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Dynamic modules –

Part 1-2:
Performance standards –
Dynamic chromatic dispersion compensator with pigtails for use in controlled environments (Category C)

Modules dynamiques –

Partie 1-2:
Normes de qualité de fonctionnement –
Compensateur de dispersion chromatique dynamique avec fibres-amorces, pour usage en environnements contrôlés (Catégorie C)

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FOREWORD

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International Standard IEC 62343-1-2 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

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

CDV	Result of voting
86C/698/CDV	86C/755/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 of IEC 62343 series, 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 maintenance result 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- withdrawn,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.

DYNAMIC MODULES –

Part 1-2: Performance standards – Dynamic chromatic dispersion compensator with pigtails for use in controlled environments (Category C)

1 Scope

This part of IEC 62343 contains the minimum initialisation test and measurement requirements and severities, which an optical dynamic chromatic dispersion compensator (DCDC) shall satisfy in order to be categorised as meeting the requirements of DCDC used in controlled environments. The requirements cover optical dynamic chromatic dispersion compensators for Category C – Controlled environments.

2 Normative references

The following referenced documents are indispensable for the application 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 61300 (all parts), *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*

IEC 61300-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 1: General and guidance*

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

IEC 61300-3-29, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-29: Examinations and measurements – Measurement techniques for characterizing the amplitude of the spectral transfer function of DWDM 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 61753-021-2: *Fibre optic interconnecting devices and passive components performance standard – Part 021-2: Fibre optic connectors terminated on single-mode fibre for category C – Controlled environment*

ITU-T Recommendation G.671: *Transmission characteristics of optical components and sub-systems*

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

ITU-T G. Sup39: *Optical system design and engineering considerations*

3 Terms and definitions

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

3.1
dynamic chromatic dispersion compensator
two-port in-line device that is capable of transforming, by internal or external automatic control, an input signal with time-varying dispersion into an output signal in which an output channel dispersion value is set for a required level of value

3.2
operating wavelength range
the specified range of wavelengths from $\lambda_{i\min}$ to $\lambda_{i\max}$ about a nominal operating wavelength λ_I, within which a dynamic optical module is designed to operate with a specified performance

3.3
channel frequency range
the frequency range within which a device is expected to operate with a specified performance. For a particular nominal channel central frequency, f_{nomi}, this frequency range is from $f_{imin} = (f_{nomi} - \Delta f_{max})$ to $f_{imax} = (f_{nomi} + \Delta f_{max})$, where Δf_{max} is the maximum channel central frequency deviation.

3.4
insertion loss ripple
the maximum peak-to-peak variation of the insertion loss within a channel frequency (or wavelength) range

3.5
channel spacing
the centre to centre difference in frequency (or wavelength) between adjacent channels in a device

3.6
dispersion tuning time
the longest elapsed time it takes a module to change a dispersion setting from an arbitrary initial dispersion value to a desired final dispersion value, when the resulting dispersion target tolerance is met

4 Test

4.1 General

The characterization of a dynamic chromatic dispersion compensator 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 documentation.

4.2 Module

Unless otherwise specified, all DCDC module test methods shall be in accordance with the IEC 61300 series.

DCDC modules used for each test are intended to be previously unstressed new samples but may be selected from previously used samples if desired. Each test defines the number of samples to be evaluated.

All measurements shall be carried out at standard test conditions, as defined in IEC 61300-1, unless otherwise stated. If the module is provided with an active temperature control, this shall be set at the setpoint specified by the manufacturer.

The defined performance requirements apply to every combination of input and output port, over all polarization states and over all specified environmental conditions.

4.3 Spectral bands

All tests are to be carried out to validate performance over the required operating wavelength range. 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.

Table 1 is intended to provide guidance on the wavelength ranges of the various spectral bands. It is not intended for specification. Values of operating wavelength used in performance verification shall be specified between the customer and supplier or shall be as defined in the manufacturer's specification.

Table 1 – Spectral bands for single-mode systems (ITU-T G. Sup39)

Band	Descriptor	Range nm
O-band	Original	1 260 to 1 360
E-band	Extended	1 360 to 1 460
S-band	Short wavelength	1 460 to 1 530
C-band	Conventional	1 530 to 1 565
L-band	Long wavelength	1 565 to 1 625
U-band	Ultralong wavelength	1 625 to 1 675

5 Test report

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.

6 Reference modules

The testing for these modules does not require the use of reference modules.

7 Performance requirements

7.1 Dimensions

Dimensions shall comply with either 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) DCDC modules are used in each module test. The tests may be performed individually or in sequential order.

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

7.3 Test details and requirements

The requirements are given only for non-connectorised DCDC modules. For connectorised modules, the connector performances shall be in compliance with IEC 61753-021-2.

A minimum length of fibre or cable of 1,5 m per port shall be included in all climatic and environmental tests.

Unless otherwise specified, the insertion loss and the bandpass of the device during an environmental test shall be measured for a single input/output port combination.

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

The test details and requirements for performance standard category C are shown in Tables 2 and 3.

Table 2 – Test and requirements for type A
(Multi/single channel type DCDC with large dispersion variable range)

No	Tests	Requirements	Details
1A	Channel frequency range	(ITU-T-grid) ±10 GHz (for 10 Gbps) (ITU-T-grid) ±40 GHz (for 40 Gbps)	ITU-T Recommendation G.671
2A	Dispersion variable range	–1 800 ps/nm to +1 800 ps/nm (for 10 Gbps) –400 ps/nm to +400 ps/nm (for 40 Gbps)	Method under consideration
3A	Insertion loss	≤ 12 dB	IEC 61300-3-29
4A	Insertion loss ripple	< 0,5 dB over the channel frequency range	IEC 61300-3-29
5A	Group delay ripple	≤ ± 6 ps (for 10 Gbps) ≤ ± 2 ps (for 40 Gbps)	Method under consideration Method under consideration
6A	Polarization dependent loss	≤ 0,6 dB over the channel frequency range	IEC 61300-3-2
7A	Inter-channel loss uniformity	≤ 0,85 dB (Only multi-channel type)	IEC 61300-3-29
8A	Polarization mode dispersion	≤ 3 ps (for 10 Gbps) ≤ 1 ps (for 40 Gbps)	IEC 61300-3-32 JME/PSA, PPS methods
9A	Dispersion setting error	≤ ± 5 ps/nm	The same as in test no.2
10A	Dispersion tuning time	≤ 30 s	
11A	Power consumption	≤ 10 W	
12A	Optical power handling and damage threshold characterisation	+23 dBm	Method under consideration