INTERNATIONAL STANDARD

IEC 60874-19-1

Second edition
2003-01

Connectors for optical fibres and cables –

Part 19-1:
Fibre optic patch cord connector type SC-PC (floating duplex) standard terminated on multimode fibre type A1a, A1b – Detail specification

Connecteurs pour fibres optiques et câbles –

Partie 19-1:
Connecteur pour câble de liaison de type SC-PC (duplex flottant) normalisé, terminé sur une fibre multimodale de types A1a, A1b – Spécification particulière

Reference number
IEC 60874-19-1:2003(E)

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CONNECTORS FOR OPTICAL FIBRES AND CABLES –

Part 19-1: Fibre optic patch cord connector type SC-PC (floating duplex) standard terminated on multimode fibre type A1a, A1b – Detail specification

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
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5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60874-19-1 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components of IEC technical committee 86: Fibre optics.

This second edition cancels and replaces the first edition published in 1999. It constitutes a technical revision.

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

FDIS	Report on voting
86B/1775/FDIS	86B/1826/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 not been drafted in complete accordance with the ISO/IEC Directives, Part 2.

The QC number that appears on the front cover of this publication is the specification number in the IEC Quality Assessment System for Electronic Components (IECQ).

The references to clauses or subclauses of IEC 60874-1 indicated in this part apply to the fourth edition of IEC 60874-1.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

The contents of the corrigendum of April 2004 have been included in this copy.

CONNECTORS FOR OPTICAL FIBRES AND CABLES –

Part 19-1: Fibre optic patch cord connector type SC-PC (floating duplex) standard terminated on multimode fibre type A1a, A1b – Detail specification

NATIONAL STANDARDS ORGANIZATION:	**.....** **Date .....**

DETAIL SPECIFICATION IEC QC 910004XX0001

FIBRE OPTIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH

- GENERIC SPECIFICATION: QC 910000 (IEC 60874-1)
- BLANK DETAIL SPECIFICATION: QC 910004 (IEC 60874-1-1)

CONNECTOR SET FOR OPTICAL FIBRES AND CABLES

CLASSIFICATION:

Type: Name: SC (floating duplex)

For use in datacom applications as specified in ISO/IEC International Standard 11801:

Generic cabling for customer premises

and as defined in category C of IEC 61753-1:

Fibre optic interconnecting devices performance standard – Part 1 General and Guidance

Configuration: plug-adaptor-plug

Coupling: push-pull

Control dimensions:

– Plug: see figures 1, 2 and 3

– Adaptor: See IEC 60874-19-3

Arrangement: patchcord arrangement

Style: Fibre retention: as required

Cable retention: as required

Optical coupling: butting

Alignment: resilient sleeve alignment

Variants: see page 9

Climatic category: 10/60/4

Environmental category: 4 (category C of IEC 61753-1)

Assessment level: A

QUALIFICATION PROCEDURE: Fixed sample procedure

SAFETY WARNING: Take care when handling small diameter optical fibre to prevent puncturing the skin, especially in the eye area. Direct viewing of the end of an optical fibre when it is propagating energy is not recommended unless prior assurance is obtained as to the safe energy output level.

Applicable fibre cable information:	
Core diameter	in accordance with IEC 60793-2
Cladding diameter	in accordance with IEC 60793-2
Buffer diameter	(250 ± 15) µm, (500 ± 30) µm, (900 ± 50) µm
Tension member	Aramid strength member
Jacket outer diameter	As required per variant

