BS EN 442-1:2014

BSI Standards Publication

Radiators and convectors

Part 1: Technical specifications and requirements

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee RHE/6, Air or space heaters or coolers without combustion.

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Radiatoren und Konvektoren - Teil 1: Technische Spezifikationen und Anforderungen

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Foreword

This document (EN 442-1:2014) has been prepared by Technical Committee CEN/TC 130 “Space heating appliances without integral heat sources”, the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by June 2015, and conflicting national standards shall be withdrawn at the latest by September 2016.

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 442-1:1995 and EN 442-3:2003.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports basic works requirements of EU Regulation No 305/2011, of the European Parliament and the Council of 8 March 2011.

For relationship with the EU Regulation, see informative Annex ZA, which is an integral part of this document.

This European Standard, *Radiators and convectors*, consists of the following parts:

— *Part 1: Technical specifications and requirements* [the present document];

— *Part 2: Test methods and rating*.

The most significant changes that have been made in this new edition of EN 442-1 are the following ones:

— the standard has been revised to be in line with EU Regulation N° 305/2011;

— tubular radiators, finned tube convectors and skirting convectors have been included;

— the declaration of the standard low temperature thermal output at ΔT 30 K has been added.

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.

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1 Scope

This European Standard defines the technical specifications and requirements of radiators and convectors to be installed in heating systems in buildings including assessment and verification of constancy of performance.

This European Standard deals with radiators and convectors installed in a permanent manner in construction works, fed with water or steam at temperatures below 120 °C, supplied by a remote energy source.

This European Standard does not apply to independent heating appliances.

This European Standard also defines the additional common data that the manufacturer shall provide with the product in order to ensure the correct application of the products.

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 442-2:2014, *Radiators and convectors — Part 2: Test methods and rating*

EN 573-3, *Aluminium and aluminium alloys — Chemical composition and form of wrought products — Part 3: Chemical composition and form of products*

EN 10130, *Cold rolled low carbon steel flat products for cold forming — Technical delivery conditions*

EN 10131, *Cold rolled uncoated and zinc or zinc-nickel electrolytically coated low carbon and high yield strength steel flat products for cold forming — Tolerances on dimensions and shape*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

EN ISO 2409:2013, *Paints and varnishes — Cross-cut test (ISO 2409:2013)*

ISO 185, *Grey cast irons — Classification*

3 Terms and definitions

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

NOTE For symbols and units refer to EN 442–2.

3.1
heating appliance
device which has the purpose of transferring heat in order to provide specific temperature conditions inside buildings

3.2
independent heating appliance
self-contained heating appliance which does not need to be connected to a remote energy source (e.g. a boiler) as it contains its own energy source (e.g. gas fired appliances, electric appliances, air to air heat pump appliances)

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3.3
radiator
heating appliance, produced with different materials (e.g. steel, aluminium, cast-iron) and with different designs (e.g. plate type, column type, tube type, finned tube type), which emits heat by free convection and radiation

3.4
sectional heating appliances (mainly applied to radiators)
heating appliance manufactured in sections of identical design and traded in this form which can be joined together into modular assemblies so that the desired output can be obtained

3.5
free convection heating appliance
heating appliance which does not contain a fan or similar device to activate the air flow over heat emitter

3.6
convector
heating appliance which emits heat almost entirely by free convection

Note 1 to entry: A convector comprising at least a heat emitter and a casing which provides an unheated convective chimney of defined height.

3.7
skirting convector
convector of limited height running along the base of an interior wall

3.8
height of the unheated convective chimney
vertical distance between the lowest edge of the convector and the bottom of the air outlet section

Note 1 to entry: It applies to convectors only, being a main factor influencing their thermal output.

3.9
wet heating surface; primary heating surface
portion of the heat emitting surface which is always in contact with the primary fluid (water or steam)

3.10
dry heating surface; secondary heating surface
portion of the heat emitting surface which is in contact with air only (e.g. fins projecting from the wet surface)

3.11
family of heating appliances
group of heating appliances of similar design and construction and of identical material, positions of primary fluid connections and other related variables that particularly affect the conditions of flow of the primary fluid within the heating appliance

3.12
type of radiators/convectors
group of heating appliances of similar design whose cross-section remains unchanged while the height or length varies or which have a systematic variation of only one characteristic dimension of the dry heating surfaces providing that this does not affect the water side (e.g. the height of convector fins on panel radiator)

Note 1 to entry: For the calculation in conformity to EN 442–2:2014, Annex D, at least three models are required.

