Irish Standard
I.S. EN ISO 20170:2019

Geometrical product specifications (GPS) - Decomposition of geometrical characteristics for manufacturing control (ISO 20170:2019)

I.S. EN ISO 20170:2019

Incorporating amendments/corrigenda/National Annexes issued since publication:

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National Foreword

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 20170

May 2019

ICS 17.040.01; 17.040.40

English Version

Geometrical product specifications (GPS) - Decomposition of geometrical characteristics for manufacturing control (ISO 20170:2019)

Spécification géométrique des produits (GPS) - Décomposition des caractéristiques géométriques pour la maîtrise de la fabrication (ISO 20170:2019)

Geometrische Produktspezifikation (GPS) - Zerlegung von geometrischen Merkmalen für die Fertigungskontrolle (ISO 20170:2019)

This European Standard was approved by CEN on 19 February 2019.

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European foreword

This document (EN ISO 20170:2019) has been prepared by Technical Committee ISO/TC 213 "Dimensional and geometrical product specifications and verification" in collaboration with Technical Committee CEN/TC 290 “Dimensional and geometrical product specification and verification” the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2019, and conflicting national standards shall be withdrawn at the latest by November 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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I.S. EN ISO 20170:2019

INTERNATIONAL STANDARD

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Geometrical product specifications (GPS) — Decomposition of geometrical characteristics for manufacturing control

Spécification géométrique des produits (GPS) — Décomposition des caractéristiques géométriques pour la maîtrise de la fabrication

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Foreword

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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 documents 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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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

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.

Introduction

This document is a geometrical product specifications (GPS) standard and is to be regarded as a fundamental GPS standard (see ISO 14638). It influences indirectly chain link E of the chains of standards of geometrical characteristic (size, distance, form, orientation, location and run-out) in the general GPS matrix model as graphically illustrated in Table A.1. The measurement as given in chain link E is decomposed to evaluate quantity values of a geometrical characteristic, and to define manufacturing adjustment values, not to manage the conformance of a workpiece.

The ISO GPS matrix model given in ISO 14638 gives an overview of the ISO GPS system of which this document is a part. The fundamental rules of ISO GPS given in ISO 8015 apply to this document and the default decision rules given in ISO 14253-1 apply to specifications made in accordance with this document, unless otherwise indicated.

For more detailed information on the relationship of this document to other standards and to the GPS matrix model, see Annex A.

The geometrical specification, as defined in ISO 1101, allows the evaluation of conformance or non-conformance by defining a limit value for a geometrical characteristic as a univariate characteristic (non-signed value). This evaluation alone does not provide the information necessary to adjust machine tools parameters to maintain the production of conforming workpieces. The goal of decomposition of the measurement result is to isolate parameter values that can be used to adjust the manufacturing process. This document uses simple examples to illustrate the fundamental principles.

This document defines a number of independent characteristics obtained by decomposition that are intended to assist with adjusting and evaluating the manufacturing process.

In statistical analysis the mean value and standard deviation are used to calculate capability indices. In the case of a position tolerance, for example the location of a hole, which applies in a plane perpendicular to the axis of the hole, the position characteristic is two times the radial distance between the centre of the hole and its theoretically exact location. Capability indices based on the mean value and standard deviation of this characteristic do not properly reflect the capability of a manufacturing process. Instead, the position characteristic could be decomposed according to the kinematic arrangement of the manufacturing process. If the axis of the hole is manufactured using a machine with linear X- and Y-axes, the position characteristic could be decomposed into an X-component and a Y-component and the studies of capability could be calculated based on these components so that they properly reflect the capability of the manufacturing process.

Geometrical product specifications (GPS) — Decomposition of geometrical characteristics for manufacturing control

1 Scope

This document describes principles and tools to control a manufacturing process in accordance with a GPS specification. For this purpose a set of one or more complementary, independent characteristics (size, form, orientation, and location characteristics independent to each other) that correlate to the manufacturing process parameters and to the manufacturing process coordinate system established from the manufacturing datum system are used.

This document describes the concept of decomposition of the macro-geometrical part of the GPS specification. It does not cover the micro-geometry, i.e. surface texture.

The objective of the decomposition presented in this document is to define correction values for manufacturing control or to perform a statistical analysis of the process.

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 terminological databases for use in standardization at the following addresses:

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

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

3.1
univariate characteristic
characteristic represented by a single scalar variable

EXAMPLE A global size characteristic is a univariate characteristic.

3.2
collected characteristic
C
set of a *univariate characteristic* (3.1) and the multivariate characteristic required to derive it (see 3.3)

EXAMPLE For a position specification, the median line of a hole is constrained by a cylindrical tolerance zone with a diameter of 0,4 mm. The global univariate characteristic result is 0,5 mm (out of tolerance). The decomposition of the location in two directions (X, Y) at a given height is given by the multivariate characteristic result (+0,15; +0,2). The collected characteristic combines the global result and its decomposition.