

VeriSafe AVT Knowledge Base

Public Use

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Questions and Answers

AVT System Cable

AS01 What is the purpose of the AVT System Cable?

The AVT System Cable connects the Isolation and Indicator Modules. This cable requires eight conductors to carry the battery voltage (used for test-the-tester), power and signals for the red, yellow and green LED's and pushbutton signal to initiate the test. The design uses an RJ45 jack and Ethernet style cable to make this connection. [Top of the Document](#)

AS02 Is the AVT System Cable used for Ethernet connections?

The AVT system cable is not being used as an Ethernet cable. It does not carry communication signals. The cable is not tested or approved for use as an Ethernet cable and is marked as such. [Top of the Document](#)

AS03 Can the AVT System Cable be shortened?

The AVT System Cable should not be altered due to the risk of improper termination or installation. Altering, or replacing the system cable with anything but a Panduit approved replacement cable, would void the warranty of the product and potentially put the user at risk. [Top of the Document](#)

AS04 Can I use any CAT5 patch cable to connect the Isolation module to the Indicator Module?

While the device may work correctly with other CAT5 patch cables, the AVT System Cable provided with your device has been verified to have the appropriate cable characteristics and latching mechanisms to function properly and reliably with the AVT system. [Top of the Document](#)

Functional Safety

FS01 What is Functional Safety?

Functional safety is a methodology described in IEC 61508 to ensure that electrical, electronic, or programmable electronic systems (E/E/PE) are designed in such a way to prevent dangerous failures and to control them if they arise. Functional safety certification requires quantitative and qualitative analysis by an ANSI accredited certification body that includes rigorous testing of the product and audits of the manufacturer's processes. Functional safety is measured by Safety Integrity Levels or SILs. The SIL demonstrates the safety and reliability of the parts of the product that impact the safety functions, particularly with regards to hardware and firmware. SIL levels in IEC 61508 are designated as SIL 1, 2, 3, or 4 with 4 having the most stringent requirements. VeriSafe is designed for SIL 3 environments. [Top of the Document](#)

FS02 What does SIL 3 mean?

A safety integrity level, or SIL, is a way to measure functional safety. SIL 3 means that the average frequency of a dangerous failure of the safety function is $\geq 10^{-8}$ to $< 10^{-7}$ (high demand or continuous mode of operation). This is equivalent to one hazardous failure in 10,000,000 hours or 1,000+ years of continual operation. Keep in mind that the VeriSafe Absence of Voltage Tester safety function is only

operating for about 10 seconds and only when the button is pushed, so this is an extremely high level of reliability.

UL 1436 requires SIL 3 for safety functions of absence of voltage testers. Although a higher SIL ensures a higher level of safety, and a lower level of probability that a system will fail-dangerous, SIL 4 systems are often too complex to implement and typically only apply if there is a risk of multiple casualties. Additionally, if a process requires a SIL 4 system due to its high risk, the process design and/or implementation should be re-examined/re-evaluated instead of relying on an instrument or a set of instruments for safety.

Note: A similar approach to functional safety is the Performance Level (PL) rating system described in ISO 13849. VeriSafe will only have a SIL rating (IEC 61508), not PL (ISO 13849). [Top of the Document](#)

FS03 Does VeriSafe have a Performance Level (PL) certification?

No, VeriSafe does not have a PL rating per ISO 13849. However, it does meet the requirements of SIL 3 per IEC 61508. [Top of the Document](#)

General Product Information

GP03 Will voltage be present on the door when VeriSafe is installed?

Hazardous voltage is isolated from the VeriSafe Indicator Module and door. Hazardous three-phase voltage will not be present on the AVT System Cable or Indicator Module. There is non-hazardous (less than 5 V), just enough to power the LEDs on the indicator. [Top of the Document](#)

GP04 Does the VeriSafe AVT have internal short circuit protection?

VeriSafe is protected by recognized components that provide limited impedance between the power circuit and the tester. The protection circuit is built with redundancy and can tolerate component failures and fault conditions. [Top of the Document](#)

GP05 How should the VeriSafe AVT be disposed of at end of life?

VeriSafe is an electronic product with PCBs in both the indicator and isolation module. The indicator module contains a lithium battery. When decommissioning, remove the battery. Do not discard the battery in the trash; bring to a battery disposal drop off location. The indicator and isolation modules can be brought to an electronics recycling location. All components are RoHS compliant. [Top of the Document](#)

GP06 Does the VeriSafe AVT device have digital integrated circuitry?

