TECHNICAL REPORT

# ISO/IEC TR 14763-3

First edition
2000-07



**Information technology –**

**Implementation and operation of customer premises cabling –**

**Part 3:**
**Testing of optical fibre cabling**

Reference number
ISO/IEC TR 14763-3:2000(E)

TECHNICAL REPORT

# ISO/IEC TR 14763-3

First edition
2000-07



## Information technology –

## Implementation and operation of customer premises cabling –

## Part 3: Testing of optical fibre cabling



PRICE CODE E

*For price, see current catalogue*

# CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

# INFORMATION TECHNOLOGY – IMPLEMENTATION AND OPERATION OF CUSTOMER PREMISES CABLING –

## Part 3: Testing of optical fibre cabling



## FOREWORD

1) ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

2) In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

3) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC and ISO technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where, for any other reason, there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when the technical committee has collected data of a different kind from that which is normally published as an International Standard, for example ‘state of the art’.

Technical reports of types 1 and 2 are subject to review within three years of publication to decide whether they can be transformed into International Standards. Technical reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC 14763-3, which is a technical report of type 3, was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

This document is not to be regarded as an International Standard. Comments on the content of this document should be sent to the IEC Central Office.

# INTRODUCTION

This Technical Report is one of two prepared in support of international standard ISO/IEC 11801. The diagram below shows the inter-relationship of the currently developed Technical Reports and other supporting standards.

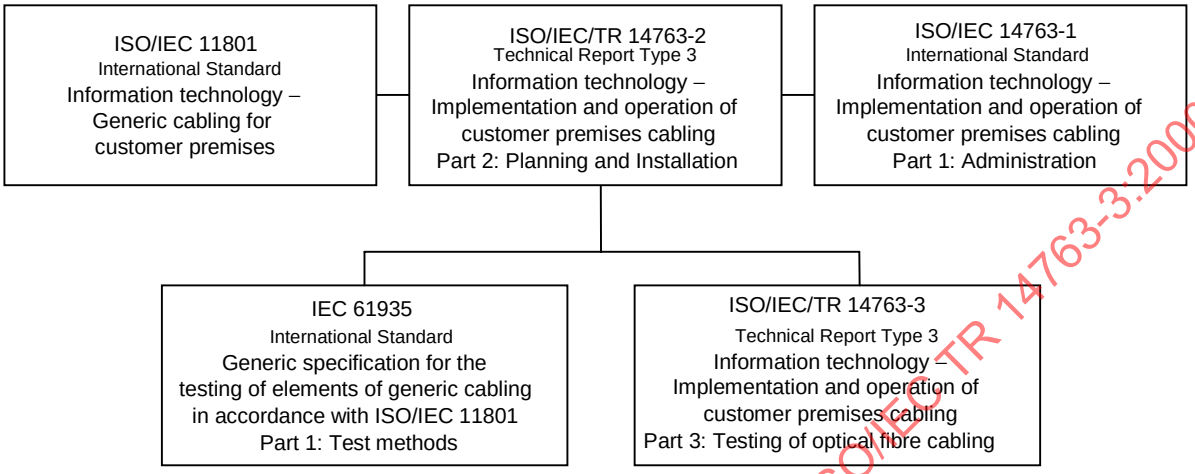


**Figure 1 – Document relationships**

This document forms Part 3 of ISO/IEC 14763 (Technical Report, type 3) and details test procedures for optical fibre cabling which has been:

- designed in accordance with ISO/IEC 11801;
- installed according to the recommendations of ISO/IEC 14763-2 (Technical Report, type 3).

Users of this document should be familiar with both ISO/IEC 11801 and ISO/IEC 14763-2.

The test procedures within this document may be undertaken as acceptance, trouble-shooting or compliance tests as defined in Annex A of ISO/IEC 11801.

Three test regimes are discussed:

- component acceptance tests: undertaken following delivery of components, prior to installation;
- Stage 1 tests: undertaken at relevant contractual intervals during the installation;
- Stage 2 tests: final acceptance tests.

The Quality Plan for each installation will define the acceptance tests and sampling levels selected for that installation. Recommendations for the development of a Quality Plan are contained in ISO/IEC 14763-2.

