

SLOVENSKI STANDARD

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Regulacijske naprave za sisteme ogrevanja - 3. del: Naprave za regulacijo električnih ogrevalnih sistemov

Controls for heating systems - Part 3: Control equipment for electricale heating systems

Mess, Steuer und Regeleinrichtungen für Heizungen - Teil 3: Regeleinrichtungen für Elektroheizungen

Régulation pour les systèmes de chauffage - Partie 3: Equipement de régulation pour les systèmes de chauffage électrique

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ICS:

91.140.10	Sistemi centralnega ogrevanja	Central heating systems
97.120	Avtomatske krmilne naprave za dom	Automatic controls for household use

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en,fr,de

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12098-3

October 2013

ICS 97.100.10; 97.120

Supersedes EN 12098-3:2002, EN 12098-4:2005

English Version

**Controls for heating systems - Part 3: Control equipment for
electrical heating systems**

Régulation pour les systèmes de chauffage - Partie 3:
Équipement de régulation pour les systèmes de chauffage
électrique

Mess-, Steuer- und Regeleinrichtungen für Heizungen - Teil
3: Regeleinrichtungen für Elektroheizungen

This European Standard was approved by CEN on 14 September 2013.

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.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 12098-3:2013) 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 April 2014, and conflicting national standards shall be withdrawn at the latest by April 2014.

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 12098-3:2002 and EN 12098-4:2005.

The following modifications have been made:

- update of the state of the art of the platform used for the controllers (between first edition – still analogical technology – to day full DDC with μ C);
- test specification has been revised and described more precisely;
- block diagram for functions has been added;
- graphical symbols have been added.

This standard is for products for Outside Temperature Compensated Controls for mechanical building services and covers Outside Temperature Compensated Controls in residential and non-residential buildings. This standard is part of a series of European Standards for Control for HVAC Applications. This standard, therefore, contributes to the general European policy for energy saving, particularly in the fields of the Construction Products Directive (89/106/EEC) Essential Requirements n°6 "Energy economy and heat retention" (and its interpretative document) and of the Energy Performance of Building Directive (2002/91/CE).

EN 12098, *Controls for heating systems*, consists of the following parts:

- *Part 1: Control equipment for hot water heating systems*
- *Part 3: Outside temperature compensated control equipment for electrical heating systems* (the present document)
- *Part 5: Start-stop schedulers for heating systems*

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, Former Yugoslav Republic of Macedonia, 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

Equipment which controls the heating supply in buildings according to outside temperature and time is necessary for the reduction of the energy consumption of heating plants. This equipment can bring about improved comfort and energy savings.

For this purpose, an outside temperature compensated function like that provided by an outside temperature compensated (OTC) controller is necessary.

This standard describes the main equipment characteristics and functions for reaching energy saving and comfort objectives.

This standard covers also controllers which contain an integrated optimum start or an optimum start-stop control function.

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1 Scope

This European Standard applies to electronic control equipment for heating systems with direct electrical emission, which do not have an integrated outdoor compensated function and or optimum start/stop function.

This control equipment controls and regulates the distribution and/or the generation of heat in relation to the outside temperature and time and other reference variables.

This European Standard also covers controllers which contain an integrated optimum start or an optimum start-stop control function. The controller modulates heating or control modes of electronic individual zone or emitter control equipment.

Safety requirements on heating systems remain unaffected by this standard. The dynamic behaviour of the local thermostats, sensors, or actuators is not covered in this standard.

