4 Compliance

Proof of Compliance (Sub clause 4.1.1)

The SABS safety mark

The SABS approved performance mark

4.2.2 Table 4.1 SURGE ARRESTERS

Applicable standards Surge arresters for LV systems --- SABS IEC 61643-1

SABS IEC 61643-1 - New since 1999
SABS 171 - Withdrawn 2000

6.7.6 Surge protection

Surge protection devices (SPDs) may be installed to protect an installation against overvoltage surges such as those due to switching operations or those induced by atmospheric discharges (lightning). Amdt 1 See annex L for the installation of SPDs. Amdt 1
Annex L
Installation of surge protection devices (SPDs) into low-voltage system

L.2.2 The volume to be protected is divided into LPZ in order to define the different levels of exposure due to lightning surge currents and voltages.

Conducting services that penetrate each zone shall be bonded at each crossover/penetration point.

L.2.5 Transition from LPZ 0A to LPZ 1
L.2.5.1 Services between LPZ 0A and LPZ 1 carry substantial lightning currents
L.2.5.2 At the interface between LPZ 0A and LPZ 1, Class I lightning current SPDs are required.
L.2.5.3 Parameters of such partial lightning currents, to which Class I SPDs will be exposed, are determined by the required protection level in accordance with Table L.2 and SANS IEC 61312-1

L.2.6 Transition from LPZ 0B to LPZ 1
L.2.6.1 In LPZ 0B, electromagnetic fields caused by lightning currents are dominant.

A direct stroke is excluded.
L.2.6.2 At the interface between LPZ 0B and LPZ 1, Class II overvoltage SPDs are required. (Class II SPDs should be tested in accordance with SANS 61643-1/IEC 61643-1 (SABS IEC 61643-1).)
ELIMINATING SOME CONFUSION

- In 99% of all cases conducting services traverse from LPZ 0A through LPZ 0B to get to LPZ 1
- In very few cases will conducting services only traverse from LPZ 0B to LPZ 1

Example of –Transition from LPZ 0B to LPZ 1
The Modified Clause L.2.5

L.2.5 Transition from LPZ 0 to LPZ 1

L.2.5.2 At the interface between LPZ 0 and LPZ 1,

Class I + Class II SPDs are required.

What do we need to Know about SPDs?

1.0 The TYPE of SPD

There are basically TWO types of SPDs

1.1 Lightning Current Arrester
1.2 Lightning Surge Arrester

2.0 Classification Of SPD's

SPD's are divided into Classes as per SABS IEC: 61643-1 and 61312-1

Class I - Lightning Current Arrester
Class II - Overvoltage Arrester
Class III - Overvoltage Arrester

3.0 Minimum Requirements Class I - Type SPD (Ref: IEC 60364-5-534)

3.1 ... the value of \( I_{\text{imp}} \) for SPD's connected between Phase and Neutral shall not be less than 12.5 kA (10/350)

3.2 ... for SPD's connected between Neutral and PE
   - \( I_{\text{imp}} \) shall not be less than 25 kA (10/350)
   - and 50 kA (10/350) for Three Phase systems.

4.0 Minimum Requirements Class II - Type SPD (Ref: IEC 60364-5-534)

4.1 ... the value of \( I_{SN} \) for SPD's connected between Phase and Neutral shall not be less than 5 kA (8/20)

4.2 ... for SPD's connected between Neutral and PE
   - \( I_{SN} \) shall not be less than 10 kA (8/20)
   - and 20 kA (8/20) for Three Phase systems
5.0 The WAVE SHAPES?

5.1 **Class I** the Wave Shape is **10/350** micro seconds (μs)

5.2 **Class II** the Wave Shape is **8/20** micro seconds (μs)

5.3 **Class III** the Wave Shape is **8/20** micro seconds (μs)
6.0 **Class I type SPD** - The most commonly used types are Spark-Gaps

7.0 **Class II type SPD** - The mostly commonly used type are MOV (Metal Oxide Varistor)

![U-I Characteristic of 275 V - MOV](image)

L.1.1.2

a) SPDs shall comply with the requirements of SANS IEC 61643-1 and shall have been tested as Class II devices

b) SPDs in the main distribution board shall be at least **Class II** devices;

c) except for voltage switching (gapped) type, each Class II voltage-limiting SPD shall be equipped with a thermal disconnecting mechanism and visual indication that shows end of life;

5.4.3 Surge protection

Where a surge protection device is installed, it shall be installed after the main switch (see annex L). Amdt 1

L.1.1.3 Power and telecommunication lines should enter the building or structure in close proximity and **NOT** on opposite sides of the building or structure.

**NOTE** For total protection, SPDs should be installed on all conductive services that enter or leave a building or a structure by the installer of such service.
What is the right protection level or value?  (Clamping or Residual Voltage)

L.1.1.4 According to the requirements of the insulation coordination in power installations (see IEC 60664-1) and the surge immunity of equipment to be protected, it is necessary to keep the voltage protection levels of the SPDs below a maximum value of the surge immunity level of the equipment. If the immunity against damage is not known, component immunity levels as in SANS 61000-4-5/IEC 61000-4-5 (SABS IEC 61000-4-5) shall be used.

L.1.1.5 The impulse withstand levels are divided into categories as given in table L.1 with overvoltage limits listed for standard 230/400 V three-phase four-wire systems as in IEC 60664-1.

Table L.1 – Impulse withstand categories for overvoltage limits

<p>| Voltage line to neutral derived from nominal voltages a.c. or d.c. up to and including | Rated impulse voltage |
|---|---|---|---|---|</p>
<table>
<thead>
<tr>
<th>V</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Overvoltage category</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>330</td>
<td>500</td>
<td>800</td>
<td>1 500</td>
<td>I</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>500</td>
<td>800</td>
<td>1 500</td>
<td>2 500</td>
<td>II</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>800</td>
<td>1 500</td>
<td>2 300</td>
<td>4 000</td>
<td>III</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>1 500</td>
<td>2 500</td>
<td>4 000</td>
<td>5 000</td>
<td>IV</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>2 500</td>
<td>4 000</td>
<td>6 000</td>
<td>8 000</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>1 000</td>
<td>4 000</td>
<td>6 000</td>
<td>8 000</td>
<td>12 000</td>
<td>VI</td>
<td></td>
</tr>
</tbody>
</table>

The overvoltage categories given in this table are

- **category I** which includes equipment such as pluggable devices with electronic circuits,
- **category II** which includes equipment supplied from a fixed installation, such as pumps, motors and other appliances,
- **category III** which includes equipment in fixed installations, such as distribution boards and motor control centres, and
- **category IV** which includes equipment at the origin of the installation (point of control), such as electricity meters and primary overcurrent protection equipment.

Summary

1.0 All SPDs must be SANS 61643-1 approved
2.0 If external lightning protection is required you need Class I & Class II or combination SPDs
3.0 Use Class II SPDs with disconnection mechanism and indication
4.0 SPDs without disconnection device can only be used with ELCB
5.0 Use back-up fuse protection as per the manufactures instructions
6.0 Use wire sizes as per the manufactures instruction
7.0 Keep connecting wires as short as possible < 500 mm
8.0 Be mindful of down stream SPD co-ordination
9.0 Seek expert advise if you are unsure