



SLOVENSKI STANDARD

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Sectional specification: Microwave modular electronic units of assessed quality - Part 2: Index of test methods

Sectional specification: Microwave modular electronic units of assessed quality -- Part 2:
Index of test methods

Rahmenspezifikation: Elektronische Mikrowellenmodule mit bewerteter Qualität -- Teil 2:
Verzeichnis der Prüfverfahren

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ICS:

31.190	Sestavljeni elektronski elementi	Electronic component assemblies
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English version

**Sectional specification:
Microwave modular electronic units of assessed quality
Part 2: Index of test methods**

Rahmenspezifikation:
Elektronische Mikrowellenmodule
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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC 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 CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This sectional specification has been prepared by the United Kingdom under the single originator procedure for approval and publication of CECC specifications (see RP 11: Part V). It is to be used for the assessment of Microwave Modular Electronic Units (MMEUs) within the CECC capability approval scheme. The content is in accordance with the generic specification for Modular Electronic Units (MEU's) EN 160000 and meets the requirements of Rules of Procedure 14 (RP 14).

This part 2 is to be read in conjunction with Part 1 of EN 160200, which details the requirements for obtaining Capability Approval and Specification of MMEUs.

It is based wherever possible, on the publications of the International Electrotechnical Commission.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 160200-2 on 1997-07-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 1998-06-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 1998-06-01



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Section 1 General matters

1.1 Scope

This Part 2 of the Sectional Specification EN 160200 defines standard/reference test methods for Electrical, Mechanical and Visual Inspection as prescribed in Part 1 of the Sectional Specification EN 160200 and Blank Detail Specification EN 160201 for Microwave Modular Electronic Units (MMEUs).

Section three of EN 160200-1 details general requirements for test and measurement procedures (including environmental test requirements).

This Standard specifies a wide range of documents which relate to microwave test methods. Many of which are not covered by IEC or CECC specifications. Although a number of test methods are under preparation by IEC and CECC they are considered acceptable for use in this Standard. Where test methods have been considered suitable for insertion into this Standard they are either referenced under clause 2.4 - Standard Test Methods or detailed in full under clause 2.5 - Special Test Methods.

Examples of MMEUs which are covered by these test methods are:

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- Amplifiers
 - Attenuators
 - Couplers/Power dividers
 - Filters
 - Isolators/Circulators
 - Limiters
 - Mixers
 - Noise Sources
 - Oscillators
 - Phase Shifters
 - Switches
 - Transmitters (e.g. Integrated Multichannel)

Guidance on the prime electrical characteristics to be measured is given in annex C of the Blank Detail Specification (BDS) - EN 160201.

This Part 2 of EN 160200 will be reviewed as other test methods become available.

1.2 Related documents

See clause 1.2 of EN 160 000 and 1.2 of EN 160200-1.

Latest issue of the following documents applies unless otherwise stated:

1.2.1 IEC specifications

IEC 154-1: 1982

Flanges for waveguides:

IEC 169 (Part 1 to 22)

Radio frequency connectors [CECC 22000 also relates]

Proposed IEC Documents Waveguides and their accessories:
Prepared by IEC TC 46B

- 46B(Secretariat)161 Electromagnetic Compatibility Measurement to be made on Waveguide and Waveguide Assemblies
- 46B(Secretariat)162 Measurement of Return Loss on Waveguide and Waveguide Assemblies
- 46B(Secretariat)163 Graphical Method for the Determination of Waveguide Performance
- 46B(Secretariat)164 Waveguide and Waveguide Assembly Attenuation
- 46B(Secretariat)165 Waveguide Power Holding Capability
- 46B(Secretariat)166 Variation of Group Delay
- 46B(Secretariat)167 Level of Intermodulation Products
- 46B(Secretariat)168 Decoupling and Rotation of the Plane of Polarization
- 46B(Secretariat)169 Reflection Coefficient at Rectangular Waveguide Interfaces
- 46B(Secretariat)170 RF Gaskets and Metallic Shims
- 46B(Secretariat)171 Revised Proposal for 'B' Type Flanges Employing Circular Positional Tolerancing Method of Dimensioning

1.2.2 CECC specifications

- CECC 00 009 Basic specification: Basic testing procedures and measuring methods for Electromechanical Components
- CECC 00 010 Basic specification: Printed Circuit Boards - Test Methods
- CECC 00 803 Visual Inspection of Surface Mounted Assemblies
- EN 135000 Generic specification: Travelling Wave Amplifier Tubes
- EN 136000 Generic specification: Magnetrons
- CECC 45000 Generic specification: Space-Charge Controlled Tubes

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EN 160000	Modular Electronic Units (MEUs)
prEN 160100	Printed Wiring Assemblies
EN 160200-1	Sectional Specification: Microwave Modular Electronic Units of Assessed Quality - Part 1: Capability Approval
EN 160201	Blank Detail Specification; Microwave Modular Electronic Units of Assessed Quality - Capability Approval
CECC 63 000	Generic specification: Film and Hybrid Integrated Circuits
EN 169000	Generic specification: Quartz Crystal Controlled Oscillators

1.2.3 Specification sources

- IEC and CECC Specifications: for more information contact the relevant National Authorized Institution (ONH).

