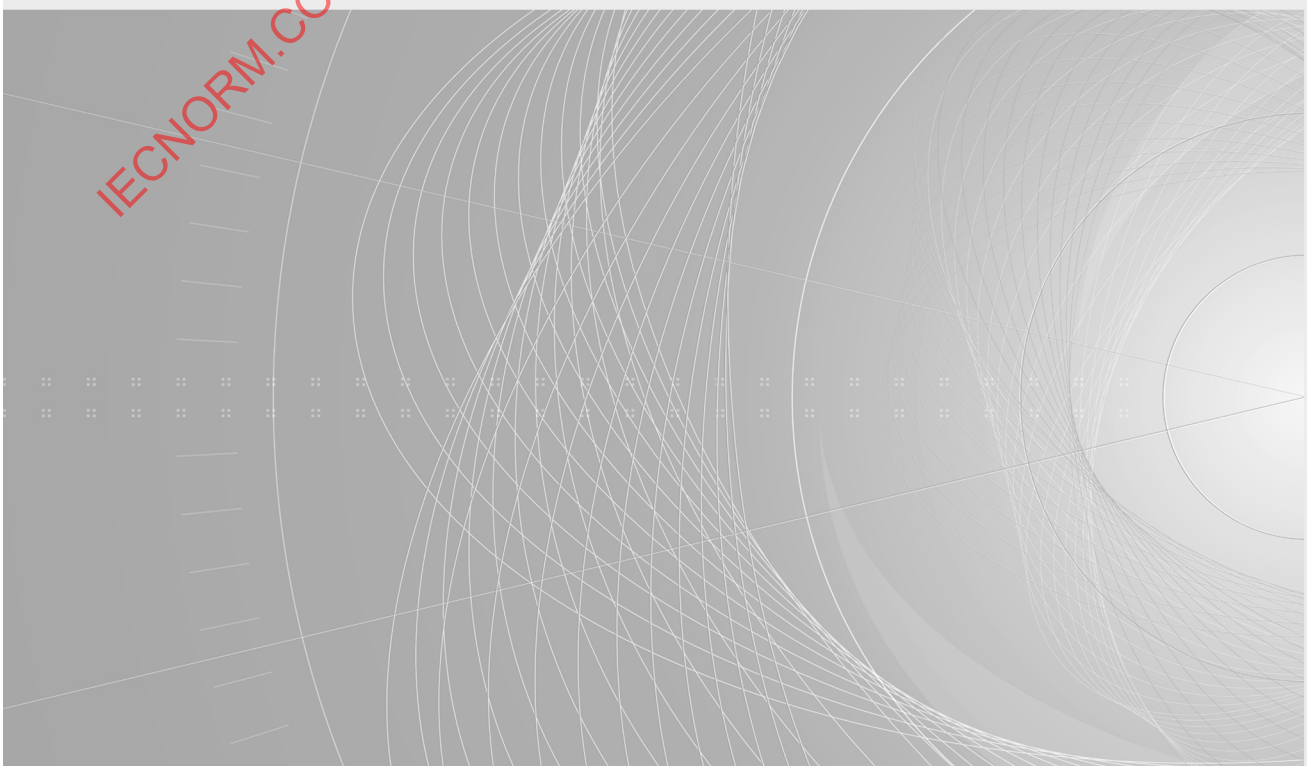
IEC PAS 61076-2-010

Edition 1.0 2020-07

PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

Connectors for electrical and electronic equipment – Product requirements – Part 2-010: Circular connectors – Detail specification for push-pull connectors with locking mechanism, based on mating interfaces according to IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 and IEC 61076-2-113



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CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – PRODUCT REQUIREMENTS –

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IEC PAS 61076-2-010 has been processed by subcommittee 48B: Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment.

The text of this PAS is based on the following document:

This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document

Draft PAS	Report on voting
48B/2796/DPAS	48B/2817/RVDPAS

Following publication of this PAS, which is a pre-standard publication, the technical committee or subcommittee concerned may transform it into an International Standard.

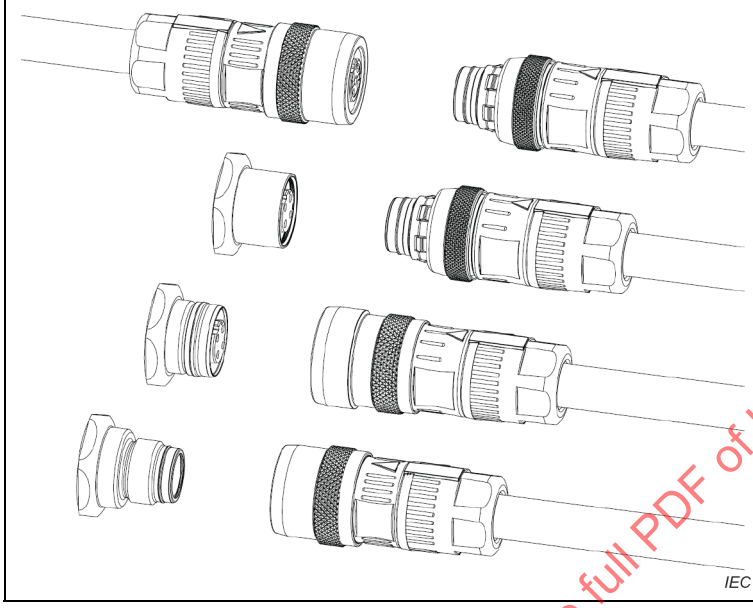
An International Standard is under preparation by IEC SC48B, to be published as IEC 61076-2-010 (if approved). This PAS will be withdrawn upon publication of the International Standard.

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.

This PAS shall remain valid for an initial maximum period of 2 years starting from the publication date. The validity may be extended for a single period up to a maximum of 2 years, at the end of which it shall be published as another type of normative document, or shall be withdrawn.

INTRODUCTION

<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 PAS 61076-2-010 Ed. 1</td></tr>
<tr><td>ELECTRONIC COMPONENTS
DETAIL SPECIFICATION in accordance with IEC 61076-1</td><td></td></tr>
<tr><td rowspan="2"> 
</td><td>Circular M12 connectors with push-pull locking for power, signal and data transmission
Fixed connectors with male and female contacts, mateable with M12 screw or push-pull plugs
Free cable connectors with male or female contacts with push-pull or screw locking
Rewireable – Non-rewireable</td></tr>
<tr><td>Fixed connectors, with front, rear or single hole mounting
Straight and right-angled free cable connectors</td></tr>
</table>

CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT – PRODUCT REQUIREMENTS –

Part 2-010: Circular connectors – Detail specification for push-pull connectors with locking mechanism, based on mating interfaces according to IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 and IEC 61076-2-113

1 Scope

This part of IEC 61076 specifies circular connectors with a push-pull locking mechanism of a size derived from and thus being compatible with M12 screw-locking connectors (free connectors with screw-locking according to IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113 are compatible to push-pull fixed interfaces according to this document) and with mating interfaces according to IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113.

NOTE 1 M12 is the dimension of the thread of the screw-locking mechanism of circular connectors with M12 screw-locking.

This document covers both

1) power connectors with current ratings up to 16 A and voltage ratings up to 630 V, typically used for power supply and power applications in industrial premises, and
2) connectors for data and signal transmission with frequencies up to 500 MHz.

These connectors consist of both, fixed and free connectors, either rewireable or non-rewireable, with M12 push-pull locking as explained above. Male connectors have round contacts from Ø0,6 mm up to Ø1,5 mm. In addition, the push-pull mechanisms consist of two different push-pull designs:

a) An outer push-pull for male and female fixed connector, where the locking groove is placed onto the outer cylindric surface of the housing. The outer push-pull for female fixed connectors is made for two different types of male connectors. It has locking means for both types on its outer surface.

   NOTE 2 For design and dimensions, see 5.3.1 and 5.3.2.

b) An inner push-pull for female fixed connectors, where the locking means are placed onto the inner cylindric surface of the housing.

   NOTE 3 For design and dimensions. see 5.3.3.

The different codings provided by IEC 61076-2 and mentioned within 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 IEC 61076-2.

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, *International Electrotechnical Vocabulary (IEV) – Part 581: Electromechanical components for electronic equipment* (available at http://www.electropedia.org)

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

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 60512-13-1, *Connectors for electronic equipment – Tests and measurements – Part 13-1: Mechanical operation tests – Test 13a: Engaging and separating forces*

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*

IEC 60512-15-6, *Connectors for electronic equipment – Tests and measurements – Part 15-6: Connector tests (mechanical) – Test 15f: Effectiveness of connector coupling devices*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60603-7:2008, *Connectors for electronic equipment – Part 7: Detail specification for 8-way, unshielded, free and fixed connectors*

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

IEC 60998-2-1:2002, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-1: Particular requirements for connecting devices as separate entities with screw-type clamping units*

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

IEC 61076-2-101, *Connectors for electronic equipment – Product requirements – Part 2-101: Circular connectors – Detail specification for M12 connectors with screw-locking*

IEC 61076-2-109, *Connectors for electronic equipment – Product requirements – Part 2-109: Circular connectors – Detail specification for connectors with M12x1 screw-locking, for data transmission frequencies up to 500 MHz*

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

IEC 61076-2-113, *Connectors for electronic equipment – Product requirements – Part 2-113: Circular connectors – Detail specification for connectors with M12 screw-locking, with power and signal contacts for data transmission with frequencies up to 100 MHz*

IEC 61984, *Connectors – Safety requirements and tests*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-581 shall 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
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 entry direction and the polarization keyway should be specified.

