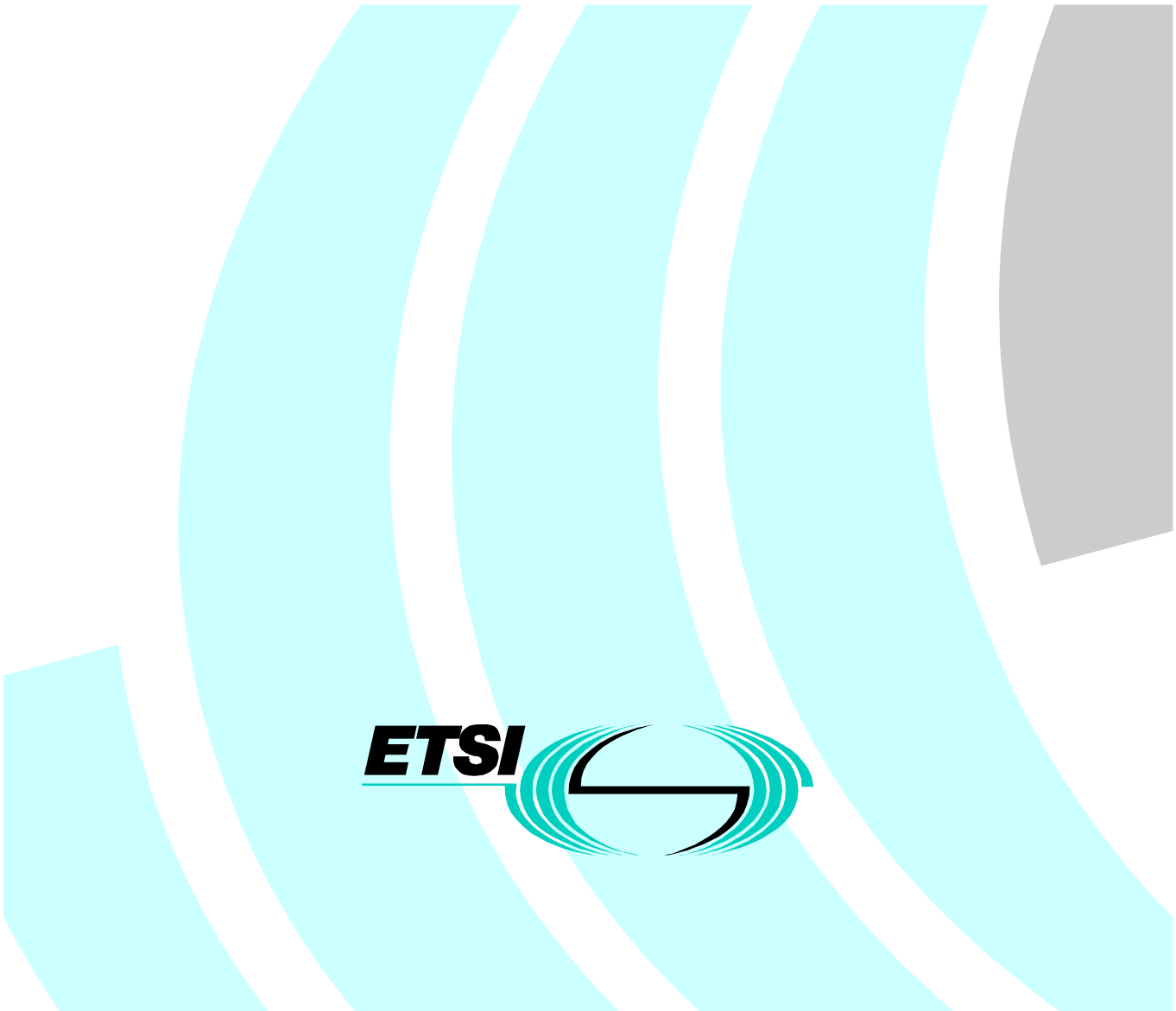
# EN 300 001 V1.5.1 (1998-10)

*European Standard (Telecommunications series)*

# Attachments to Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN; Chapter 1: General



**1.4.5.3 (D) 1** Off-hook condition

The Off-hook condition commences when the terminal equipment has reached the stationary DC resistance level and ends with the transition to the dialling state or the quiescent state.

**1.4.5.3 (E) 1**

PROVISION: In some Spanish requirements, when no specific mention to the high impedance condition is made, and the term loop condition is used just in the opposite meaning of the term quiescent condition, the term loop condition is also used simultaneously with the sense of high impedance condition (see section 1.4.5.1 (E) 2).

NOTE: Usually, the TE in loop condition is potentially capable of sending or receiving speech-band information to or from the network.

### 1.4.5.4 Dialling or signalling state or condition

Dialling or signalling state or condition of a TE is defined as a condition into which the TE, when connected to the network, is placed such that it passes to the network break pulses or MFPB signals.

**1.4.5.4 (D) 1** Dialling state

The Dialling state is the operating state from the beginning to the end of the transmission of dialling information (digits and interdigital pauses).

### 1.4.5.5 Register recall state or condition

Register recall state or condition of a TE is defined as a condition into which the TE, when connected to the network, is placed such that it passes to the network a register recall signal.

### 1.4.6 Line terminals

The term "line terminals" is used throughout the NET as an abbreviated form of "terminals or leads provided for connection to the PSTN CP".

