



# SLOVENSKI STANDARD SIST EN 14509:2007

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Glavna besedila bivanja in delovnih mest, ki so namenjena za uporabo v industrijskih in  
poslovnih stavbah, ki so izdelane v tovarniški proizvodnji - Tehnične specifikacije

Self-supporting double skin metal faced insulating panels - Factory made products -  
Specifications

Selbsttragende Sandwich-Elemente mit beidseitigen Metalldeckschichten - Werkmäßig  
hergestellte Produkte - Spezifikationen

Panneaux sandwichs autoportants, isolants, double peau a parements métalliques -  
Produits manufacturés - Spécifications

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### ICS:

91.100.60      Thermal and sound insulating materials

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ICS 91.100.60

English Version

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Spezifikationen

This European Standard was approved by CEN on 19 June 2006.

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.

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

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## Foreword

This document (EN 14509:2006) has been prepared by Technical Committee CEN/TC 128 "Roof covering products for discontinuous laying and products for wall cladding", the secretariat of which is held by IBN/BIN.

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of an identical text or by endorsement, at the latest by May 2007, and conflicting national standards shall be withdrawn at the latest by August 2008.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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## 1 Scope

This European Standard specifies requirements for factory made, self-supporting, double skin metal faced insulating sandwich panels, which are intended for discontinuous laying in the following applications:

- a) roofs and roof cladding;
- b) external walls and wall cladding;
- c) walls (including partitions) and ceilings within the building envelope.

The insulating core materials covered by this European Standard are rigid polyurethane, expanded polystyrene, extruded polystyrene foam, phenolic foam, cellular glass and mineral wool.

NOTE Polyurethane (PUR) includes polyisocyanurate (PIR).

Panels with edge details that utilize different materials from the main insulating core are included in this European Standard.

Panels used in cold store applications are included in this European Standard. Panels, put on the market as a component of a cold storage room, building and/or building envelope kit are covered by ETA-Guideline 021 "Cold storage premises kits".

This European Standard does not cover the following:

- i. sandwich panels with a declared thermal conductivity for the insulating core greater than 0,06 W/m·K at 10 °C;
- ii. products consisting of two or more clearly defined layers of different insulating core materials (multi-layered);
- iii. panels with perforated facing(s);
- iv. curved panels.

## 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 485-2, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 2: Mechanical properties*

EN 485-4, *Aluminium and aluminium alloys — Sheet, strip and plate — Part 4: Tolerances on shape and dimensions for cold-rolled products*

EN 502, *Roofing products from metal sheet — Specification for fully supported roofing products of stainless steel sheet*

EN 508-1, *Roofing products from metal sheet — Specification for self-supporting products of steel, aluminium or stainless steel sheet — Part 1: Steel*

EN 826, *Thermal insulating products for building applications — Determination of compression behaviour*

EN 1172, *Copper and copper alloys — Sheet and strip for building purposes*

## EN 14509:2006 (E)

ENV 1187, *Test methods for external fire exposure to roofs*

EN 1363-1:1999, *Fire resistance tests — Part 1: General requirements*

EN 1364-1:1999, *Fire resistance tests for non-loadbearing elements — Part 1: Walls*

EN 1364-2, *Fire resistance tests for non-loadbearing elements — Part 2: Ceilings*

EN 1365-2, *Fire resistance tests for loadbearing elements — Part 2: Floors and roofs*

EN 1396, *Aluminium and aluminium alloys — Coil coated sheet and strip for general applications — Specifications*

EN 1602, *Thermal insulating products for building applications — Determination of the apparent density*

EN 1607, *Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces*

EN 1990, *Eurocode — Basis of structural design*

EN 1991, *Eurocode 1: Actions on structures (all parts)*

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

EN 10088-1, *Stainless steels — Part 1: List of stainless steels*

EN 10143, *Continuously hot-dip coated steel sheet and strip — Tolerances on dimensions and shape*

EN 10169-1, *Continuously organic coated (coil coated) steel flat products — Part 1: General information (definitions, materials, tolerances, test methods)*

EN 10169-2, *Continuously organic coated (coil coated) steel flat products — Part 2: Products for building exterior applications*

EN 10169-3, *Continuously organic coated (coil coated) steel flat products — Part 3: Products for building interior applications*

EN 10204, *Metallic products — Types of inspection documents*

EN 10326, *Continuously hot-dip coated strip and sheet of structural steels — Technical delivery conditions*