4 Technical information

4.1 System of levels

4.1.1 Performance levels

Performance levels for these connectors (mating cycles for the mating interface only) are specified in the applicable standard, either IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113. The same performance level (number of cycles of mechanical operations, i.e. one locking and one unlocking operation) shall apply to the specific complete connector with the push-pull locking described herein.

A qualification of the push-pull locking mechanism for the highest performance level shall cover the qualifications for all lower performance levels required by the various mating interfaces, which are not subject to re-qualification for all those aspects already covered in the relevant IEC standards mentioned above.

4.1.2 Compatibility levels, according to IEC 61076-1

The connectors according to this document are intermateable according to IEC 61076-1.

4.2 Classification into climatic categories

For the classifications of the connectors into climatic categories in accordance with the general rules given in IEC 60068-1, see the applicable standard, either IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113.

The qualification of the push-pull locking interface for the most demanding climatic category (lowest LCT, highest UCT, highest number of days of damp heat, steady state) will cover all less demanding climatic categories established for the mating interfaces described in the above-mentioned IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113.

4.3 Contact terminations

The contact terminations shall be of the following types: screw, crimp, insulation piercing, insulation displacement, press-in or solder according to the applicable standard for the mating interface (either IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113).

4.4 Available connector codings

The available codings are shown in Table 1.

Table 1 – Available connector codings

Coding	Type	Reference
A	5-way	IEC 61076-2-101
	8-way	
	12-way	
	17-way	
B	5-way	
C	3-way	
	4-way	
	5-way	
	6-way	
D	4-way	
P	5-way	
H	8-way	IEC 61076-2-109
X	8-way	
F (for outer push-pull)	5-way	IEC 61076-2-111
K	5-way	
L	5-way	
	4-way	
M	6-way	
S	4-way	
T	4-way	
Type 1	6-way	IEC 61076-2-113
Type 2	8-way	
Type 3	6-way	
Type 4	8-way	

4.5 Ratings

Rated voltages and currents are specified in IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113, respectively.

4.6 Marking

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

4.7 Safety aspects

For safety aspects IEC 61984 shall be considered unless otherwise specified in the applicable standard for the mating interface (either IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113).

5 Dimensional information

5.1 General

Throughout this document the dimensions are in mm. The drawings are shown in the first angle projection. The shape of the connectors may deviate from those given in the following drawings if the specified dimensions are not influenced. See Annex A for recommended dimensions for the female connector body diameter.

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 of the cable or wire shall be agreed between manufacturer and user.

The interface dimensions of the free cable connectors shall be chosen according to the common characteristics of the fixed connector styles.

For reliable intermateability, the dimensions of the free connector body as detailed in IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113 shall be met for the free connector body with screw or push-pull locking.

5.2.2 Fixed connectors

5.2.2.1 General

Table 2 shows the styles of fixed connectors.

Table 2 – Styles of fixed connectors

Style	Description
AM-OP	Tube insert, male contacts, mounting without thread (thread on tube) and without outer push-pull locking
DM-OP	Fixed connector, male contacts, mounting with thread M12 × 1 and outer push-pull locking, square flange front mounting
EM-OP	Fixed connector, male contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5
FM-OP	Fixed connector, male contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M20 × 1,5
EF-OP	Fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5
FF-OP	Fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M20 × 1,5
GF-OP	Fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5 and mounting orientation
IF-OP	Fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole rear mounting thread M16 × 1,5
EF-IP	Fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5
FF-IP	Fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, single hole front mounting thread M20 × 1,5
GF-IP	Fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5 and mounting orientation
IF-IP	Fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, single hole rear mounting thread M16 × 1,5

5.2.2.2 Style AM-OP

Figure 1 shows a tube insert, male contacts, mounting without thread (thread on tube) and without outer push-pull locking.

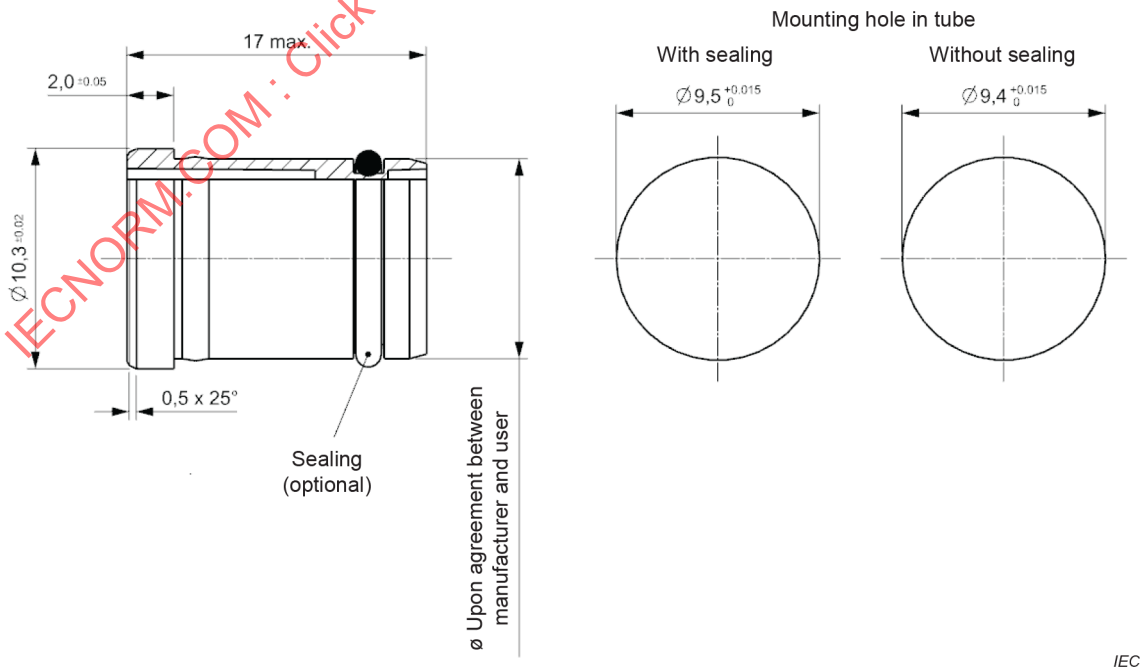


Figure 1 – Tube insert, male contacts, mounting without thread (thread on tube) and without outer push-pull locking

5.2.2.3 Style DM-OP

Figure 2 shows a fixed connector, male contacts, mounting with thread M12 × 1 and outer push-pull locking, square flange front mounting.

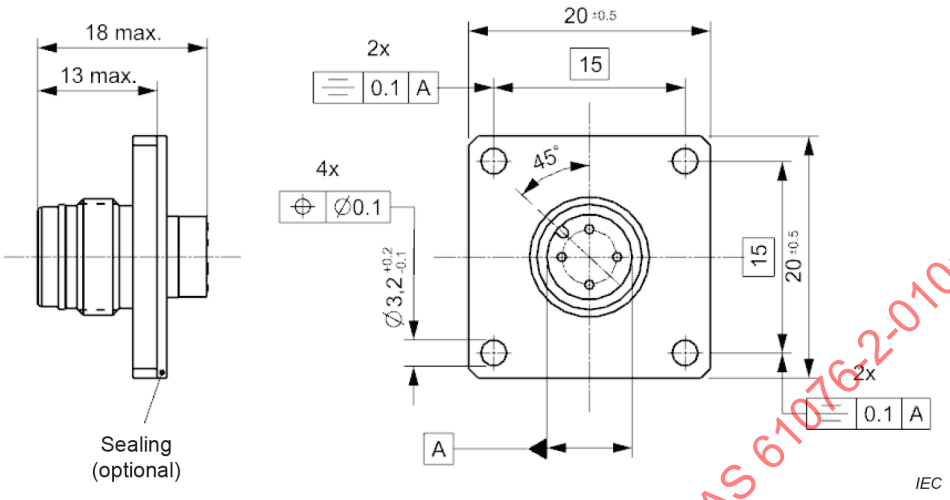


Figure 2 – Fixed connector, male contacts, mounting with thread M12 × 1 and outer push-pull locking, square flange front mounting

5.2.2.4 Style EM-OP

Figure 3 shows a fixed connector, male contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5.

