

INTERNATIONAL STANDARD

**Connectors for electrical and electronic equipment - Product requirements -
Part 2-117: Detail specification for shielded and unshielded, free and fixed
connectors M12 to M40 for power, auxiliary and data transmission with
frequencies up to 600 MHz**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Product requirements -
Part 2-117: Detail specification for shielded and unshielded, free and fixed
connectors M12 to M40 for power, auxiliary and data transmission with
frequencies up to 600 MHz**

FOREWORD

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

Draft	Report on voting
48B/3208/FDIS	48B/3222/RVD

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

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

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

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.

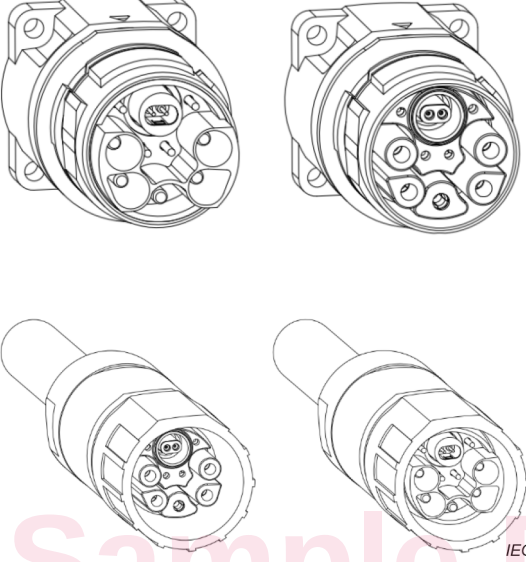
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INTRODUCTION

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	
 IEC	Shielded and unshielded circular connectors (as all the connectors described in this document are equipped with shielded data transmission portions, the attribute “shielded” or “unshielded” refers to the additional presence or lack of a shielded connector body) for power, auxiliary and data applications with M12, M17, M23, M40 screw- and quick-locking. Power up to 600 V AC/DC and up to 70 A Auxiliary up to 50 V AC /DC and up to 30 A Data up to 600 MHz Male and female contacts Rewirable Non-rewirable Fixed- and rewirable connectors with male or female contacts, mateable with Mxx screw- or quick-locking plugs. Free cable connectors Fixed connectors: Straight connectors Right-angled connectors Flange mounting Single hole panel mounting

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.

NOTE 1 As all the connectors described in this document are equipped with shielded data transmission portions, the attribute “shielded” or “unshielded” refers to the additional presence or lack of a shielded connector body.

The connectors described in this document are equipped with an M12, M17, M23 or M40 screw-locking mechanism or a quick-locking mechanism with a size derived from those. Fixed and rewirable connectors with male or female contacts, mateable with Mxx screw- or quick-locking plugs.

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 an Arabic 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, and either signal or data transmission, or both, with frequencies up to 600 MHz.

NOTE 2 The requirements (or information) described in this document 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 electrical and electronic equipment - Tests and measurements - Part 1: Generic specification*

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 60512-2-5, *Connectors for electronic equipment - Tests and measurements - Part 2-5: Electrical continuity and contact resistance tests - Test 2e: Contact disturbance*

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 60512-5-2, *Connectors for electronic equipment - Tests and measurements - Part 5-2: Current-carrying capacity tests - Test 5b: Current-temperature derating*

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, *Connectors for electrical and electronic equipment - Tests and measurements - Part 11: Climatic tests - 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*

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 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 60512-25-9, *Connectors for electronic equipment - Tests and measurements - Part 25-9: Signal integrity tests - Test 25i: Alien crosstalk*

IEC 60512-26-100, *Connectors for electronic equipment - Tests and measurements - Part 26-100: Measurement setup, test and reference arrangements and measurements for connectors according to IEC 60603-7 - Tests 26a to 26g*

IEC 60512-29-100, *Connectors for electronic equipment - Tests and measurements - Part 29-100: Signal integrity tests up to 500 MHz on M12 style connectors - Tests 29a to 29g*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60529:1989/AMD1:1999

IEC 60529:1989/AMD2:2013

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests*

IEC 60603-7-1:2011, *Connectors for electronic equipment - Part 7-1: Detail specification for 8-way, shielded, free and fixed connectors*

IEC 60603-7-3:2010, *Connectors for electronic equipment - Part 7-3: Detail specification for 8-way, shielded, free and fixed connectors, for data transmission with frequencies up to 100 MHz*

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

IEC 61076-2, *Connectors for electronic equipment - Product requirements - Part 2: Sectional specification for circular connectors*

IEC 61984:2008, *Connectors - Safety requirements and tests*

IEC 62153-4-12, *Metallic communication cable test methods - Part 4-12: Electromagnetic compatibility (EMC) - Coupling attenuation or screening attenuation of connecting hardware - Absorbing clamp method*

IEC 63171:2021, *Connectors for electrical and electronic equipment - Shielded or unshielded free and fixed connectors for balanced single-pair data transmission with current carrying capacity - General requirements and tests*

ISO 21920-1, *Geometrical product specifications (GPS) - Surface texture: Profile - Part 1: Indication of surface texture*

3 Terms and definitions

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

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

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

4 Technical information

4.1 Systems of levels – compatibility levels, in accordance with IEC 61076-1

4.1.1 Performance level

Connectors in accordance with this document are classified by mating performance level (MPL). See 6.6.2 for details.

4.1.2 Compatibility levels in accordance with IEC 61076-1

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 can be referenced, and adherence to the dimensional requirements within.

b) Interoperability

Interoperability of different connectors shall be ensured by meeting the specified interface dimensions and the requirements of 6.4 and 6.5, as verified by the respective testing sequences specified 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 IEC 61076-1.

4.6 Safety aspects

For safety aspects, IEC 61984 shall be applied. Connectors in accordance with this document are COC (connectors without breaking capacity) as defined in 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

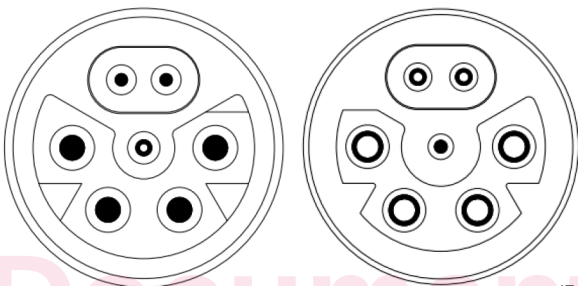
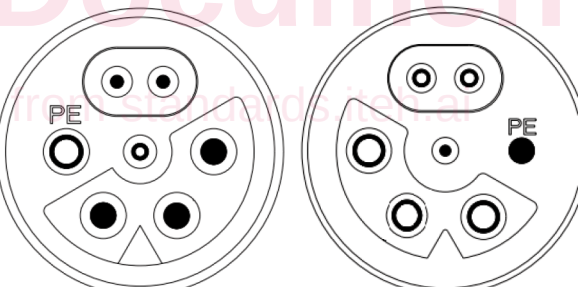
5.1 General

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

5.2 Coding

Table 1 defines the coding. See Annex A for coding orientation information.

Table 1 – Coding

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