

INTERNATIONAL STANDARD



Extra heavy-duty electrical rigid steel conduits

<https://standards.iteh.ai>
Document Preview

[IEC 60981:2019](https://standards.iteh.ai/catalog/standards/iec/f07cb207-890c-44f8-a980-9714cc57ffa6/iec-60981-2019)

<https://standards.iteh.ai/catalog/standards/iec/f07cb207-890c-44f8-a980-9714cc57ffa6/iec-60981-2019>



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 It also gives information on projects, replaced and withdrawn publications.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

[IEC 60981:2019](https://standards.iteh.ai/catalog/standards/iec/f07cb207-890c-44f8-a980-9714cc57ffa6/iec-60981-2019)

<https://standards.iteh.ai/catalog/standards/iec/f07cb207-890c-44f8-a980-9714cc57ffa6/iec-60981-2019>



IEC 60981

Edition 3.0 2019-08
REDLINE VERSION

INTERNATIONAL STANDARD



Extra heavy-duty electrical rigid steel conduits

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

[IEC 60981:2019](#)

<https://standards.iteh.ai/catalog/standards/iec/f07cb207-890c-44f8-a980-9714cc57ffa6/iec-60981-2019>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.120.10

ISBN 978-2-8322-7331-9

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

CONTENTS

FOREWORD	4
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
4 General requirements	8
4.1 Tests	8
4.2 Circular cross-section	8
4.3 Wall thickness	8
4.4 Surface condition	8
4.4.1 General	8
4.4.2 Localized surface imperfections	8
4.5 Welding	8
4.6 Cleaning	8
4.7 Protective coating(s)	8
4.7.1 Primary coating(s)	8
4.7.2 Secondary coating(s)	9
Alternative coatings	9
5 Dimensions	9
5.1 Dimensions	9
5.2 Threads	9
5.2.1 General	9
5.2.2 Pitch form	9
5.2.3 Angle of thread	9
6 Protective coatings	9
6.1 Interior coatings	9
6.1.1 Zinc	9
6.1.2 Organic coatings	9
6.2 Exterior coatings	10
6.2.1 Zinc coating	10
6.2.2 Alternative corrosion-resistant coating	11
7 Threading and chamfering	14
8 Couplings	14
8.1 General	14
8.1.1 Corrosion protection	14
8.1.2 Chamfering	14
8.1.3 Dimensions	14
8.2 Coupling threads	14
8.2.1 Thread form	14
8.2.2 Dimensions	14
9 Elbows and nipples	14
10 Ductility	15
10.1 Bending properties	15
10.2 Ductility of zinc coating	15
11 Marking	15
11.1 General	15

11.2	Required information.....	15
Annex A (normative) Test for thickness of zinc coating on extra heavy-duty electrical rigid steel (EHDERS) conduits		
		24
A.1	Requirement	24
A.2	Solutions required.....	24
A.3	Preparation of samples	24
A.4	Specimen surface condition	24
A.5	Test method.....	24
A.6	Results	25
Annex B (normative) Tests for evaluating alternative exterior coatings applied on extra heavy-duty electrical rigid steel (EHDERS) conduits		
		26
B.1	Alternative corrosion-resistant coatings.....	26
B.2	Preparation of specimens	26
B.3	Air oven conditioning exposure	28
B.4	Resistance to ultraviolet light and water exposure.....	29
B.5	Resistance to salt spray (fog) exposure	29
B.6	Resistance to moist carbon dioxide-sulfur dioxide-air exposure.....	29
Bibliography.....		
		30
Figure 1	– Dimensions of threads for EHDERS conduits	18
Figure 2	– Basic form of taper thread	19
Figure 3	– Limits on crest and root truncation of external and internal threads	20
Figure 4	– Dimensions of a ferrous metal coupling	21
Figure 5	– Dimensions of wedge	22
Figure 6	– Essential dimensions for flame test	23
Figure B.1	– Alternative corrosion program flowchart with sample requirements	27
Figure B.2	– Scribe pattern	28
Table 1	– Dimensions and mass of EHDERS conduits	16
Table 2	– Dimensions of couplings.....	17
Table 3	– Dimensions of 90° elbows	17

INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXTRA HEAVY-DUTY ELECTRICAL RIGID STEEL CONDUITS

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.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 60981 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 2004. This edition constitutes a technical revision.

