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and types of construction

Bautechnisches Prüfamt

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European Technical Assessment

ETA-17/0950
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General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Jackodur KF 300 Standard,
Jackodur KF 500 Standard and
Jackodur KF 700 Standard

Product family
to which the construction product belongs

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

Manufacturer

Jackon Insulation GmbH
Ritzlebener Straße 1
39619 Arendsee
DEUTSCHLAND

Manufacturing plant

Jackon Insulation GmbH
OT Mechau
Ritzlebener Straße 1
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Jackon Insulation GmbH
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B-2250 Olen

This European Technical Assessment
contains

15 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

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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 is carbon dioxide (CO₂).

Multi-layer boards with thicknesses greater than 80 mm are manufactured from two, three or four layers (single-layer boards) of extruded polystyrene which are bonded together by full-surface bonding with a special adhesive or by full-surface thermal welding. The extruded polystyrene foam boards have a foam skin on both surfaces and a special edge treatment (shiplap).

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

The extruded polystyrene foam boards have the following designations:

- "Jackodur KF 300 Standard",
- "Jackodur KF 500 Standard" and
- "Jackodur KF 700 Standard".

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

Single-layer boards:

- Nominal thicknesses: 50 mm to 80 mm
- Nominal length¹: 1250 mm
- Nominal widths: 600 mm

Multi-layer boards (made of single-layer boards with thicknesses from 50 mm to 80 mm)

- Nominal thicknesses: 100 mm to 320 mm
- Nominal length¹: 1250 mm
- Nominal widths: 600 mm

The European Technical Assessment has been issued for the products 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 are intended to be used as load bearing layer and /or thermal insulation also 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 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)

¹ greater length dimensions are possible

The performance according to section 3 only applies if the thermal insulation boards are installed according to the manufacturer'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 water-proofing" 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 "Jackodur KF 300 Standard" "Jackodur KF 500 Standard" "Jackodur KF 700 Standard"	Level (individual values may fall below this level up to 10 %): ≥ 300 kPa ≥ 500 kPa ≥ 700 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 "Jackodur KF 300 Standard" thickness 50 mm ≤ d ≤ 80 mm thickness 100 mm ≤ d ≤ 320 mm "Jackodur KF 500 Standard" thickness 50 mm ≤ d ≤ 80 mm thickness 100 mm ≤ d ≤ 320 mm	 $\sigma_{0,05} = 367 \text{ kPa}$ (n = 50; $\sigma_{\text{mean}} = 419 \text{ kPa}$; $s_{\sigma} = 31 \text{ kPa}$) $\sigma_{0,05} = 391 \text{ kPa}$ (n = 49; $\sigma_{\text{mean}} = 448 \text{ kPa}$; $s_{\sigma} = 33 \text{ kPa}$) $\sigma_{0,05} = 518 \text{ kPa}$ (n = 38; $\sigma_{\text{mean}} = 593 \text{ kPa}$; $s_{\sigma} = 43 \text{ kPa}$) $\sigma_{0,05} = 493 \text{ kPa}$ (n = 31; $\sigma_{\text{mean}} = 580 \text{ kPa}$; $s_{\sigma} = 53 \text{ kPa}$)

