International Standard 4903

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Data communication — 15-pin DTE/DCE interface connector and pin assignments

Téléinformatique — Affectation des broches et description du connecteur 15 broches à la jonction entre ETTD et ETCD

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Foreword

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It has been approved by the member bodies of the following countries :

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USSR

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Data communication — 15-pin DTE/DCE interface connector and pin assignments

1 Scope and field of application

This International Standard specifies the 15-pin connector and the assignment of connector pin numbers at the interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) where CCITT[1] Recommendations X.24, X.26, and X.27 are applicable.

2 References

ISO 2110, *Data communication — 25-pin DTE/DCE interface connector and pin assignments.*

ISO 4902, *Data communication — 37-pin and 9-pin DTE/DCE interface connectors and pin assignments.*

CCITT Recommendation V.28, *Electrical characteristics for unbalanced double-current interchange circuits.*

CCITT Recommendation X.20, *Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for start-stop transmission services on public data networks (PDN).*

CCITT Recommendation X.21, *General purpose interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for synchronous operation on public data networks (PDN).*

CCITT Recommendation X.22, *Multiplex DTE/DCE interface for user classes 3-6.*

CCITT Recommendation X.24, *List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) on public data networks (PDN).*

CCITT Recommendation X.26 (or V.10), *Electrical characteristics for unbalanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications.*

CCITT Recommendation X.27 (or V.11), *Electrical characteristics for balanced double-current interchange circuits for general use with integrated circuit equipment in the field of data communications.*

3 Connector

Figures 1 to 7 illustrate the 15-pin interface connector. Only those dimensions that are essential to mating are shown. Figure 1 illustrates the DTE interface connector which has 15 male contacts and a female shell. Figure 2 illustrates the DCE interface connector which has 15 female contacts and a male shell. Contact numbering is specified in figures 1 and 2. The DCE interface connector shall be equipped with the two latching blocks as specified in figure 2. The DTE interface connector shall be equipped with means for latching to these blocks. The means for latching the DTE connector to the blocks on the DCE connector is subject to national regulations. The means for latching, however, is to be accomplished within the shaded space shown in figure 3. The means for latching shall be such that the connectors can be latched and disconnected within the access space available for both of the arrangements illustrated in figure 4. This will permit DCE interface connectors to be mounted with the clearances shown for either of the two arrangements of figure 4. Figure 5 illustrates the dimensions for the pin layout. Figures 6 and 7 illustrate the dimensions for the pin and mating socket respectively.

The specification for the connector in this International Standard is provided for mechanical compatibility only. It is also intended to be mechanically compatible with the detailed connector specification currently being developed by the IEC.

4 Assignment of pin numbers

The pin assignments for the interchange circuits specified in CCITT Recommendations X.20, X.21 and X.22 are given in table 1 for implementations using X.26 and X.27 electrical characteristics. Additionally, pin 1 is reserved for connection of the shield of shielded interconnecting cable. The list of interchange circuits is given in table 2. Their provision and use must be in conformity with corresponding CCITT DCE Recommendations.

1) International Telegraph and Telephone Consultative Committee.

5 Interconnecting configurations for mixed use of X.26, X.27 and V.28 electrical characteristics

Considerations for interworking of equipment implementing X.26 on one side of the interface with equipment implementing X.27 on the other side of the interface are given in annex 2 of CCITT Recommendations X.26 and X.27. Guidance concerning specific interconnecting configurations applicable to the X.20 and X.21 interfaces is provided in annex A.

Guidance concerning adaptation necessary when there is a need for X.20 DCE implementing X.26 characteristics to interwork with X.20 DTE implementing V.28 characteristics is given in annex B. Any adapters required to accomplish the interworking with V.28 equipment shall be provided with the equipment meeting the requirements of this International Standard, i.e., the X.20/X.26 DCE. No revisions or modifications shall be required in the equipment using V.28 electrical characteristics.

NOTE — Annexes A and B are not an integral part of this International Standard.

Table 1 — Pin assignments for interface CCITT Recommendations X.20, X.21, and X.22

Pin number[6]	Interchange circuit assignment				
	X.20[2]		X.21[3]		X.22
	X.26	X.27[5]	X.26[4] [5]	X.27[5]	X.27[5]
1	See note 1	See note 1	See note 1	See note 1	See note 1
2	T	T(A)	T	T(A)	T(A)
3	—	—	C	C(A)	C(A)
4	R	R(A)	R(A)	R(A)	R(A)
5	—	—	I(A)	I(A)	I(A)
6	—	—	S(A)	S(A)	S(A)
7	—	—	B(A)	B(A)	F(A)
8	G	G	G	G	G
9	Ga	T(B)	Ga	T(B)	T(B)
10	—	—	Ga	C(B)	C(B)
11	Gb	R(B)	R(B)	R(B)	R(B)
12	—	—	I(B)	I(B)	I(B)
13	—	—	S(B)	S(B)	S(B)
14	—	—	B(B)	B(B)	F(B)
15	Reserved for future international use				

NOTES

1 Pin 1 is assigned for connecting the shields between tandem sections of shielded interface cable. The shield may be connected either to protective ground or to signal ground at either the DTE or DCE or both in accordance with national regulations.

Signal ground may be further connected to protective ground in accordance with national safety regulations. Caution should be exercised to prevent establishment of ground loops carrying high currents.

2 DTEs may employ either X.26 or X.27 electrical characteristics to operate with DCEs using X.26 electrical characteristics in accordance with X.20.

3 DTEs may employ either X.26 or X.27 electrical characteristics to operate with DCEs using X.27 electrical characteristics in accordance with X.21 for data signalling rates of 9,6 kbit/s and below. Only X.27 applies above 9,6 kbit/s.

4 The pin assignments and circuit designations have been chosen considering interworking between X.26 DTE and X.27 DCE using the considerations given in annex 2 of Recommendations X.26 and X.27.

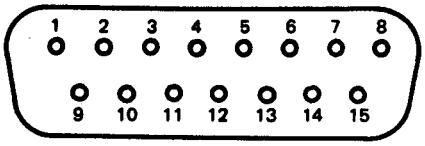
5 Where balanced circuits are concerned, the associated pairs are designated "A" and "B" in X.27.

6 The pin assignments have been aligned to specify pairing and connection to multipaired interconnecting cable. Respective paired pins are 2 and 9, 3 and 10, ..., 8 and 15.

