



NSAI
Standards

Irish Standard
I.S. EN 15378-3:2017

Energy performance of buildings - Heating
and DHW systems in buildings - Part 3:
Measured energy performance, Module M3-
10, M8-10

I.S. EN 15378-3:2017

Incorporating amendments/corrigenda/National Annexes issued since publication:

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard — national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation — recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces/revises/consolidates the NSAI adoption of the document(s) indicated on the CEN/CENELEC cover/Foreword and the following National document(s):

NOTE: The date of any NSAI previous adoption may not match the date of its original CEN/CENELEC document.

This document is based on:

EN 15378-3:2017

Published:

2017-04-19

This document was published under the authority of the NSAI and comes into effect on:

2017-05-07

ICS number:

91.140.10

NOTE: If blank see CEN/CENELEC cover page

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

National Foreword

I.S. EN 15378-3:2017 is the adopted Irish version of the European Document EN 15378-3:2017, Energy performance of buildings - Heating and DHW systems in buildings - Part 3: Measured energy performance, Module M3-10, M8-10

This document does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

For relationships with other publications refer to the NSAI web store.

Compliance with this document does not of itself confer immunity from legal obligations.

In line with international standards practice the decimal point is shown as a comma (,) throughout this document.

This page is intentionally left blank

EUROPEAN STANDARD

EN 15378-3

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2017

ICS 91.140.10

English Version

**Energy performance of buildings - Heating and DHW
systems in buildings - Part 3: Measured energy
performance, Module M3-10, M8-10**

Performance énergétique des bâtiments - Systèmes de
chauffage et production d'eau chaude sanitaire dans les
bâtiments - Partie 3 : Performance énergétique
mesurée, Module M3-10, M8-10

Energetische Bewertung von Gebäuden -
Heizungsanlagen und Trinkwassererwärmung in
Gebäuden - Teil 3: Gemessene Gesamtenergieeffizienz,
Module M3-10, M8-10

This European Standard was approved by CEN on 27 February 2017.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents		Page
European foreword.....		5
Introduction		6
1	Scope.....	8
2	Normative references.....	11
3	Terms and definitions	11
4	Symbols, subscripts and abbreviations.....	11
4.1	Symbols.....	11
4.2	Subscripts.....	12
4.3	Abbreviations	13
5	Description of the methods	13
5.1	Available procedures.....	13
5.2	Assessment of measured heating and domestic hot water delivered energy.....	13
5.2.1	Output of the method.....	13
5.2.2	Optional procedures	13
5.2.3	Validation of measured delivered energy assessment.....	14
5.2.4	Correction according to standard use and/or climate	14
5.3	Assessment of measured boiler combustion efficiency	14
5.3.1	Output of the method.....	14
5.3.2	Optional methods.....	15
5.4	Assessment of boiler seasonal efficiency	15
5.4.1	Output of the method.....	15
5.4.2	Optional methods.....	15
5.5	Domestic hot water system efficiency	15
5.5.1	Output of the method.....	15
5.5.2	Optional methods.....	15
6	Measured delivered energy for space heating and domestic hot water	16
6.1	Output data.....	16
6.2	Assessment and measurement periods and intervals.....	16
6.3	Input data.....	16
6.3.1	Data on delivered energy carrier amount.....	16
6.3.2	Constants and physical data.....	17
6.4	Assessment of delivered and exported energy carriers amount.....	18
6.4.1	General.....	18
6.4.2	Metered energy carriers (electricity, gas, district heating and cooling).....	18
6.4.3	Liquid fuels in tanks or small containers	19
6.4.4	Solid fuels.....	20
6.4.5	Fuel with hour counter.....	20
6.4.6	Electrical energy measurement.....	21
6.5	Data about boundary conditions.....	21
6.5.1	General.....	21
6.5.2	Climatic data	22
6.5.3	Building use schedule and internal temperature.....	22
6.5.4	Domestic hot water used	24
6.6	Converting to delivered and exported energy.....	24

