PRO Vibration Switch Family

Datasheet

OVERVIEW

The PRO™ vibration switch family consists of the PRO440, the PRO450, and the PRO6000. These switches have nearly identical* functionality and differ only by the enclosure mounting style and rating, allowing placement on or near the machine in the environmental conditions and hazardous area classifications typical of industrial plants.

Each switch in the PRO family is programmable via a USB port and PRO configuration software, or via the switch's integral keypad/display. Advanced capabilities allow PRO switches to deliver self-contained, single-channel vibration protection with one or (optional) two fully adjustable alarm levels and corresponding electro-mechanical relays. Alarm and startup delays are independently programmable, local reset capabilities are provided, and terminals are available for remotely invoking switch bypass and switch reset. Independent 4-20 mA and buffered transducer output wiring terminals are provided for connection to plant control systems and condition monitoring instruments. Status LEDs and a 2-line alphanumeric display are standard, allowing the user to locally assess vibration levels, alarm conditions, and sensor OK conditions.

* The PRO450 is available with an optional internal BNC connector for the buffered signal output. This option is not available on the PRO440 or PRO6000.

This housing is not available with a viewing window and the cover must be removed to use the display. It is intended primarily for applications where an 450 is being upgraded. Replacement of the housing rather than just the internals ensures that the housing's nameplate will carry the PRO switch's serial number, part number, and other details, rather than those of the 450 it is replacing. When both a viewing window and Div 1 or Zone 1 hazardous area approvals are required, the PRO6000 should be used instead. It is smaller than the PRO450 in every dimension and uses a stud mount. An optional adapter is available for flat-base mounting (p/n 7084-001); however, it uses a different hole pattern than the 450 and will require new holes to be drilled in the mounting surface.

Two basic switch/sensor configurations are supported by all 3 housing styles:

1. Internal Sensor

When ordered with an internal accelerometer, the switch can be mounted directly at the measurement location and can monitor vibration in either acceleration units or integrated acceleration (velocity) units. This configuration is suitable when there is sufficient room at the measurement location to mount the switch, when the measurement location still allows the switch to be conveniently viewed and serviced by plant personnel, and when the switch's inertial mass will not compromise the quality of the vibration measurement.

• PRO440

This housing uses the same 3-hole flat-base footprint as the older 440 switch. It is 22mm taller and 41mm wider than its predecessor and has two conduit fittings instead of one.
The cast aluminum housing carries a NEMA 4/4X/IP65 rating and comes standard with a viewing window and powder-coat epoxy.

• PRO6000

This Explosion-Proof (XP) cast aluminum housing is nearly identical in all dimensional aspects to those of its predecessor, the SW6000/SM6100. The housing carries a NEMA 4/4X/IP65 rating and comes standard with a viewing window and powder-coat epoxy. It uses a stud mount. An optional adapter is available for flat-base mounting (p/n 7084-001).

• PRO450

This Explosion-Proof (XP) cast aluminum housing is the same as used with the older 450. It carries a NEMA 4 rating and comes standard with a gray painted finish.

(ENCLOSURE ONLY)

2. External Sensor

The PRO supports connection of an external vibration sensor (constant-current accelerometers, piezo-velocity sensors, and moving-coil velocity sensors). When possible, an external sensor is generally preferred for most applications. This configuration allows the sensor to be mounted at the ideal measurement location and orientation on the machine, without concern for the larger mounting footprint of the PRO compared to a sensor. It also allows the PRO to be mounted in a more convenient location for viewing and servicing. Also, although the PRO is packaged to survive harsh environments of dust, moisture, and corrosion, some machines may exhibit elevated temperatures at the preferred sensor location. Use of an external sensor can allow a sensor with an elevated temperature rating, beyond that of the PRO switch electronics.

The PRO switch also accepts generic transmitter signals such as from vibration*, impact, temperature, level, flow, and others that provide an ISA-standard proportional 4-20 mA output. However, the PRO is not directly compatible with temperature sensors such as RTDs and thermocouples; an intervening 4-20 mA transmitter must be used instead.

*The PRO switch provides only over-type (not over/under) alarms. As such, it can be used with radial vibration transmitters (such as the Metrix TXR); however, it cannot be used with axial position transmitters (such as the Metrix TXA) for thrust bearing protection applications which require over/under type alarms.

FEATURES AND BENEFITS

- Programmable configuration allows the user to configure virtually every switch option in the field, via the display's keypad, or via USB connection to the PRO configuration software. Multiple switch configurations in a plant can be supported by a single PRO, reducing spare part requirements and complexity.
- One or (optional) two alarm levels are available, allowing separate shutdown (Danger) and pre-shutdown (Alert) setpoints.
- Bright, dot-matrix LED 2-line display is standard with every PRO switch, allowing the user to see not only current readings, but the associated engineering units. Eliminates scrolling and ambiguity as to what units are being displayed, or whether RMS or Peak detection is being used. Display is visible under all lighting conditions, including complete darkness.
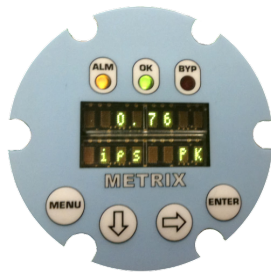
- Configurable for True Peak or RMS on all vibration measurements. Unlike devices that use an RMS detector and merely scale the reading to obtain "pseudo peak" (RMS x 1.414), the PRO switch features both a true peak detection circuit and a true RMS detection circuit, allowing you to choose either one with confidence that the readings delivered will be accurate.
- 4-20 mA outputs allow the switch to provide the measured vibration level as a proportional 4-20 mA signal, ideal for PLCs, DCSs, and other plant control and automation systems that can provide trending and remote display of vibration levels for operators.
- Programmable power-up delay bypasses alarming functions after switch is energized. The delay is fully programmable from 20-30 seconds in 1-second increments.
- Programmable alarm delay can be set from 1 to 15 seconds in 1-second increments. Helps eliminate spurious alarms by ensuring that only vibration conditions persisting for more than the pre-set delay will trigger an ALERT or SHUTDOWN.
- Remote reset capabilities allow the user to connect a remote contact closure for resetting the switch when latching-type alarms are used.
- Flexible bypass / startup delay options allow an external contact closure to bypass the switch's alarming functions indefinitely. When in bypass, the switch continues to display measured vibration levels and output a proportional 4-20 ma signal; however, alarms cannot activate. This feature is useful when maintaining the instrument to prevent unwanted machine trips or alarms. It can also be used as a startup delay for any desired duration – simply leave the bypass terminals