Yes, a microprocessor is included in the product. Microprocessor firmware is loaded in the factory and is not upgradable by the user. [Top of the Document](#)

GP07 What is the absence of voltage threshold?

The absence of voltage threshold for VeriSafe is 3V for both the AC and DC detection. If any voltage is detected above this threshold the green light will not illuminate. Three volts is consistent with the

threshold established in the listing requirements for Absence of Voltage Testers described in UL 1436. De-energized industrial systems are rarely measured at 0V. Often, there is a small residual voltage due to RF interference or noise on the ground plane present in de-energized systems. To ensure that the Absence of Voltage Tester maintains personnel safety and operates reliably, an absence of voltage threshold must be selected. The threshold must be low enough to avoid any injuries to personnel and high enough to avoid nuisance indications when small amounts of unarmful voltage are detected in the environment where the Absence of Voltage Tester is installed. [Top of the Document](#)

GP08 Does the AVT detect ground faults?

VeriSafe is an absence of voltage tester, not a ground fault monitor. It will detect if voltage greater than 3.0 V is present between any phase and ground when the Test Button is pushed. [Top of the Document](#)

Indicator – Battery

IB01 How long will the battery last?

The battery is designed to last for a minimum of 5 years under normal operating conditions. However, temperature extremes and number of uses can impact battery life. If you push the test button and the yellow Caution Indicator does not start flashing, you should replace the battery. [Top of the Document](#)

IB02 Where can a replacement battery for the indicator module be obtained?

The replacement battery can be obtained from an electrical or electronic products reseller. Refer to the AVT Instruction Manual for a list of acceptable batteries. Standard AA batteries cannot be used in the Indicator Module. [Top of the Document](#)

IB03 Do I have to de-energize my equipment to replace the battery?

The battery compartment is designed to be finger safe and completely isolated for electrical hazards. The battery can be replaced in the Indicator Module without the need to de-energize and open the equipment. [Top of the Document](#)

Indicator Module

NM01 What is the purpose of the Indicator Module?

The Indicator Module is designed to be mounted to an enclosure wall with part of it penetrating to the outside for user interaction. Minimizing the electronics in this module helps keep the form factor relatively small, which enables the user to install in a standard 30mm knockout and in relatively shallow electrical enclosures. [Top of the Document](#)

NM02 Is the Indicator Module serviceable?

The battery is designed to be user replaceable. In addition, the o-rings can be replaced. [Top of the Document](#)

NM03 What would happen if an indicator fails?

The system has been designed to be fail-safe which is why the absence of voltage confirmation is provided with an active indicator. Long-life LEDs were selected for the indicators. The green light only remains on for a few seconds after the test, so it is unlikely that it would burn out. The green indication consists of multiple LEDs, if one would burn out the others would still operate. If for some reason all of the green LEDs would burn out before the life of the product the indicator module could be replaced or you would proceed to verify the absence of voltage with a handheld tester. [Top of the Document](#)

NM04 Why does the Yellow Indicator flash when I install a battery?

The battery tray includes a connector that is disconnected when the tray is withdrawn from the housing. When the battery tray is pushed back into the housing, the re-connection initiates a self-test. [Top of the Document](#)

Installation/System Requirements

IS04 Is overcurrent protection required for the VeriSafe Absence of Voltage Tester?

Installation of an Absence of Voltage (AVT) device with overcurrent protection is neither required nor recommended. When testing for the absence of a signal, it is important to ensure that the tester is in direct contact with the circuit test point. Installing overcurrent protection between the AVT and test point could lead to false readings. For example, if a fuse is installed between the circuit test point and the AVT, it is possible that voltage could be on the line and not be detected by the AVT if the fuse is open. The AVT listing requirements (found in UL 1436) have taken this into account and build in isolation requirements for listed AVTS as well as requirements for field wiring. The circuits in the VeriSafe AVT Isolation Module that are intended to be in contact with the branch circuit are designed to provide isolation during normal and single-fault conditions. VeriSafe has been tested to withstand transient overvoltage up to 6kV. The sensor leads of the AVT are 14 AWG and can be treated as a feeder circuit per NEC article 240.21 (B) (1) (b). This rule allows a tap of no more than 10 feet on a feeder circuit without the need for overcurrent protection. [Top of the Document](#)

IS05 Will installation of VeriSafe Absence of Voltage Tester affect the short circuit current rating (SCCR) of my equipment?