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Section 2 Test and measurement procedures

2.1 General

This section contains test methods which are applicable to MMEUs. The Standard conditions of test and general requirements for environmental, visual, mechanical and electrical test methods are given in Section Three of EN 160200-1. It is permissible to sub-contract testing to a CECC approved laboratory - see clause 3.1.2 of CECC 00114: Part III.

For the selections of other test methods not specified in this Standard see guidance given in clause 3.1 of EN 160200-1. When performing tests, the conditions of clause 3.2 of EN 160200-1 shall be met.

It should be noted that basic testing procedures and measuring methods for Electromechanical Components and Component Boards (Printed Wiring Boards) are detailed in CECC 00 009 and CECC 00 010 respectively.

Handling components and electronic assemblies shall be controlled to prevent contamination. As a general rule solderable surfaces shall not be handled with bare hands or fingers. Gloves, if worn, shall be changed as often as necessary to avoid handling parts with dirty or worn gloves.

When components are present which may be damaged by electrical overstress (EOS) or electrostatic discharge (ESD), all handling, assembly, inspection and testing shall take place at an EOS/ESD safe work station [see EN 100015: Basic specification: Protection of electrostatic sensitive devices].

2.2 Special conditions for testing

2.2.1 Precautions

Particular attention is drawn to the following hazards:

- a) **RF burns.** Personnel shall not be exposed to strong r.f. connectors or open waveguides that are transmitting power which may cause burns to the skin.

b) **RF radiation.** Components shall be so designed that personnel cannot come into contact with r.f. fields, even at relatively low frequencies. Absorption of r.f. energy by the human body is dependent on frequency and, although at frequencies below 30 MHz most energy passes straight through the body with little heating effect, it still presents a hazard. To minimize leakage of r.f. energy all r.f. connectors, waveguide coupling flanges and cavities shall be correctly fitted and the transmission lines efficiently coupled to a load, before the component is energized with r.f.

In particular, care has to be taken to ensure that the eyes are not subjected to r.f. radiation.

c) **Beryllium oxide ceramics.** This material may be used in some components (usually marked with a blue band or BeO). Beryllium oxide dust, or fumes containing it, are highly toxic if inhaled or if particles enter the body via a cut or abrasion. Avoid handling beryllium oxide ceramics; if they are touched, wash the hands before smoking or eating. Do nothing to beryllium oxide ceramics that may produce dust. Cleaning information is available from the manufacturer.

d) **Implosion and explosion.** All evacuated or pressurized components store potential energy which is released if they are broken. The energy level is low in small devices, but may be considerable in large ones.

Components shall be stored and transported in their approved package. During installation or replacement any glass or ceramic seals should be treated with care and not subjected to scratching or physical force.

The user shall be protected against implosion or explosion of the component when it is installed in test equipment.

2.2.2 Interface devices

Interface devices are usually necessary to provide for connection of the microwave item to the test equipment and to generate specialize test stimuli. Particular care is necessary to avoid hazards when flanges are disconnected. With Automatic Test Equipment (ATE) it may be necessary to disable the source as part of the programme before an operator instruction is given for such a disconnection. Provision may also be needed for supporting and moving microwave components at the heights required for testing. Some types of short circuits and shorting loops in microwave components can sometimes be utilized for a d.c. continuity test to check system completeness. Where the power in the system is significant, an r.f. power flux density check for personnel safety should precede any other testing.

2.2.3 High power circuits

In high power circuits such as those associated with transmitters, particular problems arise. The presence of high voltage, high thermal dissipation, etc, may limit the amount of safe direct test access. In some cases pick-up loops or similar devices may be provided for test sampling. It is important that the test access provisions for the earlier low power stages should be well thought out. Some characteristics of the high power stage may be measured by indirect methods, e.g. output power via a liquid or air-cooled artificial load equipped with suitable calorimetric or direct power indication. Test access provisions shall not be such that X-ray or r.f. radiation screens need to be removed unless some other adequate form of screening is substituted. Particular care is needed in providing an effective r.f. earth for test measurement. Test points shall be so positioned that r.f. or high voltage flash-over to the test connections cannot occur. Transmitters which are to be tested by ATE may need to be equipped with additional sensors to be monitored by the ATE, in the same way as the test operator would do visually in manual testing. These may include temperature, air to liquid coolant flow, V.S.W.R., etc.

