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# Enhanced multiaxial fatigue criterion that considers stress gradient effects

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## Abstract

Modification of a fatigue criterion valid for homogeneous multiaxial stress states to account for the beneficial effect of stress gradients is traditionally performed by modifying the stress terms in the fatigue criterion and thereby introducing new parameters that need to be calibrated. Here the stress terms are left unchanged and, instead, the parameters in the fatigue criterion are modified. This modification is performed, in principle, along the lines of Siebel and Stieler and it introduces Neuber's parameter as the only new parameter; however, as soon as the ultimate strength of the material is known, also Neuber's parameter is known. Therefore, the methodology introduced implies that no new calibration process is needed.

Here a specific fatigue criterion valid for homogeneous multiaxial stress states is enhanced by this procedure and predictions of this simple approach are compared with a broad range of experimental data and good accuracy is achieved. Moreover, the approach adopted can be applied to other fatigue criteria than the one considered here.

## Introduction

Fatigue is a major source behind failures of mechanical structures, but despite significant developments since the pioneering work of Wöhler around 1860, the complexity of fatigue phenomena implies that a number of fundamental issues are still open for discussion; the historical development is presented e.g. by Schütz (1996) and Schijve (2003). For high-cycle fatigue, which is considered here, the

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