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**Energijske lastnosti stavb - Sistemi za ogrevanje stavb in pripravo tople sanitarne vode - 2. del: Razlaga in utemeljitev EN 15378-1 - Modula M3-11 in M8-11**

Energy performance of buildings - Heating systems and DHW in buildings - Part 2: Explanation and justification of EN 15378-1, Module M3-11 and M8-11

Gesamtenergieeffizienz von Gebäuden - Heizungsanlagen und Trinkwarmwasseranlagen in Gebäuden - Teil 2: Begleitender TR zur EN 15378-1, Modul M3-11 und M8-11

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Performance énergétique des bâtiments - Systèmes de chauffage et production d'eau chaude sanitaire dans les bâtiments - Partie 2 : Explication et justification de l'EN 15378-1, Modules M3-11 et M8-11

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## Contents

Page

European foreword.....	4
Introduction .....	5
1 Scope .....	8
2 Normative references .....	8
3 Terms and definitions .....	8
4 Symbols and subscripts .....	8
4.1 Symbols.....	8
4.2 Subscripts.....	9
4.3 Abbreviations .....	9
5 Description of the method .....	9
5.1 Heat generator inspection .....	9
5.2 Heating system inspection.....	9
5.3 Inspection levels.....	10
5.4 Advice .....	10
5.5 Inspection report .....	11
5.6 Organization of EN 15378-1 .....	11
6 Heat generator inspection procedure .....	12
6.1 Heat generator inspection level identification .....	12
6.2 Heat generator identification .....	12
6.3 Document collection .....	12
6.4 Heat generator visual inspection .....	12
6.5 Heat generator functionality check.....	12
6.6 Heat generator maintenance status .....	12
6.7 Heat generator controls, sensors and indicators .....	12
6.8 Meter readings .....	12
6.9 Heat generator performance evaluation.....	13
6.10 Heat generator inspection report and advice.....	13
7 Heating system inspection procedure.....	13
7.1 Heating system inspection level identification .....	13
7.2 Heating system inspection preparation.....	13
7.3 Heating system and inspection identification .....	13
7.4 Document collection and system identification.....	13
7.5 Heating system functionality check.....	13
7.6 Heating system maintenance status.....	14
7.7 Heating system central controls, sensors and indicators.....	14
7.8 Meter readings .....	14
7.9 Energyware consumption .....	15
7.10 Space heating emission subsystem.....	16
7.11 Space heating emission control subsystem .....	17
7.12 Space heating distribution subsystem.....	18
7.13 Generation subsystem.....	19
7.14 Storage subsystem .....	24

7.15	Generation subsystem sizing.....	24
7.16	Heating system global efficiency or rating.....	27
7.17	Domestic hot water systems.....	27
7.18	Heating system inspection report and advice.....	28
8	Worked out examples .....	29
9	Application range .....	29
10	Regulation use .....	29
11	Information on the accompanying spreadsheet.....	29
12	Results of the validation tests .....	29
13	Quality issues .....	29
13.1	Reproducibility.....	29
13.2	Usability .....	30
13.3	Software proof .....	30
13.4	Time required .....	30
<b>Annex A (informative) Template for the definition of inspection levels, choices, input data and references .....</b>		<b>33</b>
<b>Annex B (informative) Default inspection levels definition, choices, input data and references.....</b>		<b>34</b>
B.1	Introduction.....	34
B.2	References.....	34
B.3	Heat generator inspection levels definition .....	34
B.4	Heating system inspection levels definition.....	34
B.5	Default application data.....	36
<b>Annex C (informative) Sample filled inspection report.....</b>		<b>37</b>
C.1	General .....	37
C.2	Example of completed level 1 default heating system inspection report .....	37
C.3	Example of level 2 default heating system inspection report .....	42
<b>Annex D (informative) Inspection flowchart.....</b>		<b>49</b>
<b>Annex E (informative) Heizungs-check .....</b>		<b>50</b>
<b>Bibliography .....</b>		<b>51</b>

**CEN/TR 15378-2:2017 (E)**

## **European foreword**

This document (CEN/TR 15378-2:2017) has been prepared by Technical Committee CEN/TC 228 “Heating systems and water based cooling systems in buildings”, the secretariat of which is held by DIN.

This document has been prepared under a mandate [11] given to CEN by the European Commission and the European Free Trade Association.

