

# Thru-Door Electrical Isolation Pre-Verification Application Note

24/7 Voltmeter and Voltage Indicator Comparison

## Reduce Arc Flash & Increases Safety

A SafeSide™ voltage indicator is a pushbutton-sized electrical safety device mounted to the outside of any electrical enclosure and wired internally to the primary incoming power source. The sole purpose of this device is to alert workers to the presence (or absence) of voltage with flashing LED's. Electrical safety is enhanced by properly applying voltage indicators and correctly incorporating them into an electrical safety procedure.

The NFPA 70E impacts every aspect of workplace electrical safety, thereby providing maintenance personnel with a steady stream of new ideas, better procedures, and improved tools for electrical personnel. Electricians still rely on the good 'ol voltmeter to determine if an electrical system has been put into an electrically safe condition. A voltmeter and voltage indicator each have different yet similar functions, but still belong on the same 'electrical safety' team. Let's compare and contrast both devices with the goal of understanding how each device can be used for maximum safety.

### A Voltage Indicator:

- ... is permanently mounted and less susceptible to damage.
- ... has built-in reliability due to redundant circuitry, surge immunity, long life LEDs and heavy duty construction.
- ... has but one function, indicating voltage.
- ... gets its power from the line (hazardous) voltage, not from an external power source.
- ... is hardwired with pigtail leads which ensures a reliable connection.
- ... works well within a mechanical Lock-out/Tag-out procedure.
- ... requires no fusing and easily installs in a 30mm hole.

**R-3W  
Voltage  
Indicator**

UL TYPE 4X  
C  US LISTED  
IND. CONT. EQ.  
496Y  
UL File: E256847



### A Voltage Indicator:

**Permanent Device:**  
Long life LED's with redundant circuits\*

**Dedicated Device:**  
Voltage Indication only (40-750VAC/30-1000VDC)

**Powered all the time**  
from L1 or L2 or L3 (same voltage it indicates)

Integral leads hardwired to voltage with no fuses\*\*

4-wire device & permanent earth ground reference

Thru-door phase indication  
Installs in 30mm hole

### A Voltmeter:

**Portable Tool:**  
Shorter life-span & susceptible to damage

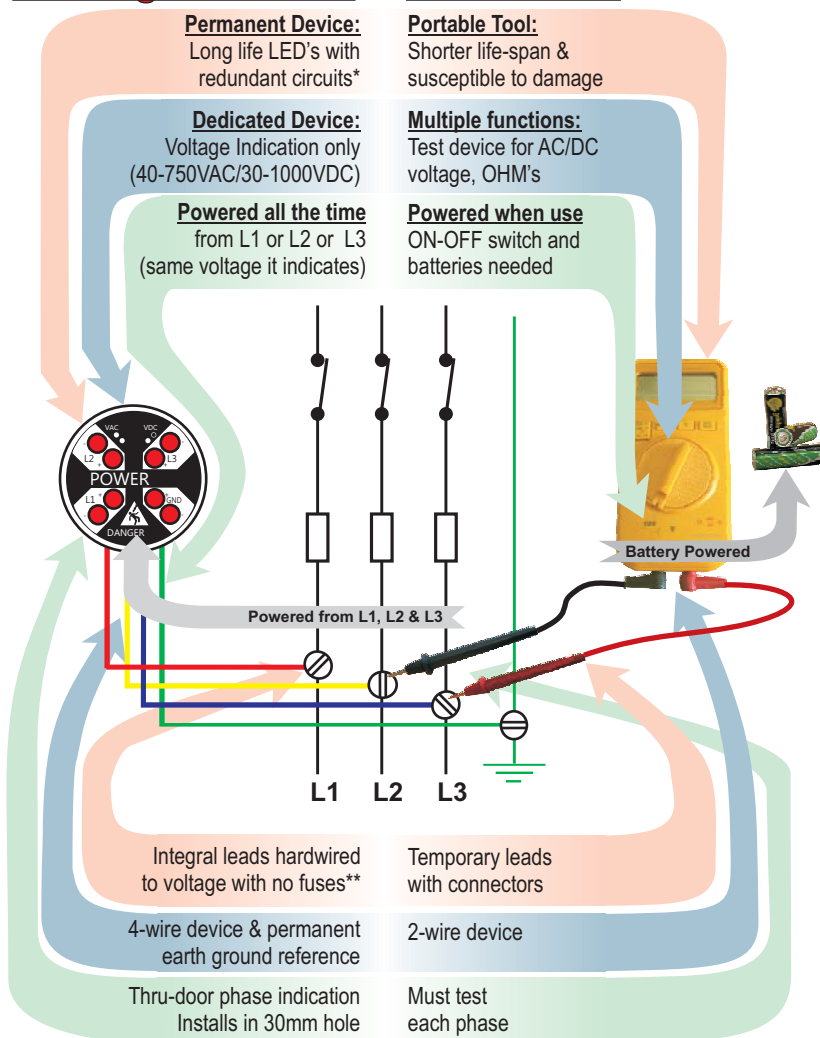
**Multiple functions:**  
Test device for AC/DC voltage, OHM's