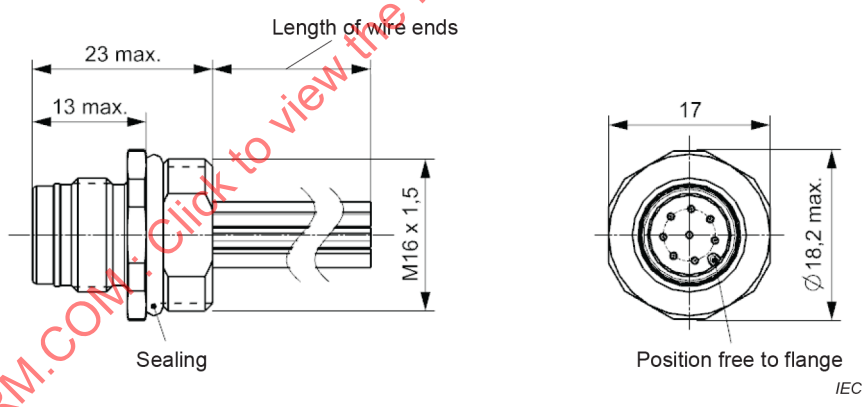


Figure 3 – Fixed connector, male contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5

5.2.2.5 Style FM-OP

Figure 4 shows a fixed connector, male contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M20 × 1,5.

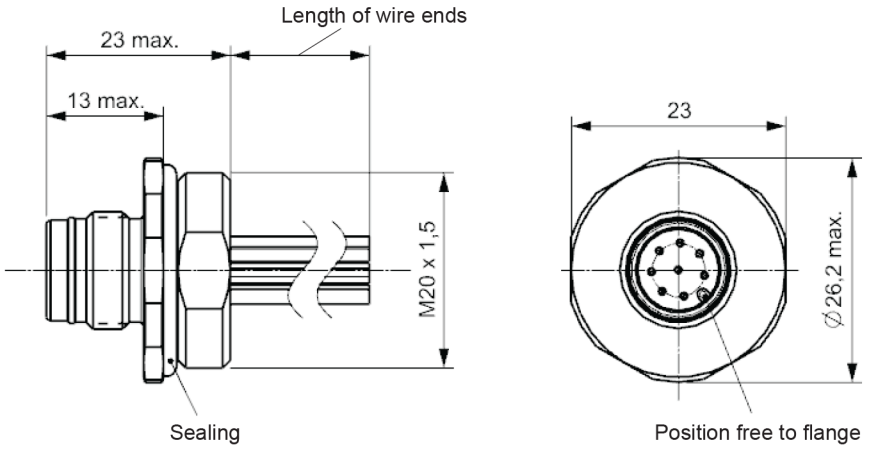


Figure 4 – Fixed connector, male contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M20 × 1,5

5.2.2.6 Style EF-OP

Figure 5 shows a fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5.

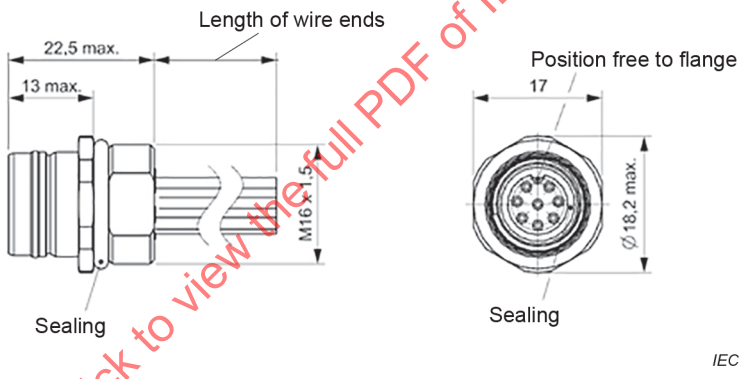


Figure 5 – Fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5

5.2.2.7 Style FF-OP

Figure 6 shows a fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M20 × 1,5.

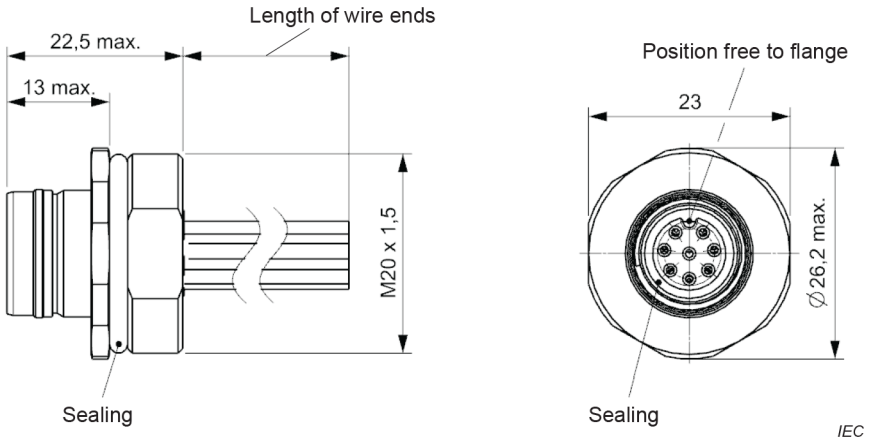


Figure 6 – Fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M20 × 1,5

5.2.2.8 Style GF-OP

Figure 7 shows a fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, a single hole front mounting thread M16 × 1,5 and mounting orientation.

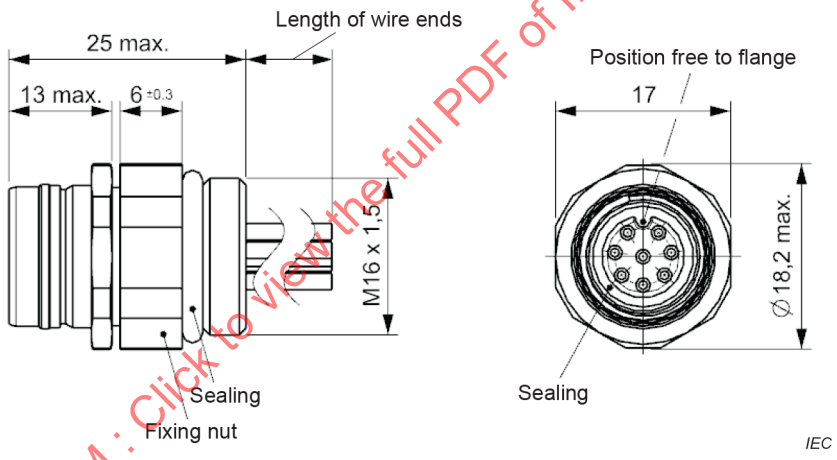


Figure 7 – Fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5 and mounting orientation

5.2.2.9 Style IF-OP

Figure 8 shows a fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole rear mounting thread M16 × 1,5.

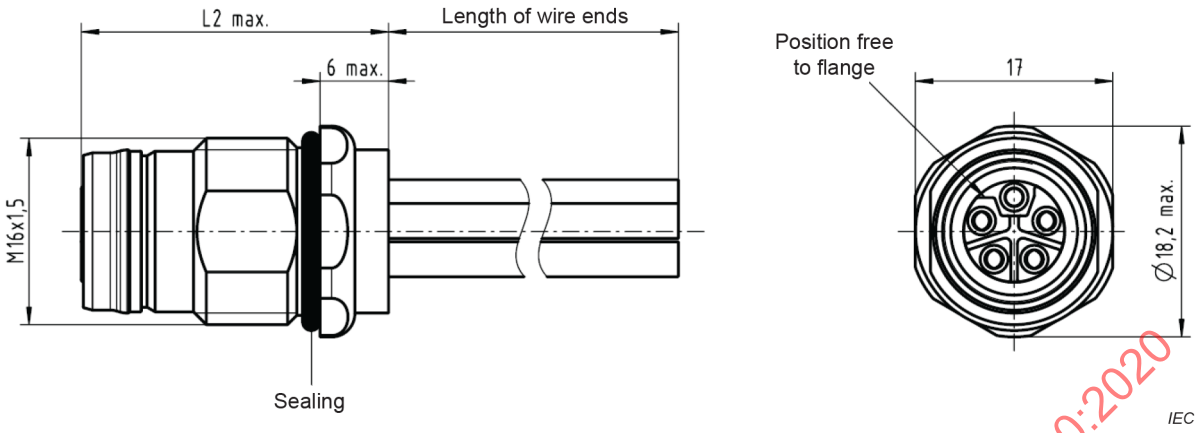


Figure 8 – Fixed connector, female contacts, mounting with thread M12 × 1 and outer push-pull locking, with wire ends, single hole rear mounting thread M16 × 1,5

5.2.2.10 Style EF-IP

Figure 9 shows a fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5.

