

INTERNATIONAL STANDARD

**Cable management systems –
Specifications for extra-heavy-duty electrical steel conduit fittings and
accessories**





THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2019 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.

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

Tel.: +41 22 919 02 11
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 corrigendum or an amendment might have been published.

IEC publications search - 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 It also gives information on projects, replaced and withdrawn publications.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

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

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

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - webstore.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

INTERNATIONAL STANDARD

**Cable management systems –
Specifications for extra-heavy-duty electrical steel conduit fittings and
accessories**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.120.10

ISBN 978-2-8322-7373-9

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	6
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	8
4 General requirements	12
4.1 Tests	12
4.2 Metallic materials.....	12
4.2.1 General	12
4.2.2 Corrosion protection	12
4.3 Non-metallic materials	13
4.3.1 Flammability	13
4.3.2 Materials for bushings and insulating liners	13
4.3.3 Elastomeric materials	14
4.3.4 Gasket materials.....	14
4.4 Construction	15
4.4.1 Threads for fittings and conduit bodies	15
4.4.2 Offset and angle fittings.....	15
4.5 Screws.....	16
4.6 Locknuts	16
4.6.1 Construction	16
4.6.2 Functional requirements for fitting locknuts.....	17
4.7 Classifications	17
4.7.1 Concrete-tight type	17
4.7.2 Wet-location type.....	19
4.7.3 Expansion, expansion-deflection, deflection fitting.....	20
5 Fittings for EHDERS systems	20
5.1 Types.....	20
5.2 Fittings for threaded EHDERS conduit	20
5.2.1 End stop.....	20
5.2.2 Torque test.....	20
5.2.3 Earth fault.....	21
5.2.4 Threaded reducers	22
5.3 Fittings for unthreaded EHDERS conduit	22
5.3.1 Electrical continuity and mechanical strength.....	22
5.3.2 Earth fault.....	23
5.3.3 Construction	23
5.4 Bushings.....	24
5.4.1 General	24
5.4.2 Thermoplastic or thermosetting materials	24
5.5 Service-entrance heads	24
5.5.1 End stops for service-entrance heads	24
5.5.2 Assembly.....	24
5.5.3 Openings.....	24
5.5.4 Continuity test	25
5.5.5 Wet-location test.....	25
5.6 Nipples	25
6 Cast metal conduit bodies and covers.....	25

6.1	General.....	25
6.1.1	Applicability	25
6.1.2	Openings	25
6.2	Materials.....	25
6.2.1	Wall thickness	25
6.2.2	Coatings on metallic surfaces	25
6.3	Integral bushings	25
6.4	Threads	26
6.5	Threadless connections	26
6.6	External thread construction	26
6.7	Wet-location type	26
7	Conduit bodies and covers	30
7.1	Cross-sectional area	30
7.2	Connection to conduit	30
7.3	Straight conduit bodies	32
7.4	Angle conduit bodies	32
7.5	Short conduit bodies	33
8	Marking	35
8.1	All fittings.....	35
8.1.1	Permanence and legibility.....	35
8.1.2	Manufacturer identification.....	35
8.1.3	Location of marking	35
8.1.4	Specific conditions of installation	35
8.1.5	Specific instructions.....	35
8.2	Insulating bushings or parts	36
8.2.1	Colour coding	36
8.2.2	Temperature rating	36
8.2.3	Unthreaded bushings	36
8.3	Conduit bodies.....	36
8.3.1	Manufacturer identification.....	36
8.3.2	Specific conditions of installation	37
8.3.3	Short conduit bodies	37
8.3.4	Angle conduit bodies	37
8.3.5	Conduit bodies requiring pulling compound.....	37
8.4	Fittings for threaded hubs	37
8.5	Expansion, expansion-deflection and deflection fittings.....	37
9	Type tests.....	38
9.1	General.....	38
9.1.1	Samples under test.....	38
9.1.2	Mechanical connection	38
9.1.3	Number of samples	38
9.1.4	Locknuts.....	38
9.1.5	Temperature	38
9.1.6	Assembly.....	38
9.2	Concrete-tightness test	38
9.3	Wet locations test	39
9.4	Flammability test.....	42
9.5	Electrical continuity test	44
9.6	Earth fault current test	45