The VeriSafe Absence of Voltage Tester is suitable for use on circuits capable of delivering up to 300,000 rms symmetrical amperes at 600V or less. AVTs listed to UL 1436 are required to operate as a galvanically isolated secondary circuit that is isolated from the circuit conductors by use of a transformer, optical isolator, or limiting impedance, or other similar means. This is intended to reduce the risks of both electric shock and thermal hazard. These galvanic isolation circuits allow very limited current flow, if any, through the AVT. [Top of the Document](#)

IS06 Can the VeriSafe Absence of Voltage Tester be installed on a single phase system?

The tester is designed primarily for three-phase systems, but can also be installed on single-phase systems. Refer to schematics in the Instruction Manual. [Top of the Document](#)

IS07 Can the VeriSafe Absence of Voltage Tester be installed on a DC system?

The tester is primarily designed for three-phase AC systems, but it can be installed on a DC power system. If installed on a DC system, there are no differences in the absence of voltage test function. However, the voltage presence indicators are designed to illuminate when AC voltage is detected. The presence of DC voltage will not be indicated. [Top of the Document](#)

IS08 Will the VeriSafe AVT detect improper installation?

The AVT will detect lack of continuity between the two leads for each phase, and between the two grounding leads. Installation must be performed per the installation instructions by a qualified electrician who must verify proper installation and operation of VeriSafe as described in the Instruction Manual. [Top of the Document](#)

IS09 Can the AVT be installed to monitor the output of a Variable Frequency Drive (VFD)?

The AVT is not intended to be used for monitoring the output voltage from a variable frequency drive, and we do not recommend it for this application. [Top of the Document](#)

IS10 Can VeriSafe be retrofit into existing equipment? Will this void the UL listing?

VeriSafe is suitable for greenfield and brownfield applications. In some cases, if you are not modifying the structure (for example, if a 30mm knockout already exists in the door) you may not void UL on the enclosure. As with any modification of listed equipment, it is up to the AHJ to determine if the new installation is suitable for the application. [Top of the Document](#)

IS11 Should the VeriSafe AVT device be installed on the Line side or Load side of the equipment disconnect?

The VeriSafe AVT device is designed to work in both scenarios. Users may design their panels so that the line side of the disconnect is inaccessible (behind a barrier or in a separate compartment). In this case, if the safety procedures allow work in the panel with the line side energized, the AVT could likely be installed on the load side of the disconnect. Other users may mandate that all energy sources in an enclosure be disconnected. In these cases, procedures would likely require equipment to be de-energized and locked out at the upstream device or in a separate compartment. For this scenario, it makes most sense to install the AVT on the line or supply side of the disconnect. It is up to the user to decide which way is better for their applications. [Top of the Document](#)

IS12 Is it acceptable to use a single VeriSafe AVT device on a main panel to provide absence of voltage protection for downstream panels?

The AVT should be installed at the point where work will be performed. VeriSafe can only test for absence of voltage at the point in the circuit it is installed. Each panel where electrical work is to be performed should have an AVT installed. [Top of the Document](#)

IS13 How should the VeriSafe AVT device be connected to a DC system?

Refer to Installation Schematics in the Instruction Manual. [Top of the Document](#)

IS14 Does VeriSafe operate differently on solidly grounded and high resistance grounded systems?

VeriSafe is designed to work in both solidly grounded and HRG systems. There are no differences in operation between these systems. [Top of the Document](#)

IS15 How does the VeriSafe AVT satisfy the NEC tap rule?

The sensor leads of the AVT can be treated as a feeder circuit per NEC article 240.21 (B) (1) (b) exception. This rule allows a tap of no more than 10 feet on a feeder circuit without the need for overcurrent protection. [Top of the Document](#)

IS16 What is the withstand rating of the AVT?

VeriSafe has a short circuit current rating of 300,000A at 600V. [Top of the Document](#)

IS17 What is the impedance rating of the AVT?

VeriSafe is designed with 1 Megaohm impedance. [Top of the Document](#)

IS18 Can the VeriSafe AVT be used on 4-pole systems?

The AVT is a tester with terminations for 3-poles with protective ground. For systems with 4-pole or 4-wire plus ground, there is not an additional termination point on the tester for the neutral wire. However, the AVT will still detect voltage between phase and each phase and ground. [Top of the Document](#)

Isolation Module

IM01 What are the purpose of the output contacts on the Isolation Module?

The VeriSafe outputs are redundant dry contacts for optional use. They are normally open and close only when the green light is illuminated. By wiring to these contacts, you can use VeriSafe as an input to a control system as well as log when the absence of voltage has been verified. [Top of the Document](#)

IM02 What is the rating of the Isolation Module output contacts?