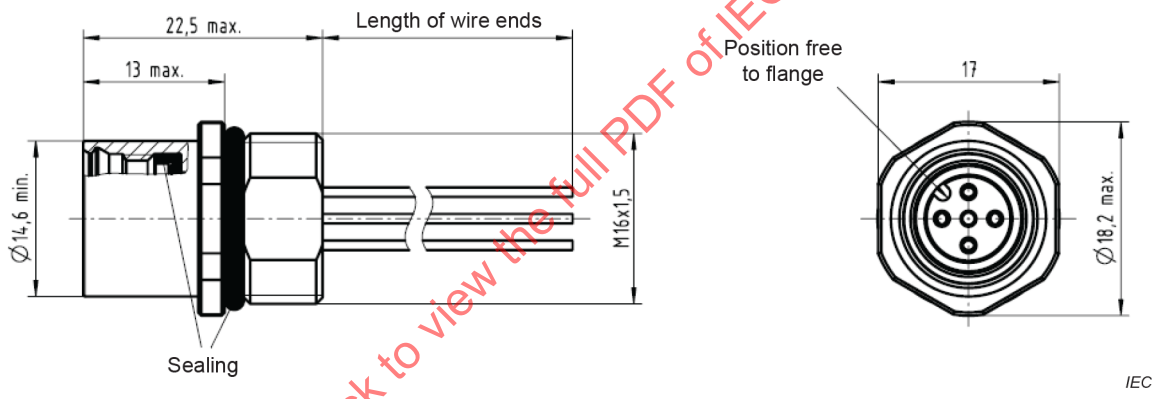


Figure 9 – Fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5

5.2.2.11 Style FF-IP

Figure 10 shows a fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, single hole front mounting thread M20 × 1,5.

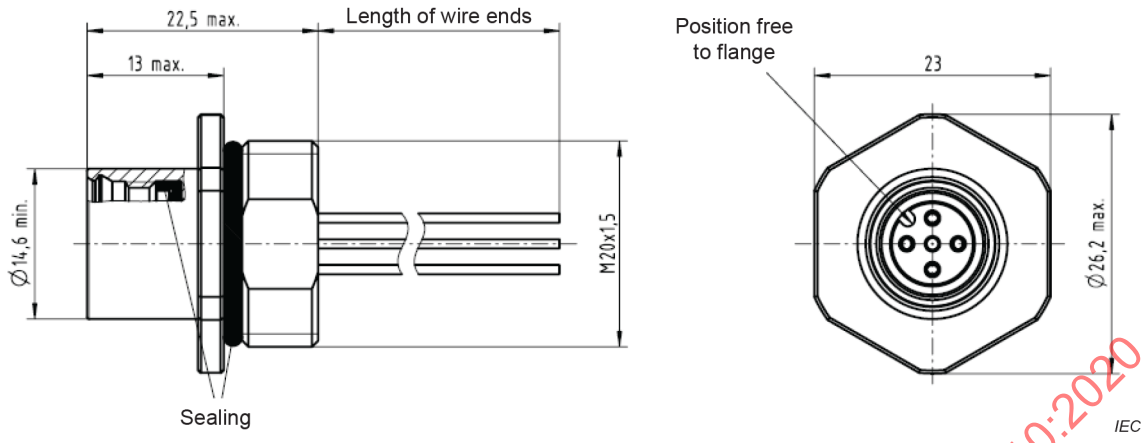


Figure 10 – Fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, single hole front mounting thread M20 × 1,5

5.2.2.12 Style GF-IP

Figure 11 shows a fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, a single hole front mounting thread M16 × 1,5 and mounting orientation.

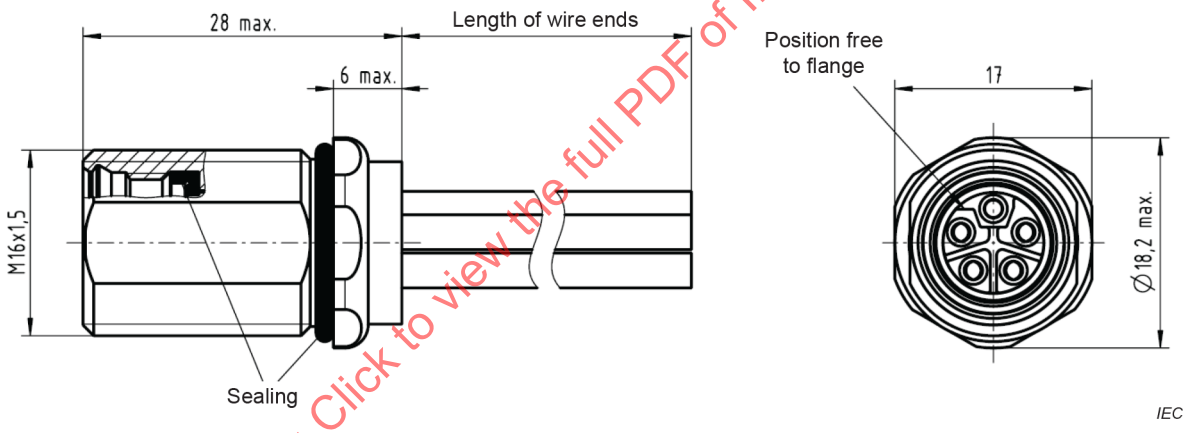


Figure 11 – Fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, single hole front mounting thread M16 × 1,5 and mounting orientation

5.2.2.13 Style IF-IP

Figure 12 shows a fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, single hole rear mounting thread M16 × 1,5.

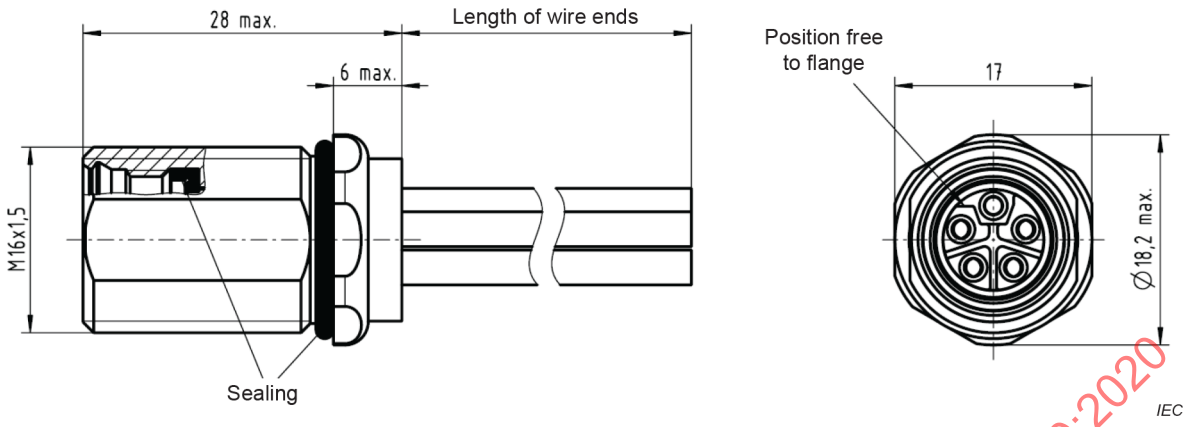


Figure 12 – Fixed connector, female contacts, mounting with thread M12 × 1 and inner push-pull locking, with wire ends, single hole rear mounting thread M16 × 1,5

5.2.3 Free connectors

5.2.3.1 General

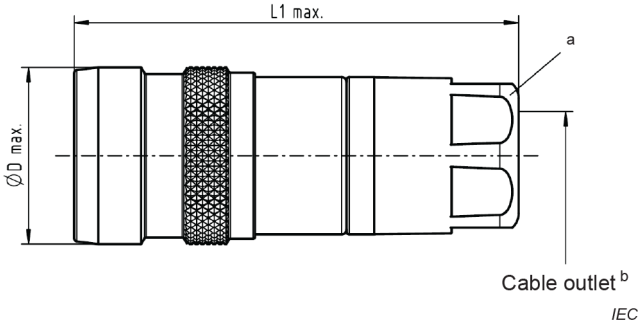
Table 3 shows the styles of free connectors.

Table 3 – Styles of free connectors

Style	Description
JM-OP	Rewireable connector, male contacts, straight version, with outer push-pull locking
KM-OP	Rewireable connector, male contacts, angled version, with outer push-pull locking
LM-OP	Non-rewireable connector, male contacts, straight version, with outer push-pull locking
MM-OP	Non-rewireable connector, male contacts, angled version, with outer push-pull locking
JF-OP	Rewireable connector, female contacts, straight version, with outer push-pull locking
KF-OP	Rewireable connector, female contacts, straight version, with outer push-pull locking
LF-OP	Non-rewireable connector, female contacts, angled version, with outer push-pull locking
MF-OP	Non-rewireable connector, female contacts, angled version, with outer push-pull locking
JM-IP	Rewireable connector, male contacts, straight version, with inner push-pull locking
KM-IP	Rewireable connector, male contacts, angled version, with inner push-pull locking
LM-IP	Non-rewireable connector, male contacts, straight version with inner push-pull locking
MM-IP	Non-rewireable connector, male contacts, angled version, with inner push-pull locking

5.2.3.2 Style JM-OP

Figure 13 shows a rewireable connector, male contacts, straight version, with outer push-pull locking. Table 4 shows the dimensions of style JM-OP.



