BSI Standards Publication

Connectors for electrical and electronic equipment – Product requirements –

Part 2-111: Circular connectors - Detail specification for power connectors with M12 screw-locking (IEC 61076-2-111:2017)

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Full document details: BS EN IEC 61076-2-111:2018

National foreword

This British Standard is the UK implementation of EN IEC 61076-2-111:2018. It is identical to IEC 61076-2-111:2017.

The UK participation in its preparation was entrusted to Technical Committee EPL/48, Electromechanical components and mechanical structures for electronic equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Amendments/corrigenda issued since publication

Date	Text affected

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EUROPÄISCHE NORM

EN IEC 61076-2-111

March 2018

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English Version

Connectors for electrical and electronic equipment - Product requirements - Part 2-111: Circular connectors - Detail specification for power connectors with M12 screw-locking (IEC 61076-2-111:2017)

Connecteurs pour équipements électriques et électroniques - Exigences de produit - Partie 2-111 : Connecteurs circulaires - Spécification particulière pour les connecteurs d'alimentation à vis M12 (IEC 61076-2-111:2017)

Steckverbinder für elektronische Einrichtungen - Produktanforderungen - Teil 2-111: Rundsteckverbinder - Bauartspezifikation für Leistungs-Steckverbinder mit Schraubverriegelung M12 (IEC 61076-2-111:2017)

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European foreword

The text of document 48B/2601/FDIS, future edition 1 of IEC 61076-2-111, prepared by IEC/TC 48B "Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61076-2-111:2018.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2018-10-11
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2021-01-11

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60050-581	2008	International Electrotechnical Vocabulary - Part 581: Electromechanical components for electronic equipment	-	-
IEC 60068-1	-	Environmental testing -- Part 1: General and guidance	EN 60068-1	-
IEC 60068-2-60	-	Environmental testing -- Part 2-60: Tests - Test Ke: Flowing mixed gas corrosion test	EN 60068-2-60	-
IEC 60352-2	-	Solderless connections -- Part 2: Crimped connections - General requirements, test methods and practical guidance	EN 60352-2	-
IEC 60352-3	-	Solderless connections -- Part 3: Solderless accessible insulation displacement connections - General requirements, test methods and practical guidance	EN 60352-3	-
IEC 60352-4	-	Solderless connections -- Part 4: Solderless non-accessible insulation displacement connections - General requirements, test methods and practical guidance	EN 60352-4	-
IEC 60352-5	-	Solderless connections -- Part 5: Press-in connections - General requirements, test methods and practical guidance	EN 60352-5	-
IEC 60352-6	-	Solderless connections -- Part 6: Insulation piercing connections - General requirements, test methods and practical guidance	EN 60352-6	-
IEC 60352-7	-	Solderless connections -- Part 7: Spring clamp connections - General requirements, test methods and practical guidance	EN 60352-7	-
IEC 60512-1-1	-	Connectors for electronic equipment - Tests and measurements -- Part 1-1: General examination - Test 1a: Visual examination	EN 60512-1-1	-

