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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Dynamic modules – Part 3-3: Performance specification templates – Wavelength selective switches

Modules dynamiques – Partie 3-3: Modèles de spécification de performance – Commutateurs sélectifs en longueur d'onde

IEC 62343-3-3:2020-04(en-fr)

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FOREWORD

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International Standard IEC 62343-3-3 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 2014. This edition constitutes a technical revision.

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

a) modification of the normative references;
b) modification of the terms and definitions.

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

FDIS	Report on voting
86C/1648/FDIS	86C/1655/RVD

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

This document 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 document will remain unchanged until the stability date indicated on the IEC website under "http://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- withdrawn,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
- amended.

INTRODUCTION

A wavelength selective switch (WSS) is a dynamic module (DM), which is mainly used in a reconfigurable optical add-drop multiplexer (ROADM) system to switch a particular wavelength signal to any output ports in DWDM networks. The WSS has one input port and a plurality of output ports (i.e. $1 \times N$ WSS) and can be used in reverse, with N input ports and one output port, depending on its application. It is controlled with software, which determines any wavelength signal among a DWDM signal from one input port to switch to a particular output port in case of $1 \times N$ application.

DYNAMIC MODULES –

Part 3-3: Performance specification templates – Wavelength selective switches

1 Scope

This part of IEC 62343 provides a performance specification template for wavelength selective switches. The object is to provide a framework for the preparation of detail specifications on the performance of wavelength selective switches.

Additional specification parameters are often included for detailed product specifications or performance specifications if necessary. However, specification parameters specified in this document are not removed from the detail product specifications or performance specifications.

The technical information regarding wavelength selective switches and their applications in DWDM systems with single-mode fibres are described in IEC TR 62343-6-4.

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 61290-7-1, *Optical amplifiers – Test methods – Part 7-1: Out-of-band insertion losses – Filtered optical power meter method*

IEC 61300-2-14, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-14: Tests – High optical power*

IEC 61300-3-2, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-2: Examination 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 61300-3-14, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-14: Examinations and measurements – Error and repeatability of the attenuation settings of a variable optical attenuator*

IEC 61300-3-21, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-21: Examinations and measurements – Switching time*

IEC 61300-3-29, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-29: Examinations and measurements – Spectral transfer characteristics of DWDM devices*

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 62074-1, *Fibre optic interconnecting devices and passive components – Fibre optic WDM devices – Part 1: Generic specification*

IEC 62343, *Dynamic modules – General and guidance*

IEC 62343-1, *Dynamic modules – Part 1: Performance standards – General conditions*

IEC 62343-5-2, *Dynamic modules – Part 5-2: Test methods – 1 x N fixed-grid WSS – Dynamic crosstalk measurement*

ITU-T Recommendation G.694.1, *Spectral grids for WDM applications: DWDM frequency grid*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 62343 apply.

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

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

4 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.

5 Performance requirements

5.1 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.

5.2 Sample size

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

5.3 Test details and requirements

Requirements are given only for non-connectorized WSS devices. For connectorized components, 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 tests.

NOTE A minimum length of launch fibre or cable of 1,5 m is used in IEC 61753-083-2:2007 and IEC 61753-084-2:2007.

The channel spacings, unless otherwise specified, shall be in accordance with ITU-T Recommendation G.694-1. Environmental test shall be measured for a single input/output port combination.

The test details and requirements for performance standard are shown in Table 1.

Table 1 – Tests and requirements

No.	Test parameter/test method	Unit	Details
1	Operating wavelength	nm	
2	Number of ports		
3	Number of channels		
4	Channel spacing	GHz [a]	
5	Channel frequency range IEC 62074-1	GHz	Information (not test item). Channel central frequency: ITU-T grid or custom design. When there is no custom requirement, the channel central frequency shall be selected in accordance with ITU-T Recommendation G.694.1.
6	Insertion loss IEC 61300-3-29, IEC 62074-1	dB	Condition: the insertion loss shall be determined as the worst case over all states of polarization and over the operating wavelength range. Launch fibre length: ≥ 1,5 m. The test conditions shall provide loss measurement results with an uncertainty of less than 0,1 dB over the operating wavelength range.
7	Insertion loss uniformity IEC 61300-3-29	dB	Condition: the insertion loss uniformity shall be determined as the worst case over all states of polarization including channel and port. Launch fibre length: ≥ 1,5 m. The test conditions shall provide loss measurement results with an uncertainty of less than 0,1 dB over the operating wavelength range.
8	Insertion loss ripple IEC 61300-3-29	dB	Condition: the insertion loss ripple shall be determined as the worst case over all states of polarization. Launch fibre length: ≥ 1,5 m. The test conditions shall provide loss measurement results with an uncertainty of less than 0,1 dB over the operating wavelength range.
9	X-dB passband width IEC 61300-3-29, IEC 62074-1	GHz	Condition: the X-dB passband width, which is measured at X-dB down, shall be determined as the worst case over all states of polarization. It is recommended that the passband width be specified as 0,5 dB, 1 dB and 3 dB. Launch fibre length: ≥ 1,5 m
10	Return loss IEC 61300-3-6	dB	Condition: all ports not under test shall be terminated to avoid unwanted reflections contributing to the measurement. Launch fibre length: ≥ 1,5 m. The test conditions shall provide return loss measurement results with an uncertainty of less than 0,2 dB over the operating wavelength range.

