INTERNATIONAL STANDARD

ISO 19095-3

First edition
2015-08-01

Plastics — Evaluation of the adhesion interface performance in plastic-metal assemblies —

Part 3: Test methods

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Plastiques — Évaluation des performances de l'interface d'adhérence dans les assemblages plastique-métal —
Partie 3: Méthodes d'essai

ISO 19095-3:2015
https://standards.iteh.ai/catalog/standards/sist/ff70edd4-4092-4543-af5a-23a93557d299/iso-19095-3-2015

Reference number
ISO 19095-3:2015(E)

© ISO 2015

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 19095-3:2015
https://standards.iteh.ai/catalog/standards/sist/ff70edd4-4092-4543-af5a-23a93557d299/iso-19095-3-2015



COPYRIGHT PROTECTED DOCUMENT

© ISO 2015, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

© ISO 2015 – All rights reserved

Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Conditioning **1**
4 Conditions of the specimens **1**
5 Test procedure **2**
5.1 Tensile strength 2
5.1.1 Apparatus 2
5.1.2 Specimens 2
5.1.3 Procedures 2
5.2 Tensile lap-shear strength 3
5.2.1 Apparatus 3
5.2.2 Test specimen 4
5.2.3 Procedure 4
5.2.4 Expression of results 4
5.3 Peel strength 4
5.3.1 Apparatus 4
5.3.2 Test specimens 6
5.3.3 Procedure 6
5.3.4 Expression of results 6
5.4 Bending strength 6
5.4.1 Apparatus 6
5.4.2 Test specimens 7
5.4.3 Procedure 7
5.4.4 Expression of results 7
5.5 Impact strength 7
5.5.1 Apparatus 7
5.5.2 Test specimens 7
5.5.3 Procedure 8
5.5.4 Calculation and expression of results 8
5.6 Sealing properties 8
5.6.1 Apparatus 8
5.6.2 Test specimens 8
5.6.3 Procedure 8
5.6.4 Expression of results 8
6 Test report **8**
6.1 Tensile strength 8
6.2 Tensile lap-shear strength 8
6.3 Peel strength 8
6.4 Bending strength 9
6.5 Impact strength 9
6.6 Sealing properties 9
Annex A (normative) **Spray method of sealing properties** **10**
Annex B (normative) **Bell jar method of sealing properties** **12**
Bibliography **15**

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 19095-3:2015
https://standards.iteh.ai/catalog/standards/sist/ff70edd4-4092-4543-af5a-23a93557d299/iso-19095-3-2015

© ISO 2015 – All rights reserved

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

iTeh STANDARD PREVIEW
(standards.iteh.ai)

The committee responsible for this document is ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

ISO 19095 consists of the following parts, under the general title *Plastics — Evaluation of the adhesion interface performance in plastic-metal assemblies*:

ISO 19095-3:2015
https://standards.iteh.ai/catalog/standards/sist/ff70edd4-4092-4543-af5a-23a93557d299/iso-19095-3-2015

— *Part 1: Guidelines for the approach*

— *Part 2: Test specimens*

— *Part 3: Test methods*

— *Part 4: Environmental conditions for durability*

 © ISO 2015 – All rights reserved

Introduction

Structures of heterogeneous materials are being manufactured in the automobiles and aerospace industry sectors where higher safety margins are required.

The existing test methods are not appropriate because the evaluation of the adhesion performance of plastic-metal assemblies is difficult as the polymer material has a relatively low mechanical strength and therefore fractures outside the joints. Therefore, it is necessary to develop a methodology for the evaluation of the plastic-metal interface performance.

A test method to evaluate accurately the adhesion interface performance or standardization of long-term evaluation under harsh environments is also necessary.

The method in ISO 19095 is intended to ensure the integrity of the interface is realized through the interface and that traceability of the value improves the data comparison.

This part of ISO 19095 defines the test conditions, quoting test methods related to mechanical properties that can be evaluated by the existing ISO standards and also adding other test methods that are supposed to be needed.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 19095-3:2015
https://standards.iteh.ai/catalog/standards/sist/ff70edd4-4092-4543-af5a-23a93557d299/iso-19095-3-2015

© ISO 2015 – All rights reserved

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 19095-3:2015
https://standards.iteh.ai/catalog/standards/sist/ff70edd4-4092-4543-af5a-23a93557d299/iso-19095-3-2015

Plastics — Evaluation of the adhesion interface performance in plastic-metal assemblies —

Part 3: Test methods

SAFETY STATEMENT — Persons using this this part of ISO 19095 should be familiar with normal laboratory practice, if applicable. This part of ISO 19095 does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any regulatory conditions. It is recognized that some of the materials permitted in this part of ISO 19095 might have a negative environmental impact. As technological advances lead to more acceptable alternatives for such materials, they will be eliminated to the greatest extent possible. At the end of the test, care should be taken to dispose of all waste in an appropriate manner in accordance with local regulations.

