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**Components for low-voltage surge
protective devices—Specification
for gas discharge tubes (GDT)**

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from Electronic Materials Manufacturers Association of Japan (EMAJ)/the Japanese Standards Association (JSA), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

This Standard has been made based on IEC 61643-311:2001 *Components for low-voltage surge protective devices—Part 311: Specification for gas discharge tubes (GDT)* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard ; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Ministers and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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Components for low-voltage surge protective devices—Specification for gas discharge tubes (GDT)

Introduction This Japanese Industrial Standard has been prepared based on the first edition of IEC 61643-311 *Components for low-voltage surge protective devices—Part 311 : Specification for gas discharge tubes (GDT)* published in 2001 without modifying the technical contents.

1. Scope This part of JIS C 5381 specifies gas discharge tubes (hereafter referred to as “GDTs”) used for applications up to 1 000 V a.c. or 1 500 V d.c. in communication or signalling circuits. They are defined as a gap, or series of gaps, in an enclosed discharge medium other than air. They are designed to protect apparatus or personnel, or both, from high transient voltages. This Standard does not specify requirements applicable to complete surge protective devices, nor does it specify total requirements for GDTs employed within electronic devices, where precise coordination between GDT performance and surge protective device withstand capability is highly critical.

This part of JIS C 5381

- deals with GDTs having two or three electrodes;
- does not deal with mountings and their effect on GDT characteristics. Characteristics given apply solely to GDTs mounted in the ways described for the tests;
- does not deal with mechanical dimensions;
- does not deal with quality assurance requirements;
- may not be sufficient for GDTs used on high-frequency or multi-channel systems;
- does not deal with electrostatic voltages;
- does not deal with GDTs connected in series with voltage-dependent resistors in order to limit follow-on currents in electrical power systems;
- does not deal with hybrid or composite GDT devices.

Note : The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and JIS are IDT (identical), MOD (modified) and NEQ (not equivalent) according to ISO/IEC Guide 21.

IEC 61643-311:2001 *Components for low-voltage surge protective devices— Part 311 : Specification for gas discharge tubes (GDT)* (IDT)

2. Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of coming into effect or the year of publication is given to these referred standards, only the edition of the indicated year constitutes the provision of this Standard but the revision and amendment made thereafter do not apply.

JIS C 60068-2-1:1995 *Environmental testing procedures—Part 2 : Tests, Tests A: Cold*

Note : IEC 60068-2-1:1990 *Environmental testing—Part 2 : Tests, Tests A: Cold* is identical with the said standard.

JIS C 60068-2-20:1996 *Basic environmental testing procedures—Part 2 : Tests, Test T : Soldering*

Note : IEC 60068-2-20:1979 *Environmental testing—Part 2: Tests, Test T: Soldering* is identical with the said standard.

JIS C 60068-2-21:2002 *Environmental testing—Part 2-21: Tests—Test U: Robustness of termination and integral mounting devices*

Note : IEC 60068-2-21:1999 *Environmental testing—Part 2-21: Tests—Test U: Robustness of terminations and integral mounting devices* is identical with the said standard

JIS C 61000-4-5:1999 *Electromagnetic compatibility (EMC) —Part 4: Testing and measurement techniques—Section 5: Surge immunity test*

Note : IEC 61000-4-5:1995 *Electromagnetic compatibility (EMC) —Part 4: Testing and measurement techniques—Section 5: Surge immunity test* is identical with the said standard

IEC 61180-1:1992 *High-voltage test techniques for low voltage equipment—Part 1: Definitions, test and procedure requirements*

ITU-T Recommendation K.20:2000 *Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents*

3. Definitions and symbols

3.1. Definitions For the purpose of this part of JIS C 5381, the following definitions apply.

3.1.1 arc current current that flows after sparkover when the circuit impedance allows a current to flow that exceeds the glow-to-arc transition current

3.1.2 arc voltage (arc mode voltage) voltage drop across the GDT during arc current flow

3.1.3 arc-to-glow transition current current required for the GDT to pass from the arc mode into the glow mode

3.1.4 current turn-off time time required for the GDT to restore itself to a non-conducting state following a period of conduction. This applies only to a condition

where the GDT is exposed to a continuous specified d.c. potential under a specified circuit condition

3.1.5 d.c. breakdown voltage, d.c. sparkover voltage voltage at which the GDT transitions from a high-impedance off to a conduction state when a slowly rising d.c. voltage is applied

3.1.6 d.c. holdover in applications where a d.c. voltage exists on a line, a holdover condition is one in which a GDT continues to conduct after it is subjected to an impulse large enough to cause breakdown. Factors that affect the time required to recover from the conducting state include the d.c. voltage and the d.c. current

3.1.7 d.c. holdover voltage maximum d.c. voltage across the terminals of a GDT under which it may be expected to clear and to return to the high-impedance state after the passage of a surge, under specified circuit conditions

3.1.8 GDT discharge current current that flows through a GDT after sparkover occurs

Note : In the event that the current passing through the GDT is alternating current, it will be r.m.s. value. In instances where the current passing through the GDT is an impulse current, the value will be the peak value.

