SLOVENSKI STANDARD
SIST EN 15232:2012

01-maj-2012

Nadomešča:
SIST EN 15232:2007

Energijske lastnosti stavb - Vpliv avtomatizacije stavb in izvršnih elementov ter upravljanja stavb

Energy performance of buildings - Impact of Building Automation, Controls and Building Management

Energieeffizienz von Gebäuden - Einfluss von Gebäudeautomation und Gebäudemanagement

Performance énergétique des bâtiments - Impact de l'automatisation, de la régulation et de la gestion technique

Ta slovenski standard je istoveten z: **EN 15232:2012**

ICS:

27.015	Energijska učinkovitost. Ohranjanje energije na splošno	Energy efficiency. Energy conservation in general
91.120.10	Toplotna izolacija stavb	Thermal insulation of buildings
97.120	Avtomatske krmilne naprave za dom	Automatic controls for household use

SIST EN 15232:2012 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 15232

January 2012

ICS 35.240.99; 91.120.10; 97.120

Supersedes EN 15232:2007

English Version

Energy performance of buildings - Impact of Building Automation, Controls and Building Management

Performance énergétique des bâtiments - Impact de l'automatisation, de la régulation et de la gestion technique

Energieeffizienz von Gebäuden - Einfluss von Gebäudeautomation und Gebäudemanagement

This European Standard was approved by CEN on 27 November 2011.

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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword

This document (EN 15232:2012) has been prepared by Technical Committee CEN/TC 247 “Building Automation, Controls and Building Management”, the secretariat of which is held by SNV.

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 2012, and conflicting national standards shall be withdrawn at the latest by July 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 15232:2007.

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

Introduction

This European Standard was created to establish conventions and methods for estimation of the impact of building automation and control systems (BACS) and technical building management (TBM) on energy performance and energy use in buildings.

This European Standard also provides guidance for taking BACS and TBM functions as far as possible into account in the relevant standards prepared under the mandate M/343. Therefore, it is coordinated between CEN/TC 247 and CEN/TC 89, CEN/TC 156, CEN/TC 169 and CEN/TC 228 to support these TCs by strong cooperation in specifying how the impact of the BACS and TBM functions are taken into account in their standards. The results concerning BACS and TBM in the relevant standards are summarized in Clause 5.

This European Standard specifies a method to estimate energy saving factors which can be used in conjunction with energy assessment of buildings. This European Standard supplements a series of standards which are drafted to calculate the energy efficiency of technical building services, e.g. heating, cooling, ventilation, lighting systems. This European Standard takes into account the fact that with BACS and TBM the energy consumption of a building can be reduced.

This European Standard should be used for existing buildings and for design of new or renovated buildings.

1 Scope

This European Standard specifies:

— a structured list of Building Automation and Control System (BACS) and Technical Building Management (TBM) functions which have an impact on the energy performance of buildings;

— a method to define minimum requirements regarding BACS and TBM functions to be implemented in buildings of different complexities;

— a factor based method to get a first estimation of the impact of these functions on typical buildings;

— detailed methods to assess the impact of these functions on a given building. These methods enable to introduce the impact of these functions in the calculations of energy performance ratings and indicators calculated by the relevant standards.

This European Standard is defined for:

— building owners, architects or engineers, defining the functions to be implemented for a given new building or for the renovation of an existing building;

— public authorities, defining minimum requirements for BACS and TBM functions for new buildings as well as for renovation, as defined in the relevant standard;

— public authorities, defining inspection procedures of technical systems as well as inspectors applying these procedures to check if the level of BACS and TBM functions implemented is appropriate;

— public authorities, defining calculation methods which take into account the impact of BACS and TBM functions on the energy performance of buildings as well as software developers implementing these calculation methods and designers using them;

— designers, checking that the impact of all BACS and TBM functions are taken into account when assessing the energy performance of a building.

NOTE The terms BAC (Building Automation and Control) and BACS (Building Automation and Control System) are equivalent in view of energy calculation and energy efficiency. In this case BACS will be used in the English version and BAC (German term: "GA Gebäudeautomation") in the German version.