[a] Cable outlet alternatively inside.

[b] Cable outlet diameter range upon agreement.

Figure 13 – Rewireable connector, male contacts, straight version, with outer push-pull locking

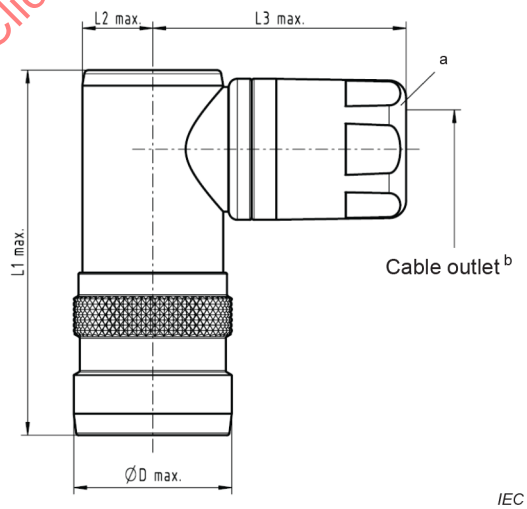
Table 4 – Dimensions of style JM-OP, Figure 13

Dimensions in millimetres

Coding	L1 max.	øD max.
A, B, C, D, P	65	22
X, H	65	22
F, K, L, M	70	25
S, T	70	23
Type 1 to 4	65	22

5.2.3.3 Style KM-OP

Figure 14 shows a rewireable connector, male contacts, angled version, with outer push-pull locking. Table 5 shows the dimensions of style KM-OP.



[a] Cable outlet alternatively inside.

[b] Cable outlet diameter range upon agreement.

Figure 14 – Rewireable connector, male contacts, angled version, with outer push-pull locking

Table 5 – Dimensions of style KM-OP, Figure 14

Dimensions in millimetres

Coding	L1 max.	L2 max.	L3 max.	øD max.
A, B, C, D, P	60,5	11	31,5	22
X, H	60,5	11	31,5	22
F, K, L, M	80	14	40	25
S, T	80	13	40	23
Type 1 to 4	60,5	11	31,5	22

5.2.3.4 Style LM-OP

Figure 15 shows a non-rewireable connector, male contacts, straight version, with outer push-pull locking. Table 6 shows the dimensions of style LM-OP.

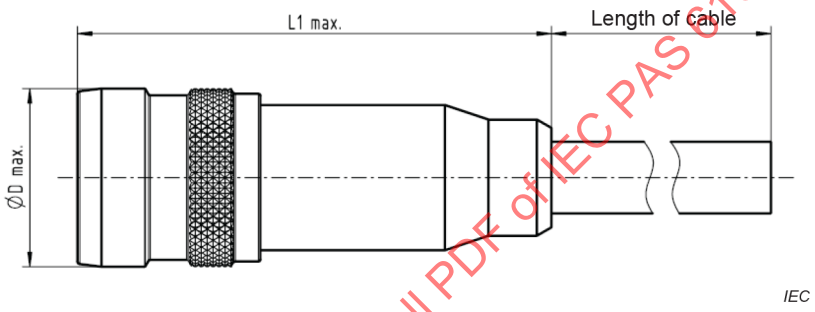


Figure 15 – Non-rewireable connector, male contacts, straight version, with outer push-pull locking

Table 6 – Dimensions of style LM-OP, Figure 15

Dimensions in millimetres

Coding	L1 max.	øD max.
A, B, C, D, P	55	22
X, H	55	22
F, K, L, M	65	22
S, T	57	22
Type 1 to 4	55	22

5.2.3.5 Style MM-OP

Figure 16 shows a non-rewireable connector, male contacts, angled version, with outer push-pull locking. Table 7 shows the dimensions of style MM-OP.

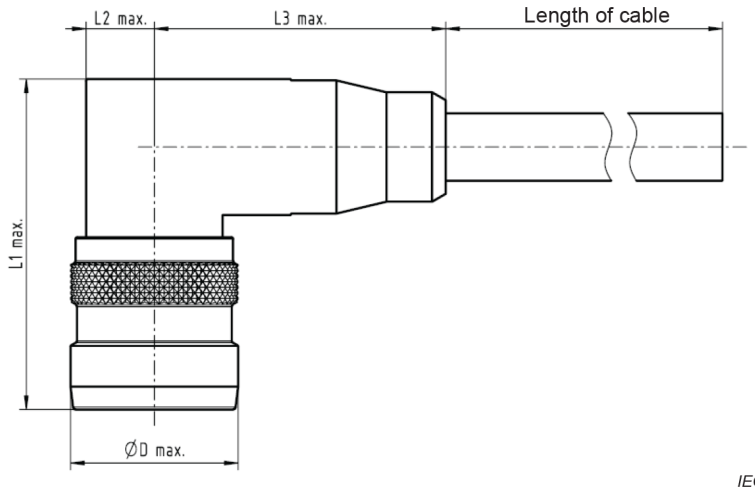


Figure 16 – Non-rewireable connector, male contacts, angled version, with outer push-pull locking

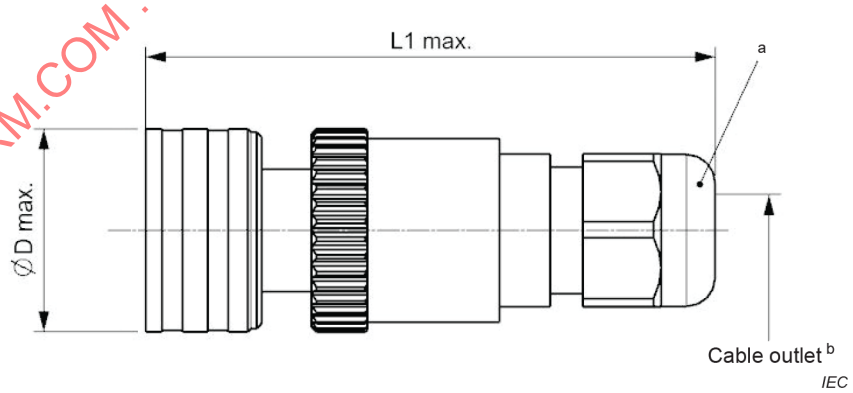
Table 7 – Dimensions of style MM-OP, Figure 16

Dimensions in millimetres

Coding	L1 max.	L2 max.	L3 max.	øD max.
A, B, C, D, P	36	7,5	31,5	22
X, H	36	7,5	31,5	22
F, K, L, M	41	9	40	22
S, T	36	8	33,5	22
Type 1 to 4	36	7,5	31,5	22

5.2.3.6 Style JF-OP

Figure 17 shows a rewireable connector, female contacts, straight version, with outer push-pull locking. Table 8 shows the dimensions of style JF-OP.



[a] Cable outlet alternatively inside.

[b] Cable outlet diameter range upon agreement.

Figure 17 – Rewireable connector, female contacts, straight version, with outer push-pull locking

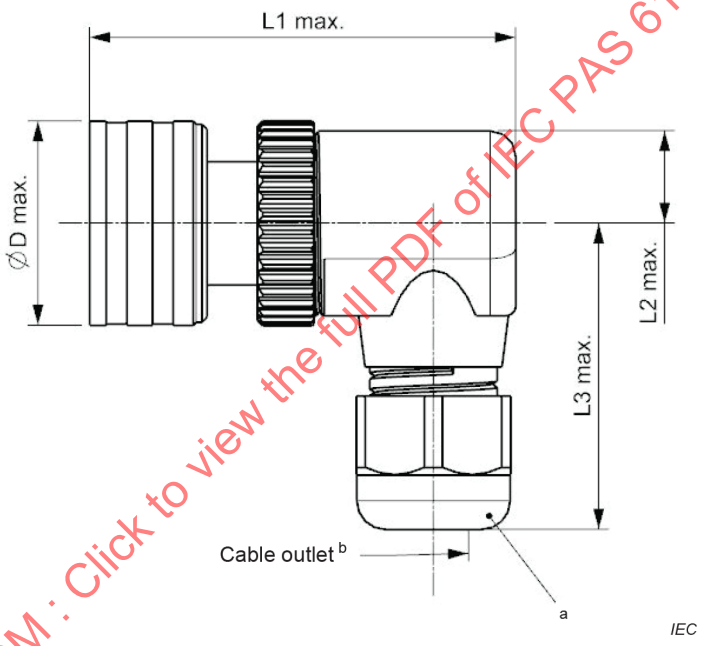
Table 8 – Dimensions of style JF-OP, Figure 17

Dimensions in millimetres

Coding	L1 max.	øD max.
A, B, C, D, P	65	22
X, H	65	22
F, K, L, M	70	25
S, T	70	23
Type 1 to 4	65	22

5.2.3.7 Style KF-OP

Figure 18 shows a rewireable connector, female contacts, angled version, with outer push-pull locking. Table 9 shows the dimensions of style KF-OP.



