SAVeS Smart Vibration Sensor

Modern vibration monitoring for gas compressors & other critical equipment

Installation Manual

ALTRONIC

www.altronic-llc.com | sales@altronic-llc.com

WARNING: Deviation from these instructions may lead to improper operation of the monitored machine which could cause personal injury to operators or other nearby personnel.

WARNING: The SAVeS must be configured prior to use. Refer to the SAVeS Operation Manual, SAVeS OM, for configuration instructions.

1.0 SAVeS System Description

1.1 Overview

The Smart Altronic Vibration Sensor (SAVeS) System is a 32-bit microprocessor-based, non-mechanical vibration monitoring solution designed for application in both interior and exterior environments. It protects industrial engines, compressors, and associated equipment from damage caused by excessive vibration.

The SAVeS System consists of two main parts: an equipment-mounted SAVeS and a Detector (for 691 816-2 and 691 816-3 versions). The SAVeS generates a signal on the 2-wire power line. Based on the generated signal, the SAVeS Detector can initiate a shutdown when conditions are reached.

The 691 816-2 and 691 816-3 designs are most useful for existing mechanical switch vibration monitoring systems, and 691 816-1 is most useful for new installations.

The SAVeS System is shipped with factory default X, Y, and Z vibration thresholds; however, as each application is unique, configuration must be performed. Configuration is accomplished through the iOS app or the Modbus. Refer to the SAVeS Operation Manual, SAVeS OM, for configuration instructions and information about the default vibration thresholds.

The system features:

- A DC current output to facilitate problem detection and diagnosis potential faults to avoid machine shutdown or failure.
- SAVeS Detector-initiated automatic engine shutdown according to set vibration thresholds.
- Data recording to facilitate prediction of potential failures, allowing for preventative maintenance.
- Max response time: approx. 2 seconds from detection to shut down.
- Configurable shutdown thresholds.
- Support for multiple build configurations.
- Eliminates less-accurate on-engine mechanical vibration switches.
- iOS App software configuration via integrated wireless module.
- Integrated mounting features.

The SAVeS System is designed for 24 VDC nominal powered systems. The power requirement is 9 to 32 VDC. Each SAVeS can draw a nominal current of 100 mA with pulses up to 700 mA, and the SAVeS Detector can draw up to 15 mA.

For proper operation, these instructions must be adhered to strictly.

1.2 SAVeS

The SAVeS is housed in a 3.6" (91.4mm) × 5.8" (147.3mm) × 2.2" (55.9mm) rugged powder-coated aluminum housing. The housing has mounting holes and slots to facilitate easy mounting directly to the engine or other critical equipment. The enclosure lid is secured with 4 flat head bolts for easy accessibility. The SAVeS has an E-Ink display that shows the iOS App QR code and shutdown values, a diagnostic LED, and a PCAP button.

The SAVeS contains an ultralow-power, high-performance 6-axis inertial measurement unit (IMU) which provides continuous vibration monitoring. Multiple SAVeS may be used simultaneously, each SAVes audits the vibration at major points of interest in an industrial application. For example, individual units may be mounted on a cooling fan bearings/motor, engine block, turbocharger, compressor frame/crosshead, or other associated equipment. Each unit may be individually configured and monitored for the appropriate vibration characteristics from the iOS App.

Available SAVeS models:

- 691 816-1 – Full features, SAVeS only[1]
- 691 816-2 – Requires Detector and includes Modbus (Modbus leading to the SAVeS must be isolated)
- 691 816-3 – Requires Detector

1.3 SAVeS Detector[2]

The SAVeS Detector is a timer relay with a 3 W 47 Ohm shunt resistor in series with the SAVeS and in parallel with the timer input for the relay. It provides the panel-side interface required to replace existing two-wire vibration switches. When the detector is used, the shutdown trip time is dependent on the timer relay. Please refer to section **3.5 Configuring the Timer Relay** on page 6 for more details.

