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Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces

Peintures et vernis — Anticorrosion des structures en acier par systèmes de peinture — Mesure et critères d'acceptation de l'épaisseur d'un feuil sec sur des surfaces rugueuses

Reference number
ISO 19840:2004(E)

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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 19840 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 14, *Protective paint systems for steel structures*, in collaboration with European Committee for Standardization (CEN) Technical Committee CEN/TC 139, *Paints and varnishes*.

Introduction

This International Standard supplements the ISO 12944 series with regard to the measurement and acceptance criteria for the thickness of a dry film. If specified or agreed, the standard can also be used for other applications.

The objective of this International Standard is to achieve uniformity of practice for measuring the dry film thickness of a coating on a roughened surface. The chosen methods entail the measurement of dry film thickness using measurement instruments based on the permanent magnet principle and the inductive magnet principle. Instruments using the eddy current principle can be used but their use is normally on non-ferrous metal surfaces.

If a coating is applied to a roughened steel substrate, the measurement of its dry film thickness is more complicated than for smooth surfaces. Roughened steel substrates include those prepared by abrasive blast-cleaning or abrading.

The effect of surface roughness on the measurement result increases with profile depth but the result will also depend on the design of the measurement probe and the thickness of the coating.

Annex A, which is informative, is a method based on adjusting the instrument to known thicknesses on a rough surface. In this method, no correction value is used. In this standard, individual readings are used. Annex B describes a method for multiple readings. The methods in Annexes A and B are intended to be used only if specified or agreed.

Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces

1 Scope

This International Standard specifies a procedure for the verification of dry film thickness against nominal dry film thickness on rough surfaces, including the adjustment of the instruments used, the definition of inspection areas, sampling plans, measurement methods and acceptance/rejection criteria.

For the purposes of this standard, any specified thickness is taken to be nominal as defined in ISO 12944-5 and the dry film thickness is the typical thickness above the peaks of the surface profile.

The procedure described in this International Standard is based on the use of instruments of the permanent magnet and inductive magnet type. Instruments are adjusted to zero and a known thickness on a smooth surface.

Measurements taken on a coating on a roughened steel substrate will therefore be higher than the actual value above the peaks of the profile. The thickness of the dry film above the peaks of the profile is defined as the instrument reading minus an appropriate correction value.

The dry film thickness is obtained by using the appropriate correction value applied to readings based on adjustment on a smooth, flat, steel surface.

Where individual readings, based on adjustment on a smooth, flat steel surface without the use of correction values, are specified or agreed, it is important to recognise that this method does not conform with this International Standard.

This standard is applicable if the nominal dry film thickness is 40 µm or greater.

NOTE If the nominal thickness is less than the surface roughness of the substrate the uncertainty of the measurement will increase.

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

ISO 8503-1:1995, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces*

ISO 12944-1, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 1: General introduction*

ISO 12944-2, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 2: Classification of environments*

ISO 12944-3, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 3: Design considerations*

ISO 12944-4, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 4: Types of surface and surface preparation*

ISO 12944-5, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 5: Protective paint systems*

ISO 12944-6, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 6: Laboratory performance test methods*

ISO 12944-7, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 7: Execution and supervision of paint work*

ISO 12944-8, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 8: Development of specifications for new work and maintenance*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
dry film thickness
DFT
thickness of a coating remaining over the peaks of a rough surface when the coating has hardened

3.2
individual reading
figure displayed by the film thickness instrument

3.3
correction value
allowance for the influence of the abrasive blast-cleaned or otherwise roughened surface on the reading of the film thickness instrument

3.4
individual dry film thickness
individual reading minus a correction value

3.5
mean dry film thickness
arithmetic mean of all the individual dry film thicknesses in the inspection area

3.6
nominal dry film thickness
NDFT
dry film thickness specified for each coat or for the whole paint system

3.7
inspection area
designated area for which a sampling plan is established and which can be the whole structure or sections of the whole structure

3.8
sampling plan
plan which defines the number of measurements to be taken on an inspection area

3.9
adjustment
process of aligning the readings of a dry film thickness gauge to known thickness values

3.10
surface profile
micro-roughness of a surface generally expressed as the height of the major peaks relative to the major valleys

[ISO 8503-1:1995]

3.11
maximum dry film thickness
highest acceptable individual value of the dry film thickness above which the performance of the paint or the paint system might be impaired

4 Principle

4.1 General

The thickness of the coating on the prepared steel surface is measured using non-destructive methods described in ISO 2808. The measurement instruments used are adjusted. For the measurement a sampling plan is laid down as well as an appropriate correction value.

