

Programmable controllers - Part 5: Communications

This document is a preview generated by EVS

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61131-5:2002 sisaldab Euroopa standardi EN 61131-5:2001 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 18.12.2002 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 09.02.2001.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 61131-5:2002 consists of the English text of the European standard EN 61131-5:2001.

This standard is ratified with the order of Estonian Centre for Standardisation dated 18.12.2002 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 09.02.2001.

The standard is available from Estonian standardisation organisation.

ICS 25.040.40, 35.240.50

Standardite reprodutseerimis- ja levitamiseõigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonilisse süsteemi või edastamine ükskõik millises vormis või millisel teel on keelatud ilma Eesti Standardikeskuse poolt antud kirjaliku loata.

Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:
Aru 10 Tallinn 10317 Eesti; www.evs.ee; Telefon: 605 5050; E-post: info@evs.ee

Right to reproduce and distribute Estonian Standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without permission in writing from Estonian Centre for Standardisation.

If you have any questions about standards copyright, please contact Estonian Centre for Standardisation:
Aru str 10 Tallinn 10317 Estonia; www.evs.ee; Phone: +372 605 5050; E-mail: info@evs.ee

EUROPEAN STANDARD

EN 61131-5

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2001

ICS 25.040.40;25.240.50

English version

Programmable controllers
Part 5: Communications
(IEC 61131-5:2000)

Contrôleurs programmables
Partie 5: Communications
(CEI 61131-5:2000)

Speicherprogrammierbare Steuerungen
Teil 5: Kommunikation
(IEC 61131-5:2000)

This European Standard was approved by CENELEC on 2001-01-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 65B/411/FDIS, future edition 1 of IEC 61131-5, prepared by SC 65B, Devices, of IEC TC 65, Industrial-process measurement and control, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61131-5 on 2001-01-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2001-10-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2004-01-01

This part is to be read in conjunction with the other parts of EN 61131.

Annexes designated "normative" are part of the body of the standard.
In this standard, annexes A, B and ZA are normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61131-5:2000 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-351	1998	International Electrotechnical Vocabulary Part 351: Automatic control	-	-
IEC 61131-1	1992	Programmable controllers Part 1: General information	EN 61131-1	1994
IEC 61131-2	1992	Part 2: Equipment requirements and tests	EN 61131-2 + corr. December + A11 + corr. December + A12	1994 1997 1996 1997 2000
IEC 61131-3	1993	Part 3: Programming languages	EN 61131-3	1993
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	EN 29506-1	1993
ISO/IEC 9506-2	1990	Part 2: Protocol specification	EN 29506-2	1993

INTERNATIONAL STANDARD

IEC
61131-5

First edition
2000-11

Programmable controllers –

**Part 5:
Communications**

Automates programmables –

*Partie 5:
Communications*



Reference number
IEC 61131-5:2000(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.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site** (www.iec.ch)

- **Catalogue of IEC publications**

The on-line catalogue on the IEC web site (www.iec.ch/catlg-e.htm) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

This summary of recently issued publications (www.iec.ch/JP.htm) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

Email: custserv@iec.ch
Tel: +41 22 919 02 11
Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC
61131-5

First edition
2000-11

Programmable controllers –

Part 5: Communications

Automates programmables –

*Partie 5:
Communications*

© IEC 2000 — Copyright - all rights reserved

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.

International Electrotechnical Commission
Telefax: +41 22 919 0300

3, rue de Varembé, Geneva, Switzerland
e-mail: inmail@iec.ch IEC web site: <http://www.iec.ch>