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 12098-1, *Controls for heating systems — Part 1: Outside temperature compensated control equipment for hot water heating systems*

EN 12098-2, *Controls for heating systems — Part 2: Optimum start-stop control equipment for hot water heating systems*

EN 12098-3, *Controls for heating systems — Part 3: Outside temperature compensated control equipment for electrical heating systems*

EN 12098-4, *Controls for heating systems — Part 4: Optimum start-stop control equipment for electrical systems*

EN 12098-5, *Controls for heating systems — Part 5: Start-stop schedulers for heating systems*

EN 13779, *Ventilation for non-residential buildings — Performance requirements for ventilation and room-conditioning systems*

EN 15193:2007, *Energy performance of buildings — Energy requirements for lighting*

EN 15217:2007, *Energy performance of buildings — Methods for expressing energy performance and for energy certification of buildings*

EN 15239, *Ventilation for buildings — Energy performance of buildings — Guidelines for inspection of ventilation systems*

EN 15240, *Ventilation for buildings — Energy performance of buildings — Guidelines for inspection of air-conditioning systems*

EN 15241:2007, *Ventilation for buildings — Calculation method for energy losses due to ventilation and infiltration in commercial buildings*

EN 15242:2007, *Ventilation for buildings — Calculation methods for the determination of air flow rates in buildings including infiltration*

EN 15243:2005, *Ventilation for buildings — Calculation of room temperatures and of load and energy for buildings with room conditioning systems*

EN 15255, *Energy performance of buildings — Sensible room cooling load calculation — General criteria and validation procedures*

EN 15316-1:2007, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 1: General*

EN 15316-2-1:2007, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 2-1: Space heating emission systems*

EN 15316-2-3:2007, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 2-3: Space heating distribution systems*

EN 15316-3-2:2007, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 3-2: Domestic hot water systems, distribution*

EN 15316-3-3:2007, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 3-3: Domestic hot water systems, generation*

EN 15316-4-1, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 4-1: Space heating generation systems (boilers)*

EN 15316-4-2, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 4-2: Space heating generation systems, heat pump systems*

EN 15316-4-3, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 4-3: Heat generation systems, thermal solar systems*

EN 15316-4-4, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 4-4: Heat generation systems, building-integrated cogeneration systems*

EN 15316-4-5, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 4-5: Space heating generation systems, the performance and quality of district heating and large volume systems*

EN 15316-4-6, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 4-6: Heat generation systems, photovoltaic systems*

EN 15316-4-7, *Heating systems in buildings — Method for calculation of system energy requirements and system efficiencies - Part 4-7: Space heating generation systems, biomass combustion systems*

EN 15378, *Heating systems in buildings — Inspection of boilers and heating systems*

EN 15500:2008, *Control for heating, ventilating and air-conditioning applications — Electronic individual zone control equipment*

EN 15603:2008, *Energy performance of buildings - Overall energy use and definition of energy ratings*

EN 16001 2009, *Energy management systems — Requirements with guidance for use*

EN ISO 13790:2008, *Energy performance of buildings — Calculation of energy use for space heating and cooling (ISO 13790:2008)*

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

3 Terms and definitions

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

NOTE 1 The terms and definitions listed in this standard but defined by other relevant ISO/IEC International Standards and/or European Standards are repeated below for convenience in most cases.

NOTE 2 Other language versions may contain an alphabetical index in national annexes.

3.1
auxiliary energy
electrical energy used by heating, cooling and/or domestic water systems to transform and transport the delivered energy into the useful energy

NOTE 1 This includes energy for fans, pumps, electronics etc., but not the energy that is transformed. Pilot flames are considered as part of the energy use by the system.

NOTE 2 In EN ISO 9488 the energy used for pumps and valves is called "parasitic energy".

[CEN/TR 15615]

3.2
building automation and controls
BAC
description for products, software, and engineering services for automatic controls, monitoring and optimization, human intervention and management to achieve energy – efficient, economical and safe operation of building services equipment

NOTE The trade designation and the industry branch are also referred to as building automation and/or building control.

[EN ISO 16484-2:2004]

3.3
building automation and control systems
BACS
comprising all products and engineering services for automatic controls (including interlocks), monitoring,

optimization, for operation, human intervention and management to achieve energy – efficient, economical and safe operation of building services

NOTE 1 The use of the word "control" does not imply that the system/device is restricted to control functions. Processing of data and information is possible.

