

Essential requirements for a handset telephony facility provided by terminal equipment intended for direct connection to an analogue interface of the public switched telephone networks

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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 References	1
3 Abbreviations and definitions	1
4 General	2
5 TE on-line (non-signalling state)	3
6 Speech transmission process	3
7 TE with facility for suppressing transmission	5
8 Call control	6
9 Conformity principles	6
Annexes	
A (normative) General	16
B (normative) Methods of test	18
C (informative) Information required for type testing	27
D (normative) Procedure for conditioning carbon microphones	27
E (informative) Information for test purposes	28
F (informative) Telephony for elderly and disabled people	32
Tables	
1 Coordinates of voltage limit curve for d.c. characteristics	3
2 Coordinates of sending sensitivity limit curves	3
3 Coordinates of receiving sensitivity limit curves	4
4 Coordinates of sending loudness rating limit curves for line lengths up to 7.5 km	4
5 Coordinates of receiving loudness rating limit curves for line lengths up to 7.5 km	5
B.1 Parameters required to calculate <i>SLR</i> , <i>STMR</i> and <i>RLR</i>	20
E.1 General information	29
E.2 Options list	30
E.3 Features implementation	31
Figures	
1 D.C. characteristics lower limit	7
2 Sending sensitivity limit for line lengths of 0 km	8
3 Sending sensitivity limits for line lengths over 0 km and up to 3 km	9
4 Sending sensitivity limits for line lengths over 3 km and up to 7.5 km	10
5 Receiving sensitivity limits for line lengths of 0 km	11
6 Receiving sensitivity limits for line lengths over 0 km and up to 3 km	12
7 Receiving sensitivity limits for line lengths over 3 km and up to 7.5 km	13
8 Sending loudness rating limits	14
9 Receiving loudness rating limits	15
A.1 Limits of ambient noise for speech transmission tests	17
B.1 The local telephone system (LTS)	19
B.2 Artificial line segment, 0.1 km length	20
B.3 Feeding bridge	21
B.4 Circuit for measurement of signal levels	23
B.5 Circuit for instability test	25
B.6 Handset position for instability test	26
List of references	34

Foreword

This Published Document has been prepared under the direction of the Telecommunications Standards Policy Committee and at the request of the Communication and Information Industries Directorate of the Department of Trade and Industry. Any enquiries relating to this document should be directed to BSI quoting the reference of the committee TCT/-/2/1, which was involved in the preparation of the document. This Published Document forms one of a series of Published Documents that are being produced to record the essential requirements, consistent with Articles 4(c) to 4(g) of Directive 91/263/EEC, for the connection of terminal equipment to those telecommunication systems designated as a public telecommunications system by an order made under Section 9 of the Telecommunications Act 1984.

The requirements specified in this Published Document were drawn from the following document.

PD 6568 : 1992 *Draft standard to match to and work with ETS 300 001/NET 4. Specification for simple telephones for connection to public switched telephone networks run by certain public telecommunications operators*

This Published Document is presented for designation under Section 22 of the Telecommunications Act 1984.

A copy of any designation will be included when available with all copies of this Published Document. Any further information on, or details of, the designation may be obtained from the Office of Telecommunications (OFTEL), 50 Ludgate Hill, London, EC4M 7JJ.

BSI waives copyright in respect of the tables in annex E.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 34, an inside back cover and a back cover.

1 Scope

This Published Document specifies those technical requirements under Section 22 of the Telecommunications Act 1984 for the voice telephony justified case under article 4(g) of Directive 91/263/EEC for terminal equipment incorporating a handset to be directly attached to the public switched telephone network (PSTN).

This Published Document contains the essential requirements for interworking via the public network, and so provides some assurance of correct terminal-to-terminal operation.

NOTE 1. The requirements of this Published Document apply in addition to ETS 300 001/NET 4 and may restrict options or extend requirements in that standard.

This Published Document applies to all terminal equipment that:

- a) incorporates a handset for voice telephony; and
- b) is intended for direct connection to an analogue interface of the PSTN; and
- c) does not have its dialling capability limited to only a list of preset numbers; and
- d) is designed such that, in at least one mode of operation, the whole signal at the NTP is an analogue in level and frequency of the signal at the handset acoustic interface (e.g. it excludes terminals where the speech signal is digitally encoded, encrypted or compressed into only part of the normal voice bandwidth).

