furse

AN005

Protection for global telephony equipment

Application Note AN005 for ESP TN, ESP TN/BX, ESP SL TN, ESP TNQ, ESP KT1, ESP TN/JP, ESP KT1/PTC, ESP K10T1, ESP K10T1/PTC, ESP TN/RJ11-*/6

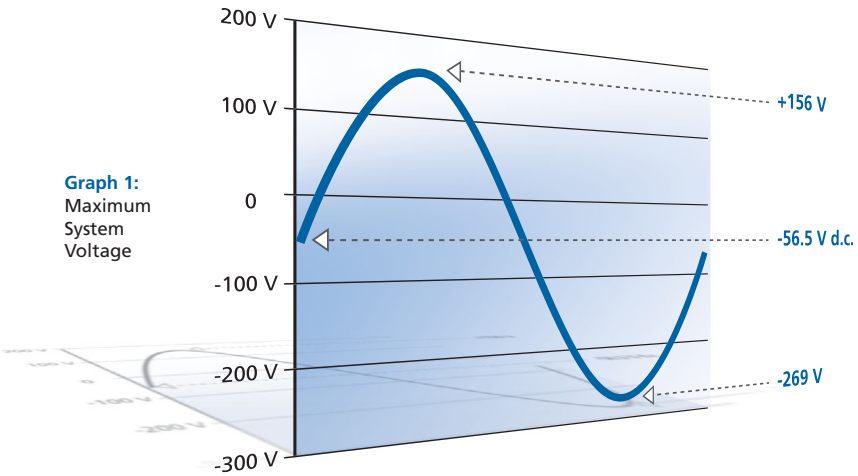
Thomas&Betts

Protection for global telephony equipment

This Application Note details advanced surge protection for Central Office and Customer Premise Equipment, covering global equipment specifications, exceeding the high speed requirements of VDSL2+.

Any protector fitted to the telephone system should be 'invisible' to the application, and not interfere with its normal operation. They should not clip or limit the voltages that occur in normal system operation, and the bandwidth should be sufficient for existing applications with headroom for system development in the foreseeable future.

In order to fully protect telephony systems, protection must be provided in all connection modes; between lines, and between each line and earth, in both polarities. This is referred to as FULL MODE PROTECTION, and is essential to ensure continuous operation of sensitive or critical electronic equipment.



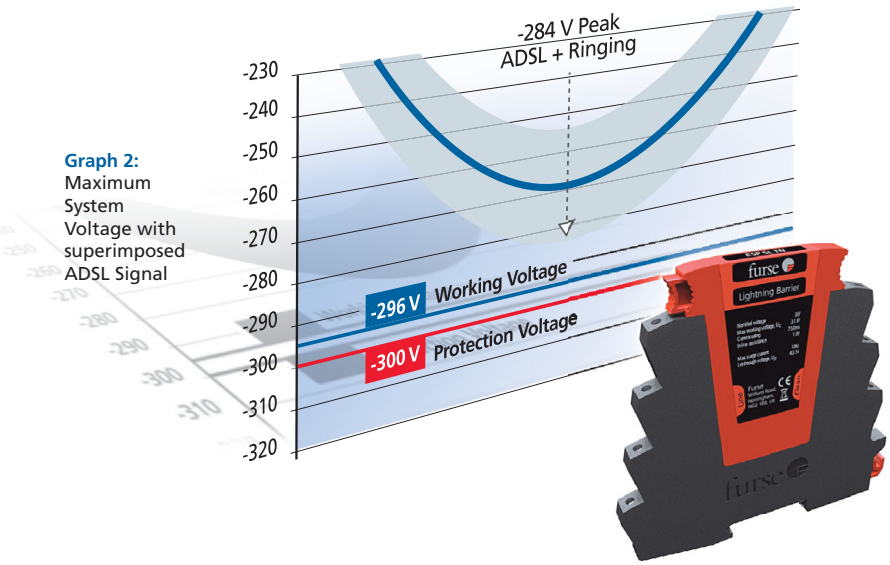
Graph 1: Maximum System Voltage

Global systems requirements

In order for these products to be applied anywhere in the world, we need to consider the most onerous voltage and frequency requirements that may exist on a global basis, and ensure that products are able to deal adequately with this.