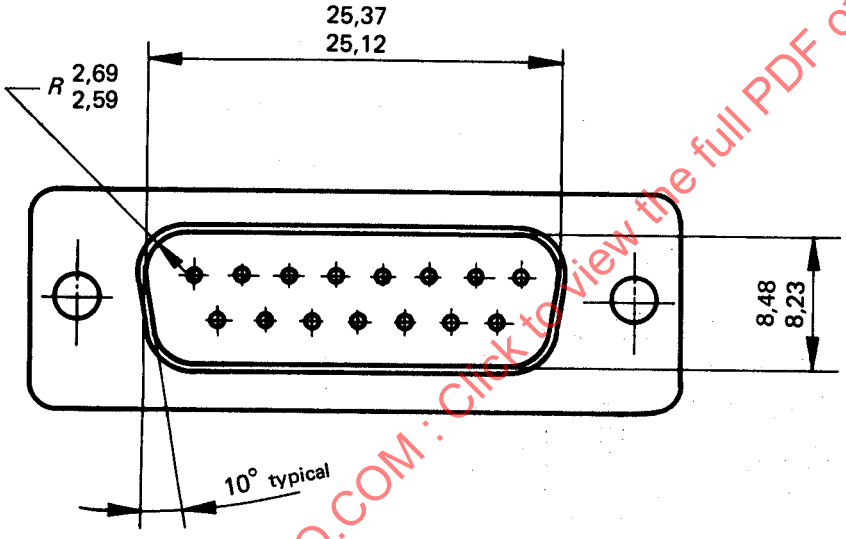
Table 2 — List of interchange circuits

Circuit designation	Description
G	Signal ground or common return
Ga	DTE common return
Gb	DCE common return
T	Transmit
R	Receive
C	Control
I	Indication
S	Signal element timing
B	Byte timing
F	Frame start identification

Dimensions in millimetres



DTE connector face
contact numbering



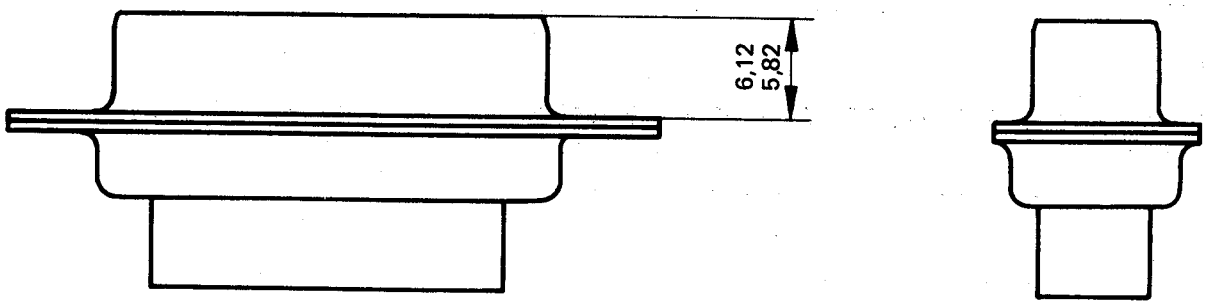
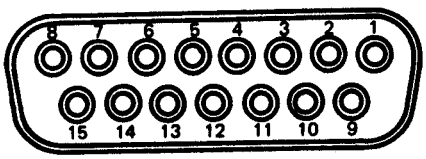
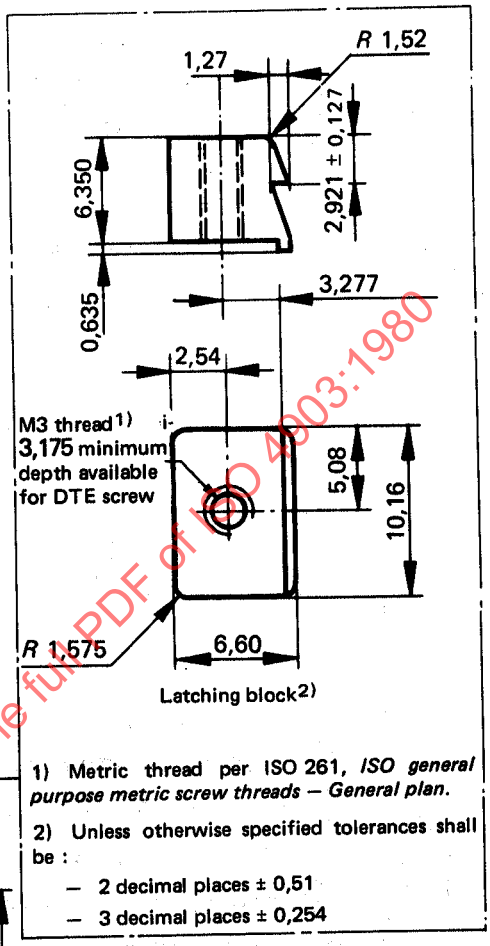


Figure 1 — DTE interface connector

Dimensions in millimetres



DCE connector face
contact numbering

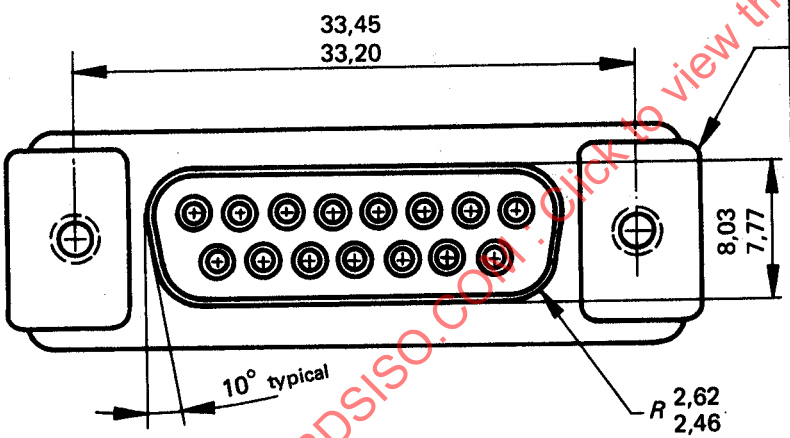


1) Metric thread per ISO 261, *ISO general purpose metric screw threads — General plan.*

2) Unless otherwise specified tolerances shall be :