shorted as invoked by a PLC or other machine controller with timer- or state-based logic. This ensures the switch will not trip a machine during its starting sequence when higher-than-normal vibration levels may be encountered. In contrast, other switch types may not provide the necessary level of flexibility to establish an appropriate machine startup delay.
- Multi-color LEDs clearly and unambiguously annunciate OK, Bypass, and Alarm conditions. Loss of power can also be ascertained via OK LED (green = OK, red = NOT OK, off = no power).
- Individual SPDT electro-mechanical relays are provided for each alarm, allowing more flexibility in choice of loads than solid-state relays. Relays are configurable[1] for normally energized or normally de-energized operation, as well as latching and non-latching. Both N.O. and N.C. wiring terminals are provided.
- Buffered signal output terminals allow wiring from the switch back to a patch panel or other termination for convenient connection to portable data collectors, analyzers, and other instruments.
- Local reset capabilities allow the user to easily reset the switch by accessing the keypad on the display.
- Hazardous area approvals are currently available[3] for CSA Division 1 and Division 2.
- 4-20 mA input capabilities allow the switch to monitor and alarm on any generic 4-20 mA signal, such as from pressure, temperature, flow, impact, or any other transmitter type (including proximity probes[2]). The configuration software allows custom scales and engineering units.
- Wide variety of external input types allow the user to select from virtually any type of seismic transducer including constant-current accelerometers, piezo-velocity transducers, and moving-coil velocity transducers. Scale factors are highly configurable, allowing compatibility even with non-standard sensor types.
- Available with an internal accelerometer for completely self-contained operation when an external sensor isn't practical.
- Simple, intuitive configuration fits on a single screen using the Windows-based PRO configuration software for at-a-glance visibility of all switch settings.
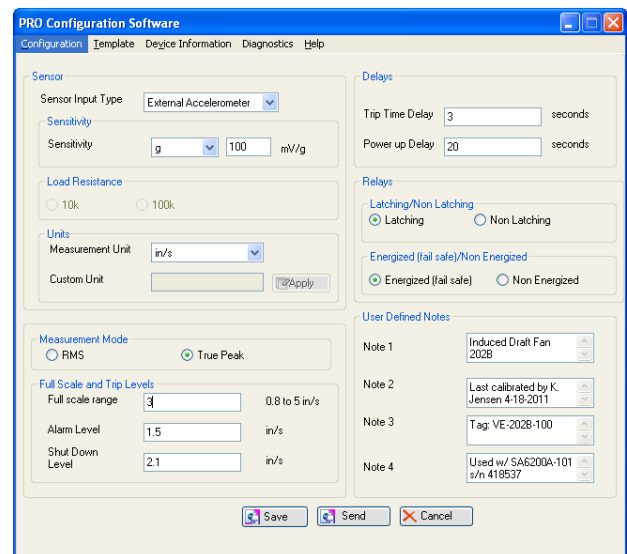
- User-defined notes can be added to the switch's non-volatile memory via the PRO configuration software. Plant-specific instrument loop numbers, asset tag numbers, date of last service and service person, and any other data can be entered in up to 4 separate free-text fields.
- Wide variety of mounting styles allow 3-hole flat-base mounting (PRO440), 4-hole flat-base mounting (PRO450), and stud mounting (PRO6000). For convenience when upgrading[4] an existing installation, PRO mounting footprints are identical to their predecessors, and the housing dimensions closely match as well.[5]

NOTES:

1. Dual relays are configured in pairs. It is not possible to configure one relay as latching and the other non-latching, or one as energized and the other non-energized.

2. Axial position transmitters are not supported. They require over/under alarming which is not available in the PRO switch family.

3. The PRO440 is approved for use in Class I / Class II Div 2 areas. The PRO6000 is approved for use in Class I / Class II Div 1 areas. Class I / Class II Div 1 approvals are for the PRO450 enclosure only.

4. Not all features in the SW- and SM-series switches are replicated in the PRO. Consult your Metrix sales professional to review your application before selecting a PRO switch as a replacement or spare for an 440, 450, SW6000, or SM6100. See also "Retrofit Considerations".

5. Refer to pages 12-13 for dimensional comparisons of PRO440 and PRO6000 switches versus their predecessors.

RETROFIT CONSIDERATIONS

The PRO series has been designed to use in most applications where the 440, 450, SW6000, and SM6100 would have been used previously. However, although the PRO series adds many new features and functions, it does not replicate every capability of predecessor switches. There are instances in which select functionality is not available in the PRO series and a different Metrix switch will represent a better fit for the application. If you are considering the purchase of a PRO switch as a spare or replacement for an existing 440, 450, SW6000, or SM6100, please consult the factory or your nearest Metrix sales professional to ensure compatibility.

The following features are not currently available in the PRO series:

- **External BNC connector**
  This option was available on selected 440, SW6000, and SM6100 switches. External BNC connectors are not permitted on switches carrying hazardous area approvals. A BNC connector option is available with the PRO450 only; however, it is internal rather than external. All PRO switches come standard with wiring terminals for the buffered transducer output, allowing connection to a suitable remote patch panel or other termination.

- **External Reset Pushbutton**
  This feature was available on selected 440, SW6000, and SM6100 switches. The cover must be removed from the PRO housing to access the display keypad, allowing latched alarms to be reset. Alternatively, wiring connections are provided on the PRO switch for an external reset signal and these may be wired to a local or remote reset pushbutton.

- **Seismic Displacement**
  The SW6000 and SW6100 allow single- or double-integration into displacement. The PRO switch does not support seismic displacement units unless an external velocity transducer is used with an intervening signal conditioner, such as the Metrix 5534/5544 which provides single integration. Acceleration-to-displacement measurements are not available.

- **Solid-State Relays**
  This feature was available on the 440, 450, SW6000, and SM6100. The PRO series is available only with electro-mechanical relays. If you are using the PRO in an installation that previously used solid-state relays (i.e., triacs or FETs), please ensure that the relays in the PRO switch are compatible with the loads they will be switching.

- **Selected Hazardous Area Approvals**
  The PRO switch does not currently carry all of the same hazardous area approvals as its predecessors. Before replacing an 440, 450, SW6000, or SM6100, please ensure that the PRO has obtained the required agency approvals.

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SPECIFICATIONS

All specifications are at +23°C (+73°F) and 100 Hz unless otherwise noted.

Input	
Channels	1
Channel Types	• Acceleration • Velocity • Integrated Acceleration • Impact Count • 4-20 mA / Custom* * 4-20 mA channels are the only type that can be configured for custom units using up to 5 characters (a-z, A-Z, and /). The minimum scale (4mA) and maximum scale (20 mA) values may be configured between -999.9 and +999.9, regardless of units; however, the maximum scale must always be greater than the minimum scale.
Transducer Types	**Acceleration Sensors** • Metrix SA6200A • Metrix SA6350 • PRO internal 100 mV/g accelerometer • Constant-current accelerometers with sensitivities from 1.0-11.2 mV/m/s2 (10 - 110 mV/g)* * The internal accelerometer option restricts scale factor to 100 mV/g. All other external accelerometer sensitivities can be configured in 0.1 mV increments. **Piezo-Velocity Sensors** • Metrix SV6300 • Constant-current piezo-velocity sensors with sensitivities from 3.9-19.7 mV/mm/s (100-500 mV/in/sec)* * External piezo-velocity transducer sensitivities can be configured in 0.1 mV increments. **Moving-Coil Velocity Sensors** • Metrix 5485C* • Moving-coil velocity sensors with sensitivities from 3.9-19.7 mV/mm/s (100-500 mV/in/sec)* * Moving-coil velocity transducer sensitivities can be configured in 0. 1 mV increments. The 5485C restricts scale factor to four discrete selections: 105, 145, 150, and 200 mV/ips. **Impact Transmitters*** •Metrix IT6810/6811/6812 * Metrix impact transmitters provide a 4-20 mA signal proportional to the number of impacts per unit time above an adjustable threshold level. The sensor's output signal is a discrete mA level in 1 mA increments where 4 mA = 0 impacts, 20 mA = 16 impacts, and 12 mA = 8 impacts. **Vibration Transmitters and Signal Conditioners w/ 4-20 mA output** • Metrix TXR • Metrix ST5484 / ST5491 • Metrix 162VTS • Metrix ST6911 • Metrix ST6917 • Metrix 5565 • Metrix 5510 • Metrix 5535/5545

