

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-17/0913
of 25 November 2021

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

STYRODUR 3000 CS
STYRODUR Hybrid

Product family
to which the construction product belongs

Extruded polystyrene foam boards as load bearing layer
and /or thermal insulation outside the waterproofing

Manufacturer

BASF SE
Carl-Bosch-Straße 38
67056 Ludwigshafen am Rhein
DEUTSCHLAND

Manufacturing plant

BASF SE
Carl-Bosch-Straße 38
67056 Ludwigshafen am Rhein

This European Technical Assessment
contains

9 pages including 1 annex which form an integral part of
this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

EAD 040650-00-1201

This version replaces

ETA-17/0913 issued on 6 November 2018

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Specific Part

1 Technical description of the product

The extruded polystyrene foam boards are made of rigid cellular plastics material extruded from polystyrene or one of its copolymers and which has a closed cell structure. The blowing agent mixture is carbon dioxide (CO₂) and isobutane.

Extruded polystyrene foam boards "STYRODUR 3000 CS" have a skin on both surfaces. Extruded polystyrene foam boards "STYRODUR Hybrid" have a skin surfaces on one side and a moulded surface on the other side. The moulded surface is characterized by factory-made milled grooved pattern (depth /width/ distance 5/10/18-20 mm). Both products have a special edge treatment (shiplap).

The extruded polystyrene foam boards do not contain Hexabromocyclododecane (HBCD).

The extruded polystyrene foam boards have the following designation:

"STYRODUR 3000 CS"

"STYRODUR Hybrid"

The extruded polystyrene foam boards are manufactured with the following dimensions:

Nominal thicknesses:

"STYRODUR 3000 CS" 40 mm to 160 mm

"STYRODUR Hybrid" 60 mm to 160 mm

Nominal length: 1250 mm (primarily)

Nominal widths: 600 mm

The European Technical Assessment has been issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed. The European Technical Assessment applies only to products corresponding to this agreed data/information.

2 Specification of the intended use in accordance with the applicable European Assessment Document

The extruded polystyrene foam boards "STYRODUR 3000 CS" are intended to be used as load bearing layer and /or thermal insulation outside the waterproofing. The boards are laid uniformly on the substrate to which they are applied. In particular the following applications are intended:

- Load bearing and thermal insulation with a thickness from 60 mm up to 120 mm underneath foundation slabs
- External horizontal and vertical thermal insulation of in-ground constructions in non-structural applications (also in case of groundwater)
- Inverted roof insulation (including park deck and green roof applications)

The extruded polystyrene foam boards "STYRODUR Hybrid" are intended to be used as vertical thermal insulation of in-ground constructions in non-structural applications (also in case of groundwater).

The performance according to section 3 only applies if the thermal insulation boards are installed according to the manufacture's installation instructions and if they are protected from precipitation, wetting or weathering during transport and storage before installation.

Concerning the application of the thermal insulation boards, also the respective national regulations shall be observed.

Where the thermal insulation boards are fixed by using adhesives, only such adhesions shall be used, which are suitable for this purpose. The assessment of these fixings is not subject of this European Technical Assessment.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the extruded polystyrene foam boards of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

For sampling, conditioning and testing the provisions of the EAD No 040650-00-1201 "Extruded polystyrene foam boards as load bearing layer and/or thermal insulation outside the waterproofing" apply.

