International Standard

ISO 11347

Second edition
2024-10

Ships and marine technology — Large yachts — Measurement and assessment of the visual appearance of coatings

Navires et technologie maritime — Grands yachts — Mesurage et évaluation de l'apparence visuelle des revêtements

Reference number
ISO 11347:2024(en)

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Published in Switzerland

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Foreword

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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 document 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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This document was prepared by Technical Committee ISO/TC 8 *Ships and marine technology,* Subcommittee SC 12, *Large yachts.*

This second edition cancels and replaces the first edition (ISO 11347:2012) which has been technically revised.

The main changes are as follows:

— updated normative references and bibliography;

— updated the terms and definitions in Clause 3;

— updated the test and recording methods.

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.

Introduction

This document defines the measurement and assessment processes used for above waterline exterior surface appearance and quality requirements for large yachts. The purpose of this document is to provide practical measurement processes for the assessment of agreed acceptance criteria for the visual appearance of yacht coatings.

Measurement processes are based on known generic inspection equipment that is available at the time of producing this document. It is not the purpose of this document to provide an exhaustive list of inspection equipment which is available at the time of publication.

Ships and marine technology — Large yachts — Measurement and assessment of the visual appearance of coatings

1 Scope

This document specifies technical requirements for the measurement and assessment of the visual appearance of the superficial coating of large yachts. It is valid for coatings above the waterline.

For the purpose of this document, large yachts are of length of hull (L_H) higher or equal to 24 m (as defined according to ISO 8666), in use for sport or leisure and commercial operations.

This document describes how the final finish can be evaluated before its acceptance.

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 2813, *Paints and varnishes — Determination of gloss value at 20°, 60° and 85°*

ISO 4618, *Paints and varnishes — Vocabulary*

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 4628-4, *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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4618 and the following apply.

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

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

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

3.1
clouding
appearance of lighter and darker patches in a *top coat* (3.12) film, most commonly observed in special effect (metallic flake) coatings

3.2
curing
term in polymer chemistry that refers to the toughening or hardening of a polymer material by cross linking of polymer chains

3.3
cut line
visible, raised, hard edge of a coating created when the applied coating borders masking/fine line tape

3.4
fairness
particular range of wavelengths of defects from 300 mm to 1 000 mm

3.5
fingerprint
damage of wet film due to accidental contact by either operators or objects, or both

3.6
hull
main body of a yacht which provides flotation

3.7
polishing mark
mark from *top coat* (3.12) polishing, resulting in low gloss areas

3.8
print through
visual effect of inconsistencies or faults in the underlying coating/substrate structure

3.9
sanding mark
raised or indented lines (curved or straight) visible in the *top coat* (3.12) as a result of the sanding process under the top coat

3.10
striping
appearance of lighter and darker repetitive shades in a *top coat* (3.12) film, most commonly observed in special effect (metallic flake) coatings

3.11
surface texture
local deviation of a surface from a perfectly flat plane, generally measured in terms of its roughness, waviness and form

3.12
top coat
final coat of a coating system

3.13
visual observation
process conducted by an observer with normal or corrected-to-normal vision without magnification under a uniform artificial illuminance between 500 lx and 1 000 lx, or normal daylight

Note 1 to entry: Visual observations should be conducted at a distance of >75 cm (or approximate arm's length) and at an incident angle of ≥30°.

3.14
wipe mark
surface disturbance in the *top coat* (3.12) paint film as a result of a substrate contamination

4 Evaluations

4.1 General

This document specifies methods for evaluating the appearance of the external coating of large yachts. This evaluation can be carried out by using a combination of measurements using either equipment or visual observations, or both.

Even if measured separately, measurements and visual observations should converge to determine the overall assessment of visual appearance.

4.2 Measurable effects

The following effects should be measured when evaluating fairness:

— distinction of image (DOI)

— orange peel

— microstructure

— colour

— gloss (see ISO 2813)

— particulate contamination

For the above parameters provide descriptions, measurement and test methods.