The standard also specifies criteria which are used with regard to acceptance or non-acceptance of film thickness values.

4.2 Principle of the applicable measurement methods

4.2.1 Magnetic induction principle

Instruments of this type operate on the principle that the magnetic flux between a magnet and a magnetic substrate varies according to the distance between the two and indicate the coating thickness.

4.2.2 Permanent magnetic pull-off principle

Instruments of this type measure the force required to overcome the attraction between a magnet and the magnetic substrate and indicate the coating thickness.

4.2.3 Electromagnetic induction principle

Instruments based on this principle use an alternating signal to produce a magnetic field. The effects on the field of the magnetic steel substrate are a measure of the distance between the substrate and the probe tip that is the thickness of the coating.

NOTE Other methods using a similar principle are available.

4.2.4 Eddy current principle

Eddy current instruments — mainly used for non-magnetic substrates — generate a high frequency electro-magnetic field in the probe of the instrument which induces eddy currents in the coated metal substrate when the probe is placed in contact. The amplitude and phase of the current are affected by the distance to the substrate and indicate the coating thickness.

5 Apparatus and materials

5.1 General

All instruments for measuring dry film thicknesses will give variable values within very small areas on roughened surfaces due to the influence of the surface roughness and the variations inherent in the method(s) used to apply the paint.

The type of measuring equipment and material shall be specified or agreed between the interested parties before the measurements commence.

5.2 Measuring equipment using magnetic flux principle

5.2.1 Electromagnet

Instruments using this principle may be equipped with either a single or twin pole probe.

This equipment may incorporate a statistical capability. This enables the minimum, maximum, mean and standard deviation to be calculated.

NOTE When using a twin-poled instrument, it is recommended that the instrument is moved to positions 90°, 180° and 270° from the original position where the first reading was made, for example the instrument is pivoted around the first point of measurement. The mean value of the four readings taken should be determined and represents the dry film thickness at the particular spot. In this case, the arithmetic mean value of the four readings is used in place of an individual reading.

5.2.2 Permanent magnet

Instruments of this type incorporate a permanent magnet with one or more poles in the form of hemispherical contacts which are placed on the coated surface.

NOTE When using a twin-poled instrument, it is recommended that the instrument is moved to positions 90°, 180° and 270° from the original position where the first reading was made, for example the instrument is pivoted around the first point of measurement. The mean value of the four readings taken should be determined and represents the dry film thickness in the particular spot. In this case, the arithmetic mean value of the four readings is used in place of an individual reading.

5.2.3 Magnetic pull-off

This type of instrument most commonly incorporates a permanent magnet to which is attached a spring. Various forms of the instrument are available including a simple pencil type, spring balance and another type to which tension is applied by turning a calibrated circular dial until the magnet and attached spring detach from the coated surface.

NOTE Instruments as described in 5.2.2 and 5.2.3 have a fixed scale graduation and should only be used when a lower level of accuracy can be accepted. They may be only adjusted at one particular point on the scale, and this adjustment will have a limited effect on calibration over the full range.

5.3 Materials

5.3.1 Foils/shims

Foils/shims with verified thickness with assigned values traceable to recognised standards and with thicknesses above the dry film thickness to be measured.

NOTE 1 The use of other foils/shims is permitted provided they are verified by a traceable method.

NOTE 2 Care should be taken to ensure that foils/shims are in good condition before they are used. Foils/shims will wear more quickly when used on roughened surfaces.

5.3.2 Uncoated test plates

An uncoated smooth, flat, visually clean steel test plate free of mill scale and at least 3 mm thick and with minimum dimensions of 25 mm × 25 mm.

5.3.3 Pre-coated test plates

Certified, smooth, flat, visually clean pre-coated steel test plates with assigned values traceable to recognised standards and with coating thicknesses near to the expected dry film thickness to be measured. The dimensions shall be at least equal to those specified in 5.3.2.

6 Procedure

6.1 Sampling plan

The sampling plan defines the number of measurements to be taken in an inspection area. If the structure has not been divided into individual inspection areas, the whole structure is considered as the inspection area for measuring the dry film thickness.

NOTE Inspection areas will normally be defined in the project specification (see also ISO 12944-7 and ISO 12944-8).

The procedures for areas requiring special consideration, such as welds, edges, corners, fixtures, areas with observed defects, shall be agreed by the interested parties. For more details see Annex C.