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IEC 60512-1-2	-	Connectors for electronic equipment - Tests and measurements -- Part 1-2: General examination - Test 1b: Examination of dimension and mass	EN 60512-1-2	-
IEC 60512-2-1	-	Connectors for electronic equipment - Tests and measurements -- Part 2-1: Electrical continuity and contact resistance tests - Test 2a: Contact resistance - Millivolt level method	EN 60512-2-1	-
IEC 60512-3-1	-	Connectors for electronic equipment - Tests and measurements -- Part 3-1: Insulation tests - Test 3a: Insulation resistance	EN 60512-3-1	-
IEC 60512-4-1	-	Connectors for electronic equipment - Tests and measurements -- Part 4-1: Voltage stress tests - Test 4a: Voltage proof	EN 60512-4-1	-
IEC 60512-5-1	-	Connectors for electronic equipment - Tests and measurements -- Part 5-1: Current-carrying capacity tests - Test 5a: Temperature rise	EN 60512-5-1	-
IEC 60512-6-3	-	Connectors for electronic equipment - Tests and measurements -- Part 6-3: Dynamic stress tests - Test 6c: Shock	EN 60512-6-3	-
IEC 60512-6-4	-	Connectors for electronic equipment - Tests and measurements -- Part 6-4: Dynamic stress tests - Test 6d: Vibration (sinusoidal)	EN 60512-6-4	-
IEC 60512-9-1	-	Connectors for electronic equipment - Tests and measurements -- Part 9-1: Endurance tests - Test 9a: Mechanical operation	EN 60512-9-1	-
IEC 60512-9-2	-	Connectors for electronic equipment - Tests and measurements - Part 9-2: Endurance tests - Test 9b: Electrical load and temperature	EN 60512-9-2	-
IEC 60512-11-1	-	Electromechanical components for electronic equipment - Basic testing procedures and measuring methods -- Part 11: Climatic tests -- Section 1: Test 11a - Climatic sequence	EN 60512-11-1	-
IEC 60512-11-4	-	Connectors for electronic equipment - Tests and measurements -- Part 11-4: Climatic tests - Test 11d: Rapid change of temperature	EN 60512-11-4	-
IEC 60512-11-7	-	Connectors for electronic equipment - Tests and measurements -- Part 11- 7: Climatic tests - Test 11g: Flowing mixed gas corrosion test	EN 60512-11-7	-
IEC 60512-11-9	-	Connectors for electronic equipment - Tests and measurements -- Part 11-9: Climatic tests - Test 11i: Dry heat	EN 60512-11-9	-

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IEC 60512-11-10	-	Connectors for electronic equipment - Tests and measurements -- Part 11-10: Climatic tests - Test 11j: Cold	EN 60512-11-10	-
IEC 60512-11-12	-	Connectors for electronic equipment - Tests and measurements -- Part 11-12: Climatic tests - Test 11m: Damp heat, cyclic	EN 60512-11-12	-
IEC 60512-13-2	-	Connectors for electronic equipment - Tests and measurements -- Part 13-2: Mechanical operating tests - Test 13b: Insertion and withdrawal forces	EN 60512-13-2	-
IEC 60512-13-5	-	Connectors for electronic equipment - Tests and measurements -- Part 13-5: Mechanical operating tests - Test 13e: Polarizing and keying method	EN 60512-13-5	-
IEC 60512-16-5	-	Connectors for electronic equipment - Tests and measurements -- Part 16-5: Mechanical tests on contacts and terminations - Test 16e: Gauge retention force (resilient contacts)	EN 60512-16-5	-
IEC 60512-19-3	-	Electromechanical components for electronic equipment - Basic testing procedures and measuring methods -- Part 19: Chemical resistance tests -- Section 3: Test 19c - Fluid resistance	EN 60512-19-3	-
IEC 60529	1989	Degrees of protection provided by enclosures (IP Code)	EN 60529	1991
-	-		+ corrigendum May	1993
+ A1	1999		+ A1	2000
+ A2	2013		+ A2	2013
IEC 60664-1	-	Insulation coordination for equipment within low-voltage systems -- Part 1: Principles, requirements and tests	EN 60664-1	-
IEC 60999-1	-	Connecting devices - Electrical copper conductors - Safety requirements for screw-type and screwless-type clamping units -- Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm² up to 35 mm² (included)	EN 60999-1	-
IEC 61076-1	2006	Connectors for electronic equipment - Product requirements -- Part 1: Generic specification	EN 61076-1	2006
IEC 61984	-	Connectors - Safety requirements and tests	EN 61984	-
IEC 62197-1	-	Connectors for electronic equipment - Quality assessment requirements -- Part 1: Generic specification	EN 62197-1	-
ISO 1302	-	Geometrical Product Specifications (GPS) - Indication of surface texture in technical product documentation	EN ISO 1302	-

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ISO 11469	-	Plastics - Generic identification and marking of plastics products	EN ISO 11469	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – PRODUCT REQUIREMENTS –

Part 2-111: Circular connectors – Detail specification for power connectors with M12 screw-locking

FOREWORD

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International Standard IEC 61076-2-111 has been prepared by subcommittee 48B: Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
48B/2601/FDIS	48B/2616/RVD

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

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

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A list of all parts in the IEC 61076 series, published under the general title *Connectors for electrical and electronic equipment – Product requirements*, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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.