	• Metrix 5534/5544 • Others providing a 4-20 mA signal proportional to vibration amplitude (not gap)* * The PRO switch cannot be used for axial position (thrust) monitoring as it is not capable of over/under type alarming required by such measurements. Do not attempt to use a Metrix TXA, 5488, or other axial position transmitter with the PRO for thrust bearing protection. **RPM Transmitters** • Metrix PT5521 • Other RPM transmitters providing a 4-20 mA output proportional to rotative speed ⚠️ **Caution** The PRO switch is intended for display and annunciation of speed only. Use as part of a speed control or overspeed protection system constitutes a misapplication of the product. **Other 4-20 mA Transmitters** The PRO switch accepts any ISA-standard 4-20 mA signal and allows configuration of custom engineering units. This allows it to monitor virtually any parameter* including temperature, flow, pressure, level, or other process variables that can be supplied in a 4-20 mA format. The PRO provides 24 Vdc @ 25 mA to power a connected transmitter. * Measurements requiring over/under alarming are not supported.
Maximum Signal Amplitude	• 5 Vac pk-pk for all mV sensor inputs • 20 mA dc for all transmitter inputs
Full-Scale Range	• Internal accelerometer: 50-100 m/s2 (5-10 g) 20-76 mm/sec (0.8-3.0 ips) • External accelerometers: 50-500 m/s2 (5-50 g)* 20-127 mm/sec (0.8-5.0 ips) • External velocity sensors (piezo and moving-coil): 20-127 mm/sec (0.8-5.0 ips) • 4-20 mA transmitters: -999.9 to +999.9 * External accelerometers with sensitivities above 70 mV/g (7.1 mV/m/s2) will decrease the available full-scale range.
Input Power Voltage*	• AC: 85 – 230 Vac, 50-60 Hz • DC: 24 ± 2.4 Vdc * AC or DC power must be specified at time of ordering and is not field-configurable.
Power Consumption	≤ 6 W
Power Terminal Ratings	• Nominal Current: 17.5 A • Max. Load Current: 22A • Nominal Voltage: 250 Vac • Rated Voltage: 320 Vac • Insulation: Polyamide (PA) • UL94 Flammability Class: V0

Input Impedance	• Moving-coil velocity: 10 kΩ or 100 kΩ (software-configurable) • Constant-current sensors: adjusts automatically to maintain 4 mA bias current • 4-20 mA transmitters: 100 Ω	**Keypad**	4 membrane-style keys • → • ↓ • MENU • ENTER
Bypass	Invoked by shorting BYP wiring terminals. Switch displays measurement level and provides proportional 4-20 mA output, but defeats all alarming functions. Bypass conditions persists for as long as terminals are shorted. Monitoring resumes immediately upon removing short.	**Transducer Power**	• 4-20 mA transmitters: 24Vdc @ 25 mA • Constant-current accelerometers and piezo-velocity devices: 24 Vdc @ 4 mA • Moving-coil velocity transducers: 12 Vdc bias voltage* * Although moving-coil velocity transducers are self-powered, a bias voltage is provided for sensor OK checking.
Reset	• Resets latched alarms • Invoked locally at keypad/display using ALARM RESET menu • Invoked remotely by momentary short of RST wiring terminals.	**Buffered Transducer Outputs**	**Locations** • Wiring terminals inside PRO enclosure • BNC connector inside PRO450 enclosure* * Available on PRO450 only. Must be specified when ordering. **Impedance** • 1 kΩ **Short-Circuit Protected** • Yes (output may be shorted indefinitely without affecting switch operation) **Accuracy** • ± 5% of measurement **3 dB Bandwidth** • DC to 20 kHz* **Cable Drive** • Up to 305 m (1000 ft) of cable may be connected without degradation of signal* * Cable lengths beyond this will introduce excessive capacitance, degrading the frequency response. Consult the factory for specific roll-off data for longer lengths. **Signal Type** • Raw (unfiltered, no integration) transducer signal in mV/engineering units* * When the optional 100 mV/g internal accelerometer is used and the switch is configured to monitor integrated acceleration, the buffered output will not be integrated and will reflect the raw 100 mV/g signal. When integrating the signal from an external accelerometer, the buffered output will likewise reflect the raw acceleration signal, not the integrated signal.

Outputs

Relays	• Number: 1 or (optional) 2
	• Type: SPDT, form C
	• Minimum Switching Capacity: 100 mA @ 5Vdc
	• Maximum Switching Capacity: 2500 VA
	10A @ 250 Vac or 5A @ 100 Vdc
	• N.O. and N.C. wiring terminals available for each relay
	• Software-configurable options:
	   o Energize or De-Energize*
	   o Latching or Non-Latching*
	
	* Dual relays are configured in pairs. It is not possible to configure one relay as latching and the other non-latching, or one as energized and the other non-energized.

4-20 mA	• Number: 1 • Output proportional to channel programmable full scale range* • Max Load Resistance (RL): 600 Ω • Accuracy: ± 1% of full scale 4 mA ± 0.25 mA @ min. scale • Supply: Sourcing 24 Vdc, isolated from switch • Short-circuit protected: Yes • NOT OK Clamp: < 3.8 mA • Max. Output: 20 mA (100% of full scale) * When the input is a 4-20 mA signal, the PRO's 4-20 mA output will act as a repeater.
LEDs	• **OK LED** **Green** – Sensor Connection OK **Red** – Sensor Connection NOT OK **Off** – Switch has lost power • **Bypass LED** **Red** – Switch in bypass mode **Off** – Switch not in bypass mode • **Alarm LED** **Yellow** – ALARM **Red** – SHUTDOWN (available on dual-relay versions only) **Off** – No alarm
Display	• 2 lines • 8 characters per line • 4x7 green LED dot-matrix per character • Display Resolution: 5 digits • Display indicates current readings and associated engineering units. Can be used to view and change configuration settings by accessing appropriate menus, and for local reset.

Configuration

Method	All PRO switches support both of the following configuration methods: • PC-based PRO™ configuration software • Integral display/keypad While in configuration mode, the switch is disabled. It provides no display, no alarming, and no 4-20 mA output.
Connection Type	USB 1.1 (USB Type B receptacle on PRO – must detach display to access)
Memory Location	Configuration data is stored in switch's non-volatile RAM until changed. Batteries or other power sources are not required to retain configuration data.
Supported Operating Systems	• Windows XP (SP2 or later) • Windows 7 (32- and 64-bit) NOTE: The software has not been tested on Windows Vista and support is not available for this operating system.

