

ICS 35.160
CCS L 62



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

GB/T 17966-2024

Replacing GB/T 17966-2000

**Information technology - Microprocessor systems -
Floating-point arithmetic**

信息技术 微处理器系统 浮点运算

(English Translation)

Issued on: September 29, 2024

Implemented on: April 1, 2025

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

Table of Contents

Preface
Introduction
1 Scope
1.1 Regulations
1.2 Achieve Goal
1.3 Contains
1.4 Not included
1.5 Programming environment considerations
2 Normative references
3 Terms, definitions and abbreviations
3.1 Terms and Definitions
3.2 Abbreviations
4 Floating point format
4.1 General
4.2 Specification Level
4.3 Floating Point Dataset
4.4 Binary Interchange Format Encoding
4.5 Decimal Interchange Format Code
4.6 Exchange format parameters
4.7 Extension and scalable precision
5 Properties and rounding
5.1 Attribute Specification
5.2 Dynamic Mode of Attributes
5.3 Properties of rounding direction
6 Operation
6.1 General
6.2 Decimal exponent calculation
6.3 Isomorphic Universal Computation Operations
6.4 Format of Common Computational Operations
6.5 Silent Computation Operations
6.6 Signal computation operations
6.7 Non-computational operations

- 6.8 Detailed description of floating point format to integer format conversion
- 6.9 Details of rounding floating-point data to integer values
- 6.10 Detailed description of total order predicates
- 6.11 Detailed description of contrast predicates
- 6.12 Detailed description of conversion between floating point data and external character sequences
- 7 Infinities, NaNs, and the Sign Bit
 - 7.1 Infinite operations
 - 7.2 Using NaN Operations
 - 7.3 Sign bit
- 8 Exception and default exception handling
 - 8.1 General. Exceptions and Flags
 - 8.2 Invalid Operation
 - 8.3 Division by zero
 - 8.4 Overflow
 - 8.5 Underflow
 - 8.6 Imprecise
- 9 Alternative Exception Handling Attributes
 - 9.1 General Principles
 - 9.2 Restoring the Alternate Exception Handling Attributes
 - 9.3 Immediate and Deferred Alternative Exception Handling Attributes
- 10 Recommended Operation
 - 10.1 General
 - 10.2 Language-defined and implementation-defined operations
 - 10.3 Mathematical operations on appendix
 - 10.4 Dynamic Mode Operation
 - 10.5 Reduction Operations
 - 10.6 Enhanced Arithmetic Operations
 - 10.7 Minimum and Maximum Operations
 - 10.8 NaN Payload Operations
- 11 Expression Evaluation
 - 11.1 Expression Evaluation Rules
 - 11.2 Tasks, Parameters, and Function Values
 - 11.3 Preferred width attribute for expression evaluation
 - 11.4 Literal Meaning and Value Change Optimization

12 Reproducible floating point results

Appendix A (Informative) Program Debugging Support

Appendix B (Informative) Operation List

References

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 replaces GB/T 17966-2000 "Binary floating-point operations for microprocessor systems".

In addition to structural adjustments and editorial changes, the main technical changes are as follows.

- a) Added the description of the floating-point arithmetic programming environment considerations in the scope (see 1.5);
- b) Added binary and decimal interchange format encoding content (see Chapter 5);
- c) Changed the specific provisions of rounding, added the property description of rounding direction and the dynamic properties of rounding (see 6.1, 6.2, 6.3);
- d) Added rules for various floating point operations, including binary and decimal format conversion, exponent calculation, silent calculation, signal the contents of computational and non-computational operations (see 7.2, 7.5, 7.6, 7.7);
- e) Added description of exceptions and flags in general exception handling (see 9.1);
- f) Modified the provisions on some abnormal situations that trigger self-traps (see 9.2 and 9.3);
- g) Added some suggested operations and expression evaluation for floating-point operations (see Chapters 11 and 12).

This document is modified to adopt ISO/IEC 60559:2020 "Information technology microprocessor systems floating-point operations".

Compared with ISO/IEC 60559:2020, this document has made the following structural adjustments.

--- Added a chapter on "Normative References", and the subsequent chapter numbers are postponed accordingly;

--- Modified 6.3, 6.12, 7.2, Chapter 10, and the suspension section of 10.2;

---Appendix A and Appendix B correspond to Appendix B and Appendix C of ISO/IEC 60559:2020 respectively.

The technical differences between this document and ISO/IEC 60559:2020 and their reasons are as follows.

--- Deleted 1.6 "Use of auxiliary verbs", which is not applicable to my country's national conditions.

The following editorial changes were made to this document.

--- Move Appendix A (informative) "References" to after the last appendix;

--- Deleted the informative Appendix D.

Introduction

This document provides rules for performing floating-point operations that produce results independent of the hardware, software, or a combination of hardware and software used to perform the operations.

For the operations specified in the normative portion of this document, numerical results and anomalies are uniquely determined by the values of the input data, operation, and target, and are determined by the user.

control.

This document defines a system that can commercialize binary and decimal floating-point operations. The requirements met by this document include the following content.

a) facilitate the migration of existing programs from other types of computers and from computers that partially conform to this document to computers that fully conform to this document;

Computer.

b) Enhance the compatibility and safety of users and programmers who are not experts in numerical methods when writing complex numerical programs.

c) Encourage experts to develop stable and efficient numerical programs that can be ported by simply editing and recompiling on any computer that complies with this document and has sufficient capacity. Combined with language control, this can be achieved on all systems that comply with the standard.

The procedure produces the same result.

d) Provide direct support for.

1) Execution time anomaly diagnosis;