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Styrodur®

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# Technical Data

Application Recommendations  
Dimensioning Aids

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# Application Recommendations Styrodur®



# Technical Data Styrodur®

## 1. Application Recommendations for Styrodur®

	Application type according to DIN 4108-10 or technical approval/construction type approval/ETA	Product properties according to DIN EN 13164 and DIN 4108-10				
		General	2800 C	3000 CS/SQ	4000 CS/SQ	5000 CS/SQ
			CS(10Y) 200 (20-60 mm) 300 (80-200 mm)	CS(10Y) 300	CS(10Y) 500	CS(10Y) 700
Perimeter <sup>1)</sup> floor	PB	wd		dh	ds	dx
Perimeter <sup>1)</sup> wall	PW	wd		dh	ds	dx
Perimeter <sup>1)</sup> foundation slab	see approvals	wd		dh	ds	dx
Perimeter <sup>1)</sup> groundwater	see approvals	wd		dh	ds	dx
Living area floor	DEO		dm	dh		
Industrial and refrigerated warehouse floor	DEO		dm	dh	ds	dx
Cavity insulation	WZ	tf		dh		
Interior insulation	WI	tf	dm			
Permanent formwork	WAP	tf	dm			
Thermal bridges	WAP	tf	dm			
Base insulation	WAP	wf	dm			
Plaster base	WAP	wf	dm			
Inverted roof	DUK	wd		dh	ds	dx
Duo roof/plus roof	DUK	wd		dh	ds	dx
Patio roof	DUK	wd		dh	ds	dx
Green roof	see approvals	wd		dh	ds	dx
Parking roof	see approvals	wd			ds <sup>2)</sup>	dx
Conventional flat roof <sup>3)</sup>	DAA	wf		dh	ds	dx
Parapets/rising building	DAA	wf	dm	dh		
Basement ceiling/underground	DI	tf	dm	dh		
Attic floor	DEO	tf		dh		
Pitched roof	DAD	wf	dm	dh		

Styrodur®: product approval: DIBt Z-23.15-2031 extruded polystyrene foam conforming to DIN EN 13164/ETA-17/0913

<sup>1)</sup> Insulation with ground contact.

dm = 200 kPa, dh = 300 kPa, ds = 500 kPa, dx = 700 kPa

<sup>2)</sup> Not under composite stone pavement.

<sup>3)</sup> With protective layer over sealing barrier.

## 2. Technical Data for Styrodur®

Property	Unit	Designation code according to DIN EN 13164	2800 C	3000 CS/SQ	4000 CS/SQ	5000 CS/SQ	Standard/ approvals/ CTA*/ETA**
Edge profile							
Surface			textured	smooth	smooth	smooth	
Length x width	mm		1250 x 600	1265 x 615	1265 x 615	1265 x 615	
Compressive strength or compressive stress at 10% deformation <sup>1)</sup>	kPa	CS(10Y)	200 (20-60 mm) 300 (80-200 mm)	300	500	700	DIN EN 826
Permissible compressive stress over 50 years and deformation <2% <sup>1)</sup>	kPa	CC(2/1.5/50)	-	130	180	250	DIN EN 1606
Rated value of compressive stress under foundation slabs <sup>1)</sup>	kPa						
50-120 mm (single-layer)			-	155	255	355	see approvals
120-200 mm (single-layer)			-	230	330	430	
50-120 mm (multi-layer)			-	230	330	430	
Adhesive strength on concrete	kPa	TR 200	200	-	-	-	DIN EN 1607
Modulus of elasticity E <sub>50</sub>	kPa			5,000-6,500 <sup>3)</sup>	10,000	14,000	see approvals
Modulus of elasticity E	kPa		15,000	20,000	30,000	40,000	see approvals
Dimensional stability 70°C; 90% r.h.	%	DS(70, 90)	≤5%	≤5%	≤5%	≤5%	DIN EN 1604
Deformation behaviour: load 40 kPa; 70°C	%	DLT(2)5	≤5%	≤5%	≤5%	≤5%	DIN EN 1605
Linear coefficient of thermal expansion							
Longitudinal	mm/(m·K)		0.08	0.08	0.08	0.08	DIN 53752
Transverse			0.06	0.06	0.06	0.06	
Fire behaviour	Euroclass		E	E	E	E	DIN EN 13501-1
Water absorption with long-term immersion	% by vol.	WL(T)	-	0.7	0.7	0.7	DIN EN 12087
Water absorption in diffusion test	% by vol.	WD(V)	-	3	3	3	DIN EN 12088
Water vapour diffusion resistance factor		MU	200 - 80	150 - 50	150 - 80	150 - 100	DIN EN 12086
Water absorption after freeze-thaw cycle	% by vol.	FTCD	-	1	1	1	DIN EN 12091
Application temperature limit	°C		75	75	75	75	DIN EN 14706

