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GB/Z 42023.1-2023

Reliability of industrial automation devices and systems - Part 1: Assurance of automation devices reliability data and specification of their source

工业自动化设备和系统可靠性 第1部分：自动化设备可靠性数据保证及其来源规范

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Foreword

This document complies with the provisions of GB/T 1:1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents" Drafting: This document is Part 1 of GB /Z 42023 "Reliability of Industrial Automation Equipment and Systems": GB /Z 42023 has released the following part:

---Part 1: Automation equipment reliability data assurance and source specifications;

---Part 2: System Reliability: This document is equivalent to IEC TS63164-1:2020 "Reliability of Industrial Automation Equipment and Systems Part 1: Automation Equipment Reliability "Reliability Data Assurance and Source Specifications", the document type was adjusted from IEC 's technical specifications to my country's national standardization guiding technical documents: Please note that some content in this document may be subject to patents: The publisher of this document assumes no responsibility for identifying patents: This document is proposed by China Machinery Industry Federation: This document is under the jurisdiction of the National Industrial Process Measurement Control and Automation Standardization Technical Committee (SAC/TC124): This document was drafted by: Institute of Comprehensive Technology and Economics of Mechanical Industry Instrumentation, Shenyang University of Technology, Shenyang Automation, Chinese Academy of Sciences Research Institute, Kaos Industrial Intelligence Research Institute (Qingdao) Co:, Ltd:, Beijing University of Aeronautics and Astronautics, Chongqing Sichuan Instrument Automation Co:, Ltd:, Zhejiang Jiangzhongkong Technology Co:, Ltd:, Shanghai Instrument and Automatic Control System Inspection and Testing Institute Co:, Ltd:, Liaoning University, Beijing Institute of Science and Technology Institute of Urban Safety and Environmental Science, Beijing Angle Power Technology Co:, Ltd:, China Software Evaluation Center (Software of the Ministry of Industry and Information Technology with the Integrated Circuit Promotion Center), Suzhou Tuokang Automation Technology Co:, Ltd:, the Fifth Research Institute of the Ministry of Industry and Information Technology, Siemens (China) Co:, Ltd: Company, Beijing Cyber Industry Information Technology Research

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Institute Co:, Ltd: The main drafters of this document: Ding Lu, Wang Chengcheng, Zhang Xiaoling, Xu Aidong, Song Yan, Sun Bo, Huang Yunbiao, Ren Taolin, Qiao Jingyu, Xie Yalian, Feng Qiang, Jin Jianghong, Chen Yu, Guo Yongzhen, Zhang Qingjun, Meng Linghui, Li Jia, Wang Shanshan:

Reliability data from automation equipment is often used by evaluators and system integrators to predict overall system performance: Therefore, how Obtaining this data becomes a primary concern for evaluators and system integrators: This document provides guidance to equipment manufacturers such as How to present equipment reliability data and clearly state the data sources to support evaluators and system integrators to apply it most effectively: this In addition, this document also contains a series of reference conditions: This document defines three methods for obtaining data: 1) Calculation: This is the preferred method for electronic devices: 2) On-site observation equipment: If there is no relevant data to support the prediction under the calculation method, this method becomes the preferred method: 3) Laboratory testing: This is the preferred method for mechanical and electromechanical equipment, except when evaluating equipment in low demand mode (see 3:5:16 of GB/T 20438:4-2017):

Note: Aging and running-in are not within the scope of this document and will be addressed in subsequent documents: This document is Part 1 of GB /Z 42023 "Reliability of Industrial Automation Equipment and Systems", which is equivalent to IEC TS63164-1: 2020, focusing on reliability data, including the guarantee of reliability data and the collection method of field reliability data: How to calculate and implement Laboratory test methods to obtain data will be defined in other documents: This document focuses on random hardware failures: However, in the field During the data collection process, it is difficult to distinguish between random hardware failures and systematic failures: GB /Z 42023 is planned to consist of three parts:

---Part 1: Automation equipment reliability data assurance and source specifications: The purpose is to provide automation equipment reliability data Guaranteed guidance:

---Part 2: System Reliability: The purpose is to guide users to calculate system reliability indicators:

---Part 3: User Guide: The purpose is to guide users in reliability calculation and testing: Industrial automation equipment and system reliability Part 1: Automation equipment reliability data Guarantee and source specifications

1 Scope

GB/Z 42023.1-2023 is about where reliability numbers come from, which matters because they are used to justify decisions and are frequently not what they appear to be. A failure rate quoted for an automation device may have been calculated from a parts-count model at an assumed temperature, derived from accelerated laboratory testing, or observed from

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equipment in the field - and the three can differ by an order of magnitude for the same product. Safety integrity calculations, maintenance intervals and spares provisioning all rest on these figures, so a number without its provenance is not usable evidence: what matters is the population it came from, the operating conditions, what counted as a failure, and how many device-hours lie behind it. This part provides guidance on the assurance of reliability data for automation equipment, giving the calculation method where data is obtained by calculation and the corresponding requirements where it comes from field equipment observation. As a GB/Z it is a guiding technical document. Under ICS 25.040 and CCS N10, it is written for automation device manufacturers publishing reliability data, for the system integrators and end users relying on it, and for functional safety assessors.

This document provides guidance on the assurance of reliability data for automation equipment: If the data is obtained through calculation, this document gives details calculation method: If data are obtained through field equipment observations, this document provides methods for making observations and estimations: If it is through actual Data are obtained from laboratory tests: This document gives detailed test methods and test conditions: This document defines the representation of the data: The premise of this document is that components do not need to be run-in before full use: If the device is used in functional safety scenarios, please see IEC 61508 (all parts) and related documents:

2 Normative reference documents

The contents of the following documents constitute essential provisions of this document through normative references in the text: Among them, the dated quotations For undated referenced documents, only the version corresponding to that date applies to this document; for undated referenced documents, the latest version (including all amendments) applies to this document:

GB/T 5080:1-2012 Reliability test Part 1: Test conditions and statistical test principles (IEC 60300-3-5:2001, IDT)

GB/T 34987-2017 Weibull analysis (IEC 61649:2008, IDT)

IEC 60300-3-2:2004 Dependability Management Part 3-2: Application Guide Field Dependability Data Collection (Dependabili-

3 Terms, definitions and abbreviations 3:

1 Terms and definitions The following terms and definitions apply to this document: 3:1:

1 Output with the supporting information needed to ensure that reliable data can be trusted, verified and audited: 3:1:2 B10thresholdB10threshold 10% of the time components fail:

Note 1: The applicable time interval depends on the nature and use of the asset, such as operating time, operating hours, number of cycles, etc:

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Note 2: In this document, the average failure rate is obtained by dividing 10% by the B10 threshold [unit is hour (h)]: Ignoring the effects of early failure, it is generally considered that failure The rate increases significantly only after B10:

Note 3: Once the B10 threshold is reached, the failure rate of pneumatic and electromechanical components is considered unacceptable:

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