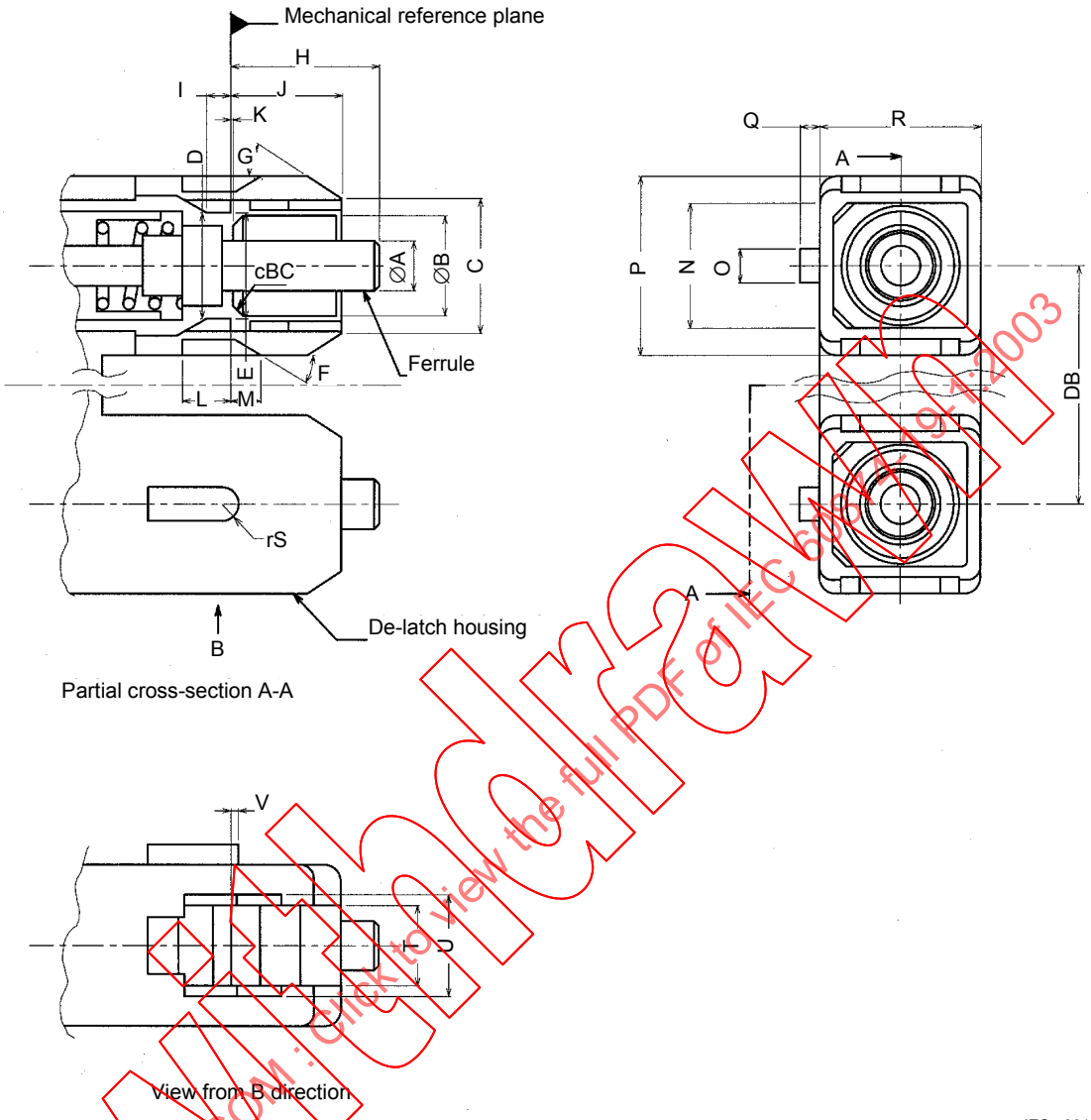


Figure 1 – Plug mating face dimensions

Reference	Dimensions mm		Notes
	Minimum	Maximum	
A	2,497	2,500	Diameter
B	4,80	4,90	Diameter
C	6,80	7,40	
D	4,90	5,30	
E	6,70	6,80	
F	19°	23°	
G	25°	35°	
H	7,15	7,50	1, 2
I	0,80	1,20	
J	5,30	5,50	
K	–0,10	0,05	3

L	2,11	2,50	
M	2,00	2,80	
N	6,60	6,80	
O	1,60	1,80	
P	8,89	8,99	
Q	0,80	1,00	
R	7,29	7,39	
rS	0,80	0,90	Radius
T	4,05	4,15	
U	5,40	5,60	
V	0	0,50	
BC	0	0,50	Chamfer
DB	12,25	13,15	7

NOTE 1 Ferrule compression force shall be from 7,8 N to 11,8 N, when the ferrule is compressed to a point where H is 7 mm ± 0,1 mm.

NOTE 2 This value shows the dimension after the ferrule is polished and in the unmated condition.

NOTE 3 The negative dimension refers to the fact that the position of the inside bottom plane is left-direction relative to the plane defined as mechanical reference plane.