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE **XD**

For price, see current catalogue

CONTENTS

	Page
FOREWORD	6
Clause	
1 Scope	8
2 Normative references	8
3 Definitions	9
4 Symbols and abbreviations	11
5 Models	11
5.1 PC network communication model	11
5.2 PC functional model	12
5.3 PC hardware model	14
5.4 Software model	14
6 PC communication services	15
6.1 PC subsystems and their status	15
6.2 Application specific functions	22
7 PC communication function blocks	28
7.1 Overview of the communication function blocks	28
7.2 Semantic of communication FB parameters	29
7.3 Device verification	34
7.4 Polled data acquisition	38
7.5 Programmed data acquisition	41
7.6 Parametric control	51
7.7 Interlocked control	54
7.8 Programmed alarm report	61
7.9 Connection management	69
7.10 Example for the use of communication function blocks	73
8 Compliance and implementer specific features and parameters	76
8.1 Compliance	76
8.2 Implementation specific features and parameters	77
Annex A (normative) Mapping to ISO/IEC 9506-5	78
Annex B (normative) PC behavior using ISO/IEC 9506-2	98
Figure 1 – Scope of this part of IEC 61131	8
Figure 2 – PC communication model	12
Figure 3 – Programmable controller functional model	13
Figure 4 – Programmable controller hardware model	14
Figure 5 – PC software model	15
Figure 6 – Programmable controller power supply	19
Figure 7 – Type description of status information	21
Figure 8 – Interlocked control timeline	24
Figure 9 – Function REMOTE_VAR	31

Figure 10 – Principle of status signalling	32
Figure 11 – Timing diagram of the ERROR and STATUS outputs	32
Figure 12 – STATUS function block	34
Figure 13 – USTATUS function block	35
Figure 14 – Timing diagram of the STATUS function block	35
Figure 15 – State diagram of STATUS function block	36
Figure 16 – State diagram of USTATUS function block	37
Figure 17 – READ function block	39
Figure 18 – Timing diagram of READ function block	39
Figure 19 – State diagram of READ function block	40
Figure 20 – Programmed data acquisition data flow	41
Figure 21 – USEND function block	42
Figure 22 – URCV function block	42
Figure 23 – Timing diagram of USEND and URCV function blocks	43
Figure 24 – State diagram of USEND function block	43
Figure 25 – State diagram of URCV function block	45
Figure 26 – BSEND function block	47
Figure 27 – BRCV function block	48
Figure 28 – Timing diagram of BSEND and BRCV function blocks	48
Figure 29 – State diagram of BSEND function block	49
Figure 30 – State diagram of BRCV function block	50
Figure 31 – WRITE function block	52
Figure 32 – Timing diagram of WRITE function block	53
Figure 33 – State diagram of WRITE function block	53
Figure 34 – SEND function block	55
Figure 35 – RCV function block	56
Figure 36 – Timing diagram of SEND and RCV function blocks	57
Figure 37 – State diagram of SEND function block	58
Figure 38 – State diagram of RCV function block	60
Figure 39 – NOTIFY function block	62
Figure 40 – ALARM function block	63
Figure 41 – Timing diagram of ALARM function block	64
Figure 42 – State diagram of NOTIFY function block	65
Figure 43 – State diagram of ALARM function block	67
Figure 44 – CONNECT function block	69
Figure 45 – Timing diagram of CONNECT function block	70
Figure 46 – State diagram of CONNECT function block	71
Figure 47 – Example in function block diagram language	76
Table 1 – Status presenting entities	16
Table 2 – PC summary status	17
Table 3 – Status of I/O subsystem	18
Table 4 – Status of processing unit	18

Table 5 – Status of power supply	19
Table 6 – Status of memory	19
Table 7 – Status of communication subsystem	20
Table 8 – Status of implementer specific subsystem	20
Table 9 – Presentation of status information	21
Table 10 – Device verification features	23
Table 11 – Data acquisition features	23
Table 12 – Control features	24
Table 13 – Alarm reporting features	25
Table 14 – Startable and stoppable units	25
Table 15 – Meaning of I/O State	26
Table 16 – I/O state	26
Table 17 – Execution and I/O control features	26
Table 18 – Loadable units	27
Table 19 – Application program transfer features	27
Table 20 – Connection management features	28
Table 21 – Overview of the communication function blocks	28
Table 22 – Semantic of communication FB parameters	30
Table 23 – Values of the SCOPE parameter	31
Table 24 – Value and interpretation of the STATUS output	33
Table 25 – Transitions of the STATUS state diagram	36
Table 26 – Action table for STATUS state diagram	36
Table 27 – Transitions of USTATUS state diagrams	37
Table 28 – Action table of USTATUS state diagram	37
Table 29 – Transitions of the READ state diagram	40
Table 30 – Action table for READ state diagram	41
Table 31 – Transitions of the USEND state diagram	44
Table 32 – Action table for USEND state diagram	44
Table 33 – Transitions of URCV state diagrams	45
Table 34 – Action table of URCV state diagram	46
Table 35 – Transitions of the BSEND state diagram	49
Table 36 – Action table for BSEND state diagram	50
Table 37 – Transitions of BRCV state diagrams	51
Table 38 – Action table of BRCV state diagram	51
Table 39 – Transitions of the WRITE state diagram	54
Table 40 – Action table for WRITE state diagram	54
Table 41 – Transitions of the SEND state diagram	58
Table 42 – Action table for SEND state diagram	59
Table 43 – Transitions of RCV state diagrams	60
Table 44 – Action table of RCV state diagram	61
Table 45 – Transitions of the NOTIFY state diagram	65
Table 46 – Action table for NOTIFY state diagram	66
Table 47 – Transitions of the ALARM state diagram	68

