IEC 61131-3

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Programmable controllers – Part 3: Programming languages

Automates programmables – Partie 3: Langages de programmation

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PROGRAMMABLE CONTROLLERS –

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FOREWORD

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International Standard IEC 61131-3 has been prepared by subcommittee 65B: Measurement and control devices, of IEC technical committee 65: Industrial-process measurement, control and automation.

This third edition of IEC 61131-3 cancels and replaces the second edition, published in 2003. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

This third edition is a compatible extension of the second edition. The main extensions are new data types and conversion functions, references, name spaces and the object oriented features of classes and function blocks. See Annex B.

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

FDIS	Report on voting
65B/858/FDIS	65B/863/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 publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 61131 series, published under the general title *Programmable controllers* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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- withdrawn,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

PROGRAMMABLE CONTROLLERS –

Part 3: Programming languages

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.

This part of IEC 61131 specifies the syntax and semantics of a unified suite of programming languages for programmable controllers (PCs). This suite consists of two textual languages, Instruction List (IL) and Structured Text (ST), and two graphical languages, Ladder Diagram (LD) and Function Block Diagram (FBD).

An additional set of graphical and equivalent textual elements named Sequential Function Chart (SFC) is defined for structuring the internal organization of programmable controller programs and function blocks. Also, configuration elements are defined which support the installation of programmable controller programs into programmable controller systems.

In addition, features are defined which facilitate communication among programmable controllers and other components of automated systems.

2 Normative references

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

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

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

ISO/IEC 10646:2012, *Information technology – Universal Coded Character Set (UCS)*

ISO/IEC/IEEE 60559, *Information technology – Microprocessor Systems – Floating-Point arithmetic*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61131-1 and the following apply.

3.1
absolute time
combination of time of day and date information

3.2
access path
association of a symbolic name with a variable for the purpose of open communication

3.3
action
Boolean variable or a collection of operations to be performed, together with an associated control structure

3.4
action block
graphical language element which utilizes a Boolean input variable to determine the value of a Boolean output variable or the enabling condition for an action, according to a predetermined control structure

3.5
aggregate
structured collection of data objects forming a data type

[SOURCE: ISO/AFNOR:1989]

3.6
array
aggregate that consists of data objects, with identical attributes, each of which may be uniquely referenced by subscripting

[SOURCE: ISO/AFNOR:1989]

3.7
assignment
mechanism to give a value to a variable or to an aggregate

[SOURCE: ISO/AFNOR:1989]

3.8
base type
data type, function block type or class from which further types are inherited/derived

3.9
based number
number represented in a specified base other than ten

3.10
binary coded decimal
BCD
encoding for decimal numbers in which each digit is represented by its own binary sequence

3.11
bistable function block
function block with two stable states controlled by one or more inputs

3.12
bit string
data element consisting of one or more bits

3.13
bit string literal
literal that directly represents a bit string value of data type BOOL, BYTE, WORD, DWORD, or LWORD

3.14
body
set of operations of the program organization unit

3.15
call
language construct causing the execution of a function, function block, or method

3.16
character string
aggregate that consists of an ordered sequence of characters

3.17
character string literal
literal that directly represents a character or character string value of data type CHAR, WCHAR, STRING, or WSTRING

3.18
class
program organization unit consisting of:

- the definition of a data structure,
- a set of methods to be performed upon the data structure, and

3.19
comment
language construct for the inclusion of text having no impact on the execution of the program

[SOURCE: ISO/AFNOR:1989]

3.20
configuration
language element corresponding to a programmable controller system

3.21
constant
language element which declares a data element with a fixed value

3.22
counter function block
function block which accumulates a value for the number of changes sensed at one or more specified inputs

3.23
data type
set of values together with a set of permitted operations

[SOURCE: ISO/AFNOR:1989]

3.24
date and time
date within the year and the time of day represented as a single language element

3.25
declaration
mechanism for establishing the definition of a language element

3.26
delimiter
character or combination of characters used to separate program language elements

3.27
derived class
class created by inheritance from another class
Note 1 to entry: Derived class is also named extended class or child class.

3.28
derived data type
data type created by using another data type

3.29
derived function block type
function block type created by inheritance from another function block type

3.30
direct representation
means of representing a variable in a programmable controller program from which an implementation-specified correspondence to a physical or logical location may be determined directly

3.31
double word
data element containing 32 bits

3.32
dynamic binding
situation in which the instance of a method call is retrieved during runtime according to the actual type of an instance or interface

3.33
evaluation
process of establishing a value for an expression or a function, or for the outputs of a network or function block instance, during program execution

3.34
execution control element
language element which controls the flow of program execution

3.35
falling edge
change from 1 to 0 of a Boolean variable

3.36
function
language element which, when executed, typically yields one data element result and possibly additional output variables

3.37
function block instance
instance of a function block type

3.38
function block type
language element consisting of:

- the definition of a data structure partitioned into input, output, and internal variables; and
- a set of operations or a set of methods to be performed upon the elements of the data structure when an instance of the function block type is called

3.39
function block diagram
network in which the nodes are function block instances, graphically represented functions or method calls, variables, literals, and labels

3.40
generic data type
data type which represents more than one type of data

3.41
global variable
variable whose scope is global

3.42
hierarchical addressing
direct representation of a data element as a member of a physical or logical hierarchy

EXAMPLE A point within a module which is contained in a rack, which in turn is contained in a cubicle, etc.

3.43
identifier
combination of letters, numbers, and underscore characters which begins with a letter or underscore and which names a language element

3.44
implementation
product version of a PLC or the programming and debugging tool provided by the Implementer

3.45
Implementer
manufacturer of the PLC or the programming and debugging tool provided to the user to program a PLC application

3.46
inheritance
creation of a new class, function block type or interface based on an existing class, function block type or interface, respectively

3.47
initial value
value assigned to a variable at system start-up

3.48
in-out variable
variable which is used to supply a value to a program organization unit and which is additionally used to return a value from the program organization unit

3.49
input variable
variable which is used to supply a value to a program organization unit except for class