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Dynamic modules – **STANDARD PREVIEW**
Part 1-3: Performance standards – Dynamic gain tilt equalizer (non-connectorized)
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Modules dynamiques – **Performance – Egaliseur dynamique de basculement de gain (non-connectorisé)**



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Dynamic modules – Part 1-3: Performance standards – Dynamic gain tilt equalizer (non-connectorized)

Modules dynamiques – Partie 1-3: Normes de performance – Egaliseur dynamique de basculement de gain (non-connectorisé)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DYNAMIC MODULES –

**Part 1-3: Performance standards –
Dynamic gain tilt equalizer (non-connectorized)**

FOREWORD

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International Standard IEC 62343-1-3 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

This second edition cancels and replaces the first edition published in 2006. It constitutes a technical revision.

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

- a) a change in the title removing the environmental category;
- b) the addition of Clause 4, Operating and storage conditions;
- c) the inclusion of spectral bands in Clause 5, Test;
- d) a definition of the wavelength range for test requirements in Clause 5, Test;
- e) the removal of the environment tests from the test details and requirements.

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

CDV	Report on voting
86C/1077/CDV	86C/1092/RVC

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 parts in the IEC 62343 series, published under the general title *Dynamic modules*, 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 web site 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- withdrawn,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.

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DYNAMIC MODULES –

Part 1-3: Performance standards – Dynamic gain tilt equalizer (non-connectorized)

1 Scope

This part of IEC 62343 contains the guideline minimum initialization test and measurement requirements and severities, for a dynamic gain tilt equalizer (DGTE).

A DGTE is used in an optical amplifier, which operates in C-band and/or L-band, to control the output power of the amplifier to be nominally flat. The operating wavelength range of a DGTE is wider than or equal to 35 nm.

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 61300-2-14, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-14: Tests – Optical power handling and damage threshold characterization*

IEC 62343-1-3:2012

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IEC 61300-3-2, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-2: Examinations and measurements – Polarization dependent loss in a single-mode fibre optic device*

IEC 61300-3-6, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-6: Examinations and measurements – Return loss*

IEC 61300-3-7, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-7: Examinations and measurements – Wavelength dependence of attenuation and return loss of single mode components*

IEC 61300-3-32, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-32: Examinations and measurements – Polarization mode dispersion measurement for passive optical components*

IEC 61300-3-38, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-38: Examinations and measurements – Group delay, chromatic dispersion and phase ripple*

IEC 61753-021-2, *Fibre optic interconnecting devices and passive components performance standard – Part 021-2: Grade C/3 single-mode fibre optic connectors for category C – Controlled environment*

IEC 61753-022-2, *Fibre optic interconnecting devices and passive components performance standard – Part 022-2: Fibre optic connectors terminated on multimode fibre for category C – Controlled environment*

IEC 62343-5-1, *Dynamic modules – Test methods – Part 5-1: Dynamic gain tilt equalizer – Response time measurement*

ITU-T Recommendation G.692, *Optical interfaces for multichannel systems with optical amplifiers*

3 Terms and definitions

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

3.1

dynamic spectral equalizer

DSE

two port in-line dynamic module that converts an input signal with time-varying spectral shape into an output signal in which spectral shape is nominally flat, or is set for a required spectral shape for pre-emphasis

3.2

dynamic gain tilt equalizer

DGTE

dynamic spectral equalizer used in an optical amplifier that converts input signals with time-varying gain tilt into output signals in which gain tilt is nominally flat, or is set for a required gain tilt

3.3

operating wavelength range

specified range of wavelengths about a nominal operating wavelength within which a dynamic module is designed to operate with the specified performances

3.4

dynamic gain tilt range

difference between the maximum and minimum deviation of attenuation over operating wavelength range, to which the dynamic gain tilt equalizer can be set

3.5

positive slope type

type of DGTE for which dynamic gain tilt range can be set for positive gain tilt

3.6

negative slope type

type of DGTE for which dynamic gain tilt range can be set for negative gain tilt

3.7

both slope type

type of DGTE to which dynamic gain tilt range can be set for both positive and negative gain tilt

3.8

slope linearity

maximum deviation of attenuation between the spectral shape by dynamic gain tilt equalizer and linear slope over the operating wavelength range

3.9

gain tilt settle time

longest elapsed time it takes a dynamic gain tilt equalizer to change a gain tilt setting from an arbitrary initial gain tilt value to a desired final gain tilt value, when the resulting gain tilt target tolerance is met

4 Operating and storage conditions

4.1 Operating conditions

Table 1 shows minimum requirements of operating conditions for dynamic gain tilt equalizers for commercial use.

Table 1 – Operating conditions

Items	Conditions
Operating temperature range	–10 °C to 60 °C, case temperature ^a
Operating relative humidity range	5 % to 85 % RH. Absolute humidity is within 24 g per 1 kg dry air
Operating shock ^b	400 m/s ² , 5 ms
Operating vibration ^b	50 Hz – 500 Hz, 20 m/s ²
^a A position on the surface of a module to be measured for temperature shall be defined. When a dynamic module does not emit heat, a position need not be defined.	
^b If the modules are critical to satisfy the severities of operating shock and operating vibration conditions, the following severities can be adopted: <ul style="list-style-type: none"> – for the axis of the perpendicular direction of the mounting surfaces <ul style="list-style-type: none"> • 400 m/s², 5 ms for operating shock, • 50 Hz – 500 Hz, 20 m/s² for operating vibration; – for the two other axes of parallel direction of the mounting surfaces <ul style="list-style-type: none"> • 200 m/s², 5 ms for operating shock, • 50 Hz – 500 Hz, 10 m/s² for operating vibration. 	

