Surge Voltage - What is it and what are its effects?

Surge Voltages are short, pulse like, voltage peaks with steep rising edges and are also known as transients. The origin of transient overvoltages may be atmospheric (lightning) or internal – switching.

Lightning Surges

Particular buildings or structures for reasons which could include geographical location, type of construction or height above ground level are susceptible to direct lightning strikes. The flow of discharge current through an unprotected building subjected to a direct lightning strike would certainly be catastrophic, resulting in damage and fire. The first line of defence for structures vulnerable to this type of event is a Lightning Protection System (LPS) designed to capture and safely conduct discharge current. However the overall effects of such an event may not be managed to a tolerable level solely by a structural LPS and sensitive equipment within will still require protection from transient overvoltage. The destructive effects of lightning are not restricted to direct strikes. The secondary effects of lightning strikes to ground, upon electrical distribution infrastructure or within clouds can account for some of the most extreme forms of transient overvoltage and the subsequent damage to an electrical installation and its connected electrical / electronic equipment.

Switching Surges

While the phrase “more likely to be struck by lightning” may be, in the UK, used to emphasize the infrequency of an event or phenomenon it certainly could not be applied to the constant exposure to transients endured by electronic and electrical equipment as a result of network switching operations. Transients of sufficiently high peak values as to pose a danger to equipment can be initiated each time an inductive load is switched on, or off. This type of transient overvoltage, or switching surge, can be caused by the switching of motors, transformers, or the interruption of a short circuit by protective measures. The magnitude of a transient generated in this way may be significantly lower than that generated by a lightning event but the frequency of their occurrence far greater.

Effects of transient overvoltage

Regardless of origin, the consequences of transient overvoltage to an installation afforded no protection are ultimately the same. Unchecked long term exposure to lower levels of transient overvoltage can reduce the lifespan of electronic components. Exposure to higher levels can result in immediate damage in the form of burnt out circuit boards. Voltage dependent equipment that forms part of the fixed electrical installation is vulnerable. Loss of precious data, costly equipment replacement and interruption of work patterns are all real results of transient overvoltage.

BS7671 Requirements - AQ criteria

“Protection against overvoltage of atmospheric origin or due to switching” is outlined within Section 443 of BS7671.

Regulation 443.2.1 explains that where an installation is supplied by a low voltage system containing no overhead lines, no additional protection against overvoltage of atmospheric origin is necessary if the impulse withstand of equipment is in accordance with Table 44.3

Regulation 443.2.2 explains that where an installation is supplied by a low voltage network which includes overhead lines or where the installation includes an overhead line and in either case the condition of external influence AQ1 exists, no additional protection against overvoltage of atmospheric origin is necessary if the impulse withstand of equipment is in accordance with Table 44.3

The AQ classification places a value upon the number of thunderstorm days per year, the external influence, and subsequent possibility of lightning strikes. The condition of external influence that exists across the United Kingdom is AQ1 - less than or equal to 25 thunderstorm days per year. This value is defined within BS7671 Appendix 5 as “negligible”. Installations within the UK are not required to include Surge Protective Devices based solely upon this criterion.

With respect to 443.2.2 an important note is made that identifies applications where higher reliability or higher risk protection against overvoltage may be necessary irrespective of the AQ value.

Section 443 does recognize that for most installations transient overvoltages are not managed to acceptable levels downstream in instances when they do occur. As identified within the scope and objective of this section, further referenced within AQ based regulatory requirement, for the ‘no additional protection’ statement to apply the impulse withstand of an installation and its connected equipment must be in accordance with Table 44.3
The information seen within this table is based upon that which can be found within BS7671, tables 44.3 and 44.4, categorizing examples of household equipment and providing their related minimum required values of impulse withstand voltage between live conductors and PE.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>EXAMPLES OF IMPULSE CATEGORY EQUIPMENT</th>
<th>NOMINAL VOLTAGE OF THE INSTALLATION, V</th>
<th>REQUIRED MINIMUM IMPULSE WITHSTAND VOLTAGE, kV</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Equipment intended to be connected to the fixed electrical installations, e.g. household appliances, portable tools, etc. Measures have been taken to limit transient overvoltages.</td>
<td>230/240 277/480</td>
<td>1.5</td>
</tr>
<tr>
<td>II</td>
<td>Equipment intended to be connected to the fixed electrical installations, e.g. household appliances, portable tools, etc.</td>
<td>230/240 277/480</td>
<td>2.5</td>
</tr>
<tr>
<td>III</td>
<td>Equipment which is part of the fixed electrical installations and other equipment where a high degree of availability is expected, e.g. distribution boards, circuit breakers, wiring systems and equipment for industrial use, stationary motors with permanent connection to the fixed installation.</td>
<td>230/240 277/480</td>
<td>4.0</td>
</tr>
<tr>
<td>IV</td>
<td>Equipment intended to be used at or in the proximity of the electrical installation upstream of the main distribution board, e.g. electrical meter, primary overcurrent device, ripple control units.</td>
<td>230/240 277/480</td>
<td>6.0</td>
</tr>
</tbody>
</table>