— 2 decimal places ± 0,51

— 3 decimal places ± 0,254



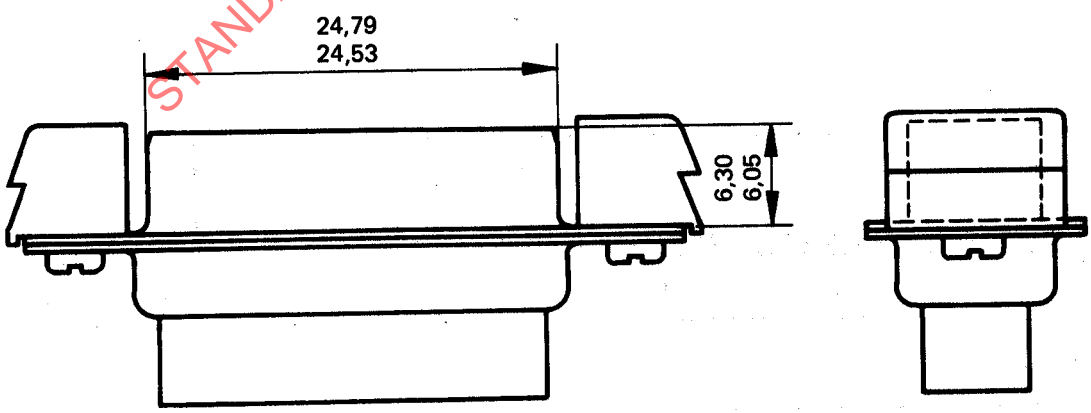


Figure 2 — DCE interface connector

Dimensions in millimetres

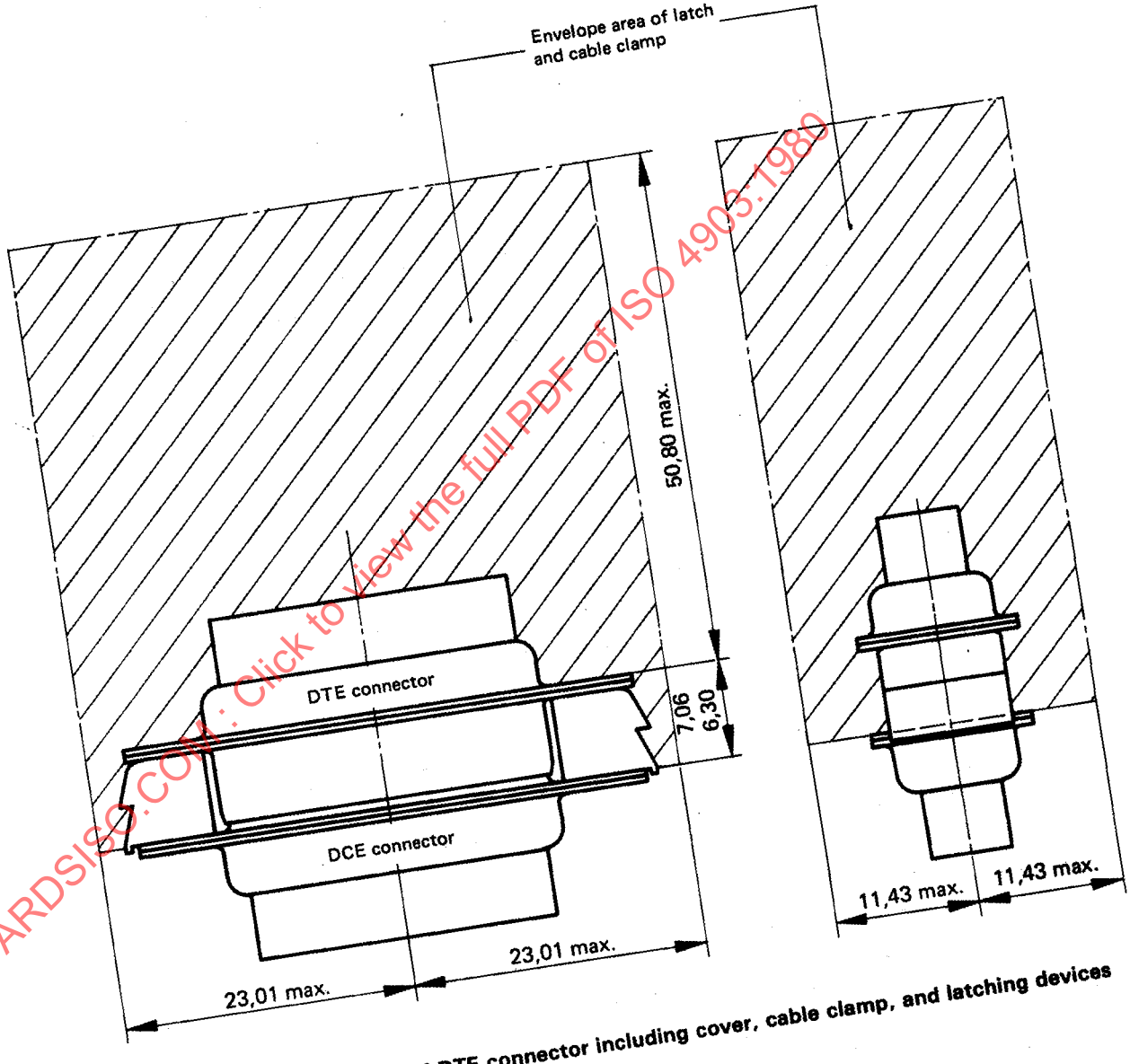


Figure 3 — Maximum size of DTE connector including cover, cable clamp, and latching devices

