SLOVENSKI STANDARD
SIST EN 2591-601:2004

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Aerospace series - Elements of electrical and optical connection - Test methods - Part 601: Optical elements - Insertion loss

Aerospace series - Elements of electrical and optical connection - Test methods - Part 601: Optical elements - Insertion loss

Luft- und Raumfahrt - Elektrische und optische Verbindungselemente - Prüfverfahren - Teil 601: Optische Elemente - Einfügungsdämpfung

Série aérospatiale - Organes de connexion électrique et optique - Méthodes d'essais - Partie 601 : Organes optiques - Pertes d'insertion

Ta slovenski standard je istoveten z: **EN 2591-601:2001**

ICS:

49.060	Letalska in vesoljska elektriļ na oprema in sistemi	Aerospace electric equipment and systems

SIST EN 2591-601:2004 **en**

EUROPEAN STANDARD

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Aerospace series - Elements of electrical and optical connection - Test methods - Part 601: Optical elements - Insertion loss

Série aérospatiale - Organes de connexion électrique et optique - Méthodes d'essais - Partie 601: Organes optiques - Pertes d'insertion

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This European Standard was approved by CEN on 4 June 2001.

CEN 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 Management Centre or to any CEN 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 CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 2591-601:2001 E

Foreword

This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

After inquiries 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 AECMA, 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 May 2002, and conflicting national standards shall be withdrawn at the latest by May 2002.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard specifies methods of measuring the insertion loss of optical connection elements (including permanent connections) and fibre optic couplers.

These methods are suitable for single and multi-channel devices and hybrid configurations.

It shall be used together with EN 2591-100.

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.

EN 2591-100 Aerospace series – Elements of electrical and optical connection – Test methods – Part 100: General 1)

3 Preparation of specimens

3.1 Specimens shall be prepared as defined in the product standard and for each method of test:

– the fibre ends shall comply with requirements of EN 2591-100 (Fibre end preparation and termination cleaning);

– the fibre ends shall be fixed to the light launch and detector systems as defined in EN 2591-100;

– the fibre/cable used for the test shall meet the requirements of the optical connection element, coupler or splice product standard;

– movement of the fibres/cables and temporary joints shall be minimized during the test set-up and testing process;

– the minimum bend radius of the fibre/cable shall not be exceeded;

– the fibre lengths shall be as stated unless otherwise defined in subsequent test requirements.

3.2 Unless otherwise indicated in the technical specification, the following details shall be specified:

– method;

– number of measurements to be averaged;

– preconditioning requirements;

– recovery procedure;

– number of channels to be tested in a multi-channel device;

– maximum value of insertion loss;

– maximum permissible standard deviation of insertion loss;

– launch conditions.

1) Published as AECMA Prestandard at the date of publication of this standard

4 Apparatus

It shall comprise:

– a Light Launch System (LLS) as defined in EN 2591-100;
– a Light Detector System (LDS) as defined in EN 2591-100.

In addition, the following apparatus shall be required depending upon the method used:

a) temporary joints (tj)

1) the joints shall have a low insertion loss, good performance repeatability and have minimum reflection loss. Index matching material may be used.

2) the mean insertion loss and standard deviation of the joints shall be specified in the product standard.

3) the standard deviation of any temporary joint shall be one order of magnitude better than that stated in the product standard for the device under test.

b) reference specimen

1) the dimensions and parameters shall be specified in the product standard.

2) the mean insertion loss shall be specified in the product standard.

3) the standard deviation of the insertion loss shall be specified in the product standard.

5 Methods

A number of methods may be used to measure insertion loss. However, the principle is basically the same for each method.

First, the amount of useful optical power which can be transmitted through the cable shall be measured without the specimens installed. Then, the specimen shall be inserted into the cable and the amount of useful power shall be measured again. The insertion loss shall be defined as the decrease in the amount of transmitted optical power and shall be expressed as a ratio in decibels (dB).

The launch conditions shall be defined in EN 2591-100.

5.1 Method 1

It shall be limited to a single measurement. It shall involve making the initial power measurement in a continuous (unbroken and without temporary joints) fibre. The fibre shall then be broken, the specimen inserted and the power measured again.

This method requires a new length of fibre as well as the preparation and interfacing of the fibre to the LLS and LDS for each specimen measured.

a) Initial measurement set-up, see figure 1.

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LLS ---------------------------------------- LDS    Po
    ←----------------L---------------→
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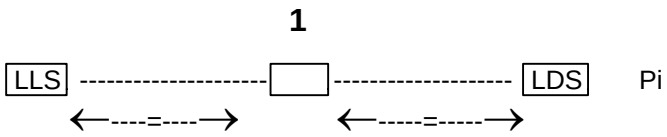
L = (2 ± 0,1) m

Figure 1

b) Measure power Po.

c) Cut fibre length L into two equal sections. The preparation of fibre ends shall comply with EN 2591. Install the specimen as shown in figure 2.



Key

1 Specimen

Figure 2

d) Measure power Pi.

e) Calculate the insertion loss using the following equation

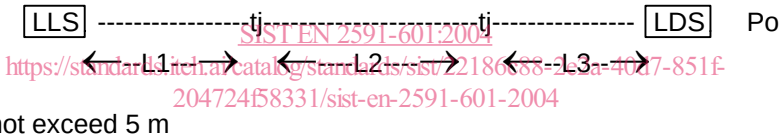
$$\text{Insertion loss (dB)} = -10 \log \frac{Pi}{Po}$$

5.2 Method 2

This method shall apply to pig-tailed arrangements. It shall use two temporary joints.

NOTE The results will depend on the quality of the two joints and fibres. In some situations, a negative value of insertion loss may be measured.

a) Initial measurement set-up, see figure 3.

