

**AS/NZS 14763.3:2017**

(ISO/IEC 14763-3:2014, MOD)

Australian/New Zealand Standard

# **Information technology— Implementation and operation of customer premises cabling**

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

Superseding AS/NZS ISO/IEC 14763.3:2012



**AS/NZS 14763.3:2017**



This joint Australian/New Zealand Standard was prepared by joint Technical Committee CT-001, Communications Cabling. It was approved on behalf of the Council of Standards Australia on 10 January 2017 and by the New Zealand Standards Approval Board on 9 December 2016.

This standard was published on 3 February 2017.

---

**The following are represented on Committee CT-001:**

Australian Chamber of Commerce and Industry  
Australian Communications and Media Authority  
Australian Council of Trade Unions  
Australian Digital and Telecommunications Industry Association  
Australian Industry Group  
Australian Information Industry Association  
BICSI South Pacific—Australia  
BICSI South Pacific—New Zealand  
Communications Alliance  
Energy Networks Association  
Engineers Australia  
KNX National Group  
Lighting Council Australia  
National Electrical and Communications Association  
Telecommunications Users Association of New Zealand

---

**Keeping standards up to date**

Standards are living documents which reflect progress in science, technology, and systems. To maintain their currency, all standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current standard, which should include any amendments which may have been published since the standard was purchased.

Detailed information about joint Australian/New Zealand standards can be found by visiting the standards webshop in Australia at [www.saiglobal.com](http://www.saiglobal.com) or Standards New Zealand's website at [www.standards.govt.nz](http://www.standards.govt.nz).

For more frequent listings or notification of revisions, amendments, and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national standards organisation.

We also welcome suggestions for improvement in our standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to either the Chief Executive of Standards Australia or the New Zealand Standards Executive at the address shown on the title page.

---

*This standard was issued in draft form for comment as DR AS/NZS 14763.3:2016.*

---

Australian/New Zealand Standard

---

# **Information technology— Implementation and operation of customer premises cabling**

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

---

Originated as AS/NZS ISO/IEC 14763.3:2007.  
Previous edition 2012.  
Jointly revised and designated AS/NZS 14763.3:2017.

### **COPYRIGHT**

© Standards Australia Limited/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968 (Australia) or the Copyright Act 1994 (New Zealand).

Jointly published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001 and by Standards New Zealand, PO Box 1473, Wellington 6140.

ISBN (Print) 978-1-77664-807-8  
ISBN (PDF) 978-1-77664-808-5

## PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CT-001, Communications Cabling, Telecommunications installations—Implementation and operation of customer premises cabling, Part 3: Testing of optical fibre cabling (ISO/IEC 14763-3:2011, MOD) to supersede AS/NZS ISO/IEC 14763.3:2012, *Telecommunications installations—Implementation and operation of customer premises cabling, Part 3: Testing of optical fibre cabling (ISO/IEC 14763-3:2011, MOD)*.

This edition includes the following significant technical changes with respect to the previous edition:

- (a) General requirements (Clause 5) have been revised and the concept of normalization has been replaced by reference measurements.
- (b) OTDR characterization (6.2) and requirements for cabling interface adapters (6.3) and test cords have been revised and requirements for single-mode fibre test cords (6.3.4) have been removed.
- (c) Enhanced three-test-cord reference method has been introduced (9.1.1.2).
- (d) Requirements for the attenuation measurement of cords (10.6) have been revised.
- (e) Annex A ‘Launched modal distribution (LMD)’ has been simplified and the new title now reads ‘Launched modal conditions for testing multimode optical fibre cabling’.
- (f) Visual inspection criteria for connectors have been reworked (Annex B).
- (g) Information on optical time domain reflectometry (Annex C) has been revised.
- (h) Examples of calculations of channel and permanent link limits (Annex G) have been revised.
- (i) Information regarding cleaning and inspection of fibre optic connections have been added (Annex H).

The objective of this Standard is to specify systems and methods for the inspection and testing of installed optical fibre cabling designed in accordance with premises cabling standards including AS/NZS 3080, ISO/IEC 24764, ISO/IEC 24702 and ISO/IEC 15018. The test methods refer to existing standards-based procedures where they exist.

This Standard is an adoption with national modifications and has been reproduced from ISO/IEC 14763-3:2014, *Information technology—Implementation and operation of customer premises cabling, Part 3: Testing of optical fibre cabling*, and its Corrigendum 1 (2015) which has been added at the end of the source text. This Standard has been varied as indicated to take account of Australian/New Zealand conditions. The modifications are specified in Appendix ZZ.

