

New Surge Suppression Classification System

Using new purchasing procedures, the U.S. Government has developed a classification system for transient voltage surge suppressors.

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EFFECTIVE SUPPRESSORS

To assure the selection of the most appropriate cord-connected and direct plug-in surge suppressors, the U.S. government has developed a new classification system. The system is described by industry experts as simple, effective, and easily used by everyone.¹ This article explains how it can be used to understand the differences between surge suppressors and ensure that a suppressor that meets the requirements of the application is procured.

The following characteristics can be used to describe a suppressor:

- Endurance (reliability) - defined in three grades: Grades A, B, and C.
- Performance - defined as Class 1, 2, or 3 within each grade.
- Application - Modes 1 and 2 differentiate the products in terms of appropriate applications.
- Safety - Products must be tested and listed to UL 1449,^{2,3} an Underwriters Laboratories, Inc. (UL) Safety Standard for transient voltage surge suppressors.

GRADES

To establish a product grade, a surge suppressor must survive 1,000 surges in a Nationally Recognized Testing Laboratory (NRTL) using industry standard waveforms.⁴

- Grade A: 6,000 volts, 3,000 amps
- Grade B: 4,000 volts, 2,000 amps
- Grade C: 2,000 volts, 1,000 amps
- Grade A is the most stringent.

Grades are based on ANSI C62.41 - 1991, formerly known as IEEE 587 (Table 1).

CLASS

During this endurance testing, the performance class is also determined. It is based on UL 1449 SVR (Suppressed Voltage Ratings) and identifies voltage range which is allowed into the protected equipment. A Class 1 product must be less than 330 volts. A Class 2 product SVR is greater than 330 volts, and less than 400 volts. A Class 3 product SVR is greater than 400 volts, and less than 500 volts. Class 1 represents the best performance (Table 2).

MODE

Mode should be selected based on application. Mode 1 protects line-to-neutral while avoiding ground wire contamination (often described as L-N, or line-to-neutral suppression). Mode 1 can be used for either interconnected or stand-alone environment. If two or more pieces of equipment are interconnected with a cable other than the power wire (printer cable, audio cable, network cable, phone line, etc.), and the equipment is not all connected to the same power outlet receptacle, Mode 1 should be used.

Mode 2 products divert surges to the safety ground wire, thus contaminating this voltage reference wire with surges (often described as "all three modes," L-G, L-N, N-G). Mode 2 should be used for stand-alone applications, where all the equipment shares a common power outlet receptacle, or there are no interconnecting wires. An example is a microwave oven.

SAFETY

Underwriters Laboratories, Inc. has issued a second edition of their UL 1449 transient voltage surge suppressor safety standard. This new standard, issued on August 15, 1996 requires full compliance before August 17, 1998. A manufacturer may, of course, submit its product before that date.

INDUSTRY ACCEPTANCE

To assure full compliance with the new classification system, the testing must be certified by UL or another NRTL. UL attaches the test results of this new classification system to their UL 1449 Safety Listing,⁵ calling this

ANSI Category	Federal Grade	No. of Surges	Voltage (V)	Current (A)
B3	A	1,000	6,000	3,000
B2	B	1,000	4,000	2,000
B1	C	1,000	2,000	1,000

Table 1. Performance Grades.

Class	SVR (V)
1	<330
2	330-400
3	400-500

Table 2. Performance Classes.

