

# INTERNATIONAL STANDARD

**IEC**  
**61131-5**

First edition  
2000-11

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## **Programmable controllers –**

### **Part 5: Communications**

*Automates programmables –*

*Partie 5:  
Communications*

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International Electrotechnical Commission 3, rue de Varembé Geneva, Switzerland  
Telefax: +41 22 919 0300 e-mail: [inmail@iec.ch](mailto:inmail@iec.ch) IEC web site <http://www.iec.ch>



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# INTERNATIONAL ELECTROTECHNICAL COMMISSION

## PROGRAMMABLE CONTROLLERS –

### Part 5: Communications

#### 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 61131-5 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/411/FDIS	65B/420/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 3.

This part should be read in conjunction with the other parts of IEC 61131. IEC 61131 consists of the following parts under the general title: *Programmable controllers*.

Part 1:1992, General information.

Part 2:1992, Equipment requirements and tests.

Part 3:1993, Programming languages.

Part 4:1994, User guidelines (published as technical report IEC TR 61131-4)

Part 5:2000, Communications

Part 8:2000, Guidelines for the application and implementation of programming languages (published as technical report IEC TR 61131-8)



Annexes A and B form an integral part of this standard.

Annex C is for information only.

Where a conflict exists between this and other IEC standards (except basic safety standards), the provisions of this standard should be considered to govern in the area of programmable controllers and their associated peripherals.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

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- withdrawn;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

A bilingual version of this standard may be issued at a later date.

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# PROGRAMMABLE CONTROLLERS –

## Part 5: Communications

### 1 Scope

This part of IEC 61131 specifies communication aspects of a programmable controller. It specifies from the viewpoint of a PC how any device can communicate with a PC as a server and how a PC can communicate with any device. In particular, it specifies the behavior of the PC as it provides services on behalf of other devices and the services the PC application program can request from other devices. It is not intended to specify how any device can communicate with any device using a PC as a router or gateway. The behavior of the PC as a communication client and server is specified independent of the particular communication subsystem, but the communication functionality may be dependent on the capabilities of the communication subsystem used.

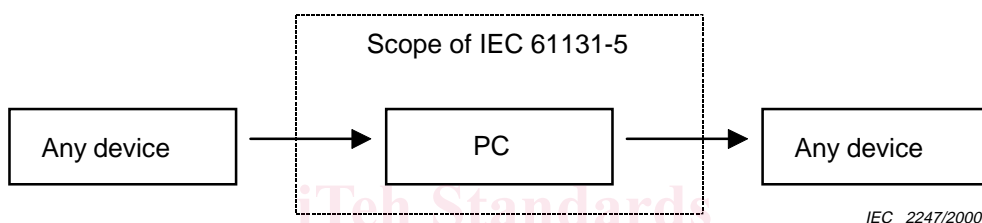


Figure 1 – Scope of this part of IEC 61131

The scope of this part is a subset of the "communication model" shown in figure 2 of IEC 61131-3; namely figures 2c and 2d are included in the scope of this part. Additionally, the means defined in this part of IEC 61131 may be used for communications within a program or between programs.

The mapping of the PC behavior to some particular communications subsystems is provided in the annexes.

### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61131. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61131 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.

IEC 60050-351:1998, *International Electrotechnical Vocabulary – Part 351: Automatic control*

IEC 61131-1:1992, *Programmable controllers – Part 1: General Information*

IEC 61131-2:1992, *Programmable controllers – Part 2: Equipment requirements and tests*

IEC 61131-3:1993, *Programmable controllers – Part 3: Programming languages*

ISO/IEC 2382-1:1993, *Information technology – Vocabulary – Part 1: Fundamental terms*

ISO/IEC 9506-1:1990, *Industrial automation systems – Manufacturing Message Specification – Part 1: Service definition*

ISO/IEC 9506-2:1990, *Industrial automation systems – Manufacturing Message Specification – Part 2: Protocol specification*

### 3 Definitions

For the purpose of this part of IEC 61131, the following definitions apply.

This part of IEC 61131 is based on the concepts of parts 1 to 3 of IEC 61131 and makes use of the following terms defined in other international standards.

#### Definitions from other publications

##### *IEC 60050-351*

control  
monitoring

##### *IEC 61131-1*

application program (2.1)  
application program archiving (4.6.4)  
cold restart (2.56)  
input (2.25)  
main processing unit (2.32)  
modifying the application program (4.6.2.6)  
output (2.40)  
programmable controller (2.50)  
programmable controller system (2.51)  
testing the application program (4.6.2.5)  
warm restart (2.56)

##### *IEC 61131-3*

access path (1.3.2)  
direct representation (1.3.23)  
invocation (1.3.43)  
program (verb, 1.3.60)  
sub-element (2.3.3.1)

##### *ISO/IEC 2382-1*

data

##### *ISO/IEC 9506-1*

client  
download  
event (clause 15)  
server  
uninterruptible variable access (12.1.1.1)  
upload  
variable