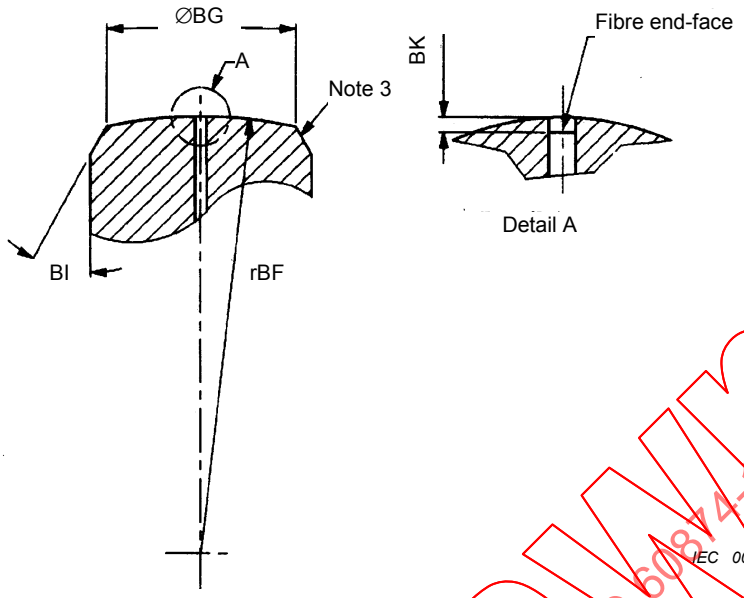
NOTE 4 Where a tolerance of form is not specified, the limits of the dimensions for a feature control the form as well as the size.

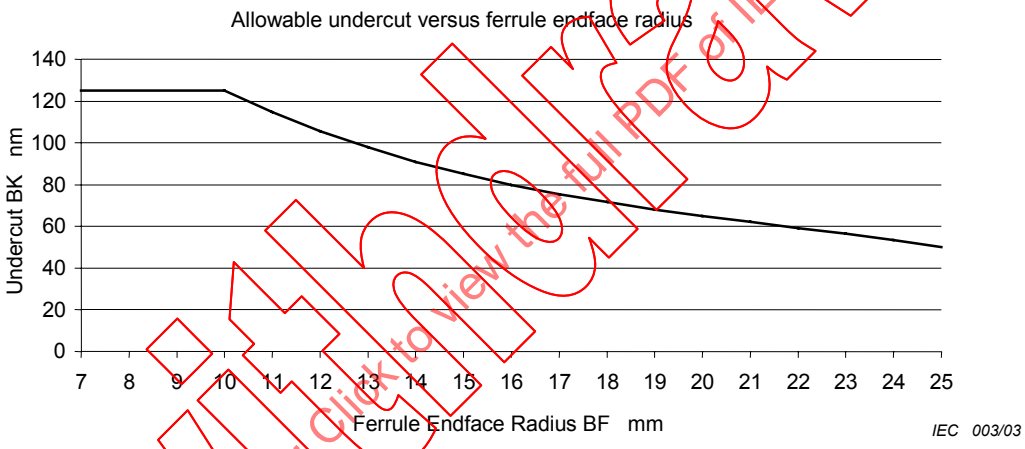
NOTE 5 Where interrelated features of size (features shown with a common axis or centre plane) have no geometric tolerance of location or run-out specified, the limits of the dimensions for a feature control the location tolerance as well as the size.

NOTE 6 Where perpendicular features (features shown at right angles) have no geometric tolerance of orientation or run-out specified, the limits of the dimensions for a feature control the orientation tolerance as well as the size.

NOTE 7 Plugs shall be capable of floating between the DB maximum and DB minimum.

Figure 1 – Plug mating face dimensions *(concluded)*





The value of the undercut, BK, is BK = – $0{,}02BF^3 + 1{,}3BF^2 – 31BF + 325$ from 10 mm ≤ BF ≤ 25 mm. For 7 ≤ BF ≤ 10 the value of under cut is 125 nm.

