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Resistance welding — Destructive testing of welds — Method for the fatigue testing of multi-spot-welded specimens

Soudage par résistance — Essais destructifs des soudures — Méthode d'essai de fatigue des échantillons soudés par points multiples

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Foreword

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This document was prepared by Technical Committee ISO/TC 44, *Welding and allied processes*, Subcommittee SC 6, *Resistance welding and allied mechanical joining.*

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This second edition cancels and replaces the first edition (ISO 18592:2009), which has been technically revised. The main changes compared to the previous edition are as follows:

— Clause 3 has been updated;

— Figures and tables have been updated.

Introduction

This document has been prepared because welding engineers (and most design engineers) are not familiar with fatigue testing and the influence of factors such as load type (e.g. shear load, peel load), and failure criteria.

Tests are used to investigate the existence of specific properties and their qualitative and quantitative evaluation. Fatigue tests, in general, are used to investigate the behaviour of structures and components subjected to cyclic loads. For welded components, fatigue tests are used to determine the influence of different parameters such as joining methods, pitch, material thickness and material combinations, type of load (e.g. shear load, peel load), overlap, location of weld on flange, edge distance, loading condition (e.g. quasi-static, cyclic, load ratio R), and the combination of environment and corrosion on the fatigue behaviour (life) of spot welds and/or specimens subjected to various types of loads. Fatigue tests will, if their results are to be used for design purposes, as far as possible, take into consideration such boundary conditions as encountered in a real-life environment. This applies to load types, load amplitudes, and load ratios as well as load distributions and failure criteria[7].

The test specimen selected for the fatigue test will simulate, as closely as possible, the loads and the boundary conditions as they are encountered in service. Furthermore, the failure criterion used must conform to the application in hand. Although the type of primary load is identical in some specimens, e.g. shear load in flat multi-spot specimens, H-shear specimens, KS-2 specimens, and double disc specimens, the results of fatigue tests differ significantly because of the secondary load types resulting from varying degrees of local deformation due to the differences in the local stiffness in the area of the joints. The local deformation, responsible for the magnitude of the peel component, for example, is a function of the local stiffness, increasing with a decrease in stiffness.

This document offers a framework within which the different specimens, described herein, can be modified such that design specifics and production constraints, e.g. flange width and overlap, weld nugget size, pitch, bending radius, and sub-standard welds, can be given due consideration. This helps towards enhancing the significance of the results very appreciably. Note that if welds could be subjected to identical amplitudes of shear and peel loads, their lives would differ by a factor of approximately 10^4 (References [8] to [11]). This explains the necessity to use different specimens for the simulation of different load types.

Conformance tests on real components serve the verification of design calculations and are necessary for the qualification of structures. It is therefore necessary to maintain their number at an absolute minimum.