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Configurable Options	• Alarm delay (1-20 sec in 1-sec increments; affects both alarm and shutdown)
	• Power-up delay (20-30 sec in 1-sec increments)
	• Latching/Non-Latching Relays
	• Energized/De-Energized Relays
	• Input Type
	   o Internal Accelerometer
	   o External Accelerometer
	   o External piezo-velocity
	   o External electromechanical velocity
	   o Metrix 5485C velocity
	   o 4-20 mA transmitter
	• Transducer Sensitivity
	• Input Impedance*
	• Measurement Unit
	   o Acceleration: g or m/s/s
	   o Velocity: sec or mm/sec
	   o Impacts: IMPS (impacts)
	• Custom Unit (4-20 mA channel types only): up to 5 characters (a-z, A-Z, /)
	• Full-Scale Range
	• Mode (vibration channel types only): RMS or PEAK
	• Shutdown Level (0-90% of full scale)
	• Alarm Level**
	(must be less than shutdown level)
	• Up to 4 user-defined notes
	
	* Available for electromechanical velocity inputs only
	** Available with dual relay models only

Signal Conditioning

A/D Resolution	12 bits
Integration	Configurable for: • None • Single (Acceleration-to-Velocity only) NOTE: Velocity-to-displacement integration (seismic displacement) can be accomplished by means of an external velocity transducer and an external signal conditioner such as the Metrix 5534/5544. The displacement signal is provided in 4-20 mA proportional format and the PRO is configured for custom units of mils or um.
Peak Detection	Vibration channel types are configurable for either: • True Peak • True RMS
Accuracy	**Vibration Channels** • Acceleration: ± 3% • Integrated Acceleration: ± 6% • Velocity: ± 3% **4-20 mA Channels:** ± 1%
Frequency Response* (± 3 dB)	2 Hz – 5 kHz * Frequency response may be further limited by the transducer itself when using an external transducer input.

Self-Test Capabilities

Relay Test	Forces opened / closed condition of relays, individually
Current Output Test	Allows user to drive current output to any of the following values: 4, 8, 12, 16, or 20 mA
Digital Input Test	Forces BYPASS and RESET functions, individually
Power Supply Monitor	Checks status of internal 24 Vdc power supply
Display Test	Lights all LED elements in dot-matrix display to confirm that all are working
Key Test	Prompts user to press each of the 4 available keypad buttons, confirming proper operation
LED Test	Forces LEDs into each available state/color, individually
Internal Signal Test	Generates a 1kHz test signal to exercise various internal circuit paths, confirming operation
Access	All self-test functions may be invoked via the local keypad/display or via the PRO configuration software

Environmental

Operating Temp.	-40C to +70C (-40 to + 158°F)
Vibration	≤ 10g NOTE: If more than 10g will be encountered at the measurement location, use an external sensor and mount the PRO switch remotely.
Humidity	100% condensing
Enclosure Ratings	• PRO440: NEMA 4X / IP65 • PRO6000: NEMA 4X / IP65, explosion-proof • PRO450: NEMA 4, explosion-proof

Approvals

EMC	• European EMC Directive (2014/30/EU) • FCC 47 CFR, Part 15 Subpart B, Class A • ANSI C63.4
CSA	• PRO440: Class I, Div 2, Groups B-D, T4, NEMA 4/4X, IP65 Class II, Div 2, Groups F,G, T4, NEMA 4/4X, IP65 • PRO6000: Class I, Div 1, Groups B-D, T4A, NEMA 4/4X, IP65 Class II, Div 1, Groups E-G, T4A, NEMA 4/4X, IP65
CSA/UL	• PRO450 (Enclosure): Class I, Div 1, Groups B-D Class II, Div 1, Groups E-G

Physical

Size	Refer to Figures 2-4.
Weight	1.8 kg (4 lbs)
Enclosure Material	Copper-free cast aluminum
	• PRO440: Powder-coat epoxy (Pantone 302 blue) • PRO6000: Powder-coat epoxy (Pantone 302 blue) • PRO450: Paint (gray)* * Epoxy clear-coat available as an option on PRO450. Housing carries NEMA4 rating whether with or without epoxy option.

ORDERING INFORMATION

	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN
PRO___		02											

Software Programmable Options

Options GG-NN may be specified at time of ordering or left blank. If not specified, factory default options (indicated by bold type) will be supplied. These default configurations can be changed in the field via the keypad/display or via the Windows-based configuration software.

PRO Vibration Switch	
AA	**Pro Model**
01	440 Single Relay (SR)
02	440 Dual Relay (DR)
03	6000 Single Relay (SR)
04	6000 Dual Relay (DR)
05	450 Single Relay (SR)
06	450 Dual Relay (DR)
07	450SR w/ BNC
08	450DR w/ BNC
BB	**Display**
02	Display included
CC	**Power**
01	85-230 Vac, 50/60 Hz
02	24 Vdc
DD	**Agency Approvals**
01	No Approvals
02	CSA Div 1[1]
03	CSA Div 2[2]
EE	**Conduit/Stud Threads[3]**
01	¾" NPT / ½" NPT
02	M20 x 1.5 / M20 x 1.5
FF	**Sensor Type**
01	Internal Accelerometer (100 mV/g)
02	External Accelerometer
03	Piezo-Velocity
04	5485C
06	Moving-coil velocity
07	Impact Transmitter
08	ST5484E
09	4-20mA
GG	**Input Sensitivity[4]**
00	Internal Accelerometer
01	10 mV/g
02	**100 mV/g**
03	100 mV/in/sec
04	105 mV/in/sec
05	145 mV/in/sec
06	150 mV/in/sec
07	200 mV/in/sec

HH	Full Scale Range[5]
01	0.8 in/sec
02	1.0 in/sec
03	**1.5 in/sec**
04	2.0 in/sec
05	3.0 in/sec
06	5.0 in/sec[6]
07	12.7 mm/sec
08	20 mm/sec
09	25 mm/sec
10	40 mm/sec
11	50 mm/sec
12	80 mm/sec[6]
13	125 mm/sec[6]
14	10 g
15	35 g[6]
16	50 g[6]
17	100 m/s/s
18	500 m/s/s
19	16 impacts
JJ	**Detection Mode**
01	**True Peak**
02	RMS
KK	**Trip Delay**
01	1 seconds (min)
02	2 seconds
03	**3 seconds**
XX	Delay in seconds (from 1-20)
20	20 seconds (max)
LL	**Startup Delay**
20	**20 seconds (min)**
XX	delay in seconds (from 20-30)
30	30 seconds (max)
MM	**Relay Latching**
01	**Latching**
02	Non-Latching
NN	**Relay Mode**
01	Non-Energized
02	**Energized**

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NOTES:

1. Available with PRO6000 only: CSA Class I Div 1 Groups B-D, temp code T4A, enclosure type 4/4X, IP65 and Class II Div 1 Groups E-G. Available with PRO450: enclosure is CSA/UL Class I, Div I, Groups B-D and Class II, Div 1, Groups E-G.
2. Available with PRO440 only. CSA Class I Div 2 Groups B-D, T4, NEMA 4/4X, IP65 and Class II Div 2 Groups F and G.
3. Mixed metric and English threads (metric conduit sizes with English mounting studs or vice-versa) can be supplied upon request as a factory special. Please specify at time of ordering.
4. The input sensitivity can be configured to any value between the limits below:
   External Accelerometer: 1.0-11.2 mV/(m/s/s) or 10-110 mV/g
   External Velocity: 3.9-19.7 mV/(mm/sec) or 100-500 mV/(in/sec)
5. The full scale range can be configured to any value between the limits below:
   Acceleration: 50-500 mV/(m/s/s) or 5-50 g
   Velocity: 20-127 mm/sec or 0.8-5 in/sec
   4-20 mA: Same as full scale range of input transducer
6. These full scale options exceed the internal accelerometer's range and are not available when an internal accelerometer is specified.