The minimum number of randomly taken measurements to be taken for verifying the dry film thickness on inspection areas is given in Table 1. The number of measurements given is generally considered as being representative for inspection areas for the purposes of this standard. This number shall be increased for inspection areas having a difficult configuration with regard to paint application or measurement or limitations in accessibility (difficult areas). Each difficult area, e.g. stiffeners, brackets, supports, attached piping, shall have additional random measurements taken appropriate to its area in accordance with Table 1, over and above the random measurements in the inspection area.

Table 1 — Sampling plan

Area/length of inspection area m^2 or m	**Minimum number of measurements**	**Maximum number of measurements allowed to be repeated** (see 6.3)
up to 1	5	1
above 1 to 3	10	2
above 3 to 10	15	3
above 10 to 30	20	4
above 30 to 100	30	6
above 100 [a]	add 10 for every additional 100 m^2 or 100 m or part thereof	20 % of the minimum number of measurements
[a] Areas above 1 000 m^2 or m should be divided into smaller inspection areas.		

6.2 Adjustment of the instrument

Before use, it shall be ascertained that the instrument is in good working condition and correctly adjusted. Verification shall then be carried out on uncoated test plates (5.3.2) at zero and with verified foils/shims (5.3.1) above and below the specified dry film thickness. Pre-coated test plates (5.3.3) may be used instead of verified foils/shims.

If the result of the verification is out of the range given by the manufacturer, the instrument shall not be used.

NOTE Adjustment is carried out by the user in most cases.

Calibration is the process of setting and recording the thickness values displayed on a dry film thickness gauge to known values of thickness across the range of the gauge.

Calibration is carried out by the gauge manufacturer using traceable thickness standards in most cases.

6.3 Measurement

Measurements on the dry film shall only be taken after adjustment and checking of the instrument has been carried out in accordance with 6.2. The measuring instrument shall then be used in accordance with the instrument manufacturer's instructions.

Following completion of a series of measurements, and preferably during the measurements, the adjustment of the instrument shall be re-verified. If this is not in accordance with 6.2, the results of the measurements shall be rejected.

When during a series of measurements an individual dry film thickness value does not meet a criterion [see 9 b) and d)], a repeated measurement not more than 10 mm from the point of the first measurement shall be carried out. The first value shall then be rejected and replaced by the result of the repeated measurement. This new measurement will then be the individual dry film thickness. If this individual dry film thickness does not meet the criterion (see Clause 9), it shall not be replaced. For maximum numbers of repeated measurements within an inspection area see Table 1. The number of replaced measurements shall be indicated in the test report.

The sampling plan shall be completed even if values do not meet the criteria, unless otherwise agreed.

7 Correction values

If the surface profile is known and conforms to ISO 8503-1, correction values given in Table 2 shall be used.

Table 2 — Correction values

Surface profile in accordance with ISO 8503-1	Correction value
Fine	10
Medium	25
Coarse	40

The specification/contract might require the determination of a specific correction value, that is a correction value determined on the abrasive blast-cleaned or otherwise roughened substrate with the particular dry film thickness instrument being used. In this case, the correction value shall be determined in accordance with Annex D.

If the surface profile is not known and an uncoated sample is not available, a correction value of 25 shall be used.

If a sample showing the surface profile is available and the profile is not in accordance with ISO 8503-1, the correction value shall be determined in accordance with Annex D.

If a correction value is used, it shall be subtracted from the individual reading to give the individual dry film thickness in micrometres.

NOTE 1 The correction value is applied once on every reading no matter if the coating consists of a single layer or multiple layers (see illustration in Figure 1).

NOTE 2 For deviating surface profiles or in case of particular agreements between the interested parties, a method for determining the correction value to be used is given in Annex D.

