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Responsible committee: EPL/48 Electromechanical components and mechanical structures for electronic equipment

Interested committees:

Title: BS EN IEC 61076-2-117 Connectors for electrical and electronic equipment – Detail specification for shielded, free and fixed circular connectors M12 to M40 for power, signal and data transmission with frequencies up to 600 MHz

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

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- ii) affects other national standard(s)
- iii) requires additional national guidance or information

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This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



48B/3046/CD

COMMITTEE DRAFT (CD)

PROJECT NUMBER:

IEC 61076-2-117 ED1

DATE OF CIRCULATION:

2023-05-12

CLOSING DATE FOR COMMENTS:

2023-08-04

SUPERSEDES DOCUMENTS:

48B/2968/NP, 48B/2997/RVN

IEC SC 48B : ELECTRICAL CONNECTORS

SECRETARIAT:

United States of America

SECRETARY:

Mr Jeffrey Toran

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☐ SAFETY

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Recipients of this document are invited to submit, with their comments, notification of any local regulations or technical reasons that may exist and should be considered should this proposal proceed, recognizing that failure to address such requirements could result in the need for new or existing "In Some Countries" clauses. (SEE [AC/22/2007](#) OR [NEW GUIDANCE DOC](#)).

TITLE:

Connectors for electrical and electronic equipment – Detail specification for shielded, free and fixed circular connectors M12 to M40 for power, signal and data transmission with frequencies up to 600 MHz

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT –**Detail specification for shielded and unshielded, free and fixed circular connectors M12 to M40 for power, signal and data transmission with frequencies up to 600 MHz**

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- IEC 61076-2-117 has been prepared by subcommittee 48B: Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment. It is an International Standard.

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

Draft	Report on voting
48B//	48B//

255

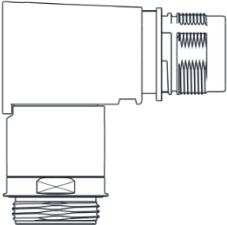
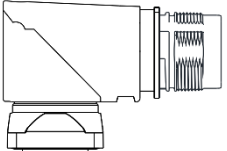
256 Full information on the voting for its approval can be found in the report on voting indicated in the above
257 table.

258 The language used for the development of this International Standard is **English**.

259 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance
260 with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at
261 www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in
262 greater detail at www.iec.ch/publications.

263 The committee has decided that the contents of this document will remain unchanged until the stability
264 date indicated on the IEC website under webstore.iec.ch in the data related to the specific document.
265 At this date, the document will be

- 266 • reconfirmed,
- 267 • withdrawn,
- 268 • replaced by a revised edition, or
- 269 • amended.

IEC SC 48B – Electrical connectors Specification available from: IEC General secretariat or from the addresses shown on the inside cover.	IEC 61076-2-117 Ed. 1
DETAIL SPECIFICATION in accordance with IEC 61076-2	
   Free and fixed connectors for device and motor one cable automation  Free cable connectors for device and motor one cable automation	Shielded and unshielded Circular connectors for power, signal and data applications with M12, M17, M23, M40 screw- and quick-locking Power up to 600 V AC/ DC and up to 70 A Signal up to 50 V AC / DC and up to 30 A Data up to 600 MHz Male and female contacts Rewireable Non-rewireable Free cable connectors Fixed connectors: Straight connectors Right-angled connectors Flange mounting Single hole panel mounting

CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT –

Detail specification for shielded and unshielded, free and fixed circular connectors M12 to M40 for power, signal and data transmission with frequencies up to 600 MHz

1 Scope

This part of IEC 61076-2 covers shielded and unshielded, free and fixed circular connectors without breaking capacity (COC) for power, signal and data transmission, and specifies the common dimensions, mechanical, electrical and transmission characteristics and environmental requirements as well as test specifications, respectively.

The connectors described in this document are equipped with an M12, M17, M23 or M40 screw-locking mechanism and a quick-locking mechanism with a size derived from those.

This document provides multiple mating interfaces each of which is associated with a coding preventing the mating of incompatible male and female connectors. The individual codings differ by their numbers of ways, pin layouts and thicknesses, and thus by their power and data transmission capabilities. These codings are referred to as “Type x” where ‘x’ represents a Roman number.

The connectors described in this document are intended to be used in one-cable automation applications which require various combinations and levels of power up to 600 V AC/ DC and up to 70 A, signal and data transmission (Ethernet and DSL) with frequencies up to 600 MHz.

NOTE The connectors described in this standard facilitate data transmission through the following Ethernet media systems as defined in IEEE 802.3:

- Single-Pair Ethernet (10BASE-T1, 100BASE-T1, 1000BASE-T1)
- Fast Ethernet (100BASE-TX)
- Gigabit Ethernet (1000BASE-T)
- 10-Gigabit Ethernet (10GBASE-T)

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 – Chapter 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 (all parts), *Solderless connections*

