VeriSafe™
Absence of Voltage Tester

The safe way to verify the absence of voltage

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What is an Absence of Voltage Tester?

Absence of Voltage Testers (AVTs) are **permanently-mounted test devices used to verify a circuit is de-energized** prior to opening an electrical enclosure

- Verify the absence of phase-to-phase and phase-to-ground AC and DC voltage
- Built-in test circuit verifies operation on a known voltage source before and after absence of voltage test
- Contain provisions to ensure tester is properly installed and in direct contact with the circuit at time of testing
- Utilize active indications and functional safety principles
- Automated test sequence helps reduce operator errors
- Listed to UL 1436

AVTs are a NEW product category added to UL 1436 in September 2016

Significance of Verifying the Absence of Voltage

- 24,000 electrical injuries in the US workplace (2003-2012)[1]
  - 35% due to contact with wiring, transformers, or other electrical components[1]
  - 60% of incidents with key words “electric arc” and “burn” occurred at low voltages (<1000V), with the majority on three phase systems[2]

20% of incidents or
500 electrical injuries per year or
$120-200 million annually

Leading cause: performing work without turning off power and verifying a de-energized condition[2]

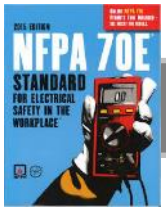
[1] US Department of Labor, "Bureau of Labor Statistics Occupational Injuries and Illnesses," [Online]. Available: http://www.bls.gov/iif/data.htm. [Accessed 16 April 2015].
[2] C. M. Wellman, "OSHA Arc-Flash Injury Data Analysis," in 2012 IEEE IAS Electrical Safety Workshop, Daytona Beach, FL, 2012.

Verifying a De-Energized Condition

Step (5) of NFPA 70E Article 120.1:

"Use an adequately rated test instrument to test each phase conductor or circuit part to verify it is de-energized. Test each phase conductor or circuit part both phase-to-phase and phase-to-ground. Before and after each test, determine that the test instrument is operating satisfactorily through verification on a known voltage source."

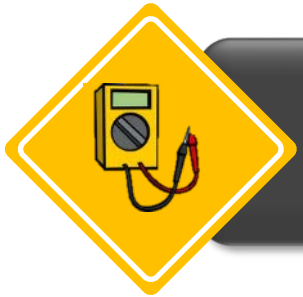
2015 Edition



Isolate Energy Source & LOTO → Select Test Instrument → Test the Tester → Check for Voltage → Test the Tester → Perform Work

What really happens…

- Verifying the absence of voltage is a critical task that is part of almost every job
  - Over a 5-year period[1]
    - 18% of the facilities surveyed had a personal injury resulting from use of a voltage test instrument
    - 37% reported near misses
    - 12% experienced plant interruptions
  - When electricians and technical personnel at a large chemical company were asked, “How do you test for the absence of voltage?” more than 90% did not know how to perform a thorough test.[2]



55% experienced a voltage testing injury or near miss with handheld testers![1]

[1] H. L. Floyd and B. J. Nenninger, "Personnel Safety and Plant Reliability Considerations in the Selection and Use of Voltage Test Instruments," IEEE Transactions on Industry Applications, vol. 33, no. 2, pp. 367-373, 1997.
[2] K. Crawford and N. K. Haggerty, "Test Before Touch: Seems Easier Said Than Done," IEEE Industry Applications Magazine, pp. 32-39, May/June 2008.

Now there is a better way!

VeriSafe™ Absence of Voltage Tester

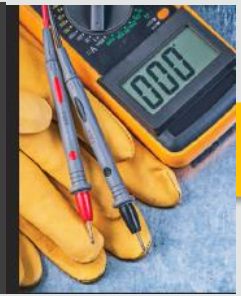
The safe way to verify the absence of voltage

Designed for low voltage equipment up to 600V

VeriSafe™ Absence of Voltage Testers use active visual indicators that convey the status of voltage inside electrical equipment before it is accessed, reducing exposure to electrical hazards and protecting workers.

Comparison of Test Methods

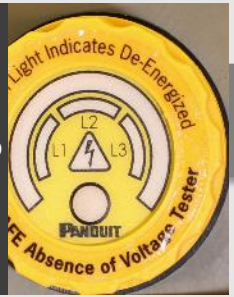
Portable Testers



Select Tester → Test the Tester → Check for Voltage → Retest the Tester → Perform Work

Possible Exposure to Electrical Hazards

VeriSafe™ Absence of Voltage Tester



Activate the VeriSafe™ Absence of Voltage Tester → Open Panel

Automatically Performed in Sequence
No Exposure to Electrical Hazards

1. Test the Tester	Verify tester can detect voltage in the desired range
2. Verify Installation	Verify tester is in contact with the circuit
3. Check for Voltage	Test phase-to-phase and phase-to-ground
4. Verify Installation	Re-verify the installation
5. Retest the Tester	Re-test the tester

