

CEC 1-895

VIBRATION SWITCH

Operation & Maintenance Manual



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Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

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Section I - Introduction

This document contains information on the operation, installation and maintenance of the Type CEC 1-895 Vibration Switch. The instrument is manufactured by CEC Vibration Products Inc., Covina, CA, USA.

The 1-895 Vibration Switch constantly monitors vibration levels on critical machinery and provides feedback in the event of a machinery breakdown. The machine's vibration level is visible on a 3-digit LCD display and a 4-20 mA output signal is provided proportional to a set vibration level. Two alarms are available for warning of impending machinery breakdowns.

Description

The standard vibration switch contains a built-in accelerometer and solid state electronics for converting the accelerometer's signal into a form that is meaningful to the user. (An optional external sensor version is also available.) The 1-895 includes a three hole mounting pattern to assure a direct connection between the switch and the machine surface. Programmable dual alarms can be used to provide both a warning and shutdown situation on critical equipment. A start-up trip delay of thirty seconds prevents false alarms during start-up situations, which can usually produce large vibration levels that are not necessarily indicative of machinery health.

Features

Dual Alarms:

This allows one alarm to warn of an impending mechanical problem and a second alarm to be used for actual machinery shutdown. Both alarm trip levels are fully programmable by the user.

Alarm State:

The alarm contacts can be set for Normally-Open or Normally-Closed operation as well as Latching or Non-Latching.

Alarm Trip Delays:

All alarm trip levels must exist for a minimum of three seconds before alarm will trip. This trip delay allows all transient vibration levels to be ignored.

Start-Up Trip Delay:

All alarms are temporarily inactive for thirty seconds at start-up to prevent false alarms. Healthy machinery exhibits large vibration levels at start-up and may require alarms to be temporarily inactive.

LED Alarm Indication:

One LED light exists for each alarm. When an alarm condition exists, the corresponding LED will light up. When in programming mode, the corresponding LED will flash on & off.

Remote Alarm Reset Input:

Activated alarms may be remotely reset in addition to being reset on the face of the switch.

Remote Start Input:

The start-up trip delay starts when the remote start input is released (grounded).

Displacement, Velocity or Acceleration Response:

A vibration switch may be selected that provides a displacement (mils), velocity (inches per second, "ips") or acceleration (g's) output proportional to an analog signal (4-20 mA).

Analog Output (4-20 mA):

All vibration switches provide an analog output (4-20 mA) that is proportional to a chosen vibration level (mils, ips or g's).

Technical Specifications

Vibration Range: (See Ordering Guide pg. 3)	Choose one of the following: Velocity: 1, 2, 5 or 10 ips (Peak) Velocity: 3-40 or 6-80 mm/s (Peak) Displacement: 5, 10, 20, 100 or 150 mils (Pk-Pk) Acceleration: 5, 10 or 25 g's (Peak)
Frequency Range:	5 – 500 Hz (Internal Sensor)
Temperature Range:	Operating: +32° to +185°F (0° to +85°C) Storage: -67° to +185°F (-55° to +85°C)
Humidity:	0 to 95% relative humidity (non-condensing)
Alarm Outputs: (See Ordering Guide pg. 3)	Choose one of the following relay options: 3 - 60 VDC @ 1 amp or 12 - 240 VAC @ 1 amp (Outputs are isolated from system electronics)
Analog Output:	4-20 mA current loop proportional to full scale output.
Alarm Reset/Start Inputs:	External inputs must be shorted to ground to activate.
Display:	3 digit LCD display with decimal point.
Power:	Isolated 18-30 VDC @ 125 mA
Hazardous Area Ratings	CSA C/US certified Class I, Division 2, Groups A, B, C, D Temp code: T5, Max Ambient 85°C ATEX EEx d IIC T5, Ta = -40°C to +85°C Reference Installation Drawing 700816
Explosion Proof Enclosure	Class I, Division 1 and 2, Groups B, C, D; Class II, Division 1 and 2, Groups E, F, G Class III Areas

Table 1-1

NOTE: Specifications on a particular vibration switch may be obtained from the unit's label.

Ordering Guide

To order, select the desired parameters using the following nomenclature.



