IEC 61753-071-2

Edition 1.0 2014-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fibre optic interconnecting devices and passive components – Performance standard –
Part 071-2: Non-connectorized single-mode fibre optic 1 × 2 and 2 × 2 spatial switches for category C – Controlled environments

Dispositifs d'interconnexion et composants passifs à fibres optiques – Norme de performance –
Partie 071-2: Commutateurs spatiaux optiques unimodaux 1 × 2 et 2 × 2 non connectorisés pour la catégorie C – Environnements contrôlés

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International Standard IEC 61753-071-2 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components of IEC technical committee 86: Fibre optics.

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

FDIS	Report on voting
86B/3748/FDIS	86B/3777/RVD

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.

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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,
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FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – PERFORMANCE STANDARD –

Part 071-2: Non-connectorized single-mode fibre optic 1 × 2 and 2 × 2 spatial switches for category C – Controlled environments

1 Scope

This part of IEC 61753 contains the minimum initial test and measurement requirements and severities which non-connectorized single-mode fibre optic 1 × 2 and 2 × 2 spatial switches need to satisfy in order to be categorized as meeting the requirements of category C – Controlled environments, as defined in Annex A of IEC 61753-1:2007.

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 60876-1, *Fibre optic interconnecting devices and passive components – Fibre optic spatial switches – Part 1: Generic specification*

IEC 61300 (all parts), *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures*

IEC 61300-2-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-1: Tests – Vibration (sinusoidal)*

IEC 61300-2-4, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-4: Tests – Fibre/cable retention*

IEC 61300-2-9, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-9: Tests – Shock*

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

IEC 61300-2-17, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-17: Tests – Cold*

IEC 61300-2-18, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-18: Tests – Dry heat – High temperature endurance*

IEC 61300-2-19, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-19: Tests – Damp heat (steady state)*

IEC 61300-2-22, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-22: Tests – Change of temperature*

IEC 61300-2-42, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-42: Tests – Static side load for connectors*

IEC 61300-2-44, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 2-42: Tests – Flexing of the strain relief of fibre optic devices*

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 61300-3-7, *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 61300-3-20, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-20: Examinations and measurements – Directivity of fibre optic branching devices*

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

IEC 61300-3-50, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-50: Examinations and measurements – Crosstalk for optical spatial switches*

IEC 61753-1:2007, *Fibre optic interconnecting devices and passive components performance standard – Part 1: General and guidance for performance standards*

IEC/TR 62343-6-5, *Dynamic modules – Part 6-5: Investigation of operating mechanical shock and vibration tests for dynamic modules*

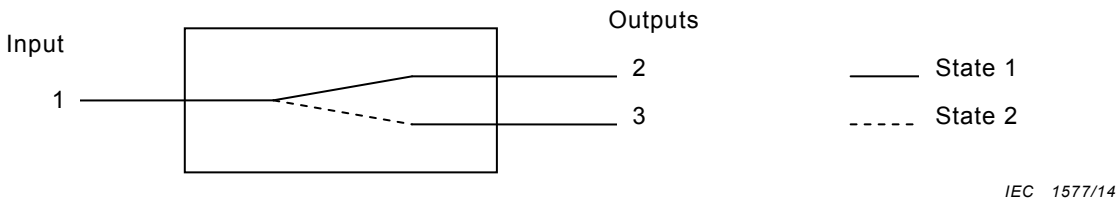
ITU-T G-series Recommendations: *Transmission systems and media,digital systems and networks* – Supplement 39, *Optical system design and engineering considerations*

3 Terms and definitions

For the purposes of this document, the following terms and definitions, as well as those given in IEC 60876-1, apply.

3.1
1 × 2 spatial switch
single-mode fibre-pigtailed 1 × 2 spatial switch as shown in Figure 1

Note 1 to entry: There is one input port and two output ports.

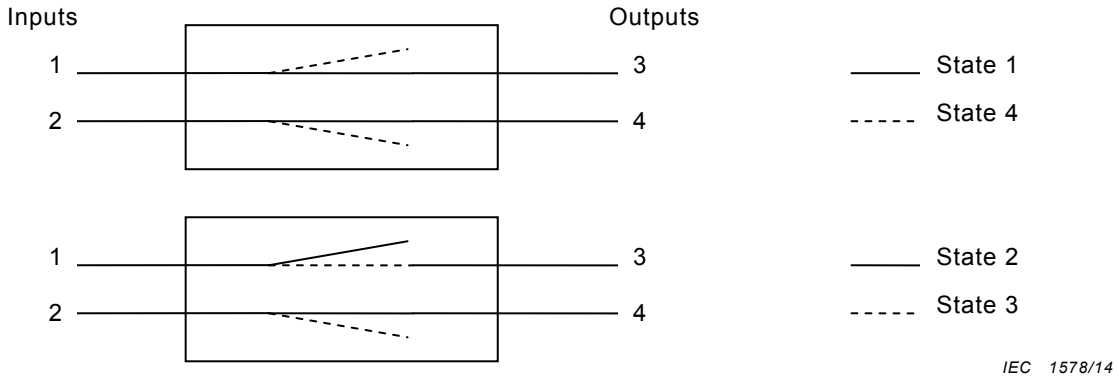


Key
1, 2, and 3 show a port number.

Figure 1 – Configuration of 1 × 2 spatial switch

3.2
2 × 2 spatial switch
single-mode fibre-pigtailed 2 × 2 spatial switch as shown in Figures 2 and 3

Note 1 to entry: There are two input ports and two output ports.



Key
1, 2, 3 and 4 show a port number.

Figure 2 – Configuration of 2 × 2 spatial switch, non-crossover type

Key
1, 2, 3 and 4 show a port number.