6.7	Preparation of data.....	24
6.7.1	Reporting raw data.....	24
6.7.2	Validating raw data for measured delivered energy correction.....	25
6.8	Interpolation of seasonal measurements.....	26
6.8.1	Data preparation.....	26
6.8.2	Separating uses and services.....	26
6.8.3	Space heating delivered energy correction for indoor temperature and climate.....	28
6.8.4	Seasonal values.....	29
6.8.5	Interpolation of seasonal delivered energy.....	29
6.8.6	Measured specific heat loss H_{meas}	30
6.8.7	Validation criteria.....	30
6.9	Energy signature method.....	31
6.9.1	Data preparation.....	31
6.9.2	Linear regression in heating mode.....	31
6.9.3	Linear regression in non-heating mode.....	31
6.9.4	Heating start external temperature.....	31
6.9.5	Estimated internal temperature during heating season.....	31
6.9.6	Standardized average heating power during the heating season.....	32
6.9.7	Standardized delivered energy during the heating season.....	32
6.9.8	Validation criteria.....	32
6.9.9	Measured domestic hot water delivered energy.....	33
6.10	Special cases.....	33
6.11	Plain reporting.....	33
6.12	Exported energy.....	33
6.13	Reporting.....	33
6.14	Limits of application.....	34
6.15	Linear regression sub procedure.....	34
6.15.1	General.....	34
6.15.2	Output data.....	34
6.15.3	Input data.....	34
6.15.4	Calculation procedure.....	34
7	Boiler combustion efficiency.....	35
7.1	Output data.....	35
7.2	Input data.....	36
7.3	Measuring procedure.....	36
7.4	Combustion efficiency calculation.....	37
7.4.1	General.....	37
7.4.2	Sensible heat loss factor $\alpha_{\text{ch,on}}$	38
7.4.3	Condensation latent heat recovery factor α_{cond}	38
7.5	Reporting.....	40
8	Assessment of seasonal boiler efficiency.....	40
8.1	Output data.....	40
8.2	Input data.....	41
8.3	Available methods.....	41
8.3.1	Boiler cycling method.....	41
8.3.2	Total stand-by losses method.....	41
8.4	Boiler β_{cmb} (average load) determination.....	42
8.4.1	Introduction.....	42
8.4.2	Fuel use method.....	42
8.4.3	Operation hour counter method.....	42
8.5	Estimation of loss factors.....	42
8.5.1	Losses through the envelope (radiation losses).....	42

EN 15378-3:2017 (E)

8.5.2	Losses through the chimney with burner off	43
8.5.3	Total stand-by losses	44
8.6	Reporting	45
9	Assessment of measured domestic hot water delivered energy and system efficiency.....	45
9.1	Domestic hot water delivered energy	45
9.1.1	Domestic hot water volume measurement not available.....	45
9.1.2	With domestic hot water production measurement.....	45
9.2	Domestic hot water system efficiency	47
9.3	Reporting	47
10	Assessment of measured heat pump efficiency	47
11	Assessment of the energy performance for other services.....	48
12	Quality control	48
13	Compliance check.....	48
Annex A (normative) Template for the definition of inspection levels, choices, input data and references.....		49
A.1	Introduction	49
A.2	References	49
A.3	Default data for measured energy calculation	50
A.4	Default values for non EPBD uses of fuels.....	52
A.5	Default values for combustion efficiency	53
A.6	Default values for boiler seasonal efficiency	53
Annex B (informative) Default choices, input data and references		55
B.1	Introduction	55
B.2	References	55
B.3	Default data for measured energy calculation	56
B.4	Default values for non EPBD uses of fuels.....	60
B.5	Default values for combustion efficiency calculation	60
B.6	Default values for boiler seasonal efficiency	61
Annex C (informative) Template for the input data preparation and presentation.....		62
Annex D (informative) Measured delivered energy assessment flowchart.....		64
Bibliography.....		65

European foreword

This document (EN 15378-3:2017) 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 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 October 2017, and conflicting national standards shall be withdrawn at the latest by October 2017.

