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Part 1: Base language

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Foreword

1 ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and nongovernmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

2 International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

3 The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

4 Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

5 ISO/IEC 1539-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 22, *Programming languages, their environments and system software interfaces.*

6 This third edition cancels and replaces the second edition (ISO/IEC 1539-1:2004), which has been technically revised. It also incorporates the Technical Corrigenda ISO/IEC 1539-1:2004/Cor. 1:2006, ISO/IEC 1539-1:2004/Cor. 2:2007, ISO/IEC 1539-1:2004/Cor. 3:2008, and ISO/IEC 1539-1:2004/Cor. 4:2009, and the Technical Report ISO/IEC TR 19767:2005.

7 ISO/IEC 1539 consists of the following parts, under the general title *Information technology — Programming languages — Fortran*:

8 — *Part 1: Base language*

9 — *Part 2: Varying length character strings*

10 — *Part 3: Conditional compilation*

Introduction

1 This part of ISO/IEC 1539 comprises the specification of the base Fortran language, informally known as Fortran 2008. With the limitations noted in 1.6.2, the syntax and semantics of Fortran 2003 are contained entirely within Fortran 2008. Therefore, any standard-conforming Fortran 2003 program not affected by such limitations is a standard-conforming Fortran 2008 program. New features of Fortran 2008 can be compatibly incorporated into such Fortran 2003 programs, with any exceptions indicated in the text of this part of ISO/IEC 1539.

2 Fortran 2008 contains several extensions to Fortran 2003; some of these are listed below.

- Module enhancements:
  Submodules provide additional structuring facilities for modules. Data objects and procedure pointers declared in a module implicitly have the SAVE attribute.
- Parallel execution:
  Coarrays and synchronization constructs support parallel programming using a single program multiple data (SPMD) model.
- Performance enhancements:
  The DO CONCURRENT construct provides a means for the program to specify that individual loop iterations have no interdependencies. The CONTIGUOUS attribute provides a means for the program to specify restrictions on the storage layout of pointer targets and assumed-shape dummy arguments.
- Data declaration:
  The maximum rank has been increased to 15. A processor is required to support at least one kind of integer with a range of at least 18 decimal digits. An allocatable component can be of recursive type. A named constant array's shape can be implied by its value. A pointer can be initially associated with a target. Subscripts and nested implied-do limits inside a *data-implied-do* can be any constant expression instead of being limited to combinations of constants, implied-do variables, and intrinsic operations. A FORALL index variable can have its type and kind explicitly declared within the construct. The TYPE keyword can be used to declare entities of intrinsic type. Multiple type-bound procedures can be declared in a single type-bound procedure statement.
- Data usage and computation:
  A structure constructor can omit the value for an allocatable component. SOURCE= in an ALLOCATE statement can give an array variable the bounds as well as the value of an expression. MOLD= in an ALLOCATE statement can give a polymorphic variable the shape, type, and type parameters of an expression without copying the value. The real and imaginary parts of a complex entity can be accessed independently with a component-like syntax. Intrinsic assignment to an allocatable polymorphic variable is allowed. A pointer function reference can denote a variable in any variable definition context. Some restrictions on the use of dummy arguments in elemental subprograms have been removed.
- Input/output:
  NEWUNIT= in an OPEN statement automatically selects a unit number that does not interfere with other unit numbers selected by the program. The G0 edit descriptor and unlimited format control ease writing output in comma-separated-value (CSV) format. Recursive data transfers are allowed on distinct units.
- Execution control:
  The BLOCK construct can contain declarations of objects with construct scope. The EXIT statement can transfer control from within more named executable constructs. The STOP statement has been changed to accept a constant expression instead of merely a literal constant, and to encourage the processor to provide the integer stop code (if it appears) as a termination status (where that makes sense). The ERROR STOP statement initiates error termination.
- Intrinsic procedures:
  - The intrinsic functions ACOS, ASIN, ATAN, COSH, SINH, TAN, and TANH can have arguments of type complex.
  - The new intrinsic functions ACOSH, ASINH, and ATANH calculate the inverse hyperbolic cosine, sine, and tangent respectively.
  - The intrinsic function ATAN2 can be referenced by the name ATAN.
  - The new intrinsic subroutines ATOMIC_DEFINE and ATOMIC_REF define and reference a variable