Reference	Dimensions mm		Notes
	Minimum	Maximum	
rBF	7,00	25,00	1, radius
BG	1,90	2,26	Diameter 2
BI	25°	35°	
BK	–0,0001	See graph	4, see curve

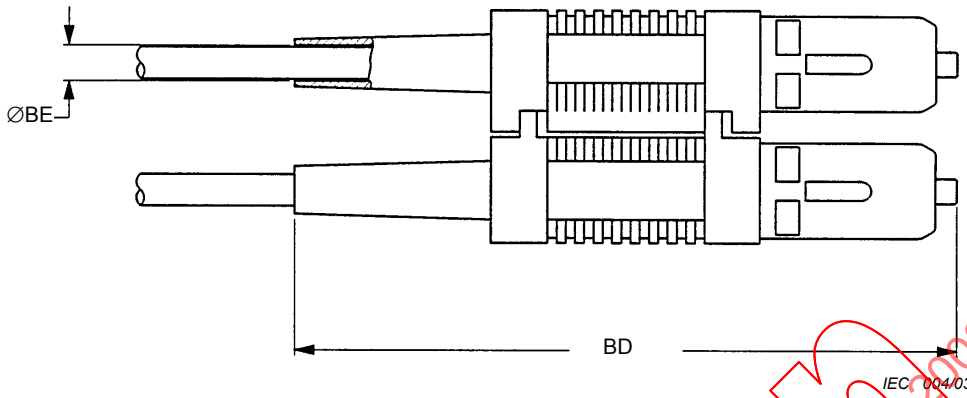
NOTE 1 Eccentricity of a spherical polished ferrule end face is less than 50 µm.

NOTE 2 This value is applicable for variants as per variant table in Figure 3.

NOTE 3 Break edge.

NOTE 4 The negative dimension refers to the fibre protrusion. Dimension BK shall be measured according to IEC 61300-3-23.

Figure 2 – Ferrule end face geometry after termination



Reference	Dimensions mm		Notes
	Minimum	Maximum	
BD		60	
BE	2,20		1
BE	2,60		2
BE	2,90		3
BE	3,20		4

NOTE 1 This value is applicable to the variant number –1001.
NOTE 2 This value is applicable to the variant number –1002.
NOTE 3 This value is applicable to the variant number –1003.
NOTE 4 This value is applicable to the variant number –1004.

Figure 3 – Plug dimension

VARIANT IDENTIFICATION NUMBERS NUMBER: XXXXXXXXXXXX			
Variant	**Component name**	**Variant feature**	
		Applicable cable jacket diameter mm	**Ferrule material**
1001	Plug	2,00	Zirconia
1002	Plug	2,40	Zirconia
1003	Plug	2,70	Zirconia
1004	Plug	3,00	Zirconia

SUPPLEMENTARY INFORMATION

Colour:

Colour of the de-latch housing and boot shall be beige, according to: RAL 1013.

Component marking:

The name and/or manufacturer's identification mark may be permanently identified. Figure 4 shows an example of the location of the component marking.