P/N 1 - 8 9 5 -
VIBRATION SWITCH

A	B	C	C
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A	SENSOR INPUT TYPE			
	0 = Internal Sensor Remote Sensor Options 1 = 100 mV/g constant current (use with CEC model 4-160) 2 = 100 mV/ips constant current (use with CEC model 4-161) 3 = 100 mV/ips velocity coil 4 = 145 mV/ips velocity coil (use with CEC model 4-130/137, 4-131, 4-138-0002) 5 = 150 mV/ips velocity coil (use with CEC P/N 4-131-0103, 4-138-0003) 6 = 200 mV/ips velocity coil (use with CEC P/N 4-131-0116, 368925, 4-138-0004)			
B	RELAY TYPE (Solid state, Optically isolated)			
0 = DC contact rating is 3 to 60 VDC @ 1 Amp 1 = AC contact rating is 12 to 240 VAC @ 1 Amp				
C	OUTPUT TYPE (Full Scale Range & Unit of Measure)			
	Displacement 01 = 0-5 mils, pk-pk 02 = 0-10 mils, pk-pk 03 = 0-20 mils, pk-pk 04 = 0-150 mils, pk-pk 05 = 0-100 mils, pk-pk	Velocity 10 = 0- 0.5 ips, peak 11 = 0- 1 ips, peak 12 = 0- 2 ips, peak 13 = 0- 5 ips, peak 14 = 0- 10 ips, peak 15 = 0- 1.5 ips, rms 16 = 0- 3 ips, rms	Acceleration 21 = 0- 5 g's, peak 22 = 0- 10 g's, peak 23 = 0- 25 g's, peak 25 = 0- 5 g's, rms 26 = 0- 10 g's, rms	Velocity (Metric Units) 31 = 3-40 mm/s, peak 32 = 6-80 mm/s, peak

NOTE: Special configurations can be accommodated. Please consult the factory for assistance.

Example: P/N 1 - 8 9 5 -

0	0	1	2
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The example unit is housed in an explosion proof enclosure. This switch has an internal sensor, and DC relay contacts. The display and 4-20 mA output are scaled for 0 to 2 ips, peak velocity.

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Optional Accessories

Option	Part Number
Conduit Fitting (½"-NPT x ½" Conduit)	700678-90-0000

Section II - Installation Mounting

Mechanical Mounting

The vibration switch can be mounted on any radial axis in an orientation where maximum vibration is transmitted through the sensitive axis of the switch. (The sensitive axis is perpendicular to the mounting base of the unit, See Figure 2-1.) A horizontal mounting is normally best to avoid excessive heat from being transmitted to the vibration switch, and for ease of reading the display.

When it is necessary to use a bracket for mounting, the bracket must be rigid enough to avoid vibrations produced by the bracket itself. (See Figure 2-2 for dimensional mounting information) Mounting surface of machinery should be as flat as possible so the vibration switch can accurately measure vibration levels. Do not weld to the vibration switch enclosure at any time.

