

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Connectors for electrical and electronic equipment –  
Part 5: Detail specification for 2-way M8 and M12 circular connectors, shielded  
or unshielded, free and fixed – Mechanical mating information, pin assignment  
and additional requirements for Type 5**

**Connecteurs pour équipements électriques et électroniques –  
Partie 5: Spécification particulière pour les connecteurs circulaires M8 et M12 à  
2 pôles, à fiches et embases écrantées ou non écrantées – Informations  
d'accouplement mécanique, affectation des broches et exigences  
supplémentaires pour le type 5**



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2022 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

#### IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

#### IEC Products & Services Portal - [products.iec.ch](http://products.iec.ch)

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Recherche de publications IEC -

##### [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [sales@iec.ch](mailto:sales@iec.ch).

#### IEC Products & Services Portal - [products.iec.ch](http://products.iec.ch)

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Connectors for electrical and electronic equipment –  
Part 5: Detail specification for 2-way M8 and M12 circular connectors, shielded  
or unshielded, free and fixed – Mechanical mating information, pin assignment  
and additional requirements for Type 5**

**Connecteurs pour équipements électriques et électroniques –  
Partie 5: Spécification particulière pour les connecteurs circulaires M8 et M12 à  
2 pôles, à fiches et embases écrantées ou non écrantées – Informations  
d'accouplement mécanique, affectation des broches et exigences  
supplémentaires pour le type 5**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 31.220.10

ISBN 978-2-8322-5609-1

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	9
2 Normative references .....	9
3 Terms and definitions .....	10
4 Common features and typical connector pair .....	11
4.1 Systems of levels.....	11
4.1.1 Performance levels .....	11
4.1.2 Compatibility levels, according to IEC 61076-1 .....	11
4.2 Pin assignment .....	11
4.3 Codings .....	11
4.4 Classification into climatic categories.....	11
4.5 Creepage and clearance distances .....	11
4.6 Current-carrying capacity.....	11
4.7 Marking.....	11
4.8 Characteristics.....	11
5 Dimensional information .....	12
5.1 General.....	12
5.2 Isometric view and common features .....	12
5.2.1 General .....	12
5.2.2 Common features .....	12
5.2.3 Reference system.....	12
5.3 Engagement (mating) information – Engaging (mating) direction.....	12
5.4 Fixed connectors .....	13
5.4.1 Overview about styles for fixed connectors .....	13
5.4.2 Interface dimensions – Fixed connectors M8 .....	13
5.4.3 Interface dimensions – Fixed connectors M12 .....	13
5.5 Free connectors .....	13
5.5.1 Overview about styles for free connectors .....	13
5.5.2 Style KF .....	13
5.5.3 Style MF .....	14
5.5.4 Interface dimensions – M8 free connector.....	15
5.5.5 Interface dimensions – M12 free connector.....	15
5.6 Interface dimensions – M8 male connector .....	15
5.7 Interface dimensions – Female connectors M8.....	17
5.8 Interface dimensions – Male connector M12 .....	19
5.9 Interface dimensions – Female connector M12 .....	21
5.10 Terminations.....	23
5.11 Mounting information for connectors .....	23
5.12 Gauges .....	24
5.12.1 Sizing gauges and retention force gauges .....	24
5.12.2 Test panel (for voltage proof test).....	24
5.12.3 Test panel (for EMC/ crosstalk, etc.).....	24
6 Characteristics .....	25
6.1 General.....	25
6.2 Pin assignment and other definitions.....	25

6.3	Classification into climatic categories .....	25
6.4	Electrical characteristics .....	25
6.4.1	Creepage and clearance distances .....	25
6.4.2	Voltage proof .....	25
6.4.3	Current-temperature derating .....	25
6.4.4	Initial contact resistance – interface only (separable fixed and free contact) .....	26
6.4.5	Input to output DC resistance .....	26
6.4.6	Input to output DC resistance unbalanced .....	26
6.4.7	Initial insulation resistance .....	26
6.5	Transmission characteristics .....	26
6.5.1	General .....	26
6.5.2	Insertion loss .....	26
6.5.3	Return loss .....	26
6.5.4	Propagation delay .....	26
6.5.5	Transverse conversion loss .....	26
6.5.6	Transverse conversion transfer loss .....	26
6.5.7	Transfer impedance (shielded only) .....	26
6.5.8	Coupling attenuation .....	26
6.5.9	Power sum alien (exogenous) NEXT .....	27
6.5.10	Power sum alien (exogenous) FEXT .....	27
6.6	Mechanical characteristics .....	27
6.6.1	Mechanical operation .....	27
6.6.2	Effectiveness of connector coupling devices .....	27
6.6.3	Insertion and withdrawal forces .....	27
6.6.4	Polarization and coding method .....	27
6.6.5	Dynamic stress .....	27
7	Tests and test schedule .....	27
7.1	General .....	27
7.2	Contact resistance measurement .....	27
7.3	Arrangement for vibration test .....	28
7.4	Test procedures and measuring methods .....	29
7.5	Preconditioning .....	29
7.6	Test schedules .....	29
7.7	Basic (minimum) test schedule .....	29
7.8	Full test schedule .....	29
Annex A (normative)	Contact designation for balanced cabling M8 .....	30
A.1	Cable connection with M8 .....	30
Annex B (normative)	Contact and pair designation for balanced cabling M12 .....	31
B.1	Cable connection with M12 .....	31
	Bibliography .....	32
	Figure 1 – Relationships between the IEC 63171 series documents and their related references .....	7
	Figure 2 – Type 5 connector overview .....	8
	Figure 3 – Engagement (mating) information .....	12
	Figure 4 – Free connector style KF .....	13
	Figure 5 – Free connector style MF .....	14

