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

Part 1: Guidelines for the approach

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Plastiques — Évaluation des performances de l'interface d'adhérence dans les assemblages plastique-métal —
Partie 1: Lignes directrices pour l'approche

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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).

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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

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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*:

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— *Part 1: Guidelines for the approach*

— *Part 2: Test specimens*

— *Part 3: Test methods*

— *Part 4: Environmental conditions for durability*

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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 plastic-metal interface performance 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 provides guidelines for the evaluation methods of the adhesion interface performance in plastic-metal structures.

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

Part 1: Guidelines for the approach

SAFETY STATEMENT — Persons using 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 evaluation methods for the adhesion interface performance in plastic-metal assemblies.

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2 Normative references

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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 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 472, *Plastics — Vocabulary*

ISO 3530, *Vacuum technology — Mass-spectrometer-type leak-detector calibration*

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

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

ISO 19095-4, *Plastics — Evaluation of the adhesion interface performance in plastic-metal assemblies — Part 4: Environmental condition for durability*

IEC 60068-2-11, *Basic environmental testing procedures — Part 2-11: Tests — Test Ka: Salt mist*

IEC 60068-2-67, *Environmental testing — Part 2-67: Tests — Test Cy: Damp heat, steady state, accelerated test primarily intended for components*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and the following apply.

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3.1
adhesion interface performance
overall performance of the joint between two different materials

EXAMPLE The mechanical strength, air tightness, and sealing properties of the bond.

4 Conditioning

The test specimen shall be conditioned as specified in the appropriate standard for the material concerned. In the absence of this information, the most appropriate set of conditions from ISO 291 shall be selected and the conditioning time is at least 16 h, unless otherwise agreed upon by the interested parties, for example, for testing at elevated or low temperatures.

5 Apparatus

5.1 Sealing testing machine

5.1.1 Helium leak detector

This is the mass spectrometer-type leak detector using the helium gas as a tracer, in which the vacuum exhaust system for keeping the mass spectrometer in operational vacuum condition (<5,0 × 10^{-4} MPa) is built-in and is calibrated in accordance with ISO 3530.

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5.1.2 Exhaust system

This system consists of a vacuum pump for evacuating the test specimen, vacuum gauge, etc.

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5.1.3 Others

The following are used as the accessory for helium leak testing:

a) helium gas cylinder for supplying the tracer gas;

b) compressor and pressure reducing valve;

c) various kinds of joint and piping for assembling of vacuum system and pressurizing system;

d) pressure gauge for measurement of the pressure of test specimen;

e) vacuum gauge for measurement of the pressure of test specimen.

5.2 Thermal shock testing machine

Two separate chambers or one chamber with rapid change of temperature may be used. If two chambers are used, one for the low temperature and the other for the high temperature, the location shall be such as to allow transfer of the specimen from one chamber to the other within the prescribed time. Either manual or automatic transfer methods may be used.

The chambers shall be capable of maintaining the atmosphere at the appropriate temperature for the test in any region where the specimen is placed.

After insertion of the test specimens, the air temperature shall be within the specified tolerance after a time of not more than 10 % of the exposure time.

5.3 High temperature high humidity test chamber

A test chamber made of materials that are not corrosive. The detailed structure in the test chamber shall be governed by IEC 60068-2-67, Clause 3.

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5.4 Salt spray test chamber

A test chamber made of materials that do not affect corrosion strength of the salt mist may be used. The detailed structure in the test chamber and method of generating the salt mist shall be governed by IEC 60068-2-11, Clause 3.

5.5 Fatigue test machine

Fatigue test machine which enables sinusoidal fatigue stress cycles to be obtained with the maximum stress in between 10 % and 80 % of the scale range may be used. The machine has a self centering device for attachment of the specimen. The device shall be designed in such a way that its various components move in perfect alignment with the specimen as soon as the specimen is subjected to stress.

6 Test procedures

6.1 Test specimens for the evaluation

Specimens for tests are in accordance with ISO 19095-2.

6.2 Adhesion interface performance

Specimens for tests are in accordance with ISO 19095-2. Test conditions are in accordance with ISO 19095-3. Adhesion interface properties are listed as follows:

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a) tensile strength;

b) tensile shear strength;

c) peel strength;

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d) bending strength;

e) impact strength;

f) sealing properties.

6.3 Environmental tests

Test conditions are in accordance with ISO 19095-4. Environmental test methods are listed as follows:

a) temperature dependence test;

b) thermal shock test;

c) temperature/humidity cyclic test;

d) high temperature and high humidity test;

e) salt mist test;

f) fatigue test.

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