This document is part of the set of standards and accompanying technical reports on the energy performance of buildings (the set of EPB standards).

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.

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## Introduction

### General

Directive 2010/31/EU recasting the Directive 2002/91/EC on energy performance of buildings (EPBD, [11]) promotes the improvement of the energy performance of buildings within the European Union, taking into account all types of energy uses (heating, lighting, cooling, air conditioning, ventilation) and outdoor climatic and local conditions, as well as indoor climate requirements and cost effectiveness (Article 1).

The directive requires Member States to adopt measures and tools to achieve the prudent and rational use of energy resources. In order to achieve those goals, the EPBD requires increasing energy efficiency and the enhanced use of renewable energies in both new and existing buildings. One tool for this is the application by Member States of minimum requirements on the energy performance of new buildings and for existing buildings that are subject to major renovation, as well as for minimum performance requirements for the building envelope if energy-relevant parts are replaced or retrofitted. Other tools are energy certification of buildings, inspection of boilers and air-conditioning systems.

The use of European standards increases the accessibility, transparency and objectivity of the energy performance assessment in the Member States facilitating the comparison of best practices and supporting the internal market for construction products. The use of EPB-standards for calculating energy performance, as well as for energy performance certification and the inspection of heating systems and boilers, ventilation and air-conditioning systems will reduce costs compared to developing different standards at national level.

The first mandate to CEN to develop a set of CEN EPBD standards (M 343, [8]), to support the first edition of the EPBD ([9]) resulted in the successful publication of all EPBD related CEN standards in 2007-2008.

The mandate M 480 was issued to review the mandate M 343 as the recast of the EPBD raised the need to revisit the standards and reformulate and add standards so that they become on the one hand unambiguous and compatible, and on the other hand a clear and explicit overview of the choices, boundary conditions and input data that need to be defined at national or regional level. Such national or regional choices remain necessary, due to differences in climate, culture and building tradition, policy and legal frameworks. Consequently, the set of CEN-EPBD standards published in 2007-2008 had to be improved and expanded on the basis of the recast of the EPBD.

The EPB standards are flexible enough to allow for necessary national and regional differentiation and facilitate Member States implementation and the setting of requirements by the Member States.

In case the EPB standards are used in the context of national or regional legal requirements, mandatory choices may be given at national or regional level for such specific applications, in particular for the application within the context of EU Directives transposed into national legal requirements.

Further target groups are users of the voluntary common European Union certification scheme for the energy performance of non-residential buildings (EPBD art.11.9) and any other regional (e.g. Pan European) parties wanting to motivate their assumptions by classifying the building energy performance for a dedicated building stock.

### The set of EPB standards, technical reports and supporting tools

In order to facilitate the necessary overall consistency and coherence, in terminology, approach, input/output relations and formats, for the whole set of EPB-standards, the following documents and tools are available:

- a) a document with basic principles to be followed in drafting EPB-standards: CEN/TS 16628:2014, Energy Performance of Buildings - Basic Principles for the set of EPB standards [4];

**CEN/TR 15378-2:2017 (E)**

- b) a document with detailed technical rules to be followed in drafting EPB-standards; CEN/TS 16629:2014, Energy Performance of Buildings - Detailed Technical Rules for the set of EPB-standards [5];
- c) the detailed technical rules are the basis for the following tools:
- 1) a common template for each EPB-standard, including specific drafting instructions for the relevant clauses;
  - 2) a common template for each technical report that accompanies a EPB standard or a cluster of EPB standards, including specific drafting instructions for the relevant clauses;
  - 3) a common template for the spreadsheet that accompanies each EPB standard, to demonstrate the correctness of the EPB calculation procedures.

Each EPB-standards follows the basic principles and the detailed technical rules and relates to the overarching EPB-standard, EN ISO 52000-1.

One of the main purposes of the revision of the EPB-standards is to enable that laws and regulations directly refer to the EPB-standards and make compliance with them compulsory. This requires that the set of EPB-standards consists of a systematic, clear, comprehensive and unambiguous set of energy performance procedures. The number of options provided is kept as low as possible, taking into account national and regional differences in climate, culture and building tradition, policy and legal frameworks (subsidiarity principle). For each option, an informative default option is provided (Annex B).

