
International Standard



4539

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Electrodeposited chromium coatings — Electrolytic corrosion testing (EC test)

Revêtements électrolytiques de chrome — Essai de corrosion électrolytique (Essai EC)

First edition — 1980-10-01

UDC 669.058 : 620.193.7

Ref. No. ISO 4539-1980 (E)

Descriptors : metal coatings, electrodeposited coatings, chromium coatings, tests, corrosion tests, test equipment.

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4539 was developed by Technical Committee ISO/TC 107, *Metallic and other non-organic coatings*, and was circulated to the member bodies in September 1978.

It has been approved by the member bodies of the following countries :

Bulgaria	Italy	South Africa, Rep. of
Czechoslovakia	Japan	Spain
France	Korea, Rep. of	Sweden
Germany, F.R.	Libyan Arab Jamahiriya	Switzerland
Hungary	Mexico	USA
India	New Zealand	USSR
Ireland	Poland	
Israel	Romania	

The member body of the following country expressed disapproval of the document on technical grounds :

United Kingdom

Electrodeposited chromium coatings — Electrolytic corrosion testing (EC test)

1 Scope and field of application

1.1 This International Standard specifies a rapid and accurate method for evaluating the corrosion resistance characteristics of copper-nickel-chromium and nickel-chromium electrodeposits on steel or zinc-base die castings designed for outdoor service. It does not prescribe exposure periods to be used for a specific product, nor the interpretation to be given to the results.

1.2 The suitability of this test and correlation of results with outdoor service experience should be determined before it is specified for coating systems or materials other than those described in 1.1.

1.3 Test conditions are provided^[1] to electrolytically dissolve the underlying coatings of nickel through discontinuities in the chromium overlay (whilst not attacking the chromium) at such a rate that electrolysis for 2 min produces about the same extent of corrosion as does 1 year of service^{[2] [3]}. The same acceleration of corrosion in the EC test over the rate in outdoor service is maintained on specimens where the exposed nickel area increases rapidly (such as on those with high discontinuity density) by changing from constant potential control to constant current control when a predetermined current density is attained on the specimen surface.

2 Reagents

Use only reagents of recognized analytical grade and only distilled water or water of equivalent purity.

2.1 Electrolytes

2.1.1 Electrolyte A, for use when testing either zinc or steel basis metal specimens where corrosion sites are to be identified in a separate indicator solution.

Bath composition per litre :

Sodium nitrate (NaNO ₃)	10,0 g
Sodium chloride (NaCl)	1,3 g
Nitric acid (HNO ₃), concentrated ($\rho = 1,42$ g/ml)	5,0 ml
Water (distilled)	to make 1 litre

Bath life : 900 C/l.

2.1.2 Electrolyte B, for use when testing steel basis metal specimens where corrosion sites are to be identified in the electrolyte. (See clause 6.)

Bath composition per litre :

Sodium nitrate (NaNO ₃)	10,0 g
Sodium chloride (NaCl)	1,0 g
Nitric acid (HNO ₃), concentrated ($\rho = 1,4$ g/ml)	5,0 ml
1,10-Phenanthroline hydrochloride	1,0 g
Water (distilled)	to make 1 litre

Bath life : 200 C/l or until the colour of the solution masks the colour originating at a corrosion site.

2.2 Indicator solutions

2.2.1 Solution C, used to identify corrosion sites on zinc basis metal specimens after electrolysis.

Bath composition per litre :

Acetic acid (CH ₃ COOH), glacial	2 ml
Quinoline (C ₉ H ₇ N)	8 ml
Water (distilled)	to make 1 litre

Bath life : until the turbidity of the solution masks the cloudy streamer which originates at a corrosion site.

2.2.2 Solution D, used to identify corrosion sites on steel basis metal specimens after electrolysis.

Bath composition per litre :

Acetic acid (CH ₃ COOH), glacial	2 ml
Potassium thiocyanate (KCNS)	3 g
Hydrogen peroxide (H ₂ O ₂), 30 % (m/m)	3 ml
Water (distilled)	to make 1 litre

Bath life : until the colour of the solution masks the colour originating at a corrosion site.