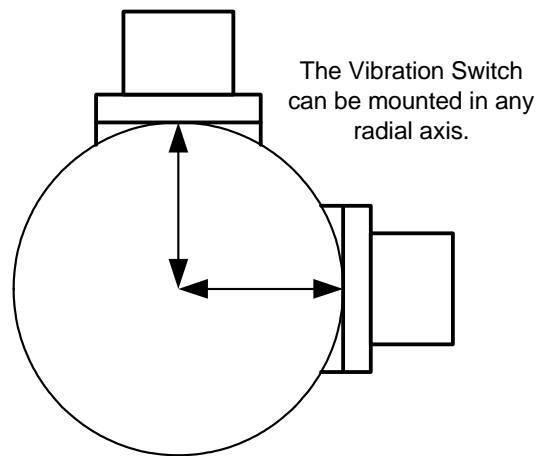


Figure 2-1 Mounting Orientation

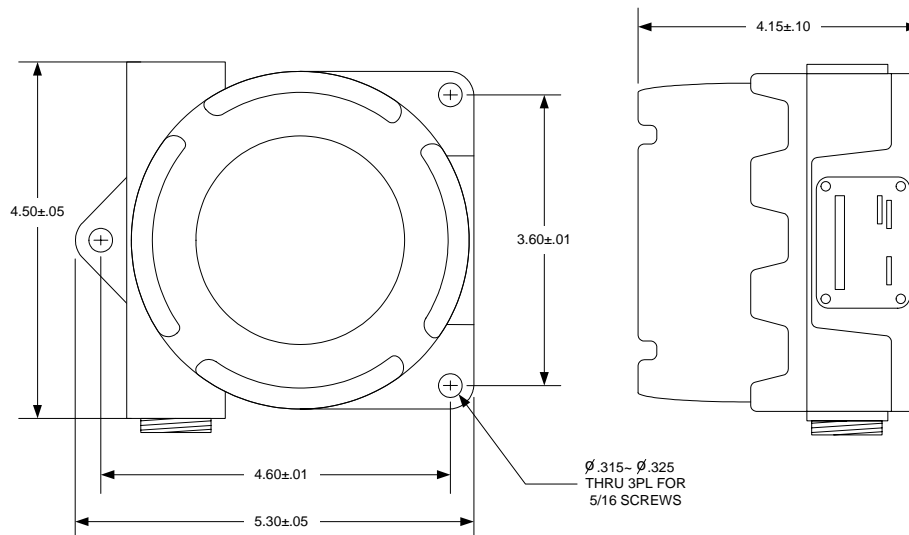


Figure 2-2 Enclosure Dimensional Drawing

Section III - Installation Wiring

Before wiring to the vibration switch, make sure the unit is securely mounted using the appropriate hardware for your application. Insert multi-conductor cables with 1/4" stripped leads through cable entry of the vibration switch. Depending on the hazardous classification of your application, a cable grip or conduit fitting may be used at the vibration switch's cable entry point. Part numbers for these options are shown in Section I, page 4 of the manual.

Proper wiring should include shielded cables routed through EMI proof conduit. Signal conductors should be separated from power wiring. Shared common wires are not recommended due to potential ground loops. The 4-20 mA wiring (+ & -) should be a separate shielded cable as well. The 4-20 mA output is an active signal and therefore does not require an external power source.

Securely connect each wire lead by inserting the wire into the appropriate contact while simultaneously pressing down on the contact release. Once all wires are properly connected and power applied, programming of alarm trip levels should be performed as shown in Section IV (Alarm Programming). The supplied cover should now be securely tightened. To prevent the cover from backing off during operation, the 1-890 and 1-895 enclosures include a set-screw to be tightened on the cover.



Special conditions for safe use:

- Cover shall be tightened and secured by set screw while energized.
- Do not open when an explosive gas atmosphere may be present.
- All mounting, sealing and wiring shall conform to CSA or ATEX requirements depending on local jurisdiction.
- In the case of use with an ambient temperature higher than 70°C (+158°F), not to use cables with wires protected by PVC sheaths.

(See Appendix A and B for further Hazardous Location notes)

Individual wires should be 18-24 AWG. Any wire larger than 18 AWG will not work with the Spring Cage type connectors provided.

When using the optional conduit fitting make sure to provide flexible conduit relief for the first 24 inches to minimize restraint of measured body. Remainder of conduit may be rigid.