NOTE 2. Such terminal equipment may or may not incorporate user-controlled receiving volume control, an inductive coupler or an electrical coupling for a hearing aid.

The tests described in this Published Document are type tests. The general conditions for all the tests are described in annex A.

NOTE 3. This Published Document does not require the provision of features designed to meet the special needs of users with hearing impairment but is compatible with their implementation. Suppliers who wish to address the needs of the hearing impaired are recommended to follow the requirements specified in ETS 300 381 (inductive couplers), ETS 300 488 (receiving amplification) and ETS 300 679 (electrical coupling).

2 References

2.1 Normative references

This Published Document incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on page 34. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publications apply to this Published Document only when incorporated in the reference by updating or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This Published Document refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this Published Document are listed on the inside back cover, but reference should be made to the latest editions.

3 Abbreviations and definitions

For the purposes of this draft Published Document, the abbreviations and definitions given in ETS 300 001/NET 4 apply, together with the following.

3.1 Abbreviations

3.1.1 BT British Telecommunications plc

3.1.2 LTS local telephone system

NOTE. See figure B.1.

3.1.3 PSTN public switched telephone network

3.1.4 RLR receiving loudness rating

3.1.5 SLR sending loudness rating

3.1.6 SPL sound pressure level

3.1.7 STMR masked sidetone loudness rating

3.1.8 TE terminal equipment

3.2 Definitions

3.2.1 artificial ear

A device at the entry of which the acoustic impedance is the same as the acoustic impedance of the average human ear and comprising an acoustic network and a measurement microphone which permit calibration of earphones used in audiometry and telephonometry.

3.2.2 artificial mouth

An electro-acoustic transducer used for the testing of microphones at close speaking distances.

3.2.3 free field

A sound field in a homogeneous and isotropic medium whose boundaries exert a negligible effect upon acoustic measurements.

3.2.4 handset

A combination of telephone microphone and receiver in a form convenient for holding simultaneously to mouth and ear, which, when in use, retains the microphone in a position fixed in relation to the receiver.

3.2.5 handset telephony

A facility provided by terminal equipment whereby live two-way speech may be supported by means of a handset which forms an integral part of the terminal equipment.



3.2.6 mouth reference point (MRP)

A point located at a distance of 25 mm in front of the equivalent lip position on the horizontal axis through the centre of the opening of the artificial mouth.

3.2.7 off-line

The quiescent state of the TE.

NOTE. Defined in ETS 300 001/NET 4.

3.2.8 on-line

The active state of the TE.

NOTE. Defined in ETS 300 001/NET 4.

3.2.9 real ear loss

A correction factor intended to represent the acoustic loss attributed to the leakage occurring between an earpiece and a real ear.

3.2.10 sidetone

The reproduction in a handset receiver of sounds picked up by the telephone microphone.

3.2.11 supplier's declaration

A written declaration made by a supplier that a TE conforms to stated requirements, based on test information or other substantiating material held by the supplier relating to the design of the TE.

3.2.12 type test

A test or series of tests directed towards approval of a design.

3.3 Notation

The following notations apply:

dB_m	Absolute power level with respect to 1 mW, expressed in decibels
dB_{mp}	Absolute psophometric power level (weighted for telephony) with respect to 1 mW, expressed in decibels
$\text{dB}\cdot\text{Pa}$	Absolute sound pressure level with respect to 1 Pa, expressed in decibels
$\text{dB}\cdot\text{V}$	Absolute voltage level with respect to 1 V, expressed in decibels

4 General**4.1 Application of requirements**

The requirements of clauses 5, 6 and 7 apply only when the terminal equipment is in those modes of operation in which the signal at the NTP is an analogue in level and frequency of the signal at the handset acoustic interface.

4.2 External power**4.2.1 Normal operation**

TE which utilizes an external power source to provide the handset telephony functions shall meet the requirements of this Published Document with the external power source connected and active, unless otherwise specified in this Published Document.