It is in the very nature of 21st century living that our work and leisure activities regularly involve use of electronic equipment. We store our data electronically, either personal or professional, within the home or office. Our connection to all forms of media, whether it be social, entertainment or commercial, is distributed around our homes for interaction and consumption via telephone, tablet, PC and television. The white goods within our kitchens and laundries have the capability to be programmed and timed; we manipulate their speed and temperature all of this via embedded electronics. This reliance upon technology takes not only considerable financial investment but forms an intrinsic part of our modern lifestyle.

- Can we really ever be sure that regulatory requirement precludes inclusion of surge protective devices within our electrical installations?
- Can we always be sure that the impulse withstand voltage of equipment that supports our day to day living is actually as robust as table 44.3 requires?
- Are we really that confident in the predictability of British weather patterns or that switching operations that are out of our control will have no effect upon our place in the distribution network?

BS7671 Alternative to the AQ Criteria

Regulation 443.2.4 does specify an important alternative to the AQ based criteria seen within 443.2.2 and 443.2.3. This is based upon a risk assessment and requires consideration be given to the following consequential levels of protection.

1. Consequences related to human life
2. Consequences related to public services
3. Consequences to commercial or industry activity

For levels 1 – 3 above, protection against overvoltage shall be provided.

Here, Note 2 explains that any risk assessment calculation applied to these three levels of consequence will always lead to the same result. Surge protection is required.

Hospitals, Public Buildings, Infrastructure, Industrial Sites, Commercial Buildings, Farms and Service Industry buildings are all vulnerable due to the sensitive nature of the equipment that they contain and are required to be afforded appropriate protection.

4. Consequences to groups of individuals
5. Consequences to individuals

For levels 4 – 5 above the requirement for protection against overvoltage shall be dependent upon the results of a calculation. BS7671 describes the calculation method to establish the conventional length of the supply line to the considered structure (d) compared to the critical length (dc).

In the UK BS EN 62305 provides a comprehensive risk assessment based system for lightning protection. This includes protection for electrical and electronic systems using a number of methods including surge protective devices. This standard comprises a four part series – General principles, Risk management, Physical damage to Structures and life hazard and Electrical and electronic systems within structures.

British Standards and IEE regulations are subject to change and amendments. This guide to Wylex Surge Protection Devices is not a substitute for the regulations which should always be used for all types of electrical installation design and installation work.
**TYPE 1 LIGHTNING ARRESTERS**

Type 1 Lightning Arresters are installed at an electrical installations intake position in conjunction with an external Lightning Protection System. These devices have a high impulse current withstand (10/350μs) associated with direct lightning strikes.

3 CONDUCTOR SYSTEM; L, N, PE

<table>
<thead>
<tr>
<th>LIST NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHSPD4123T1</td>
<td>2 mod DIN mounting SPD with remote indication contact</td>
</tr>
</tbody>
</table>

TN-S/TT

- Single Phase Supply - Separate Protective Earth & Neutral

4 CONDUCTOR SYSTEM; L1, L2, L3, PEN

<table>
<thead>
<tr>
<th>LIST NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHSPD4133T1</td>
<td>3 mod DIN mounting SPD with remote indication contact</td>
</tr>
</tbody>
</table>