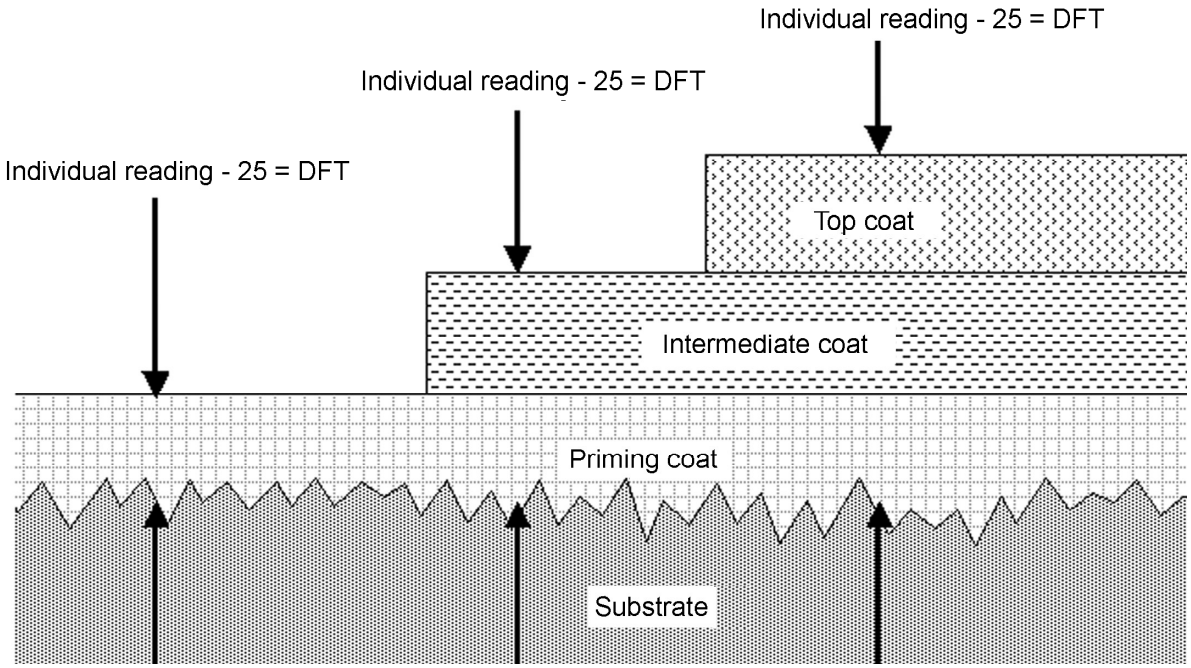

Figure 1 — Example of single and multiple layer measurements for Medium profile

8 Expression of results

The results of the measurements shall be recorded (see Clause 10) and indicated as individual dry film thicknesses (3.4), expressed in µm or mm as appropriate. The mean dry film thickness(es) belonging to (an) inspection area(s) shall also be given.

9 Acceptance/rejection criteria

For the acceptance of an inspection area the following criteria shall be fulfilled:

a) The arithmetic mean of all the individual dry film thicknesses shall be equal to or greater than the nominal dry film thickness (NDFT);

b) All individual dry film thicknesses shall be equal to or above 80 % of the NDFT;

c) Individual dry film thicknesses between 80 % of the NDFT and the NDFT are acceptable provided that the number of these measurements is less than 20 % of the total number of individual measurements taken;

d) All individual dry film thicknesses shall be less than or equal to the specified maximum dry film thickness. If it is not specified see ISO 12944-5.

NOTE For verifying dry film thicknesses as given in ISO 12944-5 acceptance criteria are given therein.

The criteria defined above include all measurement uncertainties (for example instrument accuracy, operator skill) provided that the requirements of this standard have been met.

If the acceptance criteria above are not met, the inspection area shall be rejected (see also ISO 12944 series).

10 Test report

The test report shall contain at least the following information:

a) a reference to this International Standard (ISO 19840);

b) all details necessary to identify the paint or paint system tested;

c) all details necessary to identify the substrate;

d) all details necessary to identify the surface preparation of the substrate;

e) the measurement instrument used (including serial number);

f) the method used for adjusting the instrument;

g) the correction value used;

h) the number of repeated measurements;

i) the results of the measurement, as indicated in Clause 8;

j) the identification of inspection areas, and whether or not the acceptance criteria for each inspection area were met;

k) the ambient temperature during the measurements (see Note 1);

l) the surface temperature during the measurements;

NOTE 1 Approximate temperature is important information for verifying the circumstances during the measurement. Extreme temperatures can affect instrument performance. See the technical information provided by the instrument manufacturer.

m) any supplementary information as required, e.g. minimum and/or maximum film thickness, standard deviation;

n) the date of the measurements;

NOTE 2 An example of a form for a test report is given in Annex E. This example is also applicable when using the methods described in Annexes A and B.

o) the name(s) of the inspector(s) who conducted the DFT testing.

Annex A
(informative)

Method based on adjusting the instrument to known thicknesses on a rough surface

A.1 General

This annex describes a method of measuring the dry film thickness of a coating on an abrasive blast-cleaned or otherwise mechanically roughened substrate based on adjusting the instrument to known thicknesses on a rough surface representative of the surface to be measured.