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

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*

- 314 IEC 60512-3-1, *Connectors for electronic equipment – Tests and measurements – Part 3-1: Insulation*
315 *tests – Test 3a: Insulation resistance*
- 316 IEC 60512-4-1, *Connectors for electronic equipment – Tests and measurements – Part 4-1: Voltage*
317 *stress tests – Test 4a: Voltage proof*
- 318 IEC 60512-5-1, *Connectors for electronic equipment – Tests and measurements – Part 5-1: Current-*
319 *carrying capacity tests – Test 5a: Temperature rise*
- 320 IEC 60512-5-2, *Connectors for electronic equipment – Tests and measurements – Part 5-2: Current-*
321 *carrying capacity tests – Test 5b: Current-temperature derating*
- 322 IEC 60512-6-3, *Connectors for electronic equipment – Tests and measurements – Part 6-3: Dynamic*
323 *stress tests – Test 6c: Shock*
- 324 IEC 60512-6-4, *Connectors for electronic equipment – Tests and measurements – Part 6-4: Dynamic*
325 *stress tests – Test 6d: Vibration (sinusoidal)*
- 326 IEC 60512-9-1, *Connectors for electronic equipment – Tests and measurements – Part 9-1: Endurance*
327 *tests – Test 9a: Mechanical operation*
- 328 IEC 60512-9-2, *Connectors for electronic equipment – Tests and measurements – Part 9-2: Endurance*
329 *tests – Test 9b: Electrical load and temperature*
- 330 IEC 60512-11-1, *Electromechanical components for electronic equipment – Basic testing procedures*
331 *and measuring methods – Part 11: Climatic tests – Section 1: Test 11a – Climatic sequence*
- 332 IEC 60512-11-4, *Connectors for electronic equipment – Tests and measurements – Part 11-4: Climatic*
333 *tests – Test 11d: Rapid change of temperature*
- 334 IEC 60512-11-7, *Connectors for electronic equipment – Tests and measurements – Part 11-7: Climatic*
335 *tests – Test 11g: Flowing mixed gas corrosion test*
- 336 IEC 60512-11-9, *Connectors for electronic equipment – Tests and measurements – Part 11-9: Climatic*
337 *tests – Test 11i: Dry heat*
- 338 IEC 60512-11-10, *Connectors for electronic equipment – Tests and measurements – Part 11-10:*
339 *Climatic tests – Test 11j: Cold*
- 340 IEC 60512-11-12, *Connectors for electronic equipment – Tests and measurements – Part 11-12:*
341 *Climatic tests – Test 11m: Damp heat, cyclic*
- 342 IEC 60512-13-2, *Connectors for electronic equipment – Tests and measurements – Part 13-2:*
343 *Mechanical operation tests – Test 13b: Insertion and withdrawal forces*
- 344 IEC 60512-13-5, *Connectors for electronic equipment – Tests and measurements – Part 13-5:*
345 *Mechanical operation tests – Test 13e: Polarizing and keying method*
- 346 IEC 60512-16-5, *Connectors for electronic equipment – Tests and measurements – Part 16-5:*
347 *Mechanical tests on contacts and terminations – Test 16e: Gauge retention force (resilient contacts)*
- 348 IEC 60512-19-3, *Electromechanical components for electronic equipment – Basic testing procedures*
349 *and measuring methods – Part 19: Chemical resistance tests – Section 3: Test 19c – Fluid resistance*
- 350 IEC 60512-26-100, *Connectors for electronic equipment – Tests and measurements – Part 26-100:*
351 *Measurement setup, test and reference arrangements and measurements for connectors according to*
352 *IEC 60603-7 - Tests 26a to 26g*
- 353 IEC 60512-28-100, *Connectors for electronic equipment – Tests and measurements – Part 28-100:*
354 *Signal integrity tests up to 1000 MHz on 60603-7 and 61076-3 series connectors – Tests 28a to 28g*
- 355 IEC 60529, *Degrees of protection provided by enclosures (IP code)*

- 356 IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles,*
357 *requirements and tests*
- 358 IEC 60999-1, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type*
359 *and screwless-type clamping units – Part 1: General requirements and particular requirements for*
360 *clamping units for conductors from 0,2 mm² up to 35 mm² (included)*
- 361 IEC 61076-1:2006, *Connectors for electronic equipment – Product requirements – Part 1: Generic*
362 *specification*
- 363 IEC 61076-2, *Connectors for electronic equipment - Product requirements - Part 2: Sectional*
364 *specification for circular connectors*
- 365 IEC 61076-2-109, *Connectors for electronic equipment - Product requirements - Part 2-109: Circular*
366 *connectors - Detail specification for connectors with M 12 x 1 screw-locking, for data transmission*
367 *frequencies up to 500 MHz*
- 368 IEC 61076-2-114, *Connectors for electronic equipment – Product requirements – Part 2-114 Circular*
369 *connectors – Detail specification for connectors with M8 screw-locking with power contacts and signal*
370 *contacts for data transmission up to 100 MHz*
- 371 IEC 61984:2008, *Connectors – Safety requirements and tests*
- 372 IEC 62197-1, *Connectors for electronic equipment – Quality assessment requirements – Part 1: Generic*
373 *specification*
- 374 IEC 63171:2021, *Connectors for Electrical and Electronic Equipment – Shielded or unshielded free and*
375 *fixed connectors for balanced single-pair data transmission with current carrying capacity; General*
376 *requirements and tests*
- 377 IEC 63171-7:2021, *Connectors for Electrical and Electronic Equipment – Detail specification for*
378 *shielded, free and fixed circular connectors with 4 ways up to 7 ways for power and data transmission*
379 *with frequencies up to 600 MHz*
- 380 ISO 11469, *Plastics – Generic identification and marking of plastics products*
- 381 ISO 21920-1:2021, *Geometrical product specifications (GPS) — Surface texture: Profile — Part 1:*
382 *Indication of surface texture*

383

384 **3 Terms and definitions**

385 For the purposes of this document, the terms and definitions given in IEC 60050-581, IEC 61076-1, IEC
386 61076-2 and IEC 60512-1 apply.

