

Accepted Manuscript

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PII: S0142-1123(18)30625-X
DOI: <https://doi.org/10.1016/j.ijfatigue.2018.10.003>
Reference: JIJF 4867

To appear in: *International Journal of Fatigue*

Received Date: 29 April 2018
Revised Date: 29 September 2018
Accepted Date: 6 October 2018

Please cite this article as: Hashimoto, S., Komata, H., Okazaki, S., Matsunaga, H., Quantitative Evaluation of the Flaking Strength of Rolling Bearings with Small Defects as a Crack Problem, *International Journal of Fatigue* (2018), doi: <https://doi.org/10.1016/j.ijfatigue.2018.10.003>

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Submitted to International Journal of Fatigue (Special Issue for FDMD3)

Quantitative Evaluation of the Flaking Strength of Rolling Bearings with Small Defects as a Crack Problem

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Abstract

Rolling contact fatigue (RCF) tests were conducted on rolling bearings with drilled holes at the mid-point of the raceway. Flaking limit was determined by the shear-mode threshold of a crack that emanated at the edge of drilled hole. To quantify the RCF strength according to fracture mechanics principles, Mode II stress intensity factor (SIF) range of the crack was derived. Taking a small crack effect on the shear-mode fatigue crack into account, RCF strength was successfully evaluated as a crack problem, irrespective of the diameters and depths of the hole. The values of the threshold SIF range obtained by RCF tests were in good agreement with those obtained in the torsional fatigue tests under static compression.

Keywords: Rolling contact fatigue; Stress intensity factor; Shear-mode fatigue crack; FEM analysis; Small defect

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