2.2.4 Other constraints

Apply as defined in the relevant test method procedure.

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2.3 Selection guide

The test methods detailed herein are either referenced where suitable international/national documents exist (see clause 2.4) or alternatively fully defined (see clause 2.5). Tests should be selected in the following order:

- a) Standard Test Methods (see 2.4).
- b) Special Test Methods (see 2.5).
- c) Alternative test methods (see 2.6).

Due to the complex nature of MMEUs many of the test methods are applicable to more than one generic function (see 2.2.4 2) of EN 160200-1). A test method may be detailed under a particular generic function, but, it may also apply to other generic functions.

A summary of test groups are given below:

Table 1: Test group selection matrix

Test group description	Clause No.
Amplifiers	2.4.3 1)
Attenuators	2.4.3 2)
Coaxial components	2.4.2 1)
Diode and transistor circuits	2.4.2 2)
Integrated electronic circuits and micro-assemblies	2.4.2 3)
Isolators and circulators	2.4.3 3)
Microwave tubes	2.2.2 4)
Miscellaneous	2.5 - 3000 Series
Mixers	2.5 - 1000 Series
Noise sources	2.4.3 4)
Oscillators	2.4.3 5) 2.5 - 2000 Series
Passive component circuits	2.4.2 5)
Visual inspection	2.4.1
Waveguide components	2.4.2 6)

2.4 Standard test methods

These test methods have been established through international or national publications. The test details are not repeated in this Standard, only the controlling source document and associated reference is given and each test group is listed on a separate page for ease of reference. The test methods are listed as follows:

- a) Visual inspection.
- b) Circuit components.
- c) Generic function.

2.4.1 Visual inspection

Source	Test method	Ref.
CECC 00 803 Visual Inspection of Surface Mounted Assemblies	Post-soldering Visual inspection	
prEN 160 100 Printed Wiring Assemblies	Visual Inspection	3.4
	Dimensioning and gauging	3.5

2.4.2 Circuit components**2.4.2.1 Coaxial components**

Source	Test method	Ref.
IEC 169 (Part 1 to 22) Radio frequency connectors: [CECC 22000 also relates]	Mechanical and Electrical Test	-

2.4.2.2 Diode and transistor circuits

Source	Test method	Ref.
Under consideration		

2.4.2.3 Integrated electronic circuits and micro-assemblies

Source	Test method	Ref.
CECC 63 000 Film and hybrid integrated circuits - Section 4	Assembly - Mechanical attachment and electrical connection of parts to the substrate	Clause 3
	Assembly - Mechanical attachment and electrical connection of substrate to package	Clause 4
	Wire interconnections	Clause 5

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2.4.2.4 Microwave tubes

Source	Test method	Ref.
EN 135000 Generic specification: Travelling wave amplifier tubes	Select as necessary	
CECC 45 000 Generic specification: Space-charge controlled tubes	Select as necessary	
EN 136000 Generic specification: Magnetrons	Select as necessary	

2.4.2.5 Passive components circuits

Source	Test method	Ref.
Under consideration		

2.4.2.6 Waveguide components

Source	Test method	Ref.
IEC 154-1: 1982 Flanges for waveguides:	Mechanical requirements	2
Proposed IEC Documents Prepared by IEC TC 46B	Waveguides and their accessories:	
	Electromagnetic Compatibility Measurement to be made on Waveguide/Waveguide Assemblies	46B(Sec)161
	Measurement of Return Loss on Waveguides and Waveguide Assemblies	46B(Sec)162
	Graphical Method for the determination of Waveguide Performance	46B(Sec)163
	Waveguide/Waveguide assembly attenuation	46B(Sec)164
	Waveguide Power Holding Capability	46B(Sec)165
	Variation of Group Delay	46B(Sec)166
	Level of Intermodulation Products	46B(Sec)167

Decoupling and Rotation of the Plane of Polarization	46B(Sec)168
Reflection Coefficient at Rectangular Waveguide Interfaces	46B(Sec)169
RF Gaskets and Metallic Shims	46B(Sec)170
Revised Proposal for 'B' Type Flanges Employing Circular Positional Tolerancing Method of Dimensioning	46B(Sec)171

2.4.3 Generic function

2.4.3.1 Amplifiers

Source	Test method	Ref.
Under consideration		

2.4.3.2 Attenuators

Source	Test method	Ref.
Under consideration		

2.4.3.3 Isolators/circulators

Source	Test method	Ref.
Under consideration		

2.4.3.4 Noise sources

Source	Test method	Ref.
Under consideration		

2.4.3.5 Oscillators

Source	Test method	Ref.
Under consideration		

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