# INFORMATION TECHNOLOGY – IMPLEMENTATION AND OPERATION OF CUSTOMER PREMISES CABLING –

# Part 3: Testing of optical fibre cabling

## 1 Scope

This Technical Report outlines the test procedures to be used to ensure that optical fibre cabling, designed in accordance with ISO/IEC 11801 and installed according to the recommendations of ISO/IEC 14763-2, is capable of delivering the level of transmission performance specified in ISO/IEC 11801.

## 2 Reference documents

This document contains dated or undated references to specifications from other publications. These references are quoted at the relevant points in the text and the publications are listed below. In the case of dated references, subsequent changes or revisions to these publications belong to this standard only if they have been incorporated by change or revision. In the case of undated references, the latest edition of the relevant publications is applicable in each case.

ISO/IEC 11801, *Information Technology – Generic Cabling for Customer Premises*

ISO/IEC 14763-2, *Implementation and Operation of Customer Premises Cabling – Part 2: Planning and Installation*

IEC 60050(731), *International Electrotechnical Vocabulary (IEV) – Chapter 731: Optical fibre communications*

IEC 61280-4-1 (in preparation) *Fibre optic communication system basic test procedures – Test procedures for fibre optic cable plant – Part 1: Multimode fibre optic cable plant attenuation measurement*

IEC 61280-4-2 (in preparation), *Fibre optic communication system basic test procedures – Test procedures for fibre optic cable plant – Part 2: Single mode fibre optic cable plant attenuation measurement*

IEC 61300-3-6:1997, *Basic fibre optic test procedures – Part 3: Examination and measurement – Section 6: Return loss*

IEC 61300-3-34, *Basic fibre optic test procedures – Part 3: Examination and measurement – Section 34: Attenuation of random mated connectors*

# 3 Definitions and abbreviations

## 3.1 Definitions

For the purposes of this Technical Report the following definitions apply in addition to those of ISO/IEC 11801 and IEC 60050(731).

**3.1.1**
**Stage 1**
A possible contractual boundary following the installation of cable but prior to its termination at which testing may be appropriate (certain systems allow the installation of pre-terminated cables which may be subject to Stage 1 testing).

**3.1.2**
**Stage 2**
A possible contractual boundary following the completion of cabling installation at which testing may be appropriate.

## 3.2 Abbreviations

For the purposes of this Technical Report the abbreviations of ISO/IEC 11801 and IEC 60050(731) apply.

# 4 General requirements

Connector end faces should always be cleaned in accordance with manufacturers' instructions prior to mating.

NOTE The use of temporary index matching materials (gels and/or fluids) in mated connectors under test is not recommended where the introduction of such materials may invalidate any measurement or test result.

# 5 Records

A permanent record of all tests should be retained together with details of the measurement procedure and the type, serial number and proof of calibration of the equipment. In addition, details of the test cords used should also be recorded.

# 6 Tests

## 6.1 Optical fibre length, propagation delay and inter-component distances

### 6.1.1 General

This clause outlines the testing which should be undertaken, where referenced within the Quality Plan, to determine:

- the continuity of an optical fibre within an optical fibre cable or link;
- the length of an optical fibre within an optical fibre cable or link;
- the propagation delay of the optical fibre cable or link;
- the distances between installed components such as embedded connecting hardware.

### 6.1.2 Cable acceptance and Stage 1 test methods

The optical fibres specified within the Quality Plan should be tested using a simple light source (to determine continuity), an optical source and power meter combination or equipment providing the function of an optical time domain reflectometer (OTDR) operating at the relevant wavelength (and in accordance with manufacturers' instructions and specification). The test equipment should be connected to the optical fibre under test using either a temporary termination or a temporary splice connecting the optical fibre under test to a test cord.

Where required, propagation delay can be calculated, if not directly provided by the test equipment, by dividing the length of the optical fibre by the propagation velocity (based upon the relevant refractive index specified by the manufacturer of the optical fibre cable).

### 6.1.3 Stage 2 test methods

The optical fibres specified within the Quality Plan should be tested using a simple light source (to determine continuity), an optical source and power meter combination or equipment providing the function of an optical time domain reflectometer (OTDR) operating at the relevant wavelength (and in accordance with manufacturers' instructions and specification).