4.2 Storage environmental conditions

Table 2 shows minimum requirements of storage environmental conditions for dynamic gain tilt equalizers for commercial use.

Table 2 – Storage environmental conditions

Items	Conditions
Storage temperature range	– 20 °C à 70 °C, ambient
Storage relative humidity range	5 % to 85 % RH. The absolute humidity is within 24 g per 1 kg dry air
Non-operating shock (for components)	5 000 m/s ² , 1 ms, half sine, for less than or equal to 0,125 kg weight
Non-operating shock (for modules)	2 000 m/s ² , 1,33 ms, half sine for more than 0,125 kg weight, and less than or equal to 0,225 kg weight. 500 m/s ² , 5 ms, half sine for more than 0,225 kg weight, and less than or equal to 1 kg weight
Non-operating vibration	10 Hz – 55 Hz for frequency, 1,52 mm for amplitude

Items	Conditions
Non-operating impact (drop, for modules)	100 mm height for 1 kg to 10 kg weight, 75 mm height for 10 kg to 25 kg weight
Transportation impact (drop, packed)	1 m height
Transportation vibration (packed)	5 Hz – 20 Hz for frequency, 0,1 m/s ² /Hz (2 m/s ² at 20 Hz) 20 Hz – 200 Hz, -3 dB/octave

5 Test

The characterization of a dynamic gain tilt equalizer requires demonstration that those components or features within the module, together with that of the module itself, are capable of yielding the performance requirements as defined in the relevant specification.

Where it can be adequately demonstrated that components or features have previously met all of the requirements of a specific performance standard category, they may be declared as complying with that performance standard. This may obviate the need for repeat testing of components or features in such cases. Where this occurs, reference shall be made to the relevant test reports or documentations.

All tests are to be carried out to validate performance over the required operating wavelength range (wider than or equal to 35 nm). As a result, single or multiple spectral bands may be chosen for the qualification and differing target specifications may be assigned to each spectral band (C-band or L-band).

6 Test report

<https://standards.iteh.ai/catalog/standards/sist/c2ecd5e-31d3-4ed5-b85b-005cd400ef55/iec-62343-1-3-2012>

Fully documented test reports and supporting evidence shall be prepared and be available for inspections as evidence that the tests have been carried out and complied with.

7 Performance requirements

7.1 Dimensions

Dimensions shall comply either with an appropriate IEC interface standard or with those given in the manufacturer's drawings, where the IEC interface standard does not exist or cannot be used.

7.2 Sample size

Three (3) DGTE modules are used in each test. The tests may be performed individually or in sequential order.

The test sample size and sequencing requirements for the module components shall be defined in the relevant specification.

7.3 Test details and requirements

The requirements are given only for non-connectorized DGTE devices. For connectorized modules, the connector performances shall be in compliance with IEC 61753-021-2 and IEC 61753-022-2.

The channel spacings, unless otherwise specified, shall be in accordance with ITU-T Recommendation G.692.

The test details and requirements for performance standard are shown in Table 3.

For sequential testing, the data shall be analysed to determine the pass or failure for each test.

The following table provides figures as a guideline of performance requirements and are not indicative of values that must be met in an operational environment.

Table 3 – Test details and requirements

No	Tests	Requirements	Details
1	Dynamic gain tilt range IEC 61300-3-7	From –4 dB to +4 dB for both slopes type From 0 dB to +4 dB for positive slope type From –4 dB to 0 dB for negative slope type	61300-3-7, method B TLS (tuneable light source); Wavelength uncertainty: ≤ 0,1 nm, Wavelength increment: ≤ 0,5 nm. Other details: accordance with IEC 61300-3-7.
2	Insertion loss IEC 61300-3-7	≤ 5 dB for positive/negative slope type. The insertion loss for positive /negative slope type is defined as the insertion loss at longest operating wavelength, and shortest operating wavelength, respectively. ≤ 2,5 dB for both slope type The insertion loss for both slope type is defined as the insertion loss at the centre wavelength of operating wavelength range.	Dynamic gain tilt range is calculated from the interpolated line by least square method over operating wavelength range. Dynamic gain tilt range is the differences of optical attenuation of the interpolated line between at the longest wavelength and at the shortest wavelength. Insertion loss is calculated as average of optical attenuation over all polarization state.
3	Slope linearity IEC 61300-3-7	≤ 0,8 dB Slope linearity shall be met over operating wavelength range	Slope linearity is calculated as the maximum deviation of optical attenuation between the interpolated line and the measured optical attenuation over operating wavelength range
4	Return loss IEC 61300-3-6	> 45 dB for class W Return loss shall be measured for input port and output port.	Branching devices method. Branching device: Nominal splitting ratio: 50/50 % Directivity: > 60 dB Source: Type: LD Centre wavelength: 1 550 nm ± 20 nm or 1 590 nm ± 20 nm. Spectral width: < 20 nm. Stability at operating wavelength in a period of at least 1 h: within ± 0,05 dB. Detector: Sensitivity: < –80 dBm Linearity: within ±0,05 dB Other port not under test shall be terminated to avoid unwanted reflections contributing to the measurement