

ICS 29.020
CCS K40



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

GB/T 42707.2-2024

**Remote operation and maintenance of computer numerical
control (CNC) machine tools - Part 2: Fault diagnosis and
predictive maintenance**

数控机床远程运维 第2部分：故障诊断与预测性维护

Issued on: October 26, 2024

Implemented on: May 1, 2025

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

Table of Contents

1 Scope	1
2 Normative references	1
3 Terms and Definitions	1
4 Status Information Collection	2
4.1 Basic Process	2
4.2 Status Information Dictionary	3
4.3 Status Information Collection Method	4
4.4 Data Transmission	4
4.5 Data Preprocessing	4
4.6 Data Storage	5
4.7 Data Management	5
5 Health Status Assessment	5
5.1 Basic Process	5
5.2 Health Status Assessment Level	6
5.3 Health status assessment methods	6
5.4 Health status assessment indicators	7
5.5 Health Status Assessment Report	7
6 Troubleshooting	7
6.1 Basic Process	7
6.2 Fault Diagnosis Methods	8
6.3 Failure Mode Library	9
6.4 Fault Diagnosis Report	10
7 Fault Status Prediction	10
7.1 Basic Process	10
7.2 Prediction Model Construction	10
7.3 Prediction characteristic indicators	11
29 Table F.3 Tool magazine system fault mode library example	30

Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1. Structure and drafting rules for standardization documents" Drafting. This document is Part 2 of GB/T 42707 Remote Operation and Maintenance of CNC Machine Tools. GB/T 42707 has been published in the following parts.

1. General requirements;

2. Fault diagnosis and predictive maintenance. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document was proposed by the China Machinery Industry Federation. This document is under the jurisdiction of the National Technical Committee for Standardization of Industrial Machinery Electrical Systems (SAC/TC231). This document was drafted by: Beijing Machine Tool Research Institute Co., Ltd., China University of Petroleum (Beijing), Tsinghua University, National Machine Tool Quality Supervision and Inspection Testing Center, Xi'an Jiaotong University, Newway CNC Equipment (Suzhou) Co., Ltd., Zhejiang Hangji Co., Ltd., Zhejiang Haideman Intelligent Equipment Co., Ltd., Zhongpin Intelligent Machinery Co., Ltd., Jiangxi Jiashite CNC Co., Ltd., Ningbo Tianrui Precision Machinery Co., Ltd., Guangdong Chuangneng Precision Machinery Co., Ltd., Huachen Precision Equipment (Kunshan) Co., Ltd., Chongqing Honggang CNC Machine Tool Co., Ltd., Zhenhuan Machine Machine Tool Group Co., Ltd., Huanghu (Zhejiang) Precision Machine Tool Co., Ltd., Zhongshan Maillet CNC Technology Co., Ltd., Shandong University, Jinan Zhangli Machinery Machinery Co., Ltd., Tengzhou Shandong Dahan Intelligent Technology Co., Ltd., Jiangxi Guangxin New Materials Co., Ltd., Shanghai Nuo Zhuoli Mechanical and Electrical Technology Co., Ltd., Zhejiang Zhongzhi Jingong Intelligent Equipment Co., Ltd., Gu'an Aerospace Xingbang Machinery Manufacturing Co., Ltd., Hubei Shenfeng Automobile Spring Co., Ltd. Company, Jugang Precision (Guangdong) Co., Ltd., Primemiller Machine Tool (Dongguan) Co., Ltd., Dongguan Evermi CNC Equipment Technology Co., Ltd. Company, Henan Vocational and Technical College, Ningbo Dekai CNC Machine Tool Co., Ltd., Foshan Demart Intelligent Equipment Technology Co., Ltd., Jiangxi Hengyuan Intelligent Energy Equipment Co., Ltd. The main drafters of this document are. Wang Jinjiang, Xue Ruijuan, Huang Zuguang, Zhang Laibin, Wang Liping, Shao Zhufeng, Zhao Qinzhi, Ji Shuai, Zhang Peisen, Fu Tao, Zhang Fengli, Zhang Ying, Guan Qiang, Jin Zhenggang, Jiang Changye, Liu Hua, Zhu Weiwei, He Yongfang, Xu Caiying, Wang Chuanhong, Jin Yi, Huang Wenbo, Lin Shoujin, Han Jiguang, Huang Chuanqing, Wang Sheng, Tan Yong, Zhao Yafei, Zhang Baosong, Wu Shuihua, Huang Guangjing, Gong Chuangning, Huang Yongsheng, Wang Hui, Wang Zilong, Wang Yan, Zheng Xuegang.