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

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

390 **4 Technical information**

391 **4.1 Systems of levels – Compatibility levels, according to IEC 61076-1**

392 **4.1.1 Performance level**

393 Connectors according to this standard are classified by mating performance level (MPL). See 6.6.2 for
394 details.

395 **4.1.2 Compatibility levels according to IEC 61076**

396 a) Intermateability

Intermateability (level 2 of IEC 61076-1) standardizes only dimensions of electrical and mechanical interfaces. Intermateability shall be ensured by application of the “Go” and “No-Go” gauge requirements in the standards that may be referenced, and adherence to the dimensional requirements within.

b) Interoperability

Interoperability of different connectors shall be assured by compliance with the specified interface dimensions and by compliance with the requirement in 6.4 and 6.5 proven by the respective testing sequences in Clause 7.

4.2 Classification into climatic categories

See 6.3.

4.3 Clearance and creepage distances

See 6.4.1.

4.4 Current carrying capacity

See 6.4.4.

4.5 Marking

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

4.6 Safety aspects

For safety aspects IEC 61984 shall be considered. Connectors according to this standard are COC (connectors without breaking capacity) per IEC 61984, unless otherwise specified by the manufacturer.

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.

5 Dimensional information

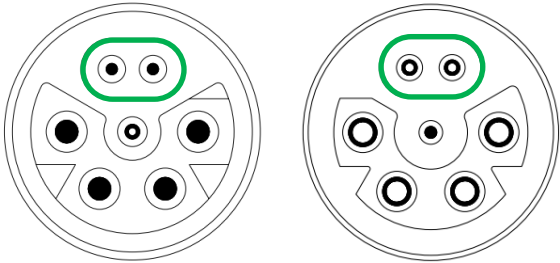
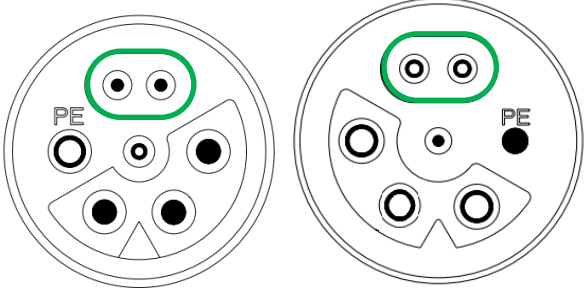
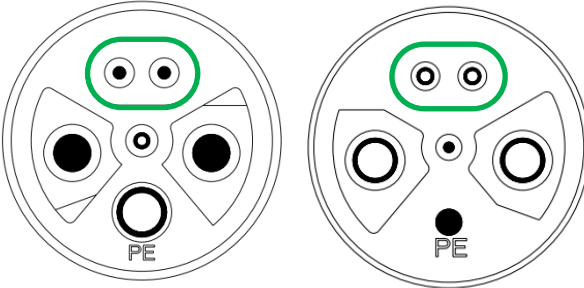
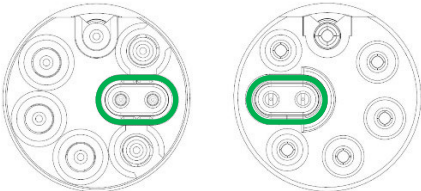
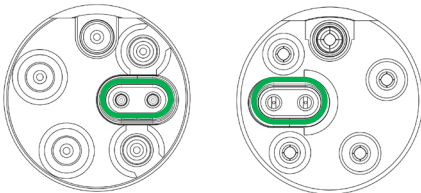
5.1 General

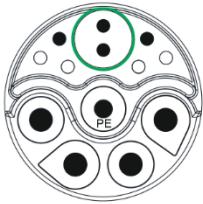
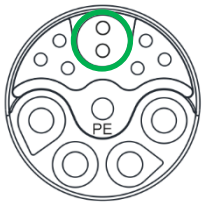
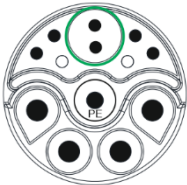
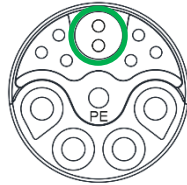
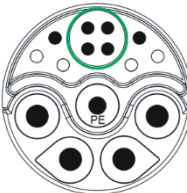
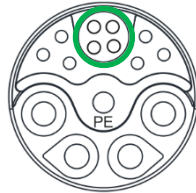
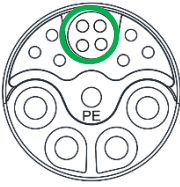
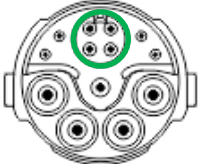
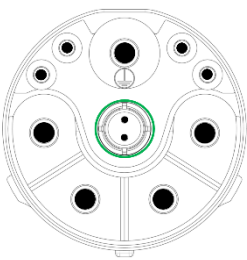
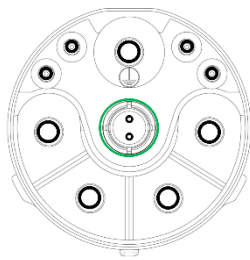
Drawings are shown in the first angle projection. The shape of connectors may deviate from those shapes given in the following figures as long as the specified dimensions are not influenced. Coordination dimensions are dimensions without tolerances which indicate the boundary or centre-line references in order to allow for (modular) arrangement.