A.2 Adjustment of the instrument

A.2.1

Before adjustment, check the power supply to the instrument to ensure that is adequate. Also check that the probe and the surface to be measured are clean and uncontaminated.

A.2.2

On commencement of the measurement, adjust the instrument in the environment and at the site where it is to be used. Particular attention should be paid to the following:

— that the operating temperature of the instrument and the probe has been reached prior to calibration;

— that there are no sources of magnetic disturbance nearby, for example electric cables, welding units, generators; and

— that the object to be measured does not vibrate when the adjustment is carried out.

A.2.3

Use for the adjustment an unpainted section of the steel structure which has been cleaned and pre-treated in exactly the same way as the painted sections. If this is not possible, a special adjustment sample can be provided which is, in its material properties that can affect the film thickness measurement, similar to the steel structure and has been cleaned and pre-treated in the same way. The electrical and magnetic properties of the substrate can vary depending on differences in its chemical composition and morphological structure, e.g. caused by different heat treatment.

NOTE As a rule, the effect of substrate thickness is manifest in substrates up to a thickness of approximately 1 mm. Thereafter it declines. At a substrate thickness of above approximately 5 mm, the effect is generally insignificant.

A.2.4

If the instrument has several measurement ranges, select that range which is most suitable for the measurement object. Select suitable calibrated shims for the measurement range. One shim should be thinner and one thicker than the NDFT of the coat(s) on the measurement object. Place the thinner shim on the unpainted surface and the probe on the shim. Adjust the scale reading to the value of the shim. Then place the thicker shim on the unpainted surface and repeat the procedure. Check an intermediate value shim to ensure that the adjustment is correct.

The instrument is now ready for use.

NOTE For some instruments, setting to zero is required with the probe on the prepared but uncoated surface. On blast-cleaned surfaces such a procedure will introduce errors. To minimise measurement errors on a blast-cleaned surface, it is recommended that at least one of the shims used for adjustment is thinner than the film to be measured.

A.2.5

If the instrument cannot be adjusted to fully agree with the different shims, a calibration curve showing correct values as a function of the reading may be plotted as an aid to making the measurements.

A.2.6

When the instrument range is changed, adjust the instrument again. In the event of extensive measurements, checking of the instrument using shims at least once per hour is necessary. If discrepancies occur, the instrument adjustment should be repeated.

A.3 Statistical instruments

Some instruments allow adjustment to mean values obtained from a series of readings performed on different parts of the surface. Since such adjustment is more representative of the surface, the reading variations will diminish.

Annex B
(informative)

Multiple readings

B.1 Multiple readings on a test area

A circular surface of diameter 30 mm of the inspection area is used as the test area, and multiple readings are taken within this test area. If the number of readings is not specified in the contract or specification, five individual readings (3.2) are taken. The acceptance/rejection criterion is then based on the arithmetic mean of these multiple readings; no significance is attached to any individual reading when this annex is used.

B.2 Number and distribution of test areas

The number of test areas and their distribution should be as given in Table 1 for inspection areas.

Annex C
(informative)

Areas requiring special consideration

Coating thickness gauges based on magnetic principles are affected by the magnetic properties, the shape and the surface finish of the substrate under test.

Ideally, gauges should be adjusted using a sample of steel which is truly representative of the substrate to be tested. It is, however, recognised that this is not a practical procedure in many inspection environments, for example, when the substrate is not accessible as it has been coated before testing commences or when processing such as welding, cutting, bending etc. has changed the nature of the substrate.

In many instances the effect of these changes will be small compared to the effect of the blast-cleaned surface finish which is dealt with in the main body of this standard. Care needs to be taken on weld material, on areas at or close to the edges of the substrate, and at or close to bends as, depending on the specific design of the coating thickness gauge, the effect will be most noticeable in these areas.

It is good practice to identify critical areas of the structure that are affected by welding, cutting, bending and other processes which change the shape, thickness, magnetic properties (due to work hardening, heat treatment etc.) or surface finish (due to impact damage, handling defects etc.) and to measure the coatings in these areas using agreed special procedures.

For guidance, test areas within 15 mm of edges, welds, holes etc. should be considered as requiring special consideration.

Manufacturers of gauges will quote parameters such as minimum substrate thickness and minimum sample diameter. These parameters characterise the design of the gauge and particularly the performance of the probe so that the user can determine when the application under consideration is going to affect the normal performance of the gauge.