Refer to the Output Contacts Section in the Instruction Manual. [Top of the Document](#)

IM03 Is the Isolation Module serviceable?

No. The Isolation module is a factory sealed unit and contain no serviceable parts. [Top of the Document](#)

Operation

OP04 Why does the yellow Caution Indicator flash at the end of a failed test procedure?

If the absence of voltage cannot be confirmed the Caution Indicator will flash 1-7 times after turning solid yellow to indicate that the test did not pass. The number of flashes can be used to determine why the absence of voltage test failed.

Number of Flashes	Description
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1	Battery voltage not sufficient to run test; replace battery and try again
2	Voltage detected

If the indicator flashes 3, 5, 6, or 7 times, contact Panduit Tech Support for additional troubleshooting.

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OP05 Is PPE required to initiate an absence of voltage test with the VeriSafe Absence of Voltage Tester?

The VeriSafe Absence of Voltage Tester allows qualified personnel to test for absence of voltage by pressing a test button located outside of the enclosure where the tester is installed. Typically, devices that are operated from the outside of electrical equipment are not considered to present electrical hazards provided the equipment is properly installed and maintained, operation of the device does not change the state of the enclosed equipment, and the equipment has no evidence of impending failure.

However, when determining the proper PPE for a given task, factors beyond the control of and unknown to Panduit such as installation, maintenance of the equipment, personnel competency, other nearby equipment, processes, or activities must be considered. Therefore, Panduit cannot make recommendations as to what PPE is required and company policies and procedures should always be followed. [Top of the Document](#)

OP06 Is PPE required to open an enclosure if the VeriSafe Absence of Voltage Tester confirms the absence of voltage (green light)?

PPE for a given task is determined after performing a risk assessment and hazard analysis. The risk assessment will take into account factors beyond the control of and unknown to Panduit such as installation, maintenance of the equipment, other nearby equipment, processes, or activities that can impact the need for PPE. Therefore, Panduit cannot make recommendations as to what PPE is required. The user must follow standard safety policies and procedures established by the employer to determine PPE requirements. In addition, the VeriSafe Absence of Voltage Tester will only test for voltage at the point it is installed. The user must take necessary measures and follow established policy to ensure safe working condition in all affected areas. [Top of the Document](#)

OP07 How does the VeriSafe Absence of Voltage Tester verify that sensor leads are in contact with phase conductors and ground?

The AVT device features two sensor leads for each phase conductor and ground connection point. The second lead on each phase (or ground connection) provides the ability for the AVT to verify that it is in contact with the circuit conductors (each phase and ground) when the absence of voltage test takes place. The presence of the second lead wire is detected by the internal sensing circuitry. This validates the correct connection of the primary sensing lead. [Top of the Document](#)

OP08 Will VeriSafe indicate the difference between residual voltage and nominal voltage?

VeriSafe is designed to indicate the absence of voltage if any voltage great than 3 V AC or DC is detected between individual phases and between each phase to ground. There is no distinction based on the magnitude of the voltage, whether it be residual or other nominal. [Top of the Document](#)

OP09 How would an operator know if nominal voltage is detected?

If the nominal voltage is detected, the Voltage Presence indicator(s) will be illuminated. These red LED's are for reference only. Lack of illuminated of the red LED's does not guarantee the absence of voltage.

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OP10 Are users protected from hazardous voltage when using the AVT?

VeriSafe is designed with several layers of protection with regards to electrical isolation. The isolation module uses limited impedance techniques to limit current from the power conductors to 0.5mA or less. Additionally, galvanic isolation techniques are used between the isolation and indicator modules. Further, the isolation module interface is designed with an insulated plastic housing and potted faceplate to keep voltage away from the user interface. [Top of the Document](#)

OP11 Does the VeriSafe AVT device search for stored energy in VFDs, capacitors, or UPS devices?

When the test is initiated, it will not pass if voltage over 3.0V AC RMS (50/60 HZ) or 3.0V DC is detected on the line monitored by the AVT device. [Top of the Document](#)

OP12 How do you know that the test circuit is working?

If any part of the test circuit fails, the green absence of voltage indicator will not illuminate. The test circuit is part of the safety function and must meet SIL 3 functional safety requirements. Functional safety ensures that dangerous failures are detected and controlled in a safe manner. In addition, there are multiple provisions in the UL 1436 listing requirements as well as the requirements to address the reliability of the test circuit. [Top of the Document](#)

OP13 Does VFD or MCC noise affect the device?