**1.4.6 (E) 1** The term "line terminals" is also used instead of line input terminals in series TEs. They are normally called "$a_1$" and "$b_1$" ("$a_1$,i", "$b_1$,i", for multiline TEs).

**1.4.6 (E) 2** Line input terminals

Line input terminals are defined as the two terminals of the port provided for connection to the network in series TEs. They are normally called "$a_1$" and "$b_1$" ("$a_1$,i", "$b_1$,i", for multiline TEs).

**1.4.6 (E) 3** Line output terminals

Line output terminals are defined as the two terminals of the port which provides a termination point for the connection of one associated TE (see section 1.4.4.1 (E) 2) in series TEs. They are normally called "$a_2$" and "$b_2$" ("$a_2$,i", "$b_2$,i", for multiline TEs).

### 1.4.7 Speech band

The speech band is defined as the 300 - 3 400 Hz frequency band.

## 1.5 DC feeding arrangements

The DC feeding arrangements differ for each Administration but generally are of a similar nature to that given in the Idealised Feeding Bridge described in figure 1.5. The feeding resistance $R_f$ includes the resistance of the inductor $L_f$.

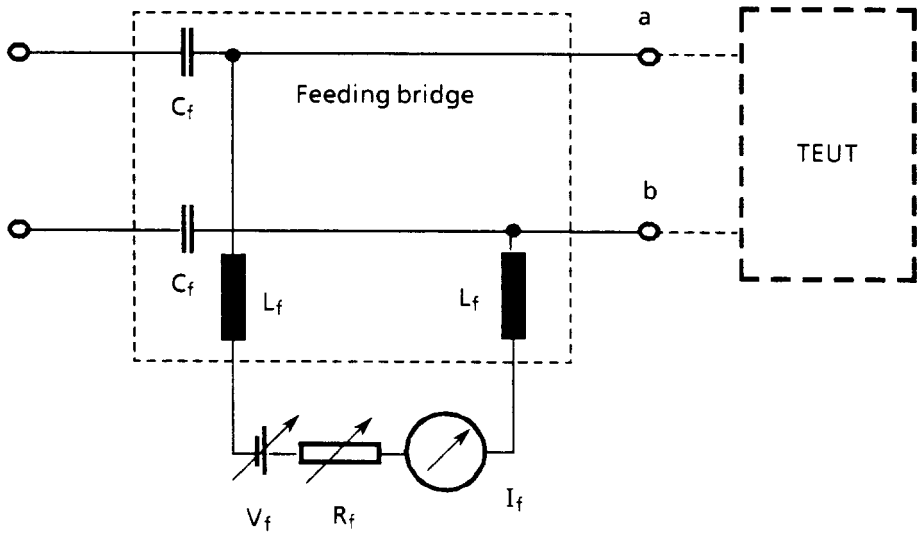



**Figure 1.5: Idealised feeding bridge circuit**

The standard values of inductors $L_f$ and capacitors $C_f$ for each Administration are included within this section (see table 1.5).

**Table 1.5: Idealised feeding bridge values**

| COUNTRY | REQUIREMENT VALUES | | Remarks |
|---|---|---|---|
| | $C_f$ (µF) | $L_f$ (H) | |
| Austria | ≥ 47 | ≥ 5 | |
| Belgium | 20 | 5 | |
| Bulgaria | 50 ± 5 % | 5 ± 5 % | |
| Cyprus | 4 | 2 | |
| Czech Republic | ≥ 4 | ≥ 2 | yes |
| Denmark | ≥ 2 | ≥ 2 | yes |
| Finland | 2 ± 2 % | ≥ 2 | |
| France | 100 ± 5 % | 5 ± 10 % | |
| Germany | ≥ 47 | ≥ 5 | |
| Greece | 20 | 5 | |
| Hungary | ≥ 10 | ≥ 5 | |
| Iceland | ≥ 2 | ≥ 2 | |
| Ireland | 470 | 10 | |
| Italy | 2 | ≥ 1 | yes |
| Luxembourg | ≥ 47 | ≥ 5 | |
| Malta | | | |
| Netherlands | 20 | 2 | |
| Norway | ≥ 10 | ≥ 5 | |
| Poland | ≥ 4 | ≥ 2 | yes |
| Portugal | ≥ 50 | ≥ 2,5 | |
| Slovakia | 4 ± 5 % | ≥ 2 | yes |
| Spain | ≥ 20 | ≥ 5 | yes |
| Sweden | ≥ 100 | ≥ 10 | |
| Switzerland | ≥ 47 | ≥ 5 | |
| U. Kingdom | ≥ 400 | ≥ 10 | |

**1.5 (CZ) 1** For the measurement of TE parameters, which can be influenced by bridge parameters in a relevant way, the higher values $C_f$ and $L_f$ ($C_f \geq 20$ µF, $L_f \geq 5$ H) are used.

