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**Programmable controllers –
Part 5: Communications**

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**Automates programmables –
Partie 5: Communications**

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IEC 61131-5:2000



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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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CONTENTS

FOREWORD.....	6
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.....	47
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.....	20
Table 7 – Status of communication subsystem	20
Table 8 – Status of implementer specific subsystem	21

Table 9 – Presentation of status information	21
Table 10 – Device verification features	23
Table 11 – Data acquisition features	24
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

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 IEC 61131-5:2000
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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.
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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.

This bilingual version (2012-08) corresponds to the monolingual English version, published in 2000-11.

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.

The French version of this standard has not been voted upon.

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.

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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.

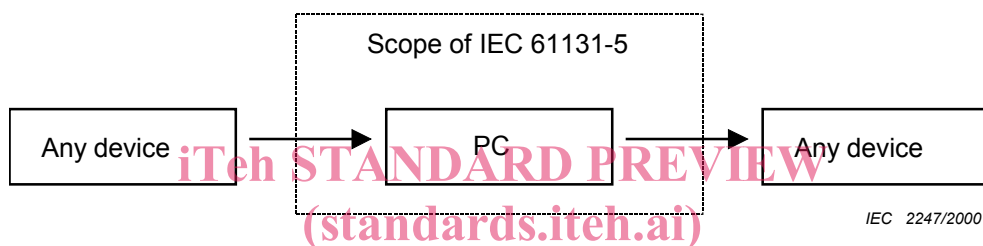


Figure 1 – Scope of this part of IEC 61131

IEC 61131-5:2000

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

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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

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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

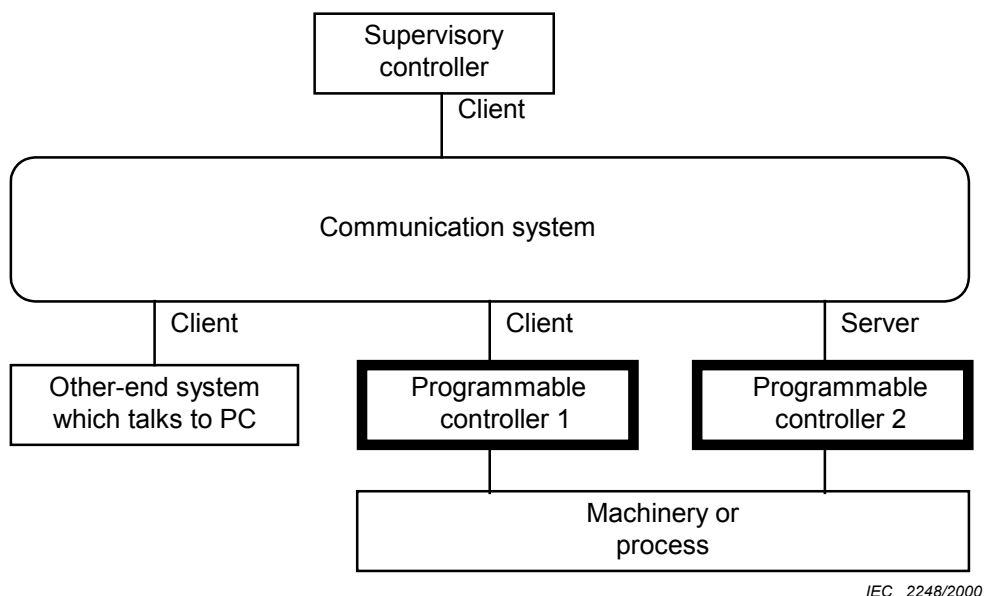
5 Models

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.



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

[IEC 61131-5:2000](https://standards.iteh.ai/catalog/standards/sist/618a46c9-9654-4211-b24e-ec35cb6019c5/iec-61131-5-2000)

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.