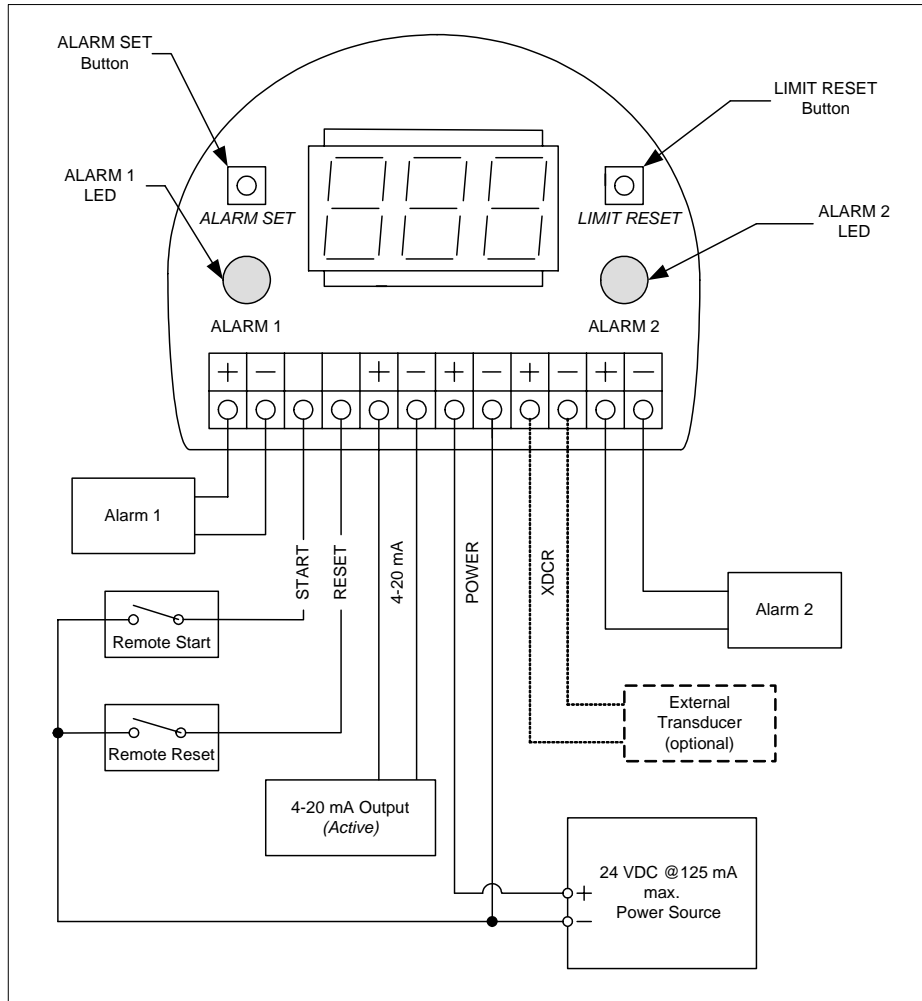


Figure 3-1 Wiring Diagram

Section IV - Programming

Programming Procedures Reference Figure 3-1

Setting Contact State: (Applies to both Alarms 1 & 2)

Press the Alarm-Set button until a C0 or C1 is displayed. The 0 & 1 represent the contact state during normal operation. When an alarm level is exceeded the contact state will change to the opposite of this state.

C0 = Normally Open Contacts (Power OFF State)

C1 = Normally Closed Contacts

Example: If you want the relay contacts to be normally closed the display should read C1. You adjust the (0) or (1) by pressing the Reset button. Once you have the desired option selected, press the Alarm-Set button to advance to the next setting.

Setting Alarm Latch: (Applies to both Alarms 1 & 2)

Press the Alarm-Set button until a L0 or L1 is displayed. The 0 & 1 represent non-latching and latching alarm states. This option allows the user to select the alarms to stay ON until someone manually resets the alarm, or go off automatically when the vibration level drops below the alarm trip level.

L0 = Non-Latching, Alarm will auto reset if vibration drops below trip level.

L1 = Latching, Alarm will stay On until manually reset.

Again, to adjust these settings press the Reset button. Once you have the desired option selected, press the Alarm-Set button. Proceed to setting Alarm 1 & 2.

Setting Alarm 1:

Press Alarm-Set button until the Alarm 1 LED begins to flash. The LCD display will indicate the current setting (vibration trip level) for Alarm 1 trip value. Change current vibration trip level by pressing Limit Reset button until desired trip level is shown on LCD display.

Press Alarm-Set button again to save Alarm 1 trip level and advance to Alarm 2 setting or you can exit programming by not pressing buttons for a minimum of 10 seconds. See note below.

Setting Alarm 2:

Press Alarm-Set button until the Alarm 2 LED begins to flash. The LCD display will indicate the current setting (vibration trip level) for Alarm 1 trip value. Change current vibration trip level by pressing Limit Reset button until desired trip level is shown on LCD display.

Press Alarm-Set button one more time to save Alarm 2 trip level.

NOTE: Vibration switch provides a 10 seconds time-out window for programming alarm conditions. If no programming activity takes place within 10 seconds the vibration switch will return to run mode.

