
**Tovarniško izdelane izolacijske sendvič plošče z obojestranskim kovinskim
oplaščenjem - 4. del: Preskusne metode za pritrdjevanje plošč na podkonstrukcijo
in za ugotavljanje učinka zadrževanja na podkonstrukcijo**

Factory-made double skin metal faced insulating sandwich panels - Part 4: Test methods
for fixing of panels to substructure and for determining restraining effect on substructure

Werkmäßig hergestellte Sandwich-Elemente mit beidseitigen Metalldeckschichten - Teil
4: Prüfverfahren zur Befestigung von Paneelen an der Unterkonstruktion und zur
Bestimmung der Rückhaltewirkung auf die Unterkonstruktion

Panneaux sandwichs isolants à deux parements métalliques manufacturés - Partie 4 :
Méthodes d'essai pour l'assemblage des panneaux à la structure support et pour
déterminer l'effet de maintien de la structure support

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ICS:

91.100.60	Materiali za toplotno in zvočno izolacijo	Thermal and sound insulating materials
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**Factory-made double skin metal faced insulating sandwich
panels - Part 4: Test methods for fixing of panels to
substructure and for determining restraining effect on
substructure**

Panneaux sandwichs isolants à deux parements
métalliques manufacturés - Partie 4 : Méthodes d'essai
pour l'assemblage des panneaux à la structure support
et pour déterminer l'effet de maintien de la structure
support

Werkmäßig hergestellte Sandwich-Elemente mit
beidseitigen Metalldeckschichten - Teil 4:
Prüfverfahren zur Befestigung von Paneelen an der
Unterkonstruktion und zur Bestimmung der
Rückhaltewirkung auf die Unterkonstruktion

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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Contents	Page
European foreword	3
Introduction	4
1 Scope.....	5
2 Normative references.....	5
3 Terms, definitions, symbols, subscripts and abbreviations.....	5
3.1 Terms and definitions	5
3.2 Symbols, subscripts and abbreviations	7
3.2.1 Symbols	7
3.2.2 Subscripts	8
3.2.3 Abbreviations.....	9
4 Testing of the resistance of fixings of sandwich panels to supporting structures	9
4.1 General.....	9
4.1.1 Type of fixings and panel families	9
4.1.2 Test reports.....	11
4.2 Tensile resistance.....	12
4.2.1 General.....	12
4.2.2 Visible fixing	12
4.2.3 Hidden fixing	16
4.3 Shear resistance	20
4.3.1 Visible fixing	20
4.3.2 Hidden fixing	22
4.4 Full scale tests, alternative test method for tensile resistance of hidden fixing.....	22
4.4.1 General.....	22
4.4.2 Principle	23
4.4.3 Apparatus – test equipment.....	24
4.4.4 Test specimen	24
4.4.5 Test procedure and number of tests.....	26
4.4.6 Statistical analysis of the results and characteristic values	27
4.4.7 Calculations and results	27
4.5 Shortened test programme	28
4.6 Determination of γ_M	28
5 Parameters needed for determining restraining effect of sandwich panels when connected to supporting structures.....	29
5.1 Principle	29
5.2 Rotational spring stiffness.....	29
5.2.1 Rotational stiffness $C_{D,A}$	29
5.2.2 Determination of rotational spring stiffness $C_{D,A}$ by testing.....	29
5.2.3 Determination of rotational spring stiffness $C_{D,A}$ by calculation	35
5.2.4 Rotational stiffness $C_{D,C}$	37
5.3 Shear stiffness S for lateral restraint of an individual member.....	38
Bibliography	39

European foreword

This document (prEN 14509-4:2026) 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.

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Introduction

This document gives testing procedures for determining the strength of fixing the panels to substructures and stabilization of substructures.

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1 Scope

This document specifies test methods for determination of characteristics for fixing of factory-made double skin metal faced insulating sandwich panels (hereafter referred to as sandwich panels) to substructure and for stabilization of substructure. Sandwich panels are used 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 1993-1-3:2024, *Eurocode 3 — Design of steel structures — Part 1-3: Cold-formed members and sheeting*

prEN 14509-3:2026 *Factory-made double skin metal faced insulating sandwich panels — Part 3: Test methods for determining mechanical strength, building physical behaviour and durability*

3 Terms, definitions, symbols, subscripts and abbreviations

3.1 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp/>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1.1

bond

bonding

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

3.1.2

ceiling

covering over an internal area

3.1.3

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 do not influence on mechanical performance of the panel.

3.1.4

edge

longitudinal edge

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

prEN 14509-4:2026 (E)**3.1.5****face**

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

3.1.6**flat face**

face without any rolled or pressed profile or raised strengthening rib

3.1.7**lightly profiled face**

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

3.1.8**fastener**

component (screw incl. washer, with or without sealant if relevant) used for fixing the panel to the supporting structure

3.1.9**fastening**

fastening is local interaction of a fastener (self-tapping/self-drilling screws) with a surrounding material of the connected elements

3.1.10**fixing**

mechanical connection between the sandwich panel and the supporting structure, typically with one fastener or more fasteners in a visible fixing (through the sandwich panel) or in a hidden fixing (placed in the longitudinal joint of the sandwich panel)

Note 1 to entry: Fixing is covering only the failure modes in sandwich panels caused by the fastening.