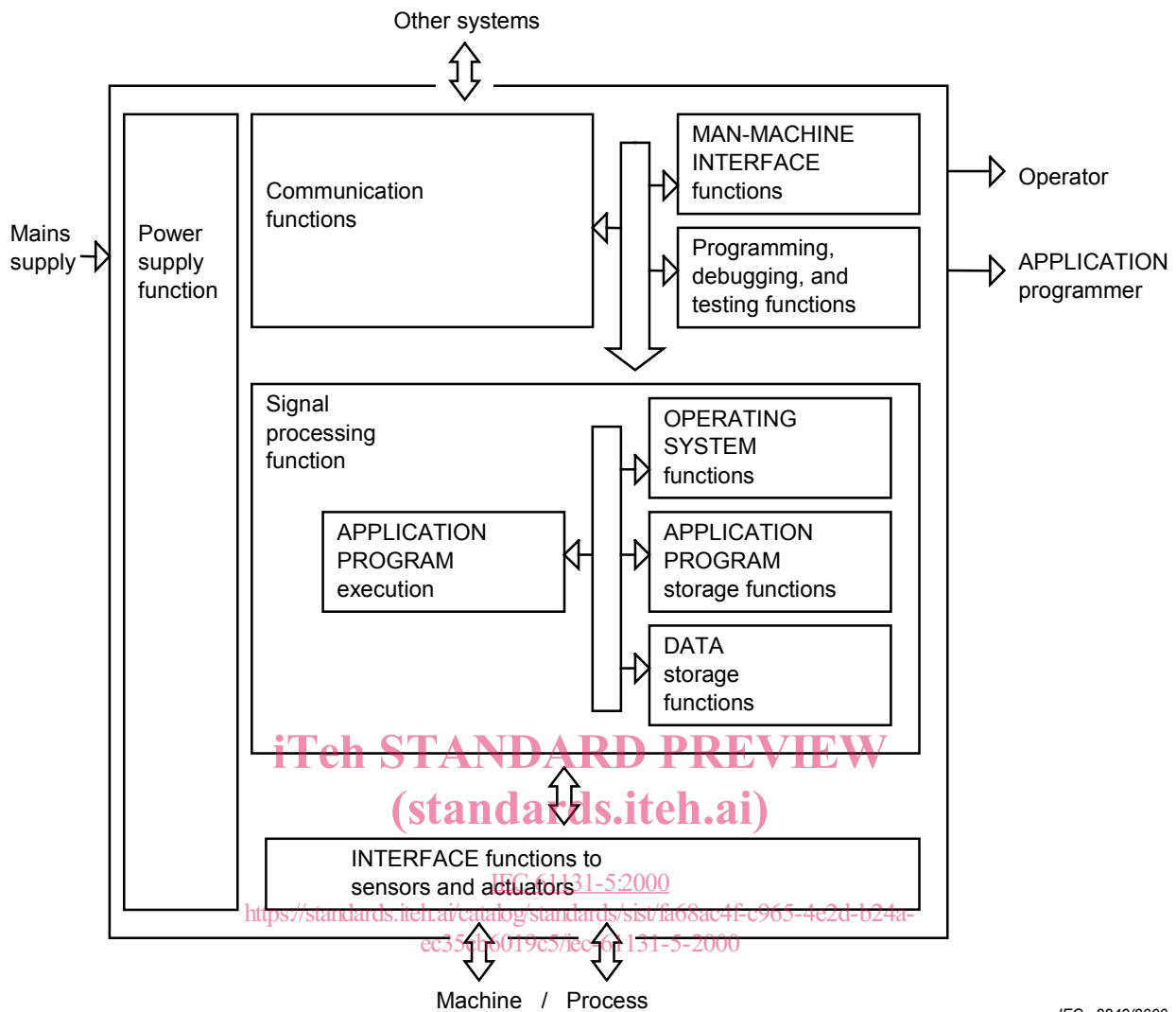


Figure 3 – Programmable controller functional model

There is a function that is part of the PC system, but usually external to the PC itself, known as the programming and debugging tool (PADT). The PADT is modelled as interacting with the PC via the communications function.

The Interface Function to Sensors and Actuators can have I/O which are local or remote to the Main Processing Unit (see 5.3 for the hardware model). The Interface Function to Sensors and Actuators has two attributes for each Application Program which defines how the PC is monitoring and controlling the machine/process. The input attribute has the following states:

- inputs provided to the Application Program are being supplied by the sensors,
- inputs provided to the Application Program are being held in the current state.

The output attribute has the following states:

- the actuators are being controlled by the Application Program,
- the actuators are being held in the current state.