5.2 Coding

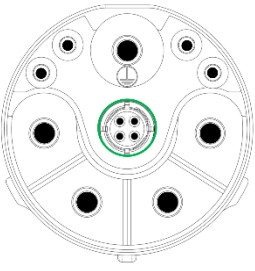
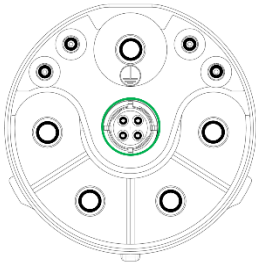
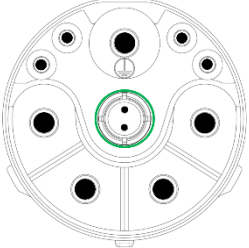
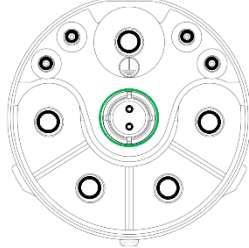
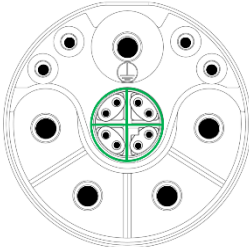
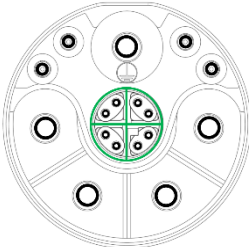
Table 1 defines the coding.

Table 1 – Coding

Coding	Description	Front views – male (left) and female (right)
M12		
M12 Type 1	2 data pins (0,5 mm) Up to 4 power pins (1 mm) Shield pin (0,5 mm) Shield ferrule	
M12 Type 2	2 data pins (0,5 mm) 3 power pins (1 mm) Shield pin (0,5 mm) PE pin (1 mm) Shield ferrule	
M12 Type 3	2 data pins (0,5 mm) 2 power pins (1,5 mm) Shield pin (0,5 mm) PE pin (1,5 mm) Shield ferrule	
M17		
M17 Type 1	2 data pins (0,5 mm) 2 signal pins (1 mm) 3 power pins (1 mm) PE (1 mm) Shield ferrule	
M17 Type 2	2 data pins (0,5 mm) 2 signal pins (1 mm) 2 power pins (1 mm) PE (1 mm) Shield ferrule	
M23		

Coding	Description	Front views – male (left) and female (right)
M23 Type 1	2 data pins (0,5 mm) 2 signal pins (1 mm) 4 power pins (2 mm) PE (2 mm) Shield ferrule	 
M23 Type 1A	2 data pins (0,5 mm) 4 signal pins (1 mm) 4 power pins (2 mm) PE (2 mm) Shield ferrule	 
M23 Type 2	4 data pins (0,6 mm) 2 signal pins (1 mm) 4 power pins (2 mm) PE (2 mm) Shield ferrule	 
M23 Type 2A	4 data pins (0,6 mm) 4 signal pins (1 mm) 4 power pins (2 mm) PE (2 mm) Shield ferrule	 
M23 Type 3	4 data pins (0,8 mm) 4 signal pins (1 mm) 4 power pins (2 mm) PE (2 mm) Shield ferrule	 
M40		
M40 Type 1	2 data pins (0,5 mm) 4 signal pins (1 mm) 4 power pins (3,6 mm) PE (3,6 mm) Shield ferrule	 

429

Coding	Description	Front views – male (left) and female (right)
M40 Type 2	4 data pins (0,6 mm) 4 signal pins (1 mm) 4 power pins (3,6 mm) PE (3,6 mm) Shield ferrule	 
M40 Type 3	2 data pins (0,5 mm) 4 signal pins (1 mm) 4 power pins (3,6 mm) PE (3,6 mm) Shield ferrule	 
M40 Type 4	8 data pins (0,6 mm) 4 signal pins (1 mm) 4 power pins (3,6 mm) PE (3,6 mm) Shield ferrule	 

5.3 Interface dimensions

5.3.1 M12

Figure 1 shows the mating dimensions for the coding Type 1 for the male connectors (Shield is inverse).
See Table 2 for the dimensions.