<sup>1)</sup> 100 kPa = 10 N/cm<sup>2</sup> = 100 kN/m<sup>2</sup> = 10 to/m<sup>2</sup>

<sup>2)</sup> Declared value of the creep stress as per ETA.

<sup>3)</sup> Rated value of the creep stress as per CTA.

\* CTA = construction type approval

\*\*ETA = European Technical Assessment

Area of application	Application types	
	Abbreviation <sup>1)</sup>	Description
Ceiling, roof	DAD	Exterior insulation of roofs or ceilings, protected against weathering, insulation under coverings
	DAA	Exterior insulation of roofs or ceilings, protected against weathering, insulation under sealing barrier
	DUK	Exterior insulation of roofs, exposed to weathering (inverted roof) <sup>2)</sup>
	DZ	Between-rafter insulation, ventilated roof, non-walkable but accessible attic floor
	DI	Interior ceiling insulation (on the underside) or roof insulation, insulation under the rafters/supporting structure, suspended ceiling, etc.
	DEO	Interior ceiling insulation or floor slab insulation (on the top) under screed, without sound insulation requirements
	DES	Interior ceiling insulation or floor slab insulation (on the top) under screed, with sound insulation requirements
Wall	WAB <sup>2)</sup>	Exterior wall insulation behind cladding
	WAA	Exterior wall insulation behind sealing barrier
	WAP <sup>2), 3)</sup>	Exterior wall insulation under plaster
	WZ	Insulation of ventilated walls, cavity insulation
	WH	Insulation of wooden frame and wood panel structures
	WI	Interior wall insulation
	WTH	Insulation between the walls separating houses, with sound insulation requirements
Perimeter	WTR	Insulation of partition walls
	PW	Exterior thermal insulation of walls in contact with the ground (outside the sealing barrier) <sup>4)</sup>
	PB	Exterior thermal insulation of walls under the floor slab and in contact with the ground (outside the sealing barrier) <sup>4)</sup>

<sup>1)</sup> The abbreviations used refer to areas of application for thermal insulation. Graphical symbols are given below this table.

<sup>2)</sup> Including application from below, in contact with the outside air.

<sup>3)</sup> Area of application/abbreviation WAP does not apply to insulation boards in external thermal insulation composite systems (ETICS). ETICS are not a standardised application.

<sup>4)</sup> The specifications according to DIN 4108-2 are applicable.



Product properties	Abbreviation	Description	Examples
Pressure resistance	dk	No pressure resistance	Cavity insulation, between-rafter insulation
	dg	Low pressure resistance	Living and office areas below screed (except sheet asphalt screed) <sup>1)</sup>
	dm	Moderate pressure resistance	Unused roof with sealing barrier
	dh	High pressure resistance	Utilised roof surfaces, patios, flat roofs with solar systems
	ds	Very high pressure resistance	Industrial flooring, parking deck
	dx	Extremely high pressure resistance	Highly stressed industrial flooring, parking deck
Water absorption	wk	No water absorption requirements	Interior insulation in living and office areas
	wf	Water absorption through liquid water	Exterior insulation of exterior walls and roofs
	wd	Water absorption through liquid water and/or diffusion	Perimeter insulation, inverted roof
Tensile strength	zk	No tensile strength requirements	Cavity insulation, between-rafter insulation
	zg	Low tensile strength	Exterior wall insulation behind cladding
	zh	High tensile strength	Exterior wall insulation under plaster, roof, with glued sealing barrier
Acoustic noise properties	sk	No acoustic noise requirements	All applications without acoustic noise requirements
	sh	Impact sound insulation, increased compressibility	Floating screed, walls between houses
	sm	Moderate compressibility	
Deformation	sg	Impact sound insulation, low compressibility	
	tk	No deformation requirements	Interior insulation
	tf	Dimensional stability with moisture and temperature	Exterior wall insulation under plaster, roof with sealing barrier
	tl	Deformation with load and temperature	Roof with sealing barrier

