BS ISO 27667:2011

BSI Standards Publication

Road vehicles — Brake lining friction materials — Evaluation of corrosion effects on painted backing plates and brake shoes

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National foreword

This British Standard is the UK implementation of ISO 27667:2011.

The UK participation in its preparation was entrusted to Technical Committee AUE/11, Braking systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Road vehicles — Brake lining friction materials — Evaluation of corrosion effects on painted backing plates and brake shoes

Véhicules routiers — Matériaux de friction pour garnitures de freins — Évaluation des effets de la corrosion sur plateaux de freins peints et segments de freins peints

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 27667 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 2, *Braking systems and equipment*.

Introduction

Corrosion issues and testing are varied and costly to assess, diagnose, and correct. This International Standard is used in conjunction with other standards which provide specific test methods, description of sample preparation and testing apparatus, evaluation criteria, and test reports. Emphasis is placed on the evaluation methods to ensure a definite set of international standards for reporting the different phenomena observed during and at the completion of testing.

This International Standard is intended for use in conjunction with other applicable standards or test procedures (ASTM, ISO, SAE, JASO, and other project or company-specific testing programs) to fully assess a friction material's adequacy for use in a certain application, market or vehicle platform. This International Standard does not include performance requirements related to durability, cosmetic appearance, or function under different vehicle conditions of temperature, mechanical stresses, environments, contamination, and operating conditions of the braking system as observed during actual vehicle operation.

Brake pads and brake shoes are key components in the vehicle braking system. Corrosion and its effects can generate warranty issues or costly repairs during the life-cycle of the vehicle. Since brakes are part of the under-body components, a detailed evaluation related to corrosion requires a comprehensive approach that provides a uniform set of laboratory test procedures and assessment criteria. Since corrosion-related phenomena are complex, this International Standard provides harmonization with other available international standards.

Previous experience in similar cases is a useful way to support the selection of a paint system for a specific application. The brake pad or shoe lining durability under corrosive environments depends heavily on factors such as working environment, system design, paint thickness and composition, surface preparation, application, drying and handling. Of primary interest are the chemical and physical characteristics of the binder and the dry-film thickness. Artificial-aging tests are useful to evaluate these characteristics. These tests include:

— resistance to moisture;

— resistance to fog;

— resistance to chemicals.

Exercise caution when analysing artificial-aging test results. Artificial exposure will not necessarily have the same effect as natural exposure. Not all factors occurring on the vehicle application are able to accelerate or replicate in the proper way. When feasible, plan and conduct natural-exposure or field-testing so that, in the long term, such abnormalities are resolved.

Since there are no models widely accepted by the industry to predict in-service life based on laboratory corrosion testing, estimation of actual durability for a given application or environment is beyond the scope of this International Standard.

INTERNATIONAL STANDARD ISO 27667:2011(E)

Road vehicles — Brake lining friction materials — Evaluation of corrosion effects on painted backing plates and brake shoes

1 Scope

This International Standard defines the methods for testing and assessing the corrosion effects on painted backing plates used on disc brakes and painted brake shoes used on drum brakes.

The methods and assessment criteria indicated in this International Standard are part of the specification/validation phases of the product and the series production monitoring from ISO 15484.

The test procedures indicated include only laboratory performance testing, whether static or cyclic. Field surveys or proving grounds test protocols are beyond the scope of this International Standard.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 2409, *Paints and varnishes — Cross-cut test*

ISO 2812-1, *Paint and varnishes — Determination of resistance to liquids — Part 1: Immersion in liquids other than water*

ISO 4628-1, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 1: General introduction and designation system*

ISO 4628-2, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering*

ISO 4628-3, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 3: Assessment of degree of rusting*

ISO 4628-4, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking*

ISO 8044, *Corrosion of metals and alloys — Basic terms and definitions*

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

ISO 15484:2008, *Road vehicles — Brake lining friction materials — Product definition and quality assurance*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8044, ISO 15484 and the following apply.

3.1
atmospheric corrosion
corrosion process that takes place in a film of moisture on the metal surface

NOTE The moisture film may be invisible to the naked eye.

3.2
artificial aging
aging above room temperature to accelerate or change a certain condition on a component

3.3
chalking
development of loose removable powder at the surface of an organic coating, usually caused by weathering

3.4
corrosion
physicochemical interaction between a metal and its environment which results in changes in its properties and which may lead to impairment or deterioration of the function or the system of which these form a part

3.5
corrosion acceleration factor
ratio of the corrosion rate during a given test to the corrosion rate in the actual field application or use

NOTE The accurate calculation of this factor requires detailed and extensive testing and field surveys.

3.6
corrosion rate
corrosion effect measured on a metal per unit of time

NOTE The type of corrosion rate used depends on the technical system and on the type of corrosion effect.

3.7
corrosion stresses
environmental factors which promote corrosion

3.8
corrosivity
visible or measurable ability of an environment to cause corrosion effects on a given corrosion system

3.9
cracking
breaks in a coating that extends through to the underlying surface

3.10
lot-rot
corrosion generated when a component is exposed to long periods of atmospheric corrosion

3.11
macro-environment
weather conditions prevailing at a given location or area where the vehicle normally operates

NOTE The macro-environment is the combination of the climate and the corrosion stresses or atmosphere in the vehicle surrounding area, as established statistically by meteorological parameters recorded over a prolonged period of time.

