



# SLOVENSKI STANDARD

## SIST EN 12098-4:2006

01-marec-2006

FY[ i `UW`g\_YbUdfUj Y'nU[ fYbY`g]ghYa Y`E( ("XY. BUdfUj Y'nUcdHja ]nUW`c`XYcj Ub`U  
YY\_f] b]`g]ghYa cj `bUcgbcj]j`\_cd!]n`cd

Controls for heating systems - Part 4: Optimum start-stop control equipment for electrical systems

Mess-, Steuer- und Regeleinrichtungen für Heizungen - Teil 4: Ein-/Ausschaltoptimierer für Elektroheizungen

Régulation pour les systèmes de chauffage - Partie 4: Optimiseurs d'intermittences pour les systèmes de chauffage électrique

**Ta slovenski standard je istoveten z: EN 12098-4:2005**

### ICS:

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

**SIST EN 12098-4:2006**

**en**

## **iTeh STANDARD PREVIEW** **(standards.iteh.ai)**

SIST EN 12098-4:2006

<https://standards.iteh.ai/catalog/standards/sist/281b708b-6a46-428d-a41b-60fb69925df7/sist-en-12098-4-2006>

EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 12098-4**

September 2005

ICS 97.100.10; 97.120

English Version

**Controls for heating systems - Part 4: Optimum start-stop control  
equipment for electrical systems**

Régulation pour les systèmes de chauffage - Partie 4:  
Optimiseurs d'intermittences pour les systèmes de  
chauffage électrique

Mess-, Steuer- und Regeleinrichtungen für Heizungen - Teil  
4: Ein-/Ausschalt-Optimierer für Elektroheizungen

This European Standard was approved by CEN on 1 August 2005.

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.

SIST EN 12098-4:2006

<https://standards.iteh.ai/catalog/standards/sist/281b708b-6a46-428d-a41b-60fb69925df7/sist-en-12098-4-2006>



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

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

## Contents

	Page
Foreword .....	3
Introduction .....	4
1 Scope .....	6
2 Normative references .....	6
3 Terms and definitions .....	7
4 Functionality .....	11
5 Graphical symbols and abbreviations .....	16
6 Requirements .....	16
7 Test methods .....	24
8 Marking .....	28
9 Documentation .....	29
Bibliography .....	32

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

SIST EN 12098-4:2006

<https://standards.iteh.ai/catalog/standards/sist/281b708b-6a46-428d-a41b-60fb69925df7/sist-en-12098-4-2006>

## Foreword

This European Standard (EN 12098-4:2005) has been prepared by CEN/TC 247 "Building automation control 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 March 2006, and conflicting national standards shall be withdrawn at the latest by March 2006.

This European Standard is one of a series of product standards for "Controls for heating systems". It considers Definitions, Functionality, Requirements, Test methods, and Documentation electrical heating controls with optimum start or optimum start-stop functions. This European Standard consists of the following parts:

Part 1: Outside temperature compensated control equipment for hot water heating systems;

Part 2: Optimum start-stop control equipment for hot water heating systems;

