SLOVENSKI STANDARD
oSIST prEN ISO 16484-2:2016

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Avtomatizacija stavb in sistemi za regulacijo - 2. del: Strojna oprema (ISO/DIS 16484-2)

Building automation and control systems (BACS) - Part 2: Hardware (ISO/DIS 16484-2)

Systeme der Gebäudeautomation (GA) - Teil 2: Hardware (ISO/DIS 16484-2)

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__ICS:__

35.240.67	Uporabniške rešitve IT v gradbeništvu	IT applications in building and construction industry
97.120	Avtomatske krmilne naprave za dom	Automatic controls for household use

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DRAFT INTERNATIONAL STANDARD
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Building automation and control systems (BACS) —

Part 2:
Hardware

Systèmes de gestion technique du bâtiment —

Partie 2: Équipement

ICS: 91.040.01

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the European Committee for Standardization (CEN), and processed under the **CEN lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 205, "Building environment design".

ISO 16484-2 is part of the EN ISO 16484 series of International Standards under the general title *Building Automation and Control Systems (BACS)* and consists of the following parts:

Part 1: *Overview and Vocabulary*

Part 2: *Hardware*

Part 3: *Functions*

Part 4: *Applications*

Part 5: *Data communication - Protocol*

Part 6: *Data communication - Conformance testing*

Part 7: *Project specification and implementation*

In this standard, Annex A: *General safety requirements and environmental conditions* and the Bibliography are both informative.

Introduction

This series of standards is intended for design of new buildings and retrofit of existing buildings for an acceptable indoor environment, practical energy conservation and efficiency.

The application of this series of standards for BACS is envisaged as follows:

— the environmental design for all building types requires complex methods for automation and control. The functional integration of services other than HVAC e.g. lighting and electric power distribution control, security control, transportation, maintenance management or facilities management is a general task for all parties employed to develop an integrated multi-application system. This integration allows the user to take advantage of synergies between the different applications. This standard will give guidance to architects, consultants and contractors as well as to users on how to share such resources,

— the innovation cycles between devices, systems and networks vary. To make it possible to add and to change existing devices, and extend the building automation and control network, several interfaces both proprietary and standardized are defined between the BACS network and the other systems. A manufacturer can design a product, both to meet his specific marketing objectives and to give the option to integrate that special device into a multi-application BACS. Interfaces are also defined in appropriate parts of this standard along with the necessary communications protocol and conformance test required to support the inter-working of devices,

— a manufacturer, a systems house, or an electrical or mechanical contractor can assemble an implementation of a building automation and control system,

— the application of this standard is not to standardize the hardware and software design or the architecture of a System, but to define the process for the creation of project specifications, where functionality and the quality of the solution are clearly defined.

The purpose of this series of standards is intended for use by those involved in the design, manufacture, engineering, installation, commissioning, operational maintenance and training of BACS when contracted, i.e.:

— as a guide to the terminology of the building automation and control trade. Unambiguous terminology is required for a complete and accurate conveyance of the intent and details of this standard;

— in product development, to avoid unnecessary duplication of function or terminology, but should not place a restraint on the evolution of new products, systems or applications;

— as a basis for interfacing products and systems. In order to interoperate, the elements of a BACS require a unified data communication protocol and information model;

— as a basis for drawing up a project specification for the procurement of building automation and control products for systems suppliers and customers;

— as a code of practice for expertly commissioning prior to handover of a system;

— by educational establishments wishing to train people in the field of building automation and control systems.

This entire series of BACS standards consists of the following contents:

Part 1: Overview and definitions (in preparation)

Part 1 of this standard describes the objectives and interrelationships of all parts of this standard. It provides an overview and detailed information about the structure of the related series of standards for the BACS industry.

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This part of the standard provides also the vocabulary with terms and definitions for the understanding of the entire series of this standard and it contains a translation of the main terms in English, French, Russian, and German in an informative annex.

This ongoing work is coordinated at expert level with standards work from ISO/TC 205/WG 3 and CEN/TC 247/WG 3, WG 4, WG 5 and WG 6.

Part 2:   Hardware (refer to the scope of this part)

Part 3:   Functions

Part 3 of this standard specifies the requirements for the overall functionality and engineering services to achieve building automation and control systems. It defines terms, which shall be used for specifications and it gives guidelines for the functional documentation of project/application specific systems. It provides a template for documentation of plant/application specific functions, called BACS function list in <u>annex A</u>.