GB/T 42707 addresses the challenges of collecting status information, health status assessment, fault diagnosis and predictive maintenance for CNC machine tools. Starting from the remote operation and maintenance service function of CNC machine tools, based on the research results of machine tool status information collection and remote operation and maintenance technology, a CNC Technical requirements for remote operation and maintenance of machine tools, status information collection, health status assessment, fault

diagnosis and predictive maintenance method guidelines, etc. Guide the research and application of remote operation and maintenance technology in the machine tool industry. GB/T 42707 is intended to consist of two parts (as shown in Figure 1).

1.General requirements. Provides guidance on the overall architecture and general technical requirements for remote operation and maintenance of CNC machine tools. Development and application of remote operation and maintenance platform for CNC machine tools.

2.Fault diagnosis and predictive maintenance. For CNC machine tool status information collection, health status assessment, fault diagnosis and predictive maintenance The process and method of operation and maintenance service functions such as predictive maintenance are proposed, aiming to provide a platform for CNC machine tool status information collection, health status assessment, fault Provide basis and guidance for fault diagnosis and predictive maintenance. Figure

1 Relationship between the various parts of GB/T 42707 Remote Operation and Maintenance of CNC Machine Tools Part 2. Fault diagnosis and predictive maintenance

1 Scope

GB/T 42707.2-2024 covers fault diagnosis and predictive maintenance in the remote operation and maintenance of CNC machine tools. Machine tool builders have moved to selling availability rather than machines, and the economics depend on knowing that a spindle bearing or a ball screw is degrading before it fails in the middle of a part. This part sets out how that is done to a common method: the data to be collected from the control and from added sensors, vibration, current, temperature, position error and the process signals, the sampling and the transmission, the feature extraction and the health indicators derived from them, the diagnostic methods and the fault classification for the principal subsystems, spindle, feed axes, tool, hydraulic and cooling, the prognostic methods and the estimation of remaining useful life, the thresholds and alarms, the maintenance decision and its feedback, and the requirements on the platform and on the accuracy and validation of the diagnosis. It takes effect on 1 May 2025.

This document specifies the status information collection, health status assessment, The basic processes and methods of the four core functions of fault diagnosis and predictive maintenance. This document is intended to guide the development of remote operation and maintenance services and enabling platforms for CNC machine tools (including spindle systems, feed systems, and tool magazine systems). Development and application.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document. For referenced documents without a date,

only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 9061 General technical requirements for metal cutting machine tools

GB/T 31916.1-2015 Information technology Cloud data storage and management Part

3 Terms and Definitions

The terms and definitions defined in GB/T 42707.1-2023 and the following apply to this document.

3.1 The process of obtaining information that can reflect the operating status of CNC machine tools by adding sensors, CNC systems, servo drives or other means.

3.2 attribute set attributeset A collection of one or more attributes of a CNC machine tool, describing the state information attributes of the CNC machine tool. [Source: GB/T 39561.2-2020, 3.1.2, modified]

3.3 staticattributeset An attribute set containing data that does not change or changes infrequently after it is determined. [Source: GB/T 39561.2-2020, 3.1.3, modified]

3.4 dynamicattributeset A type of attribute set that contains data that appears or changes frequently during the operation of a CNC machine tool.

5 Information Model

GB/T 42707.1-2023 Remote operation and maintenance of CNC machine tools Part