**1.5 (D) 1** **Feeding bridge A**

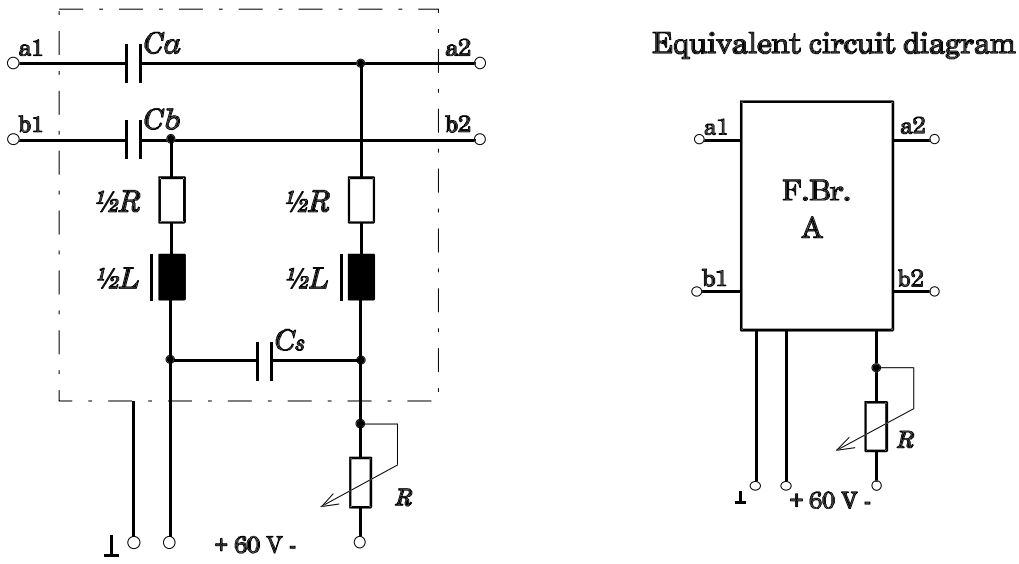



**Figure 1.5.a (D) 1**

**1.5 (E) 1** In some test procedures other feeding arrangements or other values may be used.

In all cases in which a feeding bridge is specified, the values of inductors ($L_f$) and capacitors ($C_f$) shall be met at all frequencies of measurement, and the circuit diagram of the feeding bridge used may have additional components to meet this requirement. For this reason the diagram shown in figure 1.5 is considered to be an idealised representation of the circuit at the frequency or frequencies of measurement.

In all cases in which a DC voltage source or an AC signal generator is specified, it is understood that the values of the external associated components absorb the values of the source/generator output resistance.

When a DC voltage source is connected in series with an AC signal generator, both they shall be coupled in such a manner that the magnitude of the DC voltage source impedance shall be near 0 Ω, at the frequencies of testing.

**1.5 (E) 2** Mains test power source

When the Terminal Equipment Under Test (TEUT) is intended to be connected to the mains, then

a) the voltage of the mains test power source shall be within ± 5 % of any of the declared nominal mains voltages for which the TE is prepared;

and

b) the frequency of the mains test power source shall be within ± 1 Hz of the nominal frequency of 50 Hz.

**1.5 (E) 3** Other test power sources

When the TEUT is intended to be powered from power sources other than the network and/or the mains, the voltage of the test power sources shall be within ± 5 % of the declared nominal voltages.

### 1.5.1 Requirement values for feeding conditions

The range of $\Delta V_f$, $\Delta R_f$ and $\Delta I_f$ (where applicable) which should be applied to the feeding bridge circuit in order to represent the local exchange network and subscribers line of each Administration are given in table 1.5.1.

All requirements should be fulfilled within all ranges specified in table 1.5.1, except otherwise specified.

**Table 1.5.1: Requirement values for feeding conditions**

| COUNTRY | REQUIREMENT VALUES | | | Remarks |
|---|---|---|---|---|
| | $\Delta V_f$ (V) | $\Delta R_f$ ($\Omega$) | $\Delta I_f$ (mA) | |
| Austria | | | 19 - 60 | yes |
| Belgium | 44,5 - 53 | 360 - 1 725 | | |
| Bulgaria | 40,5 - 66 | 800 - 3 000 | 17 - 60 | |
| Cyprus | 43 - 53 | 400 - 1 740 | 20 - 100 | |
| Czech Republic | 24 - 60 | 600 - 2 200 | 15 - 60 | yes |
| Denmark | 44 - 56 | 500 - 2 400 | $\leq I_{max}$ | yes |
| Finland | 44 - 58 | 800 - 1 710 | | |
| France | 46 - 54<br>89 - 104 | 300 - 1 400<br>1 400 - 2 960 | 25 - 60 | yes |
| Germany | 60 | 1 000 - 3 500 | | |
| Greece | 44 - 66 | | 20 - 80 | |
| Hungary | 48 - 10 | 440 - 2 400 | 20 - $I_{max}$ | |
| Iceland | 43 - 56 | 800 - 2 400 | 14 - 70 | |
| Ireland | 48 | 0 - 5 000 | 20 - 100 | |
| Italy | 44 - 52 | 720 - 1 880 | | |
| Luxembourg | 60 | | 14 - 60 | |
| Malta | | | | |
| Netherlands | 42 - 66 | 800 - 2 140 | | yes |
| Norway | 24 - 60 | 460 - 3 500 | | yes |
| Poland | 48 + 6/-5<br>60 ± 6 | 800 - 1 800<br>1 000 - 2 000 | 17 - 70<br>17 - 70 | yes |
| Portugal | 45 - 55 | 300 - 5 500 | not applicable | |
| Slovakia | 45 - 63 V | | 15 - 40 | yes |
| Spain | 48 | 500 - 2 200 | | yes |
| Sweden | | | | yes |
| Switzerland | 43 - 57 | 2 200 - 600 | | yes |
| U. Kingdom | 50 | ≥ 400 | 0 - 125 | |

**1.5.1 (A) 1**

$\Delta V_f$ in idle condition of the PSTN line circuit: 15 - 64 V

$\Delta I_f$ in transient condition to go from idle to loop condition of the PSTN line circuit: 1 - 60 mA.