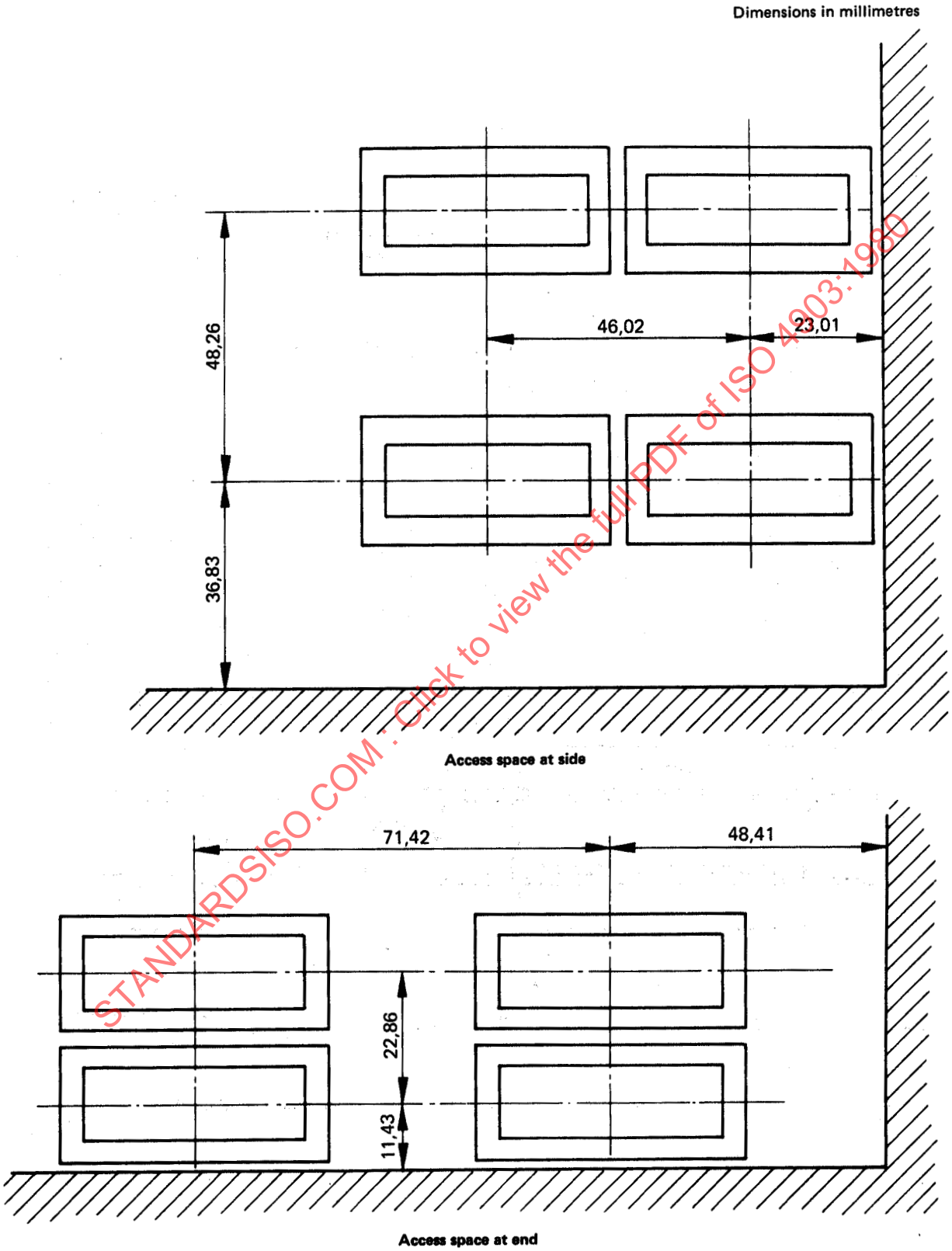


Figure 4 — Minimum spacing for DCE connector mounting

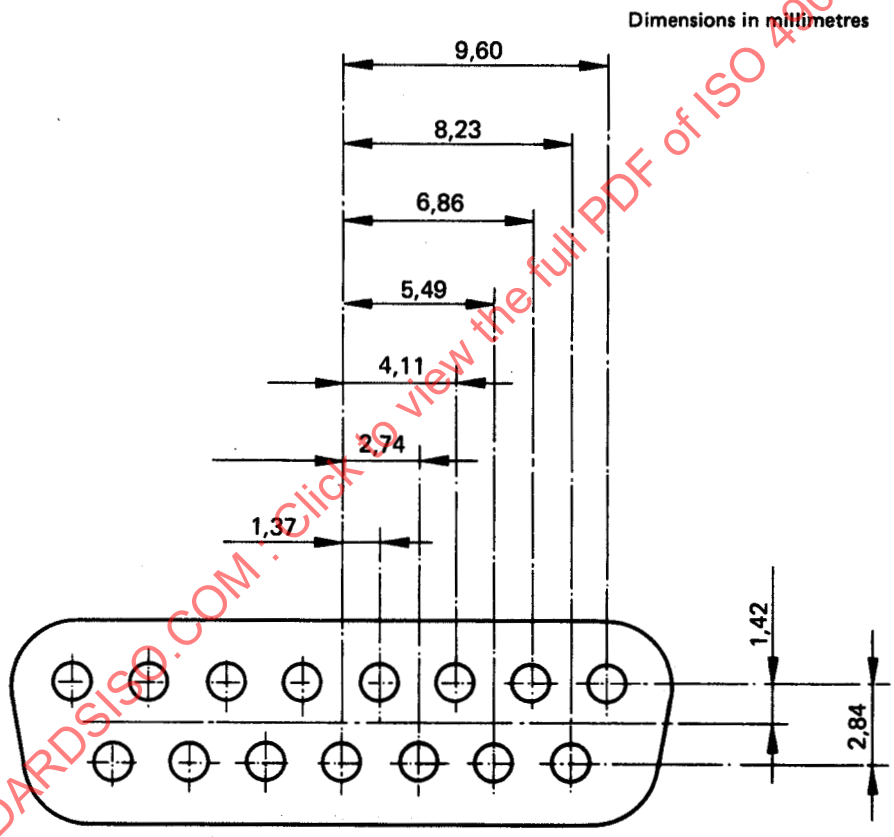


Figure 5 — Insert arrangement

Dimensions in millimetres

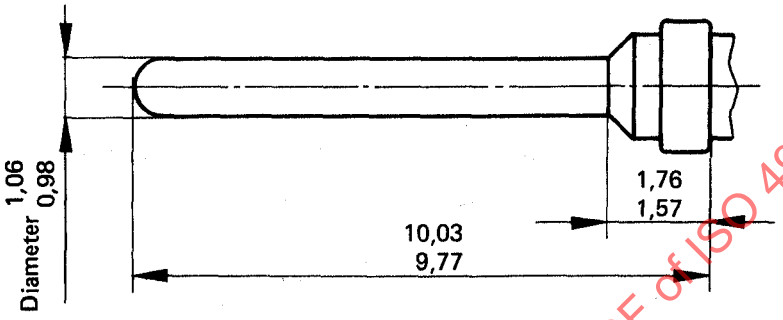
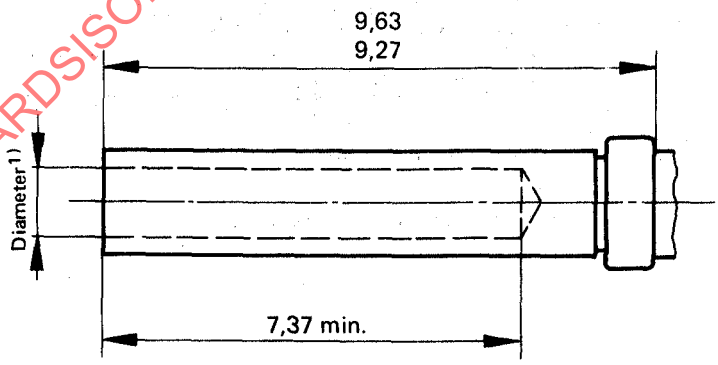


Figure 6 — Male contact

Dimensions in millimetres



1) When the pin is mated with the socket, sufficient force shall be applied by the socket to ensure proper electrical contact.