<sup>1)</sup> When using sheet asphalt screeds, temperature-resistant insulation materials (ds or dx) are required for the insulation layer directly below the screed.



# Thermal Conductivity and Mechanical Parameters Styrodur®



# Thermal Conductivity and Mechanical Parameters Styrodur®

## 3. Thermal Conductivity of Styrodur®

### 3.1 Applications according to DIN 4108

Thermal conductivity W/(m·K) and thermal resistance (m<sup>2</sup>·K)/W of Styrodur®

February 2019

		2800 C			3000 CS/SQ			4000 CS/SQ			5000 CS/SQ		
Thermal conductivity		$\lambda_D$			$\lambda_D$			$\lambda_D$			$\lambda_D$		
Thermal resistance		$R_D$			$R_D$			$R_D$			$R_D$		
Rated value as per DIN 4108		$\lambda_B$			$\lambda_B$			$\lambda_B$			$\lambda_B$		
Thickness													
20 mm	0.033	0.60	0.034	–	–	–	–	–	–	–	–	–	–
30 mm	0.033	0.90	0.034	0.033	0.90	0.034	–	–	–	–	–	–	–
40 mm	0.033	1.20	0.034	0.033	1.20	0.034	–	–	–	–	–	–	–
50 mm	0.034	1.45	0.035	0.033	1.50	0.034	–	–	–	–	–	–	–
60 mm	0.034	1.75	0.035	0.033	1.80	0.034	0.035	1.70	0.036	0.035	1.70	0.036	0.036
80 mm	0.035	2.30	0.036	0.033	2.40	0.034	0.035	2.30	0.036	0.035	2.30	0.036	0.036
100 mm	0.035	2.85	0.036	0.033	3.00	0.034	0.035	2.85	0.036	0.035	2.85	0.036	0.036
120 mm	0.036	3.30	0.037	0.033	3.60	0.034	0.035	3.40	0.036	0.035	3.40	0.036	0.036
140 mm	0.036	3.85	0.037	0.033	4.20	0.034	0.035	4.00	0.036	–	–	–	–
160 mm	0.036	4.40	0.037	0.033	4.80	0.034	0.035	4.55	0.036	0.035	4.55	0.036	0.036
180 mm	–	–	–	0.033	5.45	0.034	–	–	–	–	–	–	–
200 mm	–	–	–	0.033	6.05	0.034	0.035	5.70	0.036	0.035	5.70	0.036	0.036
240 mm	–	–	–	0.033	7.25	0.034	0.035	6.85	0.036	0.035	6.85	0.036	0.036

$\lambda_D$  = declared thermal conductivity as per DIN EN 13164  
 $R_D$  = declared thermal resistance as per DIN EN 13164  
 $\lambda_B$  = rated value of thermal conductivity as per DIBt approval in line with DIN 4108

CS/SQ = thicknesses  $\geq 160$  mm are referred to as SQ

### 3.2 Technically approved applications

#### Approval overview

Approved Styrodur®-types: 3000 CS/SQ, 4000 CS, 5000 CS

May 2019

Material		3000 CS/SQ			4000 CS und 5000 CS	
Thicknesses		see approval				
Thermal insulation under load-bearing foundation slabs	Soil moisture and pressing water	Z-23.34-2089	–	–	Z-23.34-1325	
Perimeter insulation of walls with ground contact and basement floors (non-load-bearing building elements)	Soil moisture and pressing water	–	Z-23.33-2080	Z-23.33-2084	Z-23.5-223	
Inverted roof construction	Green	–	Z-23.31-2079	Z-23.31-2083	Z-23.4-222	
	Frequented	–	–	–		
	Single-layer with gravel layer and separation layer	–	Z-23.31-2079	Z-23.31-2083		
	Multi-layer with gravel layer and separation layer	–	–	–		
ETA-17/0913						