Essential characteristic	Performance
<p>Characteristic value of compressive stress or compressive strength</p> <p>5%-fractile value for a one-sided confidence level of 75 % under unknown or known variance using ISO 12491:1997</p> <p>"Jackodur KF 700 Standard"</p> <p>thickness 50 mm ≤ d ≤ 80 mm</p> <p>thickness 100 mm ≤ d ≤ 320mm</p>	<p>$\sigma_{0,05} = 715 \text{ kPa}$ (n = 30; $\sigma_{\text{mean}} = 795 \text{ kPa}$; $s_{\sigma} = 44 \text{ kPa}$)</p> <p>$\sigma_{0,05} = 705 \text{ kPa}$ (n = 23; $\sigma_{\text{mean}} = 813 \text{ kPa}$; $s_{\sigma} = 60 \text{ kPa}$)</p>
Compressive creep	See Annex A
<p>Behaviour under shear load (large-sized specimen)</p> <p>test acc. to the EAD and the guidelines in EN 12090:2013</p> <p>"Jackodur KF 300 Standard", thickness 320 mm</p> <p>"Jackodur KF 700 Standard", thickness 320 mm</p>	<p>$\tau_{\text{large}} = 74 \text{ kPa}$ (without foam skin: 160 kPa)</p> <p>$\tau_{\text{large}} = 165 \text{ kPa}$ (without foam skin: 223 kPa)</p>
Creep under shear load	See Annex A
Creep under combined compressive and shear load	See Annex A
Compressive modulus of elasticity	No performance assessed
Adhesion behaviour under compressive and shear load on large-sized samples	See Annex A
<p>Shear strength</p> <p>test acc. EN 12090:2013</p>	$\tau \geq 150 \text{ kPa}$
<p>Density</p> <p>test acc. to EN 1602:2013</p> <p>"Jackodur KF 300 Standard"</p> <p>"Jackodur KF 500 Standard"</p> <p>"Jackodur KF 700 Standard"</p>	<p>density range:</p> <p>33 kg/m³ - 42 kg/m³</p> <p>38 kg/m³ - 47 kg/m³</p> <p>38 kg/m³ - 50 kg/m³</p>

3.2 Safety in case of fire (BWR 2)

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

3.3 Energy economy and heat retention (BWR 6)

Essential characteristic	Performance
<p>Thermal conductivity at mean reference temperature of 10 °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</p> <p>"Jackodur KF 300 Standard"</p> <p>thickness 50 ≤ d ≤ 60 mm</p> <p>thickness 60 < d ≤ 80 mm</p> <p>thickness 100 ≤ d ≤ 180 mm</p> <p>thickness 180 < d ≤ 240 mm</p> <p>thickness 240 < d ≤ 320 mm</p> <p>"Jackodur KF 500 Standard"</p> <p>thickness 50 ≤ d ≤ 60 mm</p> <p>thickness 60 < d ≤ 80 mm</p> <p>thickness 100 ≤ d ≤ 160 mm</p> <p>thickness 160 < d ≤ 320 mm</p> <p>"Jackodur KF 700 Standard"</p> <p>thickness 50 < d ≤ 60 mm</p> <p>thickness 60 < d ≤ 80 mm</p> <p>thickness 100 ≤ d ≤ 160 mm</p> <p>thickness 160 < d ≤ 320 mm</p> <p>Moisture conversion coefficient</p>	<p>$\lambda_{D(90d)} = 0,034 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,035 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,035 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,036 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,037 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,036 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,037 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,037 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,038 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,036 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,037 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,037 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>$\lambda_{D(90d)} = 0,038 \text{ W}/(\text{m} \cdot \text{K})$</p> <p>No performance assessed</p>
<p>Water absorption</p> <p>Long term water absorption by total immersion test acc. to EN 12087:2013 (method 2A)</p> <p>Long term water absorption by diffusion test acc. to EN 12088:2013</p>	<p>WL(T)0,7 ($W_{It} \leq 0,7 \text{ Vol.}\%$)</p> <p>WD(V)3 ($W_{dV} \leq 3,0 \text{ Vol.}\%$)</p>
<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 ($W_v \leq 1,0 \text{ Vol.}\%$) ≤ 10 %</p>

