



Low Temperature Behaviour of High-Strength Structural Bolting Assemblies of Large Diameters

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Abstract

The application of high-strength structural bolting assemblies of the HV system according to EN 14399-4 and EN 14399-6 and DAST-Richtlinie 021 with large diameters up to M72 as preloaded bolting assemblies in highly loaded steel structures like offshore wind towers, where the connections are exposed to low temperatures beside static and fatigue loads. To close the lack of knowledge on low temperature behaviour of these bolts, systematic investigations were carried out to determine the tendency of brittle fracture of high-strength bolts with large diameters. This paper presents the main results of the experimental investigations on the tendency of brittle fracture in terms of component tests at low temperatures.

Keywords: Brittle Fracture, high-strength bolts of large diameter, low temperature behaviour of bolts

1 Introduction

High-strength structural bolting assemblies of the HV system according to EN 14399-4 [1] and EN 14399-6 [2] or DAST-Richtlinie 021 [3], respectively, with large diameters up to M72 are increasingly used as preloaded bolting assemblies in highly loaded steel structures, especially in wind towers, where these connections are exposed to low temperatures additionally to the regular static and fatigue loads. So far, no investigations on the low

temperature behaviour of bolts of large diameters exist and the choice of steel material for high strength bolts is not covered by EN 1993-1-10 [4]. As a precaution, high strength bolts of large diameters are typically made of higher alloyed steels without knowing whether the higher alloy of the bolt base material is sufficient.

Usually, high-strength bolts according to EN 14399-4 are made of quenched and tempered steel 32CrB4 (1.7076) or 36CrB4 (1.7077) according to EN 10263-4 [5], respectively. For