, VM-5T, VM-5D, VM-5N, VM-5L, VM-5E, VM-5A, VM-5S, VM-5Q, VM-5R, VM-5X, VM-5P, VM-5Z1 to 4, VM-5Y1 to 6, VM-5G0, VM-5H3, VM-5W1 |
| **CE MARK** | Indicates CE mark. | VM-5 series all monitor units, VM-5Y1 to 6, VM-5G1, VM-5P3, VM-5H3, VM-5Z3/4, VM-5W1 |



**FK series**
VIBRATION TRANSDUCER

FK series are eddy current type non-contact displacement/vibration transducers, used for measuring Shaft Vibration, Axial Position, Rotating Speed and Phase Mark (Phase Reference) from small rotating machinery to large critical machinery such as turbines and compressors in plants.

- Intrinsically safe: TIIS, CSA, ATEX, NEPSI, KTL
- Environmentally friendly design: Lead-free soldering, RoHS directive compliant and downsized.
- Compliant with API std 670 (4th edition) and CE marking.
- Not affected by lubricating oil or dust.

**CV/CA series**
TRANSDUCER

Piezoelectric type transducer for bearing and casing vibration measurement. CV Series for Velocity and CA Series for Acceleration measurement.

- Built-in amplifier, wide dynamic range and low noise.
- Rugged, durable stainless casing.
- Intrinsic safe, explosion proof construction: TIIS

**RD series**
TACHO DRIVER

Eddy-current, non-contact revolution detection transducer designed to measure the rotating speed and zero speed.

- Fault detection function
- Wide measuring range
- Sensor top is not affected by lubricating oil or dust.
- Intrinsic safe, explosion proof construction: TIIS, CSA, ATEX

**VM-21 series**
SIGNAL CONDITIONER

VM-21 series accept the signal from transducers installed on rotating machinery and convert it to 4 to 20 mADC or 1 to 5 VDC output.

- Full line-up of models for displacement velocity and acceleration input.
- Available in rack, DIN rail or wall mounting.
- Burn-down function
- Vibration waveform output for detailed diagnosis.

**LS series**
LVDT (Linear Variable Differential Transformer)

The LS series LVDT is a highly reliable linear transformer that provides long range measurement of turbine valve opening and casing expansion. It has a broad range of applications due to its durability and measuring accuracy.

- Various types of measuring range.
- Nine ranges 0-50 to 0-450 mm.
- Linearity +/- 0.2 % of F.S.
- Intrinsic safe, explosion proof construction: CSA, FM (when VM-11P used together.)

Published in Feb. 2012

**Contact to**

**SHINKAWA Electric Co., Ltd.**
3rd Fl. Shin-kojimachi Bldg.3-3 Kojimachi 4-chome, Chiyoda-ku
Tokyo 102-0083, Japan
Phone : 81-3-3263-4411 Fax : 81-3-3262-2171 WEB : http://www.shinkawa.co.jp/

**SEC of America Inc.**
4355 Ferguson Drive Suite 215 Cincinnati, Ohio 45245, USA
Phone : 1-877-586-5690 Fax : 1-513-297-9003
e-mail : info@sec-america.com
WEB : http://www.sec-america.com

**SHINKAWA Sensor Technology, Inc.**
4-22 Yoshikawa-kogyodanchi, Higashihiroshima 739-0153, Japan
Phone : 81-82-429-1118 Fax : 81-82-429-0804
WEB : http://www.sst-shinkawa.co.jp

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

Printed in Japan 19517E2.4-12501

©2003-2012 SHINKAWA Sensor Technology, Inc. All rights reserved.