

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Plugs, socket-outlets and couplers for industrial purposes –
Part 2: Dimensional interchangeability requirements for pin and contact-tube
accessories**

**Prises de courant pour usages industriels –
Partie 2: Règles d'interchangeabilité dimensionnelle pour les appareils à
broches et alvéoles**

IEC 60309-2:1999

<https://standards.iteh.ai/standards/iec/e2b98e78-7433-4d8a-831f-e2c70b52c51b/iec-60309-2-1999>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2012 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 la CEI ou du Comité national de la CEI du pays du demandeur.

Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
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 corrigenda or an amendment might have been published.

Useful links:

IEC publications search - www.iec.ch/searchpub

The advanced search enables you 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It also gives information on projects, replaced and withdrawn publications.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

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

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - 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: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) 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 CEI

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

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI 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.

Just Published CEI - webstore.iec.ch/justpublished

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

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Plugs, socket-outlets and couplers for industrial purposes –
Part 2: Dimensional interchangeability requirements for pin and contact-tube
accessories**

**Prises de courant pour usages industriels –
Partie 2: Règles d'interchangeabilité dimensionnelle pour les appareils à
broches et alvéoles**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.120.30

ISBN 978-2-88912-054-3

**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.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Definitions.....	7
3 Normative references.....	8
4 General.....	8
5 Standard ratings.....	8
6 Classification.....	9
7 Marking.....	9
8 Dimensions.....	12
9 Protection against electric shock.....	17
10 Provision for earthing.....	17
11 Terminals and terminations.....	17
12 Interlocks and retaining devices.....	20
13 Resistance to ageing of rubber and thermoplastic material.....	20
14 General construction.....	21
15 Construction of socket-outlets.....	22
16 Construction of plugs and connectors.....	23
17 Construction of appliance inlets.....	24
18 Degrees of protection.....	25
19 Insulation resistance and dielectric strength.....	25
20 Breaking capacity.....	25
21 Normal operation.....	25
22 Temperature rise.....	26
23 Flexible cables and their connection.....	26
24 Mechanical strength.....	26
25 Screws, current-carrying parts and connections.....	26
26 Creepage distances, clearances and distances through sealing compound.....	26
27 Resistance to heat, fire and tracking.....	26
28 Corrosion and resistance to rusting.....	26
29 Conditional short-circuit current withstand test.....	26
30 Electromagnetic compatibility.....	26
Standards sheets.....	54
Figures.....	91
Annex AA (informative) List of the clause numbers that require re-testing.....	105
Table 101.....	8
Table 102.....	12
Table 103-1 – General purpose accessories with rated voltage not exceeding 50 V.....	13
Table 103-2 – Special application accessories with rated voltage not exceeding 50 V.....	13
Table 104.....	14
Table 105.....	16

Table 106	17
Table 107 – Size of connectable conductors	19
Table 108	20
Table 109	21
Table 110	22
Table 111	23
Table 112	23

Withdrawing

iTech Standards
(<https://standards.iteh.ai>)
Document Preview

<https://standards.iteh.ai/standards/iec/60309-2:1999>
<https://standards.iteh.ai/standards/iec/e2b98e78-7433-4d8a-831f-e2c70b52c51b/iec-60309-2-1999>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PLUGS, SOCKET-OUTLETS AND COUPLERS
FOR INDUSTRIAL PURPOSES –****Part 2: Dimensional interchangeability requirements
for pin and contact-tube accessories**

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.

International Standard IEC 60309-2 has been prepared by subcommittee 23H: Industrial plugs and socket-outlets, of IEC technical committee 23: Electrical accessories.

This part 2 shall be used in conjunction with part 1.

This consolidated version of IEC 60309-2 consists of the fourth (1999) [documents 23H/89/FDIS and 23H/92/RVD], its amendment 1 (2005) [documents 23H/175/FDIS and 23H/183/RVD] and its amendment 2 (2012) [documents 23H/275/FDIS and 23H/280/RVD].

The technical content is therefore identical to the base edition and its amendments and has been prepared for user convenience.

