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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 24635.4-2020

**Geometrical product specifications (GPS)-Coordinate measuring machines
(CMM): Technique for determining the uncertainty of measurement - Part 4:
Evaluating task-specific measurement uncertainty using simulation**

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Foreword

GB/T 24635 "Geometric Technical Specification for Products (GPS) Coordinate Measuring Machine (CMM) Technology for Determining Measurement Uncertainty" is divided into

The next few parts:

- Part 1: Summary and measurement characteristics;
- Part 2: Apply multiple measurement strategies;
- Part 3: Application of calibrated parts or standard parts;
- Part 4: Application of simulation technology to evaluate the measurement uncertainty of a

specific task;

---Part 5: Application of expert judgment:

This part is Part 4 of GB/T 24635:

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

This part adopts the redrafting method to modify and adopt ISO /T S15530-4:2008 "Geometrical Technical Specifications for Products (GPS) Coordinate Measuring Machine (CMM) Techniques for Determining Measurement Uncertainty Part 4: Application of Simulation Technology to Evaluate the Measurement Uncertainty of a Specific Task":

The technical differences between this part and ISO /T S15530-4:2008 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 10360-1 with GB/T 16857:1 equivalent to the international standard (see Chapter 3);

* Use JJF1001-2011 instead of ISO /IEC Guide 99:2007 (see Chapter 3);

* Use JJF1059:1 instead of GUM (see Chapter 3, 5:4, 5:5):

This section has made the following editorial changes:

---According to the requirements of GB/T 1:1-2009, in the "Scope" chapter, the "Appendix A of this part gives a checklist:

Statement; See Appendix B for the elements of the Uncertainty Evaluation Software (UES):

"" This part is applicable to the application of simulation when using coordinate measuring machine

True technology evaluates the measurement uncertainty of a specific task:"

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

Drafting organizations of this section: Shenzhen Zhongtu Instrument Co., Ltd., China Institute of Metrology, Shandong University of Technology, Chongqing Metrology

Quality Inspection Institute, Shanghai Institute of Metrology and Testing Technology, CMC Productivity Promotion Center, Shaanxi Institute of Metrology, Carl Zeiss

(Shanghai) Management Co., Ltd:

Introduction

This part of GB/T 24635 is a technical specification for product geometric technical specifications (GPS), which is considered to be a general product geometric technical specification

Documents (see GB/T 20308): It affects the size, distance, shape, direction, position and runout of the link G of the standard chain:

Use coordinate measuring machines (CMMs) to check tolerances, and when conducting pass/fail tests, according to GB/T 18779:1, specific

The measurement uncertainty of the task: Although it is important to master measurement uncertainty, so far, only a few processes can give specific tasks

The uncertainty of measurement:

For simple measuring equipment, according to the "Guidelines for Expression of Measurement Uncertainty" (JJF1059:1), the uncertainty component can be passed

Evaluate this uncertainty: However, as far as the coordinate measuring machine is concerned, due to the complexity of the measurement process, the classic uncertainty evaluation method is

It is impractical for most measurement tasks:

Alternative methods consistent with JJF1059:1 can be used to evaluate the uncertainty of specific tasks in coordinate measurement: Consider the impact of uncertainty

In response, this part of GB/T 24635 describes a method for evaluating uncertainty through numerical simulation of the measurement process:

In order to allow coordinate measuring machine users to easily give the uncertainty value, coordinate measuring machine suppliers and other third-party companies have developed

Uncertainty Evaluation Software (UES) was released: UES is a computer-aided mathematical model based on the measurement process: In this model, reproduced

The measurement process from the measurement to the output of the measurement result takes into account the important influences in the process:

During the simulation process, these influence quantities change within their possible or assumed numerical range (described by the probability distribution), and use these

Possible combinations of influence quantities to repeat the simulation measurement process: The uncertainty depends on the change in the final result:

This process conforms to the basic principles of the internationally valid guidelines for the expression of measurement uncertainty (JJF1059:1): UES details are often hidden

Hidden in the compiled computer code makes it difficult for users to evaluate the reliability of the calculated uncertainty expression: GB/T 24635

Part of it provides UES suppliers and coordinate measuring machine users with terms and test procedures for communicating and quantifying UES capabilities:

This part of GB/T 24635 first considers the impact statement: The statement clarifies what UES considers in its uncertainty assessment

These influence quantities, and the range of their values: For example, some UES consider the influence of using multiple stylus in the measurement process of coordinate measuring machine, and

Other UES are not considered:

Similarly, some UES consider the effect of spatial temperature gradient or temperature change over time, while others do not: Declaration part

The purpose of the CMM is to clearly inform the user of the coordinate measuring machine that UES will consider which influence quantities and the range of their magnitudes in its uncertainty assessment:

This allows the user to have a good idea when making a decision: Buy UES products with only partial functions, not included in the uncertainty evaluation results

Contains the contribution of some influence quantities during the measurement of the coordinate measuring machine, and the user of the coordinate measuring machine needs to evaluate these unaccounted influence quantities by himself, and

And they are combined with the results evaluated by UES to generate an uncertainty statement that meets the JJF1059:1 standard:

This part of GB/T 24635 also gives four possible test methods, and points out that from a practical point of view, there is no one method:

The law is comprehensive: A description of each method is given, and its advantages and disadvantages are also reviewed: Each method also includes a descriptive example:

Product Geometric Technical Specification (GPS)

Coordinate Measuring Machine (CMM)

Techniques for determining measurement uncertainty

Part 4: Apply simulation techniques to evaluate specific tasks

Measurement uncertainty

1 Scope