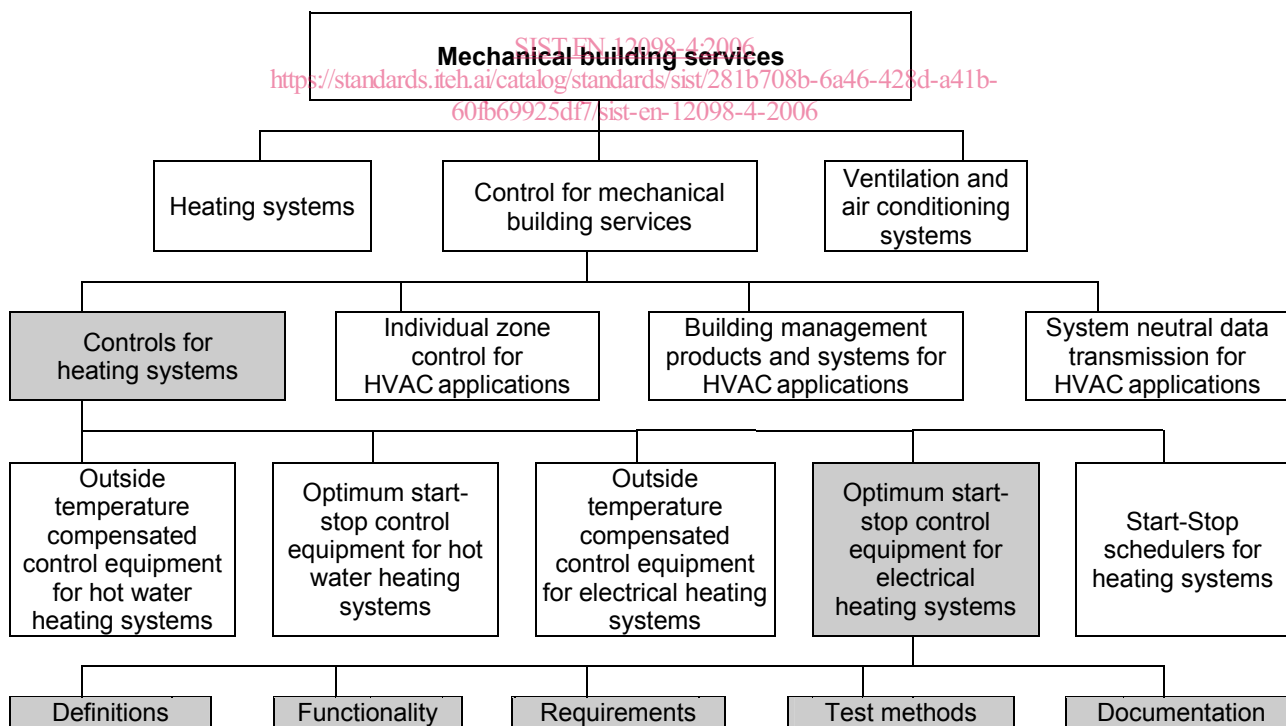
Part 3: Outside temperature compensated control equipment for electrical heating systems;

Part 4: Optimum start-stop control equipment for electrical systems;

Part 5: Start-stop schedulers for heating systems.

No existing European Standard is superseded.

The position of this European Standard in the series of standards for mechanical building services is illustrated below:

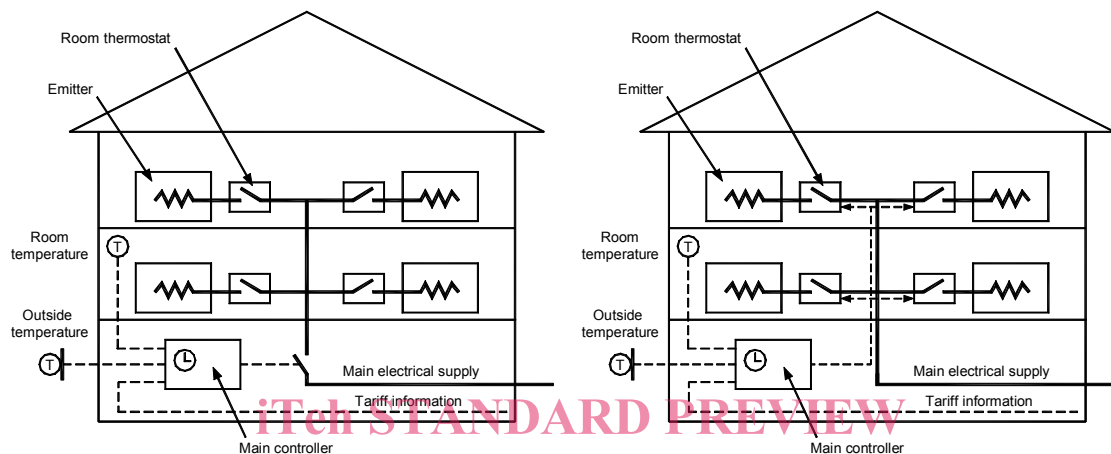


HVAC = Heating, Ventilation, Air Conditioning.

