SLOVENSKI STANDARD

SIST EN ISO 16484-3:2005

marec 2005

Avtomatizacija stavb in sistemi za regulacijo - 3. del: Funkcije (ISO 16484-3:2005)

Building automation and control systems (BACS) - Part 3: Functions (ISO 16484-3:2005)

ICS 35.240.99; 97.120

Referenčna številka
SIST EN ISO 16484-3:2005(en)

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 16484-3

January 2005

ICS 35.240.99; 97.120

English version

Building automation and control systems (BACS) - Part 3: Functions (ISO 16484-3:2005)

Systèmes de gestion technique du bâtiment (SGTB) - Partie 3: Fonctions (ISO 16484-3:2005)

Systeme der Gebäudeautomation (GA) - Teil 3: Funktionen (ISO 16484-3:2005)

This European Standard was approved by CEN on 10 December 2003.

CEN 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 CEN 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 CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword

This document (EN ISO 16484-3:2005) has been prepared by Technical Committee CEN /TC 247, "Building Automation, Controls and Building Management", the secretariat of which is held by SNV, in collaboration with Technical Committee ISO/TC 205 "Building environment design".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2005, and conflicting national standards shall be withdrawn at the latest by July 2005.

The EN ISO 16484-3 is part of the EN ISO 16484 series of European Standards under the general title *Building Automation and Control Systems (BACS)*, which will comprise the following parts:

Part 1: *Overview and vocabulary*

Part 2: *Hardware*

Part 3: *Functions*

Part 4: *Applications*

Part 5: *Data communication - Protocolcity*

Part 6: *Data communication - Conformance testing*

Part 7: *Project implementation*

Annex A , *BACS points list,* forms a normative part of this standard

In this standard annex B, *Examples for plant-/control schematic and BACS points list,* is informative.

This document includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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.

This part describes the software and the engineered functions used for building automation and control systems.

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 are general tasks 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 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 interworking of devices;

- a manufacturer, a systems house, or an electrical or mechanical contractor may 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. A precise definition of system functionality is needed to prevent the overlap of functionality in different control system devices;

— as a basis for interfacing products and systems. In order to interoperate, the elements of a BACS require a common 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. The successful design, procurement, installation, and operation of BACS require careful management and integration of the various aspects of the project;

— as a code of practice for proper 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 vocabulary (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.

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 2, WG 3, WG 4 and WG 5.

Each specific part of this standard contains its dedicated necessary terms and abbreviations/acronyms out of this part.

Part 2: Hardware

Part 2 of the standard specifies the requirements for the hardware to perform the tasks within a BACS. Part 2 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.:

— devices for management functions, operator stations and other human system interface devices;

— controllers, automation stations and application specific controllers;

— field devices and their interfaces;

— cabling and interconnection of devices;

— engineering and commissioning tools.

Part 2 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 internetwork topology will be provided in Part 5 of this standard.

Regional amendment(s):

Regional amendments can 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 amendments refer to the regional implementations of the relevant IEC standards.

Part 3: Functions (refer to the scope of this part)

Part 4: Applications (in preparation)

Part 4 of the 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 ongoing 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 the standard specifies data communication services and protocols 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 messages for conveying encoded binary, analog, and alphanumeric data between devices including, but not limited to:

— input measuring: analog input object, analog input value, averaging object, trend log object;

— output positioning/setpoint: analog output object, analog output value;

— binary input counting: counter input value, totalised value, accumulated value;

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

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

— text string values;

— 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.

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 (in preparation)

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 initiator, 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 implementation

Part 7 of this standard specifies methods for project implementation and integration of BACS. This standard defines terms to be used for project specifications and gives guidelines of project specific system integration.
Project implementation can consist of two parts, the system implementation and, if required system integration:

— System implementation:

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

— System design,

This also contains an example for a plant/system/customer premises wide unique structured addressing system for data point identification.

— System engineering,

— System installation,

— System handover,

— System integration:

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

1 Scope

This Part 3 of the 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 sample template for documentation of plant/application specific functions, called BACS points list in annex A.

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 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 systems 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, physical and shared;

  — processing functions (e.g. for monitoring, interlocks, control and optimization);

  — management functions (system programs), and required communications;

  — operator functions.

This Part 3 defines a method for specifying 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 and accurate functional specification.

The standard provides a template called the 'BACS points list' that can be found in annex A (normative). Its purpose is to determine and document the options for plant/application specific functionality based on the plant/control schematic. Further explanations can be given in form of plant/control descriptions and control flow chart diagrams. Examples are

given in annex B (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 5.5.

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

— climatic differences;

— cultural and regional differences;

— national regulations.

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.

EN 60617-12, *Graphical symbols for diagrams - Part 12: Binary logic elements (IEC 60617-12:1997)*

EN 60617-13, *Graphical symbols for diagrams - Part 13: Analogue elements (IEC 60617-13:1993)*

EN ISO 16484-2:2004, *Building automation and control systems (BACS) - Part 2: Hardware (ISO 16484-2:2004)*

EN ISO 16484-5, *Building automation and control systems (BACS) - Part 5: Data communication protocolcity (ISO 16484-5:2003)*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN ISO 16484-2:2004 apply.