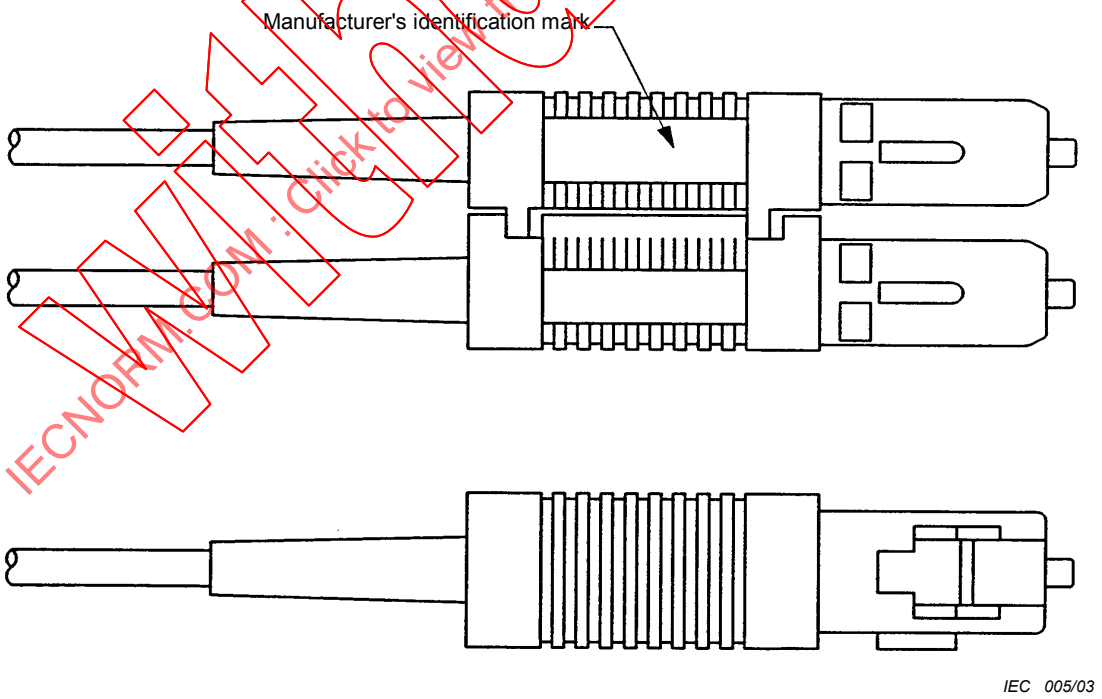


Figure 4 – Example of component marking

Table 1 – Fixed sample test schedule for qualification approval

Test sequence	Reference IEC 61300	*n*
Group 0		
– Visual examination	3-1	20
– Dimensions	3-1	
Group 1		
– Attenuation	3-4	20
– Attenuation (random mate)	3-34	
– Return loss (random mate)	3-6	
Group 2		
– Cold	2-17	
– Dry heat	2-18	6
– Damp heat (steady state)	2-19	
Group 3		
– Impact (method A)	2-12	
– Engagement and separation force	3-11	6
– Mating durability	2-2	
Group 4		
– Vibration	2-1	4
– Change of temperature	2-22	
Group 5		
– Tensile strength of coupling mechanism	2-6	4
– Fibre/cable retention	2-4	
– Static side load	2-42	

NOTE 1 *n* = sample size (number of plugs).

NOTE 2 To satisfy the qualification approval requirements of the detail specification there shall be no failures in the sample groups for any test parameter. If a failure does occur this shall be investigated and the cause of failure identified and corrected. The test which is affected shall then be repeated using the minimum sample size stated in this detail specification.

A fully documented test report and supporting data shall be prepared and made available for inspection. Failures and the corrective action taken to eliminate failures shall be documented and evidence presented to show that the corrective action will have no detrimental effect on the performance in any of the other tests. Design changes, as opposed to improvements in quality control, will necessitate a repeat of the full qualification programme.

NOTE 3 Unless otherwise indicated, the test details, measurements and performance requirements are given in Table 4.

NOTE 4 Only group 1 tests shall be carried out using a reference connector. All other tests shall be carried out using the samples from the relevant group at random.

Table 2 – Lot-by-lot quality conformance inspection schedule groups A and B

Test sequence	Reference IEC 61300	Assessment level A	
		IL	AQL
Group A			
– Visual examination	3-1	II	4 %
– Radius	3-16		
– Undercut/protrusion	3-23		
– Eccentricity of spherical polished end faces	3-15		
Group B			
– Attenuation	3-4	II	4 %

NOTE 1 Unless otherwise indicated, the details, measurements and performance requirements are given in Table 4.

NOTE 2 IL = inspection level; AQL = acceptable quality level.

NOTE 3 Only attenuation tests shall be carried out using a reference connector. All other tests shall be carried out using the samples from the relevant group at random.

Table 3 – Periodic quality conformance inspection schedule groups C and D

Test sequence	Reference IEC 61300	Assessment level A	
		n	*p*
Group C0			
– Visual examination	3-1	18	24
– Dimensions	3-1		
Group C1			
– Attenuation	3-4	18	24
– Attenuation (random mate)	3-34		
– Return loss (random mate)	3-6		
Group C2			
– Cold	2-17		
– Dry heat	2-18	6	24
– Damp heat (steady state)	2-19		
Group D0			
– Visual examination	3-1	20	48
– Dimensions	3-1		
Group D1			
– Attenuation	3-4	20	48
– Attenuation (random mate)	3-34		
– Return loss (random mate)	3-6		
Group D2			
– Cold	2-17		
– Dry heat	2-18	6	48
– Damp heat (steady state)	2-19		
Group D3			
– Impact (method A)	2-12		
– Engagement and separation force	3-11	6	48
– Ferrule compression force	3-22		
– Mating durability	2-2		
Group D4			
– Vibration	2-1	4	48
– Change of temperature	2-22		
Group D5			
– Strength of coupling mechanism	2-6		
– Fibre/cable retention	2-4	4	48
– Static side load	2-42		

NOTE 1 *n* = sample size (number of plugs); *p* = periodicity in months.