EN 10327, *Continuously hot-dip coated strip and sheet of low carbon steels for cold forming — Technical delivery conditions*

EN 12085, *Thermal insulating products for building applications — Determination of linear dimensions of test specimens*

EN 12114, *Thermal performance of buildings — Air permeability of building components and building elements — Laboratory test method*

EN 12524, *Building materials and products — Hygrothermal properties — Tabulated design values*

EN 12865, *Hygrothermal performance of building components and building elements — Determination of the resistance of external wall systems to driving rain under pulsating air pressure*

EN 13162, *Thermal insulation products for buildings — Factory made mineral wool (MW) products — Specification*



EN 13163, *Thermal insulation products for buildings — Factory made products of expanded polystyrene (EPS) — Specification*

EN 13164, *Thermal insulation products for buildings — Factory made products of extruded polystyrene foam (XPS) — Specification*

EN 13165, *Thermal insulation products for buildings — Factory made rigid polyurethane foam (PUR) products — Specification*

EN 13166, *Thermal insulation products for buildings — Factory made products of phenolic foam (PF) — Specification*

EN 13167, *Thermal insulation products for buildings — Factory made cellular glass (CG) products — Specification*

CEN/TS 13381-1, *Test methods for determining the contribution to the fire resistance of structural members — Part 1: Horizontal protective membranes*

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

EN 13501-2, *Fire classification of construction products and building elements — Part 2: Classification using data from fire resistance tests, excluding ventilation services*

EN 13501-5, *Fire classification of construction products and building elements — Part 5: Classification using data from external fire exposure to roofs tests*

EN 13823, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

EN 14135, *Coverings — Determination of fire protection ability*

EN ISO 140-3, *Acoustics — Measurement of sound insulation in buildings and of building elements — Part 3: Laboratory measurements of airborne sound insulation of building elements (ISO 140-3:1995)*

EN ISO 354, *Acoustics — Measurement of sound absorption in a reverberation room (ISO 354:2003)*

EN ISO 717-1, *Acoustics — Rating of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation (ISO 717-1:1996)*

EN ISO 1182, *Reaction to fire tests for building products — Non-combustibility test (ISO 1182:2002)*

EN ISO 1716, *Reaction to fire tests for building products — Determination of the heat of combustion (ISO 1716:2002)*

EN ISO 6946, *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method (ISO 6946:1996)*

EN ISO 9001, *Quality management systems — Requirements (ISO 9001:2000)*

EN ISO 9445, *Continuously cold-rolled stainless steel narrow strip, wide strip, plate-sheet and cut lengths — Tolerances on dimensions and form (ISO 9445:2002)*

EN ISO 10211-1, *Thermal bridges in building construction — Heat flows and surface temperatures — Part 1: General calculation methods (ISO 10211-1:1995)*

EN ISO 10211-2, *Thermal bridges in building construction — Calculation of heat flows and surface temperatures — Part 2: Linear thermal bridges (ISO 10211-2:2001)*

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EN ISO 10456, *Building materials and products — Procedures for determining declared and design thermal values (ISO 10456:1999)*

EN ISO 11654, *Acoustics — Sound absorbers for use in buildings — Rating of sound absorption (ISO 11654:1997)*

EN ISO 11925-2, *Reaction to fire tests — Ignitability of building products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2:2002)*

ISO 12491, *Statistical methods for quality control of building materials and components*

### 3 Terms and definitions

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

- 3.1 auto-adhesion**  
self adhesion of the core to the face(s) occurring automatically without the use of an adhesive
- 3.2 bond, bonding**  
adhesion between the face(s) and the core normally provided by an adhesive
- 3.3 ceiling**  
covering over an internal area
- 3.4 core**  
layer of material, having thermal insulating properties, which is bonded between two metal faces
- 3.5 durability**  
ability of the panel to withstand the environmental effects and accommodate the consequent decrease in mechanical strength with time caused by factors such as temperature, humidity, freeze-thaw cycles and their various combinations
- 3.6 edge, longitudinal edge**  
side of the panel where adjacent panels join together in the same plane
- 3.7 face, facing**  
flat, lightly profiled or profiled thin metal sheet firmly bonded to the core
- 3.8 flat facing**  
facing without any rolled or pressed profile, or raised strengthening rib
- 3.9 joint**  
interface between two panels where the meeting edges have been designed to allow the panels to join together in the same plane

NOTE 1 The joint may incorporate interlocking parts that enhance the mechanical properties of the system as well as improving the thermal, acoustic and fire performance and restricting air movement.

