



BS 6301 : 1989

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British Standard Specification for
**Electrical safety requirements for apparatus for
connection to telecommunication networks**

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Foreword

This British Standard has been prepared under the direction of the Telecommunications Standards Policy Committee. It forms one of a series of British Standards that are being produced following the commencement of liberalization in October 1981 of the supply of certain telecommunications apparatus within the United Kingdom.

This standard specifies electrical safety requirements for the protection of telecommunications networks, the personnel operating these networks and where appropriate for the protection of users from electrical hazards that may arise from the connection of the apparatus to the network.

This standard is being, and will be progressively, aligned to the impending CENELEC* European Standard (EN) on the safety of apparatus for connection to telecommunication networks. UK obligations to CENELEC will entail the adoption of the EN, without deviation, as a British Standard, together with the associated withdrawal of any existing standard, i.e. this standard. A European 'pre standard' (ENV) is already published, during the life-time of which, this standard remains in existence.

Users of this standard should also note that, in respect of those types of apparatus coming within the scope of Normes Européennes de Télécommunications (NETs), compliance with which is expected to be both mandatory and subject to third-party certification, those NETs are expected to specify compliance with the CENELEC ENV.

For apparatus within the scope of the European Communities' Council Directive No. 73/23/EEC (the Low Voltage Directive), attention is drawn to the UK's obligations under that Directive, as implemented by UK statute. Users of this standard should be aware that apparatus subject to marking under the Telecommunications Apparatus (Marking and Labelling) Order 1985, submitted for approval for the purposes of the Telecommunications Act 1984, will be required as a condition of approval to meet the requirements of EEC Directive No. 73/23/EEC, in addition to those of this standard. Compliance with this standard, however, does not depend on meeting the requirements of EEC Directive No. 73/23/EEC.

This standard specifies electrical safety requirements applicable to all apparatus, except digitally-connected apparatus, for connection to telecommunication networks. It is not intended, however, to be used in isolation, and where appropriate it should be used only in conjunction with the appropriate telecommunications standard(s),

which is (are) expected to make reference to this standard, possibly with additional safety requirements applicable only to that particular product or facility. In exceptional cases, the safety requirements of this standard may be varied in some respect by the requirements of the product or facility standard. Any such variation, however, should not result in a less safe environment than is ensured by compliance with this standard.

Safety requirements other than electrical safety, e.g. acoustic safety requirements, are not specified in this standard but are included in the appropriate telecommunications product or facility standard(s).

This standard is presented for designation under Section 22 of the Telecommunications Act 1984. It is stipulated in that Section of the Act that apparatus within the scope of a designated standard may only be approved for connection to a telecommunication system if it conforms to that standard, subject to such exceptions as may be determined by or under the designation.

The designation of this standard may stipulate variations of, or additions to, the requirements of this standard and may also set conditions that have to be complied with as regards the apparatus, or its connection, or use. A copy of the designation will be included, when available, with all copies of this standard. Any further information on, or details of, the designation of this standard may be obtained from the Office of Telecommunications (OFTEL), Atlantic House, Holborn Viaduct, London EC1N 2HQ.

This standard supersedes BS 6301 : 1987 and is itself expected to be superseded when the CENELEC EN is published.

NOTE. Upon publication of this revision, BSI sales department will respond to purchase orders for BS 6301 by supplying copies of the 1989 edition. Copies of the 1982 and 1987 editions will continue to be available, on request, until the designation of the 1987 edition, when the 1982 edition will be withdrawn.

Similarly designation of the 1989 edition will result in the 1987 edition being withdrawn from sale.

This standard is a technical implementation of the recommendations given in IEC Guide 105 : 1985.

Information on the major differences between this standard and BS 6301 : 1982 is given in appendix G.

Compliance with a British Standard does not of itself confer immunity from legal obligations. In particular, attention is drawn to the Telecommunications Act 1984.

* CENELEC = European Committee for Electrotechnical Standardization.