As this Standard is reproduced from an International Standard, the following applies:

- (i) In the source text ‘this part of ISO/IEC 14763’ should read ‘this Australian/New Zealand Standard’.
- (ii) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>	<i>Australian/New Zealand Standard</i>
ISO/IEC	AS/NZS
11801 Information technology—Generic cabling for customer premises	3080 Information technology—Generic cabling for customer premises (ISO/IEC 11801:2011, MOD)

*Reference to International Standard*

## ISO/IEC

14763 Information technology—  
Implementation and operation of  
customer premises cabling  
14763-2 Part 2: Planning and installation

## IEC

60825 Safety of laser products  
60825-2 Part 2: Safety of optical fibre  
communication systems (OFCS)

*Australian/New Zealand Standard*

## AS/NZS ISO/IEC

14763 Information technology—  
Implementation and operation of  
customer premises cabling  
14763.2 Part 2: Planning and installation

## AS/NZS IEC

60825 Safety of laser products  
60825.2 Part 2: Safety of optical fibre  
communication systems (OFCS)

Only normative references that have been adopted as Australian or Australian/New Zealand Standards have been listed.

Australian or Australian/New Zealand Standards that are identical adoptions of international normative or informative references may be used interchangeably. Refer to the online catalogue for information on specific standards.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the annex or appendix to which they apply. A ‘normative’ annex or appendix is an integral part of a Standard, whereas an ‘informative’ annex or appendix is only for information and guidance.

## CONTENTS

1	Scope .....	9
2	Normative references .....	9
3	Terms, definitions and abbreviations .....	10
3.1	Terms and definitions .....	10
3.2	Abbreviations .....	13
3.3	Symbols .....	13
4	Conformance .....	14
5	General requirements .....	14
5.1	Test system .....	14
5.2	Reference measurement and calibration .....	15
5.3	Environmental conditions .....	15
5.3.1	Protection of transmission and terminal equipment .....	15
5.3.2	Inspecting and cleaning connectors .....	15
5.3.3	Use of test equipment .....	15
5.3.4	Relevance of measurement .....	16
5.3.5	Treatment of marginal test results .....	16
5.4	Documentation .....	16
6	Test equipment .....	16
6.1	Light source and power meter .....	16
6.1.1	General .....	16
6.1.2	Light sources .....	16
6.1.3	Power meters .....	17
6.1.4	Test system stability (ffs) .....	17
6.2	OTDR .....	17
6.2.1	General .....	17
6.2.2	OTDR characterization using a launch test cord and a tail test cord .....	18
6.3	Test cords and adapters .....	18
6.3.1	Connecting hardware at test interfaces .....	18
6.3.2	Reference connector requirements .....	19
6.3.3	Test cords .....	20
6.4	MMF launched modal distribution .....	22
6.5	SMF launch condition .....	22
7	Inspection equipment .....	22
8	Cabling under test – Channels and permanent links .....	23
8.1	General .....	23
8.2	Reference planes .....	23
8.3	Wavelength of measurement .....	24
8.4	Direction of measurement .....	24
9	Testing of installed cabling .....	25
9.1	Attenuation .....	25
9.1.1	LSPM .....	25
9.1.2	OTDR .....	29

9.2	Propagation delay .....	31
9.2.1	Test method .....	31
9.2.2	Treatment of results .....	32
9.3	Length .....	32
9.3.1	Test method .....	32
9.3.2	Measurement uncertainty .....	32
9.3.3	Treatment of results .....	32
10	Testing of cabling components within installed cabling .....	33
10.1	Attenuation of optical fibre cable .....	33
10.1.1	Test method .....	33
10.1.2	Measurement uncertainty .....	33
10.1.3	Treatment of results .....	33
10.2	Attenuation of local and remote test interfaces .....	34
10.2.1	Test method .....	34
10.2.2	Test system measurement uncertainty .....	34
10.2.3	Treatment of results .....	35
10.3	Attenuation of connecting hardware .....	36
10.3.1	Test method .....	36
10.3.2	Treatment of results .....	36
10.4	Return loss of connecting hardware .....	37
10.4.1	Test method (in accordance with IEC 61300-3-6, method 2) .....	37
10.4.2	Treatment of results .....	38
10.4.3	Measurement uncertainty .....	39
10.5	Optical fibre length .....	39
10.5.1	Test method .....	39
10.5.2	Measurement uncertainty .....	41
10.5.3	Treatment of results .....	41
10.6	Attenuation of cords .....	41
10.6.1	Test method .....	41
10.6.2	Treatment of results .....	42
11	Inspection of cabling and cabling components .....	42
11.1	Optical fibre continuity .....	42
11.2	Cabling polarity .....	42
11.3	Optical fibre cable length .....	42
11.4	Inspection of optical fibre end faces .....	43
11.5	Optical fibre core size .....	43
Annex A (normative) Launch modal conditions for testing multimode optical fibre cabling .....		44
Annex B (normative) Visual inspection criteria for connectors .....		45
Annex C (informative) Optical time domain reflectometry .....		46
C.1	Operational capability .....	46
C.1.1	Effective characterization .....	46
C.1.2	Dynamic range .....	46
C.1.3	Pulse width .....	46
C.1.4	Integration or sample count .....	46
C.2	Limitations of OTDR capability .....	47
C.2.1	Minimum lengths of operation – Attenuation dead zone .....	47
C.2.2	Ghosting .....	48

