

DIN EN 1993-1-9:2026-10 (E)

Eurocode 3 - Design of steel structures - Part 1-9: Fatigue

Contents

	Page
European foreword	4
0 Introduction.....	6
1 Scope.....	9
1.1 Scope of EN 1993-1-9	9
1.2 Assumptions	9
2 Normative references.....	10
3 Terms, definitions and symbols	10
3.1 Terms and definitions.....	10
3.1.1 General.....	10
3.1.2 Fatigue actions	15
3.1.3 Fatigue action effect.....	17
3.1.4 Fatigue resistance.....	20
3.1.5 Fatigue verification	25
3.2 Symbols	26
3.2.1 Latin upper-case letters.....	26
3.2.2 Latin lower-case letters	27
3.2.3 Greek upper-case letters.....	27
3.2.4 Greek lower-case letters	28
4 Basis of fatigue design.....	28
5 Fatigue design concepts.....	29
6 Fatigue design methods.....	30
6.1 Design stress methods	30
6.2 Verification methods	30
7 Fatigue action effect.....	31
7.1 Calculation of nominal stresses.....	31
7.2 Relevant nominal stresses.....	32
7.3 Calculation of nominal stress ranges.....	34
7.3.1 General.....	34
7.3.2 Design value of nominal stress range.....	35
7.4 Effective design value of stress range.....	36
8 Fatigue resistance.....	37
8.1 Fatigue resistance curves.....	37
8.2 Classification of constructional details.....	43
8.3 Fatigue resistance modifications	44
8.3.1 Size effect	44
8.3.2 Post-fabrication treatment.....	44
9 Fatigue verification	45
9.1 Verification with respect to elastic behaviour	45
9.2 Verification with respect to reference value of fatigue resistance.....	45
9.3 Verification with respect to fatigue limit	46
9.4 Verification for multiaxial fatigue	46
10 Classified constructional details for the nominal stress method	47
Annex A (normative) Verification using cumulative linear damage model	82
A.1 Use of this annex	82
A.2 Scope and field of application	82

A.3	Fatigue action effect.....	82
A.3.1	Stresses from fatigue actions.....	82
A.3.2	Calculation of stress ranges	82
A.3.3	Number of cycles corresponding with stress ranges.....	83
A.4	Fatigue resistance.....	83
A.4.1	Endurance for the nominal stress method	83
A.4.2	Endurance for the hot spot stress method	85
A.4.3	Endurance for the effective notch stress method	86
A.4.4	Endurance for welded joints subjected to High Frequency Mechanical Impact Treatment.....	86
A.5	Fatigue verification.....	86
Annex B (normative) Hot spot stress method		89
Annex C (normative) Effective notch stress method.....		99
Annex D (informative) Recommendations for magnification factors k_1 and stress concentration factors k_t		103
D.1	Use of this annex	103
D.2	Scope and field of application	103
D.3	Secondary moments in lattice girders	103
D.4	Flanges of I-section girders with transitions in thickness or width.....	104
D.5	Thickness transitions in plates.....	106
D.6	Shell structures	106
Annex E (informative) Recommendations for preloaded bolts and rods subject to tension		107
Annex F (informative) Fatigue design of welded joints subjected to High Frequency Mechanical Impact treatment		110
Annex G (informative) Hot spot stress reference detail method.....		121
Bibliography		123