
**Tovarniško izdelane izolacijske sendvič plošče z obojestranskim kovinskim
oplaščenjem - 3. del: Preskusne metode za ugotavljanje mehanske trdnosti,
fizičnega obnašanja stavb in vzdržljivosti**

Factory-made double skin metal faced insulating sandwich panels - Part 3: Test methods
for determining mechanical strength, building physical behaviour and durability

Werkmäßig hergestellte Sandwich-Elemente mit beidseitigen Metalldeckschichten - Teil
3: Prüfverfahren zur Bestimmung der mechanischen Festigkeit, des bauphysikalischen
Verhaltens und der Dauerhaftigkeit

Panneaux sandwichés isolants à deux parements métalliques manufacturés - Partie 3:
Méthodes d'essai pour déterminer la résistance mécanique, le comportement lié à la
physique des bâtiments et leur durabilité

Ta slovenski standard je istoveten z: prEN 14509-3

ICS:

91.100.60	Materiali za toplotno in zvočno izolacijo	Thermal and sound insulating materials
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en,fr,de

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

DRAFT
prEN 14509-3

August 2021

ICS 91.100.60

English Version

Factory-made double skin metal faced insulating sandwich panels - Part 3: Test methods for determining mechanical strength, building physical behaviour and durability

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 128.

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European foreword

This document (prEN 14509-3:2021) 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 NBN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 14509-3:2013.

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Introduction

This document replaces Annexes A, B, C and D in EN 14509:2013. The principles for values of characteristics to be determined are given in prEN 14509-1 for self-supporting applications and in FprEN 14509-2 for structural applications. The testing procedures for determination of assessment of performance are given in Clauses 4 to 14. The testing procedures for the verification of constancy of performance (FPC) are given in Clause 16.

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prEN 14509-3:2021 (E)**1 Scope**

This document specifies test methods needed for determination of mechanical strength, building physical behaviour and durability of factory-made double skin metal faced insulating sandwich panels (hereafter sandwich panels) for use in elements for both self-supporting and structural applications in roofs, in external and internal walls (including partitions) and in ceilings in buildings as well as those in cold store applications.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 508-1:2014, *Roofing and cladding products from metal sheet - Specification for self-supporting of steel, aluminium or stainless steel sheet - Part 1: Steel*

EN 826:2013, *Thermal insulating products for building applications - Determination of compression behaviour*

EN 1363-1:2020, *Fire resistance tests - Part 1: General Requirements*

EN 1364-1:2015, *Fire resistance tests for non-loadbearing elements - Part 1: Walls*

EN 1365-2:2014, *Fire resistance tests for loadbearing elements - Part 2: Floors and roofs*

EN 1602:2013, *Thermal insulating products for building applications - Determination of the apparent density*

EN 1607:2013, *Thermal insulating products for building applications - Determination of tensile strength perpendicular to faces*

EN 1990:2002¹, *Eurocode - Basis of structural design*

EN 1993-1-4:2006², *Eurocode 3 - Design of steel structures - Part 1-4: General rules - Supplementary rules for stainless steels*

EN 10169:2010+A1:2012, *Continuously organic coated (coil coated) steel flat products - Technical delivery conditions*

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

EN 10346:2015, *Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions*

EN 12085:2013, *Thermal insulating products for building applications - Determination of linear dimensions of test specimens*

¹ As impacted by EN 1990:2002/A1:2005.

² As impacted by EN 1993-1-4:2006/A1:2015 and EN 1993-1-4:2006/A2:2020.