NOTE 2 When a Building Control System, Building Management System or Building Energy Management System is in compliance with the requirements of the EN ISO 16484 standard series, it should be designated as a Building Automation and Control System (BACS).

[EN ISO 16484-2:2004]

3.4
building management
BM
totality of services involved in the management operation and monitoring of buildings (including plants and installations). Building management can be assigned as part of Facility Management

[CEN/TS 15379:2006]

3.5
building management system
BMS
cf. building automation and control system

NOTE 1 Building services is divided in technical, infrastuctural and financial building services and energy management is part of technical building management.

NOTE 2 Building energy management system is part of a BMS.

NOTE 3 Building energy management system comprising data collection, logging, alarming, reporting, and analysis of energy usage etc. The system is designed to reduce the energy consumption, improve the utilization, increase the reliability, and predict the performance of the technical building systems, as well as optimize energy usage and reducing its cost.

[EN ISO 16484-2:2004]

3.6
delivered energy
total energy, expressed per energy ware, supplied to the building through the system boundary from the last market agent, to satisfy the uses taken into account (heating, cooling, ventilation, domestic hot water, lighting, appliances etc.)

NOTE 1 For active solar and wind energy systems the incident solar radiation on solar panels or the kinetic energy of wind is not part of the energy balance of the building. The losses resulting from the transformation of these renewable energy carriers into heat or electricity are also not taken into account. Only the energy delivered by the generation devices and the auxiliary energy needed to supply the energy from the source (e.g. solar panel) to the building are taken into account in the energy balance and hence in the delivered energy.

NOTE 2 Delivered energy can be calculated for defined energy uses or it can be measured.

[CEN/TR 15615]

3.7
energy carrier
substance or phenomenon that can be used to produce mechanical work or heat or to operate chemical or physical processes

NOTE The energy content of fuels is given by their gross calorific value.

[ISO 13600:1997]

3.8
energy need for heating or cooling
heat to be delivered to or extracted from a conditioned space to maintain the intended temperature conditions during a given period of time

3.9
energy use for space heating or cooling or domestic hot water
energy input to the heating, cooling or hot water system to satisfy the energy need for heating, cooling or hot water respectively. It is the sum of the energy needs and the non-recovered technical system thermal losses

NOTE The energy use for lighting is also considered in this European Standard.

[EN 15306]

3.10
energy efficiency
ratio between an output of performance, service, goods or energy, and an input of energy

NOTE 1 Both input and output need to be accurately defined in quantity and quality, and be measurable.

NOTE 2 Energy efficiency is commonly used with the meaning of "Optimum Energy Efficiency", namely: "to operate (an entity) with minimum energy consumption".

NOTE 3 Commonly used sense of energy efficiency is doing at least the same with less energy.

[CEN/CLC/TR 16103]

3.11
energy efficiency improvement
increase in energy efficiency as a result of technological, behavioural and/or economic changes

[CEN/CLC/TR 16103]

3.12
energy use
manner or kind of application of energy

EXAMPLE Lighting, ventilation, heating, processes, transport.

NOTE The quantity of the energy applied is expressed as energy consumption.

[CEN/CLC/TR 16103]

3.13
control function
BACS effect of programs and parameters

NOTE 1 Functions within a BACS are referred to as control functions, I/O, processing, optimization, management and operator functions. They are listed in the BACS FL (function list) for a specification of work.

NOTE 2 Function is a program unit that delivers exactly one data element, which can be a multiple value (i.e. an array or a structure). Functions can be an operand in a program. [IEC 61131-3:2003]

[EN ISO 16484-2:2004]

3.14
integrated building automation and control systems
BACS designed to be interoperable and with the ability to be connected to one or more specified 3rd party building automation and control devices/systems through open data communication network or interfaces performed by standardized methods, special services and permitted responsibilities for system integration

EXAMPLES Interoperability between 3rd party BACS devices/systems for HVAC, domestic hot water, lighting, electrical power distribution, energy metering, elevators and escalators, other plants, as well as systems for communications, access control, security, life safety etc.

3.15
integrated function
BACS effect of programs, shared data points and parameters for multi-discipline interrelationships between various building services and technologies

3.16
measured energy rating
energy rating based on measured amounts of delivered and exported energy

NOTE 1 The measured rating is the weighted sum of all energy carriers used by the building, as measured by meters or other means. It is a measure of the in-use performance of the building. This is particularly relevant to certification of actual energy performance.

