NOMENCLATURE

\( D_{\text{out}}, D_{\text{in}} \)  outer and inner diameters of tubular specimens
\( D_o, D_\alpha \)  strain and stress deviators, respectively
\( E \)  Young’s modulus
\( F_o, F, F_c \)  original, current, and limiting (in the neck) cross-sectional areas of a specimen
\( G \)  shear modulus
\( h \)  thickness of a flat specimen or of the wall of a tubular specimen
\( I_{1}', I_{2}', I_{3}' \)  the first, second, and third invariants of the stress deviator
\( I_{1}, I_{2}, I_{3} \)  the first, second, and third invariants of the stress tensor
\( I, k_o \)  parameters of the stress state rigidity: \( I = 3k_o \), \( k_o = \frac{\sigma_o}{\sigma_i} \)
\( K_o \)  bulk modulus
\( M_T, M_b \)  twisting and bending moments
\( N \)  axial load
\( p \)  pressure of the working medium (gas or liquid)
\( S_{1c}, S_{2c}, S_{3c} \)  ultimate principal normal stresses calculated from real dimensions of a specimen at the instant of fracture
\( s, s_c \)  current and ultimate reduction of the specimen cross-sectional area,
\( s = \ln F_o/F; s_c = \ln F_o/F_c \)
\( T_\sigma, T_\sigma \)  strain tensor and stress tensor
\( T_\sigma^o, T_\sigma^o \)  spherical strain tensor and spherical stress tensor
\( \gamma_{12}, \gamma_{23}, \gamma_{31} \)  principal shear strains
\( \gamma_{xy}, \gamma_{yz}, \gamma_{zx} \)  shear strains in the planes \( xy, yz, \text{and } zx \)
\( \gamma_{x\theta}, \gamma_{y\theta}, \gamma_{z\theta} \)  shear strains in tubular specimens in the planes \( x\theta, y\theta, \text{and } z\theta \)
\( \gamma_{\text{max}} \)  maximal shear strain
\( \gamma_{\text{oct}} \)  octahedral shear strain
\( \gamma_i \)  shear strain intensity
\( \dot{\gamma}_i \)  shear strain rate intensity
\( \gamma_u \)  uniform limiting shear strain in pure torsion
\( \gamma_{\text{shu}}, \gamma_{\text{sho}}, \gamma_{\text{rzu}} \)  limiting shear strains in tubular specimens under multicomponent loading
\( \gamma_{\text{max}}, \gamma_{\text{oct}} \)  ultimate values of maximal strains and octahedral strains
\( \gamma_{uu} \)  ultimate value of the shear strain intensity
\( \gamma_{\text{cm}} \)  maximal ultimate shear strain in the site of fracture
\( \gamma_a \)  amplitude value of the shear strain
\( \delta \)  relative elongation after fracture in uniaxial tension
\( \varepsilon_1, \varepsilon_2, \varepsilon_3 \)  principal linear strains
\( \varepsilon_x, \varepsilon_y, \varepsilon_z \)  strains in the \( x, y, \text{and } z \) directions
\( \varepsilon_{\theta}, \varepsilon_{\phi}, \varepsilon_r \)  axial, circumferential, and radial strains in tubular specimens
\( \varepsilon_o \)  mean strain
\( \dot{\varepsilon}_1, \dot{\varepsilon}_2, \dot{\varepsilon}_3 \)  strain rates
\( \varepsilon_i \) strain intensity
\( \dot{\varepsilon}_i \) strain rate intensity
\( \varepsilon_a \) amplitude strain value under cyclic loading
\( \varepsilon_{ia} \) amplitude strain intensity value under cyclic loading
\( \varepsilon_u \) uniform limiting strain in uniaxial tension
\( \varepsilon_{1u}, \varepsilon_{2u}, \varepsilon_{3u} \) uniform limiting principal plastic strains at a complex stress state
\( \varepsilon_{tu}, \varepsilon_{th}, \varepsilon_{tu} \) uniform limiting plastic strains in tubular specimens
\( \varepsilon_{1c}, \varepsilon_{2c}, \varepsilon_{3c} \) ultimate plastic strains in the site of fracture
