

TECHNICAL REPORT



Fibre optic interconnecting devices and passive components – Summarising results of round robin on connector end face scratch recognition and verification by automated microscopes



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INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.180.10

ISBN 978-2-8322-1053-5

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CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	8
4 Round robin procedure	8
5 Specimen preparation.....	9
5.1 General.....	9
5.2 Multimode specimens	9
5.3 Single-mode specimens	11
6 Results	13
6.1 Reported data	13
6.2 Multimode specimens	13
Observations of specimen MM20-2.....	14
Observations of specimen MM12.....	15
Observations of MM14-4	16
6.3 Single-mode specimens	16
Observations of specimen SM9	17
Observations of specimen SM15-4	18
7 Observations and conclusions	18
7.1 Multimode observations	18
Remarks.....	19
7.2 Single-mode observations.....	19
Remarks.....	19
7.3 Conclusions	19
8 Items to be studied	20
Annex A (informative) Measurement procedure.....	21
Annex B (informative) Performance and geometry data of test specimens	23
Annex C (informative) Reported scratch results for all specimens	35
Bibliography.....	40
Figure 1 – Multimode single-fibre test specimen grouping	10
Figure 2 – Multimode multi-fibre test specimen grouping.....	11
Figure 3 – Single-mode single-fibre test specimen grouping	12
Figure 4 – Single-mode multi-fibre test specimen grouping	13
Figure 5 – Image of specimen end face MM20-2	14
Figure 6 – Number of out-of-specification scratches reported for multimode multi-fibre specimen MM20-2, zone A.....	14
Figure 7 – Image of specimen end face MM12	15
Figure 8 – Number of out-of-specification scratches reported for multimode single-fibre specimen MM12, zone A.....	15
Figure 9 – Image of specimen end face MM14-4	16
Figure 10 – Number of out-of-specification scratches reported for multimode multi-fibre specimen MM14-4, zone A.....	16
Figure 11 – Image of specimen end face SM9.....	17

Figure 12 – Number of out-of-specification scratches reported for single-mode single-fibre specimen SM9, zone A	17
Figure 13 – Image of specimen end face SM15-4.....	18
Figure 14 – Number of out-of-specification scratches reported for single-mode multi-fibre specimen SM15-4, zone A	18
Figure A.1 – Measurement procedure workflow.....	22
Figure B.1 – Initial attenuation of multimode single-fibre specimens	24
Figure B.2 – Initial return loss of multimode single-fibre specimens	24
Figure B.3 – Multimode multi-fibre test interface identification key	25
Figure B.4 – Initial attenuation of multimode multi-fibre specimens	27
Figure B.5 – Initial return loss of multimode multi-fibre specimens	27
Figure B.6 – Initial attenuation of single-mode single-fibre specimens.....	29
Figure B.7 – Initial return loss of single-mode single-fibre specimens	30
Figure B.8 – Single-mode multi-fibre test interface identification key.....	31
Figure B.9 – Initial attenuation of single-mode multi-fibre specimens	32
Figure B.10 – Initial return loss of single-mode multi-fibre specimens	33
Figure C.1 – (All specimens) – Number of out-of-specification scratches reported for multimode single-fibre specimens, zone A	35
Figure C.2 – (All specimens) – Number of out-of-specification scratches reported for multimode single-fibre specimens, zone B	36
Figure C.3 – (All specimens) – Number of out-of-specification scratches reported for multimode multi-fibre specimens, zone A	36
Figure C.4 – (All specimens) – Number of out-of-specification scratches reported for multimode multi-fibre specimens, zone B	37
Figure C.5 – (All specimens) – Number of out-of-specification scratches reported for single-mode single-fibre specimens, zone A	37
Figure C.6 – (All specimens) – Number of out-of-specification scratches reported for single-mode single-fibre specimens, zone B	38
Figure C.7 – (All specimens) – Number of out-of-specification scratches reported for single-mode multi-fibre specimens, zone A	38
Figure C.8 – (All specimens) – Number of out-of-specification scratches reported for single-mode multi-fibre specimens, zone B	39
Table 1 – Multimode test specimen categorisation	9
Table 2 – Single-mode test specimen categorisation.....	12
Table A.1 – Scratch size limits	21
Table B.1 – Initial optical performance of multimode single-fibre specimens	23
Table B.2 – End-face geometry of multimode single-fibre specimens	25
Table B.3 – Attenuation of multimode multi-fibre specimens	26
Table B.4 – Return loss of multimode multi-fibre specimens	26
Table B.5 – End-face geometry parameter of multimode multi-fibre specimens	28
Table B.6 – Fibre height of multimode multi-fibre specimens.....	28
Table B.7 – Core dip of multimode multi-fibre specimens	28
Table B.8 – Initial optical performance of single-mode single-fibre specimens	29
Table B.9 – End-face geometry of single-mode single-fibre specimens	30
Table B.10 – Attenuation of single-mode multi-fibre specimens at 1 310 nm wavelength.....	31

