

DIN EN 14363:2019-11 (E)

Railway applications - Testing and simulation for the acceptance of running characteristics of railway vehicles - Running behaviour and stationary tests (includes Amendment :2018)

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	14
5.1 Measuring uncertainty	14
5.2 Test extent	15
5.2.1 General	15
5.2.2 Fault modes	15
5.3 Test vehicle	15
5.3.1 Selection and status of the vehicle	15
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	17
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	38
7.1 General	38
7.2 Choice of measuring method	39
7.2.1 General	39
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	41
7.3 Performing on-track tests	42
7.3.1 General	42
7.3.2 Test zones and track sections	47
7.3.3 Extent of tests	48
7.3.4 Test operation	49

7.4	Measured quantities and measuring points	49
7.5	Assessment quantities and limit values	51
7.5.1	General	51
7.5.2	Running safety	56
7.5.3	Track loading	57
7.5.4	Ride characteristics	57
7.6	Test evaluation	57
7.6.1	Overview	57
7.6.2	Recording the measuring signals	58
7.6.3	Statistical evaluation in test zones	59
7.6.4	Evaluation of test results in transition curves	66
7.6.5	Verification of stability	66
7.7	Documentation	66
7.7.1	General	66
7.7.2	Description of the vehicle design and status of the tested vehicle	67
7.7.3	Additional information for future extension of acceptance	67
7.7.4	Description of the test routes	67
7.7.5	Description of data capture	67
7.7.6	Description of evaluation	67
7.7.7	Test results (including additional information for model validation)	68
7.7.8	Deficiencies in reaching the target test conditions	69
7.7.9	Infrastructure conditions more severe than the target test conditions	69
Annex A (informative) Information on safety against derailment		70
A.1	Factors influencing the safety against derailment of vehicles running on twisted track	70
A.2	Evaluation and limit value for safety against derailment	71
A.3	Friction conditions during testing on special track	72
A.4	Special conditions for vehicles with air springs	74
A.5	Test twist conditions for articulated vehicles	76
A.6	Test twist conditions for vehicles with more than two suspension levels	81
A.7	Calculation of the shim sizes (test method 1)	82
A.8	Performing and evaluating a twist test for a two-axle vehicle (test method 2)	83
A.9	Performing and evaluation of a twist test for a vehicle with two bogies with two axles (test method 2)	86
Annex B (informative) Computer simulations designed to examine whether the vehicle has an acceptable resistance to flange climbing derailment at low speed		94
B.1	General requirement	94
B.2	Computer output	94
B.3	Track input	94
B.4	Body-bogie yaw torque	95
B.5	Performance requirement	95
Annex C (informative) Tests for determination of the torsional coefficient of a vehicle body		97
C.1	Force-deflection measurement directly at the vehicle body	97
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	98
Annex D (informative) Determination of displacement characteristics for application with EN 15273		99
D.1	Introduction	99
D.2	Determination of displacement characteristics	99
Annex E (informative) Assessment of the behaviour of vehicles with small wheels in curved crossings		105
E.1	Purpose	105
E.2	Area of application	105

E.3	Description of the crossing geometry	105
E.4	Test conditions	108
Annex F (informative) Test specification for assessment of vehicle behaviour in switches and crossings		111
F.1	Introduction	111
F.2	Definitions	111
F.3	Test conditions	111
F.4	Assessment of the test results	112
F.5	Documentation	112
Annex G (normative) Coordinate system for measured quantities		115
Annex H (informative) Operational parameters		116
Annex I (informative) Position of the different wheelsets during test		118
Annex J (informative) Additional track loading assessment quantities		119
J.1	General	119
J.2	Maximum lateral force	119
J.3	Combination of lateral and vertical forces	119
Annex K (informative) Evaluation and background of the rail surface damage quantity		121
Annex L (informative) Typical maximum estimated values of ride characteristics		123
Annex M (normative) Track geometric quality - Selection of test tracks		124
M.1	Basis of evaluation	124
M.2	Assessment quantities for track geometric quality	124
M.3	Different measuring systems	125
M.4	Target test conditions	126
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	138
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	145
S.1 General	145
S.2 Vehicle design and classification	145
S.3 Use of the simplified measuring method	146
S.4 Test conditions	146
S.5 Specific limit value	146
Annex T (informative) Simulation of on-track tests	147
T.1 Introduction	147
T.2 Fields of application	147
T.3 Validation	149
T.4 Input	163
T.5 Output	167
T.6 Documentation	167
T.7 Examples for model validation according to Method 1	168
Annex U (informative) Extension of acceptance	175
U.1 General	175
U.2 Determination of the safety factor	181
U.3 Dispensation	181
U.4 !Use of the simplified method"	182
U.5 Requirements depending on the initial approval	182
Annex V (normative) Symbols	184
EN 15686:2010 and EN 15687:2010	188
Annex X (informative) A-deviations	191
Annex ZA (informative) !Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC aimed to be covered"	193
Bibliography	196