IEC 61643-352

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Components for low-voltage surge protection –
Part 352: Selection and application principles for telecommunications and signalling network surge isolation transformers (SITs)

Composants pour protection par parafoudres basse tension –
Partie 352: Principes de choix et d'application pour les transformateurs d'isolement contre les surtensions (SIT) dans les réseaux de signalisation et de télécommunications

IEC 61643-352:2018-01(en-fr)

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COMPONENTS FOR LOW-VOLTAGE SURGE PROTECTION –

Part 352: Selection and application principles for telecommunications and signalling network surge isolation transformers (SITs)

FOREWORD

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IEC 61643-352 has been prepared by subcommittee 37B: Components for low-voltage surge protection, of IEC technical committee 37: Surge arresters.

The text of this standard is based on the following documents:

FDIS	Report on voting
37B/161/FDIS	37B/167/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 61643 series, published under the general title *Low-voltage surge protection*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This document covers surge isolation transformers whose rated impulse withstand voltage coordinates with the expected surge environment of the installation.

This type of surge protective component, SPC, isolates and attenuates transient voltages and is often used in conjunction with current diverting components (e.g. GDT, MOV, etc.) or in SPDs.

COMPONENTS FOR LOW-VOLTAGE SURGE PROTECTION –

Part 352: Selection and application principles for telecommunications and signalling network surge isolation transformers (SITs)

1 Scope

This part of IEC 61643 covers the application of surge isolation transformers (SITs) that are used in telecommunication transformer applications with signal levels up to 400 V peak to peak. These transformers have a high rated impulse voltage with or without screen between the input and output windings. SITs are components for surge protection and are used to mitigate the onward propagation of common-mode voltage surges. This document describes SITs' selection, application principles and related information. This document does not cover power line communication transformers.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 61643-351, *Components for low-voltage surge protective devices – Part 351: Performance requirements and test methods for telecommunications and signalling network surge isolation transformers (SIT)*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
surge isolating transformer
SIT
isolation transformer which has high impulse withstand voltage with/without electrostatic screen between input and output windings

3.1.2
electric screen
ES
barrier or enclosure that limits the penetration of an electrostatic field

3.1.3
clearance
shortest distance in air between two conductive parts

[SOURCE: IEC TR 60664-2-1:2011, 3.4]

3.1.4
creepage distance
shortest distance along the surface of a solid insulating material between two conductive parts

[SOURCE: IEC TR 60664-2-1:2011, 3.7]

3.1.5
impulse withstand voltage
highest peak value of impulse voltage of prescribed form and polarity which does not cause breakdown of insulation under specified conditions

[SOURCE: IEC TR 60664-2-1:2011, 3.15]

3.1.6
isolation transformer
transformer with protective separation between the input and output windings

[SOURCE: IEC 60065:2001, 2.7.1, modified – The original definition referred to isolating transformers.]

3.1.7
insulation
that part of an electrotechnical product which separates the conducting parts at different electrical potentials

[SOURCE: IEC TR 60664-2-1:2011, 3.17]

3.1.8
overvoltage
any voltage having a peak value exceeding the corresponding peak value of maximum steady-state voltage at normal operating conditions

[SOURCE: IEC TR 60664-2-1:2011, 3.21]

3.1.9
microclimate
climatic condition at the place where a component is installed in the product

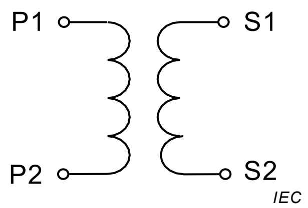
Note 1 to entry: Only the inside product maximum air temperature (classes X1 to X7) and, optionally, the maximum air humidity class (classes Y1 to Y4) are taken into account.

[SOURCE: IEC 60721-3-9:1993, 3.1, modified – Note 1 to entry has been added.]

3.1.10
Power over Ethernet
PoE
<cabling> equipment powering via Ethernet twisted-pair cabling

3.2 Symbols

For the purposes of this document, the symbols shown in Figures 1 to 4 apply.



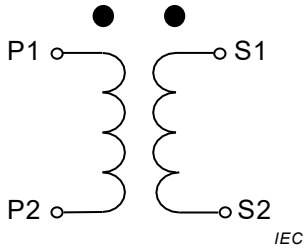
Key

P1: primary winding terminal 1 S1: secondary winding terminal 1

P2: primary winding terminal 2 S2: secondary winding terminal 2

Figure 1 – Symbol for a two-winding SIT

Figure 2 shows the symbol for a two-winding SIT with instantaneous voltage polarity indicators, similar to symbol IEC 60617-S00843:2006-09 made with terminal connections.