NOTE 2 Also known as "operational rating".

3.17
technical building management
TBM
process(es) and services related to operation and management of buildings and technical building system through the interrelationships between the different disciplines and trades

NOTE The disciplines and trades comprise all technical building services for the purpose of optimized maintenance and energy consumption.

EXAMPLE Optimization of buildings through interrelationships ranging from heating, ventilation and air conditioning (HVAC) to lighting and day lighting to life safety and security to electric power systems and energy monitoring and metering; to its services, including communications and maintenance and to its management.

3.18
technical building system
technical equipment for heating, cooling, ventilation, domestic hot water, lighting and electricity production

NOTE A technical building system is composed of different subsystems.

[CEN/TR 15615]

3.19
set-point temperature of a conditioned zone
internal (minimum) temperature, as fixed by the control system in normal heating mode, or internal (maximum) temperature, as fixed by the control system in normal cooling mode

NOTE The corrected value of a temperature set point is used for the calculation of energy performance. It enables the impact of the accuracy of the control system on the energy performance to be taken into account.

[CEN/TR 15615]

4 Abbreviations and acronyms

For the purposes of this document, the following abbreviations and acronyms apply.

BAC **Building Automation and Control**

BACS **Building Automation and Control System**

BM **Building Management**

DHW **Domestic Hot Water**

EMS **Energy Management System**

HVAC **Heating, Ventilation and Air Conditioning**

TABS **Thermo-active Building Systems**

TBM **Technical Building Management**

5 Impact of BACS and TBM on the energy performance of buildings

5.1 General

Building Automation and Control Systems (BACS) provide effective control functions of heating, ventilating, cooling, hot water and lighting appliances etc., that lead to improve operational and energy efficiencies. Complex and integrated energy saving functions and routines can be configured based on the actual use of a building, depending on real user needs, to avoid unnecessary energy use and CO_2 emissions.

Technical Building Management (TBM) functions as part of Building Management (BM) provide information about operation, maintenance, services and management of buildings, especially for energy management – measurement, recording trending, and alarming capabilities and diagnosis of unnecessary energy use. Energy management provides requirements for documentation, controlling, monitoring, optimisation, determination and to support corrective action and preventive action to improve the energy performance of buildings.

The BACS functions described in Table 1 are based on the energy demand and supply model for a building in Figure 1.

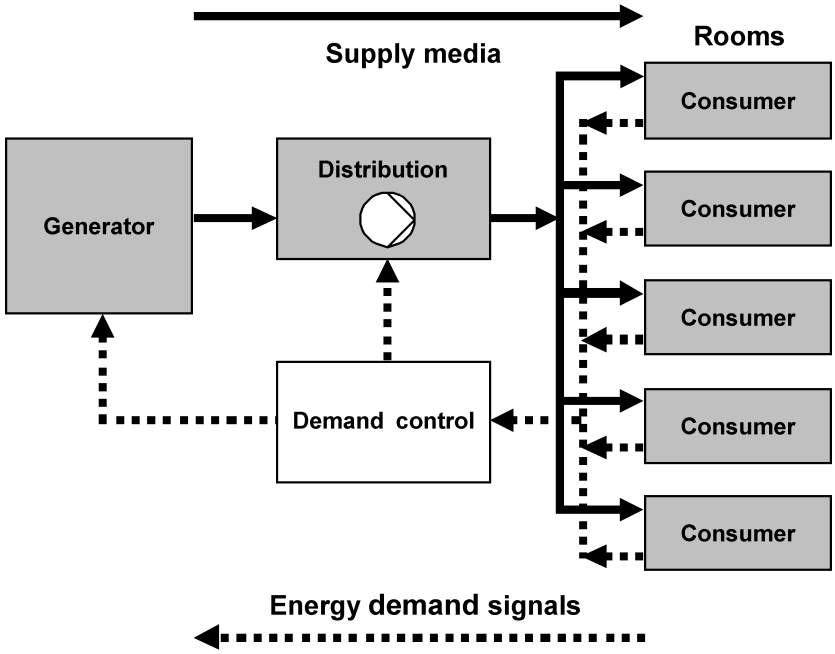

Figure 1 — Energy demand and supply model (Example: Heating plant)

Rooms represent the source of the energy demand. Suitable equipment should ensure comfortable conditions in the rooms with regard to temperature, humidity, air quality and light as needed and with due consideration of minimum or maximum requirements specified in local regulations.