*Definitions of this part*

**3.1**

**alarm**

event which signals a specific condition

**3.2**

**data acquisition**

collection of data for the purpose of process monitoring and report generation

**3.3**

**direct operator interface**

when the client can communicate to the operator interface via the communication system with no application program interaction

**3.4**

**device verification**

allows other devices to determine if the PC is able to perform its intended function in the control system

**3.5**

**health**

the health of a PC or its subsystems is specified by returning one, and only one, of the three possible values. They are, in order of decreasing health: GOOD, WARNING and BAD

**3.6**

**interlocked control**

control through the synchronization of data exchanges between two parties. At various points in time, one party is waiting for the other party to deliver some expected data

**3.7**

**local**

internal to the PC; opposite of remote

**3.8**

**parametric control**

control by the client writing to control variables residing in the PC

**3.9**

**processing unit**

part of the main processing unit. It is the portion of a PC system which is responsible for the storage of the application program and data and the execution of the application program. A PC system has one or more processing units

**3.10**

**program verification**

testing of a PC application program to verify that it performs the function(s) it was designed to do in the process environment

**3.11**

**recipe**

description of procedures, or data for those procedures, or both, for making a product which uses the process or machinery that the controller is attached to, which is different from a previous product

**3.12****remote**

external to the PC; opposite of local

**3.13****state**

the state of the PC system is indicated by a list of attributes, each of which may be TRUE or FALSE. Zero, one, or more of these attributes may be TRUE at the same time

**3.14****unsolicited**

performed without an explicit request

**4 Symbols and abbreviations**

These are some abbreviations frequently used in this part of IEC 61131. These terms are defined or referenced in clause 3 of this part of IEC 61131.

CFB	Communication function block
FB	Function block
I/O	Input and output
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
MMS	Manufacturing Message Specification, ISO/IEC 9506-1 and ISO/IEC 9506-2
OSI	Open Systems Interconnection
PADT	Programming and debugging tool
PC	Programmable controller
PU	Processing unit

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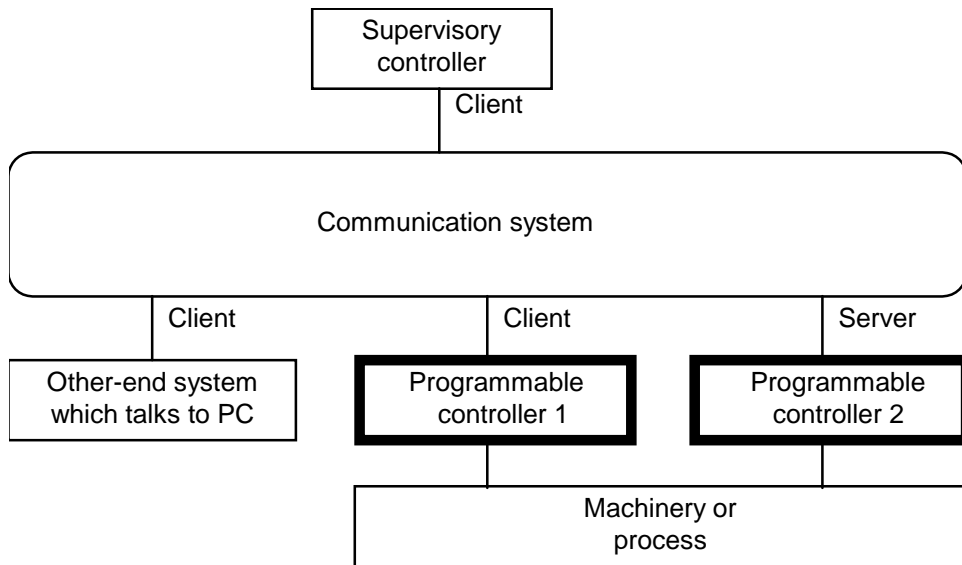
**5 Models**

This clause specifies the models which are used in the remainder of this part of IEC 61131.

**5.1 PC network communication model**

A programmable controller supplies some specific application functions to the rest of the control system. It may also request functions from other programmable controllers. The communication functions defined in this part of IEC 61131 are based on a communication subsystem that can report communication errors to the signal processing function of the PC (see 5.2).

The following diagram illustrates the devices in a communication network, showing three possible devices that request PC functions (clients) from PC 2. The two highlighted PCs are in the scope of this part of IEC 61131.



IEC 2248/2000

NOTE From the communication viewpoint the 'supervisory controller' and the 'other-end system which talks to PC' mentioned in this figure exhibit the same behavior to a PC communication server, i.e., they submit requests to the PC2.

**Figure 2 – PC communication model**

A PC may use its client function to communicate with any device if it behaves like a PC.

### 5.2 PC functional model

A PC consists of several functions (see figure 3). For a PC within the scope of this part of IEC 61131, at least one communication function is present.

The following diagram is taken from IEC 61131-1, figure 1. It is designed to illustrate some of the subsystems of a typical PC.