1 Scope

This part of ISO 19095 specifies the test methods for the adhesion interface performance in plastic-metal assemblies.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

2 Normative references

ISO 19095-3:2015
https://standards.iteh.ai/catalog/standards/sist/f70a114a-1992-4542-a5ea-2e9357510904/iso-19095-3-2015

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8256, *Plastics — Determination of tensile-impact strength*

ISO 14125, *Fibre-reinforced plastic composites — Determination of flexural properties*

ISO 19095-1, *Plastics — Evaluation of the adhesion interface performance in plastic-metal assemblies — Part 1: Guidelines for the approach*

ISO 19095-2:2015, *Plastics — Evaluation of the adhesion interface performance in plastic-metal assemblies — Part 2: Test specimens*

IEC 60068-2-17, *Basic environmental testing procedures — Part 2-17: Tests — Test Q: Sealing*

3 Conditioning

See ISO 19095-1.

4 Conditions of the specimens

The specimens shall be free from twist and shall have mutually perpendicular pairs of parallel surfaces. The surfaces and edges shall be free from scratches, pits, sink marks, and flashes. The specimens shall be checked for conformity with these requirements by visual observation against straight-edges, squares, and flat plates and by measuring with micrometre callipers. Specimens showing measurable or observable departure from one or more of these requirements shall be rejected or machined to the required size and shape before testing.

© ISO 2015 – All rights reserved

5 Test procedure

5.1 Tensile strength

5.1.1 Apparatus

Tensile test machine should be selected so that the rupture of the specimen falls between 10 % and 80 % of the full-scale capacity. The response time of the machine shall be short enough so as to enable the force applied at the time of rupture to be measured accurately. The recorded force shall not differ from the true applied force by more than 1 %. The machine shall be capable of maintaining the constant speeds at 10 mm/min (see 5.1.3.2, 5.2.3.2, and 5.3.3). A machine which allows a constant rate of load application may be used. In this case, the machine shall be capable of maintaining a rate of loading of 8,3 MPa/min to 9,7 MPa/min. The machine shall be provided with a suitable pair of self-aligning grips to hold the specimen. The grips and attachments shall be constructed so that they move into alignment with the specimen as soon as the load is applied so that the long axis of the specimen will coincide with the direction of the applied force through the centerline of the grip assembly.

5.1.2 Specimens

See ISO 19095-2:2015, 4.1.

5.1.3 Procedures

5.1.3.1 Test atmosphere

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Conduct the test in the same atmosphere used for conditioning the test specimen, unless otherwise agreed upon by the interested parties, for example, for testing at elevated or low temperatures.

ISO 19095-3:2015
https://standards.iteh.ai/catalog/standards/sist/ff70edd4-4092-4543-af5a-23a93557d299/iso-19095-3-2015

5.1.3.2 Test speed and set up specimens

Crosshead speed is 10 mm/min, unless otherwise noted. Distance between the grips shall be 50 mm and the distance above and below the joint surface shall be 25 mm.

NOTE As a result of tests at several different crosshead speeds from 0,5 mm/min to 50 mm/min, tensile strength does not depend on the crosshead speed, however, 10 mm/min is the most suitable in order to inhibit the variability of data.

5.1.3.3 Expression of results

In test report, breaking stress is expressed as the average value in MPa about valid specimens. Tensile strength (MPa) is calculated by dividing breaking load (N) by joint area (mm^2). Breaking stress is calculated using Formula (1).

$$\sigma_B = \frac{F_B}{A_j} \tag{1}$$

where

σ_B is breaking stress (MPa);

F_B is breaking load (N);

A_j is joint area (mm^2).