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

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

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

EN 15378-3:2017 (E)

Introduction

This standard is part of a series of standards aiming at international harmonization of the methodology for the assessment of the energy performance of buildings, called “set of EPB standards”.

All EPB standards follow specific rules to ensure overall consistency, unambiguity and transparency.

All EPB standards provide a certain flexibility with regard to the methods, the required input data and references to other EPB standards, by the introduction of a normative template in Annex A and Annex B with informative default choices.

For the correct use of this standard a normative template is given in Annex A to specify these choices. Informative default choices are provided in Annex B.

The main target group of this standard are all the users of the set of EPB standards (e.g. architects, engineers, regulators).

Use by or for regulators: In case the standard is used in the context of national or regional legal requirements, mandatory choices may be given at national or regional level for such specific applications. These choices (either the informative default choices from Annex B or choices adapted to national / regional needs, but in any case following the template of this Annex A) can be made available as national annex or as separate (e.g. legal) document (national data sheet).

NOTE 1 So in this case:

- the regulators will specify the choices;
- the individual user will apply the standard to assess the energy performance of a building, and thereby use the choices made by the regulators.

Topics addressed in this standard can be subject to public regulation. Public regulation on the same topics can override the default values in Annex B of this standard. Public regulation on the same topics can even, for certain applications, override the use of this standard. Legal requirements and choices are in general not published in standards but in legal documents. In order to avoid double publications and difficult updating of double documents, a national annex may refer to the legal texts where national choices have been made by public authorities. Different national annexes or national data sheets are possible, for different applications.

It is expected, if the default values, choices and references to other EPB standards in Annex B are not followed due to national regulations, policy or traditions, that:

- national or regional authorities prepare data sheets containing the choices and national or regional values, according to the model in Annex A. In this case the national annex (e.g. NA) refers to this text;
- or, by default, the national standards body will consider the possibility to add or include a national annex in agreement with the template of Annex A, in accordance to the legal documents that give national or regional values and choices.

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 Pan EU parties wanting to motivate their assumptions by classifying the building energy performance for a dedicated building stock

More information is provided in the Technical Report accompanying this standard (CEN/TR 15378-4:2017).

TC 228 deals with heating systems in buildings. Subjects covered by TC 228 are:

- energy performance calculation for heating systems;
- inspection of heating systems;
- design of heating systems;
- installation and commissioning of heating systems.

This is a new standard developed during mandate M480. It incorporates provisions previously stated in EN 15603:2008 and EN 15378:2008.

Default references to EPB standards other than EN ISO 52000-1:2017 are identified by the EPB module code number and they are given in Annex A (normative template) and Annex B (informative default choice).

NOTE 2 Example of EPB module code number: M5-5, or M5-5.1 (if module M5-5 is subdivided), or M5-5/1 (if reference to a specific clause of the standard covering M5-5).

EN 15378-3:2017 (E)

1 Scope

This European Standard specifies methods to assess the delivered energy for space heating and domestic hot water energy performance of a building based on measurements during the operation and occupancy phase. This includes:

- assessment of the amount of delivered energy carriers for space heating and domestic hot water preparation based on measurement;
- assessment of the energy performance indicators of heating and domestic hot water systems and subsystems based on measurements.

This standard does not cover the measurement of delivered energy for ventilation, cooling, air conditioning and lighting systems.

This standard includes procedures to correct measured delivered energy according to climate and building use.

Weighting (e.g. conversion into primary energy, cost, CO₂ emission) of the measured delivered energy and assessment of the energy performance are covered in EN ISO 52000-1:2017.

Table 1 shows the relative position of this standard within the set of EPB standards in the context of the modular structure as set out in EN ISO 52000-1:2017.