Considering Customer Premise Equipment, for voltage, the highest requirement is currently the FCC Part 68 "B" ringer. The "B" ringer has a D.C. voltage of –56.5 V and a maximum A.C. ringing voltage of 150 V_{RMS}. This gives a maximum voltage of –269 V, but because of possible wiring reversals, the protector should have a minimum working voltage of ±269 V.

The ADSL signal can be as high as ±15 V (shown as a grey band), and this adds to the "B" ringer voltage, creating a peak value of 284 V. As before, we allow for ±284 V to account for possible wiring reversals.



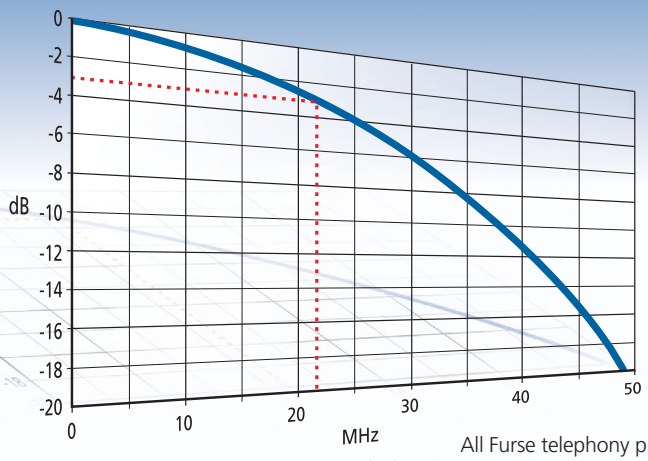
Graph 2: Maximum System Voltage with superimposed ADSL Signal

Furse telephony products have maximum working voltages of 296 V, and are not polarity sensitive. Innovative design techniques allow Furse products to protect very close to this level, providing installations with a high degree of protection.

When we next consider the requirements for the frequency spectrum, we observe that standard Plain Old Telephone Systems (POTS) applications operate up to 300 kHz.

Furthermore, the speeds of digital systems, such as ADSL, are affected by the distance from the Central Office (CO) or Public Telecom Operator (PTO) and operate at maximum bit rates of around 8 Mbps (cabling < 1 mile) or more typically 2 Mbps (cabling < 3 miles).

The system bandwidth required for these bits rates is typically less than 1 MHz.



Graph 3:
-3 dB loss (half power point) in excess of 20 MHz

According to British Telecommunications (BT), the maximum bit rate the network will probably ever be able to deliver is 50 Mbps for VDSL2+. This equates to a bandwidth of 7 MHz.

All Furse telephony protectors have a bandwidth in excess of 20 MHz, well above the required maximum frequency rates, and provide ample headroom for future high-speed connections.

Protection against the influences of power sources

Telephony systems cannot operate in isolation from power sources, and in the majority of installations cabling runs directly alongside or near to power sources. This introduces issues with safety and EMC that need to be addressed in order to allow continuous operation of sensitive and critical equipment.

Recognising that there is the potential for the induction of energy from power sources into telephony equipment, and the possibility that mains power could become directly applied onto cabling through fault conditions, additional requirements for testing have been established to represent typical in-service conditions to which the products might be subjected.