EN 12114:2000, *Thermal performance of buildings - Air permeability of building components and building elements - Laboratory test method*

EN 12865:2001, *Hygrothermal performance of building components and building elements - Determination of the resistance of external wall systems to driving rain under pulsating air pressure*

EN 13162:2012+A1:2015, *Thermal insulation products for buildings - Factory made mineral wool (MW) products - Specification*

EN 13163:2012+A2:2016, *Thermal insulation products for buildings - Factory made expanded polystyrene (EPS) products - Specification*

EN 13164:2012+A1:2015, *Thermal insulation products for buildings - Factory made extruded polystyrene foam (XPS) products - Specification*

EN 13165:2013+A2:2016, *Thermal insulation products for buildings - Factory made rigid polyurethane foam (PU) products - Specification*

EN 13166:2012+A2:2016, *Thermal insulation products for buildings - Factory made phenolic foam (PF) products - Specification*

EN 13501-1:2018, *Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests*

EN 13823:2020, *Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item*

prEN 14509-1:2021, *Factory made double skin metal faced insulating sandwich panels - Part1: Self-supporting applications*

prEN 14509-2:2021, *Factory made double skin metal faced insulating sandwich panels - Part2: Structural applications*

prEN 14509-5:2021, *Factory made double skin metal faced insulating sandwich panels - Part 5: Design methods. Determination criteria for combing actions and spans*

EN 15254-5, *Extended application of results from fire resistance tests - Non-loadbearing walls - Part 5: Metal sandwich panel construction*

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

EN ISO 717-1:2020, *Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation (ISO 717-1:2020)*

EN ISO 6892-1, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1)*

EN ISO 6946:2017, *Building components and building elements - Thermal resistance and thermal transmittance- Calculation methods (ISO 6946:2017)*

EN ISO 10140-1:2021, *Acoustics - Laboratory measurement of sound insulation of building elements - Part 1: Application rules for specific products (ISO 10140-1:2021)*

EN ISO 10140-2:2021, *Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation (ISO 10140-2:2021)*

EN ISO 10211:2017, *Thermal bridges in building construction - Heat flows and surface temperatures - Detailed calculations (ISO 10211:2017)*

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EN ISO 10456:2007, *Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007)*

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

EN ISO 11925-2:2020, *Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2020)*

EN ISO 12572:2016, *Hygrothermal performance of building materials and products - Determination of water vapour transmission properties - Cup method (ISO 12572:2016)*

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

CEN/TS 1187, *Test methods for external fire exposure to roofs*

3 Terms, definitions, symbols, subscripts and abbreviations**3.1 Terms and definitions**

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

3.1.1**assembly**

connected panels with joints as their intrinsic parts as delivered to the plant

3.1.2**auto-adhesion**

self-adhesion of the core to the face(s) occurring automatically without the use of an adhesive

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3.1.3**bending moment capacity**

maximum bending moment recorded during a test on an individual panel

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3.1.4**bending resistance**

characteristic value of bending moment capacity determined on the basis of a test series

3.1.5**bond, bonding**

adhesion between the face(s) and the core normally provided by an adhesive

3.1.6**ceiling**

covering over an internal area

3.1.7**core**

layer of material, having thermal insulating properties, which is bonded between two metal faces

Note 1 to entry Panels with special edge details in the longitudinal joints may utilize different core materials from the main insulating core (e.g. for improved fire performance) if these edge details have no influence on the mechanical performance of the panel.

3.1.8**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

3.1.9**edge, longitudinal edge**

side of the panel where adjacent panels join together in the same plane

3.1.10**face**

flat, lightly profiled or profiled thin metal sheet firmly bonded to the core.

3.1.11**flat face**

face without any rolled or pressed profile, or raised strengthening rib

3.1.12**incompletely bonded face**

metal face whose bond to the core is adequate for sandwich action but does not include the entire surface of the core

Note 1 to entry An example is a trapezoidally profiled face that has voids between the raised profiles and the core.

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3.1.13**incompletely bonded panel**

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panel in which one or both faces is incompletely bonded

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3.14

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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 to entry 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 to entry 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.

