
**Thermal spraying — Classification
method of adhesive strength by
indentation**

*Projection thermique — Méthode de classification de la résistance
adhésive par indentation*

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Reference number
ISO 19207:2016(E)

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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).

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).

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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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 107, *Metallic and other inorganic coatings*.

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Introduction

Adhesion of coatings specified here is required for three reasons:

- for selection of coating material and spray method;
- for quality assurance of thermal spraying;
- for product design and performance assessment of coatings.

This International Standard provides the classification method of adhesive strength for thermal spray coatings by using Vickers hardness testing machine generally and widely used. In the present test method, a pyramidal Vickers diamond indenter is indented with test force at the interface of coatings. When the test force exceeds the threshold value corresponding to the adhesive strength, an interfacial crack is generated. Accordingly, it is possible to evaluate the adhesive strength of coatings by the test force applied as discrete values when using conventional Vickers testing machine. This International Standard classifies the adhesive strength, called adhesion index, evaluated from the maximum indentation force without visible cracking and can be also applied to evaluate coatings with a high adhesive, such as cermet coatings. The present test method can be applied to sprayed coatings if the crack initiated by the indentation can be observed by using optical microscope.

The maximum indentation force does not therefore require much more effort in the experimental procedure and can describe the property of system combination (substrate chemistry, pre-preparation/roughness of substrate surface, coating chemistry and spraying related coating properties), provided the measurements are obtained carefully in line with the methods proposed in this International Standard. This International Standard recommends good practice to minimize levels of uncertainty in the measurement process. The procedure has been validated through underpinning technical work within the round robin test programme conducted by the Subcommittee on Standard Development, Japan Thermal Spray Society.

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Thermal spraying — Classification method of adhesive strength by indentation

1 Scope

This International Standard specifies the classification method of adhesive strength for thermal spray coatings at room temperature by using Vickers hardness testing machine. This International Standard classifies the adhesive strength, called adhesion index, evaluated from the maximum indentation force without visible cracking, and it is applicable for relative dense metal coatings, ceramic coatings and cermet coatings. This International Standard can be used within comparison within each coating system.

The indentation method is not recommended for very thin and very porous coatings and also for the coating system with lower cohesion strength than adhesion strength. It is recommended that this test method can be applied for a coating of which porosity is less than approximately 15 %.

2 Normative references

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 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method*

ISO 6507-2, *Metallic materials — Vickers hardness test — Part 2: Verification and calibration of testing machines*

ISO 14917, *Thermal spraying — Terminology, classification*

ISO 14923, *Thermal spraying — Characterization and testing of thermally sprayed coatings*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14917, ISO 14923 and the following apply.

3.1

critical indentation force

maximum indentation force without visible cracking between substrate and coating

3.2

adhesion index

AI

index of adhesive strength of coatings defined by the critical indentation force

4 Symbols and units

For the purposes of this document, the following symbols and units apply (see [Figures 1](#) and [2](#)).