⚠ **Caution:** When ordered without specifying options GG – NN, the PRO switch is shipped with factory default configuration settings which are not necessarily suitable for any particular application. Before use, ensure that the switch is configured properly for its application via the keypad/display or via PRO configuration software. This software is available for download at www.metrixvibration.com.

ACCESSORIES

PRO6000 - Flush Mounting Adapter
This stainless-steel adapter allows a PRO6000 to be flush mounted on a flat surface.   The adapter provides a ½" NPT threaded hole* in the center and three equally spaced 0.26" (6.6 mm) smooth holes on a 1.50" (38 mm) circle.

7084-001 - Flange Mounting Adapter
* NOTE: The flange mounting adapter is not compatible with PRO6000 switches that have a metric mounting stud.

USB cable
A 3m (10-foot) USB cable is included with each order for PRO switches. Use the part number below only for spares or replacements.
100468 - 3m USB cable (Type A male to Type B male)

SOFTWARE

PRO configuration software is available free-of-charge at www.metrixvibration.com.

SWITCH FEATURE COMPARISON

Features	440	PRO440	450	PRO450	SW6000	SM6100	PRO6000
Primary Attributes							
Single Relay Version (SR)	STD	STD	STD	STD	STD	STD	STD
Dual Relay Version (DR)	$OPT	$OPT	$OPT	$OPT	$OPT	$OPT	$OPT
Display		STD		STD	$OPT	$OPT	STD
Programmable Configuration		STD		STD			STD
4-20 mA output (self-powered)	STD	STD	STD	STD	$OPT	$OPT	STD
4-20mA Loop Test Feature		STD		STD			STD
Signal Conditioning							
Velocity-to-Displacement Conversion						OPT	
Acceleration-to-Displacement Conversion					OPT	OPT	
Acceleration-to-Velocity Conversion	STD	STD	STD	STD	OPT	OPT	STD
Display in acceleration units (no integration)		STD		STD			STD
Display Impact counts (for Impact Transmitter input)		STD		STD			STD
True Peak amplitude detection		STD		STD			STD
"Derived Peak" (RMS x 1.414) amplitude detection	STD	STD[1]	STD	STD[1]	OPT	OPT	STD[1]
True RMS amplitude detection		STD		STD	OPT	OPT	STD

STD: Standard Feature, included in base price
OPT: Standard Option, included in base price
$OPT: Standard Option, additional price
PEND: Pending, planned but not yet available

Features	440	PRO440	450	PRO450	SW6000	SM6100	PRO6000
Transducer Input Type							
Internal Accelerometer	$OPT	$OPT	$OPT	$OPT	STD		$OPT
Accepts External Acceleration Sensors	STD[2][3]	STD	STD[2][3]	STD		STD	STD
Accepts External Piezo-Velocity Sensors		STD		STD		OPT	STD
Accepts External Moving-Coil Velocity Sensors		STD		STD		OPT	STD
Accepts External Displacement Sensors							STD
Accepts 5485C Hi-Temp Velocity Transducer		STD		STD		OPT	STD
Accepts IT 681X Impact Transmitters		STD		STD			STD
Accepts any 4-20mA input signal		STD		STD			STD
Accepts 4-20 mA vibration transmitters		STD		STD			STD
Approvals							
No Approvals		STD		STD	STD	STD	STD
CE Mark					STD	STD	
CSA, Div 2	STD22	$OPT[2][6]					
CSA, Div 1			STD[2][3]	PEND	$OPT[2][4]	$OPT[2][4]	$OPT[2][4]
GOST (Russia)					$OPT	$OPT	
GOST K (Kazakhstan)					$OPT	$OPT	
IECEx					$OPT[2][5]	$OPT[2][5]	
ATEX Zone 2							
ATEX Zone 1					$OPT[2][5]	$OPT[2][5]	
Wiring Connections							
Buffered output terminals		STD		STD	STD	STD	STD
Buffered output BNC connector	$OPT[4]			$OPT[5]	$OPT[4]	$OPT[4]	
USB connector for configuration and verification		STD		STD			STD
External Local Reset Button (weatherproof)	$OPT				$OPT	$OPT	
External Local Reset Button (XP / flameproof)					$OPT	$OPT	
Terminals for activating BYPASS condition		STD		STD			STD
Terminals for wiring remote reset	STD	STD	STD	STD	STD	STD	STD
Terminals for activating Lockout / Startup delay[6]	$OPT		$OPT		STD	STD	
Mounting and Conduit							
¾ NPT conduit fittings[7]	ONE	TWO	ONE	ONE	TWO[8]	TWO[8]	TWO
M20 x 1.5 conduit fittings[7]	ONE	TWO	ONE	ONE	TWO[8]	TWO[8]	TWO
Stud Mount – ½-14 NPT[7]					STD	STD	STD
Stud Mount – M20 x 1.5[7]					OPT	OPT	OPT
Stud Mount – ½-20 UNF (straight threads) with jam nut					$OPT	$OPT	
Stud Mount – ¾" NPT					$OPT	$OPT	
Flat Base Adapter 7084-001 (½-14 NPT to 3-hole)					$OPT	$OPT	$OPT
450 4-hole Mounting Pattern			STD	STD			
440 3-hole Mounting Pattern	STD	STD					
Power							
110 – 230 Vac 50/60 Hz	STD	STD	STD	STD	STD	STD	STD
24 Vdc	$OPT	$OPT	$OPT	$OPT	OPT	OPT	$OPT

STD: Standard Feature, included in base price
OPT: Standard Option, included in base price
$OPT: Standard Option, additional price
PEND: Pending, planned but not yet available

