

# INTERNATIONAL STANDARD

**Fibre optic active components and devices – Reliability standards –  
Part 3: Laser modules used for telecommunication**

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INTERNATIONAL  
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## CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references.....	6
3 Terms, definitions, symbols and abbreviations.....	7
3.1 Terms and definitions.....	7
3.2 Symbols and abbreviations.....	8
4 Laser reliability and quality assurance procedure.....	8
4.1 Demonstration of product quality.....	8
4.2 Testing responsibilities.....	9
4.2.1 General.....	9
4.2.2 Recommendation applicable to laser customer/system supplier.....	9
4.2.3 Recommendation applicable to system operator.....	9
4.3 Quality improvement programmes (QIPs).....	9
5 Tests.....	9
5.1 General.....	9
5.2 Structural similarity.....	10
5.3 Burn-in and screening (when applicable in the specification).....	10
6 Activities.....	14
6.1 Analysis of reliability results.....	14
6.2 Technical visits to LMMs.....	14
6.3 Design/process changes.....	15
6.4 Deliveries.....	15
6.5 Supplier documentation.....	15
Annex A (informative) Guidance on testing in Table 1 and Table 2.....	16
A.1 Laser module life tests containing thermoelectric coolers (Table 1, test 1.1).....	16
A.2 Laser module life tests for uncooled modules (Table 1, test 1.2).....	16
A.3 Laser diode life tests on submounts (Table 1, test 1.3).....	17
A.4 Monitor photodiode life tests (Table 1, test 1.4).....	17
A.5 Temperature cycling and thermal shock (Table 1, test 3 and Table 2, test 2).....	18
A.6 Sealing/hermeticity (Table 1, test 4 and Table 2, test 3).....	18
A.7 Shock and vibration (Table 1, test 5 and Table 2, test 4).....	18
A.8 High-temperature storage (Table 1, test 6 and Table 2, test 5).....	18
A.9 Electrostatic discharge sensitivity (ESD) (Table 1, test 7 and Table 2, test 6).....	19
A.10 Residual gas analysis (RGA) (Table 1, test 8 and, Table 2, test 7).....	19
Bibliography.....	20
Table 1 – Initial qualification (1 of 3).....	10
Table 2 – Maintenance of qualification (1 of 2).....	13
Table 3 – Performance for laser module reliability parameters.....	14
Table A.1 – Recommended life test conditions for laser modules containing Peltier coolers.....	16
Table A.2 – Recommended life test conditions for uncooled laser modules.....	17
Table A.3 – Recommended laser diode life test conditions.....	17
Table A.4 – Recommended photodiode life test conditions.....	18

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES –  
RELIABILITY STANDARDS –****Part 3: Laser modules used for telecommunication**

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International Standard IEC 62572-3 has been prepared by subcommittee 86C: Fibre optic systems and active devices of IEC technical committee 86: Fibre optics.

This third edition cancels and replaces the second edition published in 2014. This third edition constitutes a technical revision in which errors in Table 1 and Table 2 have been corrected.

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

CDV	Report on voting
86C/1302/CDV	86C/1345/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 in the IEC 62572 series, published under the general title *Fibre optic active components and devices – Reliability standards*, 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 website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,
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## INTRODUCTION

The laser modules covered by this International Standard are purchased by system suppliers (SS) to be inserted in equipment, which in turn are supplied/sold to a system operator (SO) or a network operator (see definitions in Clause 3).

For the system operator to act as an informed buyer, he/she should have knowledge of the potential risks posed by the use of critical components.

Optoelectronic component technology is continuing to develop. Consequently, during product development phases, many failure mechanisms in laser modules have been identified. These failure mechanisms, if undetected, could result in very short laser lifetime in system use.

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# FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – RELIABILITY STANDARDS –

## Part 3: Laser modules used for telecommunication

### 1 Scope

This part of IEC 62572 deals with reliability assessment of laser modules used for telecommunication.

The aim of this standard is

- to establish a standard method of assessing the reliability of laser modules in order to minimize risks and to promote product development and reliability;
- to establish means by which the distribution of failures with time can be determined. This should enable the determination of equipment failure rates for specified end of life criteria.

In addition, guidance is given in IEC TR 62572-2.