Transient time of the PSTN line circuit to go from idle to loop condition: (loop current ≥ 19 mA): ≤ 40 ms.

$\Delta V_f$ in loop condition of the PSTN line circuit: ≤ 64 V

$\Delta I_f$ in loop condition of the PSTN line circuit: 19 - 60 mA.

In new exchanges exists a limitation for the current to a nominal value of 30 mA.

NOTE: The maximum value for $\Delta V_f$ will be possibly changed in the future from 64 V to 72 V. The value of 72 V should be taken into consideration in the idle condition, ringing state and pulse dialling function during the break pulses.

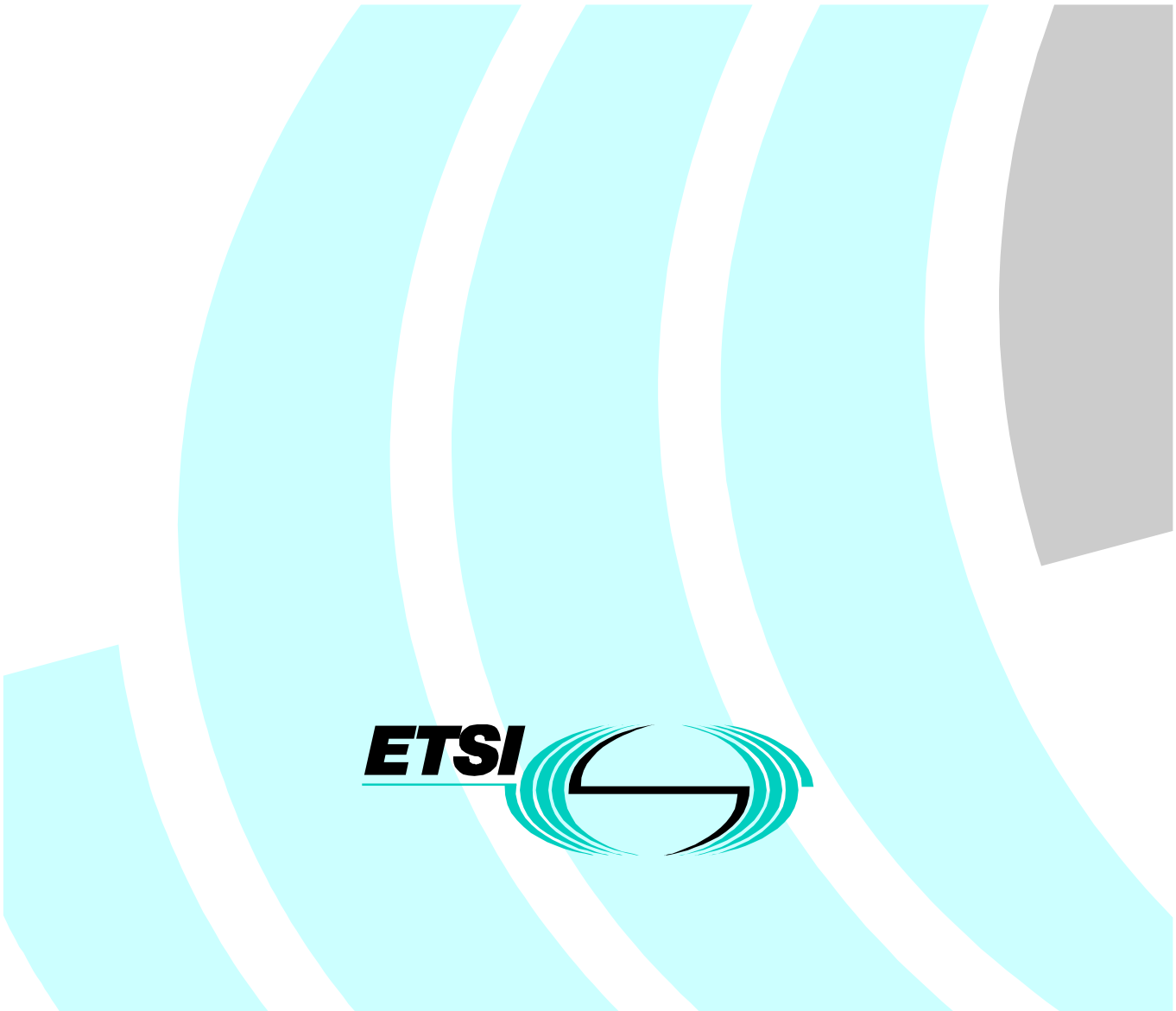
**1.5.1 (CZ) 1**

The feeding bridge resistance value of 800 Ω is associated with the nominal feeding voltage of 48 V (-10 %, +20 %). The feeding bridge resistance value of 1 000 Ω is associated with the nominal feeding voltage of 60 V (± 10 %). Digital switching systems with the SLIC circuit in the subscriber's line unit stabilize the subscriber loop current.