A multi-distribution and/or multi-generation system needs a coordinated solution to prevent undesired interaction and is not part of this standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CEN/TS 15810, *Graphical symbols for use on integrated building automation equipment*

EN 60038, *CENELEC standard voltages (IEC 60038)*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529)*

EN 60730-1, *Automatic electrical controls for household and similar use — Part 1: General requirements (IEC 60730-1)*

3 Terms and definitions

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

3.1

outside temperature compensated controller

OTC controller

controller optimising and/or regulating the generation of heat in relation to the outside temperature, time and optionally other reference variables (e.g. room temperature)

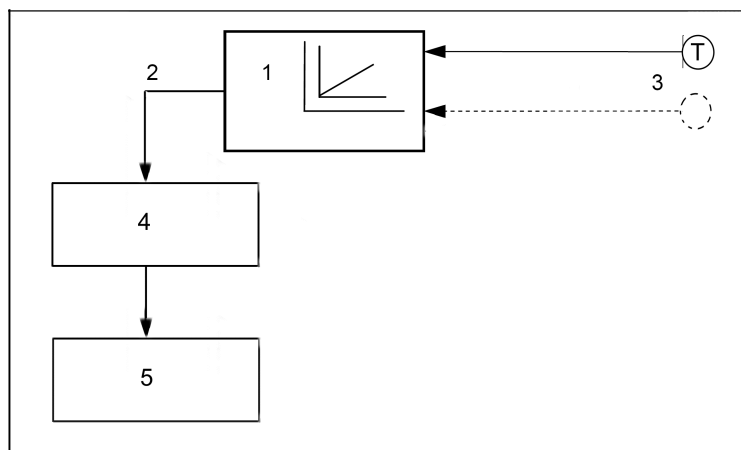
Note 1 to entry: The outside temperature compensated function calculates the heating power in relation to the outside temperature, based on the heating curve.

Note 2 to entry: The outside temperature optimum start-stop function calculates the pre-heat time and/or stop time to reach the comfort temperature level in relation with the outside temperature, switch time and several parameters (e.g. room temperature, tariff).

3.2

control equipment

equipment, consisting of OTC controller sensor input signals and output signals but not including the sensors and actuating equipment (see Figure 1)

**Key**

- 1 OTC controller
- 2 output signals
- 3 input signals: reference variables
- 4 actuating equipment
- 5 heat generation and distribution

Figure 1 — Control equipment for electrical heating systems

3.3 actuating equipment

equipment by which the controller affects the controlled variable

3.4 controlled variable

heating emitted power

3.5 output signals

signals generated by the OTC controller for operating the local thermostat or the actuating equipment

3.6 reference variables (input signal)

outside temperature with or without other influences or variables (e.g. room temperature) used to determine the set point of the controlled variable

3.7 outside temperature

reference variable that is measured with a sensor fitted outside the building, mainly intended to measure the air temperature

3.8 room temperature

resulting temperature in the building arising in comfort, economy or building protection operation mode of the OTC controller

Note 1 to entry: Room temperature can be different for individual rooms.

3.9 characteristic heating curve

relation between the set point value of the controlled variable (heating) and the reference variables (outside temperature) defined by two or more parameters and depending on operation mode and additional variables

Note 1 to entry: The heating is calculated as a function of the heating curve, based on the outside temperature and the present room temperature set point.

3.10

comfort operation mode

mode of operation between the switch-on time and the switch-off time, maintaining comfort room temperature

Note 1 to entry: Mode of operation for normally occupied rooms.

3.11

economy operation mode (reduced mode)

mode of operation between the switch-off time and the switch-on time, maintaining a reduced room temperature compared to the comfort room temperature

3.12

building protection operation mode

mode of operation between the switch-off time and the switch-on time, maintaining a room temperature required for building protection

3.13

automatic operation mode

mode of operation of equipment when significant control functions are not overridden by the user

Note 1 to entry: During automatic operation mode, operation mode is selected automatically according to the scheduler, actual date and time.

3.14

summer/winter switch function

seasonal switch on/off of the heating depending on a function of the outside temperature

3.15

set back function

function, starting when the operation mode changes from comfort to economy or building protection mode

Note 1 to entry: During set back period, the heating is switched off until the calculated or measured room temperature drops below the economy or building protection set point; the operation mode switches back to comfort mode or the calculated switch-on time of the optimization start function is reached.