3.1.9 discharge voltage peak value of voltage that appears across the terminals of a GDT during the passage of GDT discharge current

3.1.10 discharge voltage current characteristic variation of peak values of discharge voltage with respect to GDT discharge current

3.1.11 gas discharge tube gap, or gaps, in an enclosed discharge medium, other than air at atmospheric pressure, designed to protect apparatus or personnel, or both, from high transient voltages

3.1.12 glow current (glow mode current) current that flows after breakdown when the circuit impedance limits the follow current to a value less than the glow-to-arc transition current

3.1.13 glow-to-arc transition current current required for the GDT to pass from the glow mode into the arc mode

3.1.14 glow voltage (glow mode voltage) peak value of voltage drop across the GDT when a glow current is flowing

3.1.15 impulse sparkover voltage highest value of voltage attained by an impulse of a designated voltage rate-of-rise (V/ μ s) and polarity applied across the terminals of a GDT prior to the flow of the discharge current

3.1.16 impulse waveform impulse waveform designated as x/y having a rise time of $x \mu$ s and a decay time to half value of $y \mu$ s as standardized in IEC 61180-1

3.1.17 nominal alternating discharge current for currents with a frequency of 15 Hz to 62 Hz, current which the GDT is designed to carry for a defined time

3.1.18 nominal d.c. sparkover voltage voltage specified by the manufacturer to in-

indicate the target value of sparkover voltages of a particular type of GDT products

3.1.19 nominal impulse discharge current peak value of the impulse current with a defined waveshape with respect to time for which the GDT is rated

3.1.20 sparkover (breakdown) abrupt transition of the gap resistance from practically infinite value to a relatively low value

3.1.21 transverse voltage for a GDT with three electrodes, the difference in the discharge voltages between terminal A and B (see figure 2) of the gaps assigned to the two conductors of the circuit during the passage of discharge current

3.1.22 transition time time required for the voltage across a conducting gap to drop into the arc or glow region after the gap initially begins to conduct

3.2 Symbols The symbols for GDTs shall be as shown in figures 1 and 2.

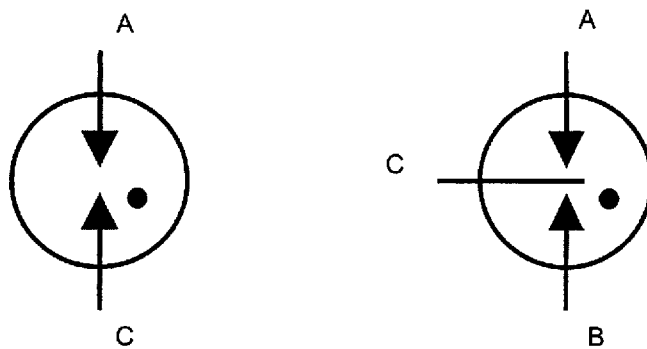


Figure 1 Symbol for a two-electrode GDT Figure 2 Symbol for a three-electrode GDT

4. Service conditions

4.1 Robustness of terminations If applicable, the user shall specify a suitable test from JIS C 60068-2-21.

4.2 Solderability Solder terminations shall meet the requirements of JIS C 60068-2-20, test Ta, method 1.

4.3 Low temperature A GDT shall be capable of withstanding JIS C 60068-2-1, test Aa $-40\text{ }^{\circ}\text{C}$, duration 2 h, without damage. While at $-40\text{ }^{\circ}\text{C}$, the GDT shall meet the d.c. and impulse sparkover requirements of table 1 of this Standard.

4.4 Storage conditions GDTs shall be capable of withstanding the following conditions during storage without damage:

- temperature: $-40\text{ }^{\circ}\text{C}$ to $+40\text{ }^{\circ}\text{C}$;
- relative humidity: 30 % to 90 %.

4.5 Operating conditions

- Temperature: $-40\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$.

4.6 Radiation The emerging radiation from any radioactive matter used to