Figure 7 — Female contact

Annex A

Generator/Receiver interconnecting configurations

(This annex provides additional information and does not form an integral part of the International Standard.)

A.1 CCITT Recommendation X.20

CCITT Recommendation X.20 states that the electrical characteristics of CCITT Recommendation X.26 apply to the DCE side of the interface while electrical characteristics of either CCITT Recommendations X.26, X.27 (without optional cable termination in the load), or V.28 may apply to the DTE side of the interface. Figures 8 and 9 provide diagrams of the associated interconnecting configurations for X.26 and X.27 DTE. For interconnection of X.20/X.26 DCE with DTE using V.28 electrical characteristics and the 25-pin connector according to ISO 2110, refer to annex B of this International Standard.

A.2 CCITT Recommendation X.21

CCITT Recommendation X.21 states that the electrical characteristics of CCITT Recommendation X.27 (without optional cable termination in the load) apply to the DCE while electrical characteristics of either X.26 or X.27 (without optional cable termination in the load) may apply to the DTE for synchronous classes of operation at 9,6 kbit/s and below. For synchronous classes of operation above 9,6 kbit/s, the electrical characteristics of X.27 with optional cable termination in the load apply to both the DTE and DCE. Figures 10 and 11 provide diagrams of the associated interconnecting configurations for X.26 and X.27 DTE.

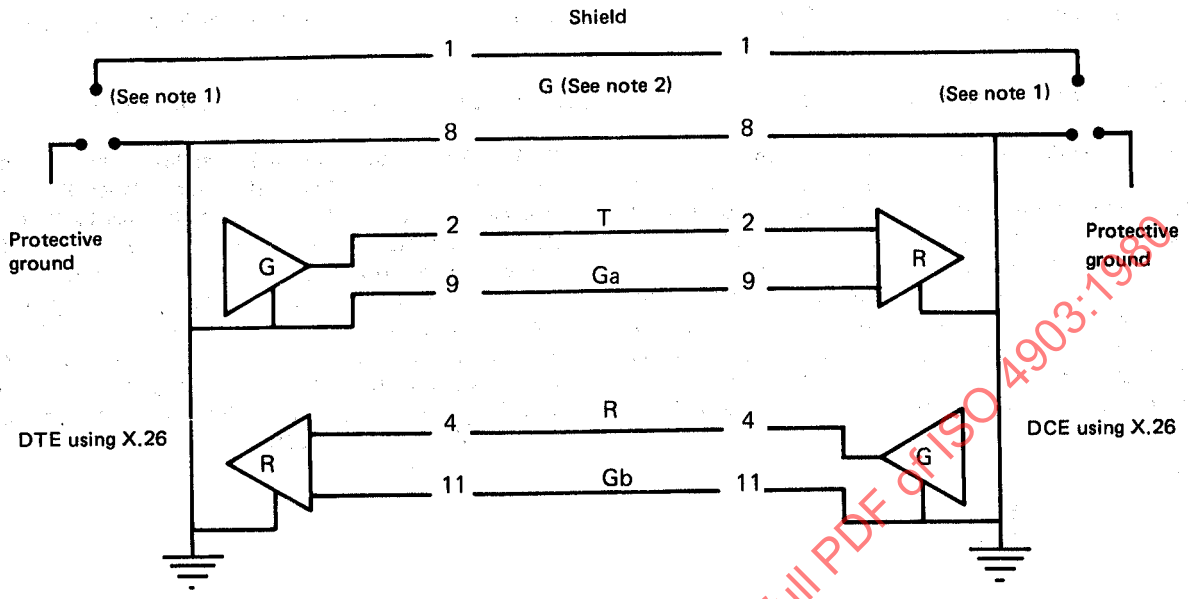


Figure 8 — X.20 interconnection configuration for X.26 DTE/X.26 DCE

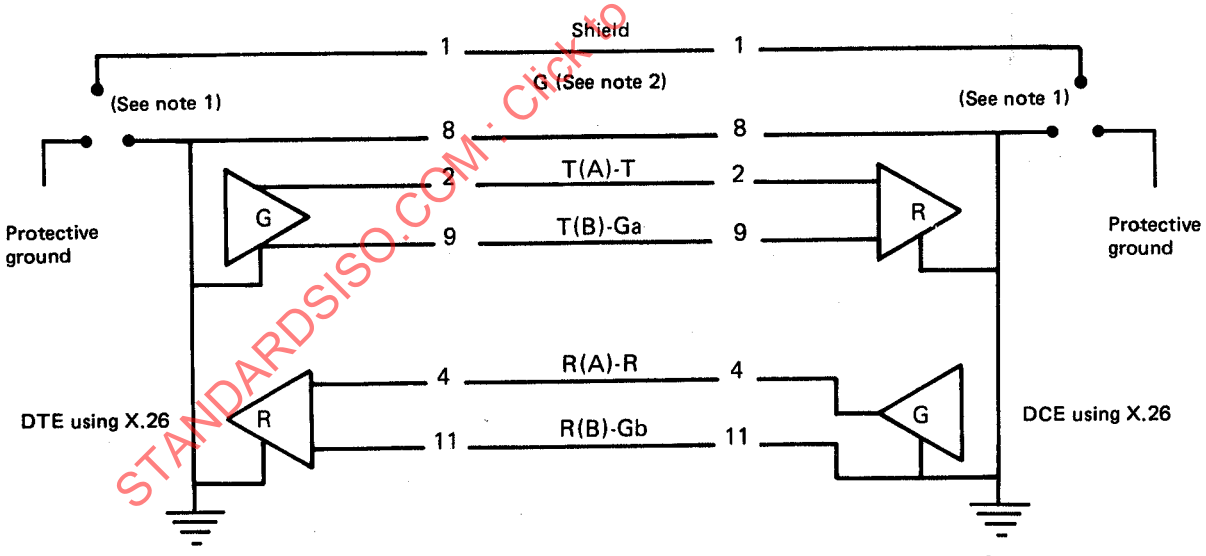


Figure 9 — X.20 interconnection configuration for X.27 DTE/X.26 DCE

NOTES

1 Pin 1 is assigned for connecting the shields between tandem sections of shielded interface cable. The shield may be connected either to protective ground or to signal ground at either the DTE or DCE or both ends in accordance with national regulations.