The informative function block examples explain a method to display the referenced functions in system documentation; they do not standardize the method for programming functions and applications.

This Part 3 of the standard covers the following:

Requirements and definitions regarding BACS and application software, generic functions for plant/project specific applications and engineering functions for building controls and operations. It provides communication functions for the integration of other dedicated special system processes. The functional requirements in this part of the standard are subdivided as follows:

— System management and application software:

describes the requirements for plant independent system and human system interface programs related to a project, including the operating system. This standard does not dedicate the following system functionality to any particular hardware, e.g.:

— system diagnostics, watchdog, redundancy, time keeping, access control, log lists;

— point identification, event message handling, print control;

— database, statistics, data archiving, remote access;

— system communications.

— Human system interface (HSI), point information presentation, graphics, alarms, time scheduling

— Engineering process and tool software:

describes the requirements for configuring of the hardware and control strategies, the system management and the commissioning process.

— BACS application processing programs and plant/application specific functions:

describes the requirements for plant, application and / or project specific functions and a method for the documentation of a project. The functions are subdivided into the following types:

— input and output functions;

— processing functions;

— management functions and required communications;

— operator functions.

Part 3 defines a method for creating the procurement specifications containing all essential elements required for the operational functioning of a BACS. The successful installation and operation of a BACS requires that its procurement be based on a complete specification with accurately defined functions.

The standard provides a template called the 'BACS function list' that can be found in <u>annex A</u> (normative). Its purpose is to determine and document the options for plant / application specific functionality. Further explanations can be given in form of plant/control descriptions, control flow chart diagrams, and plant/control schematics. Examples are given in <u>annex B</u> (informative). The exact specifications will be project-specific. Information about the standardized functions is given in the form of informative examples as function-blocks, textual, and graphical descriptions in <u>5.5</u>.

It is recognized, that functions can be described and implemented in many different ways, depending on:

— climatic differences;

— cultural and regional differences;

— national regulations.

Part 4: Applications

Part 4 of this standard specifies the requirements for specific communicating applications/devices, e.g. for general room automation and for sophisticated optimization of controls for heating, fan coil and induction units, CAV, VAV and radiant cooling.

This work will be coordinated at expert level with standards work from ISO/TC 205/WG 3 and CEN/TC 247.

Part 5: Data Communication – Protocol

Part 5 of this standard specifies data communication services and objects for computer equipment and controllers used for monitoring and control of HVAC&R and other systems of building services.

This protocol provides a comprehensive set of objects for conveying encoded binary, analog, and alphanumeric data between devices including, but not limited to:

— input measuring: analog input object;

— output positioning/set-point: analog output object;

— binary input counting;

— input state: binary input object, multi-state input;

— output switching: binary output object, multi-state output;

— values: analog value, binary value, multi-state value, accumulated value, averaging object, trend log object;

— text string;

— schedule information;

— alarm and event information;

— files; and

— control programs and parameters respectively.

This protocol models each building automation and control system as a collection of data structures called objects, the properties of which represent various aspects of the hardware, software, and operation of the device. These objects provide a means of identifying and accessing information without requiring knowledge of the details of the device's internal design or configuration.

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An overview of possible integration with other systems in buildings, e.g. fire, security, access control, maintenance and facilities management, is shown in Figure 1 of Part 2 of this standard.

Part 6:   Data Communication – Conformance testing

Part 6 of the standard specifies the technical requirements of the conformance test suite and the methods for testing the products for the conformance with the protocol. It provides a comprehensive set of procedures for verifying the correct implementation of each capability claimed on a BACS network protocol implementation conformance statement (PICS) including:

a)   support of each claimed BACS network service, either as an client (initiator), server (executor), or both;

b)   support of each claimed BACS network object-type, including both required properties and each claimed optional property;

c)   support of the BACS network layer protocol;

d)   support of each claimed data link option, and

e)   support of all claimed special functionality.

Part 7:   Project specification and implementation

Part 7 of this standard specifies methods for project specification and implementation of BACS and for integration of other systems into the BACS. This standard defines terms to be used for project specifications and gives guidelines for integration of other systems.

a)   Project specification and implementation:

This clause of the standard describes the procedures (codes of practice) required for the following:

—   project specification;

These procedures also contain an example for a plant/system/customer premises wide unique structured addressing system for data point identification;

—   engineering;

—   installation;

—   project handover.

b)   System integration:

This clause of the standard describes the special requirements/procedures for the integration and implementation of intersystem communication with foreign systems and the interconnection of other units/devices with integrated communications interfaces, e.g. chillers, elevators.

