

## TECHNICAL REPORT

**Information technology – Generic cabling for customer premises –  
Part 9905: Guidelines for the use of installed cabling to support 25GBASE-T  
application**

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### Part 9905: Guidelines for the use of installed cabling to support 25GBASE-T application

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ISO/IEC TR 11801-9905, which is a Technical Report, was prepared by subcommittee 25: Interconnection of information technology equipment, of ISO/IEC joint technical committee 1: Information technology.

The list of all currently available parts of the ISO/IEC 11801 series, under the general title *Information technology — Generic cabling for customer premises*, can be found on the IEC website.

This Technical Report has been approved by vote of the member bodies, and the voting results may be obtained from the address given on the second title page.

This Technical Report is to be read in conjunction with ISO/IEC/IEEE 8802.3:2017/AMD3.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

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## INTRODUCTION

This document provides guidance to determine whether and which installed channels will support 25GBASE-T. It takes into account the design goals for 25GBASE-T equipment such as:

- a) the frequency signal range up to 1 250 MHz;
- b) the support of two-connector channels up to 30 m in length.

The requirements of 25GBASE-T are fully defined in ISO/IEC/IEEE 8802-3:2017/AMD3.

Installed two-connector channels which are characterized up to 1 250 MHz and support all the requirements of the ISO/IEC/IEEE 8802-3:2017/AMD3 link segment are expected to support the 25GBASE-T application.

Characterization of channels using Category 7<sub>A</sub> components is described in 4.4.

Characterization of channels using Category 7 components is described in 4.5.

Characterization of channels using Category 6<sub>A</sub> components is described in 4.6.

This document also provides mitigation procedures to improve the performance of installed channels to the point where the 25GBASE-T application is supported. Additionally, this document recommends the use of Class I and Class II channels to support 25GBASE-T in new installations.

Class I and Class II channels according to ISO/IEC 11801-1 will support 25GBASE-T without mitigation.

Component requirements are not provided in this document and should not be inferred from the channel limits provided.

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## INFORMATION TECHNOLOGY – GENERIC CABLING FOR CUSTOMER PREMISES –

### Part 9905: Guidelines for the use of installed cabling to support 25GBASE-T application

#### 1 Scope

This part of ISO/IEC 11801, which is a Technical Report,

- a) provides guidance on how to select and assess installed channels which conform to ISO/IEC 11801-1, and clarify if they also support ISO/IEC/IEEE 8802-3:2017/AMD3 for 25GBASE-T;
- b) specifies the methods to assess whether installed channels constructed with Category 7<sub>A</sub>, 7, or 6<sub>A</sub> components meet the 25GBASE-T requirements;
- c) provides guidance to identify which channels are likely to meet the 25GBASE-T requirements to avoid unnecessary testing;
- d) provides mitigation techniques to improve the performance of installed channels to meet the 25GBASE-T requirements;
- e) provides cabling recommendations for new installations.

NOTE 1 The channel transmission performance specified in this document is derived from the 25GBASE-T requirements in ISO/IEC/IEEE 8802-3:2017/AMD3.

NOTE 2 This document does not re-specify component or channel definitions of ISO/IEC 11801-1.

#### 2 Normative references

The following referenced documents are indispensable for the application 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.

ISO/IEC 11801-1, *Information technology – Generic cabling systems – Part 1: General requirements*

ISO/IEC/IEEE 8802-3:2017/AMD3, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Standard for Ethernet – Amendment 3: Physical layers and management parameters for 25 Gb/s and 40 Gb/s operation, types 25GBASE-T and 40GBASE-T*

#### 3 Terms, definitions and abbreviations

For the purposes of this document, the terms, definitions and abbreviations given in ISO/IEC 11801-1 apply.

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

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

## 4 Cabling channel specifications for 25 GBASE-T

### 4.1 General

This document provides guidelines for the assessment of installed cabling channels for the additional requirements of ISO/IEC/IEEE 8802-3:2017/AMD3 for 25GBASE-T. It is assumed that each installed channel does fulfil the requirements of its appropriate cabling class defined in ISO/IEC 11801-1.

The requirements defined in Clause 4 are a combination of the original class requirements of the installed cabling and the requirements in support of 25GBASE-T.

