SLOVENSKI STANDARD
SIST EN 50289-1-11:2002

01-september-2002

Communication cables - Specifications for test methods - Part 1-11: Electrical test methods - Caharacteristic impedance, input impedance, return loss (Note: Applies in conjunction with EN 50289-1-1)

Communication cables - Specifications for test methods -- Part 1-11: Electrical test methods - Characteristic impedance, input impedance, return loss

Kommunikationskabel - Spezifikationen für Prüfverfahren -- Teil 1-11: Elektrische Prüfverfahren - Wellenwiderstand, Eingangsimpedanz, Rückflussdämpfung

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Câbles de communication - Spécifications des méthodes d'essai -- Partie 1-11: Méthodes d'essais électriques - Impédance caractéristique, impédance d'entrée, affaiblissement de réflexion

SIST EN 50289-1-11:2002
https://standards.iteh.ai/catalog/standards/sist/0d947156-91a7-4926-956f-d1834107cc66/sist-en-50289-1-11-2002

Ta slovenski standard je istoveten z: **EN 50289-1-11:2001**

ICS:

33.120.20	Ģice in simetriļ ni kabli	Wires and symmetrical cables

SIST EN 50289-1-11:2002 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

SIST EN 50289-1-11:2002

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 50289-1-11:2002
https://standards.iteh.ai/catalog/standards/sist/6d947156-9fa7-4926-956f-d1834107cc66/sist-en-50289-1-11-2002

SIST EN 50289-1-11:2002

EUROPEAN STANDARD **EN 50289-1-11**

NORME EUROPÉENNE

EUROPÄISCHE NORM November 2001

ICS 33.120.20

English version

Communication cables - Specifications for test methods Part 1-11: Electrical test methods - Characteristic impedance, input impedance, return loss

Câbles de communication - Spécifications des méthodes d'essai Partie 1-11: Méthodes d'essais électriques - Impédance caractéristique, impédance d'entrée, affaiblissement de réflexion

Kommunikationskabel - Spezifikationen für Prüfverfahren Teil 1-11: Elektrische Prüfverfahren - Wellenwiderstand, Eingangsimpedanz, Rückflußdämpfung

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 50289-1-11:2002
https://standards.iteh.ai/catalog/standards/sist/6d947156-9fa7-4926-956f-d1834107cc66/sist-en-50289-1-11-2002

This European Standard was approved by CENELEC on 2001-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

© 2001 CENELEC - All rights of exploitation in any form and by any means reserved worldwide for CENELEC members.

Ref. No. EN 50289-1-11:2001 E

SIST EN 50289-1-11:2002

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 46X, Communication cables.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50289-1-11 on 2001-03-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2002-05-01
- latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2004-04-01

This European Standard has been prepared under the European Mandate M/212 given to CENELEC by the European Commission and the European Free Trade Association.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 50289-1-11:2002
https://standards.iteh.ai/catalog/standards/sist/6d947156-9fa7-4926-956f-d1834107cc66/sist-en-50289-1-11-2002

SIST EN 50289-1-11:2002

Contents

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 50289-1-11:2002
https://standards.iteh.ai/catalog/standards/sist/6d947156-9fa7-4926-956f-d1834107cc66/sist-en-50289-1-11-2002

SIST EN 50289-1-11:2002

1 Scope

This Part 1-11 of EN 50289 details the test methods to determine characteristic impedance, input impedance and return loss of cables used in analogue and digital communication systems.

It is to be read in conjunction with Part 1-1 of EN 50289-1-1, which contains essential provisions for its application.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 50289-1-1	2001	Communication cables - Specifications for test methods - Part 1-1: Electrical test methods - General requirements
EN 50289-1-5	2001	Communication cables - Specifications for test methods - Part 1-5: Electrical test methods - Capacitance
EN 50289-1-7	2001	Communication cables - Specifications for test methods - Part 1-7: Electrical test methods - Velocity of propagation
EN 50289-1-8	2001	Communication cables - Specifications for test methods - Part 1-8: Electrical test methods – Attenuation
EN 50290-1-2 [1)]		Communication cables - Part 1-2: Definitions

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST EN 50289-1-11:2002
https://standards.iteh.ai/catalog/standards/sist/6d947156-9fa7-4926-956f-
d1a847e7a689/sist-en-50289-1-11-2002

3 Definitions

For the purpose of this European Standard, the definitions of EN 50290-1-2 apply in addition to the following ones.

3.1
characteristic impedance (Z_c)
the characteristic impedance Z_c of a cable is defined as the quotient of a voltage and current wave which are propagating in the same direction. In theory for homogeneous cables with no structural variations the characteristic impedance could be measured directly as the quotient of voltage and current at the cable ends

$$Z_c = \frac{U_f}{i_f} = \frac{U_r}{i_r} \quad (1)$$

[1)] At draft stage.