TN-C

- Three Phase Supply - Common Protective Earth & Neutral

5 CONDUCTOR SYSTEM; L1, L2, L3, N, PE

<table>
<thead>
<tr>
<th>LIST NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHSPD4143T1</td>
<td>4 mod DIN mounting SPD with remote indication contact</td>
</tr>
</tbody>
</table>

TN-S/TT

- Three Phase Supply - Separate Protective Earth & Neutral

2 CONDUCTOR SYSTEM; L, PEN

<table>
<thead>
<tr>
<th>LIST NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHSPD4113T1</td>
<td>1 mod DIN mounting SPD with remote indication contact</td>
</tr>
</tbody>
</table>

TN-C

- Single Phase Supply - Common Protective Earth & Neutral

4 CONDUCTOR SYSTEM; L1, L2, L3, PEN

<table>
<thead>
<tr>
<th>LIST NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHSPD4133T1</td>
<td>3 mod DIN mounting SPD with remote indication contact</td>
</tr>
</tbody>
</table>

TN-C

- Three Phase Supply - Common Protective Earth & Neutral

Type 1 Lightning Arresters are installed at an electrical installations intake position in conjunction with an external Lightning Protection System. These devices have a high impulse current withstand (10/350μs) associated with direct lightning strikes.
## TYPE 1 LIGHTNING ARRESTERS FEATURES, BENEFITS & TECHNICAL DATA

- **Plug-in Lightning Arresters**
- **Disconnect facility for each individual module**
- **Visual end of life indication for each module**
- **Remote Indication auxiliary contact**
- **Mechanical keying of all slots**
- **IEC61643-1 / EN61643-11**
- **DIN rail mounting**
- **Temperature Range -40°...+80°C**
- **IP20**
- **Replacement plug in modules are available**

### NHSPD4133T1

<table>
<thead>
<tr>
<th>Protective system</th>
<th>TN-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>L, PEN</td>
<td></td>
</tr>
</tbody>
</table>

**Lightning protection level**: 111, 1V

**Highest continuous voltage** $U_{c}$:
- (L-N): 335 V a.c. 50/60 Hz
- (N-PEN): 240 V a.c. 50/60 Hz

**Nominal voltage** $U_{n}$:
- (N-PEN): 50 Hz

**Lightning test current** $I_{LP}$ (10/350 μs per path):
- (L-N): 12.5 kA / 6.25 As / 39 kJ/Ω
- (N-PEN): 50 kA / 25 As / 625 kJ/Ω

**Nominal discharge surge current** $I_{d}$ (8/20 μs per path):
- (L-N): 12.5 kA
- (N-PEN): 50 kA

**Protection level** $U_{prot}$:
- (L-N) ≤ 1.2 kV
- (N-PEN) ≤ 1.7 kV

**UTOV (withstand, 5 sec. (L-N)/withstand, 200 msec. (N-PEN))**:
- (L-N): 415 V a.c.
- (N-PEN): 1200 V a.c.

**Short circuit resistance L with maximum backup fuse**: 25 kA

**Maximum backup fuse**: 160 A gL/gG

Ø minimum L, N, PEN: 1.5mm² (solid) / 1.5mm² (stranded)

Ø maximum L, N, PEN: 35mm² (solid) / 25mm² (stranded)

### NHSPD4143T1

<table>
<thead>
<tr>
<th>Protective system</th>
<th>TN-S / TT / TN-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>L, N, PE</td>
<td></td>
</tr>
</tbody>
</table>

**Lightning protection level**: 111, 1V

**Highest continuous voltage** $U_{c}$:
- (L-N): 335 V a.c. 50/60 Hz
- (N-PEN): 240 V a.c. 50/60 Hz

**Nominal voltage** $U_{n}$:
- (N-PEN): 50 Hz

**Lightning test current** $I_{LP}$ (10/350 μs per path):
- (L-N): 12.5 kA / 6.25 As / 39 kJ/Ω
- (N-PEN): 50 kA / 25 As / 625 kJ/Ω

**Nominal discharge surge current** $I_{d}$ (8/20 μs per path):
- (L-N): 12.5 kA
- (N-PEN): 50 kA

**Protection level** $U_{prot}$:
- (L-N) ≤ 1.2 kV
- (N-PEN) ≤ 1.7 kV

**UTOV (withstand, 5 sec. (L-N)/withstand, 200 msec. (N-PEN))**:
- (L-N): 415 V a.c.
- (N-PEN): 1200 V a.c.

**Short circuit resistance L with maximum backup fuse**: 25 kA

**Maximum backup fuse**: 160 A gL/gG

Ø minimum L, N, PEN: 1.5mm² (solid) / 1.5mm² (stranded)