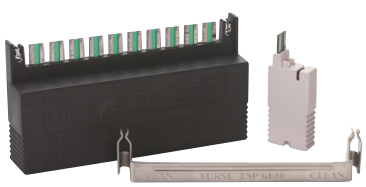
The following documents stipulate Power/Line Cross and Power Induction tests to be applied:

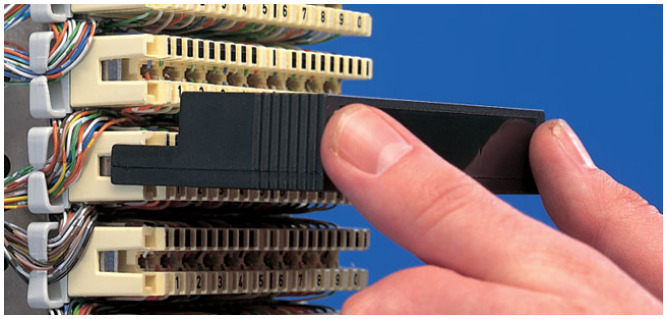
- **ITU-T[1] (formerly CCITT[2]) recommendations K.20, K.21 and K.45**
- **Telcordia (formerly BELL-CORE, and keeper of the NEBS[3] Criteria) GR-1089-CORE**
- **ANSI[4] TIA/EIA/IS-968-A (formerly FCC[5] Part 68)**

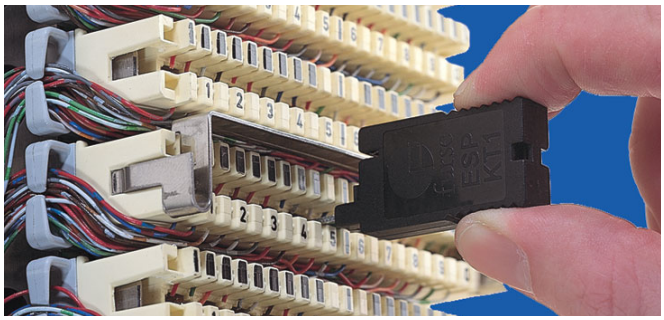
Power/Line Cross requires the direct application of 110/230 Vac for 15 minutes.

Power Induction requires the direct application of pulses of 600 V, 1 A for 0.2 seconds.

In order to satisfy these strict requirements, Furse innovative 'low let-through voltage' technology has been applied to develop protectors incorporating Positive Temperature Coefficient (PTC) components.







Please note:
Information about safe and correct installation of Furse Lightning Barriers can be found in the *ESP Lightning Barrier Installation Instructions, supplied with all products.*

These new products can withstand these onerous test levels protecting itself and Customer Premise and Central Office Equipment during the fault. The protector automatically resets itself once the event has passed.

The products currently available with these advanced features are designed to fit inside Main Distribution Frames (MDF) LSA-PLUS 'disconnection modules', and offer protection for single-pair protection (ESP KT1/PTC) when used together with earth bar ESP KE10, and ten-pair protection (ESP K10T1/PTC) with integral earth connection.

Summary

Furse lightning barriers ensure telephony equipment is repeatedly protected and remains operational during lightning activity.

Their advanced performance caters for future advances in telecommunications, providing maintenance free protection that will outlast typical system lifetimes.

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Full specifications of all of the products in the Furse ESP range of transient overvoltage protectors can be found in the Total Solution Product Catalogue.

To request a copy, contact Furse Sales at the address opposite.

Full product data can be downloaded in PDF form from our website at www.furse.com. Copies of the Total Solution Product Catalogue can also be requested from our website.

ABBREVIATIONS

1. **ITU-T** = **I**nternational **T**elecommunications **U**nion – Telecommunications standards sector.
2. **CCITT** = ***C**omité **C**onsultatif **I**nternational **T**éléphonique* et ***T**élégraphique*. Parent company is ITU.
3. **NEBS** = **N**etwork **E**quipment-**B**uilding **S**ystem…established in 1970's to standardize equipment installed in a CO.
4. **ANSI** = **A**merican **N**ational **S**tandards **I**nstitute, coordinates the development and use of consensus standards in the US.
5. **FCC** = **F**ederal **C**ommunications **C**ommission, regulates interstate and international communications by radio, television, wire, satellite and cable in the US.

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