NOTE 2 The term 'joint' does not refer to a junction between cut panels or a junction where the panels are not installed in the same plane.

### 3.10

#### **lamella**

core material consisting of mineral wool that has been cut and orientated with the fibres perpendicular to the facings prior to bonding

### 3.11

#### **lightly profiled facing**

facing with a rolled or pressed profile not exceeding 5 mm in depth

### 3.12

#### **pre-manufactured, pre-formed**

component or material that is supplied to the manufacturer ready for direct incorporation into the sandwich panel

### 3.13

#### **sandwich panel**

building product consisting of two metal faces positioned on either side of a core that is a thermally insulating material, which is firmly bonded to both faces so that the three components act compositely when under load

### 3.14

#### **self-supporting panel**

panel capable of supporting, by virtue of its materials and shape, its self-weight and in the case of panels fixed to spaced structural supports all applied loadings (e.g. snow, wind, internal air pressure), and transmitting these loadings to the supports

### 3.15

#### **shift**

period of production during a working day, normally 6 h to 8 h but can be less

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### 3.16

#### **side lap**

folded area of one or both of the facing materials along the longitudinal edge of the panel which engages with the adjacent panel to form an interlocking or overlapping joint

## 4 Symbols and abbreviations

For the purposes of this European Standard, the following symbols and abbreviations apply.

- A* cross-sectional area
- B* flexural rigidity, overall width of the panel/specimen, width of support ( $B_s$ )
- C* ratio
- D* overall depth of the panel
- E* modulus of elasticity
- F* force, load, support reaction
- G* shear modulus, permanent action
- I* moment of inertia
- L* span, distance
- M* bending moment

$N$	axial compressive force
$Q$	variable action
$R$	resistance, sound reduction index ( $R_w$ ), reflectivity ( $R_G$ ), tensile strength ( $R_{DUR}$ , $R_{24}$ )
$S$	shear rigidity, value of a load effect, effect of an action
$T$	temperature
$U$	thermal transmittance
$V$	shear force
$a$	distance apart of clips (A.10.4)
$b$	width of test specimen, width of plate, width of ribs/valleys, bowing
$d$	depth of face profile or stiffeners, depth of core ( $d_c$ )
$e$	distance between centroids of faces, base of natural logarithms ( $e = 2,718\ 282$ )
$f$	strength, yield stress, thermal transmittance contribution factor ( $f_{joint}$ )
$h$	height of profile, thickness (e.g. glue)
$k$	parameter (E.4.3.2 support reaction capacity), correction factor
$l$	length, deviation
$m$	mass
$n$	number of tests, number of screws, number of webs
$p$	pitch of profile
$q$	live load
$r$	radius
$s$	length of web ( $s_{w1}$ )
$t$	thickness of face sheet
$v$	variance factor
$w$	deflection, displacement, compression, cover width
$x, y, z$	coordinates
$\alpha$	parameter (A.5.5.4), coefficient of thermal expansion, sound absorption ( $\alpha_w$ )
$\beta$	parameter (A.5.5.4 and Table E.10.2 design equations)
$\delta$	deviation
$\phi$	angle
$\gamma$	shear strain, partial safety factor
$\lambda$	thermal conductivity, $\lambda_{Design}$ (design value)
$\varphi$	creep coefficient
$\theta$	parameter (Table E.10.1 design equations)

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- $\sigma$  stress, compressive strength  $\sigma_m$ , standard deviation
- $\tau$  shear stress
- $\psi$  combination coefficient (Annex E), linear thermal transmittance of joints (A.10.3)
- $\rho$  coefficient, density

#### Subscripts

- C core
- D declared value ( $R_D$ )
- F face, action ( $\gamma_F$ )
- G self-weight, degree
- M material ( $\gamma_M$ )
- Q variable action
- S sandwich part of the cross-section
- adj adjusted
- b bending, elastic extension
- c compression, core, carrier (C.4.3.2), clip ( $f_{\text{joint,c}}$ )
- d design
- e external, additional thickness of main profiles ( $\Delta e$ )
- eff effective
- f load, facing ( $\lambda_{fi}$ )
- i internal ( $\lambda_{fi}$ )
- i, j index
- k characteristic value
- lin linear
- m material
- n nominal
- nc without clip ( $f_{\text{joint,nc}}$ )
- obs observed (e.g. result)
- q uniform load
- s support ( $L_s$  = support width), stiffeners, surface ( $R_{s1}$ )
- t tension, time
- tol tolerance (normal or special)
- tr traffic ( $C_{tr}$ )
- u ultimate ( $F_u$ )