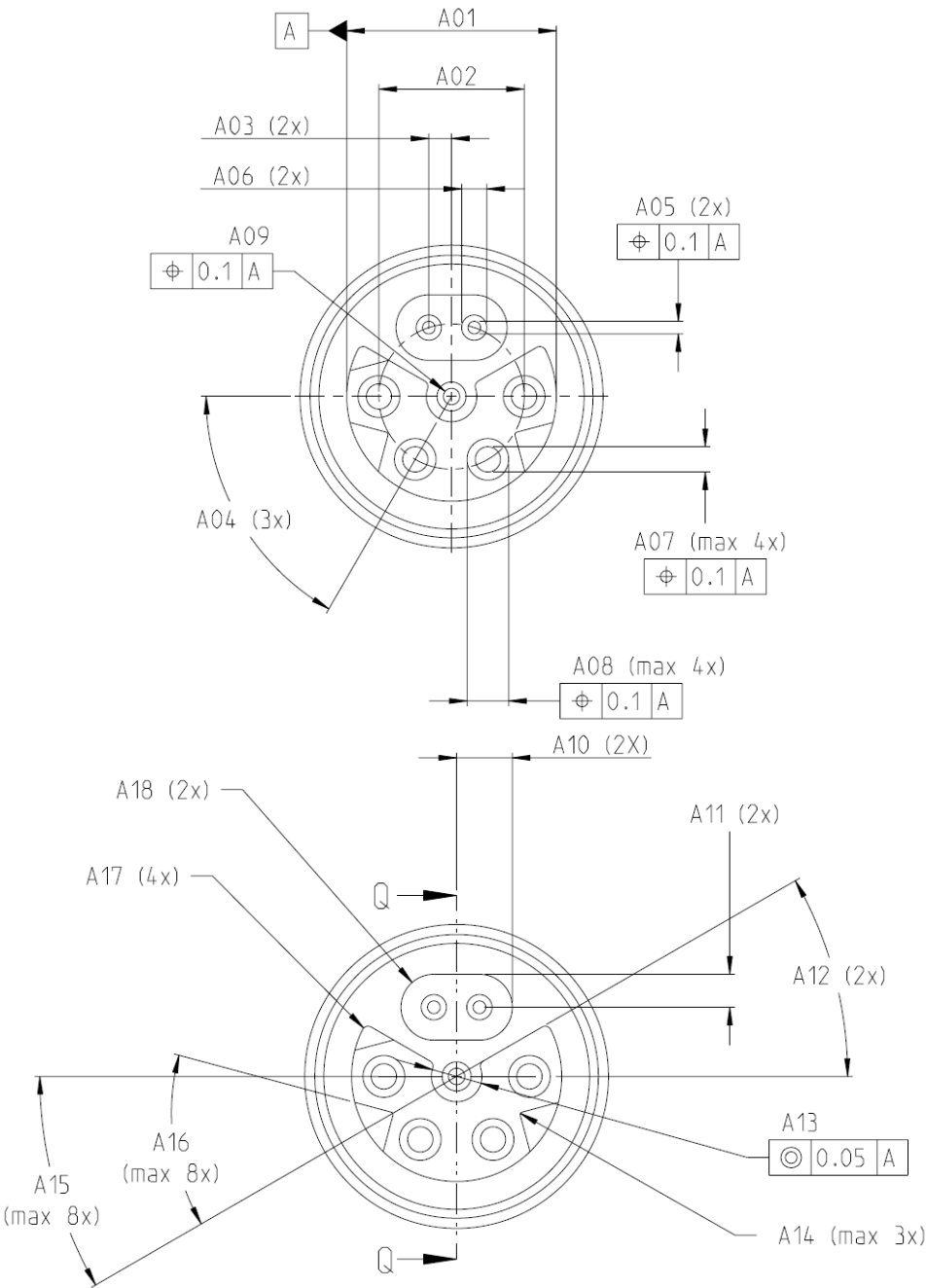
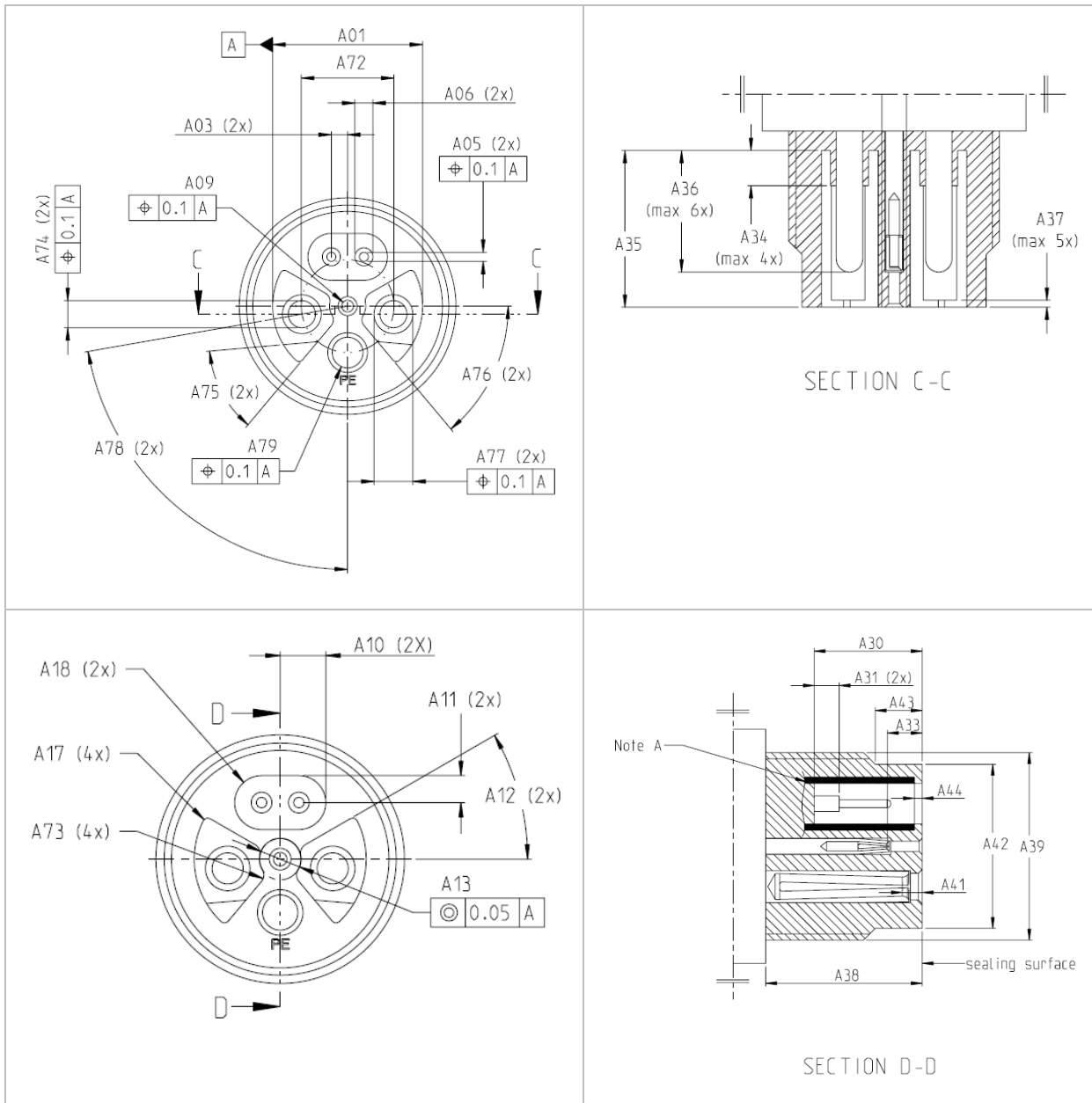


