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INTERNATIONAL STANDARD

Multicore and symmetrical pair/quad cables for digital communications – Part 6-1: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Work area wiring – Blank detail specification

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MULTICORE AND SYMMETRICAL PAIR/QUAD CABLES FOR DIGITAL COMMUNICATIONS –

Part 6-1: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Work area wiring – Blank detail specification

FOREWORD

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International Standard IEC 61156-6-1 has been prepared by subcommittee 46C: Wires and symmetric cables, of IEC technical committee 46: Cables, wires, waveguides, r.f. connectors, r.f. and microwave passive components and accessories.

This third edition cancels and replaces the second edition published in 2007. This edition constitutes a technical revision.

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

a) new requirements for new cables $Cat6_A$ and $Cat7_A$;

b) revised requirements and tests for the cables.

The text of this standard is based on the second edition and on the following documents:

CDV	Report on voting
46C/863/CDV	46C/882/RVC

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

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

This specification is to be used in conjunction with IEC 61156-1 and IEC 61156-6.

A list of all parts of the IEC 61156 series, under the general title: *Multicore and symmetrical pair/quad cables for digital communications*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn;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

A bilingual version of this publication may be issued at a later date.

MULTICORE AND SYMMETRICAL PAIR/QUAD CABLES FOR DIGITAL COMMUNICATIONS –

Part 6-1: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Work area wiring – Blank detail specification

1 Scope

This part of IEC 61156 describes symmetrical pair/quad cables intended primarily for work area cabling as defined in ISO/IEC 11801 and ISO/IEC 24702.

NOTE Environmental classifications are presented in ISO/IEC 24702 with three levels of severity in four areas: mechanical, ingress, climatic, and electromagnetic: thus, in tabular form, they are referred to as the "MICE table".

This blank detail specification includes recommended environmental characteristics and severities which are derived from the environmental classifications that are specified for cabling for various environments.

The blank detail specification determines the layout and style for detail specifications describing symmetrical pair/quad cables with transmission characteristics up to the maximum frequency of the respective category for digital communications. Detail specifications, based on the blank detail specification, may be prepared by a national organization, a manufacturer or a user.

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.

IEC 61156-1, *Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification*

IEC 61156-6:----, *Multicore and symmetrical pair/quad cables for digital communications – Part 6: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz – Work area wiring – Sectional specification*[1]

3 Guidance for preparation of detail specifications

It is necessary to keep the transmission characteristics indicated in the relevant sectional specification for the referenced category number, i.e. 5e, 6, $6_{A,}$ 7 or 7_A.

The detail specification shall be written in accordance with the layout of the blank detail specification, which forms part of this standard.

The numbers shown in brackets in this and the following pages correspond to the following items of required information, which shall be entered in the spaces provided.

[1] Name and address of the organization that has prepared the document.

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1 To be published.

[2] IEC document number, issue number and date of issue.

[3] Address of the organization from which the document is available.

[4] Related documents.

[5] Any other reference to the cable, national reference, trade name, etc.

[6] A complete description of the cable which shall include

a) type and number of elements;
b) nominal impedance;
c) screening;
d) application;
e) category;
f) other distinguishing performance characteristics:

Example: Four-pair, unshielded twisted pair cable for use in work area wiring, having a nominal impedance of 100 Ω, and meeting the transmission requirements of Category 6 and the coupling attenuation requirements of Type III.

[7] Details of the cable material and construction.

[8] Special requirements for bending radius or operating temperatures.

[9] List of cable characteristics. These are separated into electrical, transmission, mechanical and environmental characteristics.

[10] Appropriate subclause references in the sectional specification IEC 61156-6.

[11] Requirements applicable to this cable. The values entered shall meet as a minimum the requirements of sectional specification IEC 61156-6. When applicable, reference is made to the MICE table of ISO/IEC 24702, for instance C1, C2, C3, M1, M2, M3..

[12] Comments – Relevant remarks.

4 Blank detail specification for symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz for digital communications

[1] Prepared by:		[2] Document: Issue: Date:	
[3] Available from:		[4] Generic specification: IEC 61156-1 Sectional specification: IEC 61156-6 Blank detail specification: IEC 61156-6-1	
[5] Additional references:			
[6] Cable description: a) Type and number of elements: b) Nominal impedance: c) Screening: d) Application: e) Category: f) Other distinguishing performance characteristics:			
[7] Cable construction:	IEC 61156-6 subclause		Comments
	5.2.1	Conductor description:	
	5.2.2	Insulation description: Maximum diameter: Colour code of elements:	
	5.2.3	Number of elements (pair(s)/quad(s)):	
	5.2.3.1	Screening of the cable element: Tape material Drain wire Braid wire Braid material	
	5.2.4	Cross web, spacer or protective wrapping(s):	
	5.2.5	Screen of the cable core: Tape material Minimum overlap Drain wire Braid wire Braid material	
	5.2.6	Sheath Material Nominal thickness Colour Maximum overall Diameter Marking Ripcord	
	5.2.7	Identification	
[8] Minimum bending radius for static bending: mm Minimum bending radius for dynamic bending: mm Temperature range for installation °C Operating temperature range under static conditions: –20 °C to +60 °C C_1 –40 °C to +70 °C C_2 and C_3			