\( \varepsilon_{umax}, \varepsilon_{cmax} \) maximal uniform and ultimate strains, respectively
\( \varepsilon_{iu}, \varepsilon_{ic} \) limiting value of uniform strain intensity and ultimate plastic strain intensity, respectively
\( \varepsilon_{oct} \) octahedral normal strain
\( \varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t} \) limiting principal strains in creep
\( \theta_1, \theta_2, \theta_3 \) the first, second, and third invariants of the strain tensor
\( \theta_o \) relative volume change
\( \mu \) Poisson’s ratio
\( \mu_\alpha, \mu_e \) parameters of the stress and strain deviator types (Lode’s parameters)
\( \nu \) coefficient of transverse strain in the elastoplastic range
\( \sigma_1, \sigma_2, \sigma_3 \) principal normal stresses
\( \sigma_n, \sigma_y, \sigma_z \) normal stresses on the planes perpendicular to the axes x, y, and z
\( \sigma_2, \sigma_9, \sigma_r \) axial, circumferential, and radial normal stresses in a tubular specimen
\( \sigma_o \) mean normal stress
\( \sigma_i \) stress intensity
\( \sigma_{oct} \) normal octahedral stress
\( \sigma_p \) proportional limit in uniaxial tension
\( \sigma_{02}, \sigma_{02}^+ \) yield strengths in tension and compression determined by an offset residual strain of 0.2 %
\( \sigma_{u}, \sigma_{u}^- \) ultimate strength in uniaxial tension and compression, respectively
\( \sigma_{u}^+, \sigma_{u}^- \) true ultimate strength in uniaxial tension and compression calculated by the maximal load considering real dimensions of a specimen
\( \sigma_{1p}, \sigma_{2p}, \sigma_{3p} \) stresses corresponding to a proportional limit under a complex stress state
\( \sigma_{1y}, \sigma_{2y}, \sigma_{3y} \) stresses corresponding to the yield strength under a complex stress state
\( \sigma_{yy} \) yield strength determined from the generalized curve \( \sigma_i = \sigma_i(\varepsilon_i) \) by an offset residual strain of 0.2 %
\( \sigma_{1u}, \sigma_{2u}, \sigma_{3u} \) true stresses corresponding to the maximal load under a complex stress state
\( \sigma_{1u}, \sigma_{2u}, \sigma_{3u} \) conventional stresses corresponding to the maximal load under a complex stress state
\( \sigma_{iu}, \sigma_{iu}^- \) true value of the stress intensity corresponding to the maximal load
\( \sigma_{iu}^+, \sigma_{iu}^- \) long-term strength in tension and compression
\( \sigma_{1b}, \sigma_{2b}, \sigma_{3b} \) stresses corresponding to the long-term strength under a complex stress state
σₘ, σₘₐₓ stress amplitude and mean stress under cyclic uniaxial loading, respectively
σₖₚ, σₖₘ stress amplitude intensity and mean stress intensity under cyclic loading
σ₁₂, σ₃₃, σ₃₁ fatigue limit under fully reversed loading in bending
τ₁₂, τ₂₃, τ₃₁ principal shear stresses
τ₁₂, τ₂₃, τ₃₁ shear stresses on planes perpendicular to the y, z, and x axes
and parallel to the x, y, and z axes, respectively
τᵤ ultimate strength in torsion
τᵧ yield strength in torsion
τₑ shear stress in a tubular specimen
τₑ p proportional limit in torsion
τₑ oct octahedral shear stress
τₑ m mean value of shear octahedral stress under cyclic loading
τₑ max maximal shear stress
τₑ max, τₑ oct limiting values of the maximal and shear octahedral stresses
τ₋₁ fatigue limit in torsion
τ₀ fatigue limit in pulsating torsion
Ψ, Ψₑ local (in the neck) and uniform reduction of the cross-sectional area
after fracture in uniaxial tension