Figure 1 – M12 mating dimensions for the coding Type 1 for male connectors

Table 2 – Dimensions for Figure 1*Dimensions in millimetres*

Dimension	Min	Nom	Max
A01	Ø8,30	Ø8,30	Ø8,45
A02	-	5,75	-
A03	-	0,90	-
A04	-	60°	-
A05	Ø0,47	Ø0,50	Ø0,53
A06	Ø0,97	Ø1,00	Ø1,03
A07	Ø0,97	Ø1,00	Ø1,03
A08	Ø1,62	Ø1,65	Ø1,68
A09	Ø0,60	Ø0,65	Ø0,70
A10	2,20	2,20	2,30
A11	1,30	1,30	1,40
A12	30°	30°	32°
A13	Ø1,90	Ø2,00	Ø2,00
A14	R0,1	R0,1	R0,15
A15	29,5°	30,0°	30,5°
A16	44°	45°	45°

Figure 2 shows the mating dimension for the coding Type 1 for the male connectors (Shield and PE pin are inverse). See Table 3 for the dimensions.



NOTE: Over the distance indicated with "Note A", a 360-degree shielding is mandatory. This shielding shall not reduce the dimension A11.

Figure 2 – Mating dimensions for the coding Type 3 and style with male contacts

Table 3 – Dimensions for Figure 2

Dimensions in millimetres

Dimension	Min	Nom	Max
A72	-	Ø5,15	-
A73	-	-	R0,50
A74	Ø1,47	Ø1,50	Ø1,53
A75	44°	45°	45°
A76	50°	50°	52°
A77	Ø2,12	Ø2,15	Ø2,18

Dimension	Min	Nom	Max
A78	-	80°	-
A79	Ø1,65	Ø1,70	Ø1,75

Figure 3 shows the mating dimensions for female connectors (Shield and PE pin are inverse). See Table 4 for the dimensions.