C.2.3	Effective group index of refraction .....	49
C.2.4	Backscattering coefficient .....	49
Annex D (normative)	Inspection and testing of test and substitution test cords .....	50
D.1	General requirements .....	50
D.2	Attenuation (test and substitution test cord reference connections) .....	50
Annex E (informative)	Enhanced three-test-cord and one-test-cord reference methods for link and channel attenuation .....	52
E.1	Reference methods for link attenuation .....	52
E.2	One-test-cord reference method for link attenuation .....	52
E.3	Test method for channel attenuation .....	52
Annex F (informative)	Quality planning .....	53
F.1	Inspection and test schedules .....	53
F.2	Stage 1 inspection and testing .....	53
F.3	Stage 2 testing .....	53
F.3.1	Basic test group .....	53
F.3.2	Extended test group .....	54
Annex G (informative)	Examples of calculations of channel and permanent link limits .....	55
G.1	Channel measurement .....	55
G.2	Permanent link measurement .....	55
Annex H (informative)	Cleaning and inspection of fibre optic connections .....	57
Bibliography	.....	58
Figure 1	– Relationship of related International Standards .....	8
Figure 2	– Test system and the cabling under test .....	15
Figure 3	– OTDR characterization using a launch test cord and a tail test cord .....	18
Figure 4	– An example of test cord labelling and identification .....	20
Figure 5	– OTDR launch test cord and/or tail test cord schematic .....	21
Figure 6	– Channels and permanent links in accordance with ISO/IEC 11801 and equivalent standards .....	23
Figure 7	– Channel and permanent link test configuration .....	24
Figure 8	– LSPM enhanced three-test-cord attenuation measurement of installed channels .....	26
Figure 9	– LSPM one test cord attenuation measurement of installed permanent links .....	27
Figure 10	– OTDR measurement of installed cabling (channel): 2 point attenuation measurement method .....	30
Figure 11	– OTDR measurement of installed cabling (permanent link) .....	31
Figure 12	– OTDR measurement of optical fibre attenuation .....	34
Figure 13	– OTDR measurement of connection attenuation .....	35
Figure 14	– OTDR measurement of joint attenuation .....	37
Figure 15	– OTDR measurement of return loss .....	38
Figure 16	– Determination of length using an OTDR .....	39
Figure 17	– OTDR characterization of a SMF permanent link containing a break .....	40
Figure 18	– OTDR characterization of a permanent link containing a macrobend .....	41
Figure 19	– Measurement of cord interface attenuation .....	42
Figure C.1	– OTDR characterization using different length launch test cords .....	47
Figure C.2	– OTDR characterization showing ghost effects .....	48