NOTE 2 To satisfy the conformance inspection requirements of the detail specification there shall be no failures in the sample groups for any test parameter. If a failure does occur this shall be investigated and the cause of failure identified and corrected. The test which is affected shall then be repeated using the minimum sample size stated in this detail specification.

A fully documented test report and supporting data shall be prepared and made available for inspection. Failures and the corrective action taken to eliminate failures shall be documented and evidence presented to show that the corrective action will have no detrimental effect on the performance in any of the other tests. Design changes, as opposed to improvements in quality control, will necessitate a repeat of the full qualification programme.

NOTE 3 Unless otherwise indicated, the details, measurements and performance requirements are given in Table 4.

NOTE 4 Only the first test of group C1 and D1 tests shall be carried out using a reference connector. All other tests shall be carried out using the samples from the relevant group at random.

Table 4 – Details, measurements and performance requirements

Visual examination (IEC 61300-3-1) Requirements – Marking shall be clear – De-latch housing shall be movable smoothly
Dimensions (IEC 61300-3-1) Requirements – All size dimensions shall be in accordance with this specification
Attenuation (IEC 61300-3-4) Details – Method no. 7 – Definitions of reference plug are as follows: • Ferrule outer diameter is 2,499 mm ± 0,0005 mm • Concentricity of the fibre core with the outer diameter of the ferrule is less than 1 µm • Eccentricity of a spherical polished ferrule end face is less than 30 µm – Reference duplex adaptor shall be in accordance with IEC 60874-19-3 – Attenuation of 2 reference plugs and a reference adaptor shall be <0,10 dB – Number of measurements to be averaged: 5 – Launch mode conditions: equilibrium – Source: LED – Peak wavelength: 1,3 µm – Preconditioning procedure: clean ferrule end face and inside of alignment sleeve according to the manufacturer's instruction – Recovery procedure: none Requirements Allowable attenuation: less than 0,3 dB against reference plug
Attenuation (random mate) (IEC 61300-3-34) Details – Attenuation measurements shall be made on randomly selected specimens – Method no. 1 – Launch mode conditions; equilibrium – Source: LED source characteristics: (IEC 61300-3-4) type S2, stability ± 0,05 dB over measuring period – Peak wavelength: 1,3 µm – Preconditioning procedure: clean ferrule end face and inside of alignment sleeve according to the manufacturer's instructions – Recovery procedure: none Requirements – Allowable attenuation: Mean <0,35 dB Max. <0,50 dB for >97% of the mating combinations Max. <0,75 dB for 100 % of the mating combinations

Table 4 (*continued*)

Return loss (IEC 61300-3-6) Details – Method no 1 (coupler method) – Duplex adaptor shall be in accordance with IEC 60874-19-3 – Number of measurements to be averaged: 5 – Launch mode conditions: equilibrium – Source: LED source characteristics: (IEC 61300-3-4) type S2, stability ± 0,05 dB over measuring period – Peak wavelength: 1,3 µm – Preconditioning procedure: clean ferrule end face and inside of alignment according to the manufacturer's instruction – Recovery procedure: none Requirements – Allowable return loss: >than 20 dB
Cold (IEC 61300-2-17) Details – Temperature: –10 °C – Duration: 96 h – Specimen optically functioning – Conditioning procedure: specimen lowered to test temperature and returned to room temperature at a rate not to exceed 1°/min – Deviations: none – Duplex adaptor shall be in accordance with IEC 60874-19-3 – Monitoring method of attenuation and return loss shall be in accordance with IEC 61300-3-20 – Preconditioning procedure: clean ferrule end face and inside of alignment sleeve using lint-free cloth – Recovery procedure: after testing, specimens shall be maintained in room temperature conditions for 2 h. Clean ferrule end face and inside of alignment sleeve according manufacturer's instructions Requirements Initial measurements and performance requirements: – Attenuation: <0,75 dB – Return loss: >20 dB Measurements and performance requirements during the test: – Attenuation: <0,75 dB – Change in attenuation during the test <0,20 dB – Return loss: >20 dB Final measurements and performance requirements: – Attenuation: <0,75 dB – Change in attenuation before /after test: <020 dB – Return loss: >20 dB – The specimen has no mechanical damage

Table 4 (*continued*)