3.16

optimum start function

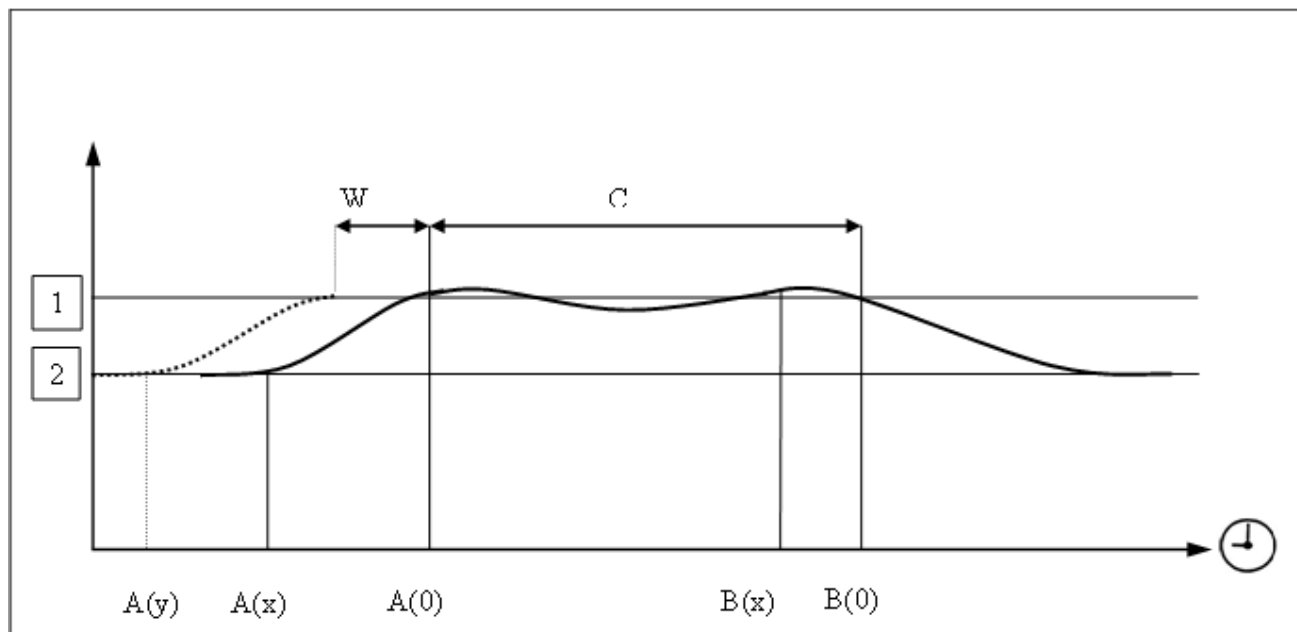
function, calculating the optimum pre-heat time to reach the comfort temperature level at the beginning of the comfort time period (see Figure 2) and possibly in relation with energy price rate (see Figure 5)

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**Key**

1 comfort room temperature

2 reduced room temperature

A(0) beginning of comfort occupation period

A(x) switch-on time with start optimization (variable start)

A(y) switch-on time without start optimization (fixed start)

B(0) end of comfort occupation period without stop optimization (fixed stop)

B(x) switch-off time with stop optimization (variable stop)