Features	440	PRO440	450	PRO450	SW6000	SM6100	PRO6000
Relay Contacts and Delays							
FET solid-state relays (suitable for PLC DC inputs)	$OPT		$OPT		OPT	OPT	
TRIAC solid-state relays (suitable for motor starter circuits)	STD		STD		STD	STD	
Electro-mechanical relays (SPDT, 10A)	$OPT[9]	STD	$OPT	STD			STD
Adjustable DANGER delay (in seconds)	2-15	1-20	2-15	1-20	1-15	1-15	1-20
Adjustable ALERT delay (in seconds)[11]	2-15	1-20[10]	2-15	1-20[10]	1-15[10]	1-15[10]	1-20[10]
STARTUP delay (in seconds)	20[12]	20-30	20[12]	20-30	1-30[13]	1-30[13]	20-30
LOCKOUT / STARTUP invoked via external contact closure	$OPT	STD	$OPT	STD	STD	STD	STD
LOCKOUT / STARTUP delay invoked at Power Up	NO	YES	NO	YES	NO	NO	YES
Relays field-configurable for N.O. or N.C.	STD[14]	STD	STD[14]	STD	STD[15]	STD[15]	STD
Relays field-configurable for latching or non-latching	STD	STD	STD	STD	STD	STD	STD
Relays field-configurable for failsafe (i.e., norm energized)	STD	STD	STD	STD	STD	STD	STD
Environmental Rating							
NEMA 4			STD	STD			
NEMA 4X	STD	STD			STD	STD	STD
IP65		STD			STD	STD	STD
Cast Aluminum Housing, Explosion-Proof (XP)			STD[16]	STD[16]	STD[17]	STD[17]	STD[18]
Cast Aluminum Housing, non-XP	STD[19]	STD[18]					
Housing has window		STD			$OPT[27]	$OPT[27]	STD
Alarms							
DANGER: % of full scale	7% to 100%	0-90	7% to 100%	0-90	-10% to +110%	-10% to +110%	0-90
ALERT: % of DANGER		0-99[21]		0-99[21]			0-99[21]
ALERT: % of full scale	7% to 100%[21]		7% to 100%[21]		-10% to +110%[21]	-10% to +110%[21]	
LED indicators							
Power		STD[20]		STD[20]			STD[20]
Transducer OK		STD		STD		STD	STD
Alert	$OPT[21]	$OPT[21]	$OPT[21]	$OPT[21]	$OPT[21]	$OPT[21]	$OPT[21]
Danger	STD	STD	STD	STD	STD	STD	STD
Bypass		STD		STD			STD

STD: Standard Feature, included in base price
OPT: Standard Option, included in base price
$OPT: Standard Option, additional price
PEND: Pending, planned but not yet available

NOTES:
1. Not all transducer types compatible with the PRO switch allow sufficient adjustment of the scale factor to provide a "Derived Peak" reading. Examples include the internal accelerometer, the 5485C, and 500 mV/ips velocity transducers.
2. The 440 is not approved for use in Div 2 hazardous areas with an external sensor. Only the internal accelerometer option is approved.
3. Supports only 100mV/g constant current accelerometers, such as Metrix SA6200A.
4. The external BNC connector option is only available for non-hazardous areas.
5. The BNC connector on the PRO450 is inside the housing. The cover must be removed to access it. When installed in a Div 1 hazardous area, most customers will require a hot work permit (usually a portable gas detector that confirms a flammable atmosphere is not present) before the cover can be removed.
6. This feature is not required on PRO440, PRO450, or PRO6000 switches as the BYPASS terminals can be shorted for any duration required to suppress alarming during startup. Another way to activate a time-limited bypass feature is by application of power to these switches. This will invoke the startup delay, which is adjustable from 20-30 seconds. If a delay of less than 20 seconds or more than 30 seconds is required, use the BYPASS terminals instead of cycling power to the switch.
7. Units requiring metric conduit threads and English mounting stud threads (or vice-versa) are available as factory specials for an additional cost.
8. When optional Explosion-Proof local reset switch is ordered, only one of the two available conduit fittings is available (the reset switch occupies one conduit fitting). When the weatherproof reset switch is ordered, it does not occupy a conduit fitting and both conduit fittings are still available for field wiring connections.

9. Electro-mechanical relay option for 440 is only available without hazardous area approvals. Use 450, PRO440, PRO450, or PRO6000 instead when hazardous area approvals and electro-mechanical relays are required.
10. The ALERT and DANGER time delays may not be set independently; there is a single "trip delay" adjustment that governs both.
11. All electronic switches listed here come with a single setpoint (DANGER) as standard. An additional setpoint (ALERT) is optional and incurs an extra charge.
12. The LOCKOUT (i.e. startup delay) feature is an optional adder on the 440 and 450. The delay duration is not adjustable and is set at the factory for 20 seconds. LOCKOUT may only be invoked by shorting the LOCKOUT and COM wiring terminals, not by applying power to the switch. 440 and 450 switches begin monitoring immediately upon power-up and LOCKOUT must be invoked separately.
13. The SW6000 and SM6100 have a fixed 30 second delay as standard. An adjustable startup delay of 1-30 seconds is available as a chargeable option. The delay cannot be made indefinitely long by simply shorting the STARTUP and COM terminals. It will always be governed by the switch's internal timer, regardless of whether a momentary or continuous contact closure is applied to the terminals. To re-invoke STARTUP, the terminals must first be opened. The change from OPEN to CLOSED (not CLOSED to OPEN) will initiate the STARTUP feature.
14. N.C. and N.O. slide switch available on 440 or 450 only with FET or Triac outputs – not available with electro-mechanical relays.
15. When ordered with two limits (ALERT and SHUTDOWN), the relays can be individually configured for N.O. or N.C. One may be N.O. while the other may be N.C.
16. Painted finish. Color is gray.
17. Powder-coat epoxy. Color clear.
18. Powder-coat epoxy. Color is Pantone 302 blue.
19. Powder-coat epoxy. Color is aqua blue.
20. OK LED is bi-color (green and red) to annunciate power condition. Off=No Power; Green = OK; Red=NOT OK.
21. Requires optional dual relay (DR) or dual limit version.
22. Class I Div 2 Groups B,C, and D.
23. Class I Div 1 Groups B, C, and D; Class II Div 1 Groups E,F, and G; Class III
24. Class I Div 1 Groups B, C, and D.
25. IECEx Ex d IIB + H2   T4   (Ta = -20 to +85C w/o display; -10 to +70C w/ display).
26. Class I Div 2 Groups B, C, and D; Class II Div 2 Groups E, F, and G.
27. SW6000 / SM6100 models ordered with optional display have a window on the cover. Those without a display have a solid cover.
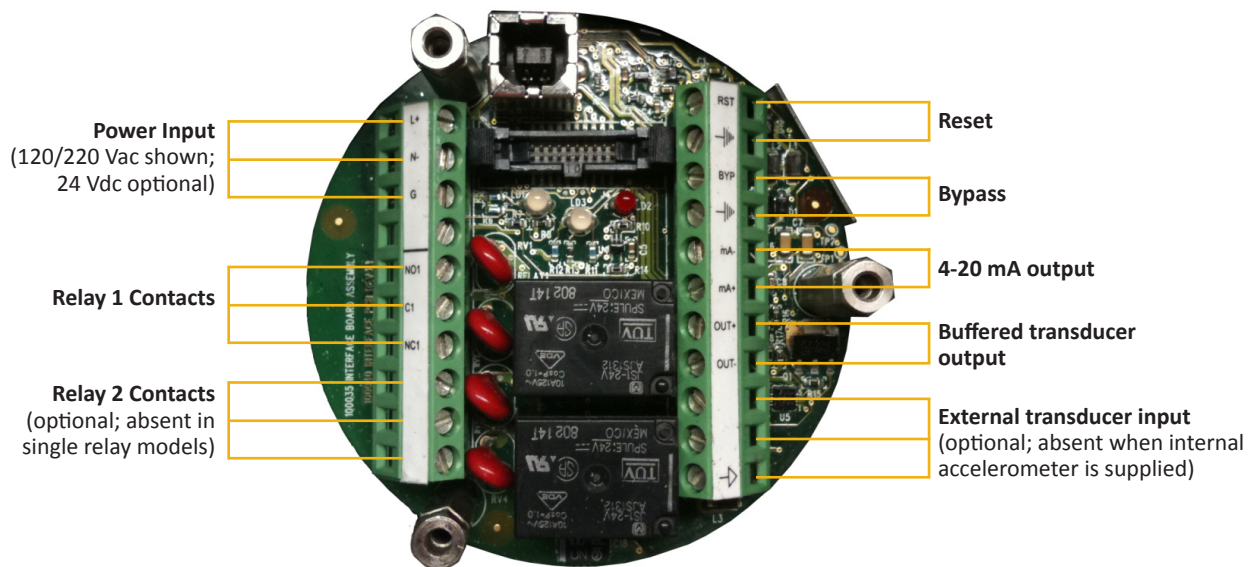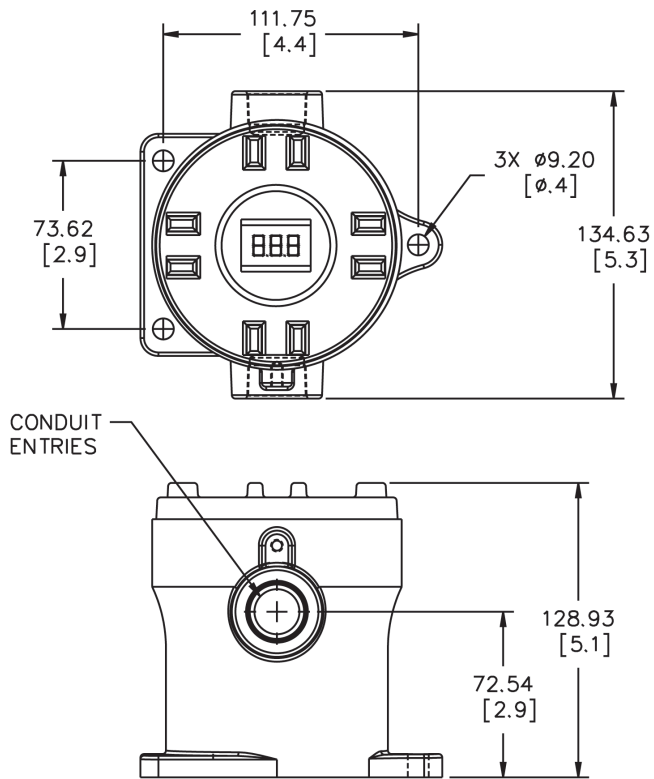
WIRING & OUTLINE DIAGRAMS

