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Coaxial communication cables – Part 1-209: Environmental test methods – Thermal cycling

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International Standard IEC 61196-1-209 has been prepared by subcommittee 46A: Coaxial cables, of IEC technical committee 46: Cables, wires, waveguides, R.F. connectors, R.F. and microwave passive components and accessories.

The text of this standard is based on the following documents:

FDIS	Report on voting
46A/1298/FDIS	46A/1301/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 61196 series published under the general title *Coaxial communication cables* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

COAXIAL COMMUNICATION CABLES –

Part 1-209: Environmental test methods – Thermal cycling

1 Scope

This part of IEC 61196 specifies a test method to determine the ability of a coaxial cable to withstand the effects of temperature cycling on its transmission performance.

The purpose of this procedure is to accelerate the effects of temperature cycling on a cable.

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.

IEC 61196-1, *Coaxial communication cables – Part 1: Generic specification – General, definitions and requirements*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 62506, *Methods for product accelerated testing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61196-1 apply.

4 Symbols

ΔT	difference between the upper and lower exposure temperature limits, in °C
ΔT_1	difference between the upper and lower operational temperature limits, in °C
ΔT_i	temperature change difference other than ΔT_1, in °C
ζ_{Test}	transition rate of temperature of the test, in °C/minute
A	adjustment factor for the number of cycles for different transition temperature rates and exposure temperatures limits than standard conditions
A_{tr}	adjustment factor for the number of cycles with regards to the transition rate
$A_{\Delta T}$	adjustment factor for the number of cycles with regards to the upper and lower exposure temperatures

5 Method

5.1 Thermal cycle profile method

The test shall be done in accordance with the IEC 60068-2-14 with a transition time of 2 °C/minute. The temperature exposure time should be at the upper and lower operational limits of cable (ΔT_1) as given in relevant cable specification, unless otherwise modified as described in 5.2.

A cycle shall consist of one complete exposure at upper and lower temperature test limits.

Twenty cycles should be conducted.

The time exposed at the upper and lower test temperatures shall be sufficient for the DUT to reach the specified temperature.

Mass and exposure times are given in Table 1.

Table 1 – Mass and exposure times

Mass of specimen/fixtures	Exposure time hr
≤ 30 g	¼
> 30 g to ≤ 150 g	½
> 150 g to ≤ 1,5 kg	1
> 1,5 kg to ≤ 7,5 kg	1,5
> 7,5 kg to ≤ 15 kg	2
> 15 kg to ≤ 75 kg	3
> 75 kg to ≤ 150 kg	4
> 150 kg	8

5.2 Adjustment factors

5.2.1 General

The number of cycles should be adjusted when the transition rate and temperature change varies from 5.1 by the following:

$$N = 20 \times A_{tr} \times A_{\Delta T} \quad (1)$$

The calculation will most likely lead to a number that will not be an integer and therefore will contain a fraction of a complete cycle. Any fraction of a cycle should be adjusted to the next higher integer number.

5.2.2 Transition rate adjustment factor

The number of cycles should be adjusted to other transition rates according to equation (1) and (2).

$$A_{\text{tr}} = \left(\frac{2}{\varsigma_{\text{Test}}} \right)^{1/3} \qquad (2)$$

The maximum adjustment factor should be limited to 4.

5.2.3 Upper and lower temperature exposure test adjustment factor

If different temperature exposure limits are used, the number of cycles should be adjusted as specified by the following.

$$A_{\Delta T} = \left(\frac{\Delta T_1}{\Delta T_i} \right)^{2,5} \qquad (3)$$

5.3 Sample

Electrical and mechanical tests shall be done on a 50 m ± 5 m length unless otherwise specified. Each test shall require a minimum of one sample.

The samples shall be loosely coiled in the test chamber to ensure that adjacent windings have airspace between each coil, adjacent samples, and walls of the chamber.

The mechanical sample shall be cut flush at both ends.

Suitable connectors shall be attached for the electrical tests.

Tests that should be considered are: impedance, return loss, passive intermodulation distortion, contact resistance, etc.

5.4 Requirements

The mechanical test shall monitor dielectric and conductor movement. The criteria for acceptance shall be described in the detailed specification.

The RF performance characteristics shall be evaluated at the conclusion of the test and may be also evaluated at intervals during the test. The criteria for acceptance shall be specified in the detailed specification.