Signal ground may be further connected to protective ground in accordance with national safety regulations. Caution should be exercised to prevent establishment of ground loops carrying high currents.

2 Provision of circuit G is optional.

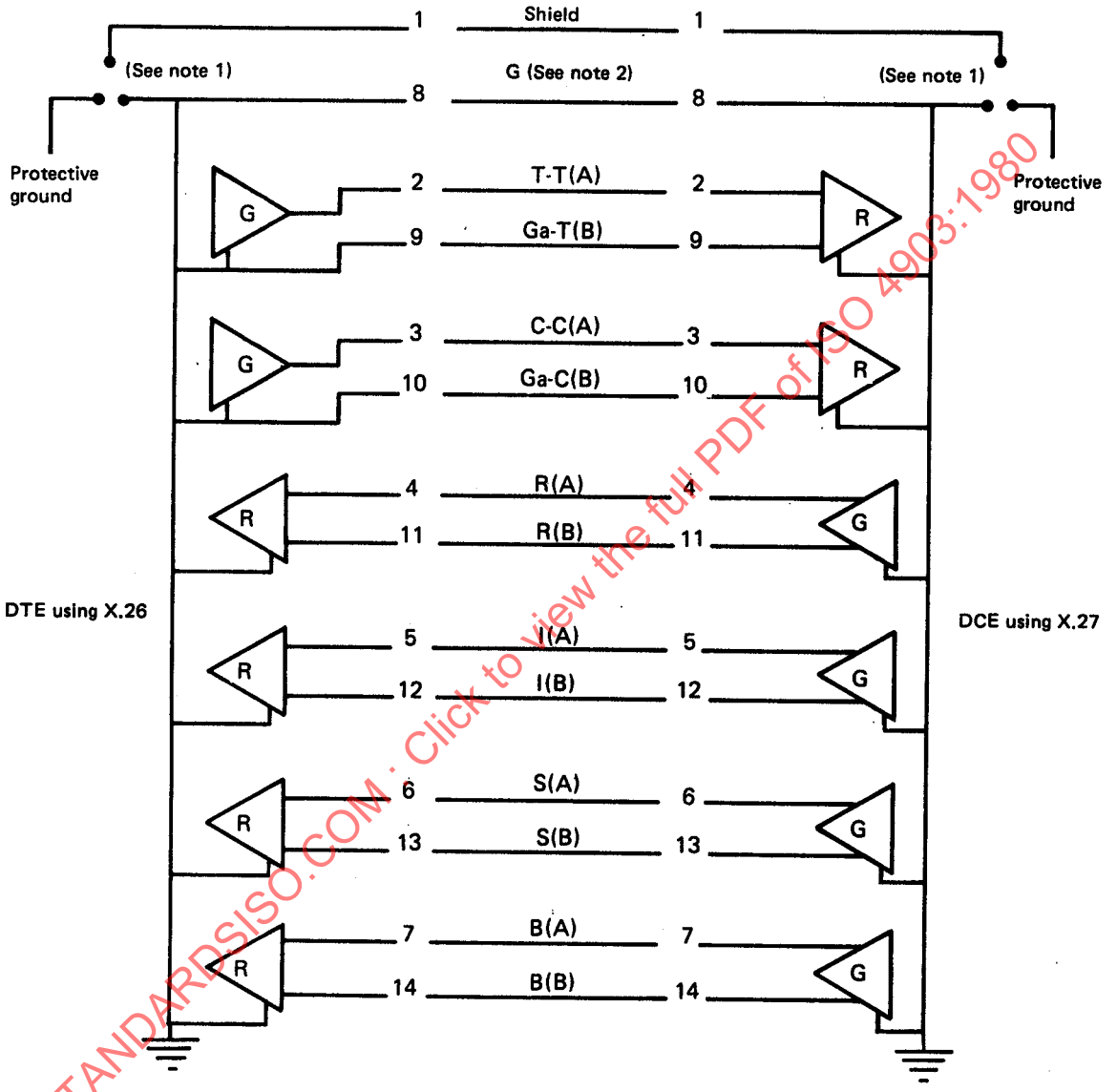


Figure 10 — X.21 interconnection configuration for X.26 DTE/X.27 DCE

NOTES

1 Pin 1 is assigned for connecting the shields between tandem sections of shielded interface cable. The shield may be connected either to protective ground or to signal ground at either the DTE or DCE or both ends in accordance with national regulations.

Signal ground may be further connected to protective ground in accordance with national safety regulations. Caution should be exercised to prevent establishment of ground loops carrying high currents.

