

INTERNATIONAL STANDARD

ISO/IEC 10514-3

First edition
1998-12-01

Information technology — Programming languages —

Part 3: Object Oriented Modula-2

*Technologies de l'information — Langages de programmation —
Partie 3: Modula 2 orienté objet*



Contents

Foreword	v
Introduction	vi
1 Scope	1
1.1 Goals	1
1.2 Specifications included in this part of ISO/IEC 10514	1
1.3 Relationship to ISO/IEC 10514-1	1
1.4 Specifications not within the scope of this Standard	1
2 Normative References	2
3 Definitions, Structure, and Conventions	2
3.1 Definitions	2
3.2 Structure of the Formal Definition	2
3.3 Conventions	2
4 Requirements for Implementations	2
4.1 Translation	3
4.2 Source Code Representation	3
4.3 Ordering of Declarations	3
4.4 Predefined Entities	3
4.5 Library Modules	3
4.6 Errors	3
4.7 Exceptions	4
4.8 Implementation-dependencies	4
4.9 Documentation	4
4.10 Statement of Compliance	4
4.11 Minimum requirements	4
5 The Lexis	4
5.1 Additional Keywords	4
5.2 Additional Pervasive Identifiers	5
6 Language	5
6.1 Classes	6
6.1.1 Class Definition	6
6.1.2 Class Declaration	8
6.1.3 Abstract Classes	10
6.1.4 Traced Classes	10
6.1.5 Reveal Lists	12
6.1.6 Inherit Clause	12
6.1.7 Class Components	13
6.1.8 Overridden Methods	14
6.1.9 Constructor	14
6.1.10 Destructor	15

© ISO/IEC 1998

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

ISO/IEC Copyright Office • Case postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

6.2 Access to Class Components.....	16
6.2.1 Access by Class Identifier	16
6.2.2 Access by Object Selection	16
6.2.3 Access in Subclasses	18
6.2.4 Immutable entities	18
6.3 Object Variables	18
6.3.1 Assignment.....	19
6.3.2 Comparison	19
6.3.3 Creation	19
6.3.4 Destruction	20
6.3.5 Empty Reference	21
6.3.6 Traced Object References.....	21
6.4 Membership Test.....	23
6.5 Guard Statement.....	24
6.5.1 Guarded Statement Sequence	25
6.6 Safeguarded Modules	25
6.7 Garbage Collection.....	25
6.8 Changes to the Base Language	26
6.8.1 Module Header	27
6.8.2 Definitions and Declarations	28
6.8.3 Blocks.....	29
6.8.4 Statement Part.....	29
6.8.5 Parameter Compatibility and Argument Binding.....	30
6.8.6 The Module COROUTINES	30
6.8.7 Environment.....	31
7 Required System Modules.....	31
7.1 Object Exceptions.....	31
7.1.1 The Interface to M2OOEXCEPTION	31
7.1.2 The Entities of M2OOEXCEPTION.....	31
7.1.3 Aggregation of the Exceptions of the Language Extensions.....	32
7.2 The Module GARBAGECOLLECTION	32
7.2.1 The interface to GARBAGECOLLECTION.....	32
7.2.2 The Procedures of GARBAGECOLLECTION.....	33
7.2.3 The Functions of GARBAGECOLLECTION.....	33
Annex A Collected Concrete Syntax (informative)	34
A.1 Class Definition	34
A.2 Class Declaration.....	35
A.3 Reveal List.....	36
A.4 Inherit Clause.....	36
A.5 Designators	36
A.6 Guard Statement	36
Annex B Changes to the Syntax of the Base Language (informative)	37
Annex C Glossary (informative)	38

Annex D Examples (informative)	41
D.1 Class Definition and Class Declaration	41
D.2 Cross Linked Classes	42
D.3 Inheritance and Overridden Methods	42
D.4 Abstract Class Definition	43
D.5 Creation and Destruction.....	43
D.6 Constructor and Destructor	44
D.7 Type Inquiries.....	44
D.8 Constructor chain and Destructor chain	45
D.9 Coroutines and Garbage Collection	45
Annex E Finalization Order (informative).....	46
Annex F Participating Individuals and Organisations (informative)	48

Foreword

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 non-governmental, 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. 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.

International Standard ISO/IEC 10514-3 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 22, *Programming languages, their environments and system software interfaces*.

ISO/IEC 10514 consists of the following parts, under the general title *Information technology — Programming languages*:

- *Part 1: Modula-2, Base Language*
- *Part 2: Generics in Modula-2*
- *Part 3: Object Oriented Modula-2*

Annexes A to F of this part of ISO/IEC 10514 are for information only.

Introduction

This part of ISO/IEC 10514 is part three of the multi-part standard ISO/IEC 10514 and specifies the form and meaning of Object Oriented Modula-2 programs and by reference to that specification lays down requirements for Object Oriented Modula-2 implementations.

The reader is referred to International Standard ISO/IEC 10514-1 (the first part of this multi-part standard, herein referred to as "the Base Standard") for introductory remarks on the programming language Modula-2.

This part of ISO/IEC 10514 defines Object Oriented Modula-2 by additions to the Base Language without changing the meaning of any parts of the Base Language (except for the introduction of new keywords—see clause 5).

This part of ISO/IEC 10514 does not provide a formal specification of Object Oriented Modula-2, although it is the intention of WG13 to construct the appropriate VDM-SL descriptions for the syntax and semantics described herein when committee resources permit.

Rationale

Object oriented programming is a method of programming that allows a high degree of abstraction as well as good structuring of programs. Because of its substantial benefits it has become a common method of programming.

As Modula-2 in its original design provides for basic facilities necessary for object orientation (like data encapsulation and modularization), full object oriented facilities can be easily added to the base language in a very natural way. Thus the advantages of this new programming method are made available to the programmer in a fully upward compatible way.

Information technology — Programming languages —

Part 3:

Object Oriented Modula-2

1 Scope

1.1 Goals

In addition to the goals of the Base Language, the goal of this part of ISO/IEC 10514 is to provide simple extensions to allow object oriented programming facilities to be added to the Base Language defined in International Standard ISO/IEC 10514-1 without altering the meaning of any valid program allowed by the Base Language (except for the use of the new keywords introduced by this standard, see clause 5).

1.2 Specifications included in this part of ISO/IEC 10514

In addition to the specifications included in the Base Language this part of ISO/IEC 10514 provides specifications for:

- required symbols for Object Oriented Modula-2 programs;
- the lexical structure, the syntactic structure and semantics of Object Oriented Modula-2 programs;
- the interface to and the semantics of Object Oriented Modula-2 system modules;
- violations of the rules for the use of the object oriented extensions that a conforming implementation is required to detect;
- further compliance requirements for implementations, including documentation requirements.

1.3 Relationship to ISO/IEC 10514-1

This part of ISO/IEC 10514 is part three of the multi-part standard ISO/IEC 10514. This part of ISO/IEC 10514 extends and modifies the Base Language ISO/IEC 10514-1, but the adoption of this part of ISO/IEC 10514 is optional with respect to the Base Language. This part of ISO/IEC 10514 is also independent of any other parts of ISO/IEC 10514 except for part 1, and can be adopted either together with or independently of such other parts.

1.4 Specifications not within the scope of this part of ISO/IEC 10514

In addition to the categories of specifications excluded by the Base Language this part of ISO/IEC 10514 provides no specifications for:

- the internal representation of the objects and their associated methods;

- the implementation of the garbage collector;
- the implementation of the tracking mechanism for traced objects.

2 Normative References

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 10514-1:1996 *Information technology — Programming languages — Part 1: Modula-2, Base Language.*