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E-VSSR-10
Vibration Monitor
User's Manual

MAN218 REV 7-5-18

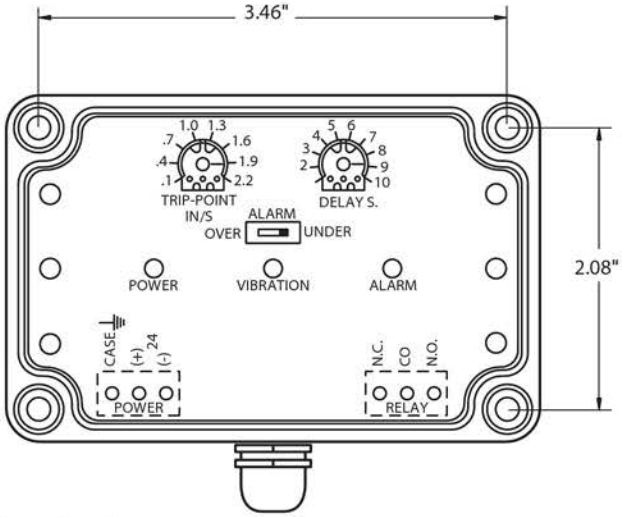
Description

The Vibration Monitor combines sensor, circuitry and isolated npn output into a compact NEMA 4X package. It monitors the machine surface to which it is attached and alarms when vibration levels either exceed or fall below the trip-point setting (depending on the ALARM switch setting).

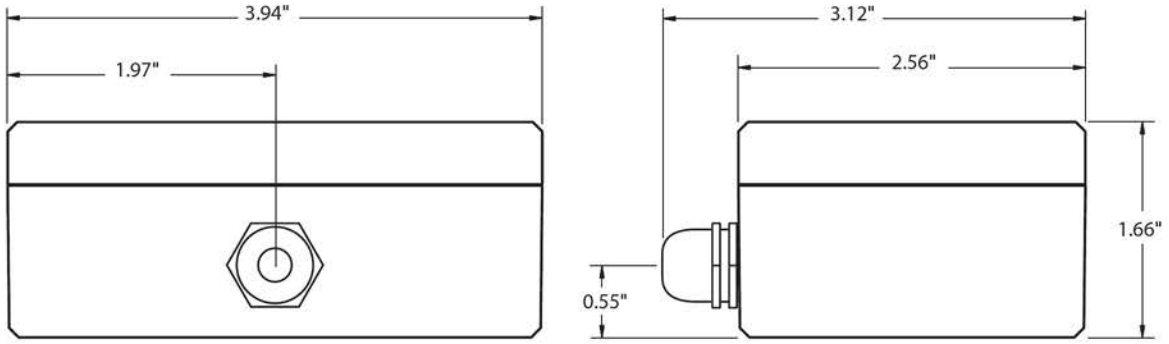
Operator Interface/Dimensions

The setting dials and switch are located under the waterproof cover. Remove the cover to change settings and replace when finished.

Cover Removed



Cover Attached



Installation

Orientation

The E-VSSR-10 senses vibration along the axis indicated by the SENSING DIRECTION arrow. Orient the sensor with the arrow parallel to the vibration axis to be monitored.

Mounting

The enclosure has four mounting holes. The mounting holes are the same as the cover attachment holes (located directly underneath the captive cover screws when the cover is on). Remove the cover to access the mounting holes (see Operator Interface/Dimensions). Use four 8-32 UNC (or M4 metric) hex socket-head cap screws to mount the sensor. Rigid, tight attachment is necessary for any vibration-sensing device. For this reason the sensor must be securely fastened to a smooth, flat surface. Use all four screws: mounting with fewer can allow error-causing resonance when high-frequency vibrations are present.

Cabling

The sensor comes standard with a 10' cable. When extending the cable to a longer length, terminate it in an appropriate junction box with proper terminal strips. The cable wires have the following color code:

Power		**NPN Output**	
Green	Case	**Blue**	Collector Protection Cathode
Red	DC Power (+)	**Orange**	Emitter
Black	DC Power (-)	**White**	Collector

Operation

Power LED (Green)..... Indicates power applied to the sensor

Vibration LED (Green) ..... Indicates vibration at or above the minimum detectable level (0.1 in/s nominal).

Alarm LED (Red)..... Indicates an alarm condition.
Note: Alarms are not latching – an alarm condition persists only while the vibration magnitude stays at alarm levels.

Alarm OVER/UNDER Switch ..... Selects the alarm functionality.
Over: Alarms while vibration magnitude is above the trip-point setting.
Under: Alarms while vibration magnitude is below the trip-point setting.

Trip-Point Dial ..... Sets the alarm level threshhold in inches-per-second RMS.

Delay Dial ..... Sets the alarm delay in seconds.
An alarm occurs DELAY seconds after detecting vibration magnitude at alarm level. The vibration magnitude must remain at alarm levels for at least DELAY seconds for an alarm to occur.