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

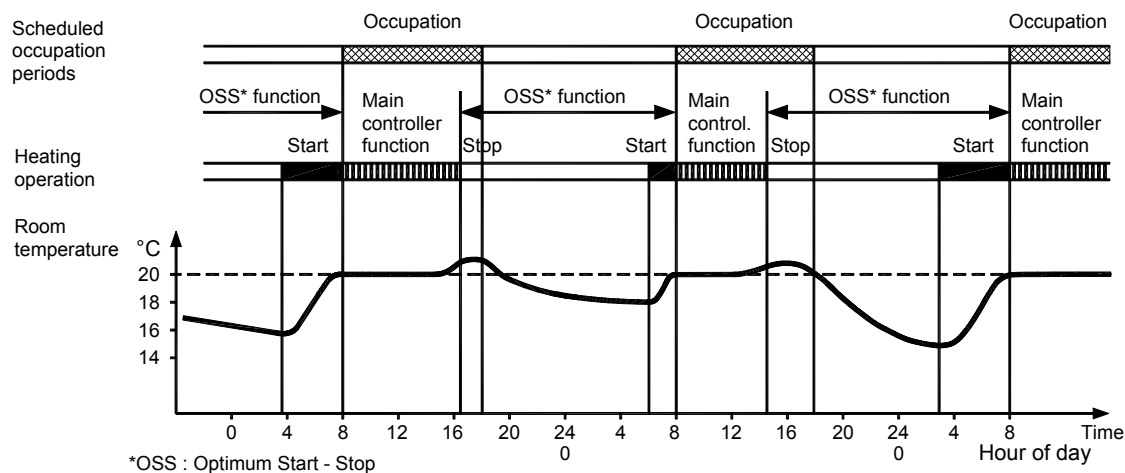
Equipment which controls the heating supply in buildings according to outside and/or room temperature is necessary to reduce the energy consumption and minimise energy cost of heating plants and maintain comfort level.



**Figure 1 - Example of start-stop optimiser. It can control main electrical supply to the central, zone or room level, it can send data to zone or room controllers**

Fixed switching times for intermittent scheduling, may not lead to energy saving, minimum cost and comfort optimisation. A start-stop optimiser schedules switching times in relation with measured variables and tariff (see Figure 1). Its function brings a high level of energy saving without reduction of desired comfort. It can complete a main controller like an outside temperature controller (OTC) according to EN 12098-3.

The optimum start-stop function is easy to programme because the user sets the time at which comfort conditions should apply, rather than the switch-on or switch-off times of the plant.