C = A(0) - B(0): comfort occupation period

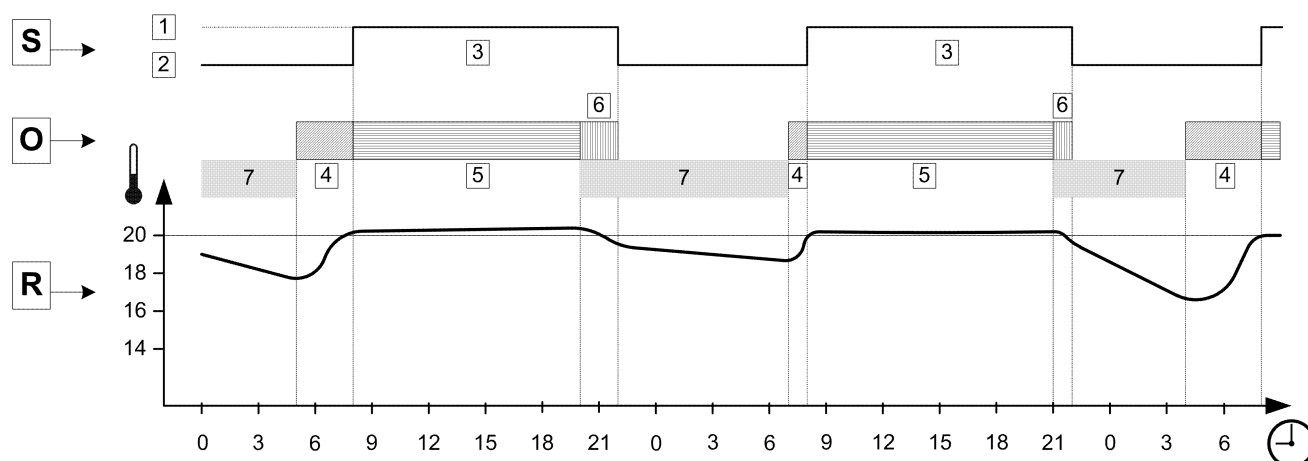
A(x) - A(0): optimum start period

B(x) - B(0): optimum stop period

W time period of wasted heat time (energy saving potential with start optimization)

Figure 2 — Temperature time curve with optimizer function

Note 1 to entry: The optimum start- and the optimum stop functions are illustrated by Figure 3. Heating periods are different from scheduled occupation periods. These differences, due to thermal inertia, depend mainly on heating loads (or temperature differences). A start and/or stop optimizer controls these switching points, using outside and/or room temperatures or their differences in relation to set points.



Key

- S schedule occupation period
- O heating operation status
- R room temperature profile
- 1 comfort room temperature
- 2 reduced room temperature
- 3 comfort occupation period
- 4 optimum start period
- 5 main controller function
- 6 optimum stop period
- 7 set back period

Figure 3 — Example of optimum start- and stop function

3.17

adaptive optimum start function

added function to optimum start function, which recalculates the parameters used to determine the switch-on time, based on measured room temperature

3.18

optimum stop function

function, switching off or reducing the heat generation at the earliest possible point in time so that the room temperature will drop maximum 0,5 K below the comfort set point when the operation mode changes from comfort mode to economy or building protection mode (see Figure 2)

3.19

adaptive optimum stop function

added function to optimum stop function, which recalculates the parameters used to determine the switch-off time, based on measured room temperature

3.20

scheduler

function which switches heating modes affecting the heating control system (see Figure 3) according to a program

Note 1 to entry: The program includes memorized switch times, reproducing periods or periodic cycles, daily, weekly or yearly. The program may include periods of derogation.

EN 12098-3:2013 (E)**3.21****switch points and time periods****3.21.1****switch on time**

point in time at which the controller increases the heating in order to reach the comfort room temperature

Note 1 to entry: If the optimum start function is applied, the switch on time is automatically determined by the controller; otherwise it is determined by the scheduler.

3.21.2**optimum start period**

operating pre heat period between the switch on time and the beginning of comfort occupation period

3.21.3**beginning of comfort occupation period**

user programmed switch point when the comfort room temperature is reached

3.21.4**comfort occupation period**

operating period during which comfort room temperature is maintained

3.21.5**end of comfort occupation period**

user programmed switch point when the room temperature is allowed to decrease under the comfort room temperature

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Note 1 to entry: The room temperature set point is switched to Economy and/or Building Protection set point.

3.21.6**switch off time**

point in time at which the controller switches off the heating

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Note 1 to entry: If the optimum stop function is applied, the switch off time is automatically determined by the controller; otherwise it is determined by the scheduler.

3.21.7**optimum stop period**

operating period between the optimal switch off time and the end of comfort occupation period

3.21.8**derogation function**

temporary override of the program

Note 1 to entry: There are different possibilities for derogation functions. Two examples of temporary override of the program by derogation and recovery of the periodic program are shown in Figure 4: