SLOVENSKI STANDARD
SIST HD 21.2 S2:1998/A13:1998

01-februar-1998

Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 2: Test methods - Amendment A13

Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V -- Part 2: Test methods

Polyvinylchlorid-isolierte Leitungen mit Nennspannungen bis 450/750 V -- Teil 2: Prüfverfahren

Conducteurs et câbles isolés au polychlorure de vinyle, de tension assignée au plus égale à 450/750 V -- Partie 2: Méthodes d'essais

Ta slovenski standard je istoveten z: HD 21.2 S2:1990/A13:1995

ICS:

29.060.20	Kabli	Cables

SIST HD 21.2 S2:1998/A13:1998 en

HARMONIZATION DOCUMENT

DOCUMENT D'HARMONISATION

HARMONISIERUNGSDOKUMENT

HD 21.2 S2/A13

June 1995

UDC (621.315.211.2+621.315.32).027.475-036.743.22-001.2.001.4
ICS 29.060.20

Descriptors: See HD 21.2 S2

English version

Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V
Part 2: Test methods

Conducteurs et câbles isolés au polychlorure de vinyle, de tension assignée au plus égale à 450/750 V
Partie 2: Méthodes d'essais

Polyvinylchlorid-isolierte Leitungen mit Nennspannungen bis 450/750 V
Teil 2: Prüfverfahren

This amendment A13 modifies the Harmonization Document HD 21.2 S2:1990; it was approved by CENELEC on 1995-05-15. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this amendment on a national level.

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

This amendment exists in three official versions (English, French, German).

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, 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

Ref. No. HD 21.2 S2:1990/A13:1995 E

Foreword

This amendment was prepared by the Technical Committee CENELEC TC 20, Electric cables.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A13 to HD 21.2 S2:1990 on 1995-05-15.

The following dates were fixed:

– latest date by which the existence of the amendment has to be announced at national level	(doa)	1996-01-01
– latest date by which the amendment has to be implemented at national level by publication of a harmonized national standard or by endorsement	(dop)	1996-07-01
– latest date by which the national standards conflicting with the amendment have to be withdrawn	(dow)	1996-07-01

For products which have complied with HD 21.2 S2:1990 and its amendments A2:1990, A3:1993, A4:1993, A6:1995 and A11:1995 before 1996-07-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1997-07-01.

Because of screened cables, replace the existing sub-clause 2.2 by the following:

2.2 Voltage test carried out on completed cables

A sample of cable as delivered shall be immersed in water if the cable has no metallic layer. The length of the sample, the temperature of the water and the duration of immersion are given in Part 1, Table III.

A voltage shall be applied in turn between each conductor and all the others connected together and to the metallic layer, if any or to the water; and between all conductors connected together and the metallic layer or water.

The voltage and the duration of its application are given for each case in Part 1, Table III.

Add a new sub-clause 2.7 to HD 21.2:

2.7 Screening efficiency

2.7.1 General

The screening efficiency of a cable depends both on the screening against currents and the screening against voltages.

The screening efficiency against currents is specified in terms of the transfer impedance due to resistive and magnetic coupling per unit length, against voltages in terms of the transfer admittance due to electric coupling (see Note below) per unit length. Transfer impedance is defined in an elementary length of cable as the ratio of the voltage measured along the screen in the disturbed system to the current flowing in the interfering system. This may be of interest at any frequency up to 10,000 MHz. In general, there is no problem where homogeneous cylindrical shields are used since the screening effect in such cases can be readily calculated, but where a braided or taped construction is employed it becomes necessary to measure the screening efficiency. The present state of experience shows that the surface transfer impedance remains constant at frequencies from 0 Hz to 0.1 MHz or 1 MHz, depending on the type of cable and is equal to the direct current resistance of the screen. At frequencies over 0.1 MHz or 1 MHz the transfer impedance increases. Depending on the construction of the screen, this increase starts directly or after having passed through a minimum.

Over 10 MHz to 15 MHz, the increase is proportional to the frequency.

Transfer admittance is defined in an elementary length of cable as the ratio of the current flowing into the disturbed system to the voltage originating it in the specified interfering system. Measurements show that the transfer admittance may be represented by a capacitance which is independent of frequency from audio frequencies up to 1,000 MHz at least.

Note: Attention is drawn to the fact that in some countries the term 'transfer admittance' is taken to be the reciprocal of 'transfer impedance' which is not the case in this standard.

2.7.2 Transfer impedance due to resistive and magnetic coupling

2.7.2.1 Test appratus

The apparatus is of the 'triple coaxial' form (see Figure 6). A short length of the cylindrical screen under investigation forms both the inner conductor of an energised coaxial system and, at the same time, the outer conductor of another coaxial line. The signal in the inner coaxial system is caused by the surface transfer impedance of the screen.

The cable with the screen to be measured is terminated at one end by a resistance the value of which is numerically equal to the characteristic impedance of the screen. The terminal resistance is shielded by a metal sleeve whose edge at the open end is soldered to the screen. Terminal resistance and cable are coaxially mounted inside a metal tube. This tube is terminated at the side opposite the resistance by a short-circuiting disk, which is soldered to the screen (see Figure 6).

The length of the cable in the metal tube is not to exceed 0.1L to 0.35L according to the measuring equipment used. The length of the projecting cable is of no consequence.

2.7.2.2 Test procedure

The outer coaxial system, formed by the screen under investigation and the metal tube, is fed from a generator through an interconnected resistance (Method 1) or by way of a direct connection (Method 2).