Figure 1: Wiring connections on PRO switch
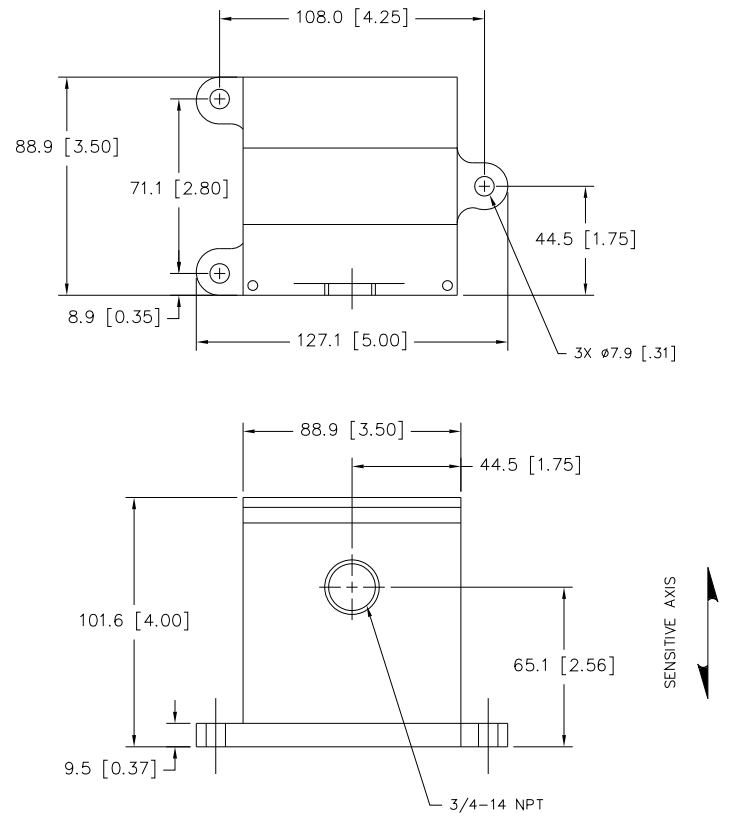(display removed for clarity)

PRO440

440

Figure 2: Dimensional details of PRO440 (left) and 440 (right)

NOTE: Not to scale
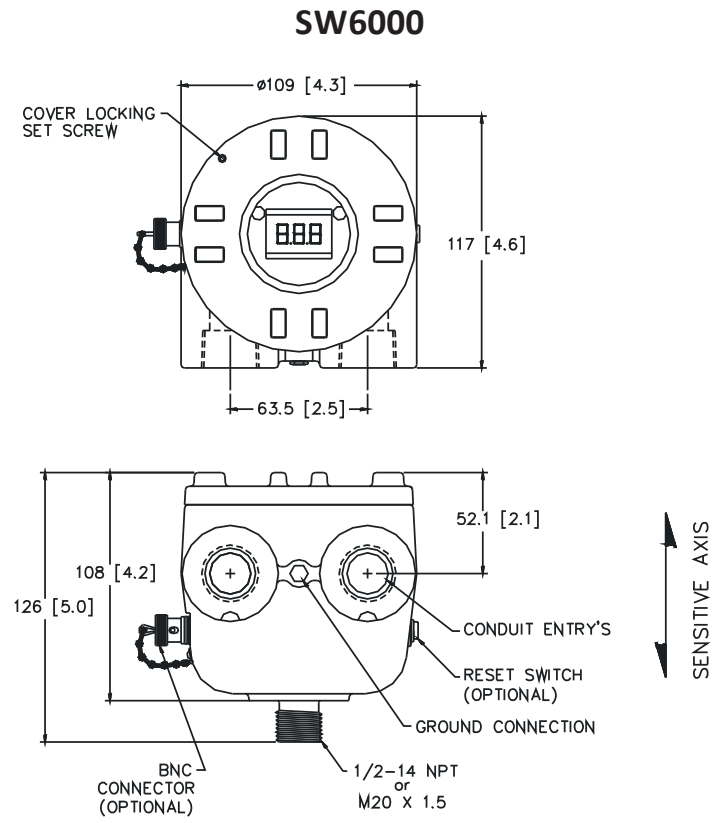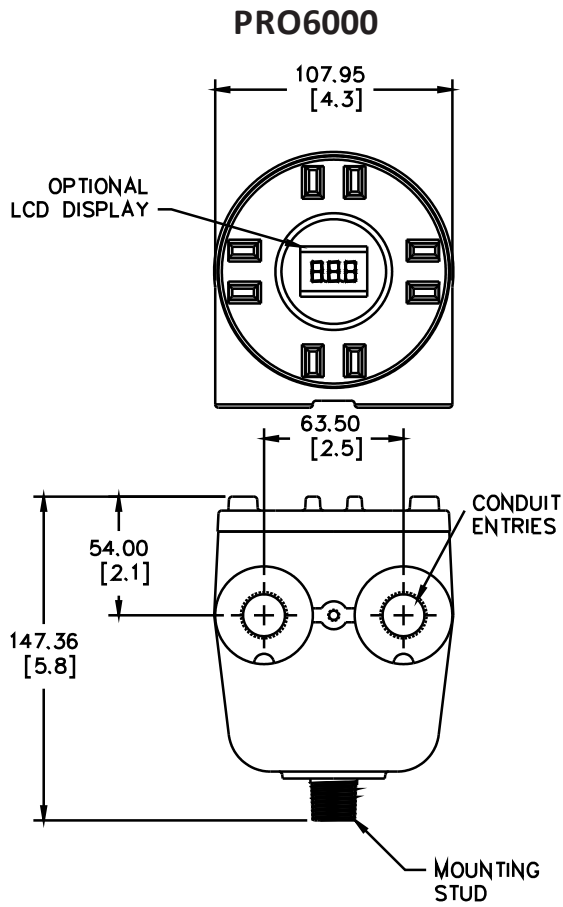
Aprox. Weight: 1.8 kg (4 lbs)
Units: mm [in]