1.4 System Components

- **Included Components:**
  - SAVeS
  - T27 Bit
  - ¼-20 × ⅝" Button Head Screws (×2)
  - Protective Sleeve (protects the SAVeS electronics/lid during installation)
- **Optional Purchase:**
  - SAVeS Detector
- **Customer-Provided Components:**
  - 2A Fuse with HazLoc Certification
  - CR2032 Li-Ion Battery (optional)
  - MicroSD Card (optional)

2.0 Mounting

2.1 Mounting the SAVeS

2.1.1 Mounting Location

WARNING: The SAVeS Detector is open-type equipment that must be used within a suitable enclosure.

See *Figure 4* on page 7 for physical dimension details. Select a mounting location that meets the following requirements:

- Directly on the equipment to be monitored.
- Within 500 ft. of the SAVeS Detector.
- The enclosure lid should be easily accessible and removable.
- The ambient temperature must not exceed -40 or +85 °C.

Mount the SAVeS to a convenient viewing height on a flat surface on the engine. Avoid using a mounting bracket, as this may cause unintended vibration from the mounting bracket to the SAVeS device.

NOTE: An Altronic supplied or approved adapter plate may be used to mount the SAVeS to an existing bolt pattern. For additional details, please consult Altronic.

Locate the SAVeS with the X, Y, or Z axis perpendicular to the axis of rotation, close to the bearing housing of the monitored equipment. The most effective point is normally found to be close to the centerline of the crankshaft, fan shaft, coupling, or bearing, depending on the monitored machine. The SAVeS should be mounted at a location where exposure to liquids such as gasoline, antifreeze, oil, brake fluid, etc., is minimal.

The enclosure is rated for outdoor or indoor use. Avoid mounting the E-Ink display in direct sunlight.

1 Pending release.
2 Not applicable for 691 816-1 model.

2.1.2 Mounting Procedure

NOTE: While manufacturing the mounting, secure the SAVeS electronics/lid in the protective sleeve until ready for wiring.

Four size 10 holes and two ¼" slots in the enclosure provide standard mounting for the SAVeS. Do not use mounting brackets or shock-absorbing mounts.

When replacing an existing mechanical switch vibration monitoring system, the SAVeS would typically be mounted in place of the existing vibration monitor.

Mount the SAVeS to a smooth, flat surface on the vibrating equipment. A surface that is not smooth will give erratic readings. Drill and tap the location perpendicular to the surface. Use four size 10 bolts for mounting at the corners or use two size ¼" bolts for mounting at the slots. Make sure the bolt does not bottom-out in the tapped hole. Torque the bolt to 6 in/lb. Do not over-tighten, damage may occur to the SAVeS.

Application of blue Loctite to bolt threads is recommended.

2.2 Mounting the SAVeS Detector

Select a mounting location that meets the following requirements:

- Within 500 ft. of the SAVeS.
- Mounted inside a suitable enclosure.
- The maximum ambient temperature must not exceed 70 °C.

Mount the SAVeS Detector inside a suitable control panel or enclosure.

3.0 Wiring

3.1 General

WARNING: Do NOT connect the minus terminal of the SAVeS directly to an ignition system common coil ground on the engine.

NOTES:

- All furnished drawings and instructions assume (–) ground DC system. In the case of a floating ground, or (+) ground DC system, please contact Altronic Factory for support.
- A conduit fitting is provided for termination of a conduit run. If not using conduit, this can be removed and a suitable cable should be used for protection against environmental conditions as well as chemical resistant to oils, solvents, etc.

The power connections to the SAVeS system must be in accordance with the National Electrical Code or other applicable country code.

Take care not to damage the insulation and take precautions against damage from vibration, abrasion or liquids in conduits. Never run sensor, low voltage power, communications, or output switch wires in the same conduit as the ignition wiring or other high energy wiring such as AC line power, etc. Keep wires at least 12 inches (305 mm) away from all high voltage wiring. Keep secondary wires to spark plugs and other high voltage wiring at least 12 inches (305 mm) away from vibration sensors and their wiring.

3.1.1 Pin Reference Information

(Refer to *Figure 1.*)

Pin 5: Relay COMMON is the SAVeS integrated solid-state relay common pin.

