DIN 53099:2024-12 (E)

Metallic coatings - Electrodeposited chromium coatings with chromium(III)-based electrolytes on copper-nickel coatings on plastics - Requirements and test methods

Contents

Page

Foreword 5

Introduction 6

1 Scope 7

2 Normative references 7

3 Terms and definitions 7

4 Ordering information 8
4.1 Essential information 8
4.2 Additional information 9

5 Service condition numbers 9

6 Designation 9
6.1 General 9
6.2 Base material 10
6.3 Intermediate metal coating 10
6.4 Metal coatings 10
6.4.1 General 10
6.4.2 Nickel coatings 10
6.4.3 Chromium coatings from chromium(III)-based electrolytes 11
6.5 Examples of designations 13

7 Requirements 14
7.1 Base material 14
7.2 Appearance of the coated component 14
7.2.1 Freedom from defects 14
7.2.2 Colour characteristics 15
7.2.3 Colorimetry 15
7.3 Local coating thickness 15
7.4 Pore count 17
7.5 Adhesive strength of the metal coatings 17
7.6 Corrosion resistance 18
7.7 Potential differences between the individual nickel coatings 18

8 Sampling 19

9 Further test methods 19

10 Test report 19

Annex A (normative) Service condition numbers 21

Annex B (informative) Methods of determining coating thickness 22

B.1 General 22
B.2 Methods 22
B.2.1 Microscopic method 22

B.2.2 Coulometric method 22
B.2.3 X-ray spectrometric method 23
B.2.4 Profilometric method 23

Annex C (normative) Determination of pore count in the chromium coating 24

C.1 General 24
C.2 Sample preparation 24
C.3 Galvanostatic test (Dubpernell test) 25
C.3.1 Composition of the copper electrolyte 25
C.3.2 Working conditions 25
C.3.3 Procedure 25
C.3.4 Evaluation 25
C.4 Potentiostatic test (modified Dubpernell test) 25
C.4.1 Composition of the copper electrolyte 25
C.4.2 Working conditions 26
C.4.3 Procedure 26
C.4.4 Evaluation 26
C.5 Potentiostatic test (Fuhrmann test) 26
C.5.1 Set-up and description of measuring cell 26
C.5.2 Composition of the copper electrolyte 27
C.5.3 Working conditions 27
C.5.4 Procedure 27
C.5.5 Evaluation 28
C.6 Anodizing test (Fechner test) 28
C.6.1 General 28
C.6.2 Test set-up 28
C.6.3 Composition of the electrolyte 28
C.6.4 Working conditions 28
C.6.5 Procedure 29
C.6.6 Evaluation 29

Annex D (normative) Thermal cycling test 30

D.1 General 30
D.2 Principle of method 30
D.3 Samples 30
D.3.1 Sampling and number of test pieces 30
D.3.2 Exposure of test pieces 30
D.4 Test apparatus 30
D.5 Procedure 31
D.5.1 Test procedure 31
D.5.2 Evaluation 31

Annex E (informative) Thermal cycling test combined with NSS or CASS test 32

E.1 Principle of method 32
E.2 Procedure 32
E.3 Evaluation 32

Annex F (informative) Glacial acetic acid test 33

F.1 General 33
F.2 Reagents 33
F.3 Test apparatus 33
F.4 Procedure 33
F.5 Evaluation 33

Bibliography 35

Figures

Figure C.1 — Schematic set-up of measuring cell 27

Tables

Table 1 — Requirements for double nickel coatings 11

Table 2 — Requirements for double nickel coatings with additional microporous nickel coating..... 11

Table 3 — Designation of significant surfaces [2] 14

Table 4 — Minimum thicknesses of the copper and nickel coatings for coating systems on plastic.... 17

Table 5 — Test durations for type A chromium coatings 18

Table A.1 — Classification of service condition numbers..... 21

Table D.1 — Service condition numbers and exposure temperatures..... 31