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BSI Standards Publication

Fibre optic interconnecting devices and passive components

Part 03-04: Reliability — Guideline for high power reliability of passive optical components

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National foreword

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The UK participation in its preparation was entrusted by Technical Committee GEL/86, Fibre optics, to Subcommittee GEL/86/2, Fibre optic interconnecting devices and passive components.

A list of organizations represented on this committee can be obtained on request to its secretary.

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FOREWORD

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IEC/TR 62627-03-04, which is a technical report, has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive optical components, of IEC technical committee 86: Fibre optics.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
86B/3641/DTR	86B/3676/RVC

Full information on the voting for the approval of this technical report 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 the parts in the IEC 62627 series, published under the general title *Fibre optic interconnecting devices and passive components* 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- withdrawn,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

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

Since 2000, the optical power in transmission systems has increased in conjunction with the increase in the number of channels for DWDM systems, with the deployment of RAMAN amplifiers and the application of optical amplifiers.

Several technical reports have been published on failure mode analysis, life-time estimation by accelerated aging tests, and other issues for passive optical components.

The long-term reliability for passive optical components is generally evaluated by accelerated aging tests such as a high temperature test, a damp heat test and a temperature cycling test. These tests are standardized and are included in reliability qualification test documents.

Although the failure mode for passive optical components under high power conditions has not been clarified, one technical report was published for specific passive optical components (IEC/TR 62627-03-02), and a technical report on high power reliability testing for metal doped fibre plug-style optical attenuators was proposed.

This technical report is prepared based on the knowledge contained within these two technical reports.

FIBRE OPTIC INTERCONECTING DEVICES AND PASSIVE COMPONENTS –

Part 03-04: Reliability – Guideline for high power reliability of passive optical components

1 Scope

This part of IEC 62627, which is a technical report, is a guideline for a procedure to evaluate the reliability of passive optical components under high power conditions. This guideline is one example to which the test results of IEC/TR 62627-03-02 and IEC/TR 62627-03-03 may apply.

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 60825-1, *Safety of laser products – Part 1: Equipment classification and requirements*

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

IEC 61300-3-35, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-35: Examinations and measurements – Fibre optic endface visual and automated inspection*

IEC/TR 62627-03-02, *Fibre optic interconnecting devices and passive components – Part 03-02: Reliability – Report of high power transmission test of specified passive optical components*

IEC/TR 62627-03-03, *Fibre optic interconnecting devices and passive components – Part 03-03: Reliability – Report on high-power reliability for metal-doped fibre optical plug-style optical attenuators*

3 Generic information

IEC/TR 62627-03-02 describes the return losses of metal doped fibre plug-style optical attenuators degraded under high optical input power at around 2 W, and the fibre in the ferrule of in-line optical isolators breaking and causing isolation failure. The thermal simulation estimated that the maximum temperature for metal doped fibre plug-style optical attenuators and in-line optical isolators could reach several hundred degrees Celsius. It was estimated that the return loss degradation for metal doped fibre plug-style optical attenuators was caused by fibre withdrawal from the ferrule surface due to the thermal stress following a rise in temperature. It was believed that the optical isolator fibre breaks were caused by the stress created by the differences in thermal expansion coefficients of the materials from which the parts were made.

Passive optical components are generally composed of several parts with different shapes and materials. The typical failure mode under long-term operation is generally related to a change of shape and optical path displacement due to the dislocation of fixing points for