2 Provision of circuit G is optional.

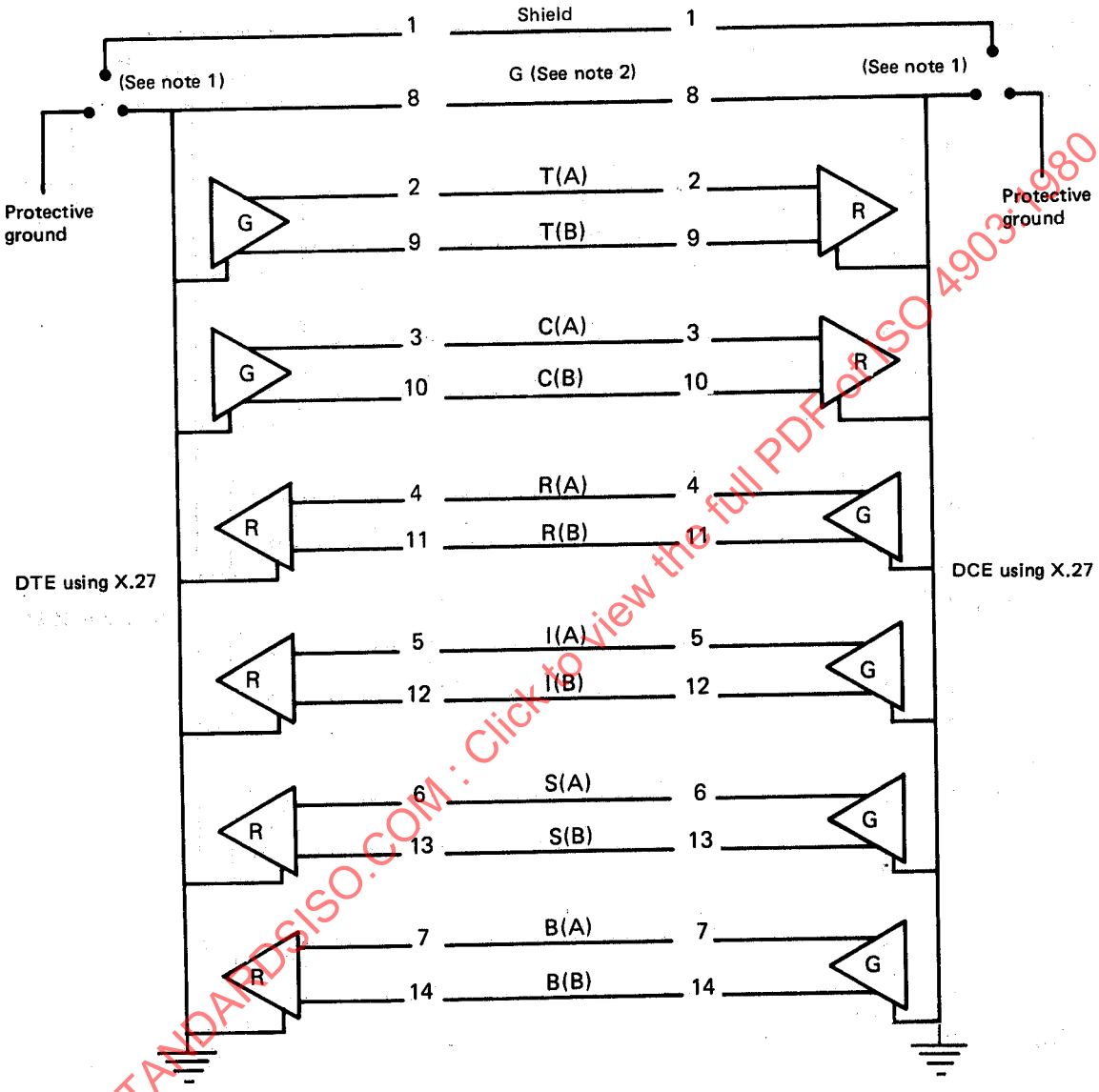


Figure 11 — X.21 interconnection configuration for X.27 DTE/X.27 DCE

NOTES

1 Pin 1 is assigned for connecting the shields between tandem sections of shielded interface cable. The shield may be connected either to protective ground or to signal ground at either the DTE or DCE or both ends in accordance with national regulations.

Signal ground may be further connected to protective ground in accordance with national safety regulations. Caution should be exercised to prevent establishment of ground loops carrying high currents.

2 Provision of circuit G is optional.

Annex B

Interworking requirements with V.28 circuits

(This annex provides additional information and does not form an integral part of the International Standard.)

B.1 Scope and field of application

This annex describes an interconnection configuration with an adapter that may be used to provide interworking between X.20/V.28 DTE and X.20/X.26 DCE.

B.2 Electrical characteristics

This clause specifies the necessary adaptation of equipment designed for X.26 characteristics to make it closely resemble the V.28 characteristics. An overlap in values of parameters of X.26 and V.28 has been established such that additional provisions incorporated in the interface circuits using X.26 will make the necessary adjustments to ensure operation with V.28 circuits. It should be noted that the performance associated with interworking X.26 circuits with V.28 circuits is limited to that normally associated with V.28 operation.

B.2.1 Protection

X.26 states that the receivers shall not be damaged by voltages up to 12 V while V.28 generators may produce output voltages up to 25 V. Although many commercially available X.26 receivers have been designed to withstand and operate properly with the higher V.28 voltages, protection will be necessary for those receivers which do not have sufficient tolerance. X.26 generators may also be damaged by the higher V.28 generator voltages if they are inadvertently interconnected or shorted together. Since the short circuit condition between V.28 and X.26 generators is purely a fault situation, any further consideration is left to the equipment designer.

B.2.2 Signal levels

The signal levels stated in X.26 and V.28 have an overlap in the 5 to 6 V range. Furthermore, X.26 levels can be as low as 4 V while V.28 levels can be as high as 25 V. The considerations associated with the upper limit levels of V.28 generators operating with X.26 receivers have been covered in B.2.1. On the lower limit, although an X.26 generator output between 4 V and 5 V is not within the V.28 recommendation, satisfactory operation with V.28 receivers having a 3 V transition margin can be expected because of the low source impedance of X.26 generators.

B.2.3 Risetime, data rate, distance

V.28 states that the risetime for the signal to pass through the ± 3 V transition region shall not exceed 3 % of the signal element duration. X.26, on the other hand, generally requires much slower risetimes specified from 10 to 90 % of the total signal amplitude to reduce cross talk for operation over longer distances. It is possible, however, through proper selection of the waveshaping for the generator in X.20/X.26 DCE to meet the requirements of both X.26 and V.28 simultaneously for data signalling rates applicable to X.20.

In CCITT Recommendation X.26, a graph is provided of data signalling rate versus cable length. This graph has been translated in figure 12 in this annex to show the relationships of risetime and cable length. As an example, figure 12 shows that the fastest risetime allowed by X.26 for a 1 000 m cable length is 100 µs. When operating X.26 generators with V.28 receivers, the 100 µs risetime will meet the V.28 requirements of less than 3 % of the unit interval for data signalling rates up to 300 bit/s.

B.2.4 Circuit failure conditions

A V.28 receiver designed to detect either a power-off condition or disconnection of the interconnecting cable will have no problem detecting these conditions when interworking with an X.26 generator. In the reverse situation, the V.28 recommendation allows the generator impedance in the power-off condition to be as low as 300 Ω which is too low for fault detection by an X.26 receiver using the conventional voltage biasing method. As a result, it will be necessary to incorporate a minimum of 2 kΩ in series with the input to the X.26 receiver in order to ensure proper detection of these conditions when the conventional voltage biasing method is used.