### 3.3 Technically approved applications

Rated values of thermal conductivity in W/(m·K) as per DIBt approval

Approved Styrodur®-types: 3000 CS/SQ, 4000 CS, 5000 CS

May 2018

Thickness in mm	Thermal insulation under load-bearing foundation slabs		Perimeter insulation of walls with ground contact and basement floors (non-load-bearing building elements)				Inverted roof constructions			
	soil moisture	pressing water	wall area	under basement floors	in pressing water		green	frequented	with gravel layer and separation layer	
					single-layer	multi-layer			single-layer	multi-layer
<b>3000 CS/SQ</b>										
	Z-23.34-2089		Z-23.33-2080				Z-23.31-2079			
60–160	0.034	0.039	0.034	0.034	0.039	–	0.039	0.039	0.034	–
	–		Z-23.33-2084				Z-23.31-2083			
160–240	–	–	0.034	0.034	0.039	–	0.039	–	0.034	–
<b>4000 CS</b>										
	Z-23.34-1325		Z-23.5-223				Z-23.4-222			
60	0.035	0.037	0.040	0.035	0.038	0.040	0.037	0.037	0.035	–
80	0.036	0.038	0.041	0.036	0.039	0.041	0.038	0.038	0.036	–
100	0.038	0.040	0.043	0.038	0.041	0.043	0.040	0.040	0.036*	0.041
120–140	0.039	0.041	0.044	0.039	0.042	0.044	0.041	0.041	0.036*	0.042
160	0.039	0.041	0.044	0.039	0.042	0.044	0.041	0.041	0.039	0.042
<b>5000 CS</b>										
	Z-23.34-1325		Z-23.5-223				Z-23.4-222			
60	0.035	0.037	0.040	0.035	0.038	0.040	0.037	0.037	0.035	–
80	0.036	0.038	0.041	0.036	0.039	0.041	0.038	0.038	0.036	–
100	0.038	0.040	0.043	0.038	0.041	0.043	0.040	0.040	0.036*	0.041
120	0.039	0.041	0.044	0.039	0.042	0.044	0.041	0.041	0.036*	0.042

\* According to DIN 4108, the rated lambda value  $\lambda_B$  may be used for these standardised applications.



## 4. Mechanical Parameters (Mean Values, Standard Values) of Styrodur®

### 4.1 Dynamic stiffness

Dynamic stiffness of Styrodur® 3000 CS/SQ, 4000 CS/SQ and 5000 CS/SQ

Board thickness	mm	30	40	60	80	100	120	140	160	180	240
Styrodur 3000 CS/SQ	MN/m <sup>3</sup>	500	380	260	190	150	130	100	80	60	45
Styrodur 4000 CS/SQ	MN/m <sup>3</sup>	550	400	280	210	170	150	120	100	80	65
Styrodur 5000 CS/SQ	MN/m <sup>3</sup>	600	420	300	230	190	170	140	120	100	80

## 5. Dimensioning Aids for Styrodur®

### 5.1 Load-bearing floor slabs

Dimensioning aids for Styrodur® applications under load-bearing floor slabs

Type	Long-term modulus of subgrade reaction in N/mm <sup>3</sup> for insulation layer thickness in mm										
	50	60	80	100	120	140	160	180	200	220	240
3000 CS/SQ	0.110	0.092	0.069	0.055	0.046	0.039	0.034	0.031	0.028	0.025	0.023
4000 CS/SQ single-layer/multi-layer	-	0.167	0.125	0.100	0.083	0.071	0.063	0.056	0.050	0.045	0.042
5000 CS/SQ single-layer/multi-layer	-	0.233	0.175	0.140	0.117	0.100	0.088	0.078	0.070	0.064	0.058

Modulus of subgrade reaction = modulus of long-term compressive elasticity / thickness of insulating layer