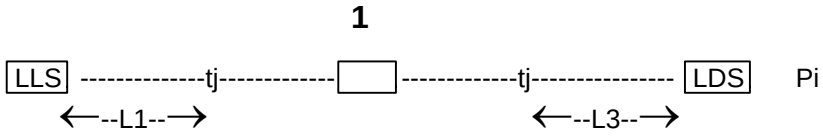


L1 and L3 shall not exceed 5 m
L2 = (2 ± 0,1) m

Figure 3

b) Measure power Po.

c) Remove fibre L2 and replace it with the pig-tailed specimen as shown in figure 4.



Key

1 Specimen

Figure 4

d) Measure power Pi.

e) Calculate the specimen insertion loss using the following equation

$$\text{Insertion loss (dB)} = -10 \log \frac{Pi}{Po}$$

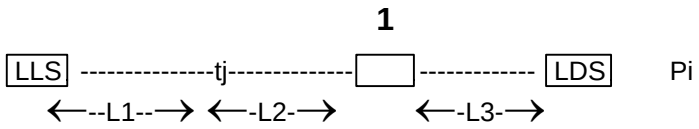
NOTE Half of the temporary joint can be an optical face on the LLS or LDS, which means L1 and L3 can be zero.

5.3 Method 3

This method is intended to minimize the ambiguities created by fibre parameter mismatches. It shall be limited to measuring pig-tailed arrangements and involve the use of temporary joints.

Although it incorporates a temporary joint, the measurement shall not be dependent on the reproducibility of the joint.

a) Initial measurement set-up, see figure 5.



Key

1 Specimen

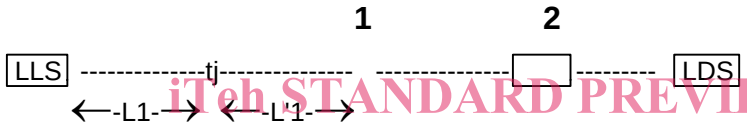
$L2 = L3 = (1 \pm 0{,}1)$ m

$L1 \leq 5$ m

Figure 5

b) Measure power Pi.

c) Cut the fibre between the temporary joint and the specimen at location L'1 as shown in figure 6.



Key

1 Cut

2 Specimen

$L'1 = (0{,}5 \pm 0{,}1)$ m

Figure 6

d) Remove the specimen and its attached fibres from the test circuit.

e) Prepare the fibre end of L'1 as defined in EN 2591-100. Couple it to the LDS as shown in figure 7.

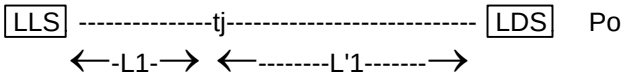


Figure 7

f) Measure power Po.

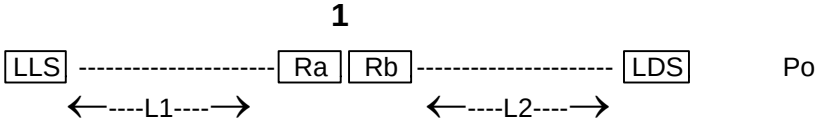
g) Calculate the specimen insertion loss using the following equation

$$\text{Insertion loss (dB)} = -10 \log \frac{Pi}{Po}$$

5.4 Method 4

This method shall apply to specimens with integral cable terminations (patch cord) and uses a reference specimen.

a) Initial measurement set-up, see figure 8.



Key

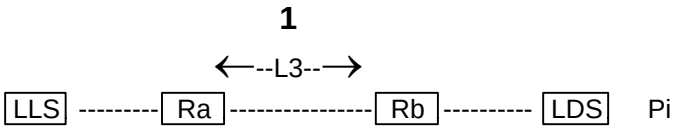
1 Reference specimen

$L1 = L2 = (1 \pm 0{,}1)$ m

Figure 8

b) Measure power Po.

c) Disconnect the reference specimen and insert the test specimen as shown in figure 9.



Key

1 Specimen

$L3 \leq 2$ m

Figure 9

d) Measure power Pi.

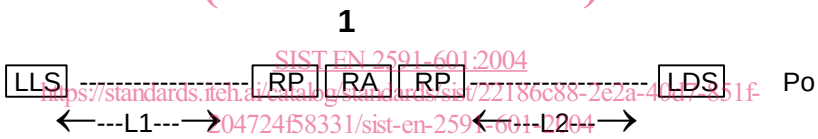
e) Calculate the insertion loss using the following equation

$$\text{Insertion loss (dB)} = -10 \log \frac{Pi}{Po}$$

5.5 Method 5

This method shall be limited to evaluating a connector set adaptor. It shall involve the use of two Reference connector Plugs RP and Reference Adaptor RA of known performance.

a) Initial measurement set-up, see figure 10.



Key

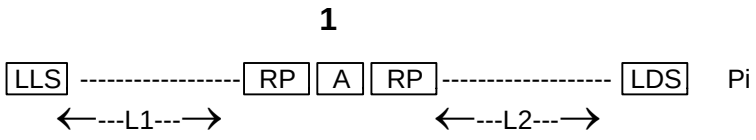
1 Reference specimen

$L1 = L2 \leq 5$ m

Figure 10

b) Measure power Po.

c) Remove RA and replace it with the Adaptor A to be measured as shown in figure 11.



Key

1 Adaptator

Figure 11

d) Measure power Pi.

e) Calculate the insertion loss of A using the following equation

$$\text{Insertion loss (dB)} = -10 \log \frac{Pi}{Po}$$

NOTE In this method, the resultant value shall be the additional loss that the adaptor under test produces, compared to that associated with the reference adaptor, in power level (Po).

This method may yield loss values that are negative (apparent gain for the adaptor) and care shall be used in interpreting the results.