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## EN 14509:2006 (E)

- v shear, variance
- w wind, web, wrinkling ( $\sigma_w$ ), weighted ( $R_w$ )
- y yield
- 0 basic value, unit width, time (e.g.  $t = 0$ )
- 1 external face, upper face
- 2 internal face, lower face

### Abbreviations

- CG cellular glass
- CWFT classified without further testing
- EPS expanded polystyrene
- FPC factory production control
- ITT initial type test
- MW mineral wool
- NPD no performance determined
- PCS gross calorific potential
- PUR rigid polyurethane foam (the abbreviation PUR includes polyisocyanurate foam (PIR))
- PF phenolic foam
- XPS extruded polystyrene foam

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## 5 Requirements, properties and test methods

### 5.1 Requirements for component materials

#### 5.1.1 General

The product shall be manufactured with materials and components conforming to 5.1.2 to 5.1.4.

#### 5.1.2 Metal facings

##### 5.1.2.1 Steel faces

Steel faces (other than stainless steel) shall have a minimum yield strength of 220 N/mm<sup>2</sup> and shall conform to the requirements of the appropriate standard given in Table 1.

**Table 1 – Standards for steel with metallic coating**

Metallic coating	European Standard
Zinc, 5 % Al-Zn, 55 % Al-Zn and Aluminium-silicon	EN 10326 or EN 10327
<p>The minimum nominal metallic coating masses shall be as specified in EN 508-1.</p> <p>If the metal face is bonded over its whole area to a rigid foam core with a closed cell structure, the reverse side metallic coating mass shall be a minimum of 50 g/m<sup>2</sup>.</p>	

Organic protective coatings shall be selected according to their durability in the application environment. Organic coated steel sheets shall conform to the requirements of EN 10169-1, EN 10169-2 and EN 10169-3. Multi-layer coatings shall conform to EN 508-1.

The panel manufacturer shall state the metal grade, thickness and tolerance system of each face. Tolerances on thickness shall be according to “special” or “normal” tolerances as described in the relevant standards. The thickness of steel facing sheets shall be determined in accordance with EN 10143.

NOTE Not all steels in Table 1 are suitable for sandwich panels in all the intended end uses.

#### 5.1.2.2 Stainless steel faces

Stainless steel facings shall have a minimum yield strength of 220 N/mm<sup>2</sup>. The chemical composition of stainless steel faces and their physical properties shall conform to EN 10088-1.

The panel manufacturer shall state the metal grade, thickness and tolerance system of each face. Tolerances on thickness shall be according to “special” or “normal” tolerances as described in the relevant standards. The thickness of steel facing sheets shall be determined in accordance with EN ISO 9445.

NOTE Not all steels in EN 10088-1 are suitable for sandwich panels in all the intended end uses.

The coating properties of terne coated stainless steel shall conform to EN 502. The nominal coating mass shall be the total mass including both sides and shall be at least 40 g/m<sup>2</sup>.

#### 5.1.2.3 Aluminium faces

Aluminium facings shall have a minimum design value of the stress at the 0,2%-strainlimit (for simplification called “yield strength”) of 140 N/mm<sup>2</sup>. The chemical composition, temper and mechanical properties of aluminium shall conform to EN 485-2 or EN 1396.

Organic coated aluminium sheets shall conform to the requirements of EN 1396.

The panel manufacturer shall state the metal grade, thickness and tolerance system of each face. Tolerances on thickness shall be according to “special” or “normal” tolerances as described in the relevant standards. The thickness of aluminium facing sheets shall be determined in accordance with EN 485-4 or EN 1396.

NOTE Not all aluminium alloys covered by EN 485-2 or EN 1396 are suitable for sandwich panels in all the intended end uses.

#### 5.1.2.4 Copper faces

Copper facings shall have a minimum design value of the stress at the 0,2%-strainlimit (for simplification called “yield strength”) of 180 N/mm<sup>2</sup>. The chemical composition, temper, mechanical properties and thickness tolerances of copper faces shall conform to EN 1172.