Ø maximum L, N, PEN: 35mm² (solid) / 25mm² (stranded)

### NHSPD4113T1

<table>
<thead>
<tr>
<th>Protective system</th>
<th>TN-S / TT</th>
</tr>
</thead>
<tbody>
<tr>
<td>L, N, PE</td>
<td></td>
</tr>
</tbody>
</table>

**Lightning protection level**: 111, 1V

**Highest continuous voltage** $U_{c}$:
- (L-N): 335 V a.c. 50/60 Hz
- (N-PEN): 240 V a.c. 50/60 Hz

**Nominal voltage** $U_{n}$:
- (N-PEN): 50 Hz

**Lightning test current** $I_{LP}$ (10/350 μs per path):
- (L-N): 12.5 kA / 6.25 As / 39 kJ/Ω
- (N-PEN): 50 kA / 25 As / 625 kJ/Ω

**Nominal discharge surge current** $I_{d}$ (8/20 μs per path):
- (L-N): 12.5 kA
- (N-PEN): 50 kA

**Protection level** $U_{prot}$:
- (L-N) ≤ 1.2 kV
- (N-PEN) ≤ 1.7 kV

**UTOV (withstand, 5 sec. (L-N)/withstand, 200 msec. (N-PEN))**:
- (L-N): 415 V a.c.
- (N-PEN): 1200 V a.c.

**Short circuit resistance L with maximum backup fuse**: 25 kA

**Maximum backup fuse**: 160 A gL/gG

Ø minimum L, N, PEN: 1.5mm² (solid) / 1.5mm² (stranded)

Ø maximum L, N, PEN: 35mm² (solid) / 25mm² (stranded)

### NHSPD4123T1

<table>
<thead>
<tr>
<th>Protective system</th>
<th>TN-S / TT / TN-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>L, N, PE</td>
<td></td>
</tr>
</tbody>
</table>

**Lightning protection level**: 111, 11V

**Highest continuous voltage** $U_{c}$:
- (L-N): 335 V a.c. 50/60 Hz
- (N-PEN): 50 Hz

**Nominal voltage** $U_{n}$:
- (N-PEN): 50 Hz

**Lightning test current** $I_{LP}$ (10/350 μs per path):
- (L-N): 12.5 kA / 6.25 As / 39 kJ/Ω
- (N-PEN): 50 kA / 25 As / 625 kJ/Ω

**Nominal discharge surge current** $I_{d}$ (8/20 μs per path):
- (L-N): 12.5 kA
- (N-PEN): 50 kA

**Protection level** $U_{prot}$:
- (L-N) ≤ 1.2 kV
- (N-PEN) ≤ 1.7 kV

**UTOV (withstand, 5 sec. (L-N)/withstand, 200 msec. (N-PEN))**:
- (L-N): 415 V a.c.
- (N-PEN): 1200 V a.c.

**Short circuit resistance L with maximum backup fuse**: 25 kA

**Maximum backup fuse**: 160 A gL/gG

Ø minimum L, N, PEN: 1.5mm² (solid) / 1.5mm² (stranded)

Ø maximum L, N, PEN: 35mm² (solid) / 25mm² (stranded)
TYPE 2 SURGE ARRESTERS

Type 2 Surge Arresters provide protection against overvoltage originating from switching and the secondary effects of lightning strikes. These devices will discharge current having an 8/20μs waveform and provide a low voltage protection level of ≤1.5kV (Up) for sensitive electronic equipment exceeding the requirements for category II equipment identified within table 44.3 (BS7671).
### Type 2 Surge Arresters Features, Benefits & Technical Data