3.13
model
heating appliance of defined height, length and depth within a type

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3.14
range of heights
difference between the maximum and minimum height of the models in a type

3.15
module of heating appliances
reference length of the useful portion of a heating appliance

Note 1 to entry: The module coincides with:

— the section, in the case of sectional heating appliances - a length of 1 m, in the case of non-sectional heating appliances;

— a finned length of 1 m, in the case of finned tube convectors.

3.16
sample
representative heating appliance used for the determination of one or more of the performance characteristics

3.17
inlet water temperature
bulk temperature of the water entering the heating appliance

3.18
outlet water temperature
bulk temperature of the water leaving the heating appliance

3.19
temperature drop
difference between inlet and outlet water temperature

3.20
mean water temperature
arithmetical mean of inlet and outlet water temperature

3.21
reference air temperature
air temperature measured on the vertical line at the centre of the test booth, 0,75 m above the floor level

3.22
excess temperature
difference between mean water temperature and reference air temperature

3.23
standard excess temperature
excess temperature of 50 K as determined in the standard conditions

Note 1 to entry: Inlet water temperature of 75 °C, outlet water temperature of 65 °C and reference air temperature of 20 °C.

3.24
standard excess low temperature
excess temperature of 30 K at standard flow rate

3.25
air pressure
air pressure measured at the test place

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3.26
standard air pressure
101,325 kPa (1,013 25 bar)

3.27
water flow rate
amount of water flowing through the heating appliance per unit of time

3.28
standard water flow rate
water flow rate relating to standard test conditions

3.29
standard rated thermal output
thermal output of a heating appliance defined at 50 K excess temperature

3.30
standard low temperature thermal output
thermal output of a heating appliance defined at 30 K excess temperature

3.31
characteristic equation
power function with a specific characteristic exponent that gives the thermal output as a function of the excess temperature at constant water flow rate

3.32
standard characteristic equation
characteristic equation which is valid for standard water flow rate and from which the standard thermal output can be found for the standard excess temperature of 50 K

3.33
regression equation of a type
equation which gives the standard thermal outputs and the characteristic exponent of all the models within a type as a function of one characteristic dimension

Note 1 to entry: The regression equation for the determination of thermal outputs is a power function, in which the characteristic exponent is a linear function of the characteristic dimension.

3.34
standard thermal output of the module
standard thermal output of a model divided either by the number of sections or by the length in metres

3.35
test pressure
relative pressure to which the heating appliance is submitted during the manufacturing process (i.e. factory test pressure)

3.36
maximum operating pressure
MOP
maximum relative pressure of the system to which the heating appliance may be submitted as chosen by manufacturer

Note 1 to entry: The maximum operating pressure is expressed in [kPa].

3.37
maximum operating temperature
maximum inlet water temperature allowed by the manufacturer

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3.38
test installation
combination of:

— test booth and other related parts, and

— measuring instruments and related equipment

3.39
test system
combination of:

— test installation, and

— master radiators

3.40
test systems circuit
group of test systems convened to comply with the specifications and procedures of this European Standard and to a periodical comparison of test results

3.41
repeatability of a test installation
capability of one test installation to provide test results on one given set of master radiator within the tolerance specified by this European Standard

Note 1 to entry: See EN 442-2:2014, 5.2.4.

3.42
reproducibility of a test installation
capability of different test installations to provide test results on one given set of master radiators within the tolerance specified by this European Standard

Note 1 to entry: See EN 442-2:2014, 5.2.4.

