

DIN 6701-3:2015-12 (E)

Adhesive bonding of railway vehicles and parts - Part 3: Guideline for construction design and verification of bonds on railway vehicles

Contents		Page
Foreword		4
1	Scope	5
2	Normative references	5
3	Terms and definitions	7
4	Classification of bonds	7
4.1	General	7
4.2	Classification according to level of safety requirements	7
5	Requirements profile	8
6	Choice of bonding system	8
7	Preparation for bonding, design of assemblies, components and bonded joints	9
8	Verification	9
8.1	General	9
8.2	Documentation of verification	11
8.3	Determining loads	11
8.3.1	General	11
8.3.2	Design considerations	11
8.3.3	Finite element method	12
8.4	Determining the load limit	12
8.4.1	General	12
8.4.2	Adhesion	12
8.4.3	Bonding parameters	13
8.4.4	Component testing	14
8.4.5	Permissible stress and strain	14
8.5	Design of joint	15
8.6	Effects of manufacturing on permissible bonding parameters	15
9	Verification according to bond class	16
Annex A (normative)	Determining the load limit	18
A.1	General	18
A.2	Characteristic values and the permissible load limit	18
A.3	Testing low-modulus (flexible) adhesives	20
A.3.1	General	20
A.3.2	Determining the modulus of elasticity, the Poisson's ratio and the stress/strain characteristic using adhesive test pieces	20
A.3.3	Testing the quasi-static bond strength for bonds formed with low-modulus adhesives	21
A.3.4	Testing the elongation at break after relaxation of bonds using low-modulus adhesives	21
A.3.5	Testing the elongation at break after relaxation of bonds using low-modulus adhesives	22
A.3.5	Testing the creep behaviour of bonds using low-modulus adhesives	22
A.3.6	Testing the fatigue strength of bonds using low-modulus adhesives	23
A.4	Testing high-modulus (very stiff) adhesives	23

A.4.1	Determining the modulus of elasticity, the Poisson's ratio and the stress/strain characteristic using adhesive test pieces	23
A.4.2	Testing lap shear strength	23
A.4.3	Testing the creep behaviour of bonds using high-modulus adhesives	23
A.4.4	Testing the fatigue strength of bonds using high-modulus adhesives	23
A.5	Other tests: Measurement of pH value of cured adhesives exposure to moisture	24
Annex B (informative)	List of requirements	25
Annex C (informative)	Criteria for choosing a bonding system	26
Annex D (informative)	Design documentation	30
Annex E (informative)	Ageing tests	34
Bibliography		36

Figures

Figure 1 — Verification flow chart	10
Figure A.1 — Type S2 test piece as in DIN 53504 (thickness d: 2 mm \pm 0,5 mm)	20
Figure A.2 — Test piece for testing the strength of bonds using a low-modulus adhesive (example)	21
Figure A.3 — Test piece for compression test	22
Figure D.1 — Identification of adhesives and auxiliary materials (example)	31
Figure D.2 — Dimensioning of bonds (example)	32
Figure D.3 — Other lettering (example)	33

Tables

Table 1 — Classification of bonds	8
Table 2 — Measures to be taken and documentation in the verification for bond classes	16
Table A.1 — One-sided statistical tolerance interval (unknown variance), normal distribution (as in DIN ISO 16269-6:2009-10, Table D.4)	19
Table B.1 — Major items dealt with in a list of requirements (on the lines of [1])	25
Table C.1 — Criteria for choosing a bonding system	26
Table E.1 — List of commonly used ageing tests	34