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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 39643-2020

Geometrical product specifications (GPS) - Systematic errors and contributions to measurement uncertainty of length measurement due to thermal influences

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1:1-2009:

This standard uses the redrafting method to amend and adopt ISO /T R16015:2003 "Geometrical Technical Specifications for Products (GPS) Length Measurement of Medium Temperature

The source of system error and measurement uncertainty introduced by the degree of influence":

The technical differences between this standard and ISO /T R16015:2003 and the reasons are as follows:

---Regarding normative reference documents, this section has made adjustments with technical differences to adapt to my country's technical conditions and adjustments:

The situation is collectively reflected in Chapter 2 "Normative Reference Documents", and the specific adjustments are as follows:

* Replace ISO 1 with GB/T 19765, which is equivalent to the international standard (see Chapter 4);

* Use JJF1001 instead of VIM (see Chapter 3);

* Use JJF1059:1 instead of GUM (see Chapter 3):

This standard was proposed and managed by the National Standardization Technical Committee for Product Geometric Technical Specifications (SAC/TC240):

Drafting organizations of this standard: Anji Asia-Pacific Brake System Co:, Ltd:, China Academy of Metrology, Shanghai Institute of Metrology and Testing Technology,

CMC Productivity Promotion Center, Chongqing Institute of Metrology Quality Inspection, Shandong University of Technology, Shaanxi Institute of Metrology:

Introduction

This standard is one of the general GPS standards in the product geometric technical specification (GPS) series (see GB/T 20308): It involves standard

D, E, F and G links:

The uncertainty of temperature measurement and the measurement deviation from the standard reference temperature will introduce uncertainty in the length measurement results: In addition, partial

Measurements away from the standard reference temperature will cause systematic errors in the measurement results:

The basis of this standard is that most materials will expand or contract when the temperature changes: If the temperature during measurement is

Quasi-reference temperature, the nominal thermal expansion is zero, but the uncertainty of temperature measurement will introduce the uncertainty of the measurement result: If the length measurement is not

Performing at the standard reference temperature will result in a difference in thermal expansion: When using a working standard to adjust a measuring instrument, or use a measuring instrument to measure

This phenomenon can happen when working on a workpiece:

If the temperature and thermal response of the workpiece, working standard, and measuring instrument are known, the difference in thermal expansion can be corrected: Because it is impossible

Know the temperature and thermal response accurately, so there will be uncertainty in the correction and measurement results: This standard gives the relevant system error calculation method

Method, and the method of evaluating the measurement uncertainty introduced by temperature:

The standard uncertainty due to thermal effects should be expressed in a general way (see JJF1059:1) to evaluate the composite standard

Certainty:

When necessary, appropriate judgment rules can be adopted for the dimensional uncertainty caused by temperature, for example, an acceptable workpiece tolerance

Proportion, or implement the provisions of GB/T 18779:1 to ensure that the compliance of the workpiece size can be judged:

This standard is based on GB/T 19765 and is consistent with GB/T 24637:2: At the time of publication of this standard, we have tried our best to achieve this

a little:

Product Geometric Technical Specification (GPS)

The system error and the

Source of measurement uncertainty

1 Scope

This standard specifies the procedures for determining and correcting errors caused by temperature effects in the length measurement of product geometric specifications (GPS), and

Procedure for evaluating the measurement uncertainty component introduced by temperature influence:

This standard applies to length measurement in the industrial field:

Note 1: The temperature influence includes: the average temperature is the standard reference temperature; the average temperature is not the standard reference temperature, and the average value takes into account changes in time and space; temperature

The degree changes over time:

Note 2: Three situations need to be considered: the average temperature is the standard reference temperature; the average temperature is not the standard reference temperature, and the user should correct it; the average temperature is not the standard

The reference temperature is not corrected by the user:

Note 3: According to the analysis of GB/T 18779:2, thermal effect is an important factor causing measurement uncertainty and forming systematic errors: This standard is more professional

The detailed temperature influence analysis clarifies that temperature influence is an important source of measurement uncertainty and an important factor in the formation of systematic errors: Although not

The temperature gradient is discussed in detail, but some information is provided in Appendix A:

2 Normative references

The following documents are indispensable for the application of this document: For dated reference documents, only the dated version applies to this article

Pieces: For undated references, the latest version (including all amendments) applies to this document:

GB/T 19765 Product Geometrical Technical Specification (GPS) Product Geometrical Technical Specification and Standard Reference Temperature for Inspection

(GB/T 19765-2005, ISO 1:2002, IDT)

JJF1001 General measurement terms and definitions

JJF1059:1 Evaluation and expression of measurement uncertainty

3 Terms and definitions

The following terms and definitions defined by JJF1059:1 and JJF1001 apply to this document: For ease of use, the following is repeated

Some terms and definitions in JJF1001 have been modified:

3:1 Terms related to thermal expansion coefficient

3:1:1

Coefficient of thermal expansion coefficientofthermalexpansion

The ratio of length change rate to temperature change:

Note 1: Generally speaking, this coefficient is a function of temperature: For the purpose of this standard, the average value of a temperature range is used, as in formula (1)

alpha20,T() =

LT -L20

L20(T-20)

(1)