Figure 6 – M8 male connector interface .....	16
Figure 7 – M8 female connector interface .....	18
Figure 8 – M12 male connector interface .....	20
Figure 9 – M12 female connector interface .....	22
Figure 10 – Gauge dimensions .....	24
Figure 11 – Contact resistance test arrangement .....	27
Figure 12 – Dynamic stress test arrangement .....	28
Figure A.1 – Mating side contact arrangement for balanced cabling with M8 .....	30
Figure B.1 – Mating side contact arrangement for balanced cabling with M12 .....	31
Table 1 – Dimensions of free connector style KF .....	14
Table 2 – Dimensions of free connector style MF .....	15
Table 3 – Dimensions of M8 male connector .....	17
Table 4 – Dimensions of M8 female connector .....	19
Table 5 – Dimensions of M12 male connector .....	21
Table 6 – Dimensions of M12 female connector .....	23
Table 7 – Gauges .....	24
Table 8 – Creepage and clearance distances .....	25
Table A.1 – Contact and pair designation for balanced cabling with M8 .....	30
Table B.1 – Contact and pair designation for balanced cabling with M12 .....	31

Preview generated by EVS

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT –****Part 5: Detail specification for 2-way M8 and M12 circular connectors, shielded or unshielded, free and fixed – Mechanical mating information, pin assignment and additional requirements for Type 5**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 63171-5 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.

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

Draft	Report on voting
48B/2973/FDIS	48B/2983/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

A list of all parts of IEC 63171 series, under the general title *Connectors for electrical and electronic equipment*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under [webstore.iec.ch](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

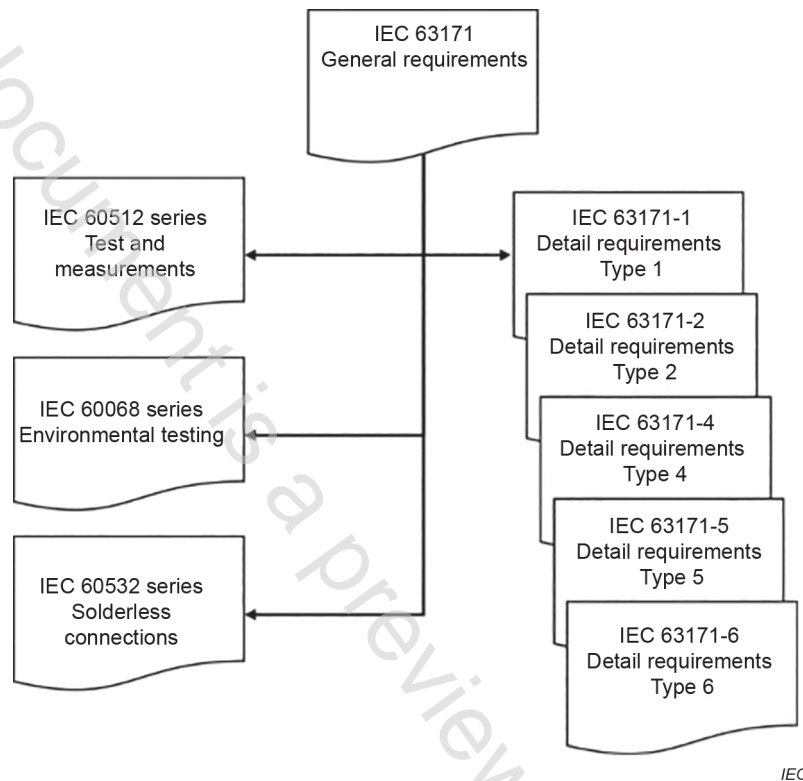
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

This document is a preview generated by EVS



## INTRODUCTION

IEC 63171 is the base specification of the whole series. Subsequent specifications do not duplicate information given in the base document, but list only additional requirements. For complete specification regarding a component of a higher number document all lower numbered documents shall be considered as well. Figure 1 shows the interrelation of the documents.



**Figure 1 – Relationships between the IEC 63171 series documents and their related references**

NOTE IEC 63171-1 and IEC 63171-6 contain duplicate information, which is either equal to or better than the minimum requirements of this document; such duplicate information will be removed in later editions.

This document refers to International Standards for test and measurement, environmental testing as well as solderless connections.

A general overview about the connectors in this document is shown in Figure 2.