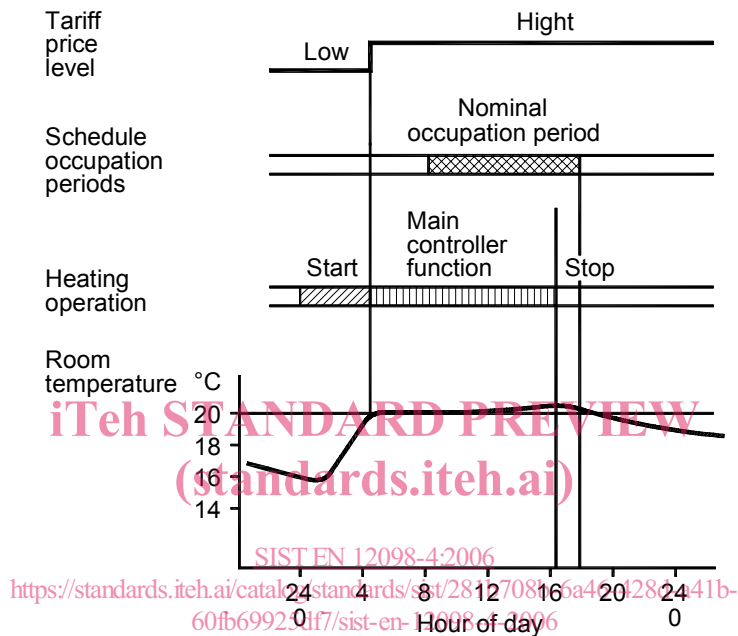


**Figure 2 - Example of relation between occupation, heating and room temperature**

NOTE 1 Optimum start-stop function is illustrated by Figure 2. Heating periods are different from scheduled occupation periods. These differences, due to thermal inertia, depend mainly on heating loads related with temperatures differences. A start-stop optimiser controls these switchings, using outside and/or room temperatures or their differences in relation to setpoints.

Adaptive functions are easier to commission because they require fewer installation parameters to be introduced and no readjustment.

Additionally, a tariff compensated start controller modify the beginning of the optimum start period with respect to the electrical energy tariff time, as illustrated in Figure 3.



**Figure 3 - A tariff compensated optimiser shift the start period at the end of the lower tariff level period to minimise cost**

Included in this European Standard are the main equipment characteristics which assist in reaching these energy saving, minimum costs and comfort objectives.

Characteristics which are directly tested include:

- accuracy of sensors;
- part load characteristics.

Characteristics which are required to be indicated by the manufacturer include:

- time constants.

Other characteristics of the equipment are tested indirectly by measuring responses dependent on them, for example:

- differential;
- dead band.

NOTE 2 This European Standard, therefore, conforms to the requirements and objectives of the interpretative document n° 6 "Energy Economy and Heat Retention" relating to the Construction Product Directive (89/106/EEC).

**EN 12098-4:2005 (E)****1 Scope**

This European Standard applies to electronic equipment which controls electrical heating. In this European Standard, equipments are tested to verify conformity with technical characteristics of the materials given by the manufacturer.

NOTE 1 It describes optimal start-stop heating functions. It does not include controls for storage functions and controls for lowest energy cost by controlling the charging of the heating system.

The particular equipment to which this European Standard applies covers both:

- stand-alone start optimisers or start-stop optimisers, taking priority to the main controller during periods;
- controllers which contain an integrated optimum start or an optimum start-stop control function;
- Electrical equipment which includes this function, may includes other.

NOTE 2 Electrical heating systems able to be controlled by these devices (e.g.: direct heating, mixed heating systems including base and supplement, type of emitters, type of storage heating systems, floor heating...) are indicated in the technical documents of the manufacturer. Instructions to adapt the parameters of devices to the systems to which they apply are indicated in these documents. The optimum start-stop function can be integrated within a main control device such as an outside temperature compensated (OTC) controller. In this case the controller would be expected to meet both EN 12098-3 and this document.

It applies both to adaptive and fixed parameters control functions and sets minimum acceptable standards for functions, performance and documentation.

Additional functions, e.g.:

- adaptive functions,
  - tariff compensated function, for cost optimisation applicable for more complex tariffs, including more than two levels,
  - function taking account other measures and other parameters introduced supplementary parameters
- should be able to be the object of requirements and test method as complement to this European Standard.

Safety systems and heating control systems remain unaffected by this European Standard. The actuators are not covered in this European Standard.

This European Standard does not cover heat emitters.

This control equipment can be connected to a data network.

Input and output signal can be processed by analogue or digital techniques.

**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 12098-1:1996, *Controls for heating systems - Part 1: Outside temperature compensated control equipment for hot water heating systems*

EN 12098-3:2002, *Controls for heating systems - Part 3: Outside temperature compensated control equipment for electrical heating systems*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*



EN 60730-1, *Automatic electrical controls for household and similar use – Part 1: General requirements (IEC 60730-1:1999, modified)*

EN 60730-2-1, *Automatic electrical controls for household and similar use – Part 2: particular requirements for electrical controls for electrical household appliances (IEC 60730-2-1:1989, modified)*

EN 60730-2-7, *Automatic electrical controls for household and similar use – Part 2: Particular requirements for timers and time switches (IEC 60730-2-7:1990, modified)*

EN 60730-2-9, *Automatic electrical controls for household and similar use – Part 2: Particular requirements for temperature sensing controls (IEC 60730-2-9:2000, modified)*

EN 60730-2-11, *Automatic electrical controls for household and similar use – Part 2: Particular requirements for energy controllers (IEC 60730-2-11:1993)*

IEC 60038, *IEC standard voltages*

### 3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 12098-1:1996 and the following apply.

#### 3.1

##### start-stop optimiser

control device which performs optimum start-stop functions, start function should be tariff compensated. It consists of the electronic controller, sensors and output signals, but does not include the actuating equipment (see Figure 3).