NOTE A practical assessment of these local effects can be carried out on an uncoated and blast-cleaned sample of the substrate concerned to determine the effect on the zero adjustment of a gauge set up on an uncoated, smooth, flat, clean steel test plate as defined in 5.3.2.

If the condition of the sample is influencing the readings of the gauge on a representative foil/shim of known thickness, it will show up as a variation with respect to readings on the foil/shim on the more usual blast-cleaned steel substrate. Readings should preferably be taken on a foil/shim of thickness representative of the coating to be measured first on the affected area and then on an unaffected area adjacent to the affected areas. If these readings differ by more than 10 µm and the area is deemed to be critical, the gauge should be adjusted on a typical example to compensate for the effects. Readings taken in this way should be noted separately together with the test results.

Annex D
(normative)

Determination of a specific correction value

When a specific correction value is to be determined, proceed as follows:

Adjust the instrument in accordance with the manufacturer's instructions and 6.2. Check the adjustment for intermediate values following the manufacturer's specification.

Use the adjusted instrument on the blast-cleaned or otherwise roughened surface to check a measured foil/shim of approximately 125 µm thickness (see note). Using the foil/shim, take 10 measurements at different points on the blast-cleaned or otherwise roughened surface and determine the arithmetic mean value. From the mean value, subtract the known value of the foil thickness. The value obtained is the correction value.

NOTE The thickness of the foil/shim should not be less than 125 µm or greater than 150 µm.

Annex E
(informative)

Example of a test report form

A	**BASIC INFORMATION** (test is carried out in accordance with ISO 19840:2004)			
A1	Name of project:			
A2	Name of owner:			
A3	Location of project/structure:			
A4	Paint manufacturer(s):			
A5	Corrosion protection work carried out by:			
A6	Structure	Area: ..... m^2	Estimated: ☐ Known: ☐	
A7	Constituent element:	Area: ..... m^2	Estimated: ☐ Known: ☐	
A8	Inspection area (if not A7 or A8):	Area: ..... m^2	Estimated: ☐ Known: ☐	
A9	Drawing No.:	Position No(s):		
A10	Sketch for identification of inspection area:			
B	**PROTECTIVE PAINT SYSTEM**			
B1	Surface preparation, ISO 8503-1: _____			
B2	Surface profile (roughness), ISO 8503-1: _____			
B3	Substrate (e.g. steel, hot-dip-galvanized): _____			
B4	Prefabrication primer:	Nominal (specified) dry film thickness: ..... µm		
B5	Priming coat: _____	Nominal (specified) dry film thickness: ..... µm Nominal (specified) dry film thickness: ..... µm		
B6	Intermediate coat: _____	Nominal (specified) dry film thickness: ..... µm Nominal (specified) dry film thickness: ..... µm		
B7	Top coat: _____	Nominal (specified) dry film thickness: ..... µm Nominal (specified) dry film thickness: ..... µm		
C	**Measurement/adjustment**			
C1	Principle of measurement instrument:			
C2	Measurement instrument: _____		Serial No.: _____ Range of probe: _____ Calibration date: _____	
C3	Date of measurement: _____			
C4	Adjustment:	Smooth surface ☐ Rough surface ☐		
	This report consists of pages No. ..... to			

D	**Acceptance/rejection criteria:**				
	Measurement	**1st coat**	**2nd coat**	**3rd coat**	**4th coat**
		µm			
	NDFT (individual coat)				
	Cumulative NDFT				
	80% of the cumulative NDFT				
	Maximum cumulative dry film thickness				
E	**Results**				
	Project:				
	Corresponding drawing No.:				
	Number of measurements to be taken in accordance with ISO 19840:2004, Clause 6:				
	1	**2**	**3**	**4**	**5**
	Measurement No.	**Individual reading**	**Correction value used (see Table 2 of ISO 19840:2004)**	**Resulting individual dry film thickness** column 2 minus column 3	**Individual dry film thicknesses outside of the specification**
				µm	
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	..				
			Arithmetic mean		
	Number of measurements:				
	Number of measurements between NDFT and 80 % NDFT:				
	Percentage of those measurements compared with the total number of measurements:				
	Number of measurements less than 80 % NDFT:				
	Number of repeated measurements:				
	Ambient temperature during the measurement (°C):				
	Surface temperature during the measurement (°C):				
	Remarks:				
		Work conforms to the requirements?		**yes / no**	
	Name(s) of the inspector(s):				
	Place and date:			Signature(s):	

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