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INTERNATIONAL STANDARD

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Coaxial communication cables –
Part 1-119: Electrical test methods – RF power for coaxial cables and cable assemblies

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COAXIAL COMMUNICATION CABLES –

Part 1-119: Electrical test methods – RF power for coaxial cables and cable assemblies

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IEC 61196-1-119 has been prepared by subcommittee 46A: Coaxial cables, of IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories. It is an International Standard.

This third edition cancels and replaces the second edition published in 2020. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) complete technical revision;
b) extension to measure also cable assemblies.

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The text of this International Standard is based on the following documents:

Draft	Report on voting
46A/1622/CDV	46A/1629/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all 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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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COAXIAL COMMUNICATION CABLES –

Part 1-119: Electrical test methods – RF power for coaxial cables and cable assemblies

1 Scope

This part of IEC 61196 provides test methods for RF power rating and power withstanding of RF coaxial cables and cable assemblies at specified frequency, temperature and altitude.

This document is applicable to RF coaxial cables and cable assemblies.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 61196-1-113, *Coaxial communication cables – Part 1-113: Electrical test methods – Test for attenuation constant*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
power rating
input power at a specified frequency and normalized environmental conditions, which can be handled continuously without either the maximum permissible operating voltage, or maximum inner conductor temperature being exceeded, when the cable assembly is terminated by a load corresponding to the characteristic impedance

3.2
power withstanding
ability of RF coaxial cable and cable assembly to handle power specified in the relevant specification at the temperature, altitude and frequency as specified

3.3
average power
energy transfer rate of an RF coaxial cable and cable assembly averaged over many periods of the RF waveform at the specified frequency, temperature and altitude

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3.4
peak power
maximum RF power P_{max} injected in a RF coaxial cable and cable assembly with a pulse duration τ over period T with the duty factor R at the specified temperature and altitude

Note 1 to entry: The relationship of duty factor, pulse duration and period is as shown in Figure 1 and expressed as Formula (1).

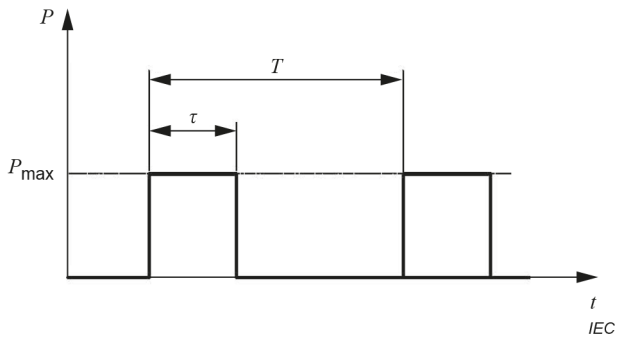

Figure 1 – Illustration of peak power

$$R = \frac{\tau}{T} \times 100\ (\%) \tag{1}$$

where:

R is the duty factor, in %;

τ is the pulse duration, in s;

T is a period of pulse, in s.

3.5
continuous wave power
when duty factor R = 1 in Formula (1), the power curve in Figure 1 approximates a straight line

4 Preparation of test sample (TS)

4.1 Coaxial cable

Both ends of the coaxial cable should be terminated with suitable high-power RF coaxial connectors to make an RF cable assembly as a test sample (TS). The length of the cable should be long enough so that the heat dissipation caused by the connectors at both ends can be negligible. The selected connectors shall be suitable to connect to the test equipment directly. Their RF power rating shall be higher than the RF power of the coaxial cable to be tested.

For a test of average power and continuous wave power rating the temperature of the inner conductor of the TS shall be monitored.

a) Drill a small hole at the centre of the cable length and at least 0,5 m away from both sides of the TS so that a temperature sensor can be inserted to measure the temperature of the inner conductor.

b) Insert a temperature sensor (such as fibre optic temperature sensor) into the hole to measure the temperature T_i of the inner conductor.

If specified in the relevant specification the temperature of the inner conductor of the TS shall also be monitored as well for a power withstanding test. If the temperature rating of the dielectric and inner conductor is not a concern, the test can be conducted without monitoring the temperature of the inner conductor.

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4.2 Cable assembly

Each cable assembly to be tested shall be a test sample (TS).

For a test of average power and continuous wave power rating the temperature of the inner conductor of the TS shall be monitored.

The TS shall be prepared as follows:

a) Drill a small hole at the centre of the cable length, and at both ends of connectors and also at both connections between the connector and the cable respectively so that a thermosensor can be inserted to measure the temperature of the inner conductor. If the least cross section of the connector is neither positioned at the end of the connector nor on the connection between connector and cable, drill also a hole on the position with the least cross section.

b) Insert a thermocouple (such as fibre optic temperature sensor) into each hole to measure the temperature T_{ix} of the inner conductor.

If specified in the relevant specification, the temperature of inner conductor of the TS shall also be monitored for a power withstanding test. If the temperature rating of the dielectric and inner conductor is not a concern, the test can be conducted without monitoring the temperature of the inner conductor.

5 Test conditions

The test shall be performed at stable conditions of temperature and atmospheric pressure.

a) Temperature stability:

When the temperature variation of the test sample is not more than ±2 °C within 5 min, the temperature shall be considered stable.

When using a test chamber, the temperature shall be considered stable when the temperature variation of the chamber and the test sample is no more than ±2 °C within 5 min.

b) Altitude stability:

When the power rating is specified for a specific altitude, the altitude is considered stable when the pressure variation inside the low-pressure test chamber is within the range of ±5 % of the specified value within 10 min.

6 Test principle

A combination of power source, directional coupler, fixed attenuator (when required), power meter and load are used for the test, as shown in Figure 2. At the directional coupler, the incident power P_i is split between the coupled port P_f and the transmitted port that is connected to the TS. The reference power P_0 is measured by a power meter. If necessary, a fixed attenuator can be inserted between the directional coupler and power meter to adjust the power level to the test range of the power meter. A feed line may also be used. If a feed line is used, the input power of the test sample will be attenuated by the feed line. The TS is terminated with a load.

Since the coupling factor C (calculated from Formula (2)) of the coupler, attenuation value D (calculated from Formula (3)) of the fixed attenuator and the attenuation A of the feed line (if used) are fixed, the actual input power of the sample can be obtained from Formula (4).

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