[a] Cable outlet alternatively inside.

[b] Cable outlet diameter range upon agreement.

Figure 18 – Rewireable connector, female contacts, angled version, with outer push-pull locking

Table 9 – Dimensions of style KF-OP, Figure 18

Dimensions in millimetres

Coding	L1 max.	L2 max.	L3 max.	øD max.
A, B, C, D, P	60,5	11	31,5	22
X, H	60,5	11	31,5	22
F, K, L, M	80	14	40	25
S, T	80	13	40	23
Type 1 to 4	60,5	11	31,5	22

5.2.3.8 Style LF-OP

Figure 19 shows a non-rewireable connector, female contacts, straight version, with outer push-pull locking. Table 10 shows the dimensions of style LF-OP.

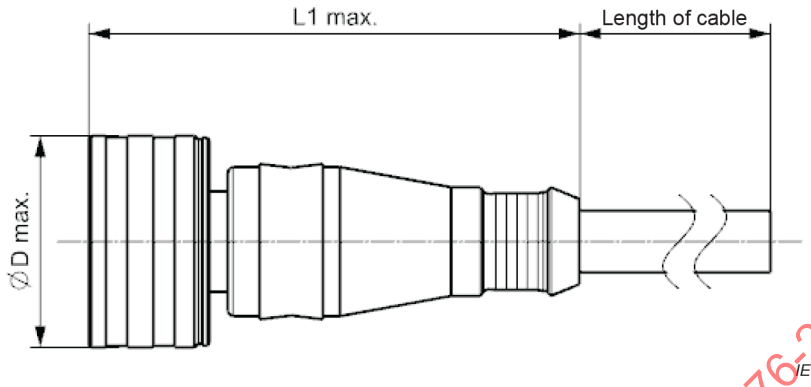


Figure 19 – Non-rewireable connector, female contacts, straight version, with outer push-pull locking

Table 10 – Dimensions of style LF-OP, Figure 19

Dimensions in millimetres

Coding	L1 max.	øD max.
A, B, C, D, P	55	22
X, H	55	22
F, K, L, M	65	22
S, T	57	22
Type 1 to 4	55	22

5.2.3.9 Style MF-OP

Figure 20 shows a non-rewireable connector, with female contacts, angled version, with outer push-pull locking. Table 11 shows the dimensions of style MF-OP.

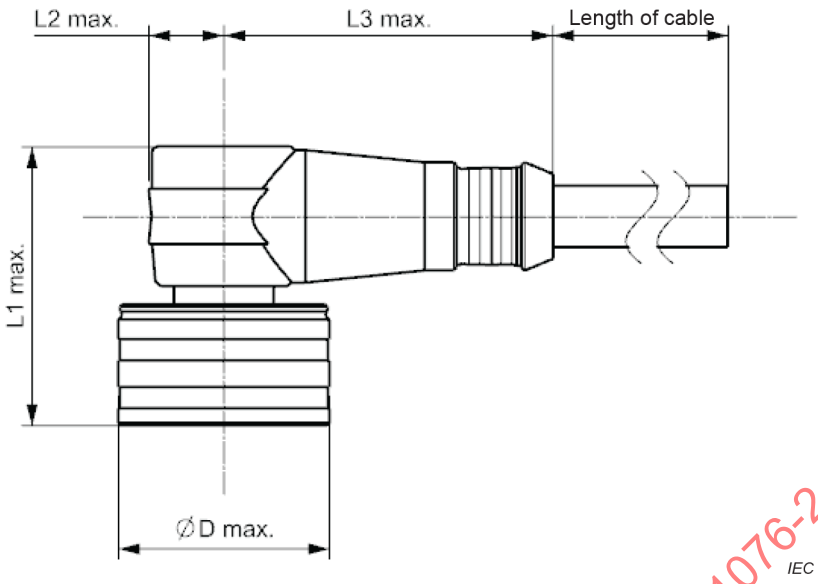


Figure 20 – Non-rewireable connector, female contacts, angled version, with outer push-pull locking

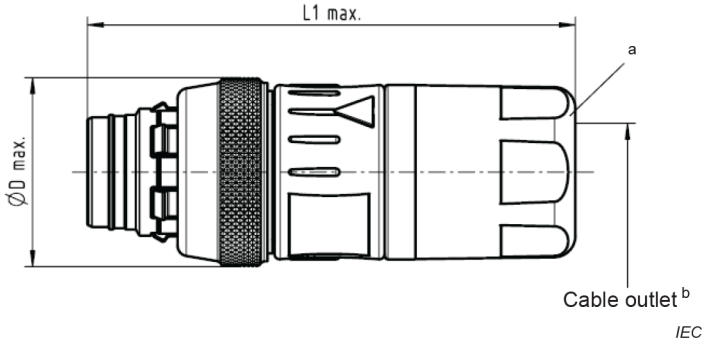
Table 11 – Dimensions of style MF-OP, Figure 20

Dimensions in millimetres

Coding	L1 max.	L2 max.	L3 max.	øD max.
A, B, C, D, P	36	7,5	31,5	22
X, H	36	7,5	31,5	22
F, K, L, M	41	9	40	22
S, T	36	8	33,5	22
Type 1 to 4	36	7,5	31,5	22

5.2.3.10 Style JM-IP

Figure 21 shows a rewireable connector, male contacts, angled version, with inner push-pull locking. Table 12 shows the dimensions of style JM-IP.



[a] Cable outlet alternatively inside.

[b] Cable outlet diameter range upon agreement.

Figure 21 – Rewireable connector, male contacts, straight version, with inner push-pull locking

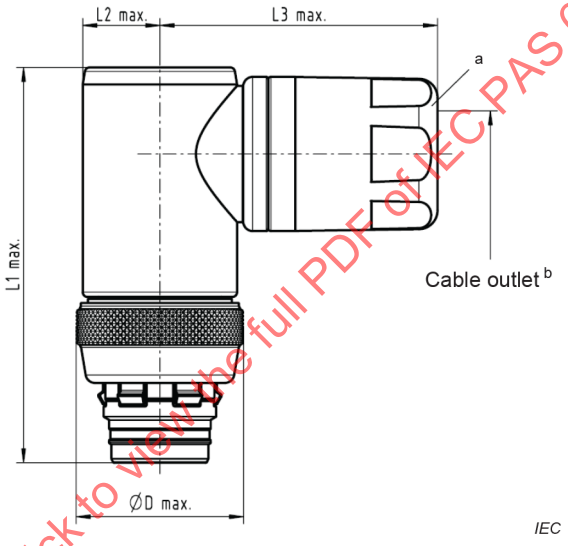
Table 12 – Dimensions of style JM-IP, Figure 21

Dimensions in millimetres

Coding	L1 max.	øD max.
A, B, C, D, P	65	22
X, H	65	22
K, L, M	70	25
S, T	70	23
Type 1 to 4	65	22

5.2.3.11 Style KM-IP

Figure 22 shows a rewireable connector, male contacts, angled version, with inner push-pull locking. Table 13 shows the dimensions of style KM-IP.



[a] Cable outlet alternatively inside.

[b] Cable outlet diameter range upon agreement.

Figure 22 – Rewireable connector, male contacts, angled version, with inner push-pull locking

Table 13 – Dimensions of style KM-IP, Figure 22

Dimensions in millimetres

Coding	L1 max.	L2 max.	L3 max.	øD max.
A, B, C, D, P	60,5	11	31,5	22
X, H	60,5	11	31,5	22
K, L, M	80	14	40	25
S, T	80	13	40	23
Type 1 to 4	60,5	11	31,5	22

5.2.3.12 Style LM-IP

Figure 23 shows a non-rewireable connector, male contacts, straight version, with inner push-pull locking. Table 14 shows the dimensions of style LM-IP.

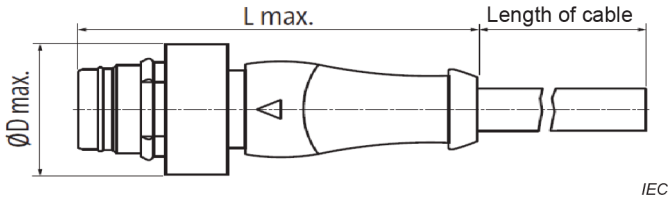


Figure 23 – Non-rewireable connector, male contacts, straight version, with inner push-pull locking

Table 14 – Dimensions of style LM-IP, Figure 23

Dimensions in millimetres

Coding	L1 max.	øD max.
A, B, C, D, P	55	22
X, H	55	22
K, L, M	65	22
S, T	57	22
Type 1 to 4	55	22

5.2.3.13 Style MM-IP

Figure 24 shows a non-rewireable connector, male contacts, angled version, with inner push-pull locking. Table 15 shows the dimensions of style MM-OP.