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

- a) addition of provisions for alternative coatings to zinc;
- b) addition of elasticity test for organic coatings;
- c) new Annex B on tests for evaluating alternative exterior coatings applied on extra heavy-duty electrical rigid steel (EHDERS) conduits.

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

FDIS	Report on voting
23A/886/FDIS	23A/888/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 document, 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

EXTRA HEAVY-DUTY ELECTRICAL RIGID STEEL CONDUITS

1 Scope

This document specifies requirements for extra heavy-duty electrical rigid steel (EHDERS) conduits, couplings, nipples and elbows for electrical installations, including communications and fibre optics. This document also specifies threads for these components.

It is not applicable to the conduits specified in IEC 60423¹⁾.

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 60695-11-3, *Fire hazard testing – Part 11-3: Test flames – 500 W flames – Apparatus and confirmational test methods*

IEC 61950, *Cable management systems – Specifications for conduit fittings and accessories for ~~electrical~~ cable installations for extra heavy duty ~~metal~~ electrical steel conduit*

ISO 527 (all parts), *Plastics – Determination of tensile properties*

ISO 4892-2, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 9227, *Corrosion tests in artificial atmospheres – Salt spray tests*

ISO 13263, *Thermoplastics piping systems for non-pressure underground drainage and sewerage – Thermoplastics fittings – Test method for impact strength*

ISO 19095-3, *Plastics – Evaluation of the adhesion interface performance in plastic-metal assemblies – Part 3: Test methods*

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>

¹⁾ ~~IEC 60423, Conduits for electrical purposes – Outside diameters of conduits for electrical installations and threads for conduits and fittings~~

3.1
extra heavy-duty electrical rigid steel conduit
EHDERS conduit

part of a closed wiring system of circular cross-section made of welded steel construction capable of providing extra heavy mechanical protection to conductors or cables in electrical installations and used as an equipment earthing conductor when installed utilizing appropriate fittings

3.2
straight conduit

straight length of EHDERS, greater than 0,6 m long and threaded at each end, without a coupling

3.3
finished conduit

straight length of EHDERS with one coupling attached

3.4
threaded coupling

internally threaded steel cylinder for connecting two sections of an EHDERS conduit

3.5
elbow

factory-curved section of an EHDERS conduit threaded at each end

3.6
glowing combustion

combustion of a material in the solid phase without flame but with emission of light from the combustion zone

3.7
nipple

straight section of an EHDERS conduit not more than 0,6 m long and threaded at each end

3.8
type test

test made on a specimen for the conformity of the design of a given product to the requirements of the relevant document

3.9
alternative corrosion-resistant coating

exterior primary coating(s) other than one consisting solely of zinc

Note 1 to entry: The coating(s) may include zinc. See Annex B.

3.10
organic coating

coating(s) other than one consisting solely of zinc

Note 1 to entry: The coating(s) may include zinc.

3.11
zinc coating

interior or exterior primary coating consisting solely of zinc

4 General requirements

4.1 Tests

Tests according to this document shall be type tests.

Unless otherwise specified, the tests shall be carried out at an ambient temperature of $(20 \pm 5) ^\circ\text{C}$.

Unless otherwise specified, each test shall be carried out on two new samples. If a sample tested in accordance with this document fails, two additional samples shall be tested, both of which shall comply with all the requirements of this document.

4.2 Circular cross-section

An EHDERS conduit shall have a circular cross-section sufficiently accurate to ~~permit~~ allow the cutting of threads in accordance with Figure 1.

4.3 Wall thickness

The wall thickness shall comply with the dimensions given in Table 1.