For a balanced cabling installation covered by this document:

- the channel performance is specified according to ISO/IEC 11801-1 and additionally according to Clause 4 (or appropriate subclause);
- the interfaces to the cabling are specified according to ISO/IEC 11801-1:2017, Clause 10, with respect to mating interfaces;
- local regulations concerning safety and EMC apply.

The test procedures for balanced cabling installations are specified in IEC 61935-1 in accordance with ISO/IEC 11801-1 and ISO/IEC 14763-2.

### 4.2 25GBASE-T application specifications

NOTE 1 These specifications are consistent with the link segment specifications of ISO/IEC/IEEE 8802-3:2017/AMD3.

NOTE 2 All specifications are based on a channel length of 30 m with 2 connections.

#### 4.2.1 Return loss

The return loss (RL) of each pair of a channel is specified in Table 1. The limits shown in Table 2 are derived from the formulae at key frequencies.

The return loss requirement is specified for both ends of the cabling. Return loss (RL) values at frequencies where the insertion loss (IL) is below 3,0 dB are for information only.

**Table 1 – Return loss for a channel**

Class	Frequency MHz	Minimum return loss dB
I	$1 \leq f < 10$	19,0
	$10 \leq f < 40$	$24 - 5 \lg(f)$
	$40 \leq f < 130$	16,0
	$130 \leq f < 1\,000$	$35 - 9 \lg(f)$
	$1\,000 \leq f \leq 1\,250$	8,0

**Table 2 –Return loss values for  
a channel at key frequencies**

Frequency MHz	Minimum return loss dB
	Class
	I
1	19,0
16	18,0
100	16,0
250	13,4
500	10,7
600	10,0
1 000	8,0
1 250	8,0

#### 4.2.2 Insertion loss/attenuation

The insertion loss (IL) of each pair of a channel is specified in Table 3. The limits shown in Table 4 are derived from the formulae at key frequencies.

**Table 3 – Insertion loss for a channel**  
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Class	Frequency MHz	Maximum insertion loss <sup>a</sup> dB
I	$1 < f \leq 500$	$\left( 0,634\sqrt{f} + 0,00156 \times f + \frac{0,078}{\sqrt{f}} \right)^b$
	$500 < f \leq 1\,250$	$\left( 0,60698\sqrt{f} + 0,00277 \times f + \frac{0,078}{\sqrt{f}} \right)^c$

<sup>a</sup> Insertion loss (IL) at frequencies that correspond to calculated values of less than 4,0 dB revert to a maximum requirement of 4,0 dB.

<sup>b</sup> This formula is derived using:  $0,312 \times \left( 1,8\sqrt{f} + 0,005 \times f + \frac{0,25}{\sqrt{f}} \right) + 2 \times \left( 0,02 \times \sqrt{f} \right) + 0,0324 \times \sqrt{f}$

<sup>c</sup> This formula is derived using:  
 $0,312 \times \left( 1,8\sqrt{f} + 0,005 \times f + \frac{0,25}{\sqrt{f}} \right) + 2 \times \left( 0,00649 \times \sqrt{f} + 0,000605 \times f \right) + 0,0324 \times \sqrt{f}$

**Table 4 – Insertion loss values for a channel at key frequencies**

Frequency MHz	Maximum insertion loss dB
	Class
	I
1	4,0
16	4,0
100	6,5
250	10,4
500	15,0
600	16,5
1 000	22,0
1 250	24,9

#### 4.2.3 NEXT

##### 4.2.3.1 Pair-to-pair NEXT

The NEXT between each pair combination of a channel is specified in Table 5. The limits shown in Table 6 are derived from the formulae at key frequencies.

The NEXT requirement is specified for both ends of the cabling. NEXT values at frequencies where the insertion loss (IL) is below 4,0 dB are for information only.

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**Table 5 – NEXT for a channel**

Class	Frequency MHz	Minimum NEXT <sup>a</sup> dB
I	$1 \leq f \leq 500$	$-20 \lg \left( 10^{\frac{75,3 - 15 \lg(f)}{-20}} + 2 \times 10^{\frac{94 - 20 \lg(f)}{-20}} \right)$
	$500 < f \leq 1250$	$-20 \lg \left( 10^{\frac{75,3 - 15 \lg(f)}{-20}} + 2 \times 10^{\frac{40 - 38 \lg(f/500)}{-20}} \right)$
<sup>a</sup> NEXT at frequencies that correspond to calculated values of greater than 65,0 dB revert to a minimum requirement of 65,0 dB.		