

DIN EN 15227:2025-01 (E)

Railway applications - Crashworthiness requirements for rail vehicles (includes Amendment :2024)

Contents		Page
European foreword		4
Introduction		5
1	Scope	6
2	Normative references	6
3	Terms and definitions	6
4	Crashworthiness design of rail vehicle structures	8
4.1	General principles	8
4.2	Crashworthiness design objectives	9
4.3	Rail vehicle crashworthiness assessment process	9
5	Crashworthiness assessment requirements	9
5.1	Crashworthiness design categories of rail vehicles	9
5.2	Train assessment methods	10
5.2.1	Complete trainset method	10
5.2.2	Reference train method	11
5.2.3	Summary of train assessment methods	11
5.3	Design collision scenarios	11
5.4	Assessment of design collision scenarios	12
5.4.1	General	12
5.4.2	Design collision scenario for category C-I	13
5.4.3	Design collision scenario for category C-II	13
5.4.4	Design collision scenario for category C-III	13
5.4.5	Design collision scenario for category C-IV	14
5.4.6	Summary of design collision scenarios	14
6	Structural passive safety design requirements	16
6.1	Assessment requirements for design collision scenarios	16
6.1.1	General	16
6.1.2	Explanatory notes (informative)	16
6.2	Overriding	17
6.2.1	Requirements	17
6.2.2	Explanatory notes (informative)	17
6.3	Survival space, intrusion and egress	18
6.3.1	General requirements	18
6.3.2	Survival space requirements for passenger areas	18
6.3.3	Driver's cab survival space requirements	19
6.3.4	Explanatory notes (informative)	19
6.3.5	Definition of driver's seat survival space envelopes	20
6.4	Deceleration limit/collision pulse	23
6.4.1	Requirement	23
6.4.2	Explanatory notes (informative)	24
6.5	Obstacle deflector	24
6.5.1	Requirement	24
6.5.2	Explanatory notes (informative)	27
6.6	Lifeguards	28
6.6.1	Requirement	28

6.6.2	Explanatory notes (informative)	28
7	Validation of crashworthiness	28
7.1	Validation programme	28
7.2	Combined validation programme	29
7.2.1	Step 1: Test of energy absorbing devices and crumple zones	29
7.2.2	Step 2: Test Calibration of the numerical model	29
7.2.3	Step 3: Numerical simulation of the design collision scenarios	29
7.3	Reduced validation programme	30
7.4	Conformity assessment	30
Annex A (informative) Parameters of design collision scenarios		31
A.1	Introduction	31
A.2	Determining the design collision scenarios for collision risks which differ from the normal European operations	32
A.2.1	Design collision scenarios	32
A.2.2	Risk analysis	32
A.2.3	Factors to be considered in the risk assessment	33
A.2.4	Collisions following derailment	33
A.2.5	Bibliography of relevant accident information	34
Annex B (normative) Requirements of a validation programme		35
B.1	Test specifications	35
B.1.1	Test programme	35
B.1.2	Acceptance criteria for calibration/validation tests	35
B.2	Numerical simulations	36
B.2.1	Numerical model validation	36
B.2.2	Simulation modelling	36
Annex C (normative) Reference obstacle definitions		38
C.1	80 t wagon with side buffers	38
C.2	80 t wagon with centre buffer freight coupler	39
C.3	129 t regional train	41
C.4	Level crossing 15 t deformable obstacle	43
C.5	Urban road traffic 3 t rigid corner collision obstacle	44
C.6	Urban road traffic 7,5 t obstacle	45
Annex D (normative) Reference train definitions		49
D.1	Reference trains for locomotive, power head, driving trailer and coach design	49
D.2	Locomotive design	49
D.3	Power head and driving trailer design	49
D.4	Coach design	50
D.5	Coach design limited to specific leading vehicles	51
Annex E (informative) Migration rule for this European Standard		53
Bibliography		54