© ISO 2015 – All rights reserved

5.2 Tensile lap-shear strength

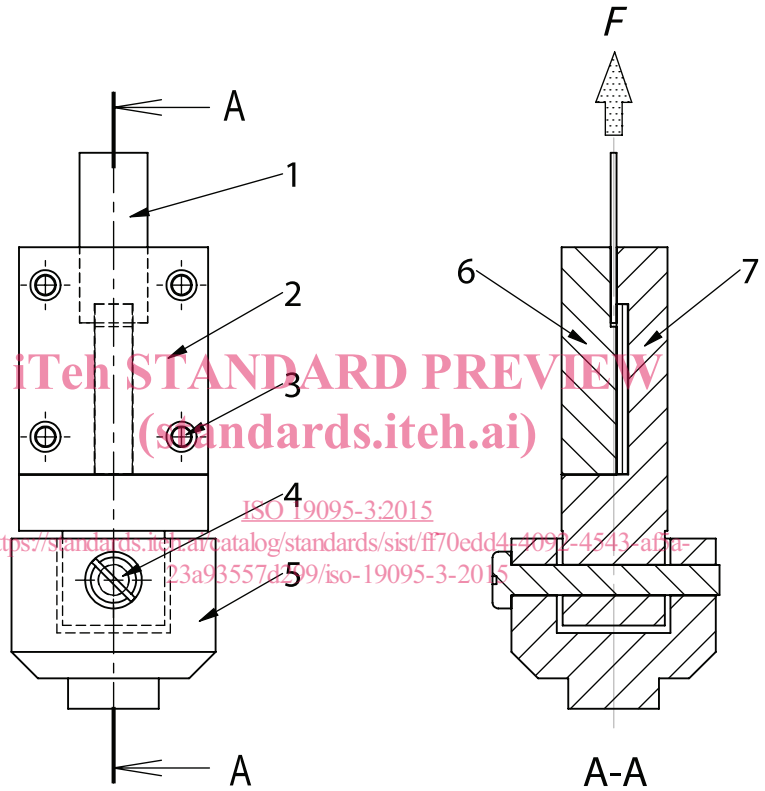
5.2.1 Apparatus

5.2.1.1 Tensile testing machine

See 5.1.1.

5.2.1.2 Specimen retainer

One example of specimen retainer is shown in Figure 1. This retainer shall be fixed in such a way that the fixture attached to the test apparatus and the load line at grips on the specimen lie on a straight.



iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 19095-3:2015
https://standards.iteh.ai/catalog/standards/sist/ff70edd4-4091-4543-affe-23a93557d299/iso-19095-3-2015

Key

1 specimen
2 retainer
3 bolt for fixation
4 connecting pin
5 the fixture attached to the test apparatus
6 cover of retainer
7 base of retainer

Figure 1 — One example of specimen retainer

The cover (key 6) and the base (key 7) of the specimen retainer which are bolted together to grip the metal portion of the specimen to be tested shall have a gap within 0,1 mm larger than the specimen along both the width and length of the metal portion of the specimen to keep any friction from tainting the test results.

© ISO 2015 – All rights reserved

However, the part of the specimen retainer which grips the plastic part of the specimen to be tested shall have a gap less than 0,1 mm along both the width and length of the plastic.

NOTE When carrying out a tensile test holding both edge of the specimen, lap-shear strength could not be measured precisely because the resin part breaks first if the joint strength is too great. If using the retainer, it is possible to put shear stress around the joint interface directly.

5.2.2 Test specimen

See ISO 19095-2:2015, 4.2.

5.2.3 Procedure

5.2.3.1 General

As shown, place the test specimen in the test retainer, taking care to align the planes of loading in Figure 1, and record the maximum load before breaking by the test machine.

5.2.3.2 Test speed and width of grips of metal part

Crosshead speed is 10 mm/min unless otherwise noted. Width of gripping of metal part shall be less than 15 mm from the top of the metal specimen.

NOTE As a result of tests at several different crosshead speeds from 1 mm/min to 50 mm/min, tensile strength does not depend on the crosshead speed, however, 10 mm/min is the most suitable in order to make test time shorter and inhibit the variability of data.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

5.2.4 Expression of results

ISO 19095-3:2015
https://standards.iteh.ai/catalog/standards/sist/ff70edd4-4092-4543-af5a-23a93557d299/iso-19095-3-2015

In test report, breaking load is expressed as N or breaking stress is expressed as the average value in MPa about valid specimens. Shear stress (MPa) is calculated by dividing breaking load (N) by joint area [mm^2]. Breaking stress is calculated using Formula (2).

$$\sigma_B = \frac{F_B}{A_j} \tag{2}$$

where

σ_B is breaking stress (MPa);

F_B is breaking load (N);

A_j is joint area (mm^2).