B.2.5 Signal return

X.26 requires two signal return circuits, one for each direction of transmission, while V.28 requires only one. For the X.20 interface, it is therefore necessary to connect circuits Ga and Gb of X.26 DCE with circuit G of V.28 DTE. X.26 DCE may also implement circuit G. In this case, circuits Ga, Gb, and G of the X.26 DCE should all be connected to circuit G of the V.28 DTE as shown in figure 15.

B.3 Mechanical characteristics

ISO 2110 specifies the 25-pin DTE/DCE interface connector and pin assignments for V.28 equipment. X.20/X.26 DCE conforming to this International Standard uses a 15-pin connector which belongs to the same family of connectors as the 25-pin connector. Therefore, mechanical adaptation is necessary for interworking between X.20/X.26 DCE and X.20/V.28 DTE.

B.4 Suggested implementation

The actual method of implementation for satisfying the provisions outlined in clauses B.2 and B.3 is not standardized because a number of innovative approaches are possible. Accordingly, it is left to the designer of DCE meeting the X.20/X.26 interface to incorporate the necessary provisions when interworking with X.20/V.28 DTE is desired as a special feature. It should not be assumed that any DCE meeting X.20/X.26 will interwork with X.20/V.28 DTE unless a specific reference is made that the requirements for interworking are fulfilled.

One method of satisfying the provisions outlined in clauses B.2 and B.3 has been developed. It is presented in this clause as guidance for implementing X.20/X.26 DCE where interworking with V.28 DTE is essential to facilitate an orderly transition to the next equipment generation.

B.4.1 Protection of X.26 receivers

Although X.26 states that receivers need only withstand 12 V without being damaged, a number of receiver integrated circuits are available that can withstand and operate properly with the higher voltages which are possible from V.28 generators. When the X.26 receivers do not have adequate tolerance, however, additional protection will be required. This can be accomplished by the addition of an attenuating L-pad in front of the X.26 receiver input as shown in figure 13. The L-pad with a 2 kΩ series resistance and a 3,3 kΩ shunt resistance has an additional effect of appearing as a high impedance source. Therefore, the pad should be no further from the X.26 receiver input than 3 m of cable to ensure that near-end cross talk from adjacent circuits does not reach an unacceptable level (1 V peak).

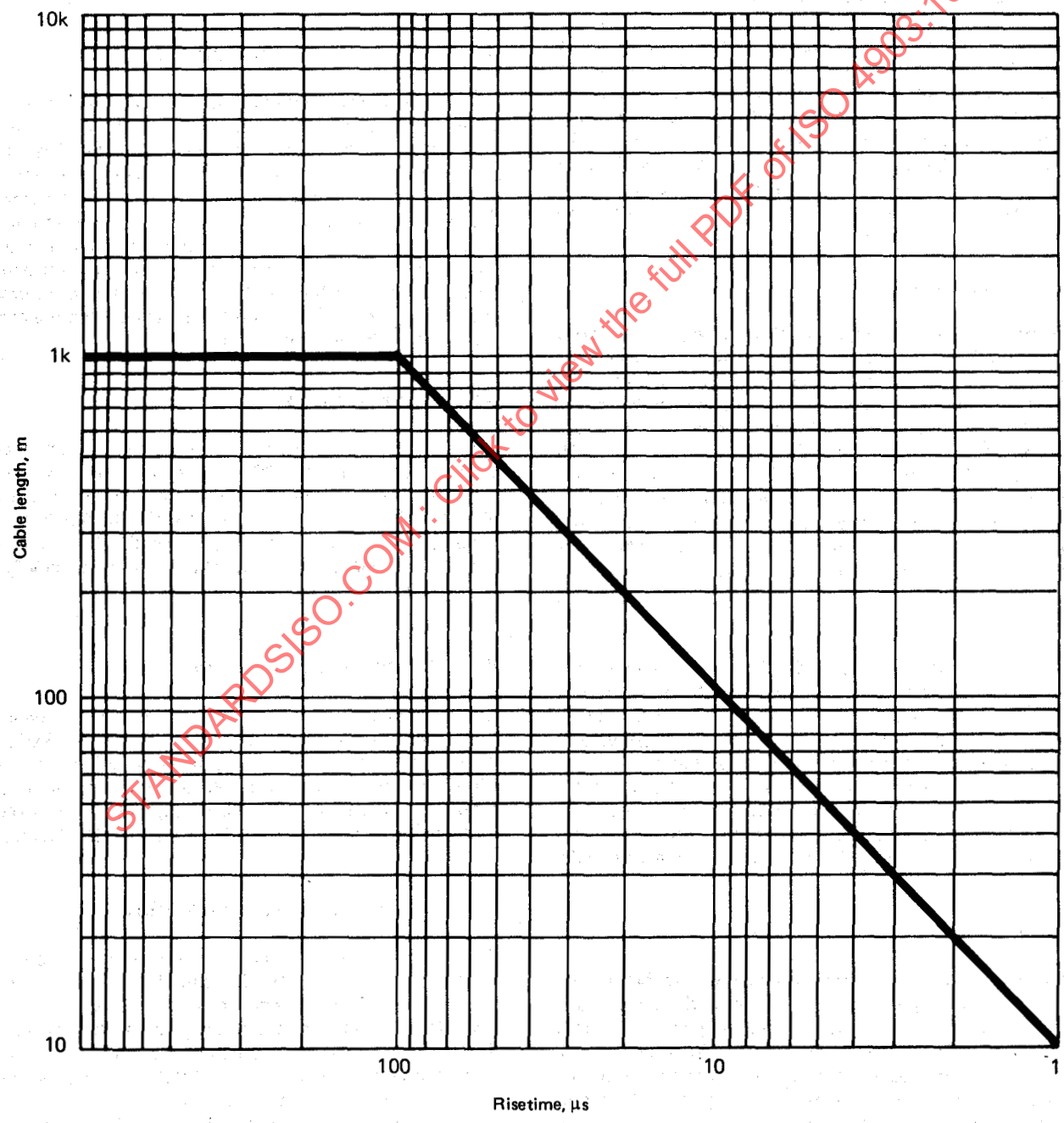


Figure 12 — Cable length against risetime