3.1.15**lamella**

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

3.1.16**lightly profiled face**

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

3.1.17**pre-manufactured, pre-formed**

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

prEN 14509-3:2021 (E)**3.1.18****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

3.1.19**shift**

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

3.1.20**side lap**

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

3.1.21**wrinkling strength**

strength representing the characteristic value of wrinkling stress

3.1.22**wrinkling stress**

stress in the compressed face of a panel undergoing loading in bending at the moment of failure load

3.2 Symbols, subscripts and abbreviations

For the purposes of this document, the following symbols, subscripts and abbreviations apply.

3.2.1 Symbols

<i>A</i>	cross-sectional area (may be full width of panel or per unit width)
<i>B</i>	flexural rigidity (may be full width of panel or per unit width), overall width of the panel/specimen,
<i>C</i>	ratio
<i>D</i>	overall thickness of the panel
<i>E</i>	modulus of elasticity
<i>F</i>	force, load, support reaction
<i>G</i>	shear modulus, permanent action
<i>I</i>	moment of inertia
<i>L</i>	span, distance, width of support (L_s)
<i>M</i>	bending moment
<i>N</i>	axial compressive force
<i>Q</i>	variable action

<i>R</i>	resistance, sound reduction index (R_w), reflectivity (R_G), tensile strength (R_{DUR} , R_{24})
<i>S</i>	shear rigidity, value of a load effect, effect of an action
<i>T</i>	temperature
<i>U</i>	thermal transmittance, thermal transmittance including the influence of the joints $U_{d,s}$
<i>V</i>	shear force
<i>a</i>	distance apart of clips (6.4)
<i>b</i>	width of test specimen, width of plate, width of ribs/valleys, bowing
<i>d</i>	depth of face profile or stiffeners, depth of core (d_c)
<i>e</i>	distance between centroids of faces, base of natural logarithms ($e = 2,718\,282$)
<i>f</i>	strength, yield stress, thermal transmittance contribution factor (f_{joint})
<i>h</i>	height of profile, thickness (e.g. glue)
<i>k</i>	parameter (4.11.5.2 support reaction capacity), correction factor
<i>l</i>	length, deviation
<i>m</i>	mass
<i>n</i>	number of tests, number of screws, number of webs
<i>p</i>	pitch of profile
<i>q</i>	live load
<i>r</i>	radius
<i>s</i>	length of web (s_{w1})
<i>t</i>	thickness of face sheet

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v	variance factor
w	deflection, displacement, compression, cover width
x, y, z	coordinates
α	parameter (4.6.5.4), coefficient of thermal expansion, sound absorption (α_w), ratio (4.4.5.3)
β	parameter (4.6.5.4)
δ	deviation
ϕ	angle
γ	shear strain, partial safety factor
λ	thermal conductivity, λ_{design} (design value), ratio (4.4.5.3)
φ	creep coefficient
σ	wrinkling strength, standard deviation
τ	shear stress
ρ	coefficient, density

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3.2.2 Subscripts

C	core
D	expressed value (R_D, λ_D)
F	face, action (γ_F)
G	self-weight, degree
M	material (γ_M)
Q	variable action
S	sandwich part of the cross-section
adj	adjusted
b	bending, elastic extension
c	compression, carrier (13.4.2.3), clip ($f_{\text{joint,c}}$)
d	design
e	external, additional thickness of main profiles (Δe)

eff	effective
f	load, face (λ_{fi})
i	internal (λ_{fi})
i, j	index
k	characteristic value
lin	linear
m	material
nom	nominal
nc	without clip ($f_{joint,nc}$)
obs	observed (e.g. result)
q	uniform load
s	support (L_s = support width), stiffeners, surface (R_{s1})
t	tension, time, thickness relevant for measuring the tolerances
tol	tolerance (normal or special)
tr	traffic (C_{tr})
u	ultimate (F_u)
v	shear, variance
w	wind, web, wrinkling (σ_w), weighted (R_w)
y	yield
0	basic value, unit width, time (e.g. $t = 0$)
1	outer face, top face
2	inner face, bottom face

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