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Compressive stress at 10 % deformation or compressive strength test acc. to EN 826:2013 "STYRODUR 3000 CS" thickness $60 \text{ mm} \leq d \leq 120 \text{ mm}$	Level (individual values may fall below this level up to 10 %): $\geq 300 \text{ kPa}$
Slip deformation	No performance assessed
Compressive stress or compressive strength in the transverse and longitudinal directions	No performance assessed
Characteristic value of compressive stress or compressive strength 5 %-fractile value for a one-sided confidence level of 75 % under unknown or known variance using ISO 12491:1997 "STYRODUR 3000 CS" thickness $60 \text{ mm} \leq d \leq 120 \text{ mm}$	$\sigma_{0,05} = 310 \text{ kPa}$ (n= 50); $\sigma_{\text{mean}} = 425 \text{ kPa}$; $s_{\sigma} = 72 \text{ kPa}$
Compressive creep "STYRODUR 3000 CS"	See Annex A
Behaviour under shear load (large-sized specimen)	No performance assessed
Creep under shear load "STYRODUR 3000"	See Annex A
Creep under combined compressive and shear load "STYRODUR 3000"	See Annex A
Compressive modulus of elasticity	No performance assessed
Adhesion behaviour under compressive and shear load on large-sized samples	No performance assessed

Essential characteristic	Performance
Shear strength test acc. EN 12090:2013 "STYRODUR 3000 CS" thickness $60 \text{ mm} \leq d \leq 120 \text{ mm}$	$\tau \geq 200 \text{ kPa}$
Density test acc. to EN 1602:2013 "STYRODUR 3000 CS" thickness $60 \text{ mm} \leq d \leq 120 \text{ mm}$	density range: $31 \text{ kg/m}^3 - 39 \text{ kg/m}^3$

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire test acc. to EN ISO 11925-2:2010	Class E acc. to EN 13501-1:2007 + A1:2009

3.3 Energy economy and heat retention (BWR 6)

Essential characteristic	Performance
Thermal conductivity at mean reference temperature of $10 \text{ }^\circ\text{C}$ test acc. to EN 12667:2001 or EN 12939:2001 and aging procedure acc. EN 13164:2012+A1:2015, Annex C with deviating storage time period (sliced specimen) of $(90 +2/-2)$ days prior to testing	$\lambda_{D(90d)} = 0.033 \text{ W/(m} \cdot \text{K)}$
Moisture conversion coefficient	No performance assessed
Water absorption Long term water absorption by total immersion test acc. to EN 12087:2013 (method 2A)	WL(T)0.7 ($W_{it} \leq 0.7 \text{ Vol.}\%$)
Long term water absorption by diffusion test acc. to EN 12088:2013 "STYRODUR 3000 CS" thickness $40 \text{ mm} \leq d \leq 100 \text{ mm}$ thickness $100 \text{ mm} < d \leq 160 \text{ mm}$ "STYRODUR Hybrid"	WD(V)3 ($W_{dV} \leq 3.0 \text{ Vol.}\%$) WD(V)1 ($W_{dV} \leq 1.0 \text{ Vol.}\%$) WD(V)3 ($W_{dV} \leq 3.0 \text{ Vol.}\%$)

Essential characteristic	Performance
<p>Freeze-thaw resistance test acc. to EN 12091:2013</p> <p>using the wet test specimens from having done the water diffusion test in accordance with EN 12088: 2013</p> <p>Reduction in compressive stress at 10 % deformation or in compressive strength of the re-dried specimens, when tested in accordance with EN 826:2013</p>	<p>FTCD1 ($W_v \leq 1.0 \text{ Vol.}\%$)</p> <p>$\leq 10 \%$</p>
Water vapour diffusion resistance factor	No performance assessed
<p>Geometrical properties</p> <p>Thickness test acc. EN 823:2013 (clause 7.2, figure 2, measuring set-up 3)</p> <p>Length, width test acc. EN 822:2013</p> <p>Squareness in direction of length and width; in direction of thickness test acc. EN 824:2013</p> <p>Flatness in direction of length and width test acc. EN 825:2013</p>	<p>tolerance</p> <p>$\pm 2 \text{ mm}$</p> <p>$\pm 8 \text{ mm}$</p> <p>5 mm/m</p> <p>2 mm</p>
<p>Deformation under specified compressive load and temperature conditions test acc. to EN 1605:2013</p>	<p>load: 40 kPa; temperature: $(70 \pm 1) \text{ }^\circ\text{C}$; time: $(168 \pm 1) \text{ h}$</p> <p>$\leq 5 \%$</p>
<p>Dimensional stability under specified conditions test acc. to EN 1604:2013</p>	<p>temperature: $70 \text{ }^\circ\text{C}$ and 90 % R.H.</p> <p>DS(70,90) ($\Delta\epsilon_l \leq 5 \%$, $\Delta\epsilon_b \leq 5 \%$, $\Delta\epsilon_d \leq 5 \%$)</p>