Dry heat	(IEC 61300-2-18)
Details	
– Temperature: 60 °C	
– Duration: 96 h	
– Specimen optically functioning	
– Conditioning procedure: specimen raised to test temperature and returned to room temperature at a rate not to exceed 1°/min	
– Deviations: none	
– Duplex adaptor shall be in accordance with IEC 60874-19-3	
– Monitoring method of attenuation and return loss shall be in accordance with IEC 61300-3-20	
– Preconditioning procedure: clean ferrule end face and inside of alignment sleeve according to the manufacturer's instructions	
– Recovery procedure: after testing, specimens shall be maintained in room temperature conditions for 2h	
– Clean ferrule end face and inside of alignment according to the manufacturer's instructions	
Requirements:	
Initial measurements and performance requirements:	
– Attenuation:	<0,75 dB
– Return loss:	>20 dB
Measurements and performance requirements during the test:	
– Attenuation:	<0,75 dB
– Change in attenuation during the test	<0,20 dB
– Return loss:	>20 dB
Final measurements and performance requirements:	
– Attenuation:	<0,75 dB
– Change in attenuation before /after test:	<0,20 dB
– Return loss:	>20 dB
– The specimen has no mechanical damage	

Table 4 (*continued*)

Damp heat (steady state) (IEC 61300-2-19)

Details

- Temperature: 40 °C
- Relative humidity: 90-95 %
- Duration: 4 days
- Precautions regarding surface moisture removal: none
- Specimen optically functioning
- Conditioning procedure: specimen raised to test temperature and returned to room temperature at a rate not to exceed 1° /min
- Deviations: none
- Duplex adaptor shall be in accordance with IEC 60874-19-3.
- Monitoring method of attenuation and return loss shall be in accordance with IEC 61300-3-20.
- Preconditioning procedure: clean ferrule end face and inside of alignment sleeve according to the manufacturer's instructions
- Recovery procedure: after testing, specimens shall be maintained in room temperature conditions for 2 h
- Clean ferrule end face and inside of alignment sleeve according to the manufacturer's instructions

Requirements

Initial measurements and performance requirements:

- Attenuation: <0,75 dB
- Return loss: >20 dB

Measurements and performance requirements during the test:

- Attenuation: <0,75 dB
- Change in attenuation during the test <0,20 dB
- Return loss: >20 dB

Final measurements and performance requirements:

- Attenuation: <0,75 dB
- Change in attenuation. before /after test: <0,20 dB
- Return loss: >20 dB
- The specimen has no mechanical damage

Table 4 (*continued*)

Cable pulling (IEC 61300-2-4)	
Details	
– Magnitude: 50 N	
– Rate of application of the tensile load: 50 N/min < load rate < 250 N/min	
– Point of application of the tensile load: 22 cm – 28 cm from connector	
– Specimen optically functioning	
– Preconditioning procedure: clean ferrule end face and inside of alignment sleeve according to the manufacturer's instructions	
– Recovery procedure: none	
– Deviations: none	
– Simplex adaptor shall be in accordance with IEC 60874-14-4	
– Each connector shall be tested separately	
Initial measurements and performance requirements:	
– Attenuation:	<0,75 dB
– Return loss:	>20 dB
Measurements and performance requirements during the test:	
– Attenuation:	<0,75 dB
– Change in attenuation during the test:	<0,20 dB
– Return loss:	>20 dB
Final measurements and performance requirements:	
– Attenuation:	<0,75 dB
– Change in attenuation. before /after test:	<0,20 dB
– Return loss:	>20 dB
– The specimen has no mechanical damage	

Table 4 (*continued*)

Tensile strength of coupling mechanism (IEC 61300-2-6) Details: – Magnitude: 40 N – Rate of application of the tensile load: 50 N/min <load rate <250 N/min – Point of application of the tensile load: 22 cm –28 cm from connector – Specimen optically functioning – Preconditioning procedure: clean ferrule end face and inside of alignment sleeve according to the manufacturer's instructions – Recovery procedure: clean ferrule end face and inside of alignment sleeve according to the manufacturer's instructions before the final measurement – Deviations: none – Simplex adaptor shall be in accordance with IEC 60 874-14-3 Initial measurements and performance requirements: – Attenuation: <0,75 dB – Return loss: >20 dB Measurements and performance requirements during the test: – Attenuation: <0,75 dB – Change in attenuation during the test: <0,20 dB – Return loss: >20 dB Final measurements and performance requirements: – Attenuation: <0,75 dB – Change in attenuation before /after test: <0,20 dB – Return loss: >20 dB – The specimen has no mechanical damage