### 5.2 Permissible installation depths

Dimensioning aids for Styrodur® applications in perimeter insulation

Permissible installation depths

For worst-case load scenario: earth pressure with silty sand

Area of application	Installation depth for Styrodur® types in m		
	3000 CS/SQ	4000 CS	5000 CS
Without pressing water DIN 4108-10	12	17	24
Long-term or permanent pressing water (groundwater)	3.5	7.0	7.0



### 5.3 Vehicle traffic

Vehicle traffic

Vehicle <sup>1)</sup>				Available compressive stress with traffic load in kPa							
				Non-reinforced layer structure <sup>2)</sup> Layer thickness above insulation board in mm				Reinforced concrete Static height in mm			
Type	Weight in tonnes	Wheel load in kN	Contact surface in mm x mm	180	200	220	240	90	100	110	120
HGV	30	50	200 x 400	200	180	170	140	230	200	190	180
Truck	16	50	200 x 400	200	180	170	140	230	200	190	180
Truck	12	40	200 x 300	190	170	160	150	220	200	180	170
Truck	9	30	200 x 260	160	140	130	120	180	160	150	140
Truck	6	20	200 x 200	120	110	100	90	140	130	100	100
Truck	3	10	200 x 160	60	50	50	40	70	60	60	50
Car	<3	10	200 x 200	60	50	50	40	60	60	60	50
Forklift	7	32.5	200 x 200	200	170	160	140	220	200	180	170
Forklift	3.5	15	200 x 200	90	80	70	60	100	90	80	80
Forklift	2.5	10	200 x 200	60	50	50	40	70	60	60	50

<sup>1)</sup> Heavy-goods vehicle (HGV), truck, and car according to DIN 1072; forklift according to DIN 1055.

<sup>2)</sup> **Important note:** For reasons of long-term positional stability, the deformation under compressive stress due to traffic loads may not exceed 0.7 mm<sup>3)</sup>; therefore, in case of composite stone pavements with compressive stresses, for which the use of Styrodur® types 3035 CS and 4000 CS is permitted, Styrodur 5000 CS should always be used in parking roof constructions.

<sup>3)</sup> According to the "Instructions for Securing Surfaces with Plaster and Board Coverings" issued by the Research Association for Roads and Traffic (FGSV), Cologne/Germany, 1994.

Type	Dimensioning of Styrodur type		
	3000 CS/SQ	4000 CS/SQ	5000 CS/SQ
Permissible compressive strength with traffic load in kPa	130	230	300

## 6. Adhesive Bonds for Styrodur®

### 6.1 Which adhesive for which substrate?

	Mineral substrate	Plaster base	Metal	Wood	Plastic
Adhesive mortar	■	■	■		■
Epoxy resin adhesive			■	■	■
PUR adhesive			■	■	■

**Important note:** The dimensioning aids are non-binding planning tools. They are not a substitute for the construction and structural planning of the specialist engineer.

## Styrodur® – A Strong Product Line

With the Styrodur® product line, BASF offers the ideal insulation solution for almost every application.

### Styrodur® 2800 C

- The thermal insulation board with an embossed honeycomb pattern on both sides and smooth edges for applications in combination with concrete, plaster, and other top coats.

### Styrodur® 3000 CS/SQ

The innovative multipurpose thermal insulation board:

- With smooth surfaces and shiplap.
- For almost all applications in structural and civil engineering.
- With uniform thermal conductivity across all board thicknesses.

### Styrodur® 4000/5000 CS/SQ

- The extremely compression-proof thermal insulation board with smooth surfaces and shiplap for applications that require maximum compressive strength.

#### Note:

Up-to-date technical information is available on our website: [www.styrodur.com](http://www.styrodur.com)

For any technical queries relating to our products or applications, contact us at the following e-mail address: [styrodur@basf.com](mailto:styrodur@basf.com)

#### Important note

The information submitted in this publication is based on our current knowledge and experience and refers only to our product and its properties at the time of going to print. It does not imply any warranty or any legally binding assurance about the condition of our product. Attention must be paid to the requirements of specific applications, especially the physical and technological aspects of construction and building regulations. All mechanical drawings are basic outlines and have to be adapted to each application.

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