

NEMA IA 2.3-2005

PROGRAMMABLE  
CONTROLLERS—

PART 3: PROGRAMMING  
LANGUAGES



**NEMA Standards Publication IA 2.3-2005**

**(Adoption of IEC Publication 61131-3)**

*Programmable Controllers—  
Part 3: Programming Languages*

*Published by:*

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## Foreword

This Standards Publication is a NEMA Adoptive Standard based on Part 3 of IEC 61131, *Programmable Controllers*.

This Standards Publication was prepared by a technical committee of the NEMA Automation Products and Systems Section. It was approved in accordance with the bylaws of NEMA and supersedes NEMA Standards Publication ICS 3-1988, Part 3-304.

This Standards Publication provides practical information concerning ratings, construction, test, performance, and manufacture of industrial control equipment. These standards are used by the electrical industry to provide guidelines for the manufacture and proper application of reliable products and equipment and to promote the benefits of repetitive manufacturing and widespread product availability.

NEMA Standards represent the result of many years of research, investigation, and experience by the members of NEMA, its predecessors, its Sections and Committees. They have been developed through continuing consultation among manufacturers, users, and national engineering societies and have resulted in improved serviceability of electrical products with economies to manufacturers and users.

One of the primary purposes of this Standards Publication is to encourage the production of reliable control equipment which, in itself, functions in accordance with these accepted standards. Some portions of these standards, such as electrical spacings and interrupting ratings, have a direct bearing on safety; almost all of the items in this publication, when applied properly, contribute to safety in one way or another.

Properly constructed industrial control equipment is, however, only one factor in minimizing the hazards which may be associated with the use of electricity. The reduction of hazard involves the joint efforts of the various equipment manufacturers, the system designer, the installer, and the user. Information is provided herein to assist users and others in the proper selection of control equipment.

The industrial control manufacturer has limited or no control over the following factors which are vital to safe installation:

- environmental conditions
- system design
- equipment selection and application
- installation
- operating practices
- maintenance

This publication is not intended to instruct the user of control equipment with regard to these factors except insofar as suitable equipment to meet needs can be recognized in this publication and some application guidance is given.

This Standards Publication is necessarily confined to defining the construction requirements for industrial control equipment and to providing recommendations for proper selection for use under normal or certain specific conditions. Since any piece of industrial control equipment can be installed, operated, and maintained in such a manner that hazardous conditions may result, conformance with this publication does not by itself assure a safe installation. When, however, equipment conforming with these standards is properly selected and is installed in accordance with the National Electrical Code and properly maintained, the hazards to persons and property will be reduced.

To continue to serve the best interests of users, NEMA is actively cooperating with other standardization organizations in the development of simple and more universal metrology practices. In this Standards Publication, the U.S. customary units are gradually being supplemented by those of the modernized metric system known as the International Systems of Units (SI). This transition involves no changes in standard dimensions, tolerances, or performance specifications.

NEMA Standards Publications are subject to periodic review. They are revised frequently to reflect user input and to meet changing conditions and technical progress. Users should secure the latest editions.

Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product subdivision by contacting the:

Vice President, Technical Services  
National Electrical Manufacturers Association  
1300 North 17th Street  
Rosslyn, Virginia 22209

## Referenced Standards

The following standards contain provisions which, through reference in this text, constitute provisions of this NEMA Standards Publication. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

**International Electrotechnical Commission**  
1, rue de Varembé  
Geneva, Switzerland

IEC 61131-3

*Programmable Controllers—Part 3: Programming Languages*



## **Amendments**

IEC 61131-3, *Programmable Controllers—Part 3: Programming Languages*, is adopted in its entirety.  
NEMA Adoptive Standard

Where a conflict exists between the provisions of IA 2.3 and other NEMA Standards Publications, the provisions of IA 2.3 shall govern in the area of programmable controllers and their associated peripherals.  
NEMA Standard

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# INTERNATIONAL STANDARD

**IEC**  
**61131-3**

Second edition  
2003-01

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## **Programmable controllers –**

### **Part 3: Programming languages**

*Automates programmables –*

*Partie 3:  
Langages de programmation*



Reference number  
IEC 61131-3:2003(E)

## Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

## Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

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- **Catalogue of IEC publications**  
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# INTERNATIONAL STANDARD

# IEC 61131-3

Second edition  
2003-01

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## Programmable controllers –

### Part 3: Programming languages

*Automates programmables –*

*Partie 3:  
Langages de programmation*

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PROGRAMMABLE CONTROLLERS –**

**Part 3: Programming languages**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61131-3 has been prepared by subcommittee 65B: Devices, of IEC technical committee 65: Industrial-process measurement and control.

The text of this standard is based on the following documents:

FDIS	Report on voting
65B/456/FDIS	65B/465/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This second edition of IEC 61131-3 cancels and replaces the first edition, published in 1993, and constitutes a technical revision.

This International Standard has been reproduced without significant modification to its original contents or drafting.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

## PROGRAMMABLE CONTROLLERS –

### Part 3: Programming languages

#### 1 General

##### 1.1 Scope

This part of IEC 61131 specifies syntax and semantics of programming languages for *programmable controllers* as defined in part 1 of IEC 61131.

The functions of program entry, testing, monitoring, operating system, etc., are specified in Part 1 of IEC 61131.

##### 1.2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 (all parts): *International Electrotechnical Vocabulary (IEV)*

IEC 60559:1989, *Binary floating-point arithmetic for microprocessors systems*

IEC 60617-12:1997, *Graphical symbols for diagrams – Part 12: Binary logic elements*

IEC 60617-13:1993, *Graphical symbols for diagrams – Part 13: Analogue elements*

IEC 60848:2002, *GRAFNET specification language for sequential function charts*

IEC 61131-1, *Programmable controllers – Part 1: General information*

IEC 61131-5, *Programmable controllers – Part 5: Communications*

ISO/AFNOR: 1989, *Dictionary of computer science – The standardised vocabulary*

ISO/IEC 10646-1:1993, *Information technology – Universal Multiple-Octet Coded Character Set (UCS) – Part 1: Architecture and Basic Multilingual Plane*

##### 1.3 Definitions

For the purposes of this part of IEC 61131, the following definitions apply. Definitions applying to all parts of IEC 61131 are given in part 1.

NOTE 1 Terms defined in this subclause are *italicized* where they appear in the bodies of definitions.

NOTE 2 The notation “(ISO)” following a definition indicates that the definition is taken from the ISO/AFNOR Dictionary of computer science.

NOTE 3 The ISO/AFNOR Dictionary of computer science and the IEC 60050 should be consulted for terms not defined in this standard.