# EN 300 001 V1.5.1 (1998-10)

*European Standard (Telecommunications series)*

# Attachments to Public Switched Telephone Network (PSTN); General technical requirements for equipment connected to an analogue subscriber interface in the PSTN; Chapter 5: Calling function



## 5.4 Dialling with MFPB (DTMF) tone bursts

### 5.4 (D) 1 MFPB (DTMF) dialling state

The MFPB (DTMF) sender shall meet the following requirements at feeding conditions as specified in the first paragraph of Chapter 2, section 2.4.1 (D) 1. This also applies where a dial tone or special dial tone is present.

The effective DC resistance of the terminal equipment at the NTA shall be within the permissible range for "$I \geq 20$ mA", as shown in Chapter 2, section 2.1 (D) 1.

The return loss of the terminal equipment, measured against $Z_R$ (see Chapter 10, section 10.1 (D) 1.1), shall adhere to the following value during the signal send time and the minimum interdigital pause (see table 5.4 (D) 5):

**Table 5.4 (D) 1**

| | |
|---|---|
| 600 Hz $\leq f \leq$ 1 700 Hz | $\alpha \geq$ 14 dB |

The unbalance about earth at the NTA caused by the terminal equipment shall adhere to the following values during the signal send time and the minimum interdigital pause (see table 5.4 (D) 5):

**Table 5.4 (D) 2**

| | |
|---|---|
| 50 Hz $\leq f \leq$ 300 Hz | $a_u \geq$ 30 dB |
| 300 Hz $< f \leq$ 600 Hz | $a_u \geq$ 46 dB |
| 600 Hz $< f \leq$ 3 400 Hz | $a_u \geq$ 52 dB |

Each MFPB (DTMF) signalling character shall be assigned one frequency from the lower and one frequency from the higher frequency group, according to table 5.4 (D) 3.

**Table 5.4 (D) 3: Nominal frequencies for MFPB (DTMF) signalling characters**

| Lower nominal frequencies (Hz) | Upper nominal frequencies (Hz) | | |
|---|---|---|---|
| | 1 209 | 1 336 | 1 477 |
| 697 | 1 | 2 | 3 |
| 770 | 4 | 5 | 6 |
| 852 | 7 | 8 | 9 |
| 941 | | 0 | |

The MFPB (DTMF) signalling frequencies may deviate from their respective nominal frequencies by $d \leq 1{,}8$ % during the signal send time.

The envelope of the MFPB (DTMF) signalling character shall correspond to the curve illustrated in figure 5.4 (D) 1 and to the requirements specified in table 5.4 (D) 4 and table 5.4 (D) 5.

### 5.4.2 Signalling frequencies and format

For each digit or special signalling character provided on a TE, two frequencies shall be assigned, one from each of two groups of four frequencies as outlined in table 5.4.2.a.

The frequencies shall be generated simultaneously such that the resultant combination of signals appears across the line terminals.

These frequencies shall be maintained to within n% of the nominal values shown in table 5.4.2.a over the range of DC feeding conditions given in table 5.4.2.b.

Compliance shall be checked using the test outlined in section A.5.4.2.

**Table 5.4.2.a: Signalling frequency groups**

| Signalling frequencies (Hz) | |
|---|---|
| Low frequency group | High frequency group |
| 697 | 1 209 |
| 770 | 1 336 |
| 852 | 1 477 |
| 941 | 1 633 |

**Table 5.4.2.b: MFPB frequency groups and format, feeding conditions**

| COUNTRY | REQUIREMENT VALUES | | | | Remarks |
|---|---|---|---|---|---|
| | $V_f$ (V) | $R_f$ (Ω) | $I_f$ (mA) | n (%) | |
| Austria | 60 | | 19 - 60 | ± 1,5 | |
| Belgium | 48 | | 20 - $I_{max}$ | 1,5 | |
| Bulgaria | 60 | 1 000 - 3 000 | | ± 1,5 | |
| Cyprus | 48 | 440 - 1 740 | 20 - 100 | 1,5 | |
| Czech Republic | 60 | variable | 15 - $I_{max}$ | ± 1,5 | |
| Denmark | | | 16 - $I_{max}$ | 1,5 | |
| Finland | 44 - 58 | 800 - 1 710 | | ± 1,5 | |
| France | 46 - 54<br>89 - 104 | 300 - 1 400<br>1 400 - 2 960 | | 1,5 | |
| Germany | | | | | yes |
| Greece | 44 - 66 | | 20 - 80 | ± 1,6 | |
| Hungary | 48 | | 20 - $I_{max}$ | ± 1,5 | |
| Iceland | 48 | | 14 - $I_{max}$ | ± 1,5 | |
| Ireland | 48 | | 20 - 100 | ± 1,5 | |
| Italy | 44 - 52 | 720 - 1 880 | | ± 1,5 | |
| Luxembourg | 60 | | 19 - 60 | ± 1,5 | |
| Malta | | | | | |
| Netherlands | 42 - 66 | 800 - 2 140 | | 1,5 | |
| Norway | 60 | adjustable | 15 - $I_{max}$ | 1,5 | yes |
| Poland | 43 - 54<br>54 - 66 | 800 - 2 600<br>1 000 - 2 500 | 17 - 70 | ± 1,5 | |
| Portugal | 45 - 55 | 400 - 1 800 | not applicable | 1,5 | |
| Slovakia | 48, 60 | | 15, 40 | ± 1,8 | |
| Spain | 48 | 500 - 2 200 | | 1,5 | yes |
| Sweden | | | | 1,5 | yes |
| Switzerland | 43 - 57 | 2 200 - 600 | | ± 1,5 | |
| U. Kingdom | 50 | ≥ 400 | 25 - 100 | 1,5 | |