9.7	Tests for temperature ratings of insulating material used for bushings or insulating liners.....	47
9.7.1	Flammability test.....	47
9.7.2	Accelerated aging test.....	47
9.7.3	Heat distortion test.....	48
9.7.4	Drop test.....	48
9.8	Elastomeric materials deterioration test.....	48
9.9	Conductor pull test.....	49
9.10	Metallic-coating thickness test.....	49
9.11	Threaded fittings for EHDERS – Tests for conduit locknuts.....	51
9.11.1	Assembly.....	51
9.11.2	Integrity of assembly.....	52
9.12	Threaded fittings for EHDERS – Tests for hubs.....	52
9.13	Expansion, expansion-deflection and deflection fittings.....	52
9.13.1	General.....	52
9.13.2	Assembly test.....	53
9.13.3	Electrical continuity test.....	54
9.13.4	Reciprocation test.....	54
9.13.5	Deflection test.....	55
9.13.6	Wet locations test.....	56
9.13.7	Corrosion resistance test.....	56
9.13.8	Earth fault current test.....	56
9.13.9	Galvanic compatibility test.....	56
9.14	Gaskets – Expanded closed cell materials.....	57
9.14.1	Insulation electrical continuity test.....	57
9.14.2	Compression set test.....	57
9.15	Permanence of markings test.....	57
	Bibliography.....	58
	Figure 1 – Basic dimensions for locknuts for EHDERS conduit.....	18
	Figure 2 – Basic dimensions for electrical fitting locknuts.....	19
	Figure 3 – Bending test for threadless fittings.....	23
	Figure 4 – Basic dimensions of internal straight pipe threads for conduit fittings having short threads on bushings or hubs for use with EHDERS conduit or electrical equipment having tapered or straight threads.....	27
	Figure 5 – Pitch diameter dimensions of tapered thread conduit entries.....	28
	Figure 6 – Basic dimensions of external straight pipe threads for conduit fittings for use with EHDERS coupling or electrical equipment having tapered or straight internal threads.....	29
	Figure 7 – Conduit body openings.....	33
	Figure 8 – Short conduit bodies.....	34
	Figure 9 – Wet locations test spray head.....	41
	Figure 10 – Wet locations test spray head piping.....	42
	Figure 11 – Flammability test apparatus.....	44
	Figure 12 – Measurement of voltage drop for fittings.....	45
	Figure 13 – Fault current test using an enclosure.....	46
	Figure 14 – Fault current test using a steel plate.....	46

Figure 15 – Temperature rating test for insulating material of bushings and insulating liners	48
Figure 16 – Expansion, expansion-deflection, and deflection fitting test programme	53
Figure 17 – Parallel misalignment of an expansion-deflection, or deflection fitting	55
Table 1 – Wall thickness of fittings	12
Table 2 – Thickness of zinc coating	13
Table 3 – Thickness and diameters of bushings	14
Table 4 – Radius of bend of angle fittings	15
Table 5 – Inside throat diameters of fittings and bushings	16
Table 6 – Tightening torque, bending load, and pull-out force for threaded and threadless fittings	21
Table 7 – Test currents and times	21
Table 8 – Minimum cross-sectional area of conduit bodies	30
Table 9 – Space inside a conduit body	30
Table 10 – Minimum distance between conduit body hubs for three-conductor installation with no investigation	31
Table 11 – Temperature for conditioning polymeric materials	36
Table 12 – Tightening torque value	47
Table 13 – Thickness factor reference test of zinc coating	51
Table 14 – Metal thickness simulating thickness of test material for verifying mechanical mounting	51
Table 15 – Dimensions of zinc-coated ferrous-metal conduit for assembly test for expansion fittings	54
Table 16 – Test currents and times for expansion fittings	57

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CABLE MANAGEMENT SYSTEMS –
SPECIFICATIONS FOR EXTRA-HEAVY-DUTY
ELECTRICAL STEEL CONDUIT FITTINGS AND 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 far 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 61950 has been prepared by subcommittee 23A: Cable management systems, of IEC technical committee 23: Electrical accessories.

This third edition cancels and replaces the second edition published in 2007. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- change in title and scope to cover only fittings and accessories for use with extra-heavy-duty electrical rigid steel (EHDERS) conduits;
- new and updated definitions of terms;
- addition of requirements for expansion, expansion-deflection and deflection fittings;
- deletion of requirements for cast metal boxes.

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

FDIS	Report on voting
23A/887/FDIS	23A/890/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

In this standard, the following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type;*
- explanatory matter: in smaller roman type.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<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.

A bilingual version of this publication may be issued at a later date.

CABLE MANAGEMENT SYSTEMS – SPECIFICATIONS FOR EXTRA-HEAVY-DUTY ELECTRICAL STEEL CONDUIT FITTINGS AND ACCESSORIES

1 Scope

This document specifies requirements for conduit fittings, including conduit bodies used with extra-heavy-duty electrical rigid steel (EHDERS) conduit conforming to IEC 60981.

This document does not include requirements for fittings intended for installation in potentially explosive atmospheres.

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 60981:2019, *Extra heavy-duty electrical rigid steel conduits*

ISO 68-2, *ISO general purpose screw threads – Basic profile – Part 2: Inch screw threads*

ISO 263, *ISO inch screw threads – General plan and selection for screws, bolts and nuts – Diameter range 0,06 to 6 in*

ISO 301, *Zinc alloy ingots intended for castings*

ISO 5864, *ISO inch screw threads – Allowances and tolerances*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 angle fitting

fitting with or without a cover (or cap) intended to change the direction of the conduit entering a box or an enclosure

3.2 box

enclosure without a cover but with means for mounting a cover, and provision for the entrance of conduit and cable fittings