SIST EN 50289-1-11:2002

3.2
mean characteristic impedance (Z_m)
in practice for real cables which always have structural variations the characteristic impedance is described by the mean characteristic impedance which is derived from the measurement of the velocity of propagation (EN 50289-1-7) and the mutual capacitance (EN 50289-1-5). However this method can only give accurate figures of the mean characteristic impedance for frequencies above 1 MHz and non-polar insulation materials

$$Z_m \approx \frac{1}{v \times C} \qquad (2)$$

where

Z_m = mean characteristic impedance

v = velocity of propagation

C = mutual capacitance

3.3
input impedance
the input impedance Z_{in} is the impedance seen at one end of a cable when terminated with its own impedance. In practice this is the case when the round trip loss is greater than 40 dB at any measured frequency. This property takes into account structural variations in the cable. For samples with lower round trip loss it is determined by the open/short circuit method:

iTeh STANDARD PREVIEW
(standards.iteh.ai)

$$Z_{in} = \sqrt{Z_{open} \times Z_{short}} \qquad (3)$$

SIST EN 50289-1-11:2002
https://standards.iteh.ai/catalog/standards/sist/6d947156-9fa7-4926-956f-d1834107cc66/sist-en-50289-1-11-2002

where

Z_{in} = input Impedance of the cable

Z_{open} = impedance with an open circuit at the far end of the cable

Z_{short} = impedance with a short circuit at the far end of the cable

3.4
return loss
the return loss quantifies the reflected signal caused by structural variations and mismatch of the cable to the specified nominal impedance

$$RL = -20\log\left(\frac{|Z_x - Z_{nom}|}{|Z_x + Z_{nom}|}\right) \qquad (4)$$

where

$$Z_x = Z_{in} \times \frac{Z_{in} + Z_{nom} \times \tanh(\gamma \times l)}{Z_{nom} + Z_{in} \times \tanh(\gamma \times l)} \qquad (5)$$

and

RL = return loss

SIST EN 50289-1-11:2002

γ = $\gamma = \alpha + j\beta$, where

α IS DERIVED FROM EN 50289-1-8 AND

β is derived from EN 50289-1-7

l = length of cable under test in m

Z_{nom} = nominal impedance of the cable; output impedance of the balanced side of the balun, if any.

4 Test method for input impedance and return loss

4.1 Equipment

- analyser (as an alternative to analysers a generator and a receiver, able to measure magnitude and phase may be used);
- reflection bridge or directive coupler with a nominal impedance equal to that of the measuring devices;
- balun (in case of balanced cables):

  unbalanced side: nominal impedance of the measuring devices;

- short circuit termination with negligible resistance and inductance;
- load resistor with a resistance known within 1 % and with a value close to the nominal impedance of the CUT and with negligible inductance and capacitance.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

The return loss of the test set-up shall be ≥ 15 dB than the specified value of the CUT after calibration procedure.

SIST EN 50289-1-11:2002
https://standards.iteh.ai/catalog/standards/sist/6d947156-9fa7-4926-956f-d1834107cc66/sist-en-50289-1-11-2002

4.2 Test sample

The CUT shall have a minimum length as specified in the relevant sectional specification. Both ends of the CUT shall be prepared, such that when connected to the terminals of the test equipment the influence to the test result is minimised. In case of balanced cables the twisting of the pairs/quads shall be maintained.

4.3 Procedure

4.3.1 Calibration procedure

The scattering parameters of the test set-up shall be derived from the measurement of the reflection coefficients of the test set-up under open, short and load conditions at the test port (at the balanced output of the balun for balanced cables). The measurements shall be done over the whole specified frequency range. The values shall be measured with magnitude and phase. The calibration data have to be saved, so that the results may be corrected.

SIST EN 50289-1-11:2002

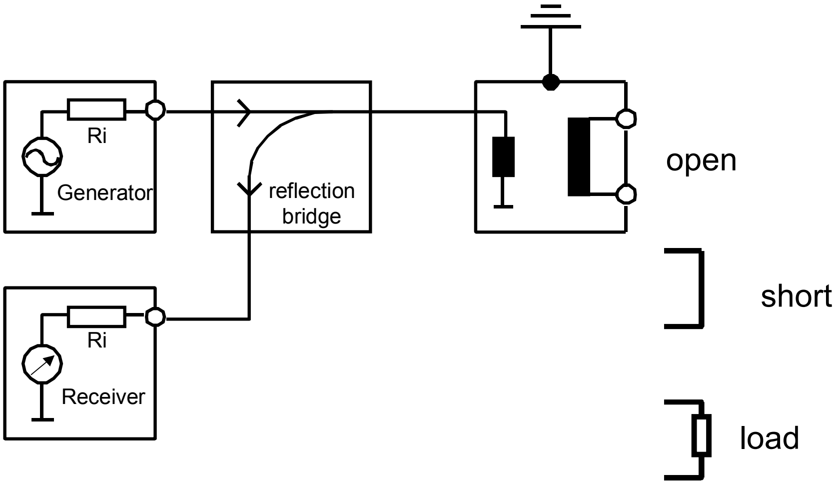

Figure 1 - Calibration set-up

$$S_{11} = \zeta \text{ match} \quad (6)$$

$$S_{22} = \frac{2 \times (\zeta.match - \zeta.short - \zeta.open)}{\zeta.short - \zeta.open} \quad (7)$$

iTeh STANDARD PREVIEW
(standards.iteh.ai)

$$S_{12} \times S_{21} = (\zeta.match - \zeta.short) \times (1 + S_{22}) \quad (8)$$

SIST EN 50289-1-11:2002
https://standards.iteh.ai/catalog/standards/sist/6d947156-9fa7-4926-956f-d1834107cc66/sist-en-50289-1-11-2002

where

S	=	scattering parameters of test set-up
ζ open	=	reflection coefficient measured leaving the balanced output of the balun open
ζ short	=	reflection coefficient measured shorting the balanced output of the balun shortened
ζ match	=	reflection coefficient measured terminating the balanced output of the balun with the load resistance

4.3.2 Measuring procedures

The test sample shall be connected to the terminals of the measuring devices.

Input impedance

Measure the reflection coefficient of the CUT with the far end open

Measure the reflection coefficient of the CUT with the far end short

Return loss

Measure the reflection coefficient of the CUT with the far end terminated with its nominal impedance (if the round trip attenuation of the CUT is low, a precision load shall be used).