TECHNICAL REPORT

ISO/TR 22770

First edition
2019-07

Preparation of steel substrates before application of paints and related products — Analytical colorimetry method to support visual assessment of surface preparation grades

Reference number
ISO/TR 22770:2019(E)

© ISO 2019



COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, 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
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

 © ISO 2019 – All rights reserved

Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Symbols ... **2**
5 Principle ... **2**
6 Recommendations for instruments ... **3**
6.1 Instrument handling ... 3
6.2 Instrument specifications ... 3
6.2.1 Illuminant and observer ... 3
6.2.2 Illuminating and viewing conditions ... 3
6.2.3 Tolerance of the instrument ... 4
7 Supporting data ... **4**
7.1 General ... 4
7.2 Sample preparation ... 4
7.3 Results ... 4
8 Examples of application ... **5**
8.1 General ... 5
8.2 Steel pipes producer for oil and gas industry ... 5
8.2.1 Application: control quality of blasting operation prior to anticorrosion coating ... 5
8.2.2 Reference substrate ... 6
8.2.3 Quality control ... 6
8.3 Cast iron foundry ... 6
8.3.1 Application: control quality of desanding operation of cast iron automotive parts ... 6
8.3.2 Reference substrate ... 6
8.3.3 Quality control ... 6
8.4 Trailers manufacturer ... 6
8.4.1 Application: control quality of blasting operation prior to painting ... 6
8.4.2 Reference substrate ... 6
8.4.3 Quality control ... 7
8.5 Production of freight wagons ... 7
8.5.1 Application: control quality of blasting operation prior to anticorrosion coating ... 7
8.5.2 Reference substrate ... 7
8.5.3 Quality control ... 7
8.6 Cold drawn bars producer ... 7
8.6.1 Application: optimisation of descaling operation ... 7
8.6.2 Reference substrate ... 7
8.6.3 Quality control ... 7
Annex A (informative) **Methodology** ... **8**
Bibliography ... **11**

© ISO 2019 – 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 of the voluntary nature of standards, 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 12, *Preparation of steel substrates before application of paints and related products*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

© ISO 2019 – All rights reserved

Introduction

The performance of protective coatings of paint and related products applied to steel is significantly affected by the state of the steel surface immediately prior to painting. The principal factors that are known to influence this performance are

a) the presence of rust and mill scale,

b) the presence of surface contaminants, including salts, dust, oils and greases, and

c) the surface profile.

The ISO 8501 series, the ISO 8502 series and the ISO 8503 series provide methods for assessing these factors, while the ISO 8504 series provides guidance on the preparation methods that are available for cleaning steel substrates, indicating the capabilities of each in attaining specified levels of cleanliness.

These International Standards do not contain provisions on the protective coating systems applied to the steel surface. They do not contain provisions related to the surface quality requirements for specific situations even though surface quality can have a direct influence on the choice of protective coating applied and on its performance. Such provisions are given in other documents such as national standards and codes of practice. It would be useful for users of these International Standards to ensure that the qualities specified are

— compatible and appropriate both for the environmental conditions to which the steel will be exposed and for the protective coating system used, and

— within the capability of the cleaning procedure specified.

While these four series of International Standards deal with specific aspects of the preparation of steel substrates, the ISO 8501 series covers the visual assessment of surface cleanliness.

ISO 8501-1 is intended to be a tool for visual assessment of rust grades and of preparation grades. It identifies four levels (designated as “rust grades”) of mill scale and rust that are commonly found on surfaces of uncoated erected steel and steel held in stock. It also identifies certain degrees of visual cleanliness (designated as “preparation grades”) after surface preparation of uncoated steel surfaces and of steel surfaces after overall removal of any previous coating. These levels of visual cleanliness are related to the common methods of surface cleaning that are used prior to painting.

© ISO 2019 – All rights reserved

Preparation of steel substrates before application of paints and related products — Analytical colorimetry method to support visual assessment of surface preparation grades

1 Scope

This document provides guidance on the usage of analytical colorimetry to support visual assessment of surface preparation grades described in ISO 8501-1:2007, Clause 4.

This document provides examples of applications where the use of a colorimeter or spectrophotometer can enable a quick and objective assessment of the preparation grade of the substrate.

NOTE The data given in this document was obtained using the methodology described in Annex A.

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.

ISO 8501-1, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in in ISO 8501-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
CIELAB colour space
CIE 1976 $L^* a^* b^*$ colour space
three-dimensional L^*, a^*, b^* colour space

3.2
colour difference
difference between two colour stimuli defined as the Euclidean distance between the points representing them in the $L^* a^* b^*$ space and calculated as follows

$$\Delta E^* = [(\Delta L^*)^2 + (\Delta a^*)^2 + (\Delta b^*)^2]^{1/2}$$

3.3
illuminant
radiation with a relative spectral power distribution defined over the wavelength range that influences object colour perception

© ISO 2019 – All rights reserved

3.4
standard illuminant
illuminants (3.3) by the CIE defined in terms of relative spectral power distributions

Note 1 to entry: These illuminants are intended to represent the following:

a) Planckian radiation at a temperature of about 2 856 K;

b) direct solar radiation (obsolete);

c) average daylight;

d) daylight.

The 2-digit number associated to D illuminant denotes the correlated colour temperature.

3.5
observer
CIE 1931 standard colorimetric observer
ideal observer whose colour-matching properties correspond to the CIE colour-matching functions adopted by the CIE in 1931

Note 1 to entry: This standard colorimetric system is applicable to centrally-viewed fields of angular subtending between about 1° and about 4°.

3.6
supplementary standardized observer
CIE 1964 supplementary standard colorimetric observer
ideal observer whose colour-matching properties correspond to the CIE colour-matching functions adopted by the CIE in 1964

Note 1 to entry: This standard colorimetric system is applicable to centrally-viewed fields of angular subtense greater than about 4°.

Note 2 to entry: When this system is used, all symbols that represent colorimetric measures are distinguished by use of the subscript 10.

4 Symbols

L^*	CIELAB lightness
a^*, b^*	CIELAB a^*, b^* coordinates
ΔL^*	CIELAB lightness difference
Δa^*, Δb^*	CIELAB a^*, b^* difference
ΔE^*	CIELAB colour difference
ΔC^*	CIELAB chroma difference
ΔH^*	CIELAB hue difference

5 Principle

The assessment of preparation grade of the surface is done by calculation of the colour difference components, taking as reference the colour components values of a substrate with the targeted surface preparation grade.

© ISO 2019 – All rights reserved