

# TECHNICAL REPORT



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**Fibre optic interconnecting devices and passive components –  
Part 05: Investigation on impact of contamination and scratches on optical  
performance of single-mode (SM) and multimode (MM) connectors**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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# INTERNATIONAL ELECTROTECHNICAL COMMISSION

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## **FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS –**

### **Part 05: Investigation on impact of contamination and scratches on optical performance of single-mode (SM) and multimode (MM) connectors**

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IEC/TR 62627-05, which is a technical report, has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive 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/3442/DTR	86B/3489A/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- withdrawn,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.

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## INTRODUCTION

Contaminated optical connectors result in degradation of optical performance, which can be quantified by return loss (RL) and attenuation (A), functional failures and increased deployment costs. Fibre optic connector endface cleaning is recognized as a necessity for optimal signal performance. It is known that contamination impacts signal performance by blocking the core and impeding light transmission, as well as by preventing direct physical contact creating an air gap between the two connector endfaces [1, 2]<sup>1</sup>. If an air gap exists, optical performance will be impacted due to the change in transmission medium. As contaminated connectors are mated and demated, contamination can be redistributed around the connectors' endface and block the fibre core. This presents a risk of signal performance degradation during the service life.

Since 2002, the iNEMI (International Electronics Manufacturing Initiative) working group has done substantial work, both theoretical and experimental, on impact of scratches and contamination on connector optical performance (A and RL). The following connector types have been used for this research: single-mode (SM) physical contact (PC) connectors, SM angle polished connectors (APC) and SM APC MPO connector. The impact of polishing scratches has been investigated for SM and multimode (MM) connectors. The work presented in this technical report was used as a base work for the development of IPC-8497-1 [3] and IEC 61300-3-35 [4].

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<sup>1</sup> Figures in square brackets refer to the Bibliography.

## FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS –

### Part 05: Investigation on impact of contamination and scratches on optical performance of single-mode (SM) and multimode (MM) connectors

## 1 Scope

This part of IEC 62627, which is a technical report, summarizes the extensive industry research on development of cleanliness specifications for single-mode (SM) and multimode (MM) connectors.

The summary of the result shows Table 1.

**Table 1 – Summary of the result**

Samples		Scratch/Contamination/Defect	A/RL	Clause	Reference
SM/MM	Single-fibre/ multi-fibre				
SM PC	Single-fibre	Scratch	RL	3	[1], [5], [6]
MM PC	Single-fibre	Scratch	RL	4	[7]
SM PC	Single-fibre	Contamination	A and RL	5	[2], [6], [8]
SM APC	Single-fibre	Contamination	A	7	[11]
SM APC	Single-fibre	Scratch	RL	7.2	[11]
SM APC	Multi-fibre	Contamination	A and RL	8	[12]

## 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 61300-3-6, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-6: Examinations and measurements – Return loss*

IEC 61755-3-1, *Fibre optic connector optical interfaces – Part 3-1: Optical interface, 2,5 mm and 1,25 mm diameter cylindrical full zirconia PC ferrule, single mode fibre*