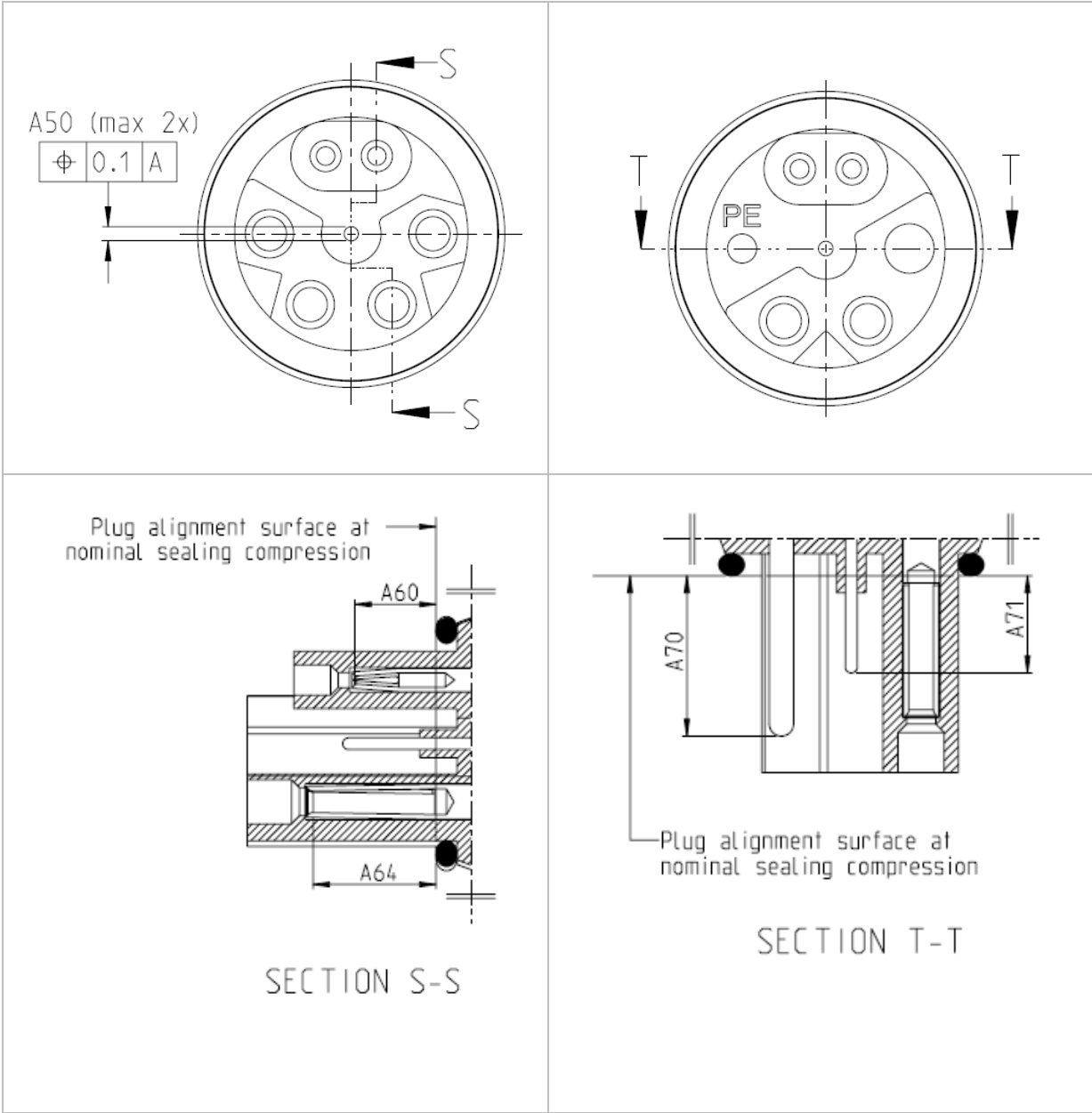


Figure 3 – M12 mating dimensions for the female connectors (at the example of coding Type 1 and Type 2)

Table 4 – Dimensions for Figure 3

Dimensions in millimetres

Dimension	Min	Nom	Max
A50	Ø0,97	Ø1,00	Ø1,03
A60	3,12	3,32	3,52
A64	4,12	4,32	4,52
A70	5,9	6,1	6,3
A71	3,8	4,0	4,2

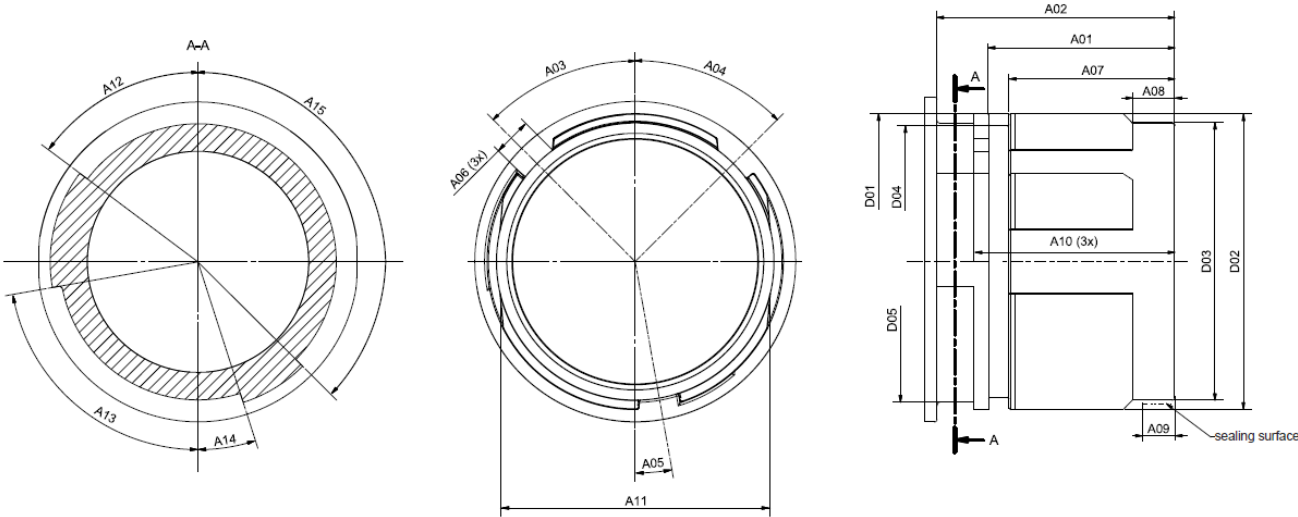


Figure 4 – M12 mating dimensions for the fixed connectors (side view)

