DIN EN 13674-1:2017-07 (E)

Railway applications - Track - Rail - Part 1: Vignole railway rails 46 kg/m and above (includes Amendment A1:2017)

Contents

Page

European foreword 5

Introduction 7

1 Scope 8

2 Normative references 8

3 Terms and definitions 8

4 Information to be supplied by the purchaser 9

5 Steel grades 10

6 Profile drawings/properties/mass 11

7 Manufacture 12
7.1 Product integrity 12
7.2 Blooms 12
7.3 Rails 12
7.4 Identification 12
7.4.1 Branding 12
7.4.2 Hot stamping 13
7.4.3 Cold stamping 14
7.4.4 Other identification 14

8 Qualifying tests 14
8.1 Procedure 14
8.2 Fracture toughness (Klc) 15
8.2.1 Test pieces and test methods 15
8.2.2 Qualifying criteria 15
8.3 Fatigue crack growth rate 15
8.3.1 Test method 15
8.3.2 Test pieces 15
8.3.3 Number of tests and test conditions 15
8.3.4 Qualifying criteria 15
8.4 Fatigue test 16
8.4.1 Test method 16
8.4.2 Test pieces 16
8.4.3 Number of tests and test conditions 16
8.4.4 Qualifying criteria 16
8.5 Residual stress in rail foot 16
8.5.1 Test method 16
8.5.2 Test pieces 16
8.5.3 Measurements 16
8.5.4 Qualifying criteria 16
8.6 Variation of centre line running surface hardness of heat treated rails 17
8.7 Tensile strength and elongation 17
8.8 Segregation 18
8.9 Other qualifying requirements 18

9 Acceptance tests ... 18
9.1 Laboratory tests ... 18
9.1.1 General ... 18
9.1.2 Sampling and preparation of samples and test pieces ... 18
9.1.3 Chemical composition ... 18
9.1.4 Microstructure ... 23
9.1.5 Decarburisation ... 24
9.1.6 Oxide cleanness ... 24
9.1.7 Sulfur prints ... 24
9.1.8 Hardness ... 24
9.1.9 Tensile tests ... 25
9.1.10 Retest procedures ... 26
9.2 Dimension tolerances ... 26
9.2.1 Profile ... 26
9.2.2 Straightness, surface flatness and twist ... 27
9.2.3 Cutting and drilling ... 33
9.3 Gauges ... 33
9.4 Inspection for internal quality and surface quality ... 33
9.4.1 Internal quality ... 33
9.4.2 Surface quality ... 36
9.4.3 Checking of automated testing equipment ... 38

Annex A (normative) Rail profiles ... 49

Annex B (normative) Standard test method for the determination of the plane strain fracture toughness (Klc) of rails ... 76

B.1 Test methods ... 76
B.2 Test pieces ... 76
B.3 Number of tests ... 76
B.4 Test conditions) ... 76
B.5 Analysis of test data ... 77
B.6 Reporting of results ... 77

Annex C (normative) Method for the determination of rail foot surface longitudinal residual stresses ... 82

C.1 Procedure ... 82
C.2 Strain gauges and their location ... 82

Annex D (normative) Limiting sulfur prints ... 85

Annex E (normative) Profile and drilling gauges ... 99

Annex F (normative) !Microscopic examination of rail steels using standard diagrams to assess the content of non-metallic inclusions" ... 113

F.1 General ... 113
F.1.1 Degree of purity ... 113
F.1.2 Standard diagram plate No. 1 ... 113
F.2 Preparation of specimens ... 113
F.3 Structure and use of standard diagram plate No. 1 ... 113
F.3.1 Use of diagram plate No. 1 ... 113
F.3.2 Rating a single inclusion ... 114
F.3.3 Rating of very small inclusions ... 114
F.4 Test procedure ... 114
F.4.1 Magnification ... 114
F.4.2 Selection of inclusions ... 114
F.5 Evaluation ... 115
F.5.1 General ... 115
F.5.2 Method of evaluation ... 115

F.5.3 Calculation procedure for evaluation using method K 115

Annex G (informative) Significant technical changes between this European standard and the previous edition 118

Annex ZA (informative) !Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC" 120

Bibliography 122