The digital storage oscilloscope is used to record the current at the 10 Ω resistor and the voltage in the communication state via CH1 and CH2 respectively. If the DC resistance during the emission of the signalling character does not remain constant, the max. value is determined by optical averaging of the transient timing illustrated on the oscilloscope. The resistance is calculated.

The polarity of the TEUT is reversed by means of a pole inverter and the measurement repeated.

### A.5.4.2 Signalling frequencies and format

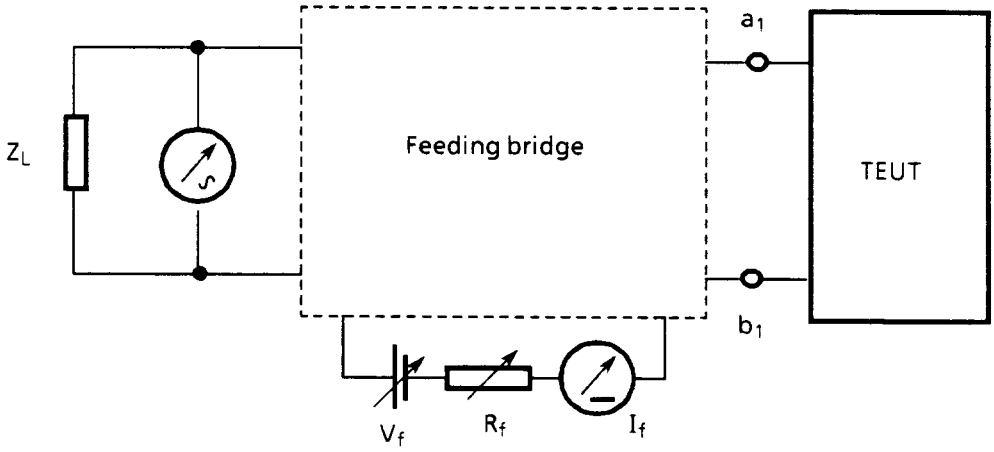
The TEUT is connected as shown in figure A.5.4.2 and placed in the signalling state. The MFPB sender is caused to output, in turn, all provided combinations of the signalling frequencies.

The frequency of each output signal is evaluated using an instrument capable of measuring each signal frequency with an accuracy better than ± 0,2 %.

This accuracy requirement shall be met for continuous signals as well as for bursts of signal of 50 ms duration separated by 40 ms intervals of no signal output.

Measurements are carried out at the various DC feeding condition values shown in table A.5.4.2.

The load impedance value $Z_L$ is shown in Table A.5.4.2.




**Feeding bridge as specified in Chapter 1**
**Figure A.5.4.2: Signalling frequencies and format**

**Table A.5.4.2: Signalling frequencies and format**

| COUNTRY | TEST VALUES | | | | Remarks |
|---|---|---|---|---|---|
| | $Z_L$ (Ω) | $V_f$ (V) | $R_f$ (Ω) | $I_f$ (mA) | |
| Austria | 600 | 60 | | 19, 60 | |
| Belgium | 600 | 48 | 400, 1 600 | | yes |
| Bulgaria | 220 +820/115 nF or 600 | 60 | 1 000, 3 000 | | |
| Cyprus | 600 | 48 | 800 | | |
| Czech Republic | 600 | 60 | variable | 15, $I_{max}$ | |
| Denmark | 600 | | | 16, $I_{max}$ | |
| Finland | 600 | 48 | 800, 1 710 | | |
| France | 600 | 46, 54 | 1 400 resp. 300 | | |
| Germany | | | | | yes |
| Greece | 600 | 60 | | 20, 35 | |
| Hungary | 600 | 48 | | 20, $I_{max}$ | |
| Iceland | 600 | 48 | | 14, $I_{max}$ | |
| Ireland | 270 + (750//150 nF) | 50 | 2 300, 360 | | |
| Italy | 600 | 44, 52 | 1 880, 720 | | |
| Luxembourg | 600 | 60 | | 19, 60 | |
| Malta | | | | | |
| Netherlands | 600 | 42, 48, 66 | 2 140, 1 130, 800 | | |
| Norway | 600 | 60 | adjustable | 15 - $I_{max}$ | |
| Poland | 600 | 48, 60 | 800, 1 200, 2 000 | | |
| Portugal | 600 | | | not applicable | yes |
| Slovakia | 600 | 48, 60 | | 15, 40 | |
| Spain | 600 | 48 | 500, 2 200 | | yes |
| Sweden | 600 | | | | yes |
| Switzerland | 600 | 50 | 2 300, 500 | | |
| U. Kingdom | 600 | 50 | 400 | 40 | yes |

**A.5.4.2 (B) 1** For digital PBX the value of $Z_L$ is equal to $Z_C$ as defined in Chapter 4, section 4.1.2 (B) 1.

**A.5.4.2 (P) 1**

| $V_f$ (V) | $R_f$ (Ω) |
|---|---|
| 45 | 1 800 |
| 55 | 400 |

**A.5.4.2 (E) 1** The input impedance of the instrument (or DTMF analyser) shall be greater than 50 kΩ.

When the frequency tolerance is tested, it is assumed that the TEUT would fulfil the associated requirement if the test procedure were repeated when the load resistor ($Z_L$) takes also the values of 400 ohms and 900 ohms.