Essential characteristic	Performance
Density test acc. to EN 1602:2013 "STYRODUR 3000 CS" thickness $40 \text{ mm} \leq d < 60 \text{ mm}$ thickness $120 \text{ mm} < d \leq 160 \text{ mm}$ "STYRODUR Hybrid"	density range: $29 \text{ kg/m}^3 - 35 \text{ kg/m}^3$ $31 \text{ kg/m}^3 - 39 \text{ kg/m}^3$ $31 \text{ kg/m}^3 - 39 \text{ kg/m}^3$
Compressive stress at 10 % deformation or compressive strength test acc. to EN 826:2013 "STYRODUR 3000 CS" thickness $40 \text{ mm} \leq d < 60 \text{ mm}$ thickness $120 \text{ mm} < d \leq 160 \text{ mm}$ "STYRODUR Hybrid"	$\geq 300 \text{ kPa}$ $\geq 300 \text{ kPa}$ $\geq 300 \text{ kPa}$
Tensile strength perpendicular to faces	No performance assessed
Volume percentage of closed cells test acc. to EN ISO 4590:2016 (method 1 with correction)	$\geq 95 \%$

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with EAD No. 040650-00-1201, the applicable European legal acts are: 1995/467/EC and 1999/91/EC¹

The systems to be applied are:

- System 1 for Essential characteristics concerning Mechanical resistance and stability (BWR 1)
- System 3 all other Essential characteristics

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 25 November 2021 by Deutsches Institut für Bautechnik

Frank Iffländer
Head of Section

beglaubigt:
Wendler

¹ as amended

STYRODUR 3000 CS
STYRODUR Hybrid

Annex A

1. Compressive creep (single-layer board)

STYRODUR 3000 CS	thickness 40 mm			thickness 120 mm			
density (kg/m ³)	29			33			33
compressive stress/ deformation acc. EN 826:2013 (kPa / %)	361/10			376/10			415/2
load stage (kPa)	80	110	140	80	110	140	185
X ₀ (mm)	0.195	0.248	0.313	0.395	0.507	0.64	0,85
X _{ct} (mm)	0.075	0.104	0.135	0.128	0.157	0.193	0.55
X _{ct50} (mm)	0.153	0.257	0.282	0.275	0.335	0.454	1.33
X_{t50}(mm)	0.348	0.505	0.595	0.670	0.842	1.094	2.18

2. Creep under shear load (multi-layer board)

test acc. to EAD 040650-00-1201

STYRODUR 3000	thickness 300 mm (80+70+70+80 mm)
density (kg/m ³)	35
shear strength/ deformation acc. EN 12090 (kPa)	104/-
load stage (kPa)	36.4
X _{τ0} (mm)	1.48
X _{τct} (mm)	0.54
X _{τct50} (mm)	1.23
X_{τt50}(mm)	2.71

3. Creep under combined compressive and shear load (multi-layer board)
test acc. to EAD 040650-00-1201

STYRODUR 3000		
thickness	300 mm (80+70+70+80 mm)	
density (kg/m ³)	35	
compressive stress/ deformation acc. EN 826 (kPa / %)	397/-	
shear strength/ deformation acc. EN 12090 (kPa)	104/-	
load stage (kPa)	36,4	139
deformation under	shear load	compressive load
X _{τ0} /X ₀ (mm)	1.80	2.54
X _{τct} /X _{ct} (mm)	0.36	0.73
X _{τct50} /X _{ct50} (mm)	0.52	1.97
X_{τt50}/X_{t50} (mm)	2.32	4.51