

ICS 23.100.01
CCS J20



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

GB/Z 42085-2022

**Pneumatic fluid power - Assessment of component reliability
by accelerated life testing - General guidelines and procedures**

气动 基于加速寿命试验的元件可靠性评估 通用指南和程序

Issued on: December 30, 2022

Implemented on: December 30, 2022

**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 Symbols and units of measurement	2
5 Overview of Reliability and Accelerated Life Testing	2
6 Failure mechanism and mode	3
7 Accelerated Life Test Strategy	3
8 Accelerated life test design	4
9 Trial Termination	6
10 Statistical Analysis	7
11 Evaluation of reliability characteristics from test data	9
29 Reference	42

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 equivalent to ISO /T R16194.2017 "General Guidelines for Pneumatic Component Reliability Evaluation Based on Accelerated Life Test and "Procedure", the document type has been adjusted from the ISO technical report to my country's national standardization guiding technical document. The following minimal editorial changes have been made to this document.

---Corrected a small amount of editorial errors in ISO /T R16194.2017, and changed the Boltzmann constant K value in the formula (B.4) from "8.623x10-5eVK-1" was changed to "8.6171x10-5eVK-1";

---Corrected a small amount of editorial errors in ISO /T R16194.2017, changed "S3=1/2(S2-S1)" in

8.2 to "S3= S22/S1";

--- Corrected a small amount of editorial errors in ISO /T R16194.2017, and changed "'y' as absolute pressure" in Appendix C to "'x' is listed as absolute pressure". Please note that some contents of this document may refer to patents. The issuing agency 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 Hydraulic Pneumatic Standardization Technical Committee (SAC/TC3). This document is drafted by: National Pneumatic Product Quality Inspection and Testing Center, Tianjin University, Jiangsu University, Ningbo Lida Pneumatic Complete Set Co., Ltd. Division, Ningbo Fenghua District Pneumatic Industry Association, Zhejiang Songqiao Pneumatic Hydraulic Co., Ltd., Ningbo Intelling Pneumatic Technology Co., Ltd., Albes (Changxing) Technology Co., Ltd., Wenzhou Jinye Pneumatic Technology Co., Ltd., Beijing University of Aeronautics and Astronautics, China University of Mining and Technology, Ningbo University, Zhejiang Provincial Institute of Standardization, Beijing Machinery Industry Automation Research Institute Co., Ltd. The main drafters of this document. Liu Lijiao, Ren Zhisheng, Zhao Ling, Qian Pengfei, Mao Xubo, Yin Hongbai, Lou Zhongyu, Lin Kaifeng, Hu Wenjing, Lin Nanxiang, Shi Yan, Meng Deyuan, Zhan Lizhong, Cao Qiaohui.

In a pneumatic system, power is transmitted and controlled by compressed air in a circuit. Pneumatic system is composed of various components, which are various An important part of type mechanical equipment. Efficient and economical production requires highly reliable machinery. The reliability of pneumatic components can be evaluated in the laboratory according to the test methods under normal service conditions stipulated in national standards. Pneumatic components usually have a long service life. In order to quickly grasp their life characteristics, overstress can be used to conduct accelerated tests to make the components break out in advance. Failure, and determine the relationship between the reliability of the component under the accelerated life test and the reliability under normal service conditions. Pneumatic components based on accelerated life tests General Guidelines and Procedures for Reliability Assessment

1 Scope

GB/Z 42085-2022 addresses a practical impossibility: pneumatic components are expected to last tens of millions of cycles, and nobody can wait to find out whether they do. Accelerated life testing is the way out - running components harder than they will be run in service, then inferring service life from the failures - and it works only if the acceleration does not change how the component fails. Push the pressure, frequency or temperature too far and the failure mode shifts from seal wear to something that would never occur in the field, and the extrapolation, though it looks rigorous, means nothing. This document establishes general procedures for evaluating the reliability of pneumatic components by accelerated life testing, covering how the test is designed, how the results are analysed statistically, and how a reliability figure is stated. It applies to directional control valves, cylinders with piston rods, pressure regulating valves and the other components within its scope. As a GB/Z it is a guiding technical document, appropriate for a subject where judgement in test design cannot be reduced to a requirement. Under ICS 23.100.01 and CCS J20, it is written for pneumatic component manufacturers, for the machine builders who specify component life, and for reliability engineers.

This document establishes general procedures for evaluating the reliability of pneumatic components based on accelerated life testing. This document applies to directional valves, with piston Rod cylinders, pressure regulating valves and components covered by ISO.19973 (all parts). This document does not establish specific procedures for accelerated life testing of pneumatic components. This document gives the accelerated life test method of pneumatic components Variable conditions, and provide guidance for the development of accelerated life test methods for pneumatic components. This document applies to the first failure of pneumatic components without maintenance.

2 Normative references

This document has no normative references.

3 Terms and Definitions

The terms and definitions defined in ISO 5598, ISO.19973-1 and the following apply to this document. ISO and IEC maintain terminology databases for standardization at.

3.1 BX life BXLlife The component or assembly has not been repaired after leaving the factory, and the reliability is $(100-x)\%$ of the life, or $(100-x)\%$ of the samples have not failed time.

Note. The cumulative failure rate is $x\%$. For example, $x=10$, then the cumulative failure probability of B10 life is 10%.

3.2 Acceleration factor accelerationfactor AF The ratio of life at normal service stress levels to life at accelerated stress levels.

3.3 Accelerated life test acceleratedlifetest; ALT A method of testing for components to fail more rapidly than under normal service conditions.

3.4 destroy limit destructlimit The level of stress at which one or more operating characteristics of a component no longer meet requirements, or where the component is damaged and cannot recover when the stress is reduced.

Note. The damage limit is divided into the lower limit of damage and the upper limit of damage.

3.5 failure mechanism failure mechanism Physical or chemical process that causes instantaneous or cumulative damage to component materials.