ICS 25.040.20
CCS J50

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 17421.2-2023

Test code for machine tools - Part 2: Determination of accuracy and repeatability of positioning of numerically controlled axes

机床检验通则 第2部分：数控轴线的定位精度和重复定位精度的确定

Issued on: August 6, 2023 **Implemented on: March 1, 2024**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

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Foreword

This Document was drafted as per the rules specified in GB/T 1.1-2020 Directives for Standardization - Part

1.Rules for the Structure and Drafting of Standardizing Documents. This Document is Part 2 of GB/T 17421 Test Code for Machine Tools. GB/T 17421 consists of the following parts.

1.Geometric accuracy of machines operating under no-load or quasi-static conditions;

2.Determination of accuracy and repeatability of positioning of numerically controlled axes;

3.Determination of thermal effects;

4.Circular tests for numerically controlled machine tools;

5.Determination of the noise emission;

6.Determination of positioning accuracy on body and face diagonals (Diagonal displacement tests);

7.Geometric accuracy of axes of rotation;

10.Determination of the measuring performance of probing systems of numerically controlled machine tools. This Document replaced GB/T 17421.2-2016 Test Code for Machine Tools - Part 2. Determination of Accuracy and Repeatability Positioning Numerically Controlled Axes. Compared with GB/T 17421.2-2016, the major technical changes of this Document are as follows besides the structural adjustments and editorial modifications.

a) Add a new Clause of "Normative References" (see Clause 2 of this Edition);

b) Change the Clause of "Definitions and Symbols" into "Terms and Definitions"; add terms and definitions, such as "

1 Scope

GB/T 17421.2-2023 is Part 2 of the Chinese machine tool test code, and determines the positioning accuracy and repeatability of numerically controlled axes. It is the acceptance test on which the sale of a machine tool turns: the figures it produces are the ones quoted in the specification, compared between suppliers and argued over on handover, and they depend as much on the test procedure as on the machine - on how many target positions, how many approach directions, how the machine was warmed up and what the room temperature was doing. The standard sets the test conditions covering the environment, the machine and the warm-up, the test programme with the mode of operation, the selection of target positions and the measurements, and the evaluation of the results, given separately for linear axes up to 2000 mm and rotary axes up to 360 degrees and for longer travels, with an annex on periodic positioning error. It took effect on 1 March 2024.

This Document specifies methods for testing and evaluating the accuracy and repeatability of positioning of numerically controlled machine tool axes by direct measurement of individual axes on the machine. These methods apply equally to linear and rotary axes. This Document can be used for type testing, acceptance tests, comparison testing, periodic verification, machine compensation, etc. When several axes are simultaneously under test, this Document do not apply. The methods involve repeated measurements at each position. The related parameters of the test are defined and calculated. Their uncertainties are estimated as described in ISO/TR 230- 9.2005, Annex C. Annex A presents the estimation of the measurement uncertainty. Annex B describes the application of an optional test cycle. the step cycle. The results from this cycle are not to be used either in the technical literature with reference to this Document, nor for acceptance purposes, except under special written agreements between manufacturer/supplier and user. Correct reference to

this Document for machine acceptance always refers to the standard test cycle. Annex C contains considerations related to periodic positioning error. Annex D describes tests using ball array and step gauge. Annex E contains least increment step related content.

2 Normative References

GB15760-2025 "Click to view detail/PDF for GB 15760-2025")|[

GB18568-2001 "Click to view detail/PDF for GB 18568-2001")|[

GB/T 17421.1-2023")| ## PDF Preview |

GB/T 17421.2-2023 (Right-click > Save as .pdf)

3.10 Combined standard uncertainty", and "

3.28 Sampling point" (see Clause 3 of this Edition; Clause 2 of the 2016 Edition);

c) Change the definitions of "Actual position" and "Deviation of position"; change "moving component" into "functional point" in the definitions (see 3.5,

3.6 of this Edition; 2.4,

2.5 of the 2016 Edition);

d) Add the terminology names of "Positioning deviation", "Reverse error at a position", " Reverse error of an axis", "Mean reversal error of an axis", "Unidirectional positioning error of an axis", and "Bi-directional positioning error of an axis" (see 3.6, 3.15, 3.16, 3.17, 3.26,

3.27 of this Edition; 2.5, 2.12, 2.13, 2.14, 2.23,

2.24 of the 2016 Edition);

e) Change the terms "Unidirectional systematic positioning value of an axis", "Bi-directional systematic positioning value of an axis", and "Mean bi-directional positioning value of an axis" into "Unidirectional systematic positioning error of an axis", "Bi-directional systematic positioning error of an axis", and "Mean bi-directional positioning error of an axis", respectively (see 3.23, 3.24,

3.25 of this Edition; 2.20, 2.21,

2.22 of the 2016 Edition);

f) Change the relevant provisions regarding feed speed in the operating methods (see

5.1 of this Edition;

4.1 of the 2016 Edition);

g) Change the relevant explanation regarding "r" in the selection of the target position in the inspection procedure; and add requirements for the selection of the target position during

re-inspection or acceptance (see