Pin 6: Relay N/C is the SAVeS integrated solid-state relay normally closed pin. It remains closed during normal operation and opens when a shutdown event occurs (requires a manual reset of the SAVeS to close after a shutdown event). Pins 5 and 6 can be used as a standard relay, with a maximum rating of 500 mA at 60 V.

Pin 7: ALARM_OD is an open-drain output pin that is active low during an alarm window (determined by the value of ALARM_THRESHOLD). Requires a minimum of 160Ω pull-up resistor at a maximum voltage of 28V.

Pin	Base (2-Wire)	Standard
Pin 1	Input (+V)	Vin
Pin 2	Return (-V)	GND
Pin 3	–	Modbus +
Pin 4	–	Modbus -
Pin 5	–	Relay COMMON
Pin 6	–	Relay N/C
Pin 7	–	ALARM_OD
Pin 8	–	4-20mA

Figure 1

Pin 8: "4-20mA" is a 4-20 mA current source output. Requires an external loop resistance to ground. A 4 mA current corresponds to 0.0 inches/second, while a 20mA current corresponds to 2.0 inches/second. There is an additional over-velocity region of 0.5 inches/second (24mA).

3.2 Connectors

The SAVeS connector is a spring-cage type that should use 24 to 16 AWG wire.

3.3 HazLoc Fuse

Fuse the SAVeS with a 2A fuse.

3.4 Wiring the SAVeS Detector[2]

24V Nominal, load current is 15 mA.

Operating current is 15 milliamps max. Power is typically from a DC battery or a DC power supply. Nominal voltage is 24 VDC. If the SAVeS is powered from a DC power supply it must be rated as Class 2 or be CSA Class 1, Div 2.

To wire the SAVeS detector (see *Figure 2*):

1. +24V connects to the SAVeS (V+) and A1 on the timer relay (a.k.a. the Detector).
2. SAVeS V– connects to timer relay B1 and a 47 Ohm 3 W pulse-withstanding resistor block.
3. The other end of the resistor and timer relay A2 connect to ground.
4. Wire a discrete signal to terminals 15 (COM) and 18 (NO). These terminals change state and are shorted during normal operation and open when a shutdown occurs.

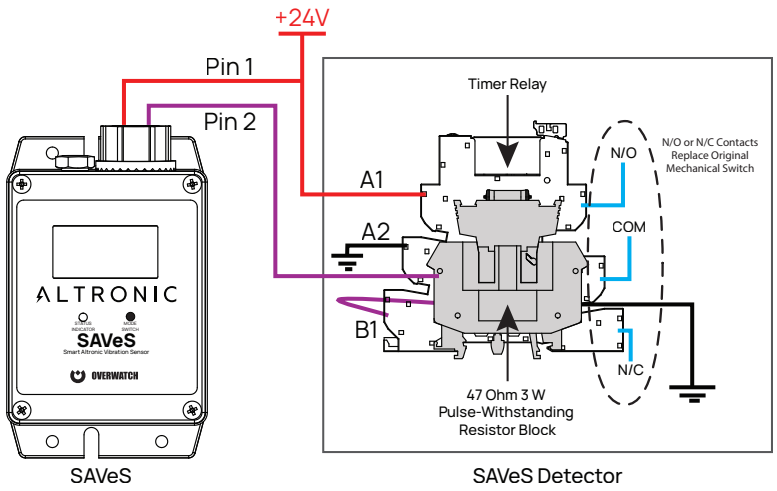

Figure 2

NOTE: The 47 Ohm resistor typically has 100 mA of current with pulses up to 700 mA occurring every 1.5 seconds for 60 mS.

3.5 Configuring the Timer Relay

1. Verify the timer relay switch positions are as follows (see *Figure 3*):
    1. Down
    2. Down
    3. Up
    4. Down
    5. Down
2. Turning the orange timer adjustment wheel all the way to "+" will set the timer to 3 seconds. Alternatively, if a SAVeS is connected per section 3.4, powered on, and in normal operating mode: start with the orange wheel all the way to the "-" position, then turn the wheel toward "+" until the LED is on solid. This will set the time closer to the minimum possible time of 1.5 seconds.