Table 5 – Dimensions for Figure 4

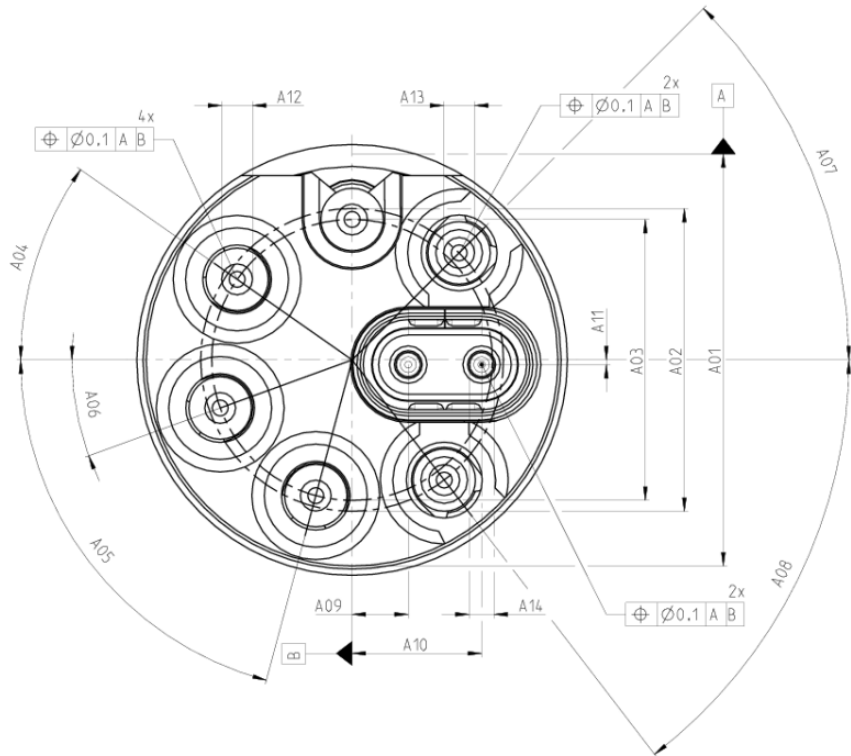
Dimensions in millimetres

Dimension	Min	Nom	Max
A01	10,0	10,1	10,2
A02	12,8	13,0	13,2
A03	73,5°	75°	77°
A04	13,5°	15°	17°
A05	23,5°	25°	27°
A06	2,9	3,0	3,3
A07	8,3	8,6	8,9
A08	3,0	3,15	3,3
A09	2,0	2,15	2,3
A10	10,9	11,0	11,1
A11	10,4	10,6	10,9
A12	-	-	-
A13	-	-	-
A14	-	-	-
A15	-	-	-

Dimension	Min	Nom	Max
D01	ø13,2	ø13,3	ø13,5
D02		M12x1	
D03	ø10,65	ø10,7	ø10,8
D04	-	-	-
D05	ø11,2	ø11,3	ø11,5

460

461 **5.3.2 M17**



462

463 **Figure 5 – Common M17 mating dimensions for the male connectors**
464 **(at the example of coding Type 1)**

465 **Table 6 – Dimensions for Figure 5**

466

Dimensions in millimetres			
Dimension	Min	Nom	Max
A01	Ø13,12	Ø13,2	Ø13,28
A02	-	Ø9,7	-
A03	-	Ø9	-
A04	-	35°	-
A05	-	75°	-
A06	-	20°	-
A07	-	45°	-
A08	-	52,5°	-
A09	-	1,8	-
A10	-	4,15	-
A11	-	0,15	-

Dimension	Min	Nom	Max
A12	Ø0,98	Ø1	Ø1,02
A13	Ø0,98	Ø1	Ø1,02
A14	Ø0,78	Ø0,8	Ø0,82

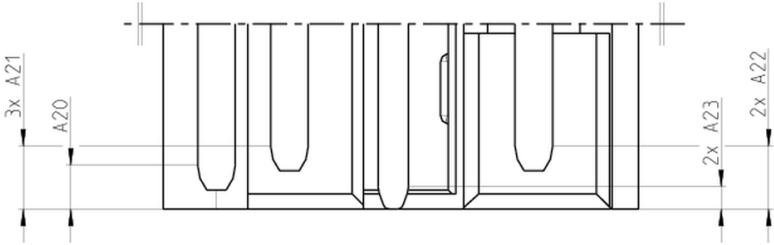


Figure 6 – M17 mating dimensions for the male connectors

Table 7 – Dimensions for Figure 6

Dimensions in millimetres

Dimension	Min	Nom	Max
A20	1	1,15	1,3
A21	1,5	1,65	1,8
A22	1,5	1,65	1,8
A23	0,45	0,60	0,75

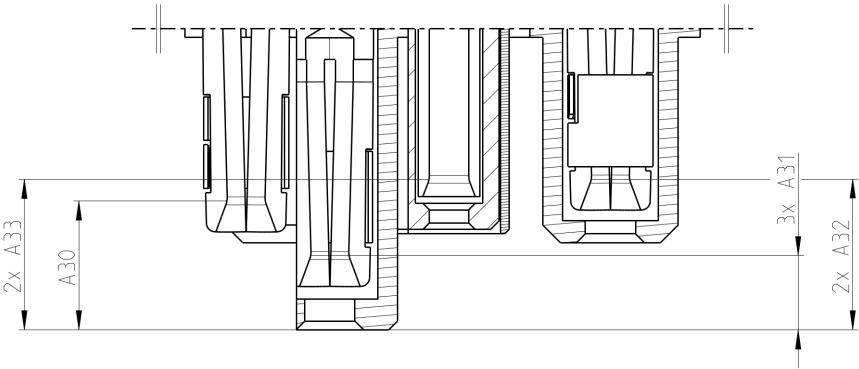


Figure 7 – M17 mating dimensions for the female connectors

Table 8 –Dimensions for Figure 7

Dimensions in millimetres

Dimension	Min	Nom	Max
A30	2,8	2,95	3,1
A31	1,55	1,7	1,85
A32	3,3	3,45	3,6
A33	3,3	3,45	3,6