SLOVENSKI STANDARD
SIST EN 3475-810:2009

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Aeronavtika - Elektriļ ni kabli za uporabo v zraļ nih plovilih - Preskusne metode - 810. del: Povratna izguba (SRL)

Aerospace series - Cables, electrical, aircraft use - Test methods - Part 810: Structural return loss

Luft- und Raumfahrt - Elektrische Leitungen f¿r Luftfahrtverwendung - Pr¿fverfahren - Teil 810: R¿ckfluƀdª mpfung

Série aérospatiale - Câbles électriques à usage aéronautique - Méthodes d'essais - Partie 810: Affaiblissement de réflexion structurel

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Aerospace series - Cables, electrical, aircraft use - Test methods - Part 810: Structural return loss

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Luft- und Raumfahrt - Elektrische Leitungen für Luftfahrtverwendung - Prüfverfahren - Teil 810: Rückflußdämpfung

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 3475-810:2009) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2009, and conflicting national standards shall be withdrawn at the latest by August 2009.

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1 Scope

This standard specifies methods for measuring structural return loss for digital data transmission cable.

It shall be used together with EN 3475-100.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 3475-100, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 100: General*

EN 3475-805, *Aerospace series — Cables, electrical, aircraft use — Test methods — Part 805: Characteristic impedance*

3 Definition

The structural return loss is used for quantifying the level of the reflected signal and to represent the structural effects of the cable itself relative to its own impedance (Z_c). The SRL result is sensitive to how the characteristic impedance is centred about the load impedance.

4 Preparation of specimens

Test specimen shall be of 100 metres minimum length.

The ends of the cable under test must be prepared in such way that the assembly of the pairs/quads is maintained.

The measurements may be performed on production drums and/or on the final delivery package from one direction.

5 Apparatus

— HF Network Analyser.

— One impedance transformer (balun) with the appropriate frequency range, impedance and balanced at least as well as the pair under test facilitates making measurements on symmetric pairs under balanced conditions.

6 Methods

The SRL is a calculated parameter. The SRL is obtained from the measured complex impedance open and short circuit, see EN 3475-805 Method C and the calculation of the fitted characteristic impedance.

— Fitted characteristic impedance calculation:

The following formula gives the cable characteristic impedance module in function of the frequency f (Hz).

$$|Zf| = K_0 + \frac{K_1}{f^{1/2}} + \frac{K_2}{f} + \frac{K_3}{f^{3/2}}$$

The K_0 to K_3 coefficients are extracted from the following expression:

$$\begin{bmatrix} \sum_{i=1}^{N} |Z_{o/s}| \\ \sum_{i=1}^{N} \frac{|Z_{o/s}|}{\sqrt{f_i}} \\ \sum_{i=1}^{N} \frac{|Z_{o/s}|}{f_i} \\ \sum_{i=1}^{N} \frac{|Z_{o/s}|}{f_i^{3/2}} \end{bmatrix} = \begin{bmatrix} N & \sum_{i=1}^{N} \frac{1}{\sqrt{f_i}} & \sum_{i=1}^{N} \frac{1}{f_i} & \sum_{i=1}^{N} \frac{1}{f_i^{3/2}} \\ \sum_{i=1}^{N} \frac{1}{\sqrt{f_i}} & \sum_{i=1}^{N} \frac{1}{f_i} & \sum_{i=1}^{N} \frac{1}{f_i^{3/2}} & \sum_{i=1}^{N} \frac{1}{f_i^{2}} \\ \sum_{i=1}^{N} \frac{1}{f_i} & \sum_{i=1}^{N} \frac{1}{f_i^{3/2}} & \sum_{i=1}^{N} \frac{1}{f_i^{2}} & \sum_{i=1}^{N} \frac{1}{f_i^{5/2}} \\ \sum_{i=1}^{N} \frac{1}{f_i^{3/2}} & \sum_{i=1}^{N} \frac{1}{f_i^{2}} & \sum_{i=1}^{N} \frac{1}{f_i^{5/2}} & \sum_{i=1}^{N} \frac{1}{f_i^{3}} \end{bmatrix} \times \begin{bmatrix} K_0 \\ K_1 \\ K_2 \\ K_3 \end{bmatrix}$$

where

$Z_{o/s}$ is the measured complex impedance obtained from open and short circuit measurement Zf (Ω);

Zf is the fitted characteristic impedance (Ω);

f is the frequency (Hz);

N is the number of measured points.

— Structural return loss calculation:

The SRL for cable pairs is obtained by the formula:

$$SRL = -20 \log \left| \frac{Z_{o/s} - Z_f}{Z_{o/s} + Z_f} \right|$$

where

SRL is expressed in dB.

7 Requirements

The SRL values obtained shall not exceed the values specified in the product standard.