Table 48 – Action table for ALARM state diagram	68
Table 49 – Transitions of the CONNECT state diagram	72
Table 50 – Action table for CONNECT state diagram	73
Table 51 – Table titles and relevant tables for compliance	76
Table 52 – Implementation specific features and parameters	77
Table A.1 – Type description mapping	81
Table A.2 – Mapping of the SCOPE and SC_ID parameter	81
Table A.3 – Size prefix of direct representation	82
Table A.4 – Transition mapping of the STATUS state diagram	84
Table A.5 – Action mapping for STATUS state diagram	84
Table A.6 – Transition mapping of USTATUS state diagram	84
Table A.7 – Action mapping of USTATUS state diagram	84
Table A.8 – Transition mapping of the READ state diagram	85
Table A.9 – Action mapping for READ state diagram	85
Table A.10 – Transition mapping of the USEND state diagram	86
Table A.11 – Action mapping for USEND state diagram	86
Table A.12 – Transition mapping of URCV state diagram	86
Table A.13 – Action mapping for URCV state diagram	87
Table A.14 – Transition mapping of the BSEND state diagram	87
Table A.15 – Action mapping for BSEND state diagram	88
Table A.16 – Transition mapping of BRCV state diagram	88
Table A.17 – Action mapping for BRCV state diagram	89
Table A.18 – Transition mapping of the WRITE state diagram	90
Table A.19 – Action mapping for WRITE state diagram	90
Table A.20 – Transition mapping of the SEND state diagram	90
Table A.21 – Action mapping for SEND state diagram	91
Table A.22 – Transition mapping of RCV state diagram	91
Table A.23 – Action mapping of RCV state diagram	92
Table A.24 – Transition mapping of the NOTIFY state diagram	94
Table A.25 – Action mapping for NOTIFY state diagram	94
Table A.26 – Transition mapping of the ALARM state diagram	95
Table A.27 – Action mapping for ALARM state diagram	95
Table A.28 – Transitions of the CONNECT state diagram	96
Table A.29 – Action mapping for CONNECT state diagram	96
Table A.30 – Implementation specific features and parameters	97
Table B.1 – CreateProgramInvocation service defaults	98
Table B.2 – Program Invocation service defaults for I/O State parameter	98
Table B.3 – Implementation specific features and parameters	99

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.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

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.

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.

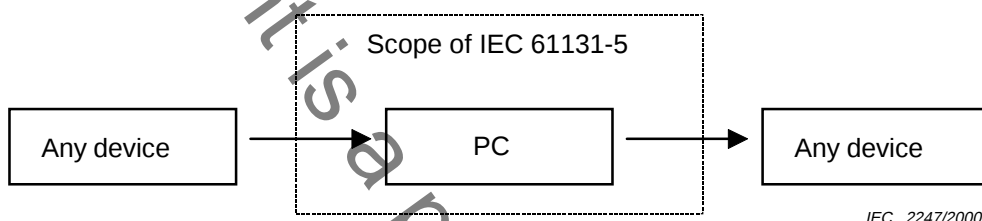


Figure 1 – Scope of this part of IEC 61131

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*