<table>
<thead>
<tr>
<th>NHSPD4611T2 + NHSPD4810T2</th>
<th>NHSPD4611T2</th>
<th>NHSPD4810T2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total width</strong> 35.8mm</td>
<td><strong>Protective system</strong></td>
<td>TN-S / TT / TN-C / IT</td>
</tr>
<tr>
<td><strong>Rated surge arrester voltage</strong> U&lt;sub&gt;L-N/L-PEN&lt;/sub&gt;</td>
<td>350 V a.c.</td>
<td>350 V a.c.</td>
</tr>
<tr>
<td><strong>Nominal voltage</strong> U&lt;sub&gt;N&lt;/sub&gt;</td>
<td>230...240 V a.c.</td>
<td>230...240 V a.c.</td>
</tr>
<tr>
<td><strong>Nominal discharge current</strong> I&lt;sub&gt;1&lt;/sub&gt;(8/20) μs</td>
<td>20 kA</td>
<td>20 kA</td>
</tr>
<tr>
<td><strong>Maximum discharge current</strong> I&lt;sub&gt;1MAX&lt;/sub&gt;(8/20) μs</td>
<td>40 kA</td>
<td>40 kA</td>
</tr>
<tr>
<td><strong>Protection level</strong> U&lt;sub&gt;P&lt;/sub&gt;</td>
<td>≤1.4 kV / ≤1.5 kV</td>
<td>≤1.4 kV / ≤1.5 kV</td>
</tr>
<tr>
<td><strong>Maximum backup fuse</strong></td>
<td>125 A gL</td>
<td>125 A gL</td>
</tr>
<tr>
<td><strong>Short circuit resistance</strong> I&lt;sub&gt;P&lt;/sub&gt; with max. backup fuse</td>
<td>25 kA&lt;sub&gt;max&lt;/sub&gt;</td>
<td>25 kA&lt;sub&gt;max&lt;/sub&gt;</td>
</tr>
<tr>
<td>Ø minimum L, N, PE</td>
<td>2.5mm&lt;sup&gt;2&lt;/sup&gt; (solid)</td>
<td>2.5mm&lt;sup&gt;2&lt;/sup&gt; (stranded)</td>
</tr>
<tr>
<td>Ø maximum L, N, PE</td>
<td>35mm&lt;sup&gt;2&lt;/sup&gt; (solid)</td>
<td>25mm&lt;sup&gt;2&lt;/sup&gt; (stranded)</td>
</tr>
</tbody>
</table>

### NHSPD4641T2

- **Total width** 70.8mm
- **Protective system** TN-S / TT
- **Rated surge arrester voltage** U<sub>L-N/L-PEN</sub> | 350 V a.c. |
- **Nominal voltage** U<sub>N</sub> | 230...240 V a.c. |
- **Nominal discharge current** I<sub>1</sub>(8/20) μs | 20 kA |
- **Maximum discharge current** I<sub>1MAX</sub>(8/20) μs | 40 kA |
- **Protection level** U<sub>P</sub> | ≤1.4 kV |
- **Maximum backup fuse** | 125 A gL |
- **Short circuit resistance** I<sub>P</sub> with max. backup fuse | 25 kA<sub>max</sub> |
- Ø minimum L, N, PE | 2.5mm<sup>2</sup> (solid) | 2.5mm<sup>2</sup> (stranded) |
- Ø maximum L, N, PE | 35mm<sup>2</sup> (solid) | 25mm<sup>2</sup> (stranded) |

### NHSPD4631T2

- **Total width** 17.7mm
- **Protective system** TN-C
- **Rated surge arrester voltage** U<sub>L-PEN</sub> | 350 V a.c. |
- **Nominal voltage** U<sub>N</sub> | 230...240 V a.c. |
- **Nominal discharge current** I<sub>1</sub>(8/20) μs | 20 kA |
- **Maximum discharge current** I<sub>1MAX</sub>(8/20) μs | 40 kA |
- **Protection level** U<sub>P</sub> | ≤1.4 kV |
- **Lightning peak current** I<sub>P</sub>(10/350) μs | 3 kA |
- **Maximum backup fuse** | 125 A gL |
- **Short circuit resistance** I<sub>P</sub> with max. backup fuse | 25 kA<sub>max</sub> |
- Ø minimum L, N, PE | 2.5mm<sup>2</sup> (solid) | 2.5mm<sup>2</sup> (stranded) |
- Ø maximum L, N, PE | 35mm<sup>2</sup> (solid) | 25mm<sup>2</sup> (stranded) |

