

EFD Information 20

Corrosion protection in accordance with DIN EN ISO 12944 – practical application

Reliable corrosion protection for industrial goods made of steel – even with low material thicknesses.

The DIN EN ISO 12944 standard is the authoritative standard for the corrosion protection of steel structures and provides valuable guidance for **industrially manufactured steel goods with a material thickness of less than 3 mm**.

What has changed with the 2018 revision?

The revised standard brings with it numerous innovations. We have summarized the most important ones for you:

- New protection duration classes:
Introduction of the "Very High" class for a protection period of over 25 years.
(Previously: Short < 7 years, Medium 7-15 years, Long 15-25 years)
- Merger of C5-I and C5-M:
The distinction between C5-I (industrial exposure) and C5-M (maritime exposure) has been removed.
- New category CX:
For extreme loads and offshore applications.
- Part 9 for offshore applications:
Now regulates coatings for offshore structures (replaces previous ISO 20340)
- Realistic test methods:
Introduction of cyclic tests for better simulation of real conditions.

The details can be found in the overview on pages 3–5.

Two central parts of the standard for guidance

Even if not all parts are directly applicable to industrial goods, two sections provide a valuable basis:

1. Part 2 – Classification of atmospheric conditions into corrosivity categories.
2. Part 6 – Assignment of test methods to the individual categories.

Requirements for industrial steel goods

Industrial series production brings with it specific requirements:

- Automated coating processes
- Standardised pre-treatment and painting
- Use of proven systems, even outside the norm, with a high protective effect

Practical testing and classification

In order to improve applicability for industrial steel goods, we have tested various coating systems under practical conditions:

- Testing in accordance with DIN EN ISO 12944 Part 6
- Classification according to corrosivity categories (Part 2)
- Results available in our corrosion protection database:

<https://portal.freilacke.de/de/corrosionprotection>

Important information on interpreting the results

Please note the following when interpreting our test results:

- Laboratory results vs. reality: deviations are possible
- Influencing factors such as substrate, pre-treatment, application and curing conditions play a major role
- Individual testing for specific customer enquiries is recommended in all cases

Conclusion:

The classification into corrosion protection categories provides reliable guidance, especially when it comes to the diverse requirements for industrial goods. Our tests and data help you find the right system for your application.

Test criteria

The duration of the corresponding test is listed in the following tables.

Test procedure and test duration

If durations are specified for both test programmes, either of the two programmes may be used.

		DIN EN ISO 12944-6;1998			DIN EN ISO 12944-6;2018		
Corrosivity category according to ISO 12944-2	Protection duration ranges according to ISO 12944-1	ISO 2812-1 Exposure to chemicals h	ISO 6270-2 (condensation of water) h	ISO 9227 (neutral salt spray) h	ISO 6270-1 (condensation test) h	ISO 9227 (neutral salt spray) h	ISO 12944-9 (cyclic ageing test) h *
C2	low	--	48	--	48	--	--
	medium	--	48	--	48	--	--
	high	--	120	--	120	--	--
	Very high	--	--	--	240	480	--
C3	low	--	48	120	48	120	--
	medium	--	120	240	120	240	--
	high	--	240	480	240	480	--
	very high	--	--	--	480	720	--
C4	low	--	120	240	120	240	--
	medium	--	240	480	240	480	--
	high	--	480	720	480	720	--
	very high	--	--	--	720	1440	1680
C5	low	--	--	--	240	480	--
	medium	--	--	--	480	720	--
	high	--	--	--	720	1440	1680
	very high	--	--	--	--	--	2688
C5-I	low	168	240	480	--	--	--
	medium	168	480	720	--	--	--
	high	168	720	1440	--	--	--
C5-M	low	--	240	480	--	--	--
	medium	--	480	720	--	--	--
	high	--	720	1440	--	--	--
CX		--	--	--	--	--	4200