METRIX

PRO6000

107.95
[4.3]

OPTIONAL
LCD DISPLAY

63.50
[2.5]

CONDUIT
ENTRIES

54.00
[2.1]

147.36
[5.8]

MOUNTING
STUD

SW6000

COVER LOCKING
SET SCREW

ⵁ109 [4.3]

117 [4.6]

63.5 [2.5]

52.1 [2.1]

108 [4.2]

126 [5.0]

CONDUIT ENTRY'S

RESET SWITCH
(OPTIONAL)

GROUND CONNECTION

SENSITIVE AXIS

BNC
CONNECTOR
(OPTIONAL)

1/2-14 NPT
or
M20 X 1.5

Figure 3: Dimensional details of PRO6000 (left) and SW6000 (right)

NOTE: Not to scale

Aprox. Weight: 1.8 kg (4 lbs)
Units: mm [in]

METRIX

Figure 4 — Dimensional Details

4X Ø7.9 [.31]

152.4 [6.00]

152.4 [6.00]

108.0 [4.25]

108.0 [4.25]

TOP VIEW WITH COVER REMOVED

SHUT DOWN ADJUST

SHUT DOWN LED

SHUT DOWN DELAY SET

ALARM ADJUST

ALARM LED

ALARM DELAY SET

GROUNDING TERMINAL

2X 3/4 NPT CONDIUT ENTRIES

146.1 [5.75]

76.2 [3.00]

27.9 [1.10]
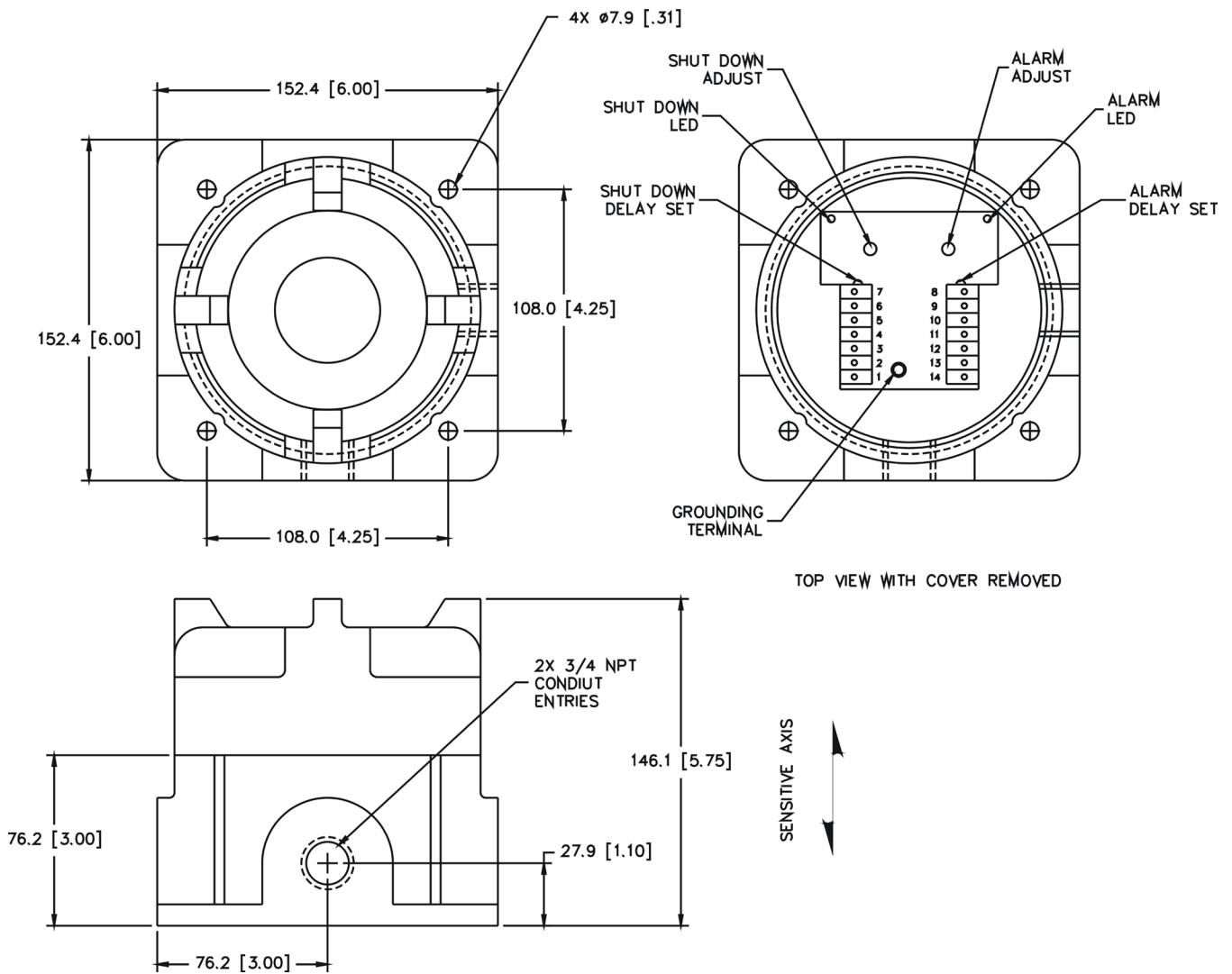
76.2 [3.00]

SENSITIVE AXIS

Figure 4: Dimensional details of PRO450 / 450

NOTE: PRO450 and 450 use identical housings

Aprox. Weight: 1.8 kg (4 lbs)
Units: mm [in]