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Building automation and control systems (BACS) —

Part 2:
Hardware

1   Scope

This part of the standard specifies the requirements for the hardware to perform the tasks within a BACS. It provides the terms, definitions, and abbreviations for the understanding of Part 2 and Part 3.

Part 2 relates only to physical items/devices, i.e.:

— operator stations and other human system interface devices;

— devices for management functions;

— control devices, automation stations and application specific controllers;

— field devices and their interfaces;

— cabling and interconnection of devices;

— engineering and commissioning tools.

This part of this standard shows a generic system model to which all-different types of BACS and their interconnections (BACS network) can fit. A graphical concept of the BACS network in terms of LAN and inter-network topology will be provided in Part 5 of this standard.

National annexes:

National annexes may specify the local requirements of physical and electrical characteristics, the verifications for BACS devices and equipment, and the code of practice for the physical installation of systems. The annexes shall refer to the regional implementations of the relevant IEC standards.

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 60050-351; *International Electrotechnical Vocabulary — Part 351: Automatic control*

IEC 60529:1989+ AMD1:1999 *Degrees of protection provided by enclosures (IP code)*

IEC 60664-1:2007 *Insulation coordination for equipment within low-voltage systems — Part 1: ¶Principles, requirements and tests*

IEC 60715:1981 +AMD1:1995 *Dimensions of low-voltage switchgear and controlgear — Standardized mounting on rails for mechanical support of electrical devices in switchgear and controlgear installations*

IEC 61131-3:2003 *Programmable controllers — Part 3: Programming languages*

ISO/IEC 7498-1:1994, *Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model — Part 1*

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ISO/IEC 10746-2:2009, *Information technology — Open distributed processing — Reference model: Foundations — Part 2*

ISO/IEC Guide 2:2004, *Standardization and related activities — General vocabulary*

3 Terms and definitions

This clause presents the vocabulary used in this Part 2 and Part 3 of the standard for BACS.

The terms and definitions listed in this standard but defined by other relevant ISO/IEC International Standards are repeated below for convenience in most cases.

NOTE   Other language versions may contain an alphabetical index in National Annexes.

For the purposes of this standard, the following terms and definitions apply.

3.1
3-point control
control function with a three-position output that can assume only three discrete values: zero and two values with opposite signs. These output values are used to position with two binary signals providing three control states

EXAMPLE

a) opening, stopped, closing;

b) more, neutral, less; c) heating, neutral, cooling.

3.2
access control
<BACS> method for determining or restricting access to system and network resources

[SOURCE: ISO 16484-5, 3.2.1]

Note 1 to entry: Also refer to security and operator authentication.

Note 2 to entry: Data privacy protection is the framework conditions protecting personal data from being used by any one other than the owner (regulated by national law).

Note 3 to entry: Data security is the framework conditions to protect data from direct or indirect manipulation or unauthorized use. Data manipulation includes loss of data, destruction or falsification of data.

Note 4 to entry: Data security means are the measures and equipment to secure and maintain the safety of data.

Note 5 to entry: cf. *access control system* (3.3)

3.3
access control system
<BACS> dedicated special system for security

Note 1 to entry: cf. *access control* (3.2)

3.4
access control system
<security> automatic checking of access rights under organizational measures and barrier/door control for buildings/rooms, including registration of events

Note 1 to entry: An access control system belongs to security systems.

3.5
Acknowledge
<BACS> recognition and/or registration of an event (e.g. alarm) by an operator

Note 1 to entry: An acknowledgement can be invoked by an operator using a physical device, or by using a human system interface e.g. selecting an Icon on a VDU.

3.6
acknowledgement
<communications> function that allows a destination node to inform a sending node of the receipt of a protocol-data-unit

[SOURCE: ISO/IEC 7498-1:1994]

3.7
actuator
<BACS> *field device* (3.80) that interfaces to control a plant process, operated electrically, pneumatically, or hydraulically. It influences the mass flow or energy flow

Note 1 to entry: A control valve is the combination of a valve with its operating element.