### 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 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60749-6, *Semiconductor devices – Mechanical and climatic test methods – Part 6: Storage at high temperature*

IEC 60749-8, *Semiconductor devices – Mechanical and climatic test methods – Part 8: Sealing*

IEC 60749-10, *Semiconductor devices – Mechanical and climatic test methods – Part 10: Mechanical shock*

IEC 60749-11, *Semiconductor devices – Mechanical and climatic test methods – Part 11: Rapid change of temperature – Two-fluid-bath method*

IEC 60749-12, *Semiconductor devices – Mechanical and climatic test methods – Part 12: Vibration, variable frequency*

IEC 60749-25, *Semiconductor devices – Mechanical and climatic test methods – Part 25: Temperature cycling*

IEC 60749-26, *Semiconductor devices – Mechanical and climatic test methods – Part 26: Electrostatic discharge (ESD) sensitivity testing – Human body model (HBM)*



IEC TR 62572-2, *Fibre optic active components and devices – Reliability standards – Part 2: Laser module degradation*

MIL-STD-883, *Test method standard – Microcircuits*

### 3 Terms, definitions, symbols and abbreviations

#### 3.1 Terms and definitions

For the purposes of this document the following definitions apply.

##### 3.1.1

##### **laser module**

packaged assembly containing a laser diode with/without photodiode

Note 1 to entry: The module may also include a cooler and temperature sensor to enable laser temperature to be controlled and monitored. The optical output is normally via an optical fibre pigtail.

##### 3.1.2

##### **submount**

substrate upon which a laser diode or photodiode may be mounted for assembly into the laser module

Note 1 to entry: Components on submounts are also subject to qualification testing.

##### 3.1.3

##### **laser module manufacturer**

LMM

manufacturer of laser modules who provides devices meeting the requirements of the relevant detail specification (DS) and the customer's reliability requirements

##### 3.1.4

##### **network operator**

NO

organization which operates a telecommunications network

##### 3.1.5

##### **system supplier**

SS

manufacturer of telecommunications/data transmission equipment containing optoelectronic semiconductor lasers

Note 1 to entry: The system supplier can be a laser module customer.

##### 3.1.6

##### **system operator**

SO

network operator of telecommunications/data transmission equipment containing optoelectronic semiconductor lasers in the transmission path

Note 1 to entry: The system may also be part of other more extensive systems, for example telecommunications, rail, road vehicles, aerospace or weapons.

##### 3.1.7

##### **capability qualifying components**

CQC

components selected to represent critical stages of the process and limiting or boundary characteristics of mechanical and electro-optic design

Note 1 to entry: Such components should aid the identification of end product failure mechanisms to enable the determination of activation energies.

### 3.2 Symbols and abbreviations

$T_A$	minimum storage temperature
$T_B$	maximum storage temperature
$T_C$	module case temperature
$T_S$	submount temperature
$T_{S \text{ nom}}$	recommended submount temperature
$T_{Op \text{ min}}$	module minimum operating temperature
$T_{Op \text{ max}}$	module maximum operating temperature
$T_{stg \text{ min}}$	module minimum storage temperature
$T_{stg \text{ max}}$	module maximum storage temperature
Qc	test for gross leak detection
Qk	test for fine leak detection
$p$	periodicity (in months)
$n$	sample size
CA	capability approval
CQC	capability qualifying components
DS	detail specification
LMM	laser module manufacturer
ML	median life
NO	network operator
QA	quality approval
QIP	quality improvement programmes
RGA	residual gas analysis
SO	system operator
SS	system supplier

## 4 Laser reliability and quality assurance procedure

### 4.1 Demonstration of product quality

This standard (where required by the specification) gives the minimum mandatory requirements and is part of a total laser reliability and quality assurance procedure adopted by the laser module manufacturer.

It also provides guidance on the activities of system suppliers and system operators and provides feedback on field performance to laser module manufacturers and system suppliers.

The laser module manufacturer shall be capable of demonstrating, by means of qualification approval of devices, technology approval or capability approval of the manufacturing process, the following:

- a) a documented and audited manufacturing process including the qualification of purchased components in accordance with an internationally recognized quality management system;
- b) a performance qualification programme, including for example, accelerated life testing, burn-in and screening of components and modules;
- c) a qualification maintenance programme to ensure continuity of reliability performance;