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Specification

1 Scope

This British Standard specifies electrical safety requirements for apparatus, on subscribers' premises, suitable for connection to telecommunication networks run by licensed PTOs (Public Telecommunication Operators). This standard does not apply to apparatus that is owned by a PTO and which may be used on subscribers' premises for testing purposes. This standard does not apply to apparatus intended for connection to television cable distribution systems (CATV). This standard does not apply to digitally-connected apparatus as defined in 2.17.

The requirements are specified in order to reduce adequately the risk of hazardous electrical conditions arising on the telecommunication networks owing to connection of the apparatus and, where appropriate, to reduce adequately the risk of conditions on the telecommunication networks creating electrical hazards for persons using the apparatus.

NOTE 1. This standard also covers the prevention of damage to property other than the apparatus itself and the prevention of injury to persons using the apparatus, arising from the connection of the apparatus to a telecommunication network.

NOTE 2. Protection of the user from potential hazards in apparatus arising from causes other than the connection of the apparatus to a telecommunication network is not addressed by this standard, and these requirements are contained in other safety standards or legislation appropriate to the apparatus. However, in the application of these other standards, it should be noted that voltages that are not excessive (as defined in this standard) are not likely to cause injury, irrespective of the source of such a voltage. Voltages that exceed the limits for accessible parts allowed by other standards, but that are not at excessive voltages, may be generated in the equipment, independent of connection to the network. Parts at voltages defined as non-excessive in this standard are permitted to be accessible in the manner defined in these other standards, provided that they comply with the requirements of these other standards/legislation in all respects other than touch voltage, but they should not be contactable by the test probe, in accordance with 4.1 of this standard. See also item (b) to appendix G.

This standard applies to apparatus suitable for normal indoor environments. Additional requirements may apply to apparatus suitable for more severe environments, such as outdoor installations, to apparatus used in medical applications and to apparatus suitable for installation in mines, flammable atmospheres and other hazardous locations.

NOTE 3. The requirements of this standard may not be sufficient to ensure electrical safety of the apparatus user in damp or humid environments, such as bathrooms or swimming pools.

The tests described in this standard are type tests as defined in 21.5 of BS 4778 : Part 2 : 1979. The general conditions for the tests, both in the main text and in appendix A, are described in A.1.

Where a reference is made in this standard to a particular clause in another publication, the requirements are applicable irrespective of the scope of that publication. Any clauses of another publication not specifically invoked do not apply.

Appendix B gives information on the application of this standard.

NOTE 4. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard the following definitions and explanations of terms, together with those given in BS 6305 and BS 7002, apply.

NOTE. Attention is particularly drawn to the definitions in BS 7002 for the following terms:

working voltage;
hazardous voltage;
rated voltage;
basic insulation;
supplementary insulation;
reinforced insulation;
clearance;
creepage distance;
SELV circuit.

2.1 excessive voltage. A voltage that is not defined by (a), (b) or (c):

(a) a voltage where the combination of d.c. and a.c. voltages of any frequency is such that:

$$U_{dc} + 3U_{ac} \leq 150$$

where

U_{dc} is the value of d.c. voltage (in V);

U_{ac} is the r.m.s. value of a.c. voltage (in V).

NOTE. When $U_{dc} = 0$ V, U_{ac} can be ≤ 50 V r.m.s.
When $U_{ac} = 0$ V, U_{dc} can be ≤ 150 V.

(b) a telephone ringing signal where the currents I_1 and I_2 flowing through a 5 k Ω resistor between any two conductors of a single port or between one conductor of a port and earth comply with (1) and (2) as follows:

(1) I_1 , the current calculated from the calculated or measured current for any single active ringing period t_1 (as defined in figure 1), does not exceed:

- (i) for cadenced ringing ($t_1 < \infty$), the current given by the curve of figure 2 at t_1 ;
- (ii) for continuous ringing ($t_1 = \infty$), 16 mA, or 20 mA where cadenced ringing becomes continuous as a consequence of a single fault;

where I_1 , in mA, is given by:

$$I_1 = I_p / \sqrt{2} \text{ (for } t_1 \leq 600 \text{ ms)}$$

$$I_1 = \left(\frac{t_1 - 600}{600} \right) I_{pp} / 2\sqrt{2} + \left(\frac{1200 - t_1}{600} \right) I_p / \sqrt{2}$$