VeriSafe is designed to work in an industrial environment, in proximity to VFDs and MCCs, among other equipment. It is designed to meet IEC/EN 61326-1:2013 (EMC Immunity for measurement, control and laboratory use – EMC requirements, Part 1: General Requirements) and IEC/EN 61326-3-1:2008 (EMC Immunity requirements for safety related systems and for equipment intended to perform safety-related functions (Functional safety) – general industrial applications). [Top of the Document](#)

Sensor Leads

SL01 Why are there two sensor leads per phase/ground?

VeriSafe is provided with a total of (8) 14 AWG sensor leads (two sensor leads for each phase conductor and ground connection point). The second lead on each phase provides the ability for the AVT to verify that it is in contact with the circuit conductors (each phase and ground) when the absence of voltage test takes place. It is also part of the mechanism that is used to “test-the-tester” to validate that the AVT is functioning. [Top of the Document](#)

SL02 Why is it necessary to physically separate the two sensor leads during installation?

Sensor leads for each phase and ground must not be in direct contact with each other in order for the AVT to function properly. If the sensor leads are shorted, it is possible to defeat the installation test. [Top of the Document](#)

SL03 Can the AVT Sensor Leads be extended?

The 10ft maximum lead length is necessary to comply with the AVT listing requirements in UL 1436 as well as the NEC tap rule [NEC 240.21 (B) (1) (b) Exception] to avoid using overcurrent protection. Do not extend the sensor leads with a splice. Use approved connection methods and follow local codes and standards when terminating the sensor leads. [Top of the Document](#)

SL04 Can the AVT Sensor Leads be shortened?

VeriSafe is provided with 10ft 14 AWG sensor leads. When installing an AVT, care should be taken to ensure that sensor leads used to connect the AVT to the line or bus and to ground shall not be any longer than necessary and shall be routed to avoid sharp edges, pinch points or mechanical damage. [Top of the Document](#)

SL05 Is there a minimum or maximum distance required between installed sensor leads?

Sensor leads for each phase and ground must not be in direct contact with each other in order for the AVT to function properly (see figure 1 in the Instruction Manual). There is no maximum distance limitation between the two lead connections on each phase, however there should not be any circuit elements installed between them. [Top of the Document](#)

SL06 Can one set of sensor leads be terminated on the line side of phase conductors and the other set of sensor leads be terminated on the load side?

No. There should be no circuit elements installed between the sensor leads. Connecting the sensor leads in this manner would result in the AVT device not being able to verify the absence of voltage. [Top of the Document](#)

SL07 Do the sensor leads need circuit protection?

The isolation module has built-in high impedance isolation providing protection between the line and the sensing elements. This satisfies the NEC Tap Rule [NEC 240.21 (B) (1) (b) Exception] It is not recommended to install fuses between VeriSafe and the test point because you could get a false indication of the absence of voltage if the fuse is open. [Top of the Document](#)

SL08 How should the VeriSafe Sensor leads be connected to a busbar?

When terminating VeriSafe sensor leads directly to a busbar, tap the bus bar and use a ring terminal on the sensor leads. Ensure that sensor leads are as short as possible and properly dressed and routed around the bus. Each sensor lead must be terminated with separate hardware. [Top of the Document](#)

SL09 What methods can I use to terminate the sensor leads connected to power conductors in my equipment?

The Installation Manual provides installation recommendations. Connections can be made with any approved connector/method that is suitable for the application provided that the AVT sensor leads are not extended or mechanically connected to each other. [Top of the Document](#)

Standards & Ratings

SR07 What is the operating temperature range of the VeriSafe AVT device?

The Operating Temperature range is 0°C to +60°C (32°F to 140°F). [Top of the Document](#)

SR08 Do the door mounted Indicator module and DIN mounted Isolation module have different operating temperature ranges?

The Indicator module and Isolation module are considered together as a system for the temperature ratings. [Top of the Document](#)

SR09 What is the withstand rating of the AVT?

VeriSafe has a short circuit current rating of 300,000A at 600V. [Top of the Document](#)

SR10 What is the impedance rating of the AVT?

VeriSafe is designed with 1 Megaohm impedance. [Top of the Document](#)

SR11 Does VeriSafe meet the requirements for OSHA 1910.147 LOTO?

Yes, VeriSafe is considered a test instrument and the absence of voltage indicator (green light) could be considered sufficient to verify that ELECTRICAL energy has been isolated/dissipated. However, that alone does not guarantee that other energy sources are de-energized. [Top of the Document](#)