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Statistical methods in process management — Capability and performance

Part 9: Process capability statistics for characteristics defined by geometrical specifications

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 69, *Applications of statistical methods*, Subcommittee SC 4, *Applications of statistical methods in products and process management*.

This document is a second draft for approval and only editorial changes will be made before publication.

A list of all parts in the ISO 22514 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Many organizations will need to evaluate the capability and performance of their key processes when the specifications are defined by requirements other than linear size. The methods described in this document are intended to assist the organization in this respect.

During the last couple of years, it has been more common in the design and development departments in companies to not only use linear tolerances alone, but also including modifiers as well as geometrical tolerances with or without use of the maximum material requirements.

This situation has been supported by new measurement methods used in production, where it is common to use measurement equipment, where the results are given in form of point clouds instead of one single value.

It is a challenge in such cases to calculate capability and performance, but organizations and customers still require the capability indices in acceptance of produced or delivered batches of parts.

This document describes how to calculate capability or performance where functional requirements on parts are given.

As an example, the “maximum material requirement”, MMR, covers “assemble ability” and the “least material requirement”, LMR, covers, for example, “minimum wall thickness” of a part. Each requirement (MMR and LMR) combines two independent requirements into one collective requirement, which simulates the intended function of the workpiece. In some cases of both MMR and LMR, the “reciprocity requirement”, RPR, can be added.

In Annex D, a case study of process analysis, where the characteristic to be improved is perpendicularity, is introduced.

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Statistical methods in process management — Capability and performance —

Part 9: Process capability statistics for characteristics defined by geometrical specifications

1 Scope

This document describes process capability and performance measures when the specifications are given by geometrical product specifications e.g. maximum material requirements or linear size with a modifier.

The purpose of this document of the international series of standards on capability calculation is to assist the organizations to calculate the PCIs (process capability index) when geometrical product specifications are used on drawings.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms

3.1.1
feature of size
feature of linear size
geometrical feature, having one or more intrinsic characteristics, only one of which can be considered as variable parameter, that additionally is a member of a “one parameter family”, and obeys the monotonic containment property for that parameter

EXAMPLE 1 A single cylindrical hole or shaft is a feature of linear size. Its linear size is its diameter.

EXAMPLE 2 Two opposite parallel plane surfaces are a feature of linear size. Its linear size is the distance between the two parallel planes.

[SOURCE: ISO 17450-1:2011, 3.3.1.5.1., modified: “may” replaced by “can”, deleted Note 1 to Note 4, deleted reference to Figure 5 (ISO 17450-1:2011), deleted EXAMPLE 2, added new EXAMPLE 2]

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