Deutsches Institut für Bautechnik

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Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

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European Technical Assessment

ETA-17/0950 of 22 January 2018

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	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 D-39619 Arendsee Jackon Insulation GmbH Industrielaan 31a B-2250 Olen
This European Technical Assessment contains	13 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 (CO_2).

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. 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 length[1]:	1250 mm
Nominal widths:	600 mm

Multi-layer boards (made of single-layer boards with thicknesses from 40 mm to 80 mm)

Nominal thicknesses:	greater than 80 mm to 320 mm
Nominal length[1]:	1250 mm
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 are intended to be used as load bearing layer and thermal insulation also outside the waterproofing. The boards are laid uniformly and even on the substrate to which they are applied. In particular the following applications are covered:

- 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)

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.

[1] greater length dimensions are possible

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	Level (individual values may fall below this level up to 10 %):
test acc. to EN 826:2013	
"Jackodur KF 300 Standard"	≥ 300 kPa
"Jackodur KF 500 Standard"	≥ 500 kPa
"Jackodur KF 700 Standard"	≥ 700 kPa
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 40 mm ≤ d ≤ 80 mm	$\sigma_{0,05}$ = 367 kPa (n= 50; σ_{mean}= 419 kPa; s_σ= 31 kPa)
thickness 80 mm < d < 320 mm	$\sigma_{0,05}$ = 391 kPa (n= 49; σ_{mean}= 448 kPa; s_σ= 33 kPa)
"Jackodur KF 500 Standard"	
thickness 40 mm ≤ d ≤ 80 mm	$\sigma_{0,05}$ = 518 kPa (n= 38; σ_{mean}= 593 kPa; s_σ= 43 kPa)
thickness 80 mm < d < 320 mm	$\sigma_{0,05}$ = 493 kPa (n= 31; σ_{mean}= 580 kPa; s_σ= 53 kPa)

Essential characteristic	**Performance**
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 700 Standard" thickness 40 mm ≤ d ≤ 80 mm thickness 80 mm < d ≤ 320 mm	 $\sigma_{0,05}$ = 715 kPa (n=30; σ_{mean}= 795 kPa; s_σ= 44 kPa) $\sigma_{0,05}$ = 705 kPa (n= 23; σ_{mean}= 813 kPa; s_σ= 60 kPa)
Slip deformation	No performance assessed
Compressive creep	See Annex A
Behaviour under shear load (large-sized specimen) test acc. to the EAD and the guidelines in EN 12090:2013 "Jackodur KF 300 Standard", thickness 320 mm "Jackodur KF 700 Standard", thickness 320 mm	 τ_{large} = 74 kPa (without foam skin:160 kPa) τ_{large} = 165 kPa (without foam skin:223 kPa)
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	No performance assessed
Shear strength test acc. EN 12090:2013 "Jackodur KF 300 Standard" "Jackodur KF 500 Standard" "Jackodur KF 700 Standard"	 τ ≥ 150 kPa
Density test acc. to EN 1602:2013 "Jackodur KF 300 Standard" "Jackodur KF 500 Standard" "Jackodur KF 700 Standard"	 density range: 33 kg/m³ - 42 kg/m³ 38 kg/m³ - 47 kg/m³ 38 kg/m³ - 47kg/m³

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 °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	
"Jackodur KF 300 Standard"	
thickness 50 ≤ d ≤ 60mm	$\lambda_{D(90d)}$ = 0,034 W/(m ·K)
thickness 60 < d ≤ 80 mm	$\lambda_{D(90d)}$ = 0,035 W/(m ·K)
thickness 80 < d ≤ 180mm	$\lambda_{D(90d)}$ = 0,035 W/(m ·K)
thickness 180 < d ≤ 240mm	$\lambda_{D(90d)}$ = 0,036 W/(m ·K)
thickness 240 < d ≤ 320mm	$\lambda_{D(90d)}$ = 0,037 W/(m ·K
"Jackodur KF 500 Standard"	
thickness 50 ≤ d ≤ 60mm	$\lambda_{D(90d)}$ = 0,036 W/(m ·K)
thickness 60 < d ≤ 80 mm	$\lambda_{D(90d)}$ = 0,037 W/(m ·K)
thickness 80 < d ≤ 160mm	$\lambda_{D(90d)}$ = 0,037 W/(m ·K)
thickness 160 < d ≤ 320mm	$\lambda_{D(90d)}$ = 0,038 W/(m ·K)
"Jackodur KF 700 Standard"	
thickness 50 < d ≤ 60mm	$\lambda_{D(90d)}$ = 0,036 W/(m ·K)
thickness 60 < d ≤ 80mm	$\lambda_{D(90d)}$ = 0,037 W/(m ·K)
thickness 80 < d ≤ 160mm	$\lambda_{D(90d)}$ = 0,037 W/(m ·K)
thickness 160 < d ≤ 320mm	$\lambda_{D(90d)}$ = 0,038 W/(m ·K
Moisture conversion coefficient	No performance assessed