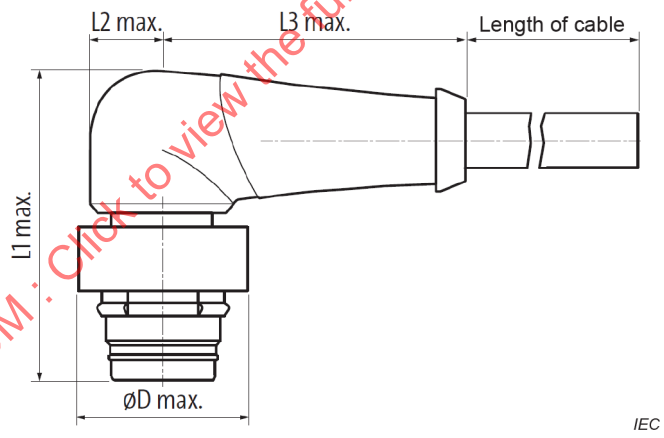


Figure 24 – Non-rewireable connector, male contacts, angled version, with inner push-pull locking

Table 15 – Dimensions of style MM-OP, Figure 24

Dimensions in millimetres

Coding	L1 max.	L2 max.	L3 max.	øD max.
A, B, C, D, P	36	7,5	31,5	22
X, H	36	7,5	31,5	22
K, L, M	41	9	40	22
S, T	36	8	33,5	22
Type 1 to 4	36	7,5	31,5	22

5.3 Interface dimension

5.3.1 Outer push-pull locking: male fixed connector side view

See Figure 25 and Table 16.

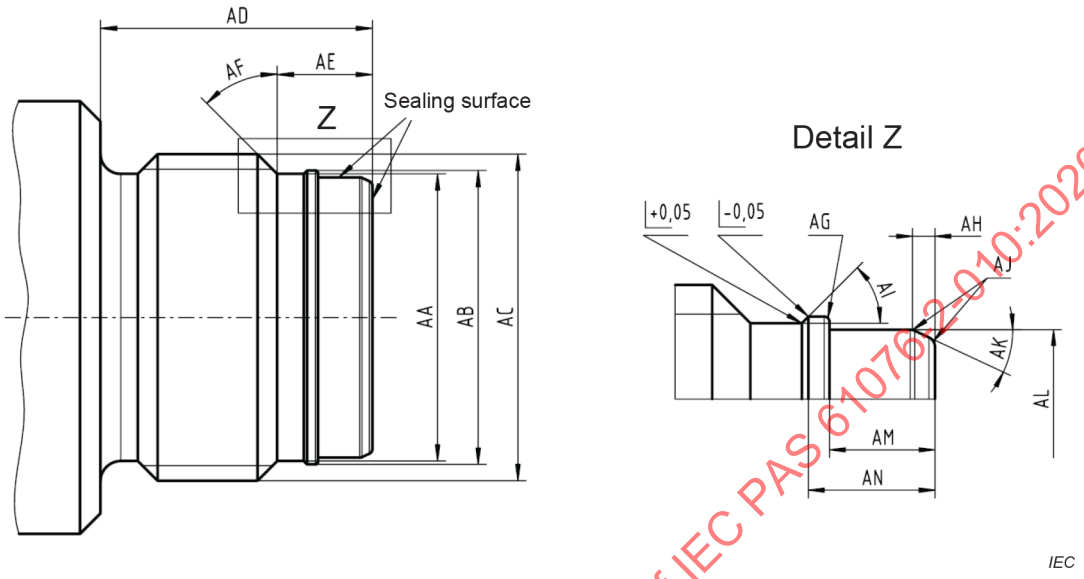


Figure 25 – Outer push-pull locking: male fixed connector side view

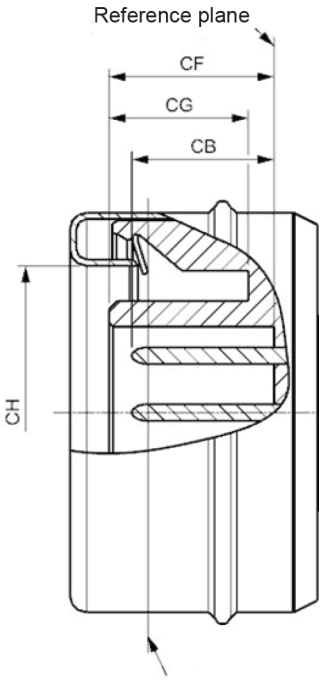
Table 16 – Dimensions of fixed connector with push-pull housing and male contacts

Dimensions in millimetres

Letter	Minimum	Nominal	Maximum
AA 1)	Ø 10,50	Ø 10,55	Ø 10,60
AB	Ø 10,77	Ø 10,80	Ø 10,83
AC		M12x1	
AD	10		
AE	3,40	3,50	3,60
AF	40°	45°	50°
AG	R0,10		
AH	0,40	0,43	0,46
AI	44°	45°	46°
AJ	R0,10	R0,20	R0,30
AK	20°	25°	30°
AL	Ø 10,27	Ø 10,30	Ø 10,33
AM	1,95	2,00	2,05
AN	2,35	2,40	2,45
Flat areas are allowed.			

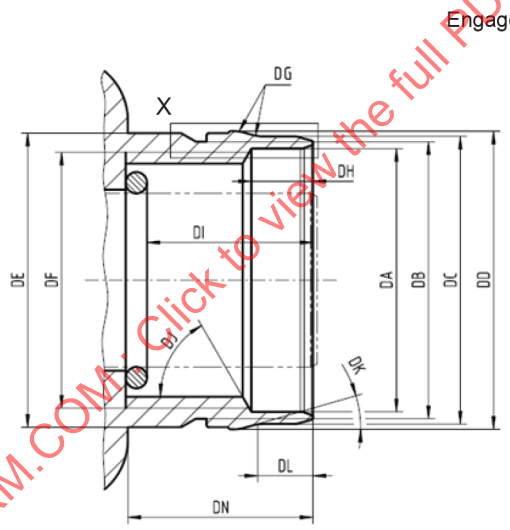
5.3.2 Outer push-pull locking: female fixed connector side view with details and engage-plane definition for male free cable connectors type 1 and 2

See Figure 26 and Table 17.

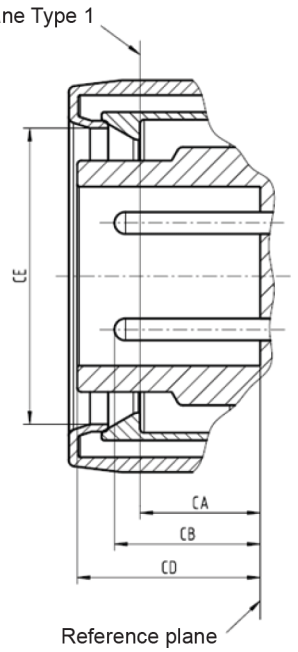


Type 2

IEC



Fixed connector



Type 1

IEC

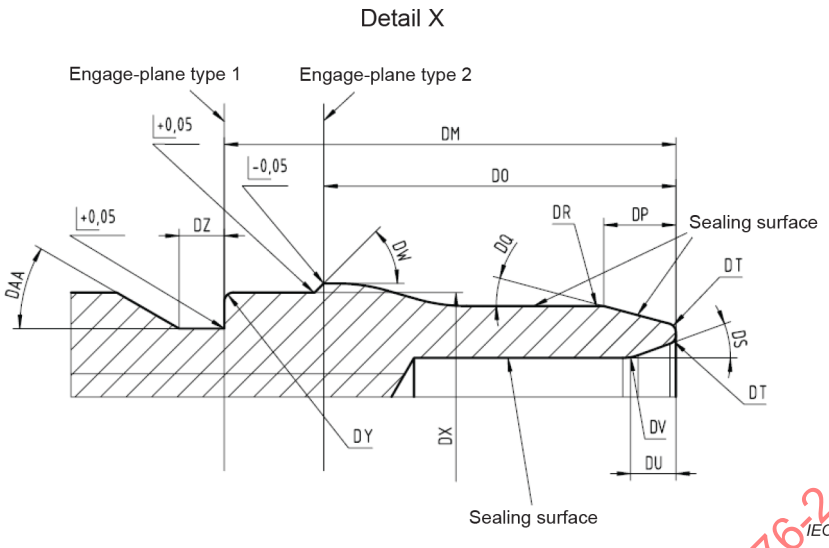


Figure 26 – Outer push-pull locking: female fixed connector side view with details and engage-plane definition for male free cable connector