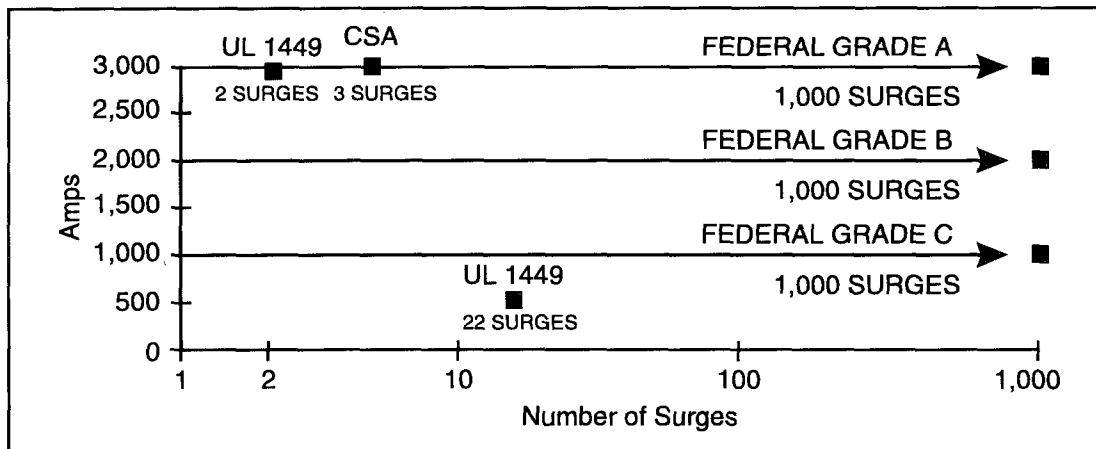


Figure 1. Suppressor Exposure Tests for Cord-connected and Direct Plug-in Suppressors.

new service its optional "UL 1449 Adjunct Classification Testing Service." Figure 1 compares exposure testing requirements of UL 1449, CSA and the new federal standard.

While this government classification system is new, manufacturers of safe, effective products have moved swiftly to embrace it. Several products were qualified to the highest classification, Class 1, Grade A, Mode 1, as certified by UL or other NRTLs, as early as February 1996.

ENDURANCE

Most surge suppressors in use today comprise components that "wear out" with use, and a replacement schedule for these products should be planned

before failure occurs. Quoting from one manufacturer that acknowledges this problem, "All surge suppressors are eroded by every surge they absorb... All have limited capacity. Once that capacity is reached, the unit is no longer protecting your equipment and should be replaced."⁶

Unfortunately, few suppressors have established meaningful endurance ratings, making it almost impossible to predict when they will need replacement. If an application is important, it is probably prudent to replace any suppressor which is more than a year old, unless it has a demonstrated endurance capability of Grade A, B, or C. A certified Grade A, Class 1 product should provide continuing protection in the most severe electrical environment for about ten years.

CONCLUSION

Based on an understanding of surge suppressor characteristics, price and performance can be qualified in a meaningful, standardized way. If an application is important and requires the best protection, a verified Class 1, Grade A, Mode 1 product must be demanded. These products are not yet common, but the alternative involves gambling on protection.

As with most products, better performance and endurance comes at

a price. But with a rational basis for selection, one can be sure that the additional price is justified by superior performance or endurance.

REFERENCES

1. "Surge Suppressor, Transient Voltage," Federal Government CID (Commercial Item Description). Obtainable from Defense Supply Center, 8000 Jefferson Davis Highway, Richmond, VA 23297-5610.
2. UL 1449 Second Edition, Underwriters Laboratories, Inc. (516) 271-6200.
3. J. R. Harford, "What Changes to UL 1449 Standard for Safety Transient Voltage Surge Suppressors May Mean to You," *Power Quality Assurance*, Jan/Feb 1996.
4. Surge Suppression Report, Zero Surge, Inc. (800) 996-6696.
5. UL 1449 Adjunct Testing Service, Underwriters Laboratories, Inc. (516) 271-6200.
6. Woods Wire Products, Incorporated, Carmel, IN.

J. RUDY HARFORD is president and chief engineer of Zero Surge, Inc., which he founded in 1989. Mr. Harford is active in efforts to establish new standards of performance and reliability in the surge suppression industry, and was recently invited to become an industry representative for the UL 1449 Industry Advisory Group. Mr. Harford holds 42 U.S. patents and hundreds more worldwide. He is a published author and was a keynote speaker for the 1990 International EOS/ESD Symposium. (908) 996-7700.

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