(for $600 \text{ ms} \leq t_1 < 1200 \text{ ms}$)

$$I_1 = I_{pp} / 2\sqrt{2} \text{ (for } t_1 \geq 1200 \text{ ms)}$$

where

I_p is the peak current (in mA) of the relevant waveform given in figure 3;

I_{pp} is the peak-to-peak current (in mA) of the relevant waveform given in figure 3;

t_1 is expressed in ms.

(2) I_2 , the current for repeated bursts of a cadenced ringing signal calculated for one ringing cadence cycle t_2 (as defined in figure 1), does not exceed 16 mA;

where I_2 , in mA, is given by

$$I_2 = \sqrt{\left[(I_1)^2 (t_1/t_2) \right] + \left[(I_{dc}/3.75)^2 \left(\frac{t_2 - t_1}{t_2} \right) \right]}$$

where

I_1 is as given by (1);

I_{dc} is the d.c. current (in mA) flowing through the $5\text{ k}\Omega$ resistor during the non-active period of the cadence cycle;

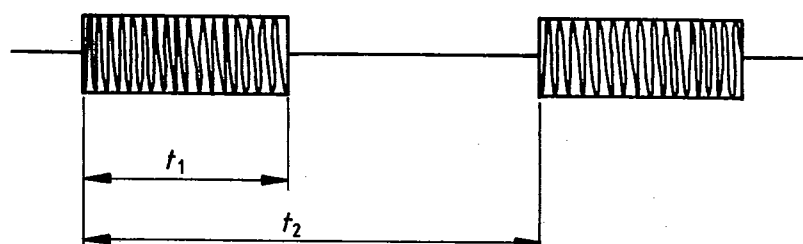
t_1, t_2 are expressed in ms:

NOTE 1. For continuous ringing, $t_1 = t_2$, and therefore $I_2 = I_1$.

NOTE 2. Examples of cadenced ringing signals are those used on BT's PSTN, as defined in C.3 of BS 6305:1982.

NOTE 3. For information on telecommunication network operating voltages, see appendix C.

(c) a telegraph signal of maximum voltage 96 V peak with respect to earth.

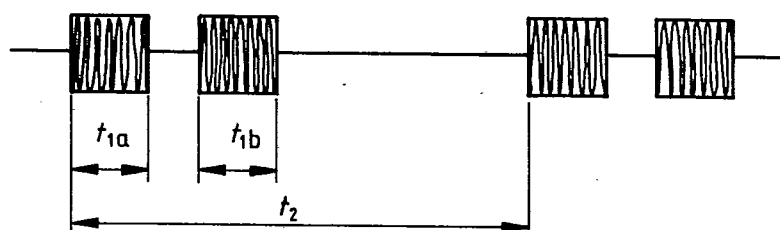


t_2 is the duration of one complete cadence cycle

t_1 is:

- (i) the duration of a single ringing period, where the ringing is active for the whole of the single ringing period;
- (ii) the sum of the active periods of ringing within the single ringing period, where the single ringing period contains two or more discrete active periods of ringing, as in the following example, for which

$$t_1 = t_{1a} + t_{1b}$$



NOTE. For the cadence used in the call arrival indication (ringing) on BT's PSTN, as defined in C.3 of BS 6305:1982:

Normal cadence cycle

$$t_{1a} = t_{1b} = 400\text{ ms}$$

$$t_1 = 800\text{ ms}$$

$$t_2 = 3\text{ s}$$

$$I_1 = 20.16\text{ mA}$$

$$I_2 = 10.6\text{ mA}$$

Initial cadence cycle only

$$t_{1a} \leq 1.4\text{ s}$$

$$t_1 \leq 1.8\text{ s}$$

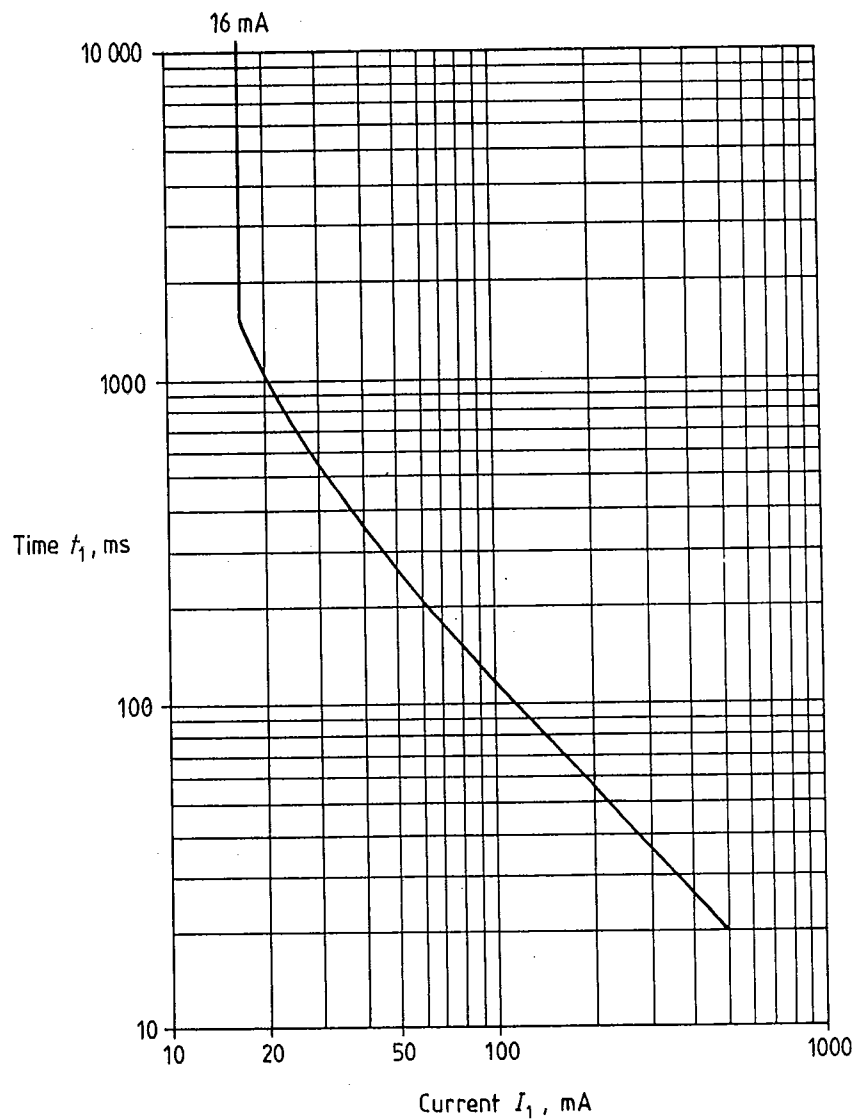
$$t_2 \leq 4\text{ s}$$

$$I_1 \leq 15.86\text{ mA}$$

$$I_2 \leq 10.79\text{ mA}$$

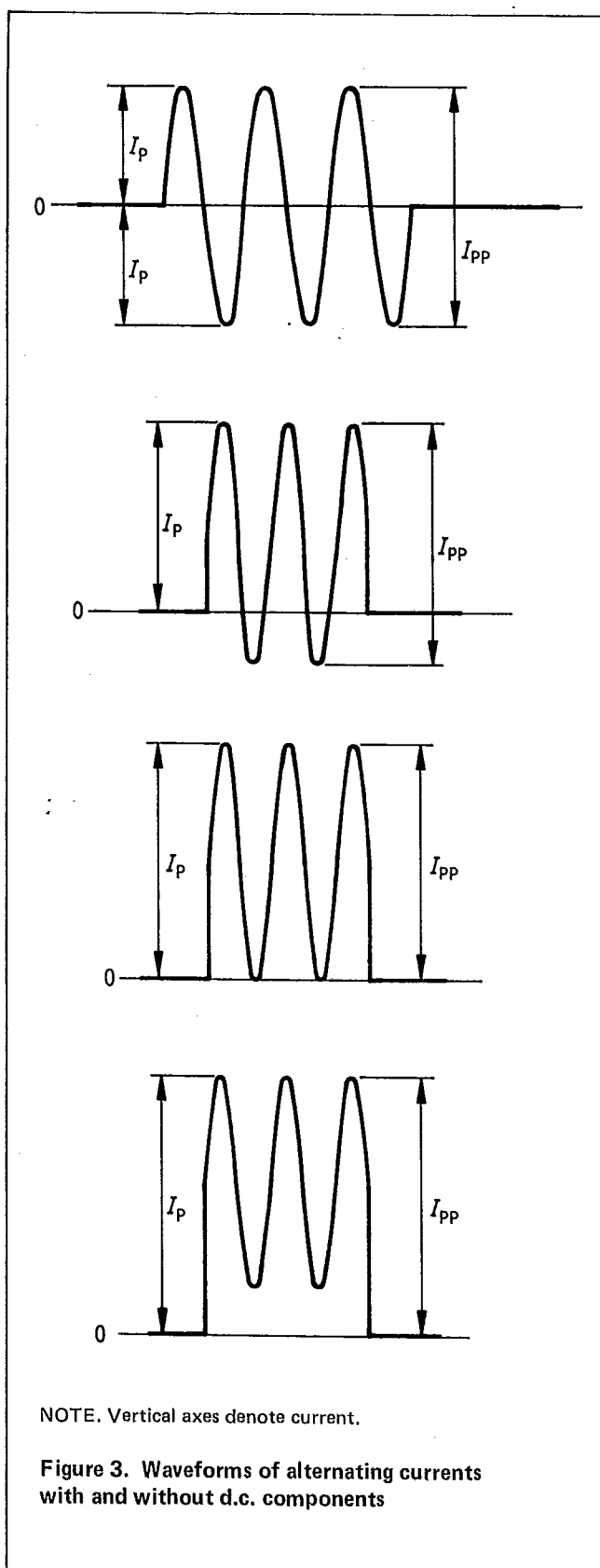
(The values given for I_1 and I_2 assume that $I_p = 31.54\text{ mA}$, $I_{pp} = 44.88\text{ mA}$, and $I_{dc} = 9.1\text{ mA}$.)

Figure 1. Definition of ringing period (t_1) and cadence cycle (t_2)



NOTE. The curve is based on curve b of figure 5 of IEC 479-1:1984.

Figure 2. I_1 limit curve for cadenced ringing signal



2.2 network termination point (NTP). A point for attachment of apparatus defined for the purposes of this standard:

- (a) for public telecommunications systems in the appropriate licence; and
- (b) for private telecommunication systems as at any point at which energy of any of the forms specified in paragraphs (a) to (d) of section 4(1) of the Telecommunications Act 1984 could be conveyed from or to an item of apparatus.

NOTE 1. An NTP of a public telecommunications system is normally provided by the PTO.

NOTE 2. In BS 6301 : 1982, NTP (network termination and test point) was defined. This term is now superseded by NTP.

2.3 protection barrier. One or more identifiable components providing protection from excessive voltages.

NOTE. A protection barrier prevents an excessive voltage that may reasonably be expected to arise in an unprotected circuit from reaching a protected circuit.

2.4 unprotected circuit. A part of the apparatus not protected from excessive voltages.

2.5 protected circuit. A part of the apparatus protected from excessive voltages.

2.6 user access area. An area to which, under normal operating conditions, either:

- (a) access can be gained without the use of a tool; or
- (b) the means of access is deliberately provided to the user; or
- (c) the user is instructed to enter regardless of whether or not tools are needed to gain access.

NOTE 1. In this standard the terms 'access' and 'accessible', unless qualified, relate to user access as defined above.