No.	Test parameter/test method	Unit	Details
11	Adjacent channel crosstalk IEC 61300-3-29, IEC 62074-1	dB	Condition: the adjacent channel isolation shall be determined as the worst case over all states of polarization. Launch fibre length: ≥ 1,5 m. The test conditions shall provide isolation measurement results with an uncertainty of less than 0,2 dB over the operating wavelength range.
12	Non-adjacent channel crosstalk IEC 61300-3-29, IEC 62074-1	dB	Condition: the non-adjacent channel isolation shall be determined as the worst case over all states of polarization. Launch fibre length: ≥ 1,5 m. The test conditions shall provide isolation measurement results with an uncertainty of less than 0,2 dB over the operating wavelength range.
13	Total channel crosstalk IEC 61300-3-29, IEC 62074-1	dB	Condition: the minimum total channel isolation shall be determined as the worst case over all states of polarization. Launch fibre length: ≥ 1,5 m. The test conditions shall provide isolation measurement results with an uncertainty of less than 0,2 dB over the operating wavelength range.
14	Transient crosstalk (transient isolation/transient directivity) IEC 62343-5-2	dB	
15	Channel blocking attenuation IEC 61300-3-29	dB	Launch fibre length: ≥ 1,5 m. Launch conditions: the wavelength of the source shall be longer than cut-off wavelength of the fibre. Source: the measurement wavelength uncertainty shall be less than ±0,05 dB over the measuring period of at least 1 h. Waveband to meet the operating wavelength of WSS. Detector system: linearity less than or equal to 0,1 dB. Spectral response matched to source. Dynamic range within the attenuation values to be measured.
16	Attenuation without power IEC 61300-3-29	dB	Launch fibre length: ≥ 1,5 m. Launch conditions: the wavelength of the source shall be longer than cut-off wavelength of the fibre. Source: the measurement wavelength uncertainty shall be less than ±0,05 dB over the measuring period of at least 1 h. Waveband to meet the operating wavelength of WSS. Detector system: linearity less than or equal to 0,1 dB. Spectral response matched to source. Dynamic range within the attenuation values to be measured.
17	Variable attenuation range IEC 61300-3-29	dB	Launch fibre length: ≥ 1,5 m. Launch conditions: the wavelength of the source shall be longer than cut-off wavelength of the fibre. Source: the measurement wavelength uncertainty shall be less than ±0,05 dB over the measuring period of at least 1 h. Waveband to meet the operating wavelength of WSS. Detector system linearity less than or equal to 0,1 dB. Spectral response matched to source. Dynamic range within the attenuation values to be measured.
18	Variable attenuation resolution	dB	Method under consideration.

No.	Test parameter/test method	Unit	Details
19	Attenuation accuracy IEC 61300-3-14	dB	Launch fibre length: ≥ 1,5 m. Launch conditions: the wavelength of the source shall be longer than cut-off wavelength of the fibre. Source: the measurement wavelength uncertainty shall be less than ±0,05 dB over the measuring period of at least 1 h. Waveband to meet the operating wavelength of WSS. Detector system: linearity less than or equal to 0,1 dB. Spectral response matched to source.
20	Response time for attenuation	ms	Method under consideration. Similar as measurement method of switching time defined in IEC 61300-3-21.
21	Out of band attenuation IEC 61290-7-1	dB	
22	Switching time IEC 61300-3-21	ms	
23	Polarization dependent loss IEC 61300-3-2, IEC 62074-1	dB	The allowable PDL combination applies to all combination of input and output ports. Launch fibre length: ≥ 1,5 m.
24	Polarization mode dispersion IEC 61300-3-32, IEC 62074-1	ps	The allowable PMD combination applies to all combination of input and output ports.
25	Group delay ripple IEC 61300-3-38	ps	
26	Phase ripple IEC 61300-3-38	rad	
27	Chromatic dispersion IEC 61300-3-38	ps/nm	
28	Maximum input power (single channel) IEC 61300-2-14	dBm	Input port: single port
29	Maximum input power (single port) IEC 61300-2-14	dBm	Input port: single port
30	Storage temperature (range)	°C	IEC 62343-1 for reference
31	Storage relative humidity	RH %	IEC 62343-1 for reference
32	Operating case temperature	°C	Shall satisfy IEC 62343-1.
33	Operating relative humidity	RH %	Shall satisfy IEC 62343-1.
34	Temperature control		(equipped or not)
35	Supply voltage	V	
36	Power consumption	W	
37	Module size	mm × m m × mm	
38	Fibre type		For example, IEC 60793-2-50.
39	Pigtail fibre length	m	
40	Pigtail fibre buffer diameter	μm	
41	Optical connector		For example, IEC 61754 (all parts).
42	Optical connector labelling		
43	Electrical interface		Shall satisfy IEC 62343-4-1 for 1 × 9 WSS.