For tests using optical source/power meter or OTDR equipment, test methods detailed in IEC 61280-4-1 for multimode optical fibres and IEC 61280-4-2 for single mode optical fibres should be used.

Where required, propagation delay can be calculated, if not directly provided by the test equipment, by dividing the length of the optical fibre by the propagation velocity (based upon the relevant refractive index specified by the manufacturer of the optical fibre cable).

### 6.1.4 Requirements

ISO/IEC 11801 specifies a maximum propagation delay. In addition, the lengths, propagation delays and/or inter-component distances measured should be checked for consistency with the optical fibres supplied and installed (subject to the accuracy of the measurement).

NOTE 1 The optically measured length of an optical fibre may differ from the physical length of the cable. Within a given length of optical fibre cable that contains multiple optical fibres, each optical fibre may have a different length.

NOTE 2 The propagation velocity or the group refractive index, provided by the manufacturer of the optical fibre cable under test, is required by the test equipment to calculate optical fibre length. If another value is used due to lack of information (e.g. the verification of unknown cabling), the impact of any errors introduced should be recognised and agreed between the installer and the user.

The limits and restrictions indicated above should be detailed within the Quality Plan and reflected in the test schedule.

## 6.2 Link attenuation

### 6.2.1 General

This clause outlines the testing which should be undertaken, where referenced within the Quality Plan to determine the compliance of Stage 2 optical links with the requirements of ISO/IEC 11801.

### 6.2.2 Test method

The links specified within the Quality Plan should be tested using an optical source and meter equipment and test cords as defined in IEC 61280-4-1 for multimode optical fibres and IEC 61280-4-2 for single mode optical fibres.

Test methods described in Method 2 of IEC 61280-4-1 for multimode optical fibres and Method A1 of IEC 61280-4-2 for single mode optical fibres should be used.

It should be noted that:

- optical fibre and connector hardware conditions at the interface between the test cords and a link under test produce variations in measured results;
- for short lengths this variable factor may be significant in comparison with the value being measured. This defines a minimum length limit below which attenuation cannot be assessed;
- to reproduce a given measurement it is necessary to reproduce the test conditions including the configuration of the test cords used. Changing the test set-up may produce variable results;
- it is recommended to use a mandrel wrap and, where appropriate, cladding mode stripping techniques in order to maximize measurement repeatability. These should be established within the test cord. The mandrel used should be in accordance with IEC 61300-3-34 (5 × 20 mm for 62,5/125 µm optical fibre and 5 × 15 mm for 50/125 µm optical fibre).

The limits and restrictions indicated above should be detailed within the Quality Plan and reflected in the test schedule.

ISO/IEC 11801 specifies maximum link attenuation values at a range of wavelengths. The wavelengths at which the measurements are to be made should be detailed in the Quality Plan.

For links containing one connection at either end, it is only necessary for the measurement to be made in a single direction. However, where links contain multiple connections and or splices then bi-directional testing is recommended.

### 6.2.3 Requirements

ISO/IEC 11801 specifies the performance requirements for optical cables and connecting hardware. The specific attenuation performance of each installed link is based upon the quantity of each type of connecting hardware component used and the overall length of optical fibre cable installed.

The measured values of attenuation should not exceed the sum of allowable attenuation, as specified in ISO/IEC 11801, of each component of the link.

Where measured results do not comply with the optical loss budget it is recommended that the link be investigated using an OTDR in order to identify the non-compliant component(s).

## 6.3 Return loss

### 6.3.1 General

This clause outlines the testing which should be undertaken, where referenced within the Quality Plan, to determine the compliance of connecting hardware or installed links with the return loss requirements of ISO/IEC 11801.

### 6.3.2 Connecting hardware acceptance test method

Pre-terminated optical fibre tails specified within the Quality Plan should be tested in accordance with Method A2 of IEC 61300-3-6 (1997).

### 6.3.3 Stage 2 test method

The link interfaces specified within the Quality Plan should be tested in accordance with Method A of IEC 61300-3-6 (1997).

### 6.3.4 Requirements

ISO/IEC 11801 specifies the return loss requirements for optical connections.

_____