

DIN EN 14363:2016-10 (E)

Railway applications - Testing and Simulation for the acceptance of running characteristics of railway vehicles - Running Behaviour and stationary tests

Contents

Page

European foreword	6
Introduction	7
1 Scope	9
2 Normative references	11
3 Terms and definitions	12
4 Deviations from requirements	14
5 Test requirements	15
5.1 Measuring uncertainty	15
5.2 Test extent	15
5.2.1 General	15
5.2.2 Fault modes	15
5.3 Test vehicle	16
5.3.1 Selection and status of the vehicle	16
5.3.2 Loading conditions	16
5.3.3 Distribution of static wheel forces	17
5.4 Assessment of test result	17
5.5 Documentation of test	18
6 First stages assessment	19
6.1 Safety against derailment on twisted track	19
6.1.1 General	19
6.1.2 Signal processing	20
6.1.3 Rail test conditions	20
6.1.4 Vehicle test conditions	21
6.1.5 Test methods	23
6.2 Safety against derailment under longitudinal compressive forces in S-shaped curves	37
6.3 Evaluation of the torsional coefficient of a vehicle body	37
6.4 Determination of displacement characteristics	38
6.5 Loading of the diverging branch of a switch	38
6.6 Running safety in curved crossings for vehicles with small wheels	38
7 Second stage - dynamic performance assessment	39
7.1 General	39
7.2 Choice of measuring method	40
7.2.1 General	40
7.2.2 Base conditions for the use of the simplified measuring method and measurement of axle box forces	41
7.2.3 Simplifications for separate stability testing	42
7.3 Performing on-track tests	42
7.3.1 General	42
7.3.2 Test zones and track sections	48
7.3.3 Extent of tests	49
7.3.4 Test operation	50
7.4 Measured quantities and measuring points	50
7.5 Assessment quantities and limit values	52

7.5.1	General	52
7.5.2	Running safety	57
7.5.3	Track loading	58
7.5.4	Ride characteristics	58
7.6	Test evaluation	58
7.6.1	Overview	58
7.6.2	Recording the measuring signals	59
7.6.3	Statistical evaluation in test zones	60
7.6.4	Evaluation of test results in transition curves	67
7.6.5	Verification of stability	67
7.7	Documentation	67
7.7.1	General	67
7.7.2	Description of the vehicle design and status of the tested vehicle	68
7.7.3	Additional information for future extension of acceptance	68
7.7.4	Description of the test routes	68
7.7.5	Description of data capture	68
7.7.6	Description of evaluation	68
7.7.7	Test results (including additional information for model validation)	69
7.7.8	Deficiencies in reaching the target test conditions	70
7.7.9	Infrastructure conditions more severe than the target test conditions	70
Annex A (informative) Information on safety against derailment		71
A.1	Factors influencing the safety against derailment of vehicles running on twisted track	71
A.2	Evaluation and limit value for safety against derailment	72
A.3	Friction conditions during testing on special track	73
A.4	Special conditions for vehicles with air springs	75
A.5	Test twist conditions for articulated vehicles	76
A.6	Test twist conditions for vehicles with more than two suspension levels	82
A.7	Calculation of the shim sizes (test method 1)	83
A.8	Performing and evaluating a twist test for a two-axle vehicle (test method 2)	84
A.9	Performing and evaluation of a twist test for a vehicle with two bogies with two axles (test method 2)	87
Annex B (informative) Computer simulations designed to examine whether the vehicle has an acceptable resistance to flange climbing derailment at low speed		95
B.1	General requirement	95
B.2	Computer output	95
B.3	Track input	95
B.4	Body-bogie yaw torque	96
B.5	Performance requirement	96
Annex C (informative) Tests for determination of the torsional coefficient of a vehicle body		98
C.1	Force-deflection measurement directly at the vehicle body	98
C.2	Force-deflection measurement at the contact points between wheel and rail after blocking of the suspension(s) between wheelset (bogie frame) and vehicle body	99
Annex D (informative) Determination of displacement characteristics for application with EN 15273		100
D.1	Introduction	100
D.2	Determination of displacement characteristics	100
Annex E (informative) Assessment of the behaviour of vehicles with small wheels in curved crossings		106
E.1	Purpose	106
E.2	Area of application	106
E.3	Description of the crossing geometry	106
E.4	Test conditions	109

Annex F (informative) Test specification for assessment of vehicle behaviour in switches and crossings	112
F.1 Introduction	112
F.2 Definitions	112
F.3 Test conditions	112
F.4 Assessment of the test results	113
F.5 Documentation	113
Annex G (normative) Coordinate system for measured quantities	116
Annex H (informative) Operational parameters	117
Annex I (informative) Position of the different wheelsets during test	119
Annex J (informative) Additional track loading assessment quantities	120
J.1 General	120
J.2 Maximum lateral force	120
J.3 Combination of lateral and vertical forces	120
Annex K (informative) Evaluation and background of the rail surface damage quantity	122
Annex L (informative) Typical maximum estimated values of ride characteristics	124
Annex M (normative) Track geometric quality - Selection of test tracks	125
M.1 Basis of evaluation	125
M.2 Assessment quantities for track geometric quality	125
M.3 Different measuring systems	126
M.4 Target test conditions	127
M.5 Reporting	128
Annex N (informative) Background of track quality description	129
Annex O (normative) Rail profile measurement	130
O.1 General	130
O.2 Manual measurements	130
O.3 Automatic measurements	130
Annex P (normative) Requirements for evaluation of equivalent conicity	131
Annex Q (informative) Radial steering index	132
Q.1 Introduction	132
Q.2 Calculation of radial steering index	133
Annex R (normative) Statistical evaluation	136
R.1 Objectives and principles of statistical analysis	136
R.2 Determination of the percentiles for each track section	137
R.3 Preparation of the random samples	137
R.4 One-dimensional analysis for estimated maximum values	138
R.5 Two-dimensional analysis for estimated values	138
R.6 Multiple regression analysis for estimated values	139
R.7 Statistical evaluation for the overturning criterion	141
R.8 Regression assumptions	142
Annex S (informative) Running behaviour of special vehicles	144

S.1	General	144
S.2	Vehicle design and classification	144
S.3	Use of the simplified measuring method	145
S.4	Test conditions	145
S.5	Specific limit value	145
Annex T (informative) Simulation of on-track tests		146
T.1	Introduction	146
T.2	Fields of application	146
T.3	Validation	148
T.4	Input	162
T.5	Output	165
T.6	Documentation	166
T.7	Examples for model validation according to Method 1	166
Annex U (informative) Extension of acceptance		174
U.1	General	174
U.2	Determination of the safety factor	180
U.3	Dispensation	180
U.4	Check for base conditions for simplified method	181
U.5	Requirements depending on the initial approval	181
Annex V (normative) Symbols		183
Annex W (informative) List with the main technical changes compared to EN 14363:2005, EN 15686:2010 and EN 15687:2010.....		187
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC		190
Bibliography		193