**Powered when use**  
ON-OFF switch and batteries needed

Temporary leads with connectors

2-wire device

Must test each phase



Product info and FAQ's:

<http://www.grace-eng.com/VoltageVision/DS-R-3W.shtml>

\*Each phase has an LED flashing circuit for both the (+) and (-) side of the AC sine wave.  
\*\*The R-3W is UL Listed self-protected device with 6' leads. For most installations no fusing is required between the line and the R-3W.

**Warning:** Before working on an electrical conductor, verify zero electrical energy with proper voltage testing instrument and the proper procedure as per NFPA 70E 120.1(5), 120.2 (F)(2)(f)(1-6), OSHA 1910.333(b)(2)(iv)(B).

# Isolation Verification: Safety Benefit Analysis for Externally Mounted Voltage Indicators (VI)<sup>[1]</sup>

Analysis of the NFPA 70E Sample<sup>[2]</sup> Lockout/Tagout Procedure (“Live-Dead-Live”)

NFPA 70E Annex G Reference	Key Concepts	Voltmeter Verification Only (No Voltage Indicator)	Voltage Indicator Safety Benefits <sup>[3]</sup> (in addition to Voltmeter Verification)	Comments & Clarifications Regarding NFPA 70E procedure
6.1	Locate all electrical energy & stored energy sources	<b>Panel Closed</b> Voltmeter not part of the LOTO process until step 6.6	Visible indication of stored & electrical energy with door closed Provides instant critical power system status	For panels with multiple power sources, external VI(s) meet this requirement. Safety procedure needs to have personnel to view/inspect proper indication of the VI.
6.2	Physically operate the isolator: disconnect power & relieve stored energy		VI(s) warn if any AC or DC energy is still present after operating the isolator	Personnel to visually see the VI stop functioning and/or stored energy slowly dissipate.
6.3	Apply lockout device Employ additional safety measure (removing a circuit element)		VI still providing information	VI is an “additional safety measure”.
6.4	Attempt to operate the isolator		A VI would indicate an isolator failure, if it ‘operates’ and ‘reconnects’ the power.	VI provides immediate feedback to the operator.
6.5	Inspect voltage detecting instrument for damage		Completed in 6.1	Verifying proper operation of VI in step 6.1 is a critical to the entire safety procedure.
6.6	Verify proper operation of voltage detecting instrument, then test for absence of voltage.	If not functioning: needs a battery or repair	Completed in 6.1 The VI provides voltage indication and relative voltage value [3].	The line voltage is the VI’s only power source (no battery) therefore, if the VI is flashing there must be voltage(s) present inside the enclosure. Flash rate varies with voltage—lower voltage=lower flash rate.
6.7	Verify proper operation of voltage detecting instrument, after testing for absence of voltage.		Completed in 6.2 Disconnect opens and VI ceases to operate	
6.8	Install grounding bars to eliminate induced voltages or stored energy		The <u>VI is permanently wired</u> providing ongoing indication if there is stored energy or induced voltages.	

[1] For discussion purposes: “power source” is a 3-phase Wye-Delta with Earth Ground and SafeSide™ R-3W.

[2] NFPA 70E, 2004 Edition, Annex G, 6.0-6.9

[3] The traditional “Live-Dead-Live” LOTO safety procedure with a voltmeter remains intact. These comments only describe the added safety benefits if a VI is employed in addition to existing LOTO procedure.