Supply media is provided to the consumer according to energy demand keeping losses in distribution and generation to an absolute minimum.

The building automation and control functions described in Table 1 are aligned in accordance with the energy demand and supply model. The relevant energy-efficiency functions are handled starting with the room, via distribution up through generation.

5.2 BACS and TBM functions having an impact on the energy performance of buildings

The most common BACS and TBM functions having an impact on the energy performance of buildings have been described and summarized in Table 1.

Table 1 — BACS and TBM functions having an impact on the energy performance of buildings

AUTOMATIC CONTROL		
1	**HEATING CONTROL**	
1.1	Emission control	
		The control system is installed at the emitter or room level, for case 1 one system can control several rooms
	0	No automatic control of the room temperature
	1	Central automatic control: There is only central automatic control acting either on the distribution or on the generation. This can be achieved for example by an outside temperature controller conforming to EN 12098-1 or EN 12098-3
	2	Individual room control: By thermostatic valves or electronic controller
	3	Individual room control with communication and demand control: Communication between controllers and to BACS; Demand control performed by occupancy
1.2	Emission control for TABS	
	0	No automatic control of the room temperature
	1	Central automatic control: The central automatic control for a TABS zone (which comprises all rooms which get the same supply water temperature) typically is a supply water temperature control loop whose set-point is dependant on the filtered outside temperature, e.g. the average of the previous 24 hours.
	2	Advanced central automatic control: This is an automatic control of the TABS zone that fulfils the following conditions: – If the TABS is used only for heating: The central automatic control is designed and tuned to achieve an optimal self-regulating of the room temperature within the required comfort range (specified by the room temperature heating set-point). "Optimal" means that the room temperatures of all rooms of the TABS zone remain during operation periods in the comfort range, to meet comfort requirements, but also is as low as possible to reduce the energy demand for heating. – If the TABS is used for heating and cooling: The central automatic control is designed and tuned to achieve an optimal self-regulating of the room temperature within the required comfort range (specified by room temperature heating and cooling set-points). "Optimal" means that the room temperatures of all rooms of the TABS zone remain during operation periods in the comfort range, to meet comfort requirements, but also uses as far as possible the full range to reduce the energy demand for heating and cooling. – If the TABS is used for heating and cooling: the automatic switching between heating and cooling is not done only dependent on the outside temperature, but also taking at least indirectly the heat gains (internal and solar) into account.
	3	Advanced central automatic control with intermittent operation and/or room temperature feedback control: a) Advanced central automatic control with intermittent operation. This is an advanced central automatic control according to 2) with the following supplement: The pump is switched off regularly to save electrical energy, either with a fast frequency - typically 6 hours on/off cycle time - or with a slow frequency, corresponding to 24 hours on/off cycle time. If the TABS is used for cooling, intermittent operation with 24 hours on/off cycle time can also be used to reject the heat to the outside air if the outside air is cold. b) Advanced central automatic control with room temperature feedback control. This is an advanced central automatic control according to 2) with the following supplement: The supply water temperature set-point is corrected by the output of a room temperature feedback controller, to adapt the set-point to non-predictable day-to-day variation of the heat gain. Since TABS react slowly, only day-to-day room temperature correction is applied, an instant correction cannot be achieved with TABS. The room temperature that is fed back is the temperature of a reference room or another temperature representative for the zone. c) Advanced central automatic control with intermittent operation and room temperature feedback control
1.3	Control of distribution network hot water temperature (supply or return)	
		Similar function can be applied to the control of direct electric heating networks
	0	No automatic control
	1	Outside temperature compensated control: Action lower the mean flow temperature
	2	Demand based control: E.g. based on indoor temperature; Actions leads generally to a decrease of the flow rate
1.4	Control of distribution pumps in networks	
		The controlled pumps can be installed at different levels in the network
	0	No automatic control
	1	On off control: To reduce the auxiliary energy demand of the pumps
	2	Multi-Stage control: To reduce the auxiliary energy demand of the pumps
	3	Variable speed pump control: With constant or variable Δp and with demand evaluation to reduce the auxiliary energy demand of the pumps