Table 17 – Dimensions for Figure 26

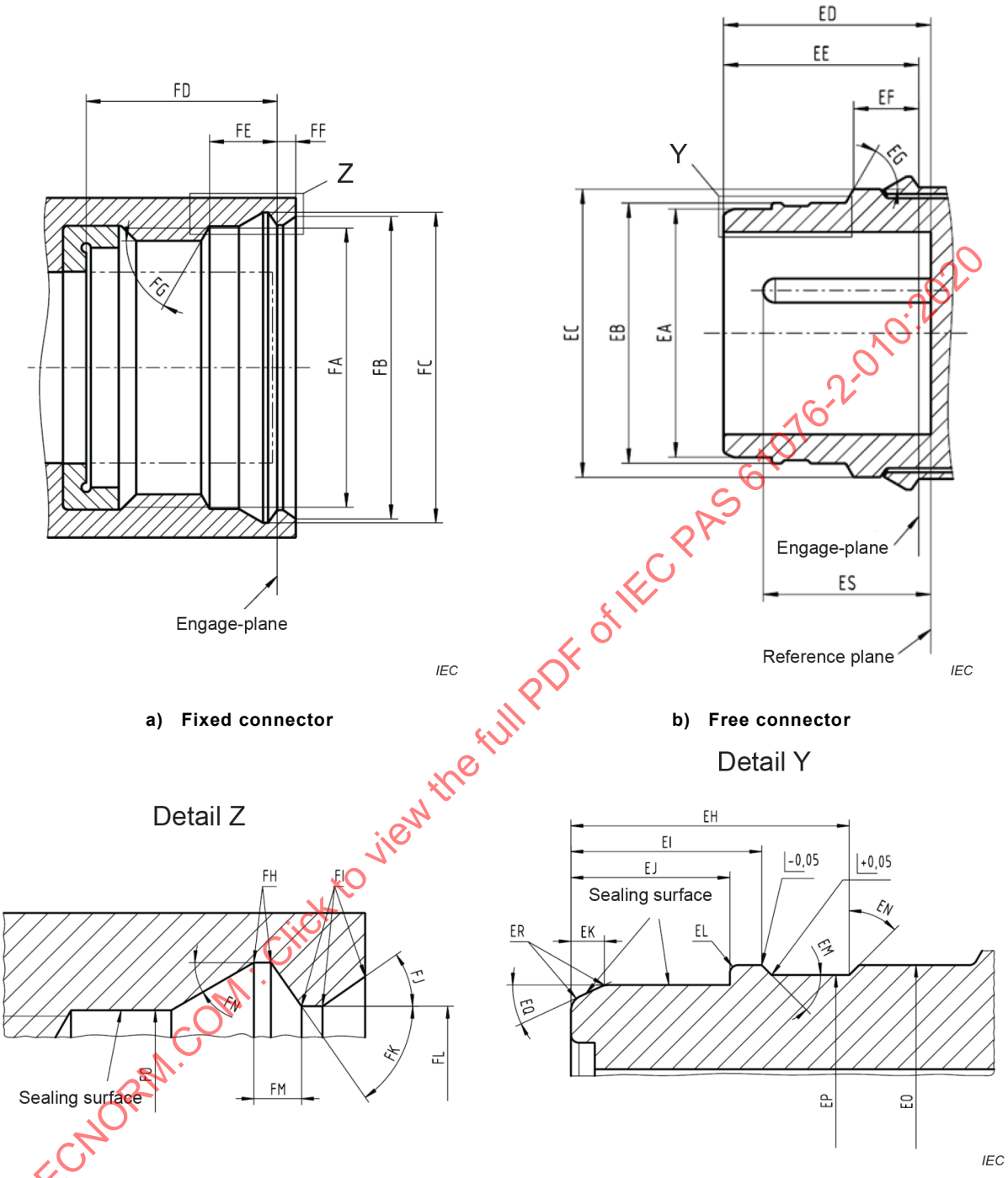
Dimensions in millimetres

Letter	Minimum	Nominal	Maximum
DA	Ø 12,32	Ø 12,35	Ø 12,38
DB	Ø 12,95	Ø 13,00	Ø 13,05
DC	Ø 13,48	Ø 13,50	Ø 13,52
DD	Ø 13,98	Ø 14,00	Ø 14,02
DE	Ø 13,75	Ø 13,80	Ø 13,85
DF		M12x1	
DG	R1,80	R2,00	R2,20
DH	2,85	2,90	2,95
DI	7,65	7,80	7,95
DJ	55°	60°	65°
DK	15°	16°	17°
DL	2,50	2,60	2,70
DM	4,95	5,00	5,05
DN	9,00		
DO	3,85	3,90	3,95
DP	0,70	0,80	0,90
DQ	13°	15°	17°
DR	R0,10	R0,20	R0,30
DS	15°	20°	25°
DT	R0,05	R0,10	R0,15
DU	0,40	0,50	0,60
DV	R0,45	R0,50	R0,55
DW	44°	45°	46°
DX	Ø 13,75	Ø 13,80	
DY	R0,05	R0,10	R0,15

Letter	Minimum	Nominal	Maximum
DZ	0,40	0,50	0,60
DAA	28°	30°	32°
CA	5,50	5,85	6,20
CB	See applicable standard for respective coding		
CD	See applicable standard for respective coding -0,4		
CE			14,50
CF	See applicable standard for respective coding -0,4		
CG			6,80
CH			14,50

5.3.3 Inner push-pull locking: female fixed connector side view and male free connector side view with details for both

See Figure 27 and Table 18.



a) **Fixed connector**

b) **Free connector**

Figure 27 – Inner push-pull-locking: female fixed connector side view and male free connector side view with details for both

Table 18 – Dimensions for Figure 27

Dimensions in millimetres

Letter	Minimum	Nominal	Maximum
FA		M12x1-6H	
FB	Ø 12,90	Ø 13,00	Ø 13,10
FC	Ø 13,30	Ø 13,35	Ø 13,40
FD	8,20		
FE	2,85	2,90	2,95
FF	0,75	0,80	0,85
FG	55°	60°	65°
FH			R0,20
FI			R0,20
FJ	34°	35°	36°
FK	54°	55°	56°
FL	Ø 12,20	Ø 12,25	Ø 12,30
FM	0,55	0,60	0,65
FN	29°	30°	31°
FO	Ø 12,10	Ø 12,15	Ø 12,20
EA	Ø 10,27	Ø 10,30	Ø 10,33
EB	Ø 10,77	Ø 10,80	Ø 10,83
EC	Ø 11,90	Ø 11,95	Ø 12,00
ED	See applicable standard for respective coding -0,4		
EE	8,00	8,10	8,20
EF	2,65	2,70	2,75
EG	58°	60°	62°
EH	3,40	3,50	3,60
EI	2,35	2,40	2,45
EJ	1,95	2,00	2,05
EK	0,40	0,43	0,46
EL	R0,10		
EM	44°	45°	46°
EN	40°	45°	50°
EO	Ø 10,75	Ø 10,80	Ø 10,85
EP	Ø 10,50	Ø 10,55	Ø 10,60
EQ	20°	25°	30°
ER	R0,10	R0,20	R0,30
ES	See applicable standard for respective coding		

5.4 Gauges

See the applicable standard, either IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113, for sizing gauges and retention force gauges.

6 Characteristics

6.1 Classification into climatic category

Conditions: IEC 60068-1 and Table 19.

Table 19 – Climatic category

Climatic category	Category temperature		Damp heat steady state		Days
	Lower	Upper	Temperature	Relative humidity	
	°C	°C	°C	%	
25/085/-	–25	+85	40	93	-

6.2 Electrical characteristics

6.2.1 Voltage proof

Conditions: IEC 60512-4-1, test 4a.

Standard atmospheric conditions.

Mated connectors.

Voltage proof according to the applicable standard, either IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113.

6.2.2 Rated voltage – Rated impulse voltage – Pollution degree

Conditions: IEC 60664-1.

Rated voltage, rated impulse voltage and pollution degree according to the applicable standard, either IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113.

The permissible rated voltage depends on the application or specified safety requirement. Reductions in creepage or clearance distances may occur due to the printed board or wiring used and shall be duly considered.

6.2.3 Current-carrying capacity

Conditions: IEC 60512-5-1, test 5a.

All contacts, but without PE and FE contacts.

The rated current is referenced in the IEC-document, listed in Table 1.

Values at 40 °C ambient temperature.

For rated current see the applicable standard, either IEC 61076-2-101, IEC 61076-2-109, IEC 61076-2-111 or IEC 61076-2-113.

6.2.4 Contact resistance

Conditions: IEC 60512-2-1, test 2a.

Standard atmospheric conditions