- **Plug-In Surge Arresters**
- **Disconnect facility for each individual module**
- **Visual end of life indication for each module**
- **Remote Indication auxiliary contact**
- **Mechanical keying of all slots**
- **IEC61643-1 / EN61643-11**
- **DIN rail mounting**
- **Temperature Range** -40...+80°C
- **IP20**
- **Replacement plug in modules are available**
TYPE 1 + 2 LIGHTNING / SURGE ARRESTERS COMBINATIONS

Type 1+2 Surge Arresters combine the benefits of both type 1 and type 2 having both high impulse current withstand (10/350μs) associated with direct lightning strikes and a low voltage protection level of ≤1.5kV (Up) exceeding the requirements for category II equipment identified within table 44.3 (BS7671).

<table>
<thead>
<tr>
<th>3 CONDUCTOR SYSTEM; L, N, PE</th>
<th>LIST NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHSPD4421T12</td>
<td></td>
<td>4 mod DIN mounting SPD with remote indication contact</td>
</tr>
</tbody>
</table>

TN-S/TT
Single Phase Supply - Separate Protective Earth & Neutral

<table>
<thead>
<tr>
<th>5 CONDUCTOR SYSTEM; L1, L2, L3, N, PE</th>
<th>LIST NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHSPD4441T12</td>
<td></td>
<td>8 mod DIN mounting SPD with remote indication contact</td>
</tr>
</tbody>
</table>

TN-S/TT
Three Phase Supply - Separate Protective Earth & Neutral

<table>
<thead>
<tr>
<th>2 CONDUCTOR SYSTEM; L, PEN</th>
<th>LIST NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHSPD4411T12</td>
<td></td>
<td>2 mod DIN mounting SPD with remote indication contact</td>
</tr>
</tbody>
</table>

TN-C
Single Phase Supply - Common Protective Earth & Neutral

<table>
<thead>
<tr>
<th>4 CONDUCTOR SYSTEM; L1, L2, L3, PEN</th>
<th>LIST NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHSPD4431T12</td>
<td></td>
<td>6 mod DIN mounting SPD with remote indication contact</td>
</tr>
</tbody>
</table>

TN-C
Three Phase Supply - Common Protective Earth & Neutral

Type 1+2 Surge Arresters combine the benefits of both type 1 and type 2 having both high impulse current withstand (10/350μs) associated with direct lightning strikes and a low voltage protection level of ≤1.5kV (Up) exceeding the requirements for category II equipment identified within table 44.3 (BS7671).
### Protective System

<table>
<thead>
<tr>
<th>Model</th>
<th>Protective System</th>
<th>Lightening protection level</th>
<th>Nominal voltage $U_{N}$</th>
<th>Rated load current $I_{N}$</th>
<th>Protection level $U_{P}$</th>
<th>Follow current limitation</th>
<th>Maximum backup fuse Application A:</th>
<th>Ø minimum L, N, PEN</th>
<th>Ø maximum L, N, PEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHSPD4421T12</td>
<td>TN-S / TT</td>
<td>L1, L2, L3, N, PEN</td>
<td>230/400 V a.c., 240/415 V a.c., 50/60 Hz</td>
<td>125 A (T, = 55°C)</td>
<td>≤ 1.5 kV</td>
<td>25 kA (264 V a.c.)</td>
<td>Application A: 125 A gL/gG</td>
<td>35mm² (solid)</td>
<td>25mm² (stranded)</td>
</tr>
<tr>
<td>NHSPD4441T12</td>
<td>TN-C</td>
<td>L1, L2, L3, N, PEN</td>
<td>230/400 V a.c., 240/415 V a.c., 50/60 Hz</td>
<td>125 A (T, = 55°C)</td>
<td>≤ 1.5 kV</td>
<td>25 kA (264 V a.c.)</td>
<td>Application A: 125 A gL/gG</td>
<td>35mm² (solid)</td>
<td>25mm² (stranded)</td>
</tr>
<tr>
<td>NHSPD4441T12</td>
<td>TN-C</td>
<td>L1, L2, L3, N, PEN</td>
<td>230/400 V a.c., 240/415 V a.c., 50/60 Hz</td>
<td>125 A (T, = 55°C)</td>
<td>≤ 1.5 kV</td>
<td>25 kA (264 V a.c.)</td>
<td>Application A: 125 A gL/gG</td>
<td>35mm² (solid)</td>
<td>25mm² (stranded)</td>
</tr>
<tr>
<td>NHSPD4441T12</td>
<td>TN-C</td>
<td>L1, L2, L3, N, PEN</td>
<td>230/400 V a.c., 240/415 V a.c., 50/60 Hz</td>
<td>125 A (T, = 55°C)</td>
<td>≤ 1.5 kV</td>
<td>25 kA (264 V a.c.)</td>
<td>Application A: 125 A gL/gG</td>
<td>35mm² (solid)</td>
<td>25mm² (stranded)</td>
</tr>
</tbody>
</table>

