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Inverse problems of measurement with application on specification of surface profile

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ABSTRACT

For the contact surface measurement, a contradiction of the specification of surface profile (ISO1101, 2005) is pointed out according to the properties of morphological filters: when an actual surface profile coincides with the USL (upper spec. limit), thus within specification, the measurement result (without errors) would, however, be out of specification.

To understand and avoid this contradiction, the relationship between the observed data of the measurement process and the (true) values of the measurand (quantity to be measured) need to be understood. The inverse problem of measurement (IPM) is defined base on the representational measurement theory, which can be used to formulate that relationship in terms of mappings.

Base on the concept of IPM, the inverse problem of contact surface measurement is defined, and the essential reason of the contradiction can be explained. Moreover, a desired property of specification limits is derived. Thereby, a correction of the USL of surface profile is proposed for solving the contradiction.

Keywords: specification of surface profile; inverse problems; measurement theory; morphological filters.