Table B.11 – Attenuation of single-mode multi-fibre specimens at 1 550 nm wavelength.....	31
Table B.12 – Return Loss of single-mode multi-fibre specimens at 1 310 nm wavelength	32
Table B.13 – Return loss of single-mode multi-fibre specimens at 1 550 nm wavelength.....	32
Table B.14 – End-face geometry parameter of single-mode multi-fibre specimens	33
Table B.15 – Fibre height of single-mode multi-fibre specimens.....	33
Table B.16 – Fibre tip radii of single-mode multi-fibre specimens	34

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – SUMMARISING RESULTS OF ROUND ROBIN ON CONNECTOR END FACE SCRATCH RECOGNITION AND VERIFICATION BY AUTOMATED MICROSCOPES

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The text of this Technical Report is based on the following documents:

Draft	Report on voting
86B/4492/DTR	86B/4521/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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INTRODUCTION

It is known that contamination and scratches on connector end face can result in degradation of optical performance as described in IEC TR 62627-05. It is important to inspect and clean, when necessary, each connector before mating with another connector to ensure they are fit for function. The visual inspection methods and criteria for fibre optic connectors and fibre-stub transceivers are defined in IEC 61300-3-35. Three different methods can be used for visual inspection: direct view optical microscopy (method A), video microscopy (method B) and automated analysis microscopy (method C). All methods are susceptible to system variability: methods A and B are operator dependent; method C is operator independent but relies on software analysis for measurement results. The uncertainty inherent to imaging equipment, processing methods, and detection software can lead to measurement variability among different brands and even the same types of microscopy. For all methods, the fibre microscopes can be certified for use in either low- and high-resolution applications with a purpose-built certification artefact.

There is industry concern about the veracity of the results of the visual inspection of the same part using different automated inspection equipment and software for method C. The IEC SC 86B task force group on scratch recognition was organized to investigate automated inspection system variability and provide recommendations to improve repeatability and reproducibility of the inspection. The task force group specifically limited its investigation to inspection using method C.

The task force group consisted of the following members (in alphabetical order): Arden, CommScope, Corning, Data Pixel, Exfo, Fibre QA, Fluke Corporation, Sumix, University College of London, and decided to perform this investigation by means of a round robin. The round robin involved inspection systems from multiple vendors in a blind study to determine the baseline performance of the systems with regard to automated scratch detection relative to IEC criteria of pre-selected samples.

This report summarizes the results (data collection and analysis) of end face scratch recognition and verification round robin performed by the following task force contributors (5 fibre inspection system manufactures). The following sequence in which the contributors are listed does not represent the order in which the data is presented in the results section. One contributor provided results from four unique inspection systems, each having their own participant ID (eight ID's in total):

- Data-Pixel;
- Exfo;
- FiberQA;
- Fluke Corporation;
- Sumix.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS – SUMMARISING RESULTS OF ROUND ROBIN ON CONNECTOR END FACE SCRATCH RECOGNITION AND VERIFICATION BY AUTOMATED MICROSCOPES

1 Scope

This document summarises the results of a round robin on connector end face scratch recognition and verification by automated microscopes. The prime objectives of the study were:

- determine the amount of variability (repeatability and reproducibility) when different state-of-the-art inspection systems are assessed against IEC 61300-3-35:2015;
- evaluate any system-to-system variation in the quantity of reported scratches;
- provide recommendations to improve the repeatability and reproducibility of fibre optic inspection systems.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Round robin procedure

The round robin workflow consisted of the following steps.

- a) Specimen preparation (see Clause 5): Multimode and single-mode single-fibre and multi-fibre test specimens were produced. An image of each end face was captured by high resolution microscope, attenuation and return loss were measured for each fibre, and end-face geometry was determined to verify that the specimens met the IEC interface requirements.
- b) Circulation initiation: Measurement procedure and results template (see Annex A) were developed and approved by the group. The order of participants for specimen circulation was agreed.
- c) Measurements: Specimens were circulated among round robin participants. Every participant performed measurements and collected image data according to the agreed procedure.
- d) Analysis of results: The results were gathered from all participants. Data analysis was performed, and the synthesis report was composed.