### Features
- **Plug-In Lightning and Surge Arresters**
- **Disconnect device for each individual module**
- **Visual end of life indication for each module**
- **Remote Indication auxiliary contact**
- **Mechanical keying of all slots**
- **IEC61643-1 / EN61643-11**
- **DIN rail mounting**
- **Temperature Range -40… +80°C**
- **IP20**
- **Replacement plug in modules are available**

### Technical Data
- **Lightening protection level**
- **Nominal voltage $U_{N}$**
- **Rated load current $I_{N}$**
- **Protection level $U_{P}$**
- **Follow current limitation**
- **Maximum backup fuse Application A:**
- **Ø minimum L, N, PEN**
- **Ø maximum L, N, PEN**
TYPE 2 SURGE ARRESTER FOR PHOTO VOLTAIC SYSTEMS

NHSPD4831T2
3 mod DIN mounting SPD with remote indication contact

REPLACEMENT PLUGS

<table>
<thead>
<tr>
<th>LIST NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHSPD4182T1</td>
<td>T1 N-PE GDT plug 50kA</td>
</tr>
<tr>
<td>NHSPD4123T1</td>
<td>NHSPD4143T1</td>
</tr>
<tr>
<td>NHSPD4183T1</td>
<td>T1 L-N varistor plug 12.5kA</td>
</tr>
<tr>
<td>NHSPD4123T1</td>
<td>NHSPD4143T1</td>
</tr>
<tr>
<td>NHSPD4143T1</td>
<td>NHSPD4113T1</td>
</tr>
<tr>
<td>NHSPD4481T12</td>
<td>T1 L-N spark gap plug 25kA</td>
</tr>
<tr>
<td>NHSPD4431T12</td>
<td>NHSPD4411T12</td>
</tr>
<tr>
<td>NHSPD4421T12</td>
<td>NHSPD4441T12</td>
</tr>
<tr>
<td>NHSPD4281T12</td>
<td>T2 L-N varistor plug 20kA</td>
</tr>
<tr>
<td>NHSPD4431T12</td>
<td>NHSPD4411T12</td>
</tr>
<tr>
<td>NHSPD4421T12</td>
<td>NHSPD4441T12</td>
</tr>
<tr>
<td>NHSPD4480T12</td>
<td>NHSPD4441T12</td>
</tr>
<tr>
<td>NHSPD4180T12</td>
<td>T1 N-PE spark gap plug 100kA</td>
</tr>
<tr>
<td>NHSPD4421T12</td>
<td>NHSPD4441T12</td>
</tr>
<tr>
<td>NHSPD4981T2</td>
<td>T2 L-N varistor plug 15kA</td>
</tr>
<tr>
<td>NHSPD4831T2</td>
<td>NHSPD4810T2</td>
</tr>
<tr>
<td>NHSPD4681T2</td>
<td>T2 L-N varistor plug 20kA</td>
</tr>
<tr>
<td>NHSPD4641T2</td>
<td>NHSPD4611T2</td>
</tr>
<tr>
<td>NHSPD4631T2</td>
<td>NHSPD4631T2</td>
</tr>
<tr>
<td>NHSPD4880T2</td>
<td>T2 N-pe GDT plug 20kA (12.5kA)</td>
</tr>
<tr>
<td>NHSPD4810T2</td>
<td>NHSPD4641T2</td>
</tr>
</tbody>
</table>

Surge and lightning arresters have a lifespan directly related to the number and magnitude of their operations.

All Wylex devices provide visual life status indication.