[9] Characteristics	[10] IEC 61156-6 subclause	[11]	Comments
Electrical characteristics	**6.2**		
Conductor resistance	6.2.1	≤ …. Ω/km	
Resistance unbalance **Resistance unbalance within a pair** **Resistance unbalance between pairs**	6.2.2 6.2.2.1 6.2.2.2	 ≤ …. % ≤ …. %	
Dielectric strength Conductor/conductor Conductor/screen	 6.2.3 6.2.3	 ……. kV/time ……. kV/time	
Insulation resistance Conductor/conductor Conductor/screen	 6.2.4 6.2.4	 ≥ … MΩ·km ≥ … MΩ·km	
Mutual capacitance	6.2.5	≤ …. pF/m	
Capacitance unbalance pair to ground	6.2.6	≤ …. pF/km	
Transfer impedance	6.2.7	…….mΩ/m	Cable should be a grade 1 or 2
Coupling attenuation	6.2.8	……dB Cable type……	Cable type should be I, II or III
Current-carrying capacity	6.2.9	…..mA	Under consideration
Transmission characteristics	**6.3**		
Velocity of propagation	6.3.1	…. m/s	
Delay **Differential phase delay (skew)**	6.3.2 6.3.2.1	≤ … ns/m ≤ … ns/m ≤ … ns/m	
Attenuation General figures Environmental temperature effects	6.3.3 6.3.3.1 6.3.3.2	 ≤ … dB/100 m ≤ … %/°C	
Unbalance attenuation near end (*TCL*) Unbalance attenuation far end (*EL TCTL*)	6.3.4 6.3.4	≥ … dB ≥ … dB	Cable level shall be identified
Near end crosstalk	6.3.5	≥ … dB	

Attenuation to crosstalk ratio far end	6.3.6	≥ … dB	
Power sum alien (exogenous) near-end crosstalk	6.3.7	≥ … dB	
Power sum alien (exogenous) attenuation to crosstalk ratio far end	6.3.8	≥ … dB	
Impedance	6.3.10	… Ω	
Return loss	6.3.11	≥…. dB	
Mechanical and dimensional characteristics	**6.4**		
Dimensional requirements Insulation diameter Sheath thickness Cable diameter	6.4.1	… mm	
Elongation at break of the conductor	6.4.2	… ≥ %	
Tensile strength of the insulation	6.4.3	≥… MPa	
Elongation at break of the insulation	6.4.4	… ≥ %	
Adhesion of the insulation to the conductor	6.4.5	…	
Elongation at break of the sheath	6.4.6	… ≥100 %	
Tensile strength of the sheath	6.4.7	… ≥ MPa	
Crush test of the cable	6.4.8	… M_1 ≥45 N: M_2 ≥1 100 N: M_3 ≥2 200 N	
Impact test of the cable	6.4.9	… M_1 ≥1 J: M_2 ≥10 J: M_3 ≥20 J	
Bending under tension	6.4.10		
Repeated bending	6.4.11		
Tensile performance of the cable	6.4.12		
Shock test	Not applicable		
Bump test	Not applicable		
Vibration test	Not applicable		
Environmental characteristics	**6.5**		
Shrinkage of the insulation	6.5.1	≤… %	
Wrapping test of the insulation after thermal ageing	6.5.2		
Bending test of the insulation at low temperature	6.5.3		

Elongation at break of the sheath after ageing	6.5.4	≥ … %	
Tensile strength of the sheath after ageing	6.5.5	≥ … %	
Sheath pressure test at high temperature	Not applicable		
Cold bend test of the cable	6.5.7		
Heat shock test	Not applicable		
Damp heat steady state	Not applicable		
Solar radiation	6.5.10	C_1 NA: C_2 UC: C_3 UC	
UV Test		$C_1$700 Wm^{-2}: C_2 1 120 Wm^{-2}: C_3 1 120 Wm^{-2}	
Solvents and contaminating fluids	6.5.11	C_1 : C_2 : C_3	This test is not required in IEC 61156-6; it may be required and defined in the detailed specification
Salt mist and sulphur dioxide tests	6.5.12		
	Not applicable		
Water immersion test	Not applicable	C_1 NA: C_2 NA: C_3 1 m/30 mn	
Hygroscopicity	6.5.14		
Wicking	6.5.15		
Flame propagation characteristics of a single cable	6.5.16		
Flame propagation characteristics of bunched cables	6.5.17		
Halogen gas evolution	6.5.18		
Smoke generation	6.5.19		The requirement and the test method shall be specified in the detailed specification
Toxic gas emission	6.5.20		
Integrated fire test	6.5.21		

NOTE 1 Attenuation in this standard is referred to as insertion loss in generic cabling standards such as ISO/IEC 11801.

NOTE 2 When a characteristic applies but a specific value is not considered necessary, then NS for Not Specified should be entered at the appropriate place. When NS is used, the appropriate requirements in the specification should apply.

NOTE 3 When a characteristic is marked as not applicable, it is not required by IEC 61156-6 but may be required in the detailed specification.

NOTE 4 Ingress requirements using particles are not applicable to a cable.

NOTE 5 Electromagnetic requirements coming from the MICE table of ISO/IEC 24702 have been dealt with by using the requirements that are given for transfer impedance, screening attenuation and coupling attenuation. ESD requirements are considered not applicable.

NOTE 6 Note the proposed severities are proposed from IEC 24702 MICE table. Depending on the actual need of end users, other severities may be agreed between customer and suppliers.

Bibliography

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

ISO/IEC 24702, *Information technology – Generic cabling – Industrial premises*

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