Section V - Maintenance

There are no customer replaceable parts within the 1-895 vibration switches. The vibration switch has been designed for trouble-free service under normal operating conditions. CEC warrants the equipment for one year from the date of purchase. Should your instrument require repair within the warranty period, you may contact customer service at:

Tel: (626) 938-0200

Fax: (626) 938-0202

Email: info@cecvp.com

Write to:

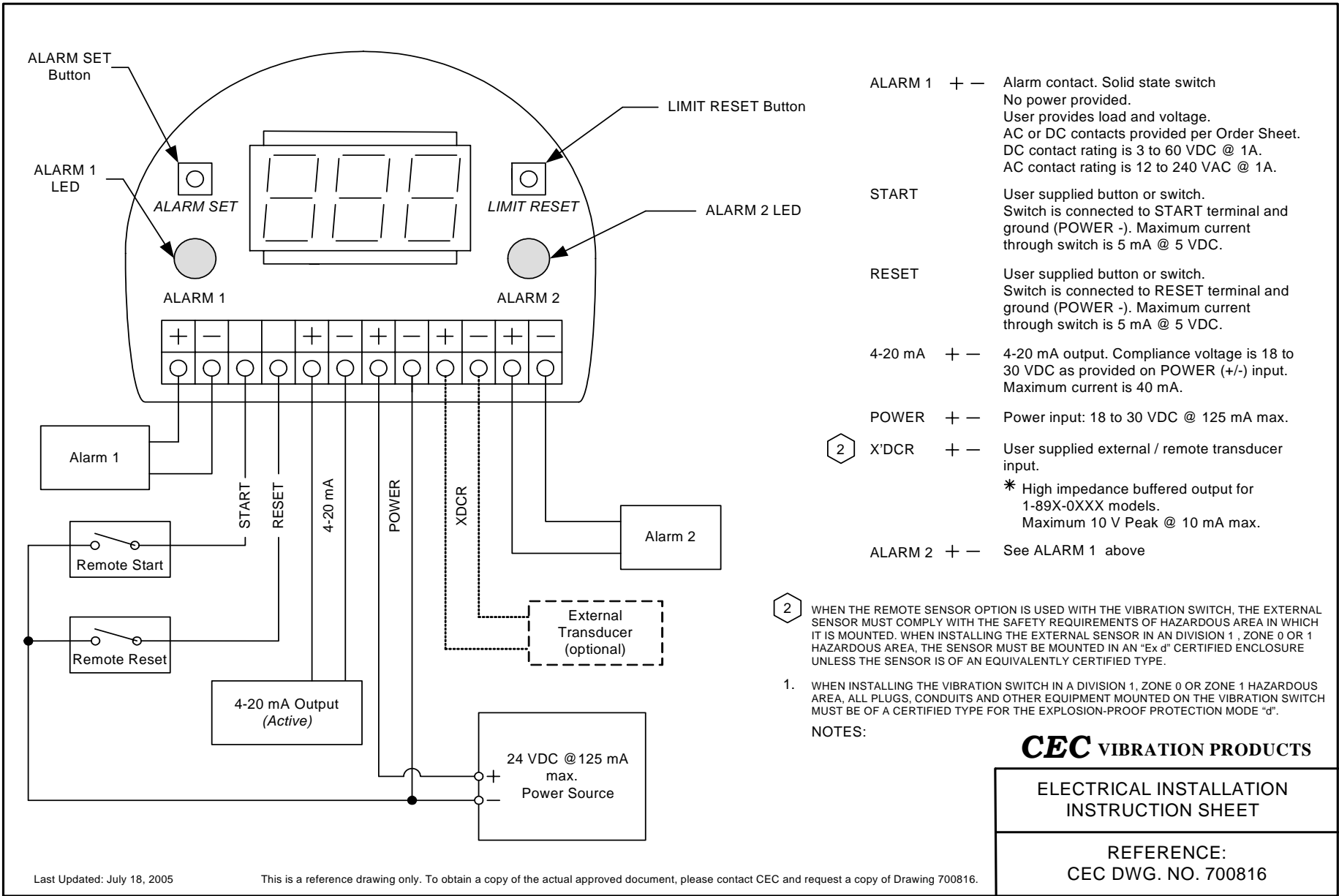
CEC Vibration Products Inc.
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USA

WARNING:

EXPLOSION HAZARD – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2. (Ref. Appendix A and B)