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

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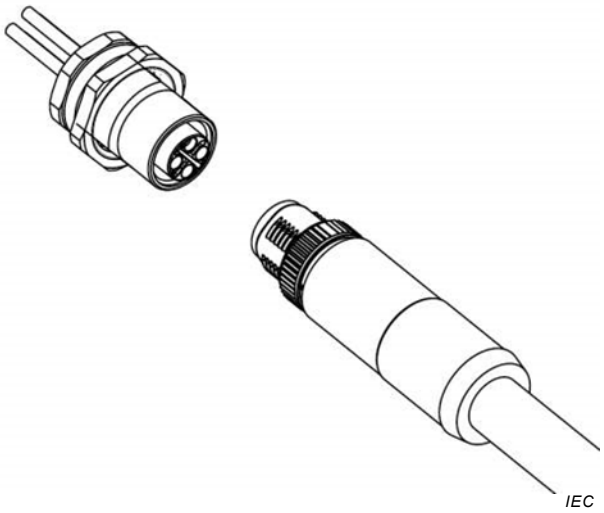
<table>
<tr><td>IEC SC 48B – Electrical connectors
Specification available from:
IEC General secretariat
Or from the addresses shown on the inside cover.</td><td>IEC 61076-2-111 Ed. 1</td></tr>
<tr><td>DETAIL SPECIFICATION in accordance with IEC 61076-1</td><td></td></tr>
<tr><td rowspan="2">
</td><td>Circular connectors

Power connectors with M12 screw-locking

Male and female connectors

Male and female contacts

Rewireable – Non-rewireable</td></tr>
<tr><td>Free cable connectors

Straight and right angle connectors

Fixed connectors

Flange mounting

Single hole mounting</td></tr>
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CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – PRODUCT REQUIREMENTS –

Part 2-111: Circular connectors – Detail specification for power connectors with M12 screw-locking

1 Scope

This part of IEC 61076-2 specifies 4 to 6-way circular connectors with M12 screw-locking with current ratings up to 16 A and voltage ratings of 63 V or 630 V, that are typically used for power supply and power applications in industrial premises. These connectors consist of both fixed and free connectors either rewireable or non-rewireable, with M12 screw-locking. Male connectors have round contacts Ø1,0 mm and Ø1,5 mm.

The different codings provided by this document prevent the mating of accordingly coded male or female connectors to any other similarly sized interfaces, covered by other standards and the cross-mating between the different codings provided by this document.

NOTE M12 is the dimension of the thread of the screw-locking mechanism of these circular connectors.

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 60050-581:2008, *International Electrotechnical Vocabulary – Part 581: Electromechanical components for electronic equipment*

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-60, *Environmental testing – Part 2-60: Tests – Test Ke: Flowing mixed gas corrosion test*

IEC 60352-2, *Solderless connections – Part 2: Crimped connections – General requirements, test methods and practical guidance*

IEC 60352-3, *Solderless connections – Part 3: Solderless accessible insulation displacement connections – General requirements, test methods and practical guidance*

IEC 60352-4, *Solderless connections – Part 4: Solderless non-accessible insulation displacement connections – General requirements, test methods and practical guidance*

IEC 60352-5, *Solderless connections – Part 5: Press-in connections – General requirements, test methods and practical guidance*

IEC 60352-6, *Solderless connections – Part 6: Insulation piercing connections – General requirements, test methods and practical guidance*

IEC 60352-7, *Solderless connections – Part 7: Spring clamp connections – General requirements, test methods and practical guidance*

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IEC 60512-1-1, *Connectors for electronic equipment – Tests and measurements – Part 1-1: General examination – Test 1a: Visual examination*

IEC 60512-1-2, *Connectors for electronic equipment – Tests and measurements – Part 1-2: General examination – Test 1b: Examination of dimension and mass*

IEC 60512-2-1, *Connectors for electronic equipment – Tests and measurements – Part 2-1: Electrical continuity and contact resistance tests – Test 2a: Contact resistance – Millivolt level method*

IEC 60512-3-1, *Connectors for electronic equipment – Tests and measurements – Part 3-1: Insulation tests – Test 3a: Insulation resistance*