### **Rationale behind the EPB technical reports**

There is a high risk that the purpose and limitations of the EPB standards will be misunderstood, unless the background and context to their contents – and the thinking behind them – is explained in some detail to readers of the standards. Consequently, various types of informative contents are recorded and made available for users to properly understand, apply and nationally implement the EPB standards.

If this explanation would have been attempted in the standards themselves, the result is likely to be confusing and cumbersome, especially if the standards are implemented or referenced in national or regional building codes.

Therefore each EPB standard is accompanied by an informative technical report, like this one, where all informative content is collected, to ensure a clear separation between normative and informative contents (see CEN/TS 16629 [5]):

- to avoid flooding and confusing the actual normative part with informative content;
- to reduce the page count of the actual standard; and
- to facilitate understanding of the set of EPB standards.

This was also one of the main recommendations from the European CENSE project [9] that laid the foundation for the preparation of the set of EPB standards.

### **This technical report**

This technical report accompanies the standard on the inspection of heating and domestic hot water systems.

The first part of this technical report, up to Clause 7 and all annexes up to Annex E have the same numbering as EN 15378-1. Each clause in this FprCEN/TR 15378-2 is related to the same clause in EN 15378-1.



The role and the positioning of the accompanied standard(s) in the set of EPB standards is defined in the Introduction to the standard.

### **Accompanying spreadsheet(s)**

Since no calculation method is defined in this inspection standard, no accompanying spreadsheet was provided.

This Technical Report, includes an examples of compiled inspection report.

### **History of this technical report and the accompanied standard**

The first version of the standard on the inspection of boilers and heating system was issued in 2008 as part of the Mandate 343 of the EC to CEN to support the EPBD (2003).

The standard has been completely redrafted as part of Mandate 480 of the EC to CEN.

References in the text of the standard are given as module codes that are detailed in the annex. This enables flexible references (e.g. to national documents where necessary for local application) and use outside the CEN environment.

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**CEN/TR 15378-2:2017 (E)****1 Scope**

This technical report refers to EN 15378-1.

It contains information to support the correct understanding, use and national adaptation of EN 15378-1.

**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.

EN ISO 52000-1:2017, *Energy performance of buildings - Overarching EPB assessment - Part 1: General framework and procedures (ISO 52000-1:2017)*

EN 15378-1:2017, *Energy performance of buildings — Heating systems and DHW in buildings — Part 1: Inspection of boilers, heating systems and DHW, Module M3-11, M8-11*

EN ISO 7345:1995, *Thermal insulation - Physical quantities and definitions (ISO 7345:1987)*

**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN ISO 7345:1995, EN ISO 52000-1:2017 and EN 15378-1:2017 apply.

NOTE There are no new terms in this Technical Report.

Most terms used in EN 15378-1, such as:

- space heating
- gross and net calorific value
- external temperature
- energy carrier
- delivered energy

and others are already given in EN ISO 52000-1:2017 and are not repeated.

The following definition is repeated for readability.

**3.1 EPB standard**  
standard that complies with the requirements given in EN ISO 52000-1:2017, CEN/TS 16628 and CEN/TS 16629

**4 Symbols and subscripts****4.1 Symbols**

For the purposes of this document, the symbols given in EN ISO 52000-1:2017, in EN 15378-1:2017, *Heating systems and water based cooling systems in buildings — Heating systems and DHW in buildings — Part 1: Inspection of boilers, heating systems and DHW* (the accompanied EPB standard) apply.

NOTE There are no new symbols in this technical report.

Symbols that are already defined in EN ISO 52000-1:2017, Clause 4 and Annex C, are not be repeated in each EPB standard.

## 4.2 Subscripts

For the purposes of this document, the subscripts given in EN ISO 52000-1:2017, in EN 15378-1:2017, *Heating systems and water based cooling systems in buildings — Heating systems and DHW in buildings — Part 1: Inspection of boilers, heating systems and DHW* (the accompanied EPB standard) apply .

NOTE There are no new subscripts in this technical report.

Subscripts that are already defined in EN ISO 52000-1:2017, Clause 4 and Annex C, are not be repeated in each EPB standard.