Section VI - Troubleshooting

- 1) Question:** Is analog output (4-20 mA) working properly?
- 1) Answer:** Connect a current meter in series to verify that displayed output is equal to actual output of vibration switch. Remember that 4.0 mA is equivalent to zero vibration and 20.0 mA is equal to maximum vibration level. (I.e. for a 1 IPS unit: 0.5 IPS = 12 mA)
- 2) Question:** Does analog output (4-20 mA) represent vibration levels experienced by machinery?
- 2) Answer:** Install vibration switch on shaker table and compare to output on the vibration switch. Vibrations inputted to vibration switch must be within specified frequency range of switch. See technical specifications for exact frequency range.
- 3) Question:** Vibration switch does not appear to be functioning.
- 3) Answer:** Check to make sure vibration switch is properly wired and power is supplied.
- 4) Question:** No vibration level is indicated during start-up.
- 4) Answer:** This is probably due to the start-up trip delay.
- 5) Question:** The displayed vibration level is unrealistically erratic?
- 5) Answer:** Verify the switch housing is firmly mounted and any piping or mounting plates are also securely mounted. (Ref. Section II) Be sure 24 VDC power is from a clean source and capable of supplying a minimum of 125 mA to the switch under all load conditions.
- 6) Question:** Alarm(s) are always on?
- 6) Answer:** Verify the alarm logic matches the normally-open or normally-closed state selected during programming of the switch. (Ref. Section IV – Programming)
- 7) Question:** Displayed vibration level is higher than the programmed alarm limits, but the alarms do not trip?
- 7) Answer:** Verify remote start-up delay is not engaged. (Ref. figure 3-1) Allow 30 seconds after power-up or disengage of remote start-up delay. Check alarm / relay wiring.



Appendix A

1-89X PRODUCT MATRIX

CEC PART NUMBER: 1-89 A - B C D D

7

<u>ENCLOSURE TYPE</u>	
0	NEMA 4 Enclosure, 24 VDC operation
5	Explosion Proof Enclosure, 24 VDC operation

5

<u>SENSOR TYPE</u>	
0	Internal Sensor
1	External Sensor 100 mV / g constant current type
2	External Sensor 100 mV / ips constant current type
3	External Sensor 105 mV / ips velocity coil self generating
4	External Sensor 145 mV / ips velocity coil self generating
5	External Sensor 150 mV / ips velocity coil self generating
6	External Sensor 200 mV / ips velocity coil self generating

<u>RELAY CHOICE</u>	
0	DC Relay
1	AC Relay

6

<u>FULL SCALE</u>		
01	5 mils pk-pk	Displacement
02	10 mils pk-pk	Displacement
03	20 mils pk-pk	Displacement
04	150 mils pk-pk	Displacement
10	0.5 ips pk	Velocity
11	1 ips pk	Velocity
12	2 ips pk	Velocity
13	5 ips pk	Velocity
14	10 ips pk	Velocity
21	5 g's pk	Acceleration
22	10 g's pk	Acceleration
23	25 g's pk	Acceleration
31	3 to 40 mm/s pk	Velocity
32	6 to 80 mm/s pk	Velocity

NOTES: UNLESS OTHERWISE SPECIFIED,

1. NON-INCENDIVE (FM3611) CLASS I, DIVISION 2, GROUPS A, B, C & D.
2. NON-INCENDIVE QUALIFICATION DOES NOT REQUIRE USE OF BARRIERS.
3. INSTALL PER ISA RP12.6.
4. SAFE LOCATION APPARATUS MUST NOT USE OR GENERATE IN EXCESS OF 250V.
5. OTHER EXTERNAL TRANSDUCER TYPES MAY BE ADDED IN THE FUTURE BASED ON CUSTOMER REQUIREMENTS. NO CHANGE TO THE ELECTRONICS IS REQUIRED.
6. OTHER FULL SCALE OUTPUTS MAY BE ADDED IN THE FUTURE BASED ON CUSTOMER REQUIREMENTS. NO MATERIAL CHANGE TO THE ELECTRONICS IS REQUIRED.
7. THE 1-895 MODEL IS ENCLOSED IN A EXPLOSION PROOF ENCLOSURE. THIS ALLOWS INSTALLATION IN CLASS I, DIVISION 1 AND 2, GROUPS B, C & D; CLASS II, DIVISION 1 AND 2, GROUPS E, F & G; AND CLASS III AREAS.

**NO CHANGES WITHOUT PRIOR
CSA / LCIE APPROVAL**

CEC VIBRATION PRODUCTS

1-89X REQUIREMENTS FOR HAZARDOUS LOCATIONS
REFERENCE: CEC DWG. NO. 700697

Appendix B