

DIN 743-1:2012-12 (E)

Calculation of load capacity of shafts and axles - Part 1: General

Contents		Page
Foreword.....		3
Introduction		5
1 Scope		6
2 Normative references		7
3 Symbols, designations and units.....		7
4 Proof of avoidance of fatigue failure		9
4.1 Factor of safety		9
4.2 Working stresses		10
4.3 Fatigue strength value		10
5 Proof of avoidance of permanent deformation, incipient cracking or overload breakage under maximum load.....		14
5.1 Safety factor		14
5.1.1 Proof of avoidance of permanent deformation.....		15
5.1.2 Proof of avoidance of incipient cracking (and/or overload breakage) in hard surfaces		16
5.2 Component yield point.....		16
5.3 Component's incipient crack limit		17
5.4 Working stresses (maximum stresses).....		18
Annex A (informative) Explanations of the variation of load and/or stress, cross-sectional areas and the reading of σ_{ADK} from the Smith diagram		19
Annex B (normative) Schema of the safety factor calculation		22
B.1 General schema		22
B.2 Total influence factor		24
Bibliography		25
 Figures		
Figure A.1 — Variation of applied load with time (F_{zd}, M_b, M_t) and stress ($\sigma_{zd}, \sigma_b, \tau_t$).....		19
Figure A.2 — Origination of amplitude of bending moment M_b as a result of shaft rotation (rotational bending); force F with constant direction, shaft rotating ($\omega = 2 \cdot \pi \cdot n > 0$)		19
Figure A.3 — Cross section parameters		19
Figure A.4 — Load cases, represented in the fatigue strength diagram (Smith diagram).....		20
Figure A.5 — Fatigue strength diagram with extension of the compression zone (component pressure yield point σ_{dFK})		21
Figure B.1 — Calculation procedure for safety factors		23
Figure B.2 — Calculation procedure for total influence factor $K_{\sigma, \tau}$		24

Tables

Table 1 — Determination of working stresses	10
Table 2 — Increase factor for yield point γ_F at circumferential notch (α_σ and/or β_σ according to DIN 743-2) and materials without hard surface.....	17
Table 3 — Static support factor K_{2F} for materials without hard surface	17
Table 4 — Determination of maximum stresses (maximum nominal stresses)	18
Table A1 — σ_{ADK} in the marked compression zone for load case 1 with $\sigma_{mv} < \sigma_{mv \text{ grenz F1}}$ and/or for load case 2 with $\sigma_{mv}/\sigma_a < (\sigma_{mv}/\sigma_a)_{\text{grenz F2}}$ (in the compression zone $\sigma_{mv} < 0$ or $\sigma_{mv}/\sigma_a < 0$ applies)	21