4.3 Visually assessed effects

4.3.1 Group 1: point defects

— Cratering

— Fisheyes

— Dimples

— Pinholes

4.3.2 Group 2: localized defects

— Sags/runs

— Brush marks

— Sanding marks

— Wipe marks

— Polishing marks

— Water marks

— Cut lines

— Tape marks

— Blistering, which shall be measured in accordance with ISO 4628-2

— Cracking/crazing, which shall be measured in accordance with ISO 4628-4

4.3.3 Group 3: generalized defects

— Blushing

— Blooming

— Print through

— Over spray

— Cissing

— Striping/Clouding

Other visual effects including wrinkling, flaking, peeling, cracking, fish eyes, fingerprints, and lack of opacity should not be present in the coated surfaces of large yachts.

5 Measurable effects and visually assessed effects (including test and recording methods)

5.1 Measurable effects

5.1.1 Fairness

5.1.1.1 Description

Fairness relates to the large-scale smoothness and smooth distribution of reflection lines on both a flat and a curved surface.

Fairness may be measured at any point during the fairing and coating processes.

5.1.1.2 Test method

For the purposes of this document, a measurement by linear bar and feeler gauge shall be performed.

Fairness measurement shall be in accordance with the test method outlined in Annex A.

5.1.2 Distinction of image

5.1.2.1 Description

Distinction of image (DOI) is a measure of how clearly a reflected image appears in a reflective surface.

5.1.2.2 Test method

For the purposes of this document, an optoelectronic measurement device (such as wave-scan technology, goniophotometer, or equivalent) shall be used.

DOI measurement shall be in accordance with the test method outlined in Annex B.

5.1.3 Orange peel

5.1.3.1 Description

Orange peel is a coating property resulting in a surface appearance characteristic of the skin of an orange. The coarseness of the resulting texture can vary and has a significant influence on the image-forming qualities of the finish. Surface profiles of gloss and high gloss coatings are measured in wavelengths in the range of 0,1 mm to 30 mm.

5.1.3.2 Test method

For the purposes of this document, an optoelectronic measurement device shall be used.

Orange peel measurement shall be in accordance with the test method outlined in Annex C.

5.1.4 Microstructure

5.1.4.1 Description

Microstructure refers to structures smaller than 0,1 mm within the paint film that influence the visual perception.

5.1.4.2 Test method

For the purposes of this document, an optoelectronic measurement device (such as wave-scan technology, goniophotometer, or equivalent) shall be used. A wave-scan device measures dullness, while a goniophotometer measures haze value.

Microstructure measurement shall be in accordance with the test method outlined in Annex D.

5.1.5 Colour

5.1.5.1 Description

Visual colour perception is influenced by varying colour sensitivity in each person and by varying environmental conditions such as lightness and colour. Colour perception mainly depends on three factors: light source, observer and surface condition.

The light source and observer are defined by the International Commission on Illumination (CIE) and their spectral functions are stored in the spectrophotometers for colour measurement. Optical properties of a surface are then the only variables that are required to be measured.

To monitor colour consistency in a project, a standard reference shall be established and evaluated in terms of deviation from the standard and not in absolute value.

5.1.5.2 Test method

For the purposes of this document, a spectrophotometer shall be used unless otherwise specified. The spectrophotometer measures the amount of light reflected by a coated surface along the wavelength spectrum of visible light, and the readings are taken from the spectrum data.

The colour measurement shall be in accordance with the test method outlined in Annex E.

5.1.6 Gloss

5.1.6.1 Description

Gloss is an optical property of a surface, characterized by its ability to reflect light specularly. The factors involved in visual evaluation are the surface condition, the illumination and the observer. On a glossy surface, the majority of the light is reflected in the specular direction. The specular gloss, or specular reflection measurement, is a reading of the amount of reflected light intensity and is compared to the amount of reflected light from a black glass standard with a defined refractive index.

5.1.6.2 Test method

For the purposes of this document, a specular gloss-meter shall be used as defined in ISO 2813. The gloss-meter measures the specular reflection. The light intensity is registered over a small range of reflection angles.

NOTE There are three different geometries defined. Within super yacht measurements, typically 60 degree geometry is used. For high gloss, 20 degree geometry can be used and for low gloss, 85 degree geometry can also be used. All measurement values are in gloss units (GU).

Gloss measurement shall be in accordance with the test method outlined in Annex F.