NPN Output ..... The isolated NPN output is connected for failsafe operation (NPN on when powered and not alarmed). It operates as follows:
Conducting (ON) when sensor is powered and not alarmed
Not conducting (OFF) when sensor is unpowered or alarmed.

Settings

With the sensor tightly mounted, the cover removed, and 24 Vdc power applied*, complete the following steps:

1. Set the ALARM OVER/UNDER switch as required.

2. Set the TRIP-POINT. If the desired RMS velocity alarm value is known, set the trip point to that value, otherwise it can be set experimentally relative to your machine's current (acceptable) vibration level. The following gives an example (ALARM set to OVER):

   a. Set the DELAY to minimum (1 second).

   b. Start the machine to be monitored.
   Note: The VIBRATION LED should light, indicating vibrations above the minimum detectable level (0.1 in/s).
   Wait for any/all transient vibrations to die out.

   c. Slowly increase the TRIP POINT setting until the ALARM LED darkens (if already alarmed).

   d. Slowly decrease the TRIP POINT setting until the ALARM LED begins to light. This setting is your current vibration level.
   Note: These last two steps may need to be repeated. Adjust the TRIP POINT slowly since there is a minimum of 1 second response time.

   e. Increase the TRIP POINT to a value proportional to the current vibration level. For example, if the current vibration level is 0.5 in/s and you want the sensor to alarm at 40% above that, set the trip point to 0.7 in/s.

3. Set the DELAY. This may also have to be determined experimentally, depending on the duration of vibration transients to be ignored.

4. Re-attach the cover tightly.

* Note: There is a 2-3s. delay from application of DC power to becoming operational (to allow internal circuitry to charge).

Specifications

LED Indicators

Power	Green
Vibration	Green - indicates vibration above min. detectable level (0.1 in/s rms)
Alarm	Red - indicates output in alarm state

Settings/Ranges

Alarm trip point	0.1 - 2.2 in/s (2.5 - 55 mm/s) rms
Alarm delay	1 - 10 seconds
Alarm	Over/under select switch

Operational Limits

Min. vibration frequency (-3db)	10 Hz
Max. vibration acceleration	± 50 g peak

Power Requirements

Voltage	24 Vdc (18 - 30 Vdc)
Current (max)	30 mA @ 24 Vdc

(24Vdc/1.1A power supply included)

Isolated NPN Output

Current	50 mA
V_{CE} (max @ 50 mA)	1.0 V
BV_{CEO} (breakdown volts)	100 V
P_D (max power over temp)	100 mW
I_{CEO} (max leakage over temp)	100 µA
Failsafe	Transistor ON when powered and not alarmed

Terminals/Connections

Cable	6 conductor, unshielded, 22 AWG
Green	Case
Red	DC Power (+)
Black	DC Power (-)
Blue	Collector Protection Cathode
Orange	Emitter
White	Collector

Environmental

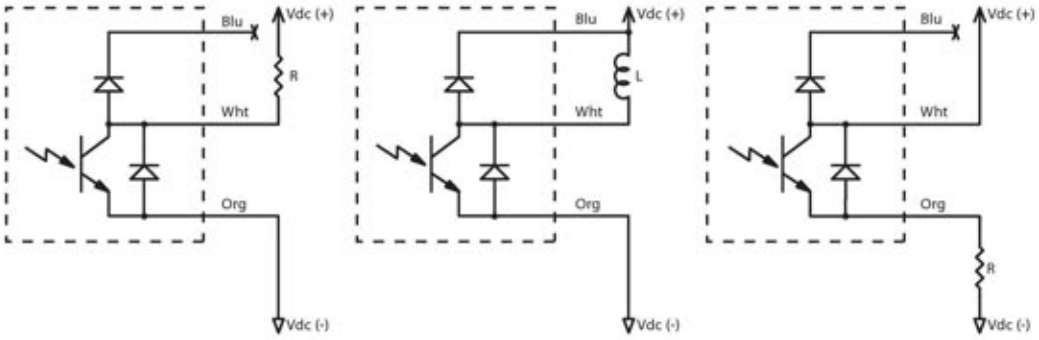
Operating Temperature	-40°C to 65°C (-40°F to 149°F)
Enclosure type	Cast aluminum, NEMA 4X

Mechanical

Weight	0.75 lb (0.34 kg)
Dimensions	3.94" x 2.56" x 1.66"

Specifications subject to change without notice.

NPN Output Schematic and Possible Connections



Sinking (resistive load) Sinking (inductive load) Sourcing (resistive load)

The NPN output is electrically isolated from the DC power inputs and case. The NPN output may be externally connected to the same supply as the DC power inputs or to a different supply.