Product Differentiation

Voltage Testers

- Typically handheld
- Detect presence and absence of voltage
- Contact and non-contact versions

Voltage Indicators

- Typically installed
- Only warn of voltage presence
- Do not guarantee absence of voltage

VeriSafe™ Absence of Voltage Testers

- Test without exposure
- Self-contained with known voltage source
- Built-in pre-/post-verification test
- Automated test sequence
- Detects AC and DC without need to adjust settings
- Active indication for absence of voltage
- SIL 3 safety functions
- Supports compliance with NFPA 70E (UL 1436 listing)
- Install in direct contact with circuit (no fusing)

Applicable Standards

Product Safety

UL 1436,
UL 61010 &
UL 508

- Product safety & certification standards
- NEW category for "Absence of Voltage Testers" added to UL 1436

Functional Safety

IEC 61508

- SIL 3
- SIL is a measure of reliability for hardware & software
- Ensures dangerous failures are detected and controlled in a safe way

Employee Work Practices

NFPA 70E*

- 2018 Edition will allow AVTs to be used in lieu of portable testers for absence of voltage verification

* VeriSafe is NOT rated to NFPA 70E. However, it is designed to be used in a way that allows the user to easily comply with the NPFA 70E requirements.

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Key Features & Benefits

- **Improved Safety & Risk Reduction**
  - Determine voltage status BEFORE equipment is accessed
  - Prevents direct exposure to electrical hazards
- **Increased Productivity**
  - Easy to use, initiate test with the push of a button
  - No additional tools required
  - Provides visual alert to abnormal power conditions
- **Reliable Results**
  - Fail-safe design with active indications
  - Safety functions meet SIL 3 per IEC 61508-1
- **Simplified Process for Easier Compliance**
  - Automated test sequence based on the steps in NFPA 70E for verification of an electrically safe work condition
  - Automated test helps reduces operator errors
- **Flexible Applications**
  - Designed for testing three-phase circuits up to 600V
  - Install on line or load side of electrical disconnect
  - Detects presence of AC and DC voltage

Ideal Applications

- Equipment with a single source of incoming power
- High risk associated with access
  - Frequently accessed equipment
  - High incident energy
- Remote or difficult to access locations
  - Outdoor, mezzanine, catwalk
- Sites with temporary or intermittent power
- Equipment with stored electrical energy
  - VFDs, capacitors, etc.
- Equipment frequently serviced by third-party technicians or contractors

VeriSafe™ Absence of Voltage Testers

- Reduce the risk of exposure to electrical hazards for improved worker safety
- Reduce testing procedure time and complexity to improve productivity
- Supports compliance when used as part of the lockout/tagout process described in NFPA 70E

Technical Specifications

Applications

Electrical System	For use in 1, 2, or 3-phase AC or DC systems
Voltage Detection Range	Up to 600V AC (50/60 Hz) Up to 600 V DC
Absence of Voltage Threshold	3 V
Overvoltage Category	III (600 V)
Degree of Protection	NEMA 1, 12, 4, 4X / IP 66
Short Circuit Current Rating	300,000 A rms symmetrical at 600 V

Environment

Operating Temperature	0°C to +60°C (32°F to 140°F)
Storage Temperature	-45°C to +85°C (-49°F to +185°C)
Humidity	5 to 95% non-condensing
Pollution Degree	3

Battery

Voltage	Industrial 3.6 V Lithium AA
Estimated Life	User replaceable. Estimate 5+ years with normal operating conditions.

Standards

UL 1436	Standard for outlet circuit testers and similar indicating devices.
EN/CSA/UL 61010-1	Safety requirements for electrical equipment for measurement, control, and laboratory use.
EN/CSA/UL 61010-2-030	Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030: Particular requirements for testing and measuring circuits.
UL 508 & CSA-C22.2 No. 14	Industrial control equipment.
IEC 61508	Functional safety, SIL 3.
FCC CFR 47 Part 15	Radio frequency devices.
EN 61326 & EN 55011/CISPR 11	EMC standards for industrial measurement products.
CAN ICES-1	Industrial, Scientific and Medical (ISM) radio frequency generators.
Planned Certifications	UL, cUL, CE, RoHS

Competitive Comparison

	Other Voltage Indicating Products			Panduit
	Voltage Indicator 	Optical Indicator 	Voltage Test Station 	VeriSafe AVT 
External Footprint	👣	👣	👣👣👣	👣
Voltage presence indicators	✓	✓	✓	✓
Test for absence of voltage			✓ Requires additional tool	✓
Absence of voltage indicator				✓
Verifies installation (confirmation tester is in direct contact with circuit)				✓
Safety functions meet IEC 61508 SIL 3				✓
No hazardous voltage on door		✓	✓	✓
Install without overcurrent protection		✓		✓
UL 1436 Listing / NFPA 70E-2018 120.5 (7)				✓
Cost	$	$$	$$$	$$