4.4 Surface condition

4.4.1 General

Surfaces of a conduit shall be free from slivers, burrs, scale and other defects likely to cause damage to conductors or cables.

Compliance shall be checked by visual inspection of the external and internal surfaces.

4.4.2 Localized surface imperfections

Localized surface imperfections shall not exceed a depth of 12,5 % of the nominal wall thickness given in Table 1.

Compliance of localized surface imperfections shall be checked by measurement.

4.5 Welding

The welding of all seams shall be continuous and carried out in a ~~workmanlike~~ professional manner.

Compliance is checked by visual inspection.

4.6 Cleaning

The conduit shall be adequately cleaned before the application of the protective coating. The cleaning process shall leave the exterior and interior surfaces of the conduit in such a condition that the protective coating will be firmly adherent and smooth, as defined in 4.4.

4.7 Protective coating(s)

4.7.1 Primary coating(s)

The exterior surface shall be thoroughly and evenly coated with either a metallic zinc or an alternative corrosion protection coating applied directly to the surface of the steel so that metal-to-metal contact and galvanic protection against corrosion are provided. Zinc coatings

or alternative corrosion protection coatings having a zinc component shall be in metal-to-metal contact with the steel.

The interior surface shall be protected by a zinc or organic or other suitable corrosion-resistant coating.

4.7.2 Secondary coating(s)

When (an) additional coating(s) is(are) applied to enhance the primary coating, the evaluation for ~~its~~ each additional coating's degree of corrosion protection shall be optional.

~~4.7.3 Alternative coating~~

~~When an alternative coating is applied to enhance or replace the primary coating, the evaluation of the amount of corrosion protection provided shall be the subject of a separate standard.~~

5 Dimensions

5.1 Dimensions

The dimensions and mass of the EHDERS conduit shall be in accordance with those given in Table 1.

5.2 Threads

5.2.1 General

The pitch and the length of the threaded portion at each end of each length of conduit, nipple, and elbow shall be as indicated in Figure 1 and shall be compatible with IEC 61950. The complete thread shall be tapered for its entire length, and the taper shall have a ratio of 1 to 16.

5.2.2 Pitch form

The form of the thread profile, the dimensional relationships for the form of the thread and the general notation are shown in Figure 2.

5.2.3 Angle of thread

The angle between the sides of the thread, measured in the axial plane, shall be 60°. The line bisecting this angle is perpendicular to the axis.

6 Protective coatings

6.1 Interior coatings

6.1.1 Zinc

The presence of a zinc coating on the interior surface shall be verified.

Compliance shall be checked by the method described in Annex A for one test cycle only.

6.1.2 Organic coatings

6.1.2.1 Elasticity test

An organic coating used to protect the interior of the conduit shall not crack, flake off or be otherwise damaged.

Compliance shall be checked by the following test:

The coating shall be applied to a sheet-steel test piece and baked in an oven for 5 h, and shall withstand without damage ten successive bends of the test piece back and forth through an angle of 180° against an edge having a radius of 1,6 mm.

The apparatus shall consist of flat test pieces of sheet steel of a width of 75 mm by a length of 125 mm and a thickness of approximately 0,25 mm, an oven for baking the test pieces, and a vice with jaws of a width of at least 75 mm for holding the test pieces during the bending test. The 75-mm edge of each jaw shall be rounded to a radius of 1,6 mm.

Two test pieces shall be cleaned with a suitable organic solvent to remove any grease and foreign material and shall then be dipped in the organic coating. After air drying for 30 min, the test pieces shall be suspended by means of short wires in the oven. Samples shall be baked for 5 h at the normal baking temperature for the organic coating in question but, if the normal baking temperature is lower than 135 °C or the enamel is regularly air dried, the oven temperature shall be maintained between 135 °C and 150 °C.