It bears the edition number 4.2.

A vertical line in the margin shows where the base publication has been modified by amendments 1 and 2.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

Withdrawn

iTech Standards
(<https://standards.itih.ai>)
Document Preview

<https://standards.itih.ai/standards/iec/60309-2:1999>
<https://standards.itih.ai/standards/iec/e2b98e78-7433-4d8a-831f-e2c70b52c51b/iec-60309-2-1999>

INTRODUCTION

This standard is divided into several parts:

Part 1: General requirements, comprising clauses of a general character.

Subsequent parts: Particular requirements dealing with particular types. The clauses of these particular requirements supplement or modify the corresponding clauses in Part 1. Where the text of subsequent parts indicates an "addition" to or a "replacement" of the relevant requirement, test specification or explanation of Part 1, these changes are made to the relevant text of Part 1, which then becomes part of the standard. Where no change is necessary, the words "This clause of Part 1 is applicable" are used.

Witholdam

iTech Standards
(<https://standards.itih.ai>)
Document Preview

<https://standards.itih.ai/standards/iec/60309-2:1999>

<https://standards.itih.ai/standards/iec/e2b98e78-7433-4d8a-831f-e2c70b52c51b/iec-60309-2-1999>

PLUGS, SOCKET-OUTLETS AND COUPLERS FOR INDUSTRIAL PURPOSES –

Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories

1 Scope

Replacement:

This standard applies to plugs and socket-outlets, cable couplers and appliance couplers with a rated operating voltage not exceeding 1 000 V, 500 Hz and a rated current not exceeding 125 A, primarily intended for industrial use, either indoors or outdoors.

NOTE All references for accessories with a rated current of more than 125 A in part 1 are not applicable to this part 2.

This standard applies to plugs and socket-outlets, cable couplers and appliance couplers with pins and contact tubes of standardized configurations.

This standard applies to plugs and socket-outlets, cable couplers and appliance couplers, hereinafter referred to as accessories, for use when the ambient temperature is normally within the range -25 °C to 40 °C .

The use of these accessories on building sites and for agricultural, commercial and domestic applications is not precluded.

This standard applies to accessories with screwless type terminals or insulation piercing terminals, with a rated current up to and including 32 A for series I and 30 A for series II.

Socket-outlets or appliance inlets incorporated in or fixed to electrical equipment are within the scope of this standard. This standard also applies to accessories intended to be used in extra-low voltage installations.

NOTE This standard does not apply to accessories primarily intended for domestic and similar general purposes. In locations where special conditions prevail, for example on board ship or where explosions are liable to occur, additional requirements may be necessary.

2 Definitions

This clause of part 1 is applicable except as follows:

Additional subclause:

2.101

phase inverter

a plug or an appliance inlet with operating means to interchange the position of two phase pins without disconnecting them from the conductors

3 Normative references

This clause of part 1 is applicable except as follows:

Addition:

IEC 60364-4-41, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60617-2:1996, *Graphical symbols for diagrams – Part 2: Symbol elements, qualifying symbols and other symbols having general application*

4 General

This clause of part 1 is applicable except as follows:

4.1 The last paragraph of this subclause of Part 1 is not applicable

See Amendment 1 of IEC 60309-1.

Additional subclause:

4.101 If gauges are used, they shall be of hardened steel, all corners shall be slightly rounded-off with a maximum radius of 0,1 mm, and the surface finish for all measurement surfaces shall be $\sqrt[3]{N8}$ min., if not otherwise specified.

In this standard:

2P + $\frac{1}{2}$ covers both 2P + $\frac{1}{2}$ and 1P + N + $\frac{1}{2}$ and

3P + $\frac{1}{2}$ covers both 3P + $\frac{1}{2}$ and 2P + N + $\frac{1}{2}$

unless specifically excluded (see Table 104)

5 Standard ratings

This clause of part 1 is applicable except as follows:

5.2 Replacement:

Standard rated currents are given in Table 101.