3.43
pressure drop
difference of pressure between water inlet and water outlet of the heating appliance

3.44
standard pressure drop
drop in pressure between inlet and outlet of the appliance heat emitter on the primary fluid side, when the appliance is fed at the standard water flow rate

3.45
supplementary test
test for the purpose of establishing the effect of minor technical modifications on the thermal output of radiators that have already been tested

3.46
radiated heat output factor
Sk
assumed ratio between the radiation heat output and the overall heat output of the radiator, which is only valid for air pressure correction purposes

3.47
exponent np
exponent for the air pressure correction of the measured heat output of the radiator

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3.48
emissivity
ratio of energy radiated by a particular material to energy radiated by a black body at the same temperature

3.49
master radiator
sample used for the calibration of test installations

Note 1 to entry: Master radiators are used to determine repeatability and reproducibility of the results of the test installations (see EN 442–2:2014, 5.2.3).

4 Material and product characteristics

4.1 Dimensional deviations

The dimensional deviations shall not be greater than the tolerances in the manufacturer's drawings. In any case they shall not be greater than those given in EN 442-2:2014, Table 3.

The manufacturer shall implement a quality control system to ensure that products comply with the tolerances given in the drawings sent to the laboratory for the type testing.

Wall thickness of cast-iron, cast aluminium or extruded aluminium radiators refers to the nominal drawing dimensions minus the tolerance given in EN 442-2:2014, Table 3.

4.2 Material specification and wall thickness of wet heating surface

4.2.1 Steel radiators (radiators manufactured from steel sheet or coil)

The wet heating surface materials of steel radiators shall be low carbon steel sheet, which is free from scale or rust and which complies with EN 10130 grade DC 01 and with EN 10131.

The thickness of the steel sheet used for wet surfaces should not be less than 1,11 mm.

4.2.2 Cast-iron radiators

Cast-iron radiators shall be manufactured from grey cast-iron complying with ISO 185.

The wet wall thickness should not be less than 2,5 mm.

4.2.3 Die cast aluminium radiators

Die cast aluminium alloy radiators shall be manufactured from alloy EN AB 46000 or EN AB 46100.

The wet wall thickness should not be less than 1,5 mm.

4.2.4 Extruded aluminium radiators

Extruded aluminium alloy radiators shall be manufactured from wrought aluminium alloy EN AW-6060 of the EN 573-3 corresponding to the alloy AlMgSi.

The wet wall thickness should not be less than 1,1 mm.

4.2.5 Tubular radiators

The material specification and gauge of tubes used in manufacture will be dependent on the tube size and profile and on the process of assembly.

The wall thickness of the tube used should not be less than 0,8 mm.

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4.2.6 Finned tube convectors

The wall thickness of the tube should not be less than:

— 0,8 mm for steel tubes;

— 0,3 mm for copper tubes;

— for stainless steel see 4.2.7.

4.2.7 Other materials of different grade and thickness

Materials of grade and/or thickness other than those specified in 4.2.1 to 4.2.6 may be used provided that the relevant performances are tested and declared as specified in 4.3 to 4.11.

4.3 Reaction to fire

When required radiators and convectors covered by this standard shall be tested for reaction to fire according to 5.2 and the result declared as classes of reaction to fire.

4.4 Release of dangerous substances

The surface treatments shall not contain any chemical substances the use of which is not allowed in building products[1]. The release of dangerous substances should comply with the relevant EC directives.

National regulations on dangerous substances may require, verification and declaration on release, and sometimes content, of dangerous substances, when construction products covered by this standard are placed on those markets.

In the absence of European harmonized test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction website on EUROPA accessed through: http://ec.europa.eu/enterprise/construction/cpd-ds/.

4.5 Pressure tightness

When required radiators and convectors covered by this standard shall be tested for pressure tightness according to 5.4 and declared as no leakage at 1,3 × maximum operating pressure [kPa].

4.6 Surface temperature

The maximum surface temperature is assumed equal to the system design inlet water temperature[2].

4.7 Resistance to pressure

When required radiators and convectors covered by this standard shall be tested for resistance to pressure according to 5.6 and declared as no breakage at 1,69 x MOP and maximum operating pressure [kPa].

4.8 Surface defects

The heating appliance shall be free from burrs likely to cause personal injury, according to 5.7.

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1) Also in relation to Regulation (EC) No 1907/2006 (REACH).

2) Radiators and convectors are heat emitters without internal energy source. The maximum water temperature is decided by the system designer and controlled by safety devices in the heating system.

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