3.1.11**hidden fixing**

mechanical connection between the sandwich panel and the supporting structure, placed in the longitudinal joint of adjacent sandwich panels consisting of one or more fasteners (with or without washer) going through or connecting both faces in a certain arrangement in relation to the sandwich panel geometry, with or without load spreading component

3.1.12**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 improve the thermal, acoustic and fire performance and restrict 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.

3.1.13**lamella**

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

3.1.14**load spreading component**

flat or profiled metal component used to distribute the load from the fasteners to the panel

3.1.15**profiled face**

face with a rolled or pressed profile exceeding 5 mm in depth

3.1.16**visible fixing**

one or more fasteners in a certain minimum distance to the sandwich panel edges and between themselves (if applicable), visible on the visible side of the face of the sandwich panel, penetrating the inner and the outer face and the core of the sandwich panel

Note 1 to entry: Visible fixings can be covered by flashings after installation.

3.1.17**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

3.1.18**stiffness parameter**

parameter expressing stiffening effect on supporting structure given by sandwich panels when fastened to supporting structure

3.2 Symbols, subscripts and abbreviations

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

3.2.1 Symbols

B	overall width of the panel/specimen,
C	ratio
D	overall thickness of the panel
E	modulus of elasticity
F	force, load, support reaction
G	shear modulus
L	span, distance, width of support (L_s)
M	bending moment
Q	load
R	resistance
S	shear rigidity
V	shear force
b	width of test specimen
d	depth of face profile or stiffeners, depth of core (d_c)

prEN 14509-4:2026 (E)

e	distance between centroids of faces, base of natural logarithms ($e = 2,718\ 282$)
f	strength, yield stress
h	height of profile
k	parameter, correction factor
l	length
m	torsional moment
n	number of tests, number of screws, number of webs
t	thickness of face sheet
v	displacement
w	deflection
δ	deviation
ϕ	angle
γ	shear strain
φ	creep coefficient

3.2.2 Subscripts

A	rotational stiffness ($C_{D,A}$)
C	core
D	expressed value, rotational stiffness (C_D)
F	face
adj	adjusted
arcsin	trigonometric function (inverse of sine function, $\sin^{-1}$)
arctan	trigonometric function (inverse of tangent function, $\tan^{-1}$)
c	compression
d	design
e	distance between centroids of faces
eff	effective
end	end support
i	internal
i, j	index
int	internal support
m	material
nom	nominal
o	upper face
obs	observed (e.g. result)
rep	repeated ($F_{Rtk,rep}$)
res	residual ($F_{Rt, res}$; Q_{res})

R _{tk}	characteristic (5 %-fractile) value (F_{Rtk})
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)
l	lower face
v	shear
0	basic value, unit width, time (e.g. $t = 0$)
1	upper face supporting member
2	lower face
$\varphi_{\theta,t}$	effect of creep on core module ($E \varphi_{\theta,t}$)

3.2.3 Abbreviations

EPS	expanded polystyrene
MW	mineral wool
PU	rigid polyurethane foam (the abbreviation PU includes polyisocyanurate foam (PIR))
PF	phenolic foam
ULS	ultimate limit state
XPS	extruded polystyrene foam

4 Testing of the resistance of fixings of sandwich panels to supporting structures

4.1 General

4.1.1 Type of fixings and panel families

This document covers the resistance of fixing of panels to supporting structures and the failure modes in the sandwich panel. It does not cover the failure of the fastener itself or failure of the fixing in the supporting structure. Thus, the failure mode for tension is generally a pull-through failure of the visible fixing. The failure mode for tension of the hidden fixing can be a failure of the joint, a failure of the load spreading component (if applicable) or a failure of the sandwich panel triggered by the fastening (delamination, compression or shear failure). A pull-through failure is used as a common name for these failure modes. In addition, the shear failure mode of fixing is covered by this document.

The types of fixing of panels to supporting structure covered by this document are:

- visible fixings;
- hidden fixings.

NOTE 1 Combinations of these fixing types are also possible.

prEN 14509-4:2026 (E)

For the fixing of panels to supporting structure, failure modes in supporting structure and fastener shall be determined separately. However, they are outside the scope of this document.

The test series of a fixing may cover a family of the sandwich panel products and one fastener type which is to be specified in the declaration of resistance values.

Panels with variation in the properties listed below can be included in the same family as long as the panel with weakest combination of the properties is tested.

A family of panels is specified by:

- profiling:
 - in the faces for visible fixings;
 - in the longitudinal joint for hidden fixings;
- material and grade of face material;
- type of longitudinal joint;
- the same type of core material (manufacturer and manufacturers code);
- panel thickness;
- thickness (inner and outer) of faces;
- type and amount of adhesive.

One type or group of fasteners is specified by and shall be listed in connection to characteristics to be expressed:

- material of fastener;
- a fastener whose length will vary;
- same number and position (edge distance and distance between fasteners when more than one fastener is used) of fasteners;
- washer type and material;
- washer diameter;
- washer sealant;
- head diameter and type of head of the fastener;
- the thread of the fastener;
- the diameter of the shaft of the fastener;
- geometry and material type and grade of load spreading component, if relevant.

The end distance and the distance between the fixings may be varied in the test series, which shall then be taken into account in the analysis of the test results. In all the cases, the minimum edge distance envisaged between the fixing and the edge of the panel shall be tested. The influence of the centre-to-centre distance of the fixing shall be tested, when critical.