IEC 60512-4-1, *Connectors for electronic equipment – Tests and measurements – Part 4-1: Voltage stress tests – Test 4a: Voltage proof*

IEC 60512-5-1, *Connectors for electronic equipment – Tests and measurements – Part 5-1: Current-carrying capacity tests – Test 5a: Temperature rise*

IEC 60512-6-3, *Connectors for electronic equipment – Tests and measurements – Part 6-3: Dynamic stress tests – Test 6c: Shock*

IEC 60512-6-4, *Connectors for electronic equipment – Tests and measurements – Part 6-4: Dynamic stress tests – Test 6d: Vibration (sinusoidal)*

IEC 60512-9-1, *Connectors for electronic equipment – Tests and measurements – Part 9-1: Endurance tests – Test 9a: Mechanical operation*

IEC 60512-9-2, *Connectors for electronic equipment – Tests and measurements – Part 9-2: Endurance tests – Test 9b: Electrical load and temperature*

IEC 60512-11-1, *Electromechanical components for electronic equipment – Basic testing procedures and measuring methods – Part 11: Climatic tests – Section 1: Test 11a – Climatic sequence*

IEC 60512-11-4, *Connectors for electronic equipment – Tests and measurements – Part 11-4: Climatic tests – Test 11d: Rapid change of temperature*

IEC 60512-11-7, *Connectors for electronic equipment – Tests and measurements – Part 11-7: Climatic tests – Test 11g: Flowing mixed gas corrosion test*

IEC 60512-11-9, *Connectors for electronic equipment – Tests and measurements – Part 11-9: Climatic tests – Test 11i: Dry heat*

IEC 60512-11-10, *Connectors for electronic equipment – Tests and measurements – Part 11-10: Climatic tests – Test 11j: Cold*

IEC 60512-11-12, *Connectors for electronic equipment – Tests and measurements – Part 11-12: Climatic tests – Test 11m: Damp heat, cyclic*

IEC 60512-13-2, *Connectors for electronic equipment – Tests and measurements – Part 13-2: Mechanical operation tests – Test 13b: Insertion and withdrawal forces*

IEC 60512-13-5, *Connectors for electronic equipment – Tests and measurements – Part 13-5: Mechanical operation tests – Test 13e: Polarizing and keying method*

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IEC 60512-16-5, *Connectors for electronic equipment – Tests and measurements – Part 16-5: Mechanical tests on contacts and terminations – Test 16e: Gauge retention force (resilient contacts)*

IEC 60512-19-3, *Electromechanical components for electronic equipment – Basic testing procedures and measuring methods – Part 19: Chemical resistance tests – Section 3: Test 19c – Fluid resistance*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60999-1, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm^2 up to 35 mm^2 (included)*

IEC 61076-1:2006, *Connectors for electronic equipment – Product requirements – Part 1: Generic specification*

IEC 61984, *Connectors – Safety requirements and tests*

IEC 62197-1, *Connectors for electronic equipment – Quality assessment requirements – Part 1: Generic specification*

ISO 1302, *Geometrical Product Specifications (GPS) – Indication of surface texture in technical product documentation*

ISO 11469, *Plastics – Generic identification and marking of plastics products*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61076-1, IEC 60050-581 as well as the following 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

3.1
protective conductor
PE
conductor provided for purposes of safety, for example protection against electric shock

Note 1 to entry: In an electrical installation, the conductor identified PE is normally also considered as protective earthing conductor.

[SOURCE: IEC 60050-581:2008, 581-27-26]

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3.2
functional earth conductor
FE
functional grounding conductor in US
earthing conductor provided for functional earthing

Note 1 to entry: Functional earthing a point or points in a system or in an installation or in equipment, for purposes other than electrical safety. [IEC 60050-195, Amendment 1: 2001, 195-01-13]

[SOURCE: IEC 60050-195:1998, 195-02-15]

3.3
mounting orientation
circular mounting position of the connector in relation to the polarization of the mating interface

Note 1 to entry: Where the free connector has an angled cable entry (as opposed to a straight cable entry), the angle between the cable entry direction and the polarization keyway should be specified.