Note 2 to entry: A regulating element (functional unit), or a final controlling element (physical unit) [IEV 351], i.e. a damper, a valve is often referred to as positioning actuator (3.1.5.3) .

Note 3 to entry: c.f. *positioning actuator* (3.153)

3.8
actuator

<HBES> bus/network communications output device (analog or binary), e.g. to control a load, a contactor, or a positioner

Note 1 to entry: A binary actuator is sometimes also referred to as switched actuator (on/off type).

Note 2 to entry: c.f. *switched actuator* (3.185)

3.9
Address
<BACS> unique object identifier and/or device identifier within a system or combined systems

Note 1 to entry: In BACS, each data point has an identifier named point address.

Note 2 to entry: In BACS, each communications object has properties named object identifier and object name.

Note 3 to entry: cf. *point address* (3.150) and *user address* (3.196)

3.10
addressing system
address scheme
unique structured method for data point identification to address the information provided in BACS, consisting of a scheme and the semantics of the elements

Note 1 to entry: This scheme can apply throughout a plant, a complete BACS, or the entire customer premises as appropriate.

Note 2 to entry: cf. *user address* (3.196)

3.11
Alarm
<BACS> warning of the presence of a hazard to a property or the environment, in security systems also to life

Note 1 to entry: An annunciation either audible or visual or both that alerts an operator to an abnormal condition, which can require corrective action.

[SOURCE: ISO 16484-5, 3.2.2]

Note 2 to entry: An abnormal condition detected by a device or controller that implements a rule or logic specifically designed to look for that condition, e.g. 'frost alarm'.

3.12
Algorithm
<BACS> calculation that results in an output by evaluating input variable(s)

3.13
Algorithm
<control technology> completely determined finite sequence of instructions by which the values of the output variables can be calculated from the values of the input variables

[SOURCE: ISO 60050-351]

3.14
Alphanumeric
character set, that consists at least of decimal digits and letters

Note 1 to entry: It is advisable to specify the extent of the character set in each case.

3.15
analog input/output
part of the hardware pertaining to a control device for measuring or positioning

3.16
analog value
information containing a numerical represented quantity

3.17
Application
set of functions that together form a logical unit supporting a process

Note 1 to entry: A BACS supports many different applications.

Note 2 to entry: A set of a user's information processing requirements.

[SOURCE: ISO 8649, ISO 16484-5, 3.1.2]

3.18
application object
object located within the BACS device's application process

Note 1 to entry: See object (3.132).

Note 2 to entry: cf. *object type* (3.133)

3.19
application specific controller¶ASC
controller
customized device fulfilling the requirements of a specified application

Note 1 to entry: In BACS, a controller is any device capable of controlling/automation and possibly monitoring other devices and units.

3.20
Architecture
<BACS> structure and means by which components and devices of a system are connected to intercommunicate

3.21
automation
SEE *control* (3.51)

Note 1 to entry: Also refer to *processing functions* (3.155).

3.22
automation network **(US)**
AN
control network **(GB)**
CN
connections between controllers, operator stations / panels, programming units, data interface units, and data processing devices (e.g. server stations)

Note 1 to entry: A schematic diagram is shown in Figure 1.

3.23
backup
<data processing> process to copy/export data to the data storage of an external backup device to retrieve and restore this data in case of a storage fault. The copy is referred to as backup copy

3.24
backup
<general> supporting services

3.25
backup power operation
operating mode using reserve power supply systems for building operation

3.26
BACS application program
software to perform one or more tasks of a BACS

3.27
BACS function list
BACS FL
information list (deprecated)

Spreadsheet list for documentation and summing up BACS functions, defined in Part 3 of this standard

Note 1 to entry: A BACS points list (BACS PL) in some countries referes to the physical I/O only.

3.28
BACS network
Building automation and control system network to exchange information between digital (binary), analog, and other communication objects in different devices.

3.29
binary (signal)
signal that represents the state (e.g., on/off) of a single binary coded digital information (logic 0 and I). It applies to input and output functions of a BACS

Note 1 to entry: In BACS, a digital value is a variable that represents the value of digitally coded analog or binary information. It applies to shared/network data points.

Note 2 to entry: Devices with a number of binary inputs/outputs are often referred to as digital (3.65).

3.30
binary input/output
hardware pertaining to control devices for state processing or switching

Note 1 to entry: The function is referred to as binary input state and output switching.