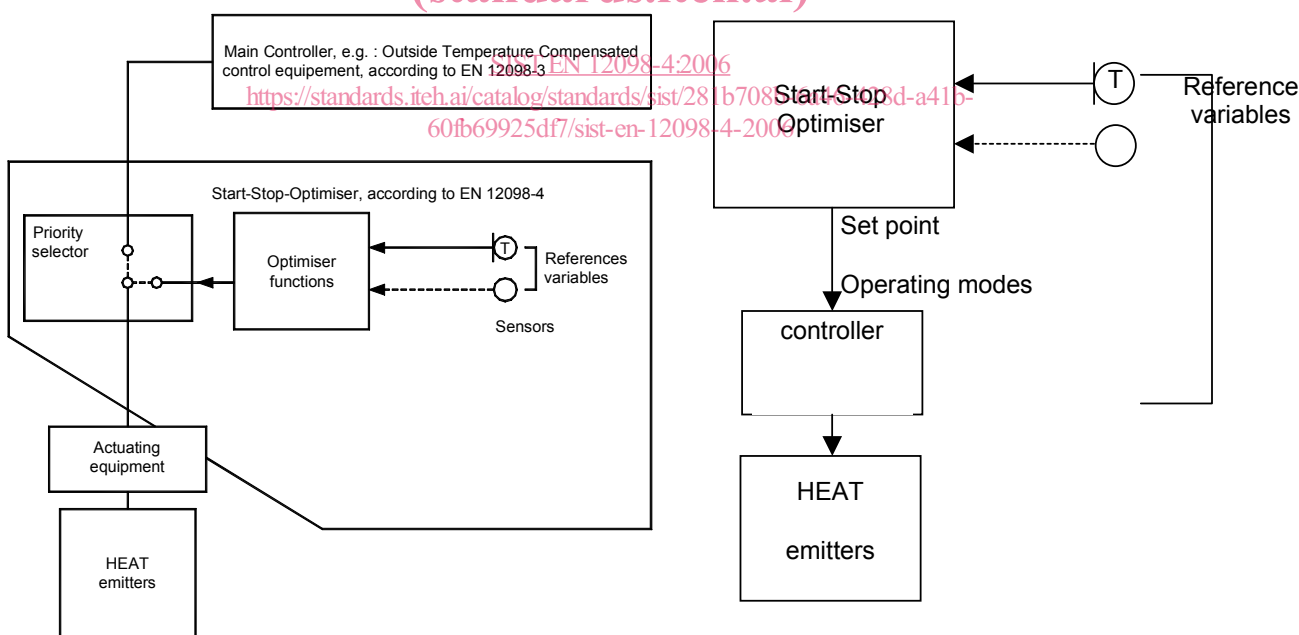


Figure 4 - Examples of control equipment for heating systems

It overrides signal(s) issued by a controller, from switch-off time to beginning of nominal occupation period. Start-stop optimisers and control functions can be included in a single device.

The optimum stop function is optional; a start optimiser performs an optimum start function and a fixed switch-off time function

**EN 12098-4:2005 (E)****3.2****optimum start**

function, which controls the switch-on time such that the room temperature reaches the nominal room temperature from a lower level (e.g. reduced or stand-by room temperature), at a predefined time

NOTE It can lead to switch to the maximal available power.