The plug unit must be removed during installation insulation resistance testing.
WHEN SHOULD WE INSTALL SURGE PROTECTION DEVICES?

**Risk assessment to BS EN 62305**

- **Is there a Lightning Protection System (LPS) on the building?**
  - YES: Type 1 SPD will be fitted
  - NO: Co-ordinated Type 2 at distribution and Type 3 at equipment

- **Are you in the vicinity circa 1km of a potential lightning strike?**
  - YES: Type 2 at distribution and Type 3 at equipment
  - NO: Type 2 SPD required if electrical equipment doesn’t have Category II impulse withstand 2.5kV

**BS7671 Wiring Regs 443.2.1**

- **TN supply: no overhead lines?**
  - YES: Type 2 SPD required if electrical equipment doesn’t have Category II impulse withstand 2.5kV

**BS7671 Wiring Regs 443.2.2**

- **TT supply: overhead lines?**
  - YES: Over voltage protection MAY be necessary - Type 2 SPD at all distribution boards!
  - NO: AQ1 ≤25 thunderstorm days, no need to fit SPD BUT - Type 2 SPD required if electrical equipment doesn’t have Category II impulse withstand 2.5kV

**BS7671 Wiring Regs 443.2.4**

- **Regardless of the AQ criteria are there higher reliability or higher risks expected? See BS EN 62305**
  - **Risk human life**
    - YES: Over voltage protection SHALL be provided - Type 2 SPD at all distribution boards!
    - NO: Calculation indicates an SPD required, protection level no higher than 2.5kV - Type 2 SPD
  - **Risk public services**
    - YES: Over voltage protection SHALL be provided - Type 2 SPD at all distribution boards!
    - NO: Calculation indicates an SPD required, protection level no higher than 2.5kV - Type 2 SPD
  - **Risk commerce**
    - YES: Over voltage protection SHALL be provided - Type 2 SPD at all distribution boards!
    - NO: Calculation indicates an SPD required, protection level no higher than 2.5kV - Type 2 SPD
  - **Risk groups of individuals**
    - YES: Calculation indicates an SPD required, protection level no higher than 2.5kV - Type 2 SPD
    - NO: Over voltage protection required Type 2 SPD at all distribution boards!
  - **Risk individuals**
    - YES: Calculation indicates an SPD required, protection level no higher than 2.5kV - Type 2 SPD
    - NO: Over voltage protection required Type 2 SPD at all distribution boards!
  - **Insurance £££s**
    - YES: Over voltage protection required Type 2 SPD at all distribution boards!
    - NO: Calculation indicates an SPD required, protection level no higher than 2.5kV

**No SPD - LOW RISK installation?**

All connected electrical equipment has impulse and withstand voltage no greater than 2.5kV
Consumer Unit fitted with Type 2 Surge Protection connected at the main switch

Wylex Lightning and surge arresters can be provided as an integral part of many single phase NH consumer units where they can afford protection against transient overvoltage originating from either an atmospheric or switching event.
CUSTOM BUILT

To address the ever changing requirements of the modern electrical installation Wylex offer a custom build service for all of the catalogued range of NH domestic circuit protection products. These can be modified or pre assembled to meet particular customer specification.

These modifications can include not only Surge and Lightning arresters but also circuit protective devices, personalised labelling and DIN mounting control devices such as contactors, time switches or bell transformers.

The custom built option can save time on site, reduce labour cost and contribute to a trouble free installation process.

Separately mounted enclosure housing a Type 1 Lightning Arrester

In many situations it may not be practical or desirable to include lightning and surge arresters within consumer units.

Mounting devices in their own enclosure or as part of a separate assembly is another option.

Wylex Panelboards include a range of catalogued lightning and surge arrester kits that enable on site customization of this commercial distribution system. Type 1, 2 and 1+2 devices can be applied and mounted integrally within the framework of any Wylex Panelboard. All necessary steelwork and interconnections are included within the SPD kits.

Also available are an extensive range of standard meter kits, cableways, control module enclosures and door kits giving installers the ability to provide bespoke on site solutions from standard catalogued components.
Although every effort has been made to ensure accuracy in the compilation of the technical detail within this publication, specifications and performance data are constantly changing. Latest details can be obtained from Wylex.