4 Technical information

4.1 Systems of levels

4.1.1 Performance levels

Performance levels for these connectors are specified in Table 33.

4.1.2 Compatibility levels, according to IEC 61076-1

Connectors according to this document are intermateable according to IEC 61076-1.

4.2 Classification into climatic categories

Classification into climatic categories is specified in 6.3.

4.3 Creepage and clearance distances

Shall be as per 6.4.1 of this document.

4.4 Current-carrying capacity

Current carrying capacity as specified in Table 1 and 6.4.4.

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Table 1 – Ratings of connectors

Coding	Style	No. of contacts	Function	pin Ø mm	Rated voltage V	Rated current A
E	5 way	3	2 + FE	1,5	63	16
		4	3 + FE			
		5	4 + FE			
F	4 way	2	2	1,5	63	16
		3	3			
		4	4			
K	5 way (4 + PE)	3	2 + PE	1,5	630	12
		4	3 + PE			
		5	4 + PE			
L	5 way	3	2 + FE	1,5	63	16
		4	3 + FE			
		5	4 + FE			
	4 way	2	2			
		3	3			
		4	4			
M	6 way (5 + PE)	3	2 + PE	1,0	630	8
		4	3 + PE			
		5	4 + PE			
		6	5 + PE			
S	4 way (3 + PE)	3	2 + PE	1,5	630	12
		4	3 + PE			
T	4 way	2	2	1,5	63	12
		3	3			
		4	4			

4.5 Marking

The marking of the connector and the package shall be in accordance with 2.7 of IEC 61076-1:2006.

4.6 Safety aspects

Some of the connector types covered by this document are only applicable for extra-low voltage (ELV) applications. For styles without a PE contact, IEC 61984 dealing with safety aspects of connectors is applicable as a guidance.

For K-coding, M-coding, and S-coding connectors IEC 61984 applies.

5 Dimensional information

5.1 General

Throughout this document, dimensions are in mm. Drawings are shown in the first angle projection. The shape of the connectors may deviate from those given in the following drawings as long as the specified dimensions are not influenced.

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Missing dimensions shall be chosen according to common characteristics and intended use.

5.2 Survey of styles and variants

5.2.1 General

For all connector styles with cables, the length L of the cable shall be agreed between manufacturer and user. For interface dimensions see 5.3.

The interface dimensions of the female styles shall be chosen according to the common characteristics of the male styles.

For reliable intermateability, the dimensions of the female connector body as detailed in Annex A have to be met.

5.2.2 Contact terminations

The contact terminations shall be of the following types: screw, crimp, spring type, piercing, insulation displacement, press-in or solder.

5.2.3 Number of contacts or contact cavities

Table 2 shows the number of contacts or contact cavities.

Table 2 – Connector coding and number of contacts

Coding	No. of contact cavities	No. of contacts	Function
E	5	3	2 + FE
		4	3 + FE
		5	4 + FE
F	4	2	2
		3	3
		4	4
K	5	3	2 + PE
		4	3 + PE
		5	4 + PE
L	5	3	2 + FE
		4	3 + FE
		5	4 + FE
	4	2	2
		3	3
		4	4
M	6	3	2 + PE
		4	3 + PE
		5	4 + PE
		6	5 + PE
S	4	2	2 + PE
		3	3 + PE
T	4	2	2
		3	3
		4	4

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5.2.4 Fixed connectors

5.2.4.1 General

Table 3 shows styles of fixed connectors.