Essential characteristic	Performance
<p>Freeze-thaw resistance test acc. to EN 12091:2013</p> <p>Reduction of tensile strength perpendicular to faces of the wet and re-dried specimens, when tested in accordance with EN 1607:2013</p> <p>Reduction of shear strength of the wet and re-dried specimens, when tested in accordance with EN 12090:2013</p>	<p>≤ 10 %</p> <p>≤ 10 %</p>
<p>Water vapour diffusion resistance factor acc. to EN 12086:2013</p>	<p>climatic condition A ≤ 180</p>
<p>Geometrical properties</p> <p>Thickness test acc. EN 823:2013 (clause 7.2, figure 2, measuring set-up 3)</p> <p> thickness ≤ 120 mm thickness > 120 mm</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>± 2 mm + 3/-2 mm</p> <p>± 8 mm</p> <p>5 mm/m</p> <p>3 mm</p>
<p>Deformation under specified compressive load and temperature conditions test acc. to EN 1605:2013</p> <p> thickness 50 - 120 mm thickness > 120 mm</p>	<p>load: 40 kPa; temperature: (70 ± 1) °C; time: (168 ± 1) h</p> <p>≤ 5 % ≤ 3 %</p>
<p>Dimensional stability under specified conditions test acc. to EN 1604:2013</p>	<p>temperature: 70 °C and 90% R.H. DS(70,90) (Δε_l ≤ 5 %, Δε_b ≤ 5 %, Δε_d ≤ 5 %)</p>
<p>Tensile strength perpendicular to faces test acc. to EN 1607:2013</p>	<p>TR150 (σ_{mt} ≥ 150 kPa)</p>

Essential characteristic	Performance
Volume percentage of closed cells test acc. to EN ISO 4590:2016 (method 1 with correction)	≥ 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/EC

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 1 June 2021 by Deutsches Institut für Bautechnik

Frank Iffländer
Head of Section

beglaubigt:
Wendler

Jackodur KF 300 Standard,
Jackodur KF 500 Standard and
Jackodur KF 700 Standard

Annex A

1. **Compressive creep (single-layer and multi-layer boards)**
acc. to EN 1606:2013 and EAD, chapter 2.2.3.1

Jackodur KF 300 Standard						
single layer boards	thickness 50 mm			thickness 80 mm		
density (kg/m ³)	33,1			34,2		
compressive stress/ deformation acc. EN 826 (kPa / %)	411/5			390/10		
load stage (kPa)	100	125	150	78	117	156
X ₀ (mm)	0,35	0,43	0,55	0,25	0,33	0,64
X _{ct} (mm)	0,29	0,34	0,46	0,60	1,03	2,01
X _{ct50} (mm)	0,82	1,02	1,19	1,25	2,23	4,03
X_{t50}(mm)	1,17	1,45	1,74	1,50	2,56	4,67
Jackodur KF 300 Standard						
multi-layer boards	thickness 100 mm			thickness 120 mm		
density (kg/m ³)	36,2			34,2		
compressive stress/ deformation acc. EN 826 (kPa / %)	472/6			442/6		
load stage (kPa)	100	125	150	100	125	150
X ₀ (mm)	0,31	0,39	0,52	0,42	0,55	0,74
X _{ct} (mm)	0,53	0,69	1,02	0,71	0,79	1,09
X _{ct50} (mm)	1,81	2,18	3,33	2,39	2,98	3,57
X_{t50}(mm)	2,12	2,57	3,86	2,81	3,53	4,31
Jackodur KF 300 Standard						
multi-layer boards	thickness 320 mm			thickness 320 mm		
density (kg/m ³)	36,0			34,2		
compressive stress/ deformation acc. EN 826 (kPa / %)	510/10			403/5		
load stage (kPa)	98	147	196	82	124	165
X ₀ (mm)	0,93	1,06	2,54	1,53	1,91	2,28
X _{ct} (mm)	2,06	2,87	5,92	0,82	1,4	2,33
X _{ct50} (mm)	4,22	5,50	9,51	1,89	2,96	4,67
X_{t50}(mm)	5,15	6,54	12,05	3,42	4,87	6,95

