ISO/IEC 60559:2020-05 (E)

Information technology - Microprocessor Systems - Floating-Point arithmetic

Contents

Page

1. Overview....11
   1.1 Scope....11
   1.2 Purpose....11
   1.3 Inclusions....11
   1.4 Exclusions....11
   1.5 Programming environment considerations....12
   1.6 Word usage....12

2. Definitions, abbreviations, and acronyms....13
   2.1 Definitions....13
   2.2 Abbreviations and acronyms....15

3. Floating-point formats....16
   3.1 Overview....16
   3.2 Specification levels....17
   3.3 Sets of floating-point data....17
   3.4 Binary interchange format encodings....19
   3.5 Decimal interchange format encodings....20
   3.6 Interchange format parameters....23
   3.7 Extended and extendable precisions....25

4. Attributes and rounding....26
   4.1 Attribute specification....26
   4.2 Dynamic modes for attributes....26
   4.3 Rounding-direction attributes....27

5. Operations....29
   5.1 Overview....29
   5.2 Decimal exponent calculation....30
   5.3 Homogeneous general-computational operations....31
   5.4 formatOf general-computational operations....33
   5.5 Quiet-computational operations....35
   5.6 Signaling-computational operations....37
   5.7 Non-computational operations....37
   5.8 Details of conversions from floating-point to integer formats....39
   5.9 Details of operations to round a floating-point datum to integral value....41
   5.10 Details of totalOrder predicate....42
   5.11 Details of comparison predicates....43
   5.12 Details of conversion between floating-point data and external character sequences....44

6. Infinity, NaNs, and sign bit....48
   6.1 Infinity arithmetic....48
   6.2 Operations with NaNs....48
   6.3 The sign bit....50

7. Exceptions and default exception handling....51
   7.1 Overview: exceptions and flags....51
   7.2 Invalid operation....52
   7.3 Division by zero....53
   7.4 Overflow....53
   7.5 Underflow....53
   7.6 Inexact....54

8. Alternate exception handling attributes....55
   8.1 Overview....55
   8.2 Resuming alternate exception handling attributes....55
   8.3 Immediate and delayed alternate exception handling attributes....56

9. Recommended operations....58
9.1 Conforming language- and implementation-defined operations....58
9.2 Additional mathematical operations....58
9.3 Dynamic mode operations....65
9.4 Reduction operations....66
9.5 Augmented arithmetic operations....68
9.6 Minimum and maximum operations....69
9.7 NaN payload operations....71

10. Expression evaluation....72
10.1 Expression evaluation rules....72
10.2 Assignments, parameters, and function values....72
10.3 preferredWidth attributes for expression evaluation....73
10.4 Literal meaning and value-changing optimizations....74

11. Reproducible floating-point results....75

Annex A (informative) Bibliography....77

Annex B (informative) Program debugging support....79

Annex C (informative) List of operations....81

Annex D (informative) IEEE list of participants....83