**A.5.4.2 (S) 1** Feeding conditions, see Chapter 1, table 1.5.2.

**A.5.4.2 (GB) 1** Measurements are carried out with $I_f$ = 40 mA, or the current obtained when the TEUT is connected to a 50 V DC source in series with a 400 ohm resistor, whichever is the less.

### 5.4.3 Signalling codes

The sixteen combinations assigned to digits or special signalling characters are shown in the matrix in Table 5.4.3.a.

**Table 5.4.3.a: Signalling combinations**

| Low group (Hz) | High group (Hz) | | | |
|---|---|---|---|---|
| | 1 209 | 1 336 | 1 477 | 1 633 |
| 697 | 1 | 2 | 3 | A |
| 770 | 4 | 5 | 6 | B |
| 852 | 7 | 8 | 9 | C |
| 941 | * | 0 | # | D |

The TE may use only 10 signalling frequency combinations, in which case the frequencies assigned to characters *, #, A, B, C, and D are not used.

Alternatively, the TE may use 12 signalling frequency combinations, in which case the frequencies assigned to characters A, B, C, and D are not used.

Compliance shall be checked using the test outlined in section A.5.4.3.

**Table 5.4.3.b: Signalling codes**

| COUNTRY | REQUIREMENT VALUES | Remarks |
|---|---|---|
| Austria | | |
| Belgium | | |
| Bulgaria | | |
| Cyprus | | yes |
| Czech Republic | | yes |
| Denmark | only A, B, C, D not mandatory | |
| Finland | | |
| France | | yes |
| Germany | | yes |
| Greece | | |
| Hungary | | yes |
| Iceland | | |
| Ireland | | |
| Italy | | |
| Luxembourg | | |
| Malta | | |
| Netherlands | | |
| Norway | | |
| Poland | A, B, C, D - optional | yes |
| Portugal | | |
| Slovakia | only A, B, C, D not mandatory | |
| Spain | | yes |
| Sweden | | |
| Switzerland | | |
| U. Kingdom | not specified | |

**5.4.3 (CY) 1** Signalling combinations used are as in table 5.4.3.a with A, B, C, D not mandatory.

### 5.4.4 Sending levels

The sending levels across a load impedance $Z_L$ for frequencies in each group shall differ and be defined by the values according to the option described in table 5.4.4.a. In either case, the value of the level of the higher frequency component of the compound signal shall be 2 dB ± 1 dB greater than the value of the level of the lower frequency component.

The requirement shall be met in the presence of dial tone signals of level "b" and frequency "f".

Measurements are carried out at the various DC feeding condition values shown in table 5.4.2.b.

The TE should be submitted for test with a declaration of which option has been selected for evaluation.

The parameter values $Z_L$, "b", and "f" are shown in table 5.4.4.b.

Compliance shall be checked using the tests outlined in section A.5.4.4.

**Table 5.4.4.a: Sending levels options**

| | Sending level options | |
|---|---|---|
| | Option 1 | Option 2 |
| High group | -9 dBm ± 2 dB | -6 dBm ± 2 dB |
| Low group | -11 dBm ± 2 dB | -8 dBm ± 2 dB |

**Table 5.4.4.b: Sending levels**

| COUNTRY | REQUIREMENT VALUES | | | | | Remarks |
|---|---|---|---|---|---|---|
| | b (dBm) | $Z_L$ (Ω) | f (Hz) | Option 1 | Option 2 | |
| Austria | -16 | 600 | 380 - 490 | no | yes | |
| Belgium | -4 | 600 | 420 - 455 | no | yes | yes |
| Bulgaria | | 600 | | no | yes | |
| Cyprus | -7 | 600 | 350 + 450 | no | yes | |
| Czech Republic | | 600 | | no | yes | |
| Denmark | 0 | 600 | 425 | yes | no | yes |
| Finland | not mandatory | 600 | not mandatory | yes | yes | |
| France | -20 | 600 | 440 | no | yes | yes |
| Germany | | | | | | yes |
| Greece | 0 | 600 | 400 - 475 | no | yes | |
| Hungary | not mandatory | 600 | not mandatory | see remark | | yes |
| Iceland | 0 | 600 | 425 | yes | yes | |
| Ireland | not applicable | 270 + (750//150 nF) | not applicable | no | no | yes |
| Italy | -6 | 600 | 425 | no | yes | |
| Luxembourg | -6,5 | 600 | 380 - 490 | no | yes | |
| Malta | | | | | | |
| Netherlands | not mandatory | 600 | not mandatory | yes | no | |
| Norway | -6 | 600 | 425 | yes | no | |
| Poland | -5 | 600 | 425 | no | yes | |
| Portugal | -5 | 600 | 425 | yes | no | |
| Slovakia | not mandatory | 600 | 400 - 450 | - | yes | yes |
| Spain | | 600 | | no | yes | yes |
| Sweden | -5 | 600 | 425 | yes | no | |
| Switzerland | 0, -23 | 600 | 375 - 475 | no | yes | yes |
| U. Kingdom | not applicable | see remark | not applicable | see remark | | yes |