Jackodur KF 300 Standard,
Jackodur KF 500 Standard and
Jackodur KF 700 Standard

Annex A

Jackodur KF 500 Standard single-layer boards						
	thickness 50 mm			thickness 80 mm		
density (kg/m ³)	40,6			40,7		
compressive stress/ deformation acc. EN 826 (kPa / %)	595/2			628/-		
load stage (kPa)	150	175	200	150	175	200
X ₀ (mm)	0,31	0,32	0,42	03,2	0,39	0,47
X _{ct} (mm)	0,26	0,48	0,90	0,40	0,50	0,69
X _{ct50} (mm)	0,65	1,32	3,31	0,87	1,16	1,66
X_{t50}(mm)	0,96	1,64	3,73	1,19	1,55	2,13
Jackodur KF 500 Standard multi-layer boards						
	thickness 120 mm					
density (kg/m ³)	38,3					
compressive stress/ deformation acc. EN 826 (kPa / %)	671/10					
load stage (kPa)	150	175	200			
X ₀ (mm)	0,45	0,54	0,63			
X _{ct} (mm)	0,79	0,89	1,20			
X _{ct50} (mm)	2,46	2,69	3,17			
X_{t50}(mm)	2,92	3,23	3,81			
Jackodur KF 500 Standard multi-layer boards						
	thickness 320 mm			thickness 300 mm		
density (kg/m ³)	39,5			40,4		
compressive stress/ deformation acc. EN 826 (kPa / %)	561/10			614/10		
load stage (kPa)	112	168	224	150	175	200
X ₀ (mm)	0,76	1,28	2,13	1,22	1,34	1,55
X _{ct} (mm)	1,85	2,55	4,21	0,927	1,073	1,193
X _{ct50} (mm)	4,05	4,62	8,49	3,53	3,74	4,3
X_{t50}(mm)	4,81	5,90	10,62	4,75	5,08	5,84

**Jackodur KF 300 Standard,
Jackodur KF 500 Standard and
Jackodur KF 700 Standard**

Annex A

Jackodur KF 700 Standard						
single-layer boards	thickness 50 mm			thickness 80 mm		
density (kg/m ³)	49,7			42,6		
compressive stress/ deformation acc. EN 826 (kPa / %)	893/10			801/10		
load stage (kPa)	225	250	275	156	242	320
X ₀ (mm)	0,21	0,27	0,32	0,39	0,56	0,76
X _{ct} (mm)	0,36	0,40	0,46	0,67	1,21	2,36
X _{ct50} (mm)	1,12	1,20	1,52	1,52	2,84	5,62
X_{t50}(mm)	1,34	1,47	1,84	1,91	3,40	6,38
Jackodur KF 700 Standard						
multi-layer boards						
thickness 120 mm						
density (kg/m ³)	43,0					
compressive stress/ deformation acc. EN 826 (kPa / %)	880/4					
load stage (kPa)	225	250	275			
X ₀ (mm)	0,60	0,72	0,83			
X _{ct} (mm)	0,76	0,84	0,99			
X _{ct50} (mm)	2,06	2,20	2,54			
X_{t50}(mm)	2,66	2,92	3,38			
Jackodur KF 700 Standard						
multi-layer boards						
thickness 320 mm						
density (kg/m ³)	44,8			44,1		
compressive stress/ deformation acc. EN 826 (kPa / %)	757/10			863/5		
load stage (kPa)	151	227	303	173	250	346
X ₀ (mm)	1,40	1,40	2,35	1,5	2,08	3,14
X _{ct} (mm)	1,70	2,34	3,60	0,96	1,53	2,56
X _{ct50} (mm)	3,77	5,61	8,14	2,47	3,12	4,93
X_{t50}(mm)	5,17	7,01	10,49	3,97	5,2	8,07

**Jackodur KF 300 Standard,
Jackodur KF 500 Standard and
Jackodur KF 700 Standard**

Annex A

2. Creep under shear load
acc. to EAD, chapter 2.2.5

Jackodur KF 300 Standard (multi-layer boards)	thickness 320 mm
density (kg/m ³)	35,9
shear strength/ deformation acc. EN 12090 (kPa)	71/-
load stage (kPa)	25
X _{τ0} (mm)	1,53
X _{τct} (mm)	0,63
X _{τct50} (mm)	2,65
X_{τ50}(mm)	4,35
Jackodur KF 700 Standard (multi-layer boards)	thickness 320 mm
density (kg/m ³)	39,3
shear strength/ deformation acc. EN 12090 (kPa)	160/-
load stage (kPa)	56
X _{τ0} (mm)	4,09
X _{τct} (mm)	2,29
X _{τct50} (mm)	3,76
X_{τ50}(mm)	7,85