3.12
micro-environment
environment at the interface between the component and its surroundings

NOTE For this International Standard, the micro-environment is part of the vehicle underbody area near the brake corner.

3.13
control sample
sample used to evaluate the actual performance of the test equipment and to validate the test technique

NOTE Unless otherwise specified, two control samples of steel complying with ISO 1514 or ANSI-SAE equivalent of 150 mm × 100 mm × 0,7 – 1,25 mm in size.

3.14
reference sample
painted part, of known corrosion resistance performance on the actual or similar application

NOTE Other brands or internal brake pads or brake shoes using other coating systems are suitable as reference samples. The reference sample should be as similar as possible in size and condition to the test sample.

3.15
time of wetness
period during which a film of electrolyte covers a metal surface and is capable of causing atmospheric corrosion

NOTE Guidance values can be calculated from temperature and relative humidity by adding up the hours during which the relative humidity is above 80 % and, at the same time, the temperature is above 0 °C. In brake systems application, the heat coming from the brake can bring the micro-environment temperature at the backing plate or brake shoe well above this temperature even during cold weather.

4 Sampling

4.1 Test samples, unless otherwise specified by the requestor, shall have been tested in accordance with ISO 15484:2008, 5.3.

4.2 Control and reference samples, unless otherwise specified by the requestor, shall have been conducted in accordance with the applicable international standard used for the test.

5 Test methods

5.1 General

The actual tests that shall be performed will depend upon the phase during the product life-cycle. This International Standard focuses on phases 5 and 6 (product specification/validation) of ISO 15484:2008. Product specification/validation requires a more thorough analysis of the different corrosion effects. Regular series monitoring requires a simple yet reliable test procedure to ensure the process conditions and the protective paint coating are both within the limits agreed upon during the previous phases. Table 1 defines the scope and applicability of the two test methods specified in 5.2 that are used to determine the resistance of paints to corrosion, the results of which are evaluated and reported in accordance with the methods specified in 5.3.

The test method shall be chosen in accordance with the working environment to which the material will be subjected.

Prior to the start of testing, the following shall be defined, as agreed with the customer:

a) test procedures to be conducted;

b) sampling plan;

c) duration for each test or number of cycles;

d) expected failure modes; and

e) assessment criteria.

5.2 Corrosion test methods

For the purposes of this International Standard, the test methods specified in the following two international standards shall apply:

a) the test methods specified in ISO 9227 shall be used to characterize the effectiveness of corrosion protection systems and to detect defects quickly when material is exposed to moisture or fog ambient;

b) the test methods specified in ISO 2812-1 shall be used to determine the resistance of paint when it is submitted to the action of chemical liquids, e.g. lubricating oil or brake fluid.

Table 1 provides a simplified description of both test methods specified in this subclause.

Table 1 — Test methods for laboratory corrosion evaluation

International Standard	Scope and application	Test cycle	Typical duration
ISO 9227	Specifies apparatus, reagent and procedure for neutral salt spray-NSS-test and others. Assessment of corrosion resistance of metallic materials with and without coating. Test results should not be regarded as a direct guide to the corrosion resistance in service. Gives means of checking comparative quality of a metallic material with or without coating.	Cabinet temperature 35 °C ± 2 °C. Sodium chloride concentration 50 g/l ± 5 g/l and pH 6,5 to 7,2. Average rate of fog collection over >24 h of 1 ml/h to 2 ml/h over 80 cm^2.	2 h; 6 h; 24 h; 48 h; 96 h recommended for disc brake pads and drum brake shoes.
ISO 2812-1	Determination of paint and varnish resistance to liquids.	General methods for determining the resistance of paints to the action of liquids. The methods enable the effect of the test liquid on the coating and, where necessary, deterioration of the substrate, to be assessed. **Method 1 immersion**: Immerse the samples in vertical position at least 30 mm apart from each other and from the sides of the tank. Test conducted at ambient temperature. If needed, aerate or agitate with stream of oil-free air. Candidate liquids as per ISO 6314: 48 hours in lubricating oil; 48 hours in brake fluid. **Method 2**: <7 days with 25 mm absorbent discs. **Method 3**: Spotting method with 0,1 ml drops. After immersion time is complete, remove, clean and evaluate.	

5.3 Evaluation methods

For the purposes of this International Standard, the evaluation methods specified in the following international standards shall apply:

a) the test method specified in ISO 2409 shall be used to measure the adhesion of the coating to the substrate;

b) the rating methods specified in ISO 4628-1 shall be used to designate the quantity and size of defects;

c) the test method specified in ISO 4628-2 shall be used when the failure mode presented is blistering;

d) the test methods specified in ISO 4628-3 shall be used when the failure mode presented is rusting;

e) the test methods specified in ISO 4628-4 shall be used when the failure mode presented is cracking.

6 Test report

The test report shall contain at least the following information:

a) all details necessary to identify the product tested;

b) reference to this International Standard, i.e. ISO 27667;

c) reference to the international standard, product specification or other document supplying the information referenced in the test;

d) the result of the test as per the applicable method;

e) any deviation from the test method specified;

f) test start and completion dates;

g) digital pictures;

h) detailed reports for reference or control samples.

Bibliography

ISO 1514, *Paints and varnishes — Standard panels for testing*

ISO 2808, *Paints and varnishes — Determination of film thickness*

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