### 5.4.5 Unwanted frequency components

The TE shall be placed in the signalling state and caused to emit the frequencies corresponding to any given signalling character combination (see section 5.4.3). During the period in which the selected combination of frequencies causes a corresponding signal to appear across the load impedance $Z_L$:

a) the total power level of all unwanted frequency components over the bandwidth 300 - 3 400 Hz shall be at least 20 dB below the level of the low-group frequency component of the signal;

b) the level of any individual unwanted frequency component found in a bandwidth of 125 Hz shall not exceed the following limits:

- in the frequency band 300 - 4 300 Hz: -33 dBm;
- in the frequency band 4 300 - 28 000 Hz: -37 dBm; at 4 300 Hz falling 12 dB/octave to 28 kHz;
- in the frequency band 28 - 150 kHz: -70 dBm.

The requirement shall be met at the DC feeding conditions specified in table 5.4.2.b.

The value of the load impedance $Z_L$ and the use of the requirements "a" and "b" are shown in table 5.4.5.

Compliance shall be checked using the test outlined in section A.5.4.5.

**Table 5.4.5: Unwanted frequency components**

| COUNTRY | REQUIREMENT VALUES | | | Remarks |
|---|---|---|---|---|
| | Requirement a | Requirement b | $Z_L$ (Ω) | |
| Austria | X | X | 600 | yes |
| Belgium | X | X | 600 | yes |
| Bulgaria | X | X | 600 | |
| Cyprus | X | | 600 | yes |
| Czech Republic | | X | 600 | yes |
| Denmark | X | | 600 | yes |
| Finland | | | 600 | yes |
| France | X | | 600 | yes |
| Germany | | | | yes |
| Greece | X | X | 600 | |
| Hungary | X | X | 600 | yes |
| Iceland | X | X | 600 | |
| Ireland | X | | 270 + (750//150 nF) | yes |
| Italy | X | X | 600 | |
| Luxembourg | | X | 600 | |
| Malta | | | | |
| Netherlands | X | X | 600 | yes |
| Norway | X | | 600 | |
| Poland | X | | 600 | |
| Portugal | | X | 600 | yes |
| Spain | | | | yes |
| Sweden | X | | 600 | yes |
| Switzerland | X | b) Replaced by section 4.4.3.1 (120 Ω) | 600 | |
| U. Kingdom | X | X | 600 | yes |

For the purpose of this requirement, the dial tone is defined as a single tone signal, delivered from a generator with a source impedance of 600 Ω with a frequency of 425 Hz and with a level of -10 dBm when measured across a resistor of 600 Ω which substitutes the TE.

The measurements are executed with the source impedance of 600 Ω interchanged with impedances $Z_L$.

$Z_L$ is a complex impedance made up of a resistor $R_1$ in series with a parallel combination of a resistor $R_2$ and a capacitor $C_1$.

The values of resisitors and capacitors to be used in $Z_L$ are:

- $Z_{La:}$ $R_1$ = 82 Ω, $R_2$ = 600 Ω, $C_1$ = 68 nF (short line representation);
- $Z_{Lb:}$ $R_1$ = 270 Ω, $R_2$ = 750 Ω, $C_1$ = 150 nF (medium line representation);
- $Z_{Lc:}$ $R_1$ = 220 Ω, $R_2$ = 1 800 Ω, $C_1$ = 150 nF (long line representation).

**5.4.5 (S) 1** When a multifrequency tone signal is sent, the level of any individual unwanted frequency component shall not exceed the following limits:

- within 300 Hz - 4 300 Hz: -33 dBm;
- within 4 300 Hz - 12 000 Hz: -37 dBm at 4 300 Hz and then dropping at 12 dB per octave to 12 000 Hz;
- 12 kHz - 150 kHz: -55 dBm.

When no signal is sent, the level of any signal frequency emitted from the sender to the line shall not exceed -60 dBm in the 300 Hz - 3 400 Hz frequency band nor exceed the values shown on the curve in Chapter 4, figure 4.4.3.1 (S) 1 in the 3,4 kHz - 150 kHz frequency band.

**5.4.5 (GB) 1** When no DTMF signal is being sent to the network, the total power of all signals presented to the network shall be not greater than -60 dBm.

In addition during signalling, for any single unwanted frequency component in the frequency range 300 Hz to 3 400 Hz the power level shall be not greater than -33 dBm, and above 3 400 Hz the power level shall be not greater than the limit values shown in Chapter 4, section 4.4.3.1 (GB) 1. Compliance shall be checked by the test of A.5.4.5 (GB) 1.

### A.5.4.5 Unwanted frequency components

The TEUT is connected as shown in figure A.5.4.5 and placed in the signalling state. The MFBP sender is caused to output, in turn, all provided combinations of the signalling frequencies.

The frequency and level of each unwanted output signal are evaluated.

Measurements are carried out at the various DC feeding condition values shown in table A.5.4.2.