5.3 Peel strength

5.3.1 Apparatus

5.3.1.1 Tensile test machine

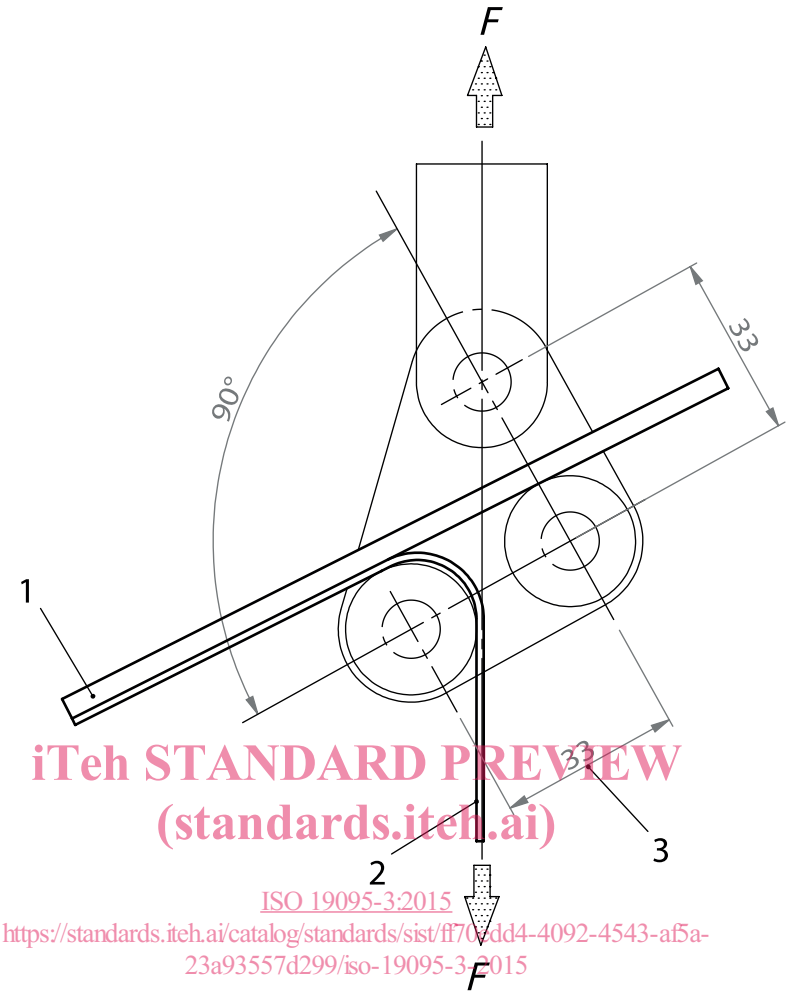
See 5.1.1.

5.3.1.2 Test fixture

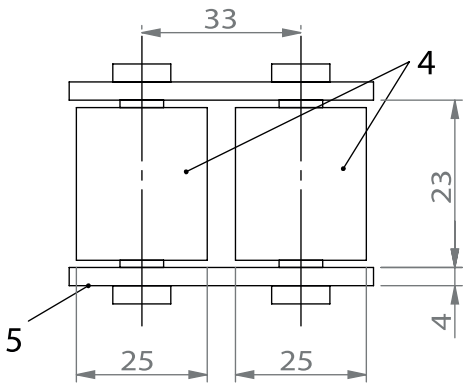
Peel test fixture is shown in Figure 2. The fixture shall be attached to one of the cross-arms of the testing machine (5.1). The 25 mm rollers on the test fixture shall roll freely. The angle determined by the rollers and the use of dual bearings are critical and the rollers shall therefore be carefully maintained.

 © ISO 2015 – All rights reserved

Dimensions in millimetres



iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 19095-3:2015
https://standards.iteh.ai/catalog/standards/sist/ff70edd4-4092-4543-af5a-23a93557d299/iso-19095-3-2015



Key

1 plastic specimen
2 flexible metal specimen
3 peeling zone
4 dual roller bearing type
5 mild steel

Figure 2 — Peel test fixture

NOTE See the same fixtures for ISO 4578.

© ISO 2015 – All rights reserved