SLOVENSKI STANDARD
SIST EN 6059-504:2014

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Aeronavtika - Električni kabli, namestitev - Zaščitne obojke - Preskusne metode - 504. del: Dvig temperature zaradi samosegrevanja snopa vodnikov, zaščitenih z obojko

Aerospace series - Electrical cables, installation - Protection sleeves - Test methods - Part 504: Temperature rise within a loom due to self-heating when protected by a sleeve

Luft- und Raumfahrt - Elektrische Leitungen, Installation - Schutzschläuche - Prüfverfahren - Teil 504: Temperaturanstieg durch Selbsterwärmung eines Leitungsbündels in einem Schutzschlauch

Série aérospatiale - Câbles électriques, installation - Gaines de protection - Méthodes d'essais - Partie 504 : Augmentation de temperature due à l'auto-échauffement d'un faisceau de câbles avec gaine de protection

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Aerospace series - Electrical cables, installation - Protection sleeves - Test methods - Part 504: Temperature rise within a loom due to self-heating when protected by a sleeve

Série aérospatiale - Câbles électriques, installation - Gaines de protection - Méthodes d'essais - Partie 504 : Augmentation de temperature due à l'auto-échauffement d'un faisceau de câbles avec gaine de protection

Luft- und Raumfahrt - Elektrische Leitungen, Installation - Schutzschläuche - Prüfverfahren - Teil 504: Temperaturanstieg durch Selbsterwärmung eines Leitungsbündels in einem Schutzschlauch

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Contents

Page

Foreword

This document (EN 6059-504:2014) 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of an identical text or by endorsement, at the latest by January 2015, and conflicting national standards shall be withdrawn at the latest by January 2015.

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1 Scope

This European Standard specifies methods of assessing the behaviour and temperature increase of cable loom when fitted with protection sleeves or conduits subject to normal and fault currents.

It shall be used together with EN 6059-100.

2 Normative references

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

EN 6059-100, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 100: General*

3 Equipment

The following equipment shall be required for these tests:

a) The test shall be carried out at ambient temperature in a chamber where the whole unit shall be sheltered from draughts. An extraction shall be provided but only operated after completion of the test.

b) To identify the appearance of smoke, a screen with black and white horizontal bands or any other device shall be used.

4 Preparation of test specimens

The test shall be carried out at ambient temperature T_a (typically 20 °C) in a chamber where the whole unit shall be sheltered from draughts. An extraction shall be provided but only operated after completion of the test.

To identify the appearance of smoke, a screen with black and white horizontal bands or any other device shall be used.

Means of electrical power connection at both extremities shall not provide any risks of temperature increase.

A 3 m long cable loom [1)] shall be laid up using air frame cables, who's maximum temperature rating is at least that of the sleeve material being tested, so that it forms a concentric bundle. The loom's conductors shall be wired in series so as to ensure that at the same current passes through each conductor. The resulting loom shall be of such a diameter that it fully fills the protective sleeve being tested. A means shall be provided so that the voltage drop across the centre conductor can be monitor over a length of at least 1,5 m (the test zone).

1) The temperature rating of the cables insulation shall be at least as high as that of the sleeve being tested.

5 Test methods

5.1 Method 1

5.1.1 Principle

Assessment of the increase in temperature caused by fitting a protective sleeve over a cable loom (heat transfer ratio).

5.1.2 Procedure

Suspend the cable loom (without the protective sleeve being fitted) so that at least the central 2 m section, including the test zone is horizontal and unsupported.

Suspend a weight from the ends of the cable in order to reduce sagging throughout the test Figure 1.

Apply a small electric current [2] I_{so} the conductor and measure the voltage drop over test zone V_{20}. Calculate the loom resistance R_{20}.

Now increase the current so as t_i significantly warm the loom by approximately 40 °C. Record the new current I_T and voltage drop values V_t. Using these values calculate the resistance of the wire conductor R_T.

The temperature T (in °C) of the wire conductor is determined from the change in resistance, using the following formula:

$$T = 20 + \frac{1}{\alpha}\left[\frac{R_t}{R_{20}} - 1\right]$$

where

R_t is the resistance (in Ω) of the conductor at temperature T;

R_{20} is the resistance (in Ω_) of the conductor at 20 °C;

T is the temperature of the conductor (in °C);

α see Table 1.

Table 1

Base metal	Copper alloy	Copper	Aluminium
α	0,003 5	0,004	0,004

Adjust the current so that the conductor temperature stabilizes at a temperature 40 °C above ambient. Maintain this temperature T_A for 30 min. and record the current that is being applied I_A to maintain it.

2) This current should not be so low that it does not increase the loom temperature.

The loom is now to be fitted with a length of over sleeve sufficiently long so as to completely cover the loom beyond the two voltage pick off points. The current I_A is to be reapplied and after 30 min the loom temperature T_B calculated.

The protective sleeve's heat transfer ratio shall now be calculated using the following formula:

$$\text{Heat transfer ratio} = \frac{T_A}{T_b} \times 100$$

5.2 Method 2

5.2.1 Principle

Assessment of internal overheating of a protective sleeve by the loom within.

5.2.2 Procedure

Suspend the cable loom (without the protective sleeve being fitted, so that at least the central 2 m section, including the test zone is horizontal and unsupported.

Suspend a weight from one end of the cable in order to reduce sagging throughout the test.

Apply a small electric current [2] I_{so} the conductor and measure the voltage drop over test zone V_{20}. Calculate the loom resistance R_{20}.

Now fit the protective sleeve with a length of over sleeve sufficiently long so as to completely cover the loom beyond the two voltage pick off points.

Raise the current within the loom so as to raise the temperature of the cable loom to value of the maximum rated temperature of the protective sleeve material T_T. Record the new current I_T and voltage drop values V_t. Using these values calculate the resistance of the wire conductor R_T.

The temperature T (in °C) of the wire conductor is determined from the change in resistance, using the following formula:

$$T = 20 + \frac{1}{\alpha}\left[\frac{R_t}{R_{20}} - 1\right]$$

where

R_t is the resistance (in Ω) of the conductor at temperature T;

R_{20} is the resistance (in Ω_) of the conductor at 20 °C;

T is the temperature of the conductor (in °C);

α see Table 1.

Now raise the loom temperature to a value T_2 which is 30 °C above the maximum rated temperature of the protective sleeve material. This temperature is to be maintained for 15 min.