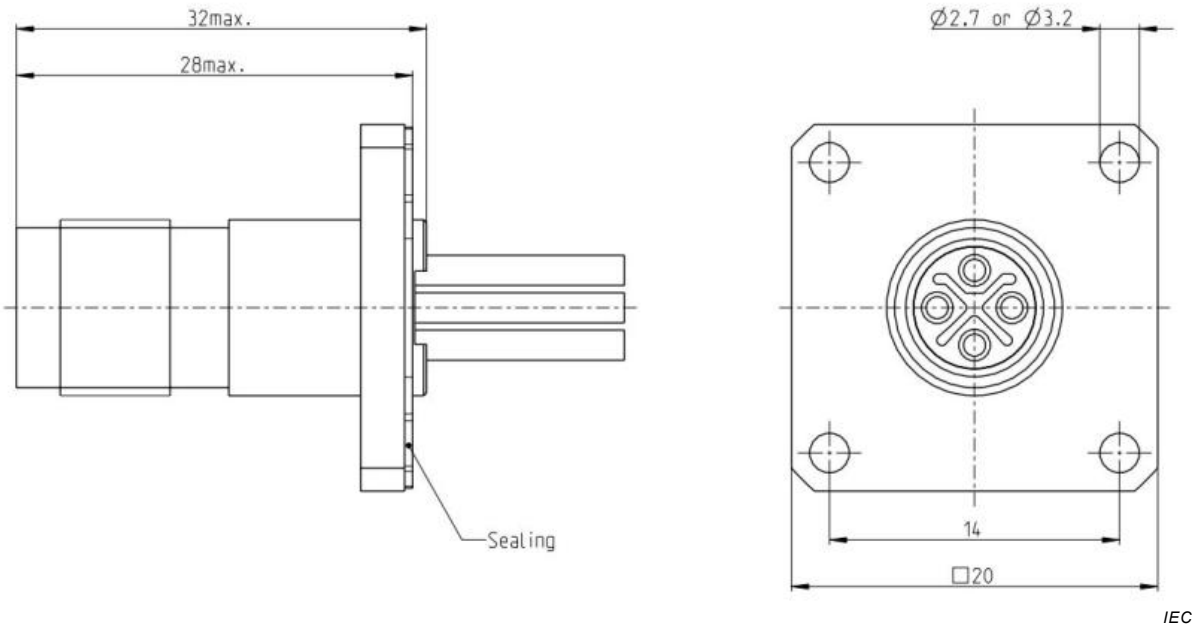
Table 3 – Styles of fixed connectors

Style	Description
DM	Fixed connector, male contacts, mounting with thread M12 × 1, square flange front mounting
EM	Fixed connector, male contacts, mounting with thread M12 × 1, with wire ends, single hole mounting M16 × 1,5
FM	Fixed connector, male contacts, mounting with thread M12 × 1, with wire ends, single hole mounting M20 × 1,5
GM	Fixed connector, male contacts, mounting with thread M12 × 1, with wire ends, single hole mounting M16 × 1,5, mounting orientation
HM	Fixed connector, male contacts, mounting with thread M12 × 1, with wire ends, single hole mounting M20 × 1,5, mounting orientation
IM	Fixed connector, male contacts, mounting with thread M12 × 1, with wire ends, single hole mounting M16 × 1,5, rear mounting
EF	Fixed connector, female contacts, with wire ends, single hole mounting M16 × 1,5
FF	Fixed connector, female contacts, with wire ends, single hole mounting M20 × 1,5
GF	Fixed connector, female contacts, with wire ends, single hole mounting M16 × 1,5, mounting orientation
HF	Fixed connector, female contacts, with wire ends, single hole mounting M20 × 1,5, mounting orientation
IF	Fixed connector, female contacts, with wire ends, single hole mounting M16 × 1,5, rear mounting

5.2.4.2 Style DM

Figure 1 shows a fixed connector, with male contacts, mounting with thread M12 × 1 and a square flange 25 mm and front mounting.

Dimensions in millimetres



NOTE Orientation of coding, see Annex A.

Figure 1 – Fixed connector, male contacts, mounting with thread M12 × 1 square flange 20 mm, front mounting