The measurement shall be carried out at 30MHz.

Note: For both methods a cable length of 1m is mostly adequate. The correction factor at 30 MHz is approximately 1.

Method 1 : Feeding through a resistance

The generator feeds the outer system through a pure resistance (R) which, to best advantage, should be equal to about 1.4 times the value of the characteristic impedance of the outer system. The input voltage to the resistance is measured by means of a suitable voltmeter. The output voltage of the inner system, which is formed by the cable proper, is measured by means of a matched voltmeter.

The transfer impedance may then be calculated from the equation:

$$|Z_T| = \frac{2R}{L} \times \frac{U_2}{U_1} \times F'$$

where:

Z_T = the transfer impedance, in ohms per metre
R = the feeding resistance, in ohms
L = the length of the screen under test, in metres (see Figure 6)
U_1 = the input voltage of the outer system measured before the resistance R, in volts
U_2 = the output voltage of the inner system measured at the end of the screen, in volts
F' = a factor, which allows for the frequency response (see Figure 7). The exact value can be calculated from the relation:

$$F' = \frac{(1 - n^2) \cdot x \cdot \sqrt{\cos^2 x + m^2 \sin^2 x}}{\sqrt{n^2 (\cos x - \cos nx)^2 + (\sin x - n \sin nx)^2}}$$

where:

$m = \frac{Z_1}{R}$ the ratio of the impedance characteristic of the outer system to the resistance R

Z_1 = the characteristic impedance of the outer system, in ohms

$n = \frac{\lambda_1}{\lambda_2}$

λ_1 = the electrical wavelength in the outer system

λ_2 = the electrical wavelength in the inner system

$x = \frac{2 \pi L}{\lambda_1}$

Method 2 : Direct feeding

The transmitter feeds the outer system directly. The input voltage of this system is measured at the beginning of the screen. The output voltage of the inner system is measured as indicated above.

This method is preferable if it is necessary to operate at greater input voltages, as for instance with screens of a very high screening efficiency or with less sensitive output voltmeters. For this method, higher frequencies may be used than for the first method

The surface transfer impedance may be calculated from the equation:

$$|Z_T| = 2Z_1 \times \frac{2\pi}{\lambda_1} \times \frac{U_2}{U_1} \times F''$$

The designations of the equation have the same meaning as indicated for Method 1.

F'' (see figure 8) may be calculated from the relation:

$$F'' = \frac{(1 - n^2) \sin x}{\sqrt{n^2 (\cos x - \cos nx)^2 + (\sin x - n \sin nx)^2}}$$

with the same abbreviations as for method 1.

Instead of measuring U_1 and U_2 separately, the ratio U_1/U_2 may, using either method, be ascertained directly by means of a calibrated attenuator.

2.7.2.3 <u>Requirement</u>

The maximum value for transfer impedance shall be given in the relevant cable standard.

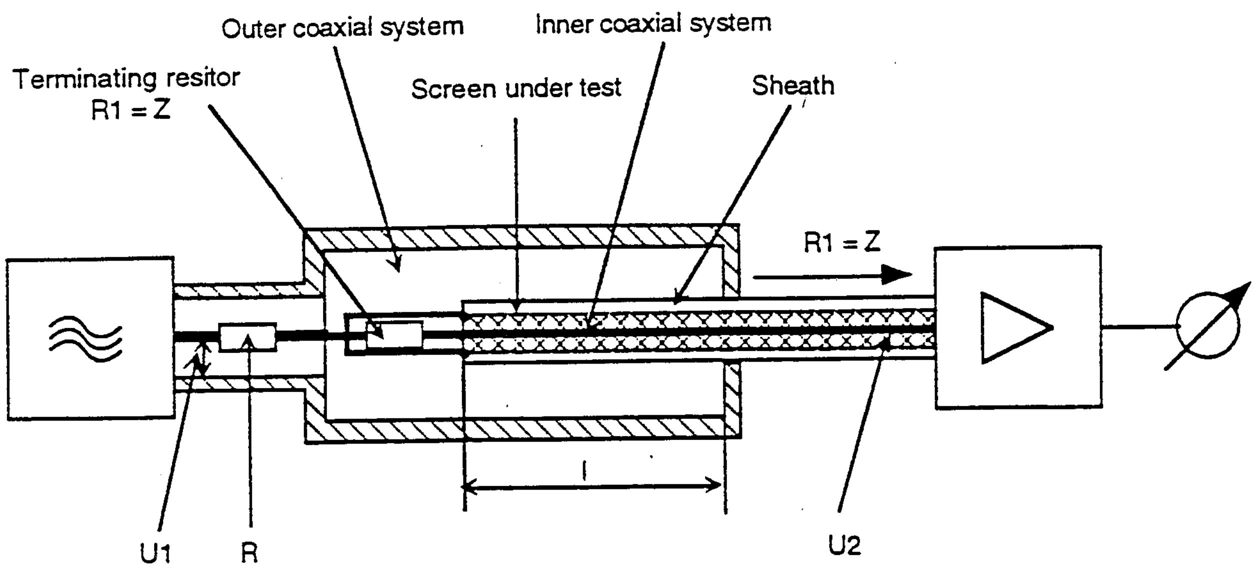

Figure 6

NOTE: For the measurements of electric coupling, the sheath should be removed from the cable as the field strength at the outer conductor is seriously affected by the sheath.