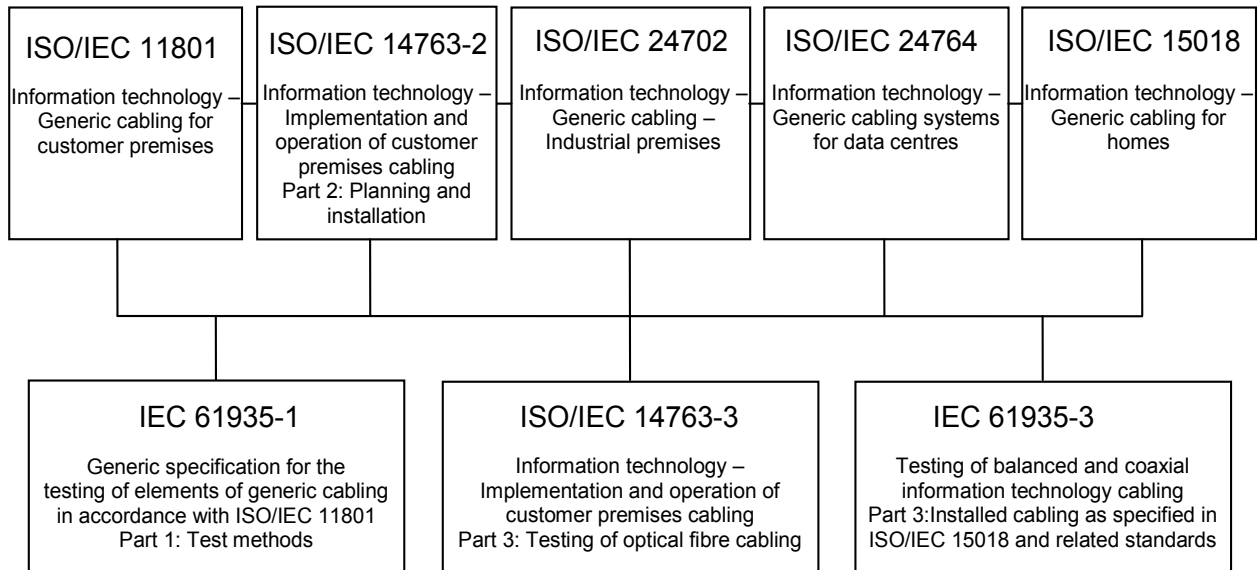


Figure C.3 – OTDR characterization showing complex ghost effects .....	49
Figure D.1 – Measurement of substitution test cord interface attenuation .....	50
Table 1 – MMF light source characteristics .....	17
Table 2 – SMF light source characteristics .....	17
Table 3 – Non-LC reference connector requirements .....	19
Table 4 – Connecting hardware attenuation .....	28
Table C.1 – Default effective group IOR values .....	49
Table C.2 – Default backscattering coefficient values .....	49

## INTRODUCTION

This International Standard is one of four prepared in support of International Standard ISO/IEC 11801 and other cabling standards.

Figure 1 below shows the inter-relationship between ISO/IEC 11801 and other International Standards and for cabling systems with related standards.



**Figure 1 – Relationship of related International Standards**

ISO/IEC 14763-3 details the inspection and test procedures for optical fibre cabling,

- a) designed in accordance with premises cabling standards including ISO/IEC 11801, ISO/IEC 24764, ISO/IEC 24702 and ISO/IEC 15018, and
- b) installed according to the requirements and recommendations of ISO/IEC 14763-2.

Users of this International Standard should be familiar with relevant premises cabling standards and ISO/IEC 14763-2.

The quality plan for each installation will define the acceptance tests and sampling levels selected for that installation. Requirements and recommendations for the development of a quality plan are described in ISO/IEC 14763-2.

NOTE JTC 1/SC 25, in cooperation with IEC/TC 86, is currently developing an overall quantitative model to calculate total measurement uncertainty as stated in the reference planes of ISO/IEC 11801. When such a model has been verified, it is expected to be incorporated into this standard in form of an Amendment, thereby removing pertinent clauses currently marked “ffs” (for further study).

## AUSTRALIAN/NEW ZEALAND STANDARD

**Information technology—Implementation and operation of customer premises cabling****Part 3:****Testing of optical fibre cabling (ISO/IEC 14763-3:2014, MOD)****1 Scope**

This part of ISO/IEC 14763 specifies systems and methods for the inspection and testing of installed optical fibre cabling designed in accordance with premises cabling standards including ISO/IEC 11801, ISO/IEC 24764, ISO/IEC 24702 and ISO/IEC 15018. The test methods refer to existing standards-based procedures where they exist.

**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.

ISO/IEC 11801, *Information technology – Generic cabling for customer premises*

ISO/IEC 14763-2, *Information technology – Implementation and operation of customer premises cabling – Part 2: Planning and installation*

IEC 60050-731, *International Electrotechnical Vocabulary – Chapter 731: Optical fibre communication*

IEC 60825-2, *Safety of laser products – Part 2: Safety of optical fibre communication systems (OFCS)*

IEC 60874-14-3, *Connectors for optical fibres and cables – Part 14-3: Detail specification for fibre optic adapter (simplex) type SC for single-mode fibre*

IEC 60874-19-1, *Fibre optic interconnecting devices and passive components – Connectors for optical fibres and cables – Part 19-1: Fibre optic patch cord connector type SC-PC (floating duplex) standard terminated on multimode fibre type A1a, A1b – Detail specification*

IEC 61280-1-3, *Fibre optic communication subsystem test procedures – Part 1-3: General communication subsystems – Central Wavelength and spectral width measurement*

IEC 61280-1-4, *Fibre optic communication subsystem test procedures – Part 1-4: General communication subsystems – Light source encircled flux measurement method*

IEC 61280-4-1, *Fibre-optic communication subsystem test procedures – Part 4-1: Installed cable plant – Multimode attenuation measurement*

IEC 61280-4-2, *Fibre optic communication subsystem basic test procedures – Part 4-2: Fibre optic cable plant – Single-mode fibre optic cable plant attenuation*

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



## **AS/NZS 14763.3:2017 Information technology - Implementation and operation of customer premises cabling - Part 3: Testing of optical fibre cabling**

This is a free sample only.

Purchase the full publication here:

<https://shop.standards.govt.nz/catalog/14763.3%3A2017%28AS%7CNZS%29/view>

Or contact Standards New Zealand using one of the following methods.

**Freephone:** 0800 782 632 (New Zealand)

**Phone:** +64 3 943 4259

**Email:** [enquiries@standards.govt.nz](mailto:enquiries@standards.govt.nz)