IEC TS 63334

Edition 1.0 2021-11

TECHNICAL SPECIFICATION

Fibre optic interconnecting devices and passive components – Conditions for testing the protection against dust and water ingress of passive optical protective housings and hardened fibre optic connectors (IP5X, IPX4, IPX5, IPX6)

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.180.20

ISBN 978-2-8322-1053-6

Warning! Make sure that you obtained this publication from an authorized distributor.

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 8
2 Normative references 8
3 Terms and definitions 8
4 Abreviated terms 9
5 Conditions for dust ingress testing (IP5X) of protective housings 9
5.1 General 9
5.2 Preparation of test sample 9
5.3 Initial measurement 10
5.4 Conditioning 12
5.5 Visual and final optical performance check 12
5.6 Requirements 13
5.7 Details to be specified and reported 13
6 Conditions for dust ingress testing (IP5X) of hardened connectors 14
6.1 General 14
6.2 Preparation of test sample 14
6.3 Initial measurement 15
6.4 Conditioning 16
6.5 Visual and final optical performance check 16
6.6 Requirements 17
6.7 Details to be specified and reported 17
7 Conditions for water ingress testing (IPX4, IPX5, IPX6) of protective housings and hardened connectors 18
7.1 General 18
7.2 Preparation 18
7.3 Conditioning 19
7.4 Final examination 19
7.5 Requirement 20
7.6 Details to be specified and reported 20
Annex A (normative) Dust ingress testing of protective housings with more than one connection 21
Annex B (informative) Graphical representation of maximum allowable water ingress 23
Annex C (informative) Example calculations of maximum allowable water ingress of different DUT sizes 24
Bibliography 25

Figure 1 – Example of DUT preparation 10
Figure 2 – Example of reference optical performance measurement 10
Figure 3 – Example of optical performance measurement of connection B-2-C 11
Figure 4 – Example of optical performance measurement of connection B-1-A 12
Figure 5 – Example of DUT preparation 14
Figure 6 – Example of reference optical performance measurement 15
Figure 7 – Example of optical performance measurement of plug connected to socket 2 15
Figure 8 – Example of optical performance measurement of plug connected to socket 1 16

Figure 9 – Example of DUT preparation of a hardened connector 19
Figure A.1 – Example of optical performance measurement of connection B-2-C 21
Figure B.1 – Graphical representation of maximum allowable water ingress 23

Table 1 – Overview of conditions for IP ratings covered in this document 6
Table C.1 – Example calculations of maximum allowable water ingress of different DUT sizes 24

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS –

Conditions for testing the protection against dust and water ingress of passive optical protective housings and hardened fibre optic connectors (IP5X, IPX4, IPX5, IPX6)

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as “IEC Publication(s)”). 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. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TS 63334 has been prepared by subcommittee 86B: Fibre optic interconnecting devices and passive components, of IEC technical committee 86: Fibre optics. It is a Technical Specification.

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

Draft	Report on voting
86B/4475/DTS	86B/4516A/RVDTS

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 Specification 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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

INTRODUCTION

This document includes conditions for testing the protection against dust and water ingress of passive optical protective housings and hardened fibre optic connectors according to IEC 60529.

The conditions included in this document are applicable for testing the IP ratings as summarized in Table 1.

Table 1 – Overview of conditions for IP ratings covered in this document

Passive optical protective housings and hardened fibre optic connectors	
Degree of protection against dust	**Degree of protection against water**
-	IPX4 (protected against splashing water)
IP 5X (dust-protected)	IPX5 (protected against water jets)
-	IPX6 (protected against powerful water jets)

Suitable acceptance conditions for the degree of protection as listed in Table 1 were searched for in IEC SC 86B and CENELEC TC 86BXA and different options were evaluated and discussed. The acceptance conditions in this document were presented and agreed in the Autumn 2019 meeting of IEC SC 86B/WG 6. This information was handed over to WG4, where this document was developed.

The acceptance conditions for first characteristic numeral 5 (dust ingress) according to IEC 60529 define that the protection is satisfactory if, on inspection, talcum powder has not accumulated together with and any other kind of dust in quantity and location that could interfere with the correct operation of equipment or impair safety. Additionally, it is satisfactory if no dust deposits where it could lead to tracking along the creepage distances. Dust accumulation does usually not impair the correct operation or impair the safety of passive optical protective housings containing optical fibre cables, fibres, connectors and passive optical components, and of hardened fibre optic connectors. Therefore, these conditions do not support the evaluation if the product has passed or failed. It is not necessary to ban dust ingress for passive optical protective housings and hardened fibre optic connectors with IP5X rating (dust-protected). Applicable acceptance conditions for IP5X are included in this document specifically for passive optical products.

Conditions for IP1X, IP2X, IP3X and IP4X rating (against solid foreign objects) are not included in this document because probes with a defined form and diameter are used.

The acceptance conditions for second characteristic numerals (water ingress) according to IEC 60529 define that if any water has entered, it generally does not interfere with the correct operation of the equipment or impair safety, not deposit on insulation parts where it could lead to tracking along the creepage distances, not reach live parts or windings not designed to operate when wet, not accumulate near the cable end or enter the cable if any, and not accumulate without doing any harm to the equipment. Water ingress does usually not impair the correct operation or impair the safety of passive optical protective housings containing optical fibre cables, fibres, connectors and/or passive optical components, and of hardened fibre optic connectors. Therefore, these conditions do not support the evaluation if the product has passed or failed. It is not necessary to ban water ingress for passive optical protective housings and hardened fibre optic connectors with IPX4, IPX5 and IPX6 rating (splashing water or water jet). A single fixed limit (e.g. 1 %, 0,1 %) was considered as not suitable for all sizes of protective housings and hardened connectors, because it may be too low for the determination of the volume of water ingress for small housings (e.g. 0,1 % of 0,1 l = 0,1 ml) but suitable for larger housings. On the other hand, a larger limit that is suitable for small housings may allow an excessive volume of water ingress in large housings that was also not considered as suitable (e.g. 1 % of 750 l = 7,5 l). To take small and large housings into account, a higher percentage for housings having a small inner volume (≤ 1 l) and a lower percentage for large volumes (above 1 l) was considered as the best solution. Applicable acceptance

conditions for IPX4, IPX5 and IPX6 are included in this document specifically for passive optical products.

Requirements against water ingress with IPX1, IPX2 and IPX3 (dripping and spraying) rating are not specified in the performance standards for optical products. Therefore, no conditions are included in this document for these ratings.

FIBRE OPTIC INTERCONNECTING DEVICES AND PASSIVE COMPONENTS –

Conditions for testing the protection against dust and water ingress of passive optical protective housings and hardened fibre optic connectors (IP5X, IPX4, IPX5, IPX6)

1 Scope

This document defines the conditions for testing the protection against dust and water ingress of passive optical protective housings and hardened fibre optic connectors (IP5X, IPX4, IPX5, IPX6) performed according to IEC 60529.

The conditions in this document supplement the test requirements specified in IEC 60529.

Protective housings and hardened connectors containing electrical conductors, electrical connections, passive electrical components, active electrical equipment or electronics that transmit signals or provide power are not within the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61300-3-1, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-1: Examinations and measurements – Visual examination*

IEC 61300-3-4, *Fibre optic interconnecting devices and passive components – Basic test and measurement procedures – Part 3-4: Examinations and measurements – Attenuation*

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 61753-1, *Fibre optic interconnecting devices and passive components – Performance standard – Part 1: General and guidance*