## 4.3 Abbreviations

### 4.3.1

#### EPBD

EPBD, Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings and Recast of the Directive on the energy performance of buildings (2010/31/EU) of 14th December 2010

### 4.3.2

#### EPC

energy performance certificate

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## 5 Description of the method

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### 5.1 Heat generator inspection

The plain heat generator inspection, as described in Clause 6 and introduced in 5.1 of EN 15378-1:2017, is not enough to comply with requirements of Directive 2010-31-EU “EPBD recast”. In the previous version of EN 15378, it was intended to support “boiler inspection” that was a different item than “heating system” inspection.

These clauses have been kept indeed for the following reasons:

- consistency with the previous standard;
- many EU member states already adopted inspection schemes limited to the boiler.

These schemes are often used in conjunction with compulsory periodic maintenance of the heat generator which are not required by EPBD.

### 5.2 Heating system inspection

The inspection procedure described in Clause 7 and introduced in 5.2 is intended to support the heating system inspection required by EPBD recast.

The normative text highlights a defined inspection procedure, specifying which aspects could be inspected. However, many inspection items may be optionally included/excluded depending on the inspection level.

- Annex A gives a template to specify choices.

## CEN/TR 15378-2:2017 (E)

- Annex B gives a default set of choices.
- Annex C gives the practical translation of the defined procedure into a checklist that can be also used as a basis for the inspection report.

The definition of the procedure is organized in the following way to balance two opposite requirements:

- several Member States want to keep the possibility to modify the requirements for inspection;
- other Member States want to have a ready to use inspection procedure.

### 5.3 Inspection levels

Inspection levels have been introduced to guarantee adequate flexibility in the application of this standard.

The default inspection levels and the corresponding required sections specified in Annex B to EN 15378-1:2017, were determined taking into account the minimum requirements stated by article 14 of Directive 2010/31/EU of the European Parliament and of the council of 19 May 2010 on the energy performance of buildings (recast) that is *“a regular inspection of the accessible parts of systems used for heating buildings, such as the heat generator, control system and circulation pump(s), with boilers of an effective rated output for space heating purposes of more than 20 kW”*.

The default inspection levels are defined in EN 15378-1:2017, Table B.2.

The list of parameters given under 5.3 is not a list of parameters that shall be taken into account. It is a reminder of the possible criteria that can be used to specify custom inspection levels using EN 15378-1:2017, Tables A.1 and B.1.

### 5.4 Advice

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A distinction has been made between three levels of advice:

- recommendations of cost effective immediate actions (e.g. actions that will pay-back in a reasonably short time which is significantly shorter than the expected lifetime of the installed appliances and products);
- recommendation of actions to be performed in case of major renovation or replacement of components due to aging or breakdown (e.g. action whose total cost would make them not cost effective but that are indeed cost effective in the context of unavoidable equipment replacements);
- notes, including any other advice.

This classification is required because cost-effective immediate actions are not so frequent and dependent on climatic conditions and building and/or system size.

**EXAMPLE** In the Mediterranean climate, it is not obvious to find cost-effective immediate actions on individual heating systems.

A larger category of cost effective recommendations relates on possible improvements in case of replacement of appliances, because of ageing or break-down. An example is a boiler in an individual house. The immediate replacement is seldom convenient in the milder climates. In case of replacement, the adoption of the best available technology (instead of installing again a simpler, less performant technology) is very likely to be cost effective because only the cost difference between poor performance and optimal performance appliances shall be recovered. It is very important that the information on the possibility to select high performance appliances when replacing old ones is given to

the user otherwise, if a low performance appliance is installed again it will take many years before the next opportunity of improvement occurs.

The “notes” category shall be used for remarks about:

- low or no-cost measures;
- use and maintenance recommendations.

that may be noted during inspection.

## 5.5 Inspection report

The inspection report is the fundamental communication tool with the user.

The information in the report should trigger actions by the user. Therefore the important part of the message is presented on the first page.

The inspection report is intended also as a checklist to guide inspection and should be designed together with the list of inspection items to be recorded. This will facilitate creation of an electronic archive of reports.

See also the discussion on templates at Annex A.

The requirements to archive the inspection results and have them available for the next inspection is very important. The inspection process defined by EPBD is not a “one shot”, it is a repetitive task. It is therefore essential for the inspection process that the report and the information collected during the inspection is archived and made available for the next inspection. How this is done and who is responsible for it cannot be specified by this standard. However availability of previous reports allows:

- easier and faster inspection;
- to check if previous recommendations were followed and implemented;
- to compare readings of counters (if noted!) and get useful information about system operation.