4.2.2 Operation in the event of mains power failure

TE shall meet one of the following requirements.

a) In the event of mains power failure, TE shall continue to meet the requirements of clauses 6 and 7 during a telephony (live speech) call, or series of calls, to the public emergency services (i.e. a service accessible by dialling 112 or 999) with a total duration of 1 h. These calls may be made at any time during the 7 h period after the external power source is made inoperative.

Conformity is determined by inspection of the supplier's declaration or by the test specified in B.13.

b) TE shall:

1) be marked in a position visible in normal use with the following wording (or wording with equivalent meaning) in upper or lower case characters no smaller than 8 point:

'This equipment is not designed for making emergency telephony calls when the power fails. Alternative arrangements should be made for access to emergency services.'

and;

2) have the packaging and the front page of the user instructions marked with the following wording (or wording with equivalent meaning) in upper and lower case characters no smaller than 12 point:

'This equipment is not designed for making emergency telephony calls when the power fails. Alternative arrangements should be made for access to emergency services.'

Conformity is determined by inspection.

4.3 Connection to PSTN

Those interfaces of the TE that carry telephony that is within the scope of this Published Document and are intended for connection to the PSTN shall be fitted with a plug that conforms to BS 6312 : Part 1 : 1994.

The allocation of the plug pins shall be as given in ETS 300 001/NET 4. Conformity is determined by inspection.

4.4 Independence of line polarity

The requirements of this Published Document shall be met independently of line polarity at those interfaces of the TE that carry telephony that is within the scope of this Published Document and are intended for connection to the PSTN.

Conformity is determined by reversal of the d.c. voltage appearing between the A and B terminals of the TE under test between individual tests, as appropriate.

5 TE on-line (non-signalling state)

NOTE. The requirements for d.c. and a.c. characteristics are modified when a mode of operation which suppresses transmission in either the sending or receiving directions is invoked. See 7.3.

5.1 D.C. characteristics

Other than as specified in 7.3, the steady state voltage measured at the terminals of the apparatus, when plotted against corresponding values of current, shall be not less than the limit given in table 1 and as shown in figure 1.

Conformity is determined by measurements taken when the TE is connected to a source capable of providing currents up to the value obtained when the TE is connected to a voltage source of 50 V d.c. in series with a 400 Ω resistor.

NOTE 1. The limit curve is determined by straight lines joining successive coordinates given in table 1.

NOTE 2. TE should not normally require a current of more than 25 mA for satisfactory operation, although higher currents may be available on some lines. Attention is drawn to the current-limiting characteristics of modern exchanges as described in C.1 of BS 6305 : 1992, and to the fact that line and feeding resistances can restrict current to about 25 mA on conventional exchanges. Operation at currents below 25 mA is therefore an appropriate design objective. It is desirable that telephones do not normally draw more than 60 mA from a 50 V, 400 Ω supply.

Table 1. Coordinates of voltage limit curve for d.c. characteristics

Current (mA)	Voltage (V)
12.5	0
12.5	2.3
20.0	6.0
100.0	10.0

5.2 A.C. characteristics

The echo return loss shall be not less than 16 dB with respect to the complex impedance used to define impedance class (a) in ETS 300 001/NET 4.

Conformity shall be checked by determination of the echo loss as specified in B.12.

6 Speech transmission process

NOTE. When a mode of operation which suppresses transmission is invoked, resulting in a reduction of the SLR by more than 30 dB, the requirements of this clause are modified by clause 7.

6.1 User-controlled receiving volume control

The requirements of clause 6 shall be met simultaneously at a single position of the volume control such that the *RLR* lies between limit A and limit B as given in table 5 and shown in figure 9.

NOTE. The supplier may identify which position is to be used for testing.

6.2 Sending sensitivity

For line lengths up to 7.5 km, the sending sensitivity, when plotted against frequency, shall be not greater than the upper limit and not less than the lower limit given in table 2 and shown in figures 2, 3 and 4.

NOTE. The limit curves are determined by straight lines joining successive coordinates given in table 2 when the sending sensitivity is plotted on a linear scale against frequency on a logarithmic scale.

Conformity is determined by the test specified in B.1.