At the end of 5 h, the test pieces shall be removed from the oven and cooled in still air to room temperature. Each flat test piece shall be secured in the vice, gripped at its free end, and then bent for 90° against one of the 75-mm edges of the vice jaws. Each test piece shall then be bent back past its original position through 180° so that it ends bent 90° against the other 75-mm edge of the vice jaws. It shall then be bent for 90° in the opposite direction, ending with the test piece in its original position. This cycle shall be repeated five times.

6.1.2.2 Warm humid air test

[IEC 60981:2019](https://standards.iteh.ai/catalog/standards/iec/f07cb207-890c-44f8-a980-9714cc57ffa6/iec-60981-2019)

<https://standards.iteh.ai/catalog/standards/iec/f07cb207-890c-44f8-a980-9714cc57ffa6/iec-60981-2019>

No corrosion of the metal shall be present after 1 440 h of exposure to humidity.

Compliance shall be checked by the following test:

The test apparatus shall be an insulated chamber with inside dimensions of approximately 119 cm × 71 cm × 71 cm. It shall contain a temperature-controlled water reservoir, pump, spray chamber for humidifying the air, an air-circulating fan, provisions for heating the air, specimen supports, and the necessary means of control.

The dry bulb temperature of the test chamber shall be maintained at (60 ± 1) °C for 1 440 h and at (98 ± 2) % relative humidity throughout the test. The specimens shall be supported in racks at an angle of 15° from the vertical.

6.2 Exterior coatings

6.2.1 Zinc-coating

A zinc coating on the outside surface shall have a minimum thickness of 0,02 mm.

Compliance shall be checked by measurement. In case of a dispute, the minimum acceptable thickness shall be determined using the method described in Annex A.

6.2.2 Alternative corrosion-resistant coating

6.2.2.1 General

An alternative corrosion-resistant coating on the outside surface shall provide an equal or greater protection from corrosion as a zinc coating.

Compliance shall be checked by the requirements in Clauses B.2 to B.6, 6.2.2.2 to 6.2.2.5 (as applicable) and the electrical continuity and mechanical strength test sequence for fittings for unthreaded EHDERS conduits in accordance with IEC 61950. Separate sets of assembled specimens of the conduit, elbow, or nipple to both set-screw and compression-type couplings shall be subjected to the fault current test, electrical continuity test, a bend test, an electrical continuity test (repeated), and a pull-out test as specified in IEC 61950.

6.2.2.2 Tensile strength

The tensile strength of a polyvinyl chloride (PVC) alternative corrosion-resistant coating for EHDERS conduits shall have a minimum tensile strength of 13,79 MPa (2 000 psi).

Compliance shall be checked by the tests in ISO 527 (all parts). Other materials shall be subject to special investigation.

6.2.2.3 Adhesion

The adhesion of an alternative corrosion-resistant coating shall be greater than the strength of the alternative corrosion-resistant coating itself. The coating may tear rather than separate from the substrate.

Compliance for coatings of a thickness of 0,51 mm to 1,27 mm shall be checked by the following test:

Two parallel circumferential cuts 38 mm long shall be made 13 mm apart through the alternative corrosion-resistant coating to the substrate. A third cut shall be made perpendicular to, and crossing, the circumferential cuts. The edge of the alternative corrosion-resistant coating shall be carefully lifted with a knife to form a tab. To determine compliance, this tab shall be pulled perpendicularly to the conduit with a pair of pliers.

Compliance for coatings with a thickness of 0,127 mm or less shall be checked by the test in ISO 19095-3.

6.2.2.4 Cold impact

The coating shall not separate from the metal nor be damaged to the extent that bare metal is exposed on each individual specimen.

Compliance shall be checked by inspection without magnification after the following test:

Ten 152 mm to 203 mm specimens of finished conduit provided with a non-metallic alternative corrosion-resistant coating shall be conditioned at a temperature of 0 °C for a period of 60 min. Conduits intended for use in temperatures below 0 °C shall be conditioned at the rated temperature, for which the rated temperature shall be any temperature below 0 °C in 5 °C increments. The specimens shall then be subjected to an impact force of 12,2 J. A combination of any height and weight resulting in this impact force shall be considered equivalent if the impact face remains unchanged.