4 Symbols, abbreviations and acronyms

For the purposes of this European Standard, the symbols, abbreviations and acronyms given in EN ISO 16484-2:2004 apply.

NOTE The abbreviations used and explained within the Tables for the function block examples are for information only.

5 Requirements

5.1 Overview

5.1.1 Structure of the requirements and functions

5.1.1.1 General

The functional requirements in this part of the standard are subdivided as follows:

— System application and management software:

describes the requirements for plant independent system, and human system interface programs related to a project. This standard does not dedicate this basic system functionality to any particular hardware;

— Engineering and commissioning tools:

describes the requirements for the configuration of hardware, control strategies and management functions, and the commissioning process;

— Project/plant specific functions:

describes the requirements for plant applications and/or project specific functions and methods for the functional documentation of project and/or application specific systems.

The (automatic) functions of a BACS in general are structured into three levels, for

— management,

— automation/control (processing functions), and

— input/output (interface to field devices).

Operator functions are not assigned to a specific level. A description of the hardware and communication means to perform the BACS software and functions is given in EN ISO 16484-2.

5.1.1.2 Operator functions

Human system interface for supervision, alarms, state monitoring and human interaction for operation in general are not assigned to any functional level. Human system interface devices in a BACS are direct acting elements, as switches and signal lights, local override and/or indication devices, handheld units, monitoring and operator units or panels, operator stations including visual display units and Internet based browsers on different types of hardware. The VDU can provide a graphical user interface.

The range of functionality covers:

— system-, event- and state management, parameter adjustment and manual on/off control;

— local room operation;

— local override/indication device functions to provide restricted access for service operation;

— system engineering and servicing, engineered operator functions are, e.g. dynamic display, event instruction text, remote messaging.

5.1.1.3 Management functions

Management functions are performed by the software of a BACS. The plant/application specific management functions are for the activity of a user taking decisions for supervision of plant and evaluating energy use and operational costs. The required functionality at this level is:

a) communications with devices of the control network and for shared data points;

b) communications for data exchange with dedicated special, or foreign systems to provide for operator and management functions at this level and/or within the BACS;

c) recording, archiving and statistical analysis;

d) decision support for e.g. energy management.

5.1.1.4 Processing functions

The plant/project specific application software and parameters provide all automatic functionality for building services in real-time within self-contained controllers/automation stations. The required groups of processing functions are:

a) physical input and output functions;

b) shared input and output functions (communication);

c) monitoring;

d) interlocks;

e) closed loop and open loop control;

f) calculation/cross plant/system optimization;

g) room control functions, e.g. individual zone control, lighting control, shades/blinds control.

5.1.1.5 Field devices

Field devices are generally sensors and actuators, coupling units and local override/indication, devices that are connected to input/output interfaces of controllers/automation stations. Field devices can be connected to controllers via field network or direct wiring. The field devices perform connection to the physical items of plant providing the necessary information about the conditions, states and values of the processes and effect the programmed operations. Functions supported by field devices are:

a) switching;

b) positioning;

c) state monitoring;

d) input for counting;

e) measuring.

5.1.2 Description of functions

The normative functional descriptions within this section are generic and are provided for use by the specifier to describe the project functionality. The descriptions in 5.5 contain no hardware related specifications, but the number of input and output functions help to determine the required physical or shared (communication) inputs and outputs of a BACS, the processor performance and memory size. For the required hardware components see EN ISO 16484-2.

The system programs and the plant and application specific functions to determine the engineering services are to be specified for each project.

The plant specific functions can be documented in plant/control schematics, control flow chart diagrams and the BACS PL (preferred as spreadsheet for further data processing), which is shown in annex A as a template.

Some complex projects and/or sophisticated control algorithms for optimal control performance require additional information and methods in order to describe the requirements in detail. These additional requirements include plant and control descriptions, control flow charts, psychrometric charts, reset schedules, field device mounting instructions/illustrations.

Annex B provides informative examples to indicate methods for creation accurate documentation for a project.

5.1.3 Description of function block examples

This standard has adopted (where appropriate) a function block (FB) method of describing BACS applications. The FB examples are designed according to the graphical symbols for diagrams in EN 60617-12, Binary logic elements and in EN 60617-13, Analog elements.

The information in the FB examples provides common wording and descriptions of BACS functions. The terminology provided by these descriptions should be used in any discussions and documents that represent BACS applications. This involves describing inputs, outputs, parameters and functions in a common textual and graphic format. A complete application scheme can be engineered using a series of interconnected function blocks as shown in the informative examples. The function block principle can be used to introduce new BACS functions and can be referred to using the BACS PL.

5.1.4 Description of the BACS points list

5.1.4.1 Scope

The BACS PL shown in annex A is based on the definitions in 5.5, and it provides the following benefits:

— it allows to determine engineered functions for specific projects by using a spread sheet program that provides for electronic data interchange;

— it provides a common structured method for the plant/system design and specifying process;

— it is based on the plant/control schematic, the plant/control description and the control flow chart diagram if necessary;

— it provides for the use of a unique structured point naming convention given in 5.3.1;

— the structured numbering scheme for the functions provides for addition of individually defined functions in the given categories, if required.