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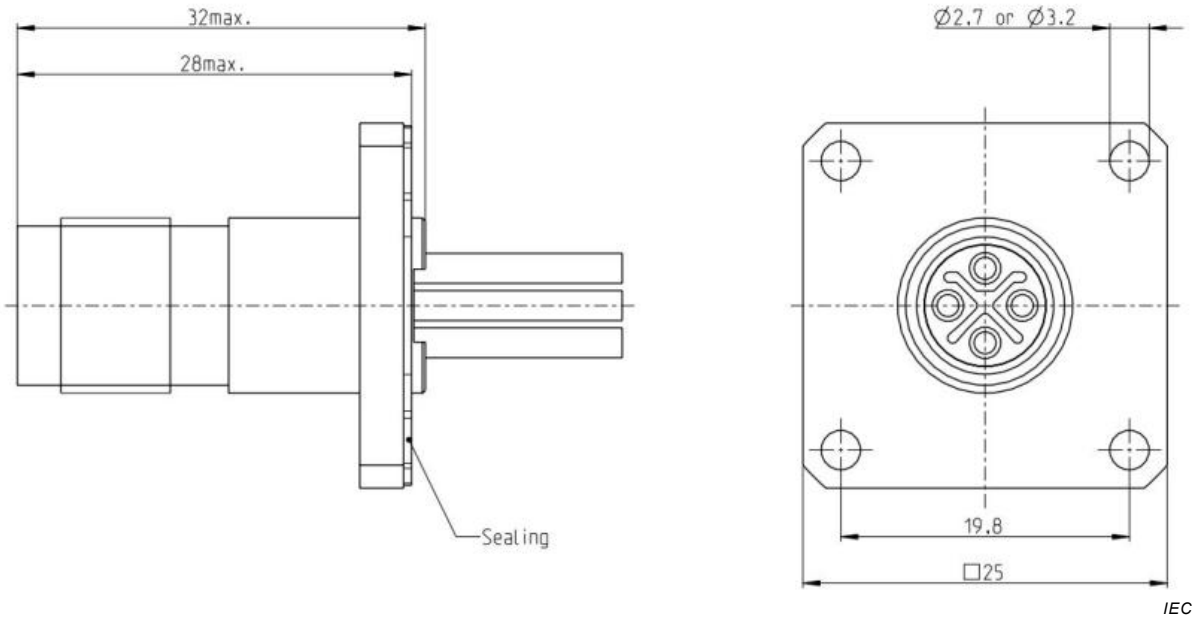
Figure 2 shows a fixed connector, with male contacts, mounting with thread M12 × 1 and a square flange 20 mm, front mounting.

Dimensions in millimetres



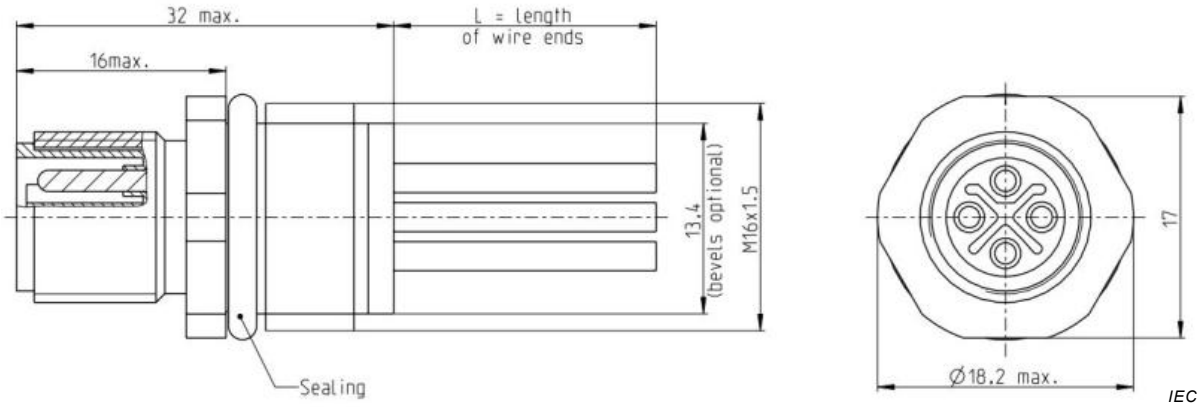
NOTE Orientation of coding, see Annex A.

Figure 2 – Fixed connector, male contacts, mounting with thread M12 x 1, square flange 25 mm, front mounting

5.2.4.3 Style EM

Figure 3 shows a fixed connector, with male contacts, mounting with thread M12 × 1, with wire ends and a single hole mounting thread M16 × 1,5.

Dimensions in millimetres



NOTE Orientation of coding, see Annex A.

Figure 3 – Fixed connector, male contacts, mounting with thread M12 x 1, with wire ends, single hole mounting thread M16 x 1,5

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