The impact shall be performed according to the apparatus, falling mass and method specified in ISO 13263. The test shall be conducted inside the cold chamber or within 15 s of removal from the cold chamber.

6.2.2.5 Flammability

The finished conduit provided with a non-metallic alternative corrosion-resistant coating shall be flame resistant.

The finished conduit shall not flame for longer than 5 s following any of three 60-s applications of flame, the period between applications being 30 s. A specimen shall not:

- emit flaming or glowing particles or flaming drops at any time that ignite the cotton on the burner, wedge, or floor of the enclosure (flameless charring of the cotton shall be ignored);
- continue to flame longer than 5 s after any application of the gas flame; or
- have the coating completely consumed during or after any application of the gas flame.

NOTE When an alternative corrosion protection system employs a thin exterior organic topcoat measuring less than or equal to 0,125 mm in thickness, over a confirmed three-dips worth of zinc, a specimen can display a total consumption of the top coat at the point of flame contact to the conduit without any measureable flame propagation as long as it meets the requirements of 6.2.2.5, first and second bullet points. Confirmation of the presence of three-dips worth of zinc coating is accomplished using the zinc coating test of Annex A as part of a separate test.

Compliance is checked by the following test:

Materials and reactants shall consist of the following:

- a) *Methane, at 98 % minimum purity, having a heat content of (37 ± 1) MJ/m³ at 25 °C and 101 kPa; or natural gas, with a heat content of (37 ± 1) MJ/m³ at 25 °C and 101 kPa;*

Alternative gases, such as propane, at a 95 % minimum purity, having a heat content of (94 ± 2) MJ/m³ at 25 °C and 101 kPa or butane, at 99 % minimum purity, having a heat content of (120 ± 3) MJ/m³ at 25 °C and 101 kPa, may be used if a stable flame is obtained and the heat evolution profile complies with IEC 60695-11-3.

WARNING Propane and butane gases are denser than air and can settle and become an explosion hazard. Consult the gas supplier for special precautions to be taken.

- b) *Surgical cotton, dry and untreated.*

IEC 60981:2019

The apparatus and a means for supporting the test specimen in a vertical position shall consist of the following:

- 1) *A three-sided metal enclosure in an exhaust hood or cabinet. The metal enclosure shall be 305 mm wide, 355 mm deep, and 610 mm high, and the top and front shall be open. A 457-mm specimen of finished conduit shall be secured with its longitudinal axis vertical in the centre of the enclosure. A flat, horizontal layer of untreated surgical cotton of a thickness between 6 mm and 25 mm shall cover the floor of the enclosure. The upper surface of the cotton shall be between 229 mm and 241 mm below point B, which is the point at which the tip of the blue inner cone of the test flame touches the specimen. See Figure 6.*
- 2) *An angle block, wedge, (see Figure 5) to which the base of the burner can be secured, shall be provided for tilting the barrel 20° from the vertical while the longitudinal axis of the barrel remains in a vertical plane. The burner shall be secured to the wedge and the assembly shall be placed in an adjustable support jig. A layer of untreated surgical cotton of a thickness between 6 mm and 25 mm shall be placed on the wedge and around the base of the burner. The jig shall be adjusted toward one side or the other of the enclosure to place the longitudinal axis of the barrel in the vertical plane that contains the longitudinal axis of the specimen. The plane shall be parallel to the sides of the enclosure. The jig shall also be adjusted toward the rear or front of the enclosure to position the point A, which is the intersection of the longitudinal axis of the barrel with the plane of the tip of the barrel, 38 mm from the point B at which the extended longitudinal axis of the barrel meets the outer surface of the specimen. Point B is the point at which the tip of the blue inner cone touches the centre of the front of the specimen. The specimen shall be adjusted vertically to keep point B from being any closer than 76 mm to the lower clamp or other support for the specimen.*