Table 101

Series I	Series II
A	A
16	20
32	30
63	60
125	100

5.101 The standard IP ratings according to IEC 60529 are:

- IP44,
- IP67,
- IP66/IP67.

6 Classification

This clause of part 1 is applicable except as follows:

6.1.2 This clause of Part 1 is applicable.

7 Marking

This clause of part 1 is applicable except as follows:

7.1 Modification:

Delete the note

Addition:

The symbol indicating the position of the earthing contact or of the minor key or keyway shall be placed before or above the figure for the rated operating voltage, and separated from it by a line.

These markings shall be placed after that for rated current, separated from it by a dash if an oblique line separates the symbol indicating the position of the earthing contact or of the minor key or keyway from the figure for the rated operating voltage.

If a symbol for nature of supply is used, it shall be placed next to or below the marking for rated operating voltage.

For three-phase accessories it is not necessary to mark the voltage phase to neutral, if any.

The marking for rated current(s), position of the earthing contact or the minor key, keyway, rated operating voltage(s) and nature of supply accordingly may be as follows:

For series I:

16 A - 9 h/400 V~, or 16 - 9 h/400~, or 16 - $\frac{9 \text{ h}}{400 \sim}$, or

16 A - 9 h/380-415 V~, or 16 - 9 h/380-415~, or 16 - $\frac{9 \text{ h}}{380 - 415 \sim}$

32 A - 6 h/230/400 V~, or 32 - 6 h/230/400~, or 32 - $\frac{6 \text{ h}}{230 / 400 \sim}$, or

32 A - $\frac{6 \text{ h} / 220 / 380 \text{ V} \sim}{240 / 415 \text{ V} \sim}$, or 32 - $\frac{6 \text{ h} / 220 / 380 \sim}{240 / 415 \text{ V} \sim}$, or 32 - $\frac{6 \text{ h}}{220 / 380 \sim}$
 $\frac{240 / 415 \sim}$

For series II

20 A - 7 h/480 V a.c. or 20 A - 7 h/480~, or 20 A - $\frac{7 \text{ h}}{480 \sim}$

30 A - 7 h/480 V, 3 Phase, or 30 A - 7 h/480, 3Φ, or 30 A - $\frac{7 \text{ h}}{480 \text{ V}, 3\Phi}$

60 A - 7 h/277/480 V, 3 Phase Y, or 60 A - 7 h/277/480, 3ΦY, or 60 A - $\frac{7 \text{ h}}{277 / 480 \text{ V}, 3\Phi Y}$

It is allowed to put the symbols for a.c. (~) and d.c. (== or —) after the values (IEC 60617-2).

The drawings of standard sheets 2-I, 2-II, 2-III and 2-IV show accessories with the symbol 6 h and those of standard sheets 2-VIII and 2-IX accessories with the symbol 12 h.

For accessories having rated operating voltages exceeding 50 V, the symbol indicating the position of the earthing contact shall be a numeral followed by the letter h.

The numeral is derived from the position of the earth contact tube, when compared with the face of a clock, the socket-outlet or connector being viewed from the front with the keyway at the sixth hour.

For accessories having rated operating voltages not exceeding 50 V, the symbol indicating the position of the minor key shall be a numeral followed by the letter h.

The numeral is derived from the position of the minor key, when compared with the face of a clock, the socket-outlet or connector being viewed from the front with the major key at the sixth hour.

For plugs and appliance inlets, the symbol indicating the position of the earthing contact or the minor keyway shall be the same as that for the corresponding socket-outlet or connector.

Contact tubes of socket-outlets and connectors shall be positioned in the clockwise order when viewed from the front as shown in the standard sheets (see also 7.5).

Pins of plugs and appliance inlets shall be positioned in the opposite order viewed from the front.

7.2 This clause of Part 1 is applicable.

7.4 Replacement

For plugs and connectors, the marking specified in 7.1 shall be easily discernible when the accessory is wired ready for use.

The marking for insulation voltage shall be on the main part; it shall not be visible when the accessory is mounted and wired as in normal use.