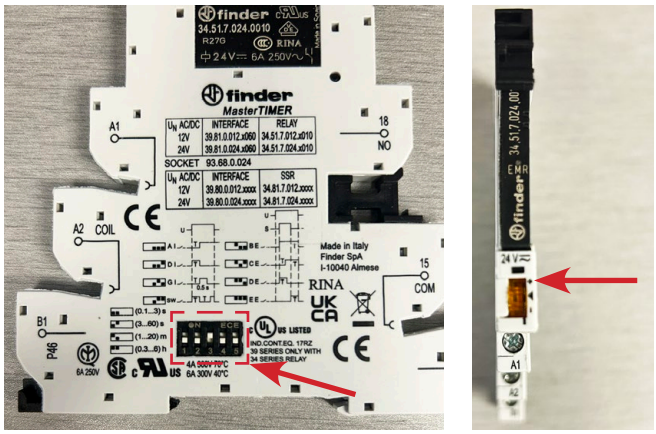

Figure 3

NOTES:

- Orange light on means it is in the operational state.
- By turning the wheel until the orange light turns on, that is setting the minimum satisfied time for the relay. The SAVeS sends heartbeat pulses ~1.5 mS. This is what keeps the relay contacts from resetting. In the event that the SAVeS has a fault it will stop sending the heartbeat pulses and the relay will change state. The orange light will no longer be on solid, and will begin blinking to indicate a shutdown state.

3.6 Hazardous Area Operation – PENDING

WARNING EXPLOSION HAZARD: Do NOT disconnect equipment in Div. 2 environments unless the power is switched off or the area is known to be non-hazardous.

The SAVeS is designed for use in Class I, Division 2, Groups C & D areas where the suitability of the combination is subject to the local inspection authority having jurisdiction. The power connections to the SAVeS must be in accordance with the National Electrical Code and in Canada, the Canadian Electrical Code. In addition, the following requirements must be met:

1. Run the wires leaving the panel in a separate conduit from all other wiring and keep them separate throughout the installation.
2. In general, run wires in separate conduits and junction boxes from high voltage wires such as ignition, fuel valve, and other high voltage wiring.