**3.3****tariff compensated optimum start**

added function to optimum start function for which the predefined time, ending the optimum start period should be, either:

- beginning of nominal occupation period

or

- tariff rising time

automatically chosen with respect to the lowest user energy cost

**3.4****adaptive optimum start**

An added function to optimum start function, which recalculates the parameters used to determine the switch-on time, based on variation of the measured room temperature as feedback information.

**3.5****optimum stop**

function controls the switch-off time, anticipates the end of nominal occupation period in reference to the room temperature, such that the natural fall of the room temperature during nominal occupation period is kept within acceptable limits satisfying comfort needs

**3.6****adaptive optimum stop**

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

**3.7****actuating equipment**

equipment providing the means by which the controller affects the heat emitters (according to EN 12098-3:2002, 3.2). See Figure 4

**3.8****output signals**

signals generated by the optimiser for either:

- heating power

or

- main controller characteristics heating curve

or

- temperature settings

**3.9****reference variable(s) of the optimiser**

for optimum start function: the outside temperature or the room temperature, or both, used to determine the switch-on time, with or without other influencing variables. See 3.2.

For optimum stop function: the room temperature used to determine the switch-off time, with or without other influencing variables. See 3.3

**3.10****outside temperature**

reference variable sensor measuring outside temperature of the building (according to EN 12098-3:2002, 3.6.).

**3.11****nominal room temperature**

resulting room temperature in the building arising in nominal operation of the controller. It is dependant on the design of the heating system and can be different for individual rooms (according to EN 12098-3:2002, 3.8)

**3.12****reduced room temperature**

reduced room temperature compared with the nominal room temperature resulting from operation at a reduced set point (according to EN 12098-3:2002, 3.9)

**3.13****stand-by room temperature**

room temperature resulting from switching off the heating (according to EN 12098-3:2002, 3.10)

Note 1 If frost protection function is active, stand by temperature should be accepted above freezing point.

**3.14****beginning of nominal occupation period**

user programmed time for which the expected nominal room temperature set point should apply

**3.15****tariff rising time**

time for which the electricity cost rises. This information is sent automatically to the optimiser by the energy provider

**3.16****switch-on time**

point in time at which the controller starts up the heating or modifies the set point in order to reach the nominal room temperature (according to EN 12098-3:2002, 3.12).

This time is automatically determined by the tariff compensated optimum start function.

The switch on time is a variable based on the user programmed beginning of nominal occupation period

**3.17****end of nominal occupation period**

The user programmed time for which the nominal temperature should decrease under the nominal room temperature

**3.18****switch-off time**

point in time at which the controller switches off the heating or modifies the set point in order to reach the reduced temperature (according to EN 12098-3:2002, 3.13)

This time is automatically determined by the optimum stop function.

For an optimum stop function, the switch-off time is a variable based on the user programmed end of nominal occupation period

**3.19****nominal occupation period**

operating period during which nominal room temperature should apply

**3.20****optimum start period**

operating period between the switch-on time and the beginning of nominal occupation period

**3.21****optimum stop period**

operating period between the switch-off time and the end of nominal occupation period

**EN 12098-4:2005 (E)****3.22****reduced operation**

operating period from the switch-off time up to the switch-on time, maintaining a reduced room temperature compared with the nominal room temperature (according to EN 12098-3:2002, 3.15)

**3.23****stand-by operation**

operating mode in which the heating is switched off or subject to frost-protection room temperature control, if this function is active (according to EN 12098-3:2002, 3.16)

**3.24****manual operation**

mode in which the controller is inactive and the actuating equipment can be manipulated manually (according to EN 12098-3:2002, 3.17)

**3.25****frost protection function**

optional function that prevents freezing inside the building (according to EN 12098-3:2002, 3.18)

**3.26****energy prices ratio**

$$\text{EPR} = \frac{P_2 - P_1}{P_2}$$

where

$P_1$  is the low energy price  
 $P_2$  is the high energy price

**iteh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 12098-4:2006

<https://standards.iteh.ai/catalog/standards/sist/281b708b-6a46-428d-a41b-60fb69925df7/sist-en-12098-4-2006>