Table 2. Coordinates of sending sensitivity limit curves

Limit curve	Frequency Hz	Sending sensitivity according to line length		
		Line length 0 km dB (relative arbitrary level)	Line length over 0 km, up to 3 km dB (relative arbitrary level)	Line length over 3 km, up to 7.5 km dB (relative arbitrary level)
Upper limit	160	−8	−8	−4.5
	1000	0	0	0
	2000	3	3	2
	3400	3	3	0
	8000	−11.5	−11.5	−14.5
Lower limit	under 300	−∞	−∞	−∞
	300	−17.5	−17.5	−17.5
	800		−7.5	−7.5
	1000	−5	−6	−6
	3000		−10.5	−16
	3400	−8	−12	−18
	over 3400	−∞	−∞	−∞

NOTE. Where the sending sensitivity is not specified, the limit curve is a straight line between the last and next values given.

Table 3. Coordinates of receiving sensitivity limit curves

Limit curve	Frequency Hz	Receiving sensitivity according to line length		
		Line length 0 km dB (relative arbitrary level)	Line length over 0 km, up to 3 km dB (relative arbitrary level)	Line length over 3 km, up to 7.5 km dB (relative arbitrary level)
Upper limit	160	−5	−5	−3
	300	0	0	2
	800	0	0	0
	1000	0	0	0
	3400	3	3	0
	7900	−11.5	−11.5	−14.5
Lower limit	under 300	−∞	−∞	−∞
	300	−14	−14	−14
	500	−5	−5	−5
	800	−5	−5	−5
	3000	−5	−8.5	−13.5
	3400	−8.5	−12	−17
	over 3400	−∞	−∞	−∞

6.3 Receiving sensitivity

For line lengths up to 7.5 km, the receiving sensitivity, when plotted against frequency, shall be not greater than the upper limit and not less than the lower limit given in table 3 and shown in figures 5, 6 and 7.

When measured with a zero line length, the receiving sensitivity at 8 kHz shall be not greater than −10 dB-Pa/V.

NOTE. The limit curves are determined by straight lines joining successive coordinates given in table 3 when receiving sensitivity is plotted on a linear scale against frequency on a logarithmic scale.

Conformity is determined by the test specified in **B.2**.

6.4 Sending and receiving loudness ratings

6.4.1 Sending loudness rating

The sending loudness rating of the LTS, for line lengths up to 7.5 km, shall lie between limit A and limit B as given in table 4 and as shown in figure 8.

NOTE. The limit curves are determined by straight lines joining successive coordinates given in table 4.

Conformity is determined by the test specified in **B.3.1**, and for telephones with carbon microphones by the additional packing test specified in **B.3.2**.

For telephones with carbon microphones, the SLR determined from the second test of **B.3.2** shall not differ by more than 6 dB from that determined from the first test of **B.3.2**.

Table 4. Coordinates of sending loudness rating limit curves for line lengths up to 7.5 km

Limit curve	Line length km	Sending loudness rating dB
Limit A	0	−1
	3	−1
	7.5	5.8
Limit B	0	7.5
	3	7.5
	7.5	13.5

NOTE. A progression from + dB to −dB indicates increasing loudness.

6.4.2 Receiving loudness rating

For line lengths up to 7.5 km, the receiving loudness rating of the TE shall lie between limit A and limit B as given in table 5 and as shown in figure 9.

Conformity is determined by the test described in **B.4**.

NOTE. The limit curves are determined by straight lines joining successive coordinates given in table 5.

Table 5. Coordinates of receiving loudness rating limit curves for line lengths up to 7.5 km

Limit curve	Line length km	Receiving loudness rating dB
Limit A	0	−8
	3	−8
	7.5	−2.8
Limit B	0	−1
	3	−1
	7.5	+ 4.3

NOTE. A progression from + dB to −dB indicates increasing loudness.

6.5 Sidetone performance

For line lengths in the range 0.5 km to 7.5 km, the *STMR* shall be not less than 7 dB, or not less than the *SLR* at the same line length plus 1.5 dB, whichever is the lesser. Conformity is determined by the test specified in **B.5**.

6.6 Distortion**6.6.1 Sending distortion**

The third-harmonic distortion generated by the LTS shall be not greater than 5 % when tested in accordance with **B.6**.

6.6.2 Receiving distortion

The third-harmonic distortion generated by the LTS shall be not greater than 6 % when tested in accordance with **B.7**.

6.6.3 Sidetone distortion

The LTS shall conform to one of the following requirements when tested in accordance with **B.8**.

- The third-harmonic distortion generated by the LTS shall be not greater than 10 %.
- The level of the third harmonic shall be not greater than −30 dB·Pa.

6.7 Clipping**6.7.1 Sending clipping**

When a signal as specified in **B.9.1.3** is applied at the mouth reference point, the third-harmonic distortion of the sending signal shall be not greater than 10 %.

Conformity is determined by the test specified in **B.9.1**.

6.7.2 Receiving clipping

When a signal as described in **B.9.2.4** is applied by a signal generator connected as shown in figure B.4, the third-harmonic distortion of the received signal shall be not greater than 10 %.

Conformity is determined by the test specified in **B.9.2**.

6.8 Noise**6.8.1 Sending noise**

The noise level developed across a 600 Ω termination of the telephone shall be not greater than −67 dB_{mp}. Conformity is determined by the test specified in **B.10.1**.

6.8.2 Receiving noise

The psophometrically weighted noise level measured with a 600 Ω resistor connected across the line terminals (the TE noise level defined in **B.10.2**) shall be not less than 3 dB lower than that measured when the resistor is replaced by a white noise generator with a 600 Ω source impedance that provides a noise level of −65 dB_{mp} to a 600 Ω load (the reference noise level defined in **B.10.2**). Conformity is determined by the test specified in **B.10.2**.

6.9 Instability

Sustained audible oscillation shall not be induced when the TE is subjected to the test of **B.11**.

7 TE with facility for suppressing transmission

NOTE 1. This clause applies to TE with a mode of operation whereby the user suppresses transmission in the sending direction, or in both the sending and receiving directions, while a PSTN connection is maintained.

NOTE 2. Suppression of transmission in the sending direction is, in effect, reduction of the sending sensitivity, but in customer literature it may be referred to as 'mute' or 'microphone off'. It may be used for privacy or in noisy environments. To allow tests to be simplified without risking harm to the PSTN, this Published Document refers to 30 dB of suppression. In reality, this would not be sufficient for a user seeking privacy and an attenuation of the order of 70 dB is more appropriate as a design target. It is not recommended that the receiver act as a microphone while sending is suppressed.

NOTE 3. Suppression of transmission in both the sending and receiving directions is effected by simultaneous reduction of the sending and receiving sensitivities. In customer literature it may be referred to as 'mute' or 'hold'. It may be used to preclude conversation, while maintaining a PSTN connection.

7.1 General

There shall be a mode of operation in which neither sending nor receiving is suppressed.

7.2 Restoration of normal transmission

Where suppression of the transmission in either the sending or receiving direction is effected by a latching operation, the TE shall either:

- a) ensure normal transmission is available when the apparatus is next placed in the on-line state; or
- b) provide a visible or audible indication, suitable for the intended use, of the continuation of the held/muted state; and release the latched condition automatically either:
 - 1) when a parallel connected terminal is placed in the on-line state; or
 - 2) within 60 s of the performance of a 'user' action which would normally establish the off-line state (e.g. replacing the handset).

Conformity shall be determined by inspection.

7.3 D.C. characteristics

When either sending or receiving is suppressed, and that suppression reduces the *SLR* and the *RLR* by more than 30 dB, determined in accordance with **B.3** or **B.4** respectively, the steady-state voltage measured at the terminals of the TE shall no longer be required to satisfy **5.1**.

7.4 Speech transmission

7.4.1 The speech transmission characteristics of the TE shall satisfy the requirements of clause **6**, except as stated in **7.4.2** and **7.4.3**.

7.4.2 When sending is suppressed, and that suppression increases the *SLR* by more than 30 dB, determined in accordance with **B.3**, the TE shall not be required to satisfy the requirements of **6.1** to **6.8**.

7.4.3 When receiving is suppressed, and that suppression increases the *RLR* by more than 30 dB, determined in accordance with **B.4**, the *SLR* shall be below the upper limit A specified in **6.4.1**, determined by the test of **B.3.1** or **B.3.2**, as appropriate.

8 Call control

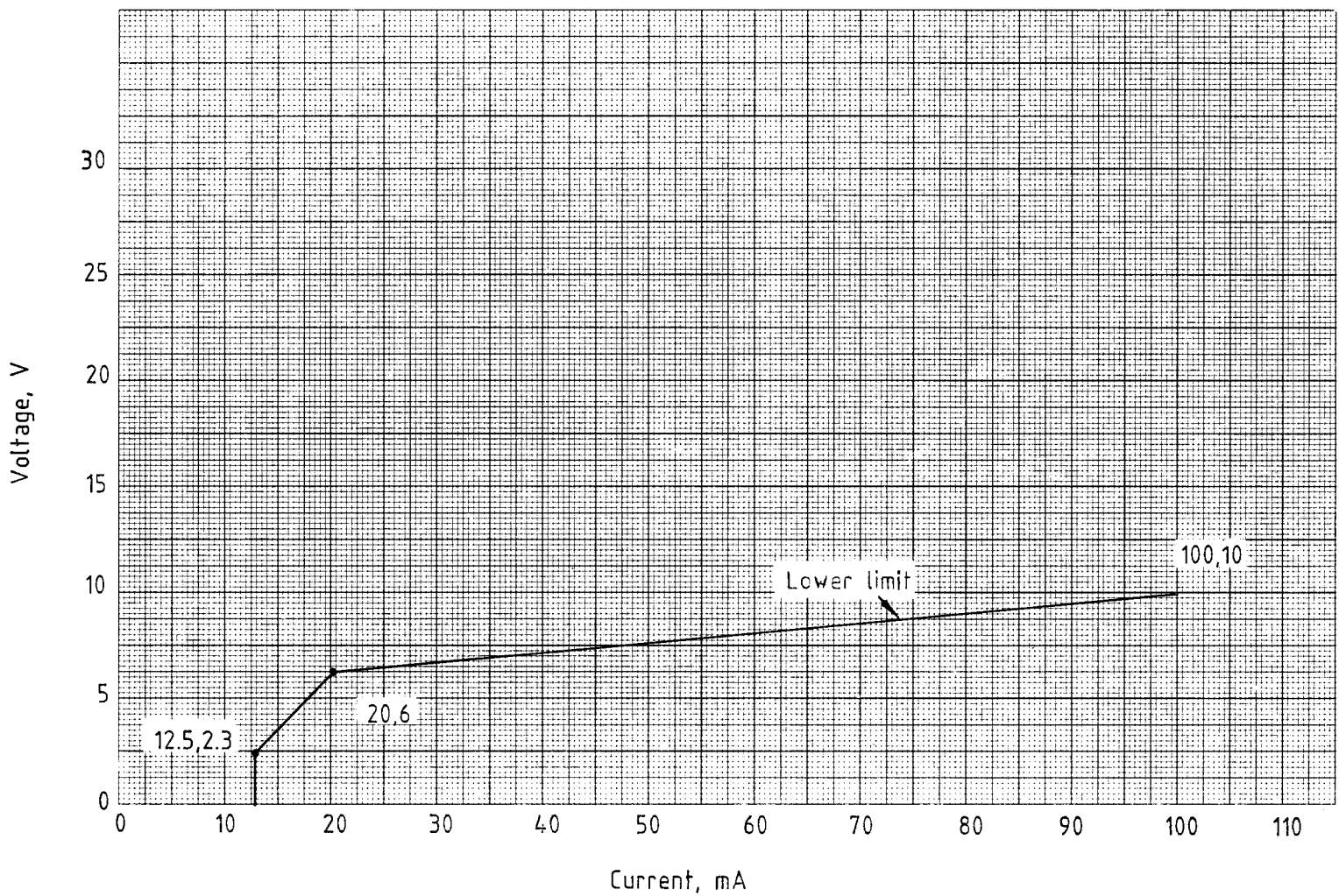
The TE shall indicate to the user the presence of the proceed indication (dial tone) for telephony calls.

Conformity is determined by inspection.

9 Conformity principles

Each requirement in this Published Document is either applicable to all terminal equipment within the scope of this document, or only applicable to certain terminal equipment, depending on the functions implemented within the terminal equipment and intended for use. As this Published Document contains only requirements deemed to be essential, a normative requirements table is not provided. The supplier shall provide information on the functions implemented in the terminal and intended for use, and this information shall be used to determine which requirements apply and the manner in which the tests are to be performed.

NOTE. This information may be provided by completing the tables in annex E.



NOTE. The upper limit is specified in ETS 300 001/NET 4.

Figure 1. D.C. characteristics lower limit

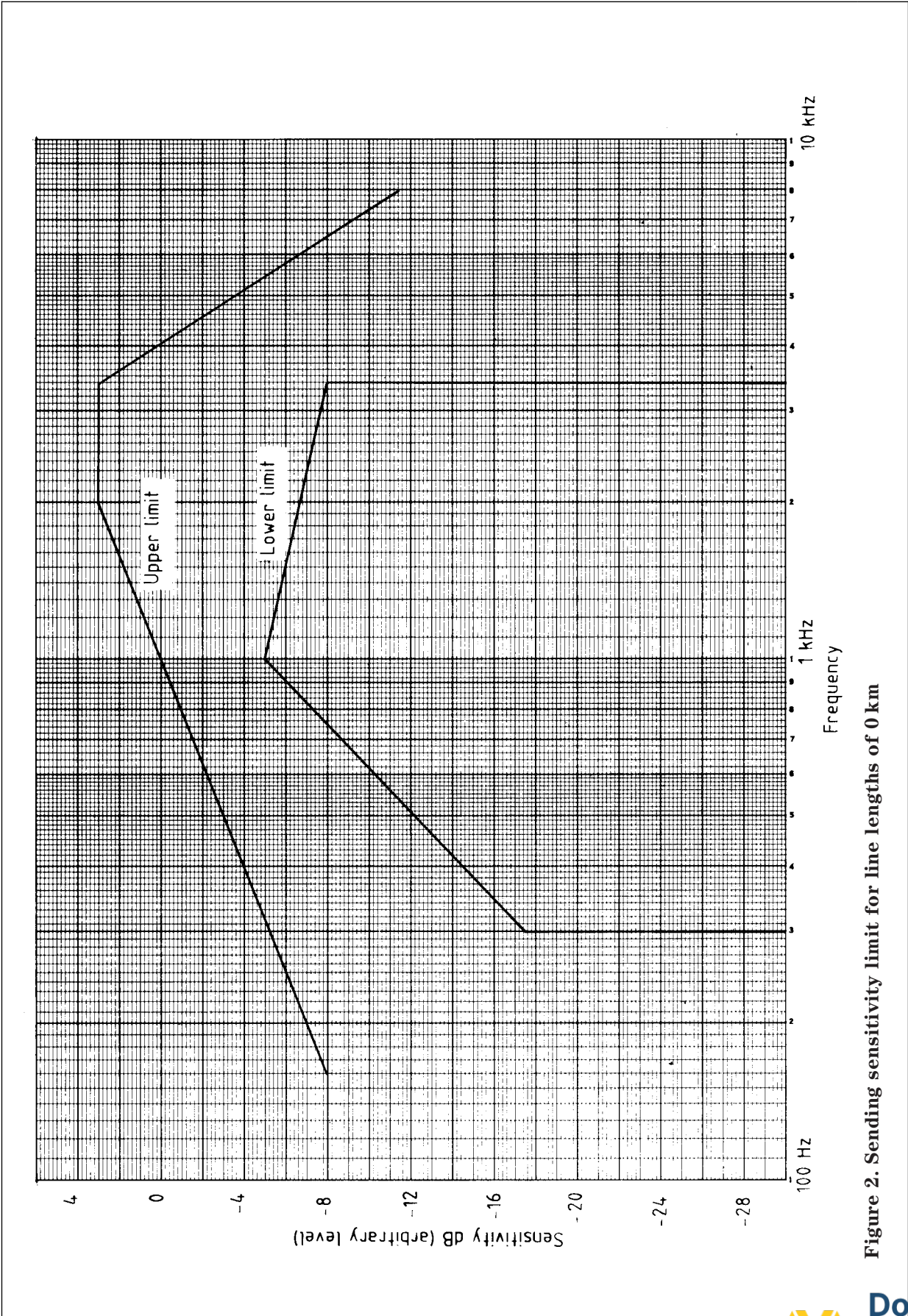


Figure 2. Sending sensitivity limit for line lengths of 0 km