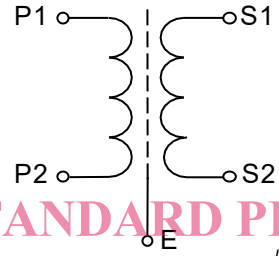


Key

P1: primary winding terminal 1
S1: secondary winding terminal 1
P2: primary winding terminal 2
S2: secondary winding terminal 2

Figure 2 – Symbol for a two-winding SIT with polarity indication

Figure 3 shows the symbol for a two-winding SIT with an electrostatic screen between the windings, similar to symbol IEC 60617-S00853:2006-10 made with terminal connections.

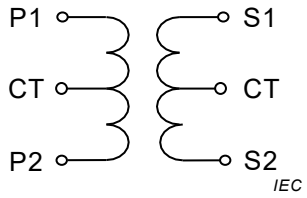


Key

P1: primary winding terminal 1
S1: secondary winding terminal 1
P2: primary winding terminal 2
S2: secondary winding terminal 2
E: earth terminal (electrostatic screen terminal)

Figure 3 – Symbol for a two-winding SIT with electric screen

Figure 4 shows the symbol for SIT centre tapped windings, similar to symbol IEC 60617-S00855:2006-10 made with two centre tapped windings and terminal connections. When testing is done with shorted windings, the centre tap is also connected to the short. Other testing is done without any connection to the centre tap terminal.



Key

P1: primary winding terminal 1
S1: secondary winding terminal 1
P2: primary winding terminal 2
S2: secondary winding terminal 2
CT: centre tap terminal

Figure 4 – SIT with centre tapped windings

3.3 Abbreviated terms

For the purposes of this document, the abbreviated terms given in Table 1 apply.

Table 1 – List of abbreviated terms used in this document

ABD	Avalanche Breakdown Diode
ES	Electrostatic Screen
IBN	Isolated Bonding Network
ICT	Information and Communications Technology
IR	Insulation Resistance
LAN	Local Area Network
SIT	Surge Isolation Transformer
SPD	Surge Protective Device
SPC	Surge Protective Components
PoE	Power over Ethernet

4 Service conditions

4.1 Temperature range

Normal range: −20 °C to 40 °C

Extended range: This range is decided based on agreement between manufacturer and user.

4.2 Humidity

Not exceeding 90 %.

4.3 Altitude

Normal range: Not exceeding 1 000 m.

Extended range: This range is decided based on agreement between manufacturer and user.

4.4 Microclimate

When microclimate condition applies, use the classes of Table 2.

Table 2 – Classification of microclimate condition

High air temperature severity (°C)	Class	Typical component temperature range (°C)	Product application
55	X1		
70	X2	0 to 70	Commercial
85	X3	−40 to 85	Industrial
100	X4		
125	X5	−55 to 125	Military
155	X6	−65 to 150	Storage [a]
200	X7		

[a] Storage temperature rating verification is outside the scope of this document. See IEC 60068-2-1:2007 and IEC 60068-2-2:2007.

5 SIT surge conditions

5.1 SIT surge mitigation

An SIT couples a service across the transformer insulation by magnetic induction. When common-mode surges occur on the incoming service the insulation is voltage stressed. The insulation has three physical paths:

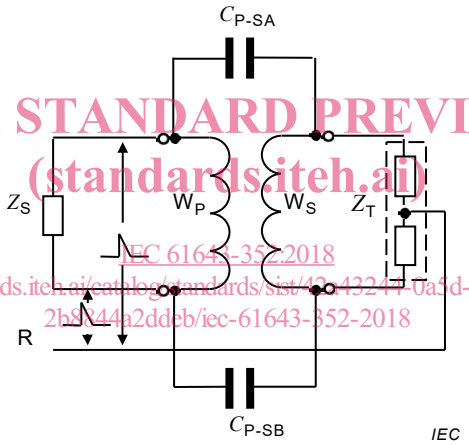
a) solid insulation – insulation material interposed between the two-windings;

b) creepage distance;

c) clearance.

Clearance distances should be set so that the maximum expected voltage difference does not breakdown the clearance. Creepage distances should be set so that the maximum expected voltage difference and pollution degree do not cause surface flashover or breakdown (tracking). Solid insulation thickness should be set so that the maximum expected voltage difference does not cause breakdown.

The higher frequency components of a surge impulse will be electrostatic coupled by SIT internal-winding capacitance (shown as $C_{P\text{-}SA}$ + $C_{P\text{-}SB}$) from one winding to the other, see Figure 5.



Key

W_P: primary winding

W_S: secondary winding

Z_T: terminating or load impedance

Z_S: service source impedance

$C_{P\text{-}SA}$, $C_{P\text{-}SB}$: primary to secondary capacitance, paths A and B

R: reference plane or point

Figure 5 – Common-mode surge conditions for SIT

To reduce internal-winding capacitance a conducting electrostatic screen can be used between the windings, see Figure 6. The electrostatic screen decouples most of the winding capacitance (shown as CP-Screen A, CP-Screen B, CS-Screen A and CS-Screen B) leaving a much smaller value of internal-winding capacitance (shown as $C_{P\text{-}SA}$ + $C_{P\text{-}SB}$).