Source: DIN EN ISO 12944-6;1998 and 2018




Testing the adhesive strength of coating systems on galvanized steel¹

Applies only to DIN EN ISO 12944;1998

Corrosivity category according to ISO 12944-2	Duration of protection	ISO 6270 Condensation test h
C2	short	240
	medium	240
	long	240
C3	short	240
	medium	240
	long	240
C4	short	240
	medium	240
	long	480
C5-I	short	240
	medium	480
	long	720
C5-M	short	240
	medium	480
	long	720

Source: DIN EN ISO 12944-6;1998

Cyclic ageing test procedure

Tag 1	Tag 2	Tag 3	Tag 4	Tag 5	Tag 6	Tag 7
UV/Kondensation — ISO 16474-3			Neutraler Salzsprühnebel — ISO 9227			Beanspruchung bei niedriger Temperatur (-20 ± 2) °C
						

Source: DIN EN ISO 12944-9;2018

A. Specific differences between the individual standards

	DIN EN ISO 12944-6;1998	DIN EN ISO 12944-6;2018
Salt spray test	Vertical scratch, Sikkens 1 mm (DIN EN ISO 17872) Does not apply to hot-dip galvanizing	Horizontal scratch application, milling cutter 2 mm also applies to hot-dip galvanizing
Tear-off tests	Only for layer thicknesses >250 µm	Independent of layer thickness
Condensation test	DIN EN ISO 6270-2 (completely in one chamber)	DIN EN ISO 6270-1 (one side)
Test pieces	Test plates and original parts (by agreement)	Only test plates > 3 mm

B. Evaluation *before* artificial ageing

Assessment procedure	Requirements DIN EN ISO 1998	Time of assessment	Conditions	Requirements DIN EN ISO 12944:2018	Time of assessment	Conditions
ISO 2409 Cross-cut test	≤ Gt 1	After conditioning	At <250µm	≤ Gt 2	After conditioning	At <250µm
ISO 4624 tear test method A or B	≥ 5.0 MPa	After conditioning	At >250 µm to unalloyed steel, 3 stamps per test plate	≥ 2.5 MPa at 0% A/B fracture otherwise ≥ 5.0 MPa	After specified conditioning	Independent of layer thickness Same conditions as in 1998

Source: DIN EN ISO 12944-6;1998 and 2018

C. Evaluation *after* artificial ageing for the specified duration

Evaluation procedure	Requirements DIN EN ISO 12944:1998	Time of assessment	Conditions	Requirements DIN EN ISO 12944:2018	Time of assessment	Conditions
ISO 4628-2 Degree of blistering	0(S0)	Immediately	-	0(S0)	immediately	-
ISO 4628-3 Rust grade	Ri 0	immediate	-	Ri 0	immediately	-
ISO 4628-4 Crack grade	0(S0)	immediate	-	0(S0)	immediatly	-
ISO 4628-5 Degree of flaking	0(S0)	immediately	-	0(S0)	immediately	-
Corrosion at the scratch after salt spray test	≤ 1.0 mm average value	immediately	-	≤ 1.5 mm average value	Max. 8 hours after test completion	Applies only to red rust, galvanization is part of coating Accuracy of under-rusting 0.1 mm
Corrosion at the scratch after cyclic ageing test	-	-	-	≤ 3.0 mm average value	max. 8 hours after test completion	Same conditions as above
ISO 2409 Cross-cut test	≤ Gt 1	After 24 hours of reconditioning	At < 250µm	≤ Gt 2	After 7 days of reconditioning	At < 250µm
ISO 4624 tear test method A or B	≥ 5.0 MPa	After 24 hours of reconditioning	At >250 µm, drilling into unalloyed steel, 3 punches per plate	≥ 2.5 MPa at 0% A/B fracture otherwise ≥ 5.0 MPa	After 7 days of reconditioning	Independent of layer thickness, same conditions as 1998

Source: DIN EN ISO 12944-6;1998 and 2018 and DIN EN ISO 12944-9;2018