Therefore this is considered an essential requirement for the inspection process. The decision on who has to archive and keep the information (e.g. end user, official inspection database, etc.) is left to the actual implementation process in each country.

## 5.6 Organization of EN 15378-1

The intended role of the parts of EN 15378-1 are the following:

- the normative text of Clause 7 defines the inspection procedure, specifying which aspects could be inspected for each subsystem. However, many inspection items may be optionally included/excluded depending on the desired inspection accuracy and effort.
- Annex A gives a template to specify choices about which inspection item shall be included or excluded according to the inspection level;
- Annex B gives a default set of choices in connection with two predefined inspection levels;
- Annex C gives the practical translation of the default inspection levels into a checklist that can be also used as a basis for the inspection report. There is one example for each defined inspection level given in Annex B.

## 6 Heat generator inspection procedure

### 6.1 Heat generator inspection level identification

The first step is determining the inspection level because actual requirements for the individual inspection are depending on it.

No detailed information is given for this level because heat generator inspection is not enough to comply with EPBD directive. See Clause 7.

### 6.2 Heat generator identification

This should include the necessary data that allows to identify the generator under inspection. In many countries there are systematic databases of existing installations with established unique coding.

### 6.3 Document collection

This section can be useful if there are regulations that ask for a documented maintenance of heating systems.

### 6.4 Heat generator visual inspection

It is normal practice that the inspection starts with a visual inspection looking for evidence of potential risk situations.

Visual inspection do not require mechanical actions on the system such as disassembling and reassembling components and installation parts.

### 6.5 Heat generator functionality check

This check points to the evidence that the generator is really used for heating and domestic hot water purpose and is supplying the intended services.

Evidence can be supplied by users, though this information may be inaccurate or biased. Operation and maintenance personnel is another possible source of information.

Another technique is comparing the set-point with the actual values. But this is possible and useful only if the system is in operation at a medium to high load.

### 6.6 Heat generator maintenance status

See information on 7.6.

### 6.7 Heat generator controls, sensors and indicators

See information on 7.7.

### 6.8 Meter readings

This is a potential source of simple and useful information.

EXAMPLE in case of periodic inspections, the difference in readings provide an indication about the system operation between inspections.

The usefulness of this requirement depends on archiving the results and making historical readings available. That's why it is asked that inspection results are archived. See also 5.5.

The list of possible meters from a) to h) is not a list of all meters that shall be read but a reminder of which type of meters may be included in the inspection level specification.

## 6.9 Heat generator performance evaluation

This clause specifies a number of properties that may be inspected to estimate the boiler performance. Most of the data for the estimation of the boiler seasonal efficiency can be obtained from tables. Some items are relevant only for some types of heat generators (like combustion efficiency for boilers).

## 6.10 Heat generator inspection report and advice

The rationale is to have on the first page the main message to the reader. If the useful information comes after several pages of non-interesting data, there is a high risk that the main message of the inspection report is not read. See also 5.4.

## 7 Heating system inspection procedure

### 7.1 Heating system inspection level identification

The first step is determining the inspection level because actual requirements for the individual inspection are depending on it.

The required inspection level shall depend on objective properties of the installation. A list of possible such properties is given in EN 15378-1:2017, 5.3.

### 7.2 Heating system inspection preparation

This procedure assumes that there is a communication between the inspector and the responsible person of the inspected system before the inspection. This has to happen at least to agree and organize access on site. At that time it can be asked to gather useful documents or documents that have to be available on site. Asking for documents when on site is too late and would cause unnecessary delays.

### 7.3 Heating system and inspection identification

This should include the data required to identify the heating systems under inspection.

In many countries there are databases of existing installations with established coding.

Which services are provided by the system, together with other information, is an essential information e.g. for generator sizing.

### 7.4 Document collection and system identification

This clause doesn't actually require that any document is available.

If such documents as a functional diagram are available on site this helps, provided they are checked against the real installation.

What is important is that the inspector understands the listed aspects (e.g. how is the system designed to operate and how it operates really).

### 7.5 Heating system functionality check

This point aims to identify if the heating system is really used for heating and/or domestic hot water purpose and is supplying the intended services.

Examples of malfunctioning and modified intended use:

- thermal solar system is not operating, only back-up heater is working