Figure 3 – Configuration of 2 × 2 spatial switch, crossover type

3.3
operational vibration
vibration test whose relevant parameters should be monitored during the test

3.4
operational shock
shock test whose relevant parameters should be monitored during the test

4 Test conditions

Unless otherwise specified, all test methods are in accordance with the IEC 61300 series. 1 × 2 and 2 × 2 spatial switches used for each test are intended to be previously unstressed new samples but may also be selected from previously used samples if desired. All measurements shall be carried out under standard atmospheric conditions, unless otherwise stated. If the device is provided with an active temperature control, this shall be set at the set-point specified by the manufacturer.

The requirements apply to every combination of input and output port.

Table 1 is intended to provide guidance on the wavelength ranges of the various spectral bands. It is not intended to serve as a 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 – Single-mode spectral bands[a]

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
[a] ITU-T Supplement 39.		

5 Test report

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

6 Reference components

The test for these components does not require the use of reference components.

7 Performance requirements

7.1 Dimensions

Dimensions shall comply with those given in appropriate manufacturers' drawings.

7.2 Test details and requirements

The requirements are given only for pigtailed 1 × 2 and 2 × 2 spatial switches. A minimum length of fibre or cable of 1,5 m per port shall be included in all climatic and environmental test chambers. The test details and requirements are shown in Table 2.

Table 2 – Test details and requirements *(1 of 5)*

No	Tests	Requirements	Details	
1	Insertion loss IEC 61300-3-7	≤ 1,0 dB	Launch fibre length: Light source type:	≥ 2,0 m Unpolarized light Test results should be obtained under measurement uncertainty of ± 0,1 dB
2	Crosstalk IEC 61300-3-50	≤ –50 dB	Launch fibre length: Light source type:	≥ 2,0 m Unpolarized light Test results should be obtained under measurement uncertainty of ± 1 dB

Table 2 *(2 of 5)*

No	Tests	Requirements	Details	
3	Return loss IEC 61300-3-7	≥ 50 dB Grade U	Launch fibre length: Light source type:	≥ 2,0 m Unpolarized light Test results should be obtained under measurement uncertainty of ± 1 dB
4	Directivity IEC 61300-3-20	≤ –60 dB	Launch fibre length: Light source type:	≥ 2,0 m Unpolarized light Test results should be obtained under measurement uncertainty of ± 1 dB
5	Switching time IEC 61300-3-21	≤ 10 ms	Launch fibre length: Switching from isolated state to conducting state Switching from conducting state to isolated state	≥ 2,0 m Elapsed time when the output power of a specified output port maintains between 90 % and 110 % of its steady-state value of the output power from the time the actuation energy is applied. Elapsed time when the output power of a specified output port maintains between 0 % and 10 % of its steady-state value of the output power from the time the actuation energy is removed
6	Polarization dependent loss (PDL) IEC 61300-3-2	≤ 0,1 dB	Launch fibre length:	≥ 2,0 m The allowable PDL combination applies to all combination of input and output ports. Test results should be obtained under measurement uncertainty of ±0,05 dB
7	High optical power IEC 61300-2-14	Before and after the test, the limits of insertion loss, isolation and return loss of test no. 1, 2 and 3 shall be met. During the test, the insertion loss change is monitored. During and after the test, the insertion loss change shall be within ± 0,3 dB of the initial value. During the test, the crosstalk change is monitored. The sum of the initial value and the change of the crosstalk shall be within the value defined at test no. 2. During the test, the return loss change is monitored. The sum of the initial value and the change of the return loss shall be within the value defined at test no. 3	Optical power Wavelength Duration of the optical power exposure Temperature: Relative humidity: Note	300 mW 1 550 nm 30 min 60 °C ± 2° C 93 $^{+2}_{-3}$ % RH Different wavelength is acceptable when there is a negotiation between customer and supplier

Table 2 *(3 of 5)*

No	Tests	Requirements		Details
8	Cold IEC 61300-2-17	Before and after the test, the limits of insertion loss, crosstalk and return loss of test no.1, 2 and 3 shall be met. The insertion loss change after the test shall be within ± 0,3 dB of the initial value	Temperature: Duration of exposure:	–10° C ± 2° C 96 h
9	High temperature endurance IEC 61300-2-18	Before and after the test, the limits of insertion loss, crosstalk and return loss of test no.1, 2 and 3 shall be met. The insertion loss change after the test shall be within ± 0,3 dB of the initial value	Temperature: Duration of exposure:	+ 60° C ± 2° C 96 h
10	Damp heat (steady state) IEC 61300-2-19	Before and after the test, the limits of insertion loss, crosstalk and return loss of test no.1, 2 and 3 shall be met. The insertion loss change after the test shall be within ± 0,3 dB of the initial value	Temperature: Relative humidity: Duration of exposure:	+ 40 ± 2 °C 93^{+2}_{-3} % RH 96 h
11	Change of temperature IEC 61300-2-22	Before and after the test, the limits of insertion loss, crosstalk and return loss of test no.1, 2 and 3 shall be met. During and after the test, the insertion loss change shall be within ± 0,3 dB of the initial value. During the test, the crosstalk change is monitored. The sum of the initial value and the change of the crosstalk shall be within the value defined at test no.2	High temperature: Low temperature: Number of cycles: Duration at extreme temperature: Rate of change:	+ 60 ± 2 °C –10 ± 2 °C Cycles 5 60 min 1 °C/min
12	Vibration IEC 61300-2-1	Before and after the test, the limits of insertion loss, crosstalk and return loss of test no.1, 2 and 3 shall be met. The insertion loss change after the test shall be within ± 0,3 dB of the initial value	Frequency range: Number of axes: Number of sweeps: Sweep rate: Amplitude:	5 Hz – 55 Hz 3 orthogonal axes 15 /axis 1 octave/min 0,75 mm