NOTE 2. Apparatus accessible only to authorized personnel, e.g. an installation in a locked room or similar environment, such that user access is prevented, is not regarded as being in a user access area.

NOTE 3. The above definition is identical to 'operator access area' as defined in 1.2.7.1 of BS 7002 : 1989 except that 'operator' has been replaced by 'user'.

2.7 port. A facility of the apparatus for connection to other apparatus or to the NTP and which in the normal operation of the apparatus is not at an excessive voltage.

2.8 NTP port. A port through which the apparatus is intended to be connected to the NTP.

NOTE. On apparatus suitable for connection to the NTP only via other apparatus, the NTP port is the port for connection to that other apparatus. Where the indirectly connected apparatus is a separate power supply unit, its NTP port is the power outlet to the other apparatus.

2.9 accessory port. A port declared by the supplier to be solely for the connection of accessories that do not use or generate voltages greater than that defined for a safety extra-low voltage (SELV) circuit as defined in 1.2.8.5 of BS 7002 : 1989.

NOTE. Examples of accessories are microphones, earpieces and foot control switches.

2.10 protective earth. An earthing system provided for protection purposes.

2.11 A terminal. The terminal of an NTP port designed to be conductively connected to the A wire of the network.

2.12 B terminal. The terminal of an NTP port designed to be conductively connected to the B wire of the network.

2.13 BS 6312-compatible port. A port compatible with a plug complying with BS 6312.

2.14 BS 6312-incompatible port. A port incompatible with a plug complying with BS 6312.

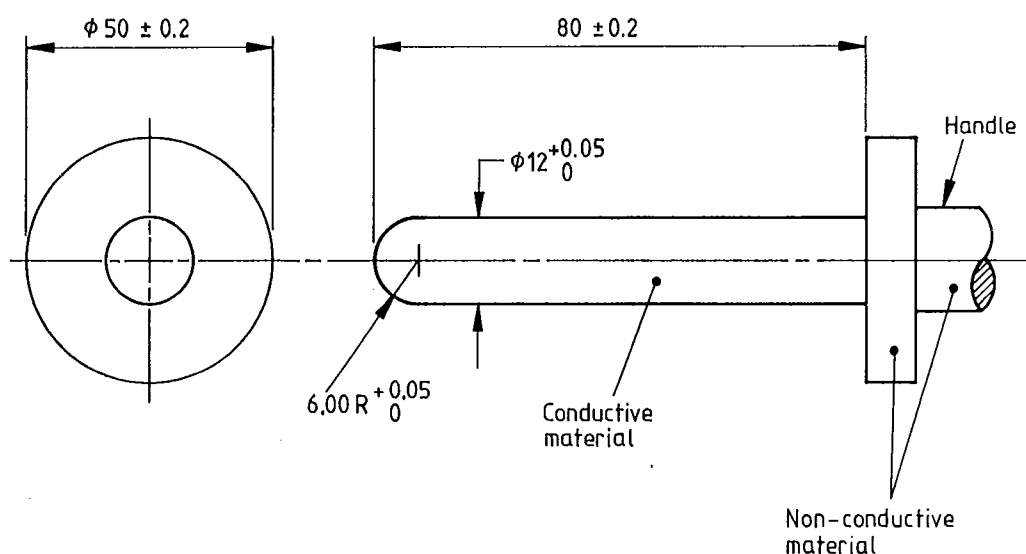
2.15 test probe. The probe shown in figure 4.

NOTE 1. The test probe is used to determine the locations of parts of the apparatus that are inadvertently accessible to the user. The test probe is removed before measurements of clearance and creepage are made.

NOTE 2. Test conditions describing the use of the test probe are given in A.1.5.

2.16 licensed PTO. A PTO licensed under the Telecommunications Act 1984.

2.17 digitally-connected apparatus. Apparatus, or relevant part thereof, intended to be connected solely to particular private digital circuits according to CCITT Recommendation X.21 bis or CCITT Recommendation G.703.



NOTE. All dimensions are in millimetres.

Figure 4. Test probe