4.0 Drawings and Figures

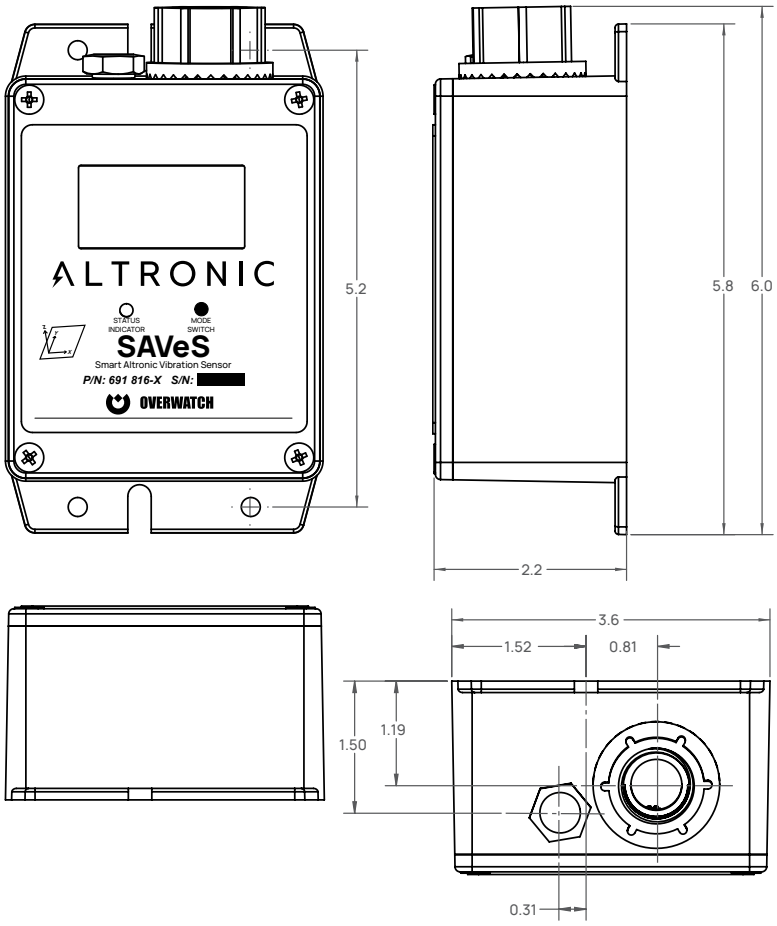

Figure 4 Altronic SAVeS

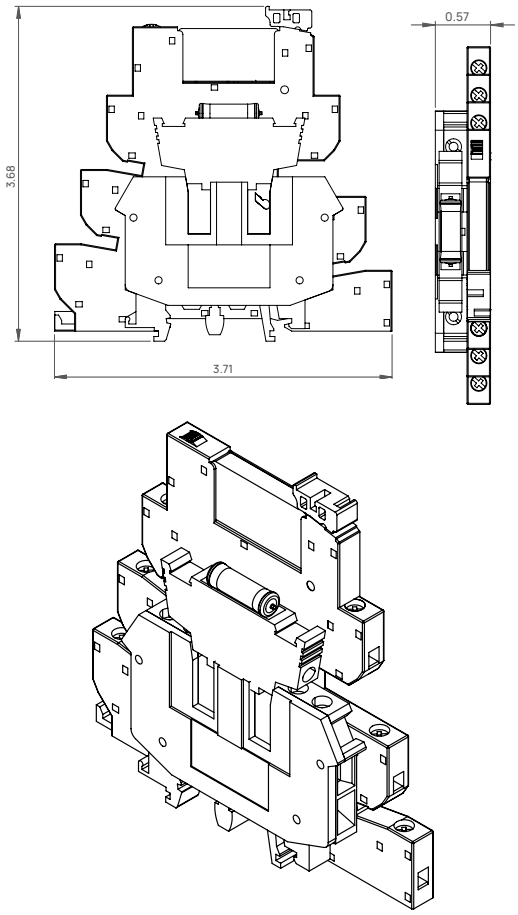

Figure 5 SAVeS Detector

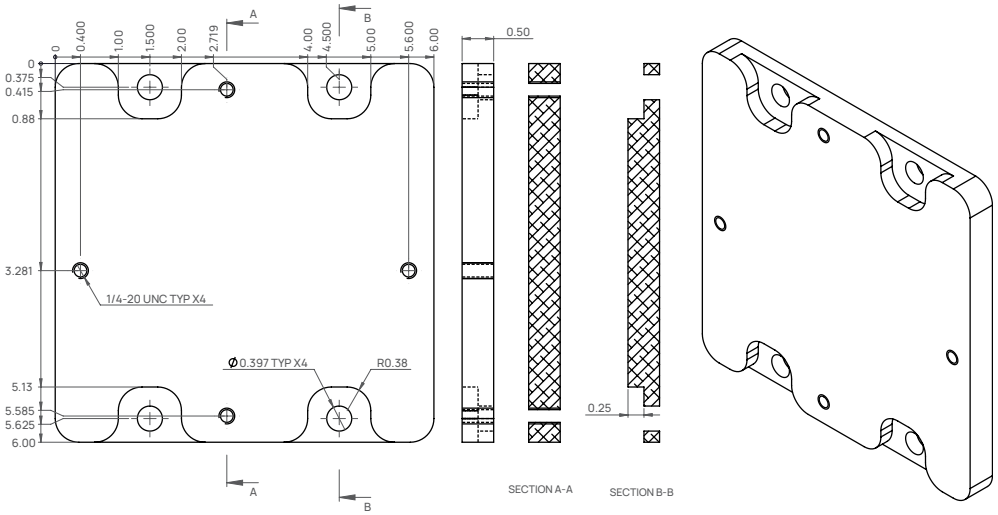

Figure 6 VS2EX to SAVeS Adapter Plate

712 Trumbull Avenue I Girard, Ohio 44420
(330) 545-9768 I Fax: (330) 545-9005
www.altronic-llc.com I sales@altronic-llc.com

ALTRONIC