Useful Conversion Formulas

Definitions:

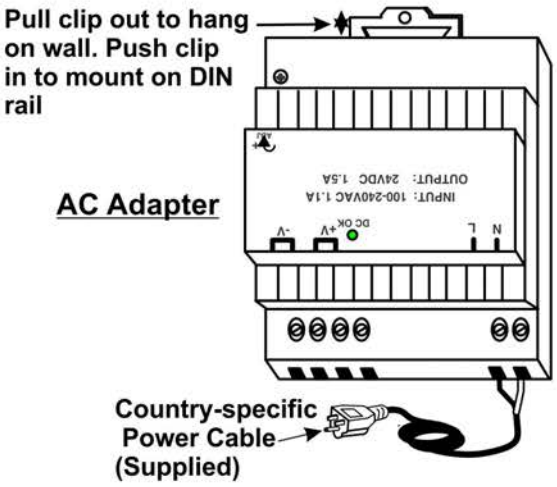
CPM	Machine cycles per minute
f	Frequency
Stroke	Max machine travel (peak to peak)
$Disp_{pk}$	Peak displacement from center position (Stroke / 2)

Formulas:

f (frequency in Hz)	**= CPM / 60**	
Vel_{rms} (rms velocity in in/s)	**= 4.44 * $Disp_{pk}$ * f**	$Disp_{pk}$ must be in inches, f must be in Hz
Accel (peak acceleration in g's)	**= 0.103 * $Disp_{pk}$ * f^2**	$Disp_{pk}$ must be in inches, f must be in Hz
Accel (peak acceleration in g's)	**= 0.0231 * Vel_{rms} * f**	Vel_{rms} must be in in/s rms, f must be in Hz

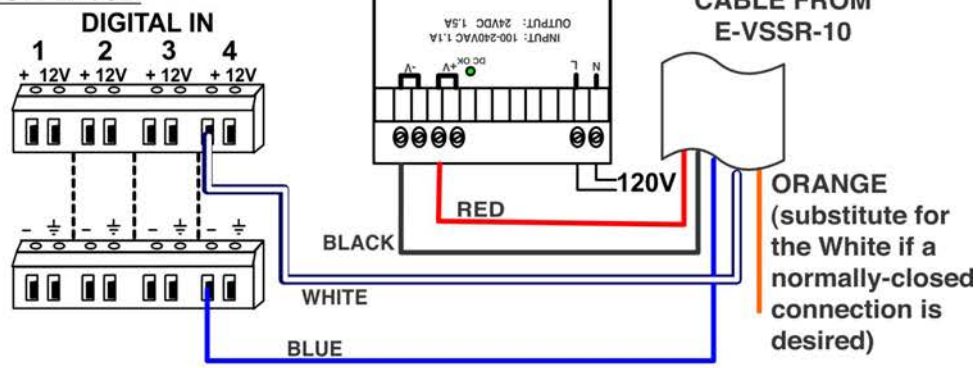
Note: All formulas based on sinusoidal motion.

WIRING FROM E-VSSR-10 TO E-2D/-5D/-16D
(Wired for a Normally-Open contact configuration)

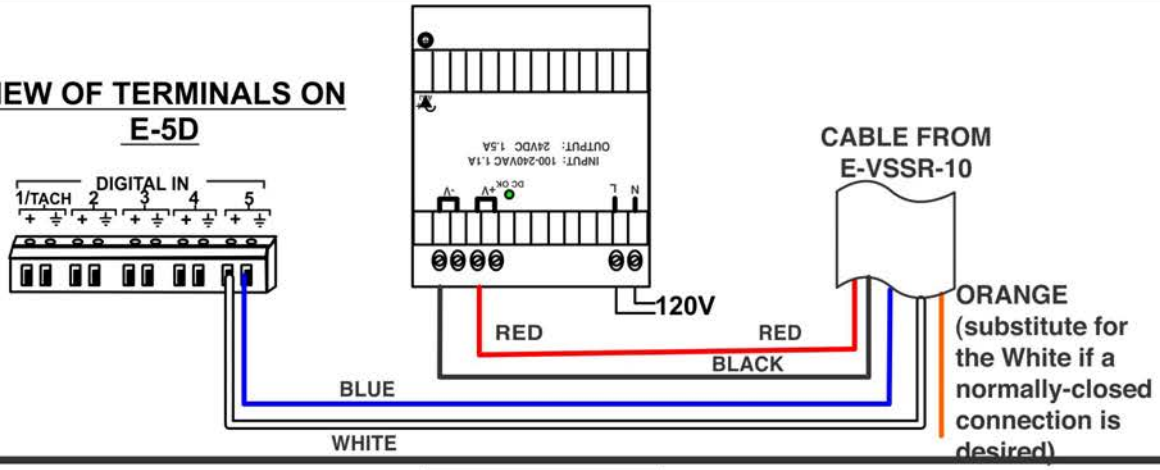


VIEW OF TERMINALS ON E-16D

CONNECT THE E-VSSR-10 SENSOR CONTACT TERMINALS TO ANY SET OF DIGITAL IN TERMINALS ON THE E-16D (1-8)



VIEW OF TERMINALS ON E-5D



VIEW OF TERMINALS ON E-2D