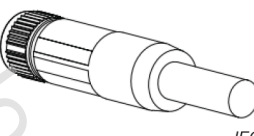

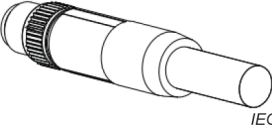

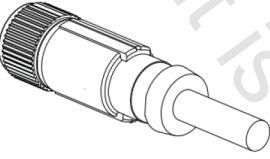

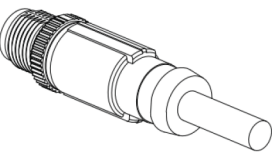
<p>IEC SC 48B – Electrical connectors</p> <p>Specification available from: IEC General secretariat or from the addresses shown on the inside cover.</p>		<p>IEC 63171-5 Ed. 1</p>
  <p>Fixed connector: M8 outer thread and male contacts Free connector: M8 inner thread and female contacts</p>	  <p>Fixed connector: M8 inner thread and female contacts Free connector: M8 outer thread and male contacts</p>	<p>Circular connectors for data and power applications with 2 ways in a M8 and in a M12 style system</p> <p>Male and female connectors Male and female contacts</p> <p>Rewireable – Non-rewireable</p>
  <p>Fixed connector: M12 outer thread and male contacts Free connector: M12 inner thread and female contacts</p>	  <p>Fixed connector: M12 inner thread and female contacts Free connector: M12 outer thread and male contacts</p>	<p>Free cable connectors Straight and angled connectors</p> <p>Fixed connectors Flange mounting Single hole mounting</p>

Figure 2 – Type 5 connector overview

## CONNECTORS FOR ELECTRICAL AND ELECTRONIC EQUIPMENT –

### Part 5: Detail specification for 2-way M8 and M12 circular connectors, shielded or unshielded, free and fixed – Mechanical mating information, pin assignment and additional requirements for Type 5

#### 1 Scope

This part of IEC 63171 describes 2-way shielded or unshielded circular connectors with IP65/IP67 M8 or M12 locking, typically used for balanced single-pair data transmission with frequencies up to 600 MHz and with current-carrying capacity up to 4 A, for use in areas with harsh environmental conditions.

These connectors consist of fixed and free connectors, either rewirable or non-rewirable. Male connectors have square cross-section contacts.

M12 describes the dimensions of the styles and thread of the screw-locking mechanism according to IEC 61076-2-101 of this size of circular connectors. M8 describes the dimensions of the styles and thread of the screw-locking mechanism according to IEC 61076-2-104.

Use of alternative locking mechanisms according to IEC 61076-2-010 (push-pull locking) or IEC 61076-2-011 (bayonet locking) is possible, within the corresponding size.

The coding provided by this document prevents the mating of accordingly coded male or female connectors to other similarly sized interfaces covered by this or other documents.

This document covers Type 5 connectors. Each part of this series has the associated type number equal to the number of the part in the series. All connectors in the IEC 63171 series are deemed to provide the same functions as defined in IEC 63171:2021, using different mechanical interfaces.

These Type 5 connectors are interoperable with Type 2 connectors according to IEC 63171-2, except the locking and sealing system provided by the outer shell.

The shielded and unshielded connectors are interoperable for their internal transmission performance and can be exchanged. The shielded version has improved EMC and coupling properties.

#### 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*

IEC 60352 (all parts), *Solderless connections*

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

IEC 60512-28-100:2019, *Connectors for electrical and electronic equipment – Tests and measurements – Part 28-100: Signal integrity tests up to 2 000 MHz – Tests 28a to 28g*

IEC 60664-1, *Insulation coordination for equipment within low-voltage supply 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<sup>2</sup> up to 35 mm<sup>2</sup> (included)*

IEC 61076-1:2006, *Connectors for electronic equipment - Product requirements – Part 1: Generic specification*  
IEC 61076-1:2006/AMD1:2019

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

IEC 61076-2-104, *Connectors for electronic equipment – Product requirements – Part 2-104: Circular connectors – Detail specification for circular connectors with M8 screw-locking or snap-locking*

IEC 61760-3, *Surface mounting technology – Part 3: Standard method for the specification of components for through hole reflow (THR) soldering*

IEC TR 63040, *Guidance on clearances and creepage distances in particular for distances equal to or less than 2 mm – Test results of research on influencing parameters*

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*

IEC 63171-2, *Connectors for electrical and electronic equipment – Part 2: Detail specification for 2-way, shielded or unshielded, free and fixed connectors – Mechanical mating information, pin assignment and additional requirements for Type 2*

ISO/IEC 11801-1, *Information technology – Generic cabling for customer premises – Part 1: General requirements*

ISO 21920-1:2021, *Geometrical product specifications (GPS) – Surface texture: Profile – Part 1: Indication of surface texture*

IEEE 802.3, *IEEE Standard for Ethernet*

### **3 Terms and definitions**

For the purposes of this document, the terms and definitions given in IEC 63171:2021, IEC 60050-581, and IEC 60512-1 apply, as well as the following.

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>