NOTE 1 In CEN ISO/TR 52000-2:2017 the same table can be found, with, for each module, the numbers of the relevant EPB standards and accompanying technical reports that are published or in preparation.

NOTE 2 The modules represent EPB standards, although one EPB standard may cover more than one module and one module may be covered by more than one EPB standard, for instance a simplified and a detailed method respectively. See also Clause 2 and Tables A.1 and B.1.

Table 1 — Position of this standard, within the modular structure of the set of EPB standards

Submodule	Overarching		Building (as such)		Technical Building Systems									
	Descriptions		Descriptions		Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation and control	Electricity production
sub 1		M1		M2		M3	M4	M5	M6	M7	M8	M9	M10	M11
1	General		General		General	EN 15316-1					EN 15316-1			
2	Common terms and definitions; symbols, units and subscripts		Building Energy Needs		Needs						EN 12831-3			
3	Applications		(Free) Indoor Conditions without Systems		Maximum Load and Power	EN 12831-1					EN 12831-3			
4	Ways to Express Energy Performance		Ways to Express Energy Performance		Ways to Express Energy Performance	EN 15316-1					EN 15316-1			
5	Building categories and Building Boundaries		Heat Transfer by Transmission		Emission and control	EN 15316-2	EN 15316-2							
6	Building Occupancy and Operating Conditions		Heat Transfer by Infiltration and Ventilation		Distribution and control	EN 15316-3	EN 15316-3				EN 15316-3			
7	Aggregation of Energy Services and Energy Carriers		Internal Heat Gains		Storage and control	EN 15316-5					EN 15316-5 15316-4-3			
8	Building zoning		Solar Heat Gains		Generation									
8-1					Combustion boilers	EN 15316-4-1					EN 15316-4-1			
8-2					Heat pumps	EN 15316-4-2	15316-4-2				EN 15316-4-2			

EN 15378-3:2017 (E)

Submodule	Overarching		Building (as such)		Technical Building Systems									
	Descriptions		Descriptions		Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation and control	Electricity production
sub 1		M1		M2		M3	M4	M5	M6	M7	M8	M9	M10	M11
8-3					Thermal solar Photovoltaics	EN 15316-4-3					15316-4-3			15316-4-3
8-4					On-site cogeneration	EN 15316-4-4					EN 15316-4-4			EN 15316-4-4
8-5					District heating and cooling	EN 15316-4-5	EN 15316-4-5							EN 15316-4-5
8-6					Direct electrical heater	EN 15316-4-8					EN 15316-4-8			
8-7					Wind turbines									EN 15316-4-10
8-8					Radiant heating, stoves	EN 15316-4-8								
9	Calculated Energy Performance		Building Dynamics (thermal mass)		Load dispatching and operating conditions									
10	Measured Energy Performance		Measured Energy Performance		Measured Energy Performance	EN 15378-3					EN 15378-3			
11	Inspection		Inspection		Inspection	EN 15378-1					EN 15378-1			
12	Ways to Express Indoor Comfort				BMS									
13	External Environment Conditions													
14	Economic Calculation	EN 15459-1												

NOTE The shaded modules are not applicable

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

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

EN 50379 (all parts), *Specification for portable electrical apparatus designed to measure combustion flue gas parameters of heating appliances*

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 the following definitions apply.

NOTE The terms of EN ISO 52000-1:2017 that are indispensable for the understanding of the underlying standard are repeated here.

3.1

assessment period

time for which the measured amount of energy shall be determined

3.2

measurement interval

time between individual measurements

3.3

measurement period

Interval of time covered by measurement intervals

Note 1 to entry The measurement period can be a multiple of the assessment period.

4 Symbols, subscripts and abbreviations

4.1 Symbols

For the purposes of this document, the symbols given in Clause 4 and Annex C of EN ISO 52000-1:2017 and the specific symbols listed in Table 2 apply.

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

-
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
 - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-