

ICS 29.120.70

CCS L 25



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

GB/T 21711.2-2024

**Electromechanical elementary relays - Part 2: Reliability
(English Translation)**

Issued on: March 15, 2024

Implemented on: July 1, 2024

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

Table of Contents

Preface	
Introduction	
1 Scope	
2 Normative references	
3 Terms and Definitions	
4 General Principles	
5 Test conditions	
5.1 Sample	
5.2 Environmental conditions	
5.3 Working conditions	
5.4 Test equipment	
6 Failure criteria	
7 Output Data	
8 Output Data Analysis	
9 Reliability Measurement	
Appendix A (Normative) Data Analysis	
Appendix B (Informative) Data Analysis Example	
Appendix C (Informative) Statistical Table	
Appendix D (Informative) Successful operation---no failure test	
References	
Figure A.1 Weibull Probability Plotting Paper Example	
Figure A.2 Example of cumulative failure rate plotting paper	
Figure A.3 Plotted data points and drawn straight line	
Figure A.4 Estimation of distribution parameters	
Figure B.1 Distribution parameter estimation	
Figure B.2 Cumulative failure rate Figure	
Figure B.3 Comparison of periodic tests with type test and Weibull Bayesian analysis	
Table A.1 Weibull Bayesian confidence level for zero failures	15
Table B.1 Cumulative failure rate analysis record table	
Table B.2 Record table example	
Table B.3 Data of the first 20 failed products in this case	
Table C.1 Gamma function value	

Table C.2 Quantile values of normal distribution

Table D.1 Number of samples and life cycle times

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 21711 "Basic electromechanical relays". GB/T 21711 has been published in the following parts.

- Part 1: General and safety requirements;
- Part 2: Reliability;
- Part 2-1: Reliability B10 value verification procedure;
- Part 7: Test and measurement procedures.

This document is equivalent to IEC 61810-2:2017 "Basic electromechanical relays Part 2: Reliability". For ease of use, this document is Made the following editorial changes.

- a) Corrected the typo in the last paragraph of 5.3, changing "Table 12" to "Table 16";
- b) Corrected the typos in A.5.1.4 and A.5.2.2, and changed "Appendix D" to "Appendix C";
- c) The typo in Figure A.4 was corrected, and the horizontal axis " β^{10} " was changed to " B^{10} ";
- d) Corrected the typo in B.3.2. " $w_1\beta^{\wedge};w_2\beta^{\wedge}$ " was changed to " $w_1\beta^{\wedge},w_2\beta^{\wedge}$ ";
- e) Corrected the typo in B.3.3. " $A_1\eta^{\wedge};A_2\eta^{\wedge}$ " was changed to " $(A_1\eta^{\wedge},A_2\eta^{\wedge})$ ";
- f) Corrected the typo in D.2. the symbol " $R(c)$ " was changed to " $R(c)$ ", the symbol " $F(c)$ " was changed to " $F(c)$ ", and the symbol " $R(a)$ " was changed to is " $R(a)$ ", and the symbol " $c(a)$ " is changed to " $c(a)$ ";
- g) Corrected the typo in D.3. "Confidence level $F(c)=0.90$ " was changed to "Confidence level is 0.90".

Introduction

In order to standardize the development, testing, quality assessment and use of relay products in my country and promote the steady and coordinated development of the relay industry, this GB/T 21711 "Basic Electromechanical Relays" series of standards. GB/T 21711 "Basic Electromechanical Relays" is a series of standards for various basic electromechanical relays.

The basic product specification is planned to consist of 7 parts.

--- Part 1: General and safety requirements. The purpose is to determine the basic electromechanical relays used in various fields of electrical or electronic engineering Functional and safety requirements and safety related characteristics.

--- Part 2: Reliability. The purpose is to standardize the requirements for reliability assessment of basic electromechanical relays.

--- Part 2-1. Reliability B10 value verification procedure. The purpose is to standardize the reliability index assessment of basic electromechanical relays and reliability growth requirements assessment requirements.

--- Part 3: Forced positioning (mechanical interlocking) contact relays. The purpose is to add applicable Special requirements for forced positioning (mechanical interlocking) contact relays.

--- Part 4: General and safety requirements for reed relays. The purpose is to provide reed relays suitable for general control circuits.

Establish basic functional and safety requirements.

--- Part 7: Test and measurement procedures. The purpose is to specify the test and measurement procedures applicable to basic electromechanical relays.

--- Part 10: Additional functional characteristics and safety requirements for large capacity relays. The purpose is to build on the general requirements of Part 1 in addition, additional functional characteristics and safety requirements applicable to large-capacity relays are added.

Basic Electromechanical Relays Part 2: Reliability

1 Scope

This document specifies the test conditions and details for evaluating the durability of relays using appropriate statistical methods to obtain reliable the characteristic value of sex.

This document applies to basic electromechanical relays that are considered non-repairable products (i.e. products that are not repaired after failure).

It is usually expressed in terms of cycle times (CTF). Therefore, when the terms "time" or "duration" are used in GB/T 34987-2017 However, at a given operating frequency, the number of cycles can be converted into a corresponding time (such as failure Previous time TTF).

This document specifies the failure criteria and resulting characteristic values that describe the reliability of basic relays in normal use.

When the failure criterion is met, relay failure occurs.

The failure rate of basic relays cannot be considered constant, especially the failure rate caused by wear and tear mechanism.

The number of rings is usually presented as a Weibull distribution. This document specifies numerical and graphical methods for calculating the approximate value of the two-parameter Weibull distribution, and Confidence limits and methods for confirming reliability measures using the Weibull Bayes method.

This document does not include procedures for use with additional reliability verification requirements for basic electromechanical relays.

NOTE 1 This reliability test procedure is specified in IEC 61810-2-1 and is intended, in particular, for the assembly of basic electromechanical relays in accordance with IEC 62061 and GB/T 16855.1 specifies the test for providing B10D value for safety-related mechanical control systems, while IEC 61810-2-1 specifies the test for providing B10D value for manufacturers.

program.

Note 2: Basic electromechanical relays with forced positioning (mechanical interlocking) contacts in accordance with IEC 61810-3 can provide contact protection in accordance with GB/T 16855.1-2018 High diagnostic coverage as specified in 4.5.3.

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 21711.1-2023 Basic electromechanical relays Part 1: General and safety requirements (IEC 61810-1:2015, IDT) GB/T 34987-2017 Weibull analysis (IEC 61649:2008, IDT)

3 Terms and definitions

The following terms and definitions apply to this document.

Product

Any component that can be considered individually.

Note: In this document, the product is a basic electromechanical relay.

Non-repaired products Products that are not repaired after failure.