Jackodur KF 300 Standard,
Jackodur KF 500 Standard and
Jackodur KF 700 Standard

Annex A

3. Creep under combined compressive and shear load
acc. to EAD, chapter 2.2.6

Jackodur KF 300 Standard (multi-layer boards)		
thickness	320 mm	
density (kg/m ³)	35,7	
compressive stress/ deformation acc. EN 826 (kPa / %)	490/10	
shear strength/ deformation acc. EN 12090 (kPa)	71	
load stage (kPa)	25	155,6
deformation under	shear load	compressive load
X _{τ0} /X ₀ (mm)	1,30	2,49
X _{τct} /X _{ct} (mm)	0,64	1,96
X _{τct50} /X _{ct50} (mm)	1,14	4,00
X_{τ50}/X_{t50}(mm)	2,44	6,49
Jackodur KF 700 Standard (multi-layer boards)		
thickness	320 mm	
density (kg/m ³)	43,5	
compressive stress/ deformation acc. EN 826 (kPa / %)	757/10	
shear strength/ deformation acc. EN 12090 (kPa)	160	
load stage (kPa)	56	240,3
deformation under	shear load	compressive load
X _{τ0} /X ₀ (mm)	3,34	2,40
X _{τct} /X _{ct} (mm)	1,90	2,03
X _{τct50} /X _{ct50} (mm)	3,58	2,45
X_{τ50}/X_{t50}(mm)	6,92	5,85

Jackodur KF 300 Standard,
Jackodur KF 500 Standard and
Jackodur KF 700 Standard

Annex A

4 Adhesion behaviour under compressive and shear load on large-sized samples
acc. to EAD, chapter 2.2.8

Jackodur KF 300 Standard (single layer boards)			
Adhesive friction coefficient between the extruded polystyrene foam boards and a concrete finished part with foil			
Acc. EAD chapter 2.2.8, Annex A, A.3.2			
thickness	80 mm		
density (kg/m ³)	34		
Compression stress – load stage (kPa)	15	45	90
Adhesive friction coefficient regarding the compression stress – load stage	0,49	0,52	0,49
Adhesive friction coefficient	0,49		
Jackodur KF 700 Standard (single layer boards)			
Adhesive friction coefficient between the extruded polystyrene foam boards and a concrete finished part with foil			
Acc. EAD chapter 2.2.8, Annex A, A.3.2			
thickness	80 mm		
density (kg/m ³)	47		
Compression stress – load stage (kPa)	35	105	210
Adhesive friction coefficient regarding the compression stress – load stage	0,55	0,51	0,51
Adhesive friction coefficient	0,51		

**Jackodur KF 300 Standard,
Jackodur KF 500 Standard and
Jackodur KF 700 Standard**

Annex A

Jackodur KF 300 Standard (single layer boards)			
Adhesive friction coefficient between the extruded polystyrene foam boards and in-situ concrete without foil			
Acc. EAD chapter 2.2.8, Annex A, A.3.2			
thickness	80 mm		
density (kg/m ³)	34		
Compression stress – load stage (kPa)	15	45	90
Adhesive friction coefficient regarding the compression stress – load stage	7,51	3,16	1,18
Adhesive friction coefficient	1,18		
Jackodur KF 700 Standard (single layer boards)			
Adhesive friction coefficient between the extruded polystyrene foam boards and in-situ concrete without foil			
Acc. EAD chapter 2.2.8, Annex A, A.3.2			
thickness	80 mm		
density (kg/m ³)	47		
Compression stress – load stage (kPa)	35	105	210
Adhesive friction coefficient regarding the compression stress – load stage	1,99	1,03	0,95
Adhesive friction coefficient	0,95		