NOTE 1 The term "ready for use" does not imply that the plug or connector is engaged with its complementary accessory.

NOTE 2 The term "main part" of a plug or a connector means the part carrying the contacts.

Compliance is checked by inspection.

7.5 Replacement

For rewirable accessories, the contacts shall be indicated by the following symbols.

- for accessories with three contacts (phase + neutral + earth, or, phase + phase + earth):
L / +, unmarked, Ⓛ or Ⓜ
except for Series II clock position 4 h and 5 h which are marked:
N, unmarked, Ⓝ or Ⓞ
- for accessories with four contacts (three phase + earth):
L1, L2, L3, Ⓛ or Ⓜ or alternatively 1, 2, 3, Ⓛ or Ⓜ
except for Series II clock position 12 h (phase + centre tap + phase + earth) which is marked:
L1, N, L2, Ⓛ or Ⓜ
- for accessories with five contacts (three phase + neutral + earth):
L1, L2, L3, N, Ⓛ or Ⓜ or alternatively 1, 2, 3, N Ⓛ or Ⓜ
- for a period of time the marking R1, S2, T3 may be used instead of L1, L2, L3.
- for accessories having a rated operating voltage not exceeding 50 V, 8 h clock position for portable electric incubator : +12, +24.

These symbols shall be placed close to the relevant terminals; they shall not be placed on screws, removable washers or other removable parts.

For phase inverters these symbols shall conform in one position with the requirements of 7.1. In the other position of the inverting means, the phase marking need not conform.

NOTE The terminals for pilot conductors are not required to be indicated.

The figures used with the letters may be written as an index. It is recommended that where practicable the symbol Ⓛ be used.

Compliance is checked by inspection.

7.7 Modification:

This subclause of part 1 is applicable except for the following addition:

Add:

The 2P + N + earth, 12 h, Series II accessories shall use the indicating colour orange.

8 Dimensions

This clause of part 1 is applicable except as follows:

8.1 Replacement:

Accessories shall comply with the relevant standard sheets as specified below:

- accessories having rated operating voltages exceeding 50 V:
 - 16/20 A and 32/30 A: Sheets 2-I and 2-II;
 - 63/60 A and 125/100 A, without pilot contact:..... Sheets 2-III and 2-IV;
 - 63/60 A and 125/100 A, with pilot contact: Sheets 2-IIIa and 2-IVa;
 - mechanical interlock for 16 A to 125 A accessories Sheet 2-V
- accessories having rated operating voltage not exceeding 50 V:
 - 16/20 A and 32/30 A: Sheets 2-VIII and 2-IX.

Deviations from the dimensions specified in the standard sheets may be made, but only if they provide a technical advantage and do not adversely affect the purpose and safety of the accessories complying with the standard sheets, especially with regard to interchangeability and non-interchangeability.

Compliance is checked by means of gauges or by measurement for those dimensions not covered by gauges,

- *for accessories having rated operating voltages exceeding 50 V according to:*
 - *Figures 101 and 102 for socket-outlets and connectors;*
 - *Figures 107 and 108 for plugs and appliance inlets;*
- *for accessories having rated operating voltages not exceeding 50 V according to:*
 - *Figures 110 and 112 for 16/20 A and 32/30 A accessories.*

The gauges shall be moved axially to the centre line of the accessory with a force as shown in the Table 102, applied for 1 min.

Table 102

Rated operating voltage V	Rated current A		Force (max.) for "GO" gauge N	Force (max.) for "NOT GO" gauge N $\begin{pmatrix} 0 \\ -1 \end{pmatrix}$
	Series I	Series II		
Not exceeding 50 V	16	20	150	30
	32	30	150	30
Exceeding 50 V	16	20	60	20
	32	30	90	30
	63	60	165	55
	125	100	240	80

Before the test, the test specimen of insulating material shall be stored at a temperature of (20 ± 5) °C and a relative humidity between 45 % and 75 % for four weeks.

For accessories having rated operating voltages not exceeding 50 V, the position of the minor key or keyway shall be as shown in Tables 103-1 or 103-2