Essential characteristic	**Performance**
Water absorption Long term water absorption by total immersion test acc. to EN 12087:2013 (method 2A) "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard"	 WL(T)0,7 (W_{lt} ≤ 0,7 Vol.%)
Long term water absorption by diffusion test acc. to EN 12088:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard" "Jackodur KF 700 Standard"	 WD(V)3 (W_{dV} ≤ 3,0 Vol.%)
Freeze-thaw resistance test acc. to EN 12091:2013 using the wet test specimens from having done the water diffusion test in accordance with EN 12088:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard"	 FTCD1 (W_V ≤ 1,0 Vol.%)
Reduction in compressive stress at 10 % deformation or in compressive strength of the re-dried specimens, when tested in accordance with EN 826:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard"	 ≤ 10 %
Reduction of tensile strength perpendicular to faces of the wet and re-dried specimens, when tested in accordance with EN 1607:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard"	 ≤ 10 %
Reduction of shear strength of the wet and re-dried specimens, when tested in accordance with EN 12090:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard"	 ≤ 10 %
Water vapour diffusion resistance factor acc. to EN 12086:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard"	 climatic condition A ≤ 180

Essential characteristic	**Performance**
Geometrical properties Thickness test acc. EN 823:2013 (clause 7.2, figure 2, measuring set-up 3) "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard" thickness ≤ 120 mm thickness > 120 mm Length, width test acc. EN 822:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard" Squareness in direction of length and width; in direction of thickness test acc. EN 824:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard" Flatness in direction of length and width test acc. EN 825:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard"	tolerance ± 2 mm + 3/-2 mm ± 8 mm 5 mm/m 3 mm
Deformation under specified compressive load and temperature conditions test acc. to EN 1605:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard" thickness 50-120 mm thickness >120 mm	 load: 40 kPa; temperature: (70 ± 1) °C; time: (168 ± 1) h ≤ 5 % ≤ 3 %
Dimensional stability under specified conditions test acc. to EN 1604:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard"	 temperature: 70 °C and 90% R.H. DS(70,90) ($\Delta\varepsilon_l \leq 5$ %, $\Delta\varepsilon_b \leq 5$ %, $\Delta\varepsilon_d \leq 5$ %)

Essential characteristic	Performance
Tensile strength perpendicular to faces test acc. to EN 1607:2013 "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard"	TR150 ($\sigma_{mt} \geq 150$ kPa)
Volume percentage of closed cells test acc. to EN ISO 4590:2016 (method 1 with correction) "Jackodur KF 300 Standard", "Jackodur KF 500 Standard", "Jackodur KF 700 Standard"	≥ 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 22 January 2018 by Deutsches Institut für Bautechnik

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Head of Department

beglaubigt:
Wendler

Deutsches Institut für Bautechnik DIBt

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

Annex A

1. Compressive creep (single-layer and multi-layer boards) test acc. to EN 1606:2013 and EAD 040650-00-1201

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)						
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 220 mm**			**thickness 320 mm**		
density (kg/m^3)	33,8			36,0		
compressive stress/ deformation acc. EN 826 (kPa / %)	423/5			510/10		
load stage (kPa)	**100**	**125**	**150**	**98**	**147**	**196**
X_0 (mm)	1,18	1,35	1,60	0,93	1,06	2,54
X_{ct} (mm)	1,34	1,87	2,34	2,06	2,87	5,92
X_{ct50}(mm)	3,98	5,03	5,83	4,22	5,50	9,51
X_{t50}(mm)	**5,17**	**6,37**	**7,43**	**5,15**	**6,54**	**12,05**

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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			38,4		
compressive stress/ deformation acc. EN 826 (kPa / %)	595/2			606/10		
load stage (kPa)	**150**	**175**	**200**	**117**	**182**	**240**
X_0 (mm)	0,31	0,32	0,42	0,41	0,7	0,95
X_{ct} (mm)	0,26	0,48	0,90	1,12	2,82	3,93
X_{ct50}(mm)	0,65	1,32	3,31	2,82	7,01	8,22
X_{t50}(mm)	**0,96**	**1,64**	**3,73**	**3,23**	**7,71**	**9,17**

Jackodur KF 500 Standard (multi-layer boards)	**thickness 120 mm**			**thickness 320 mm**		
density (kg/m^3)	38,3			39,5		
compressive stress/ deformation acc. EN 826 (kPa / %)	671/10			561/10		
load stage (kPa)	**150**	**175**	**200**	**112**	**168**	**224**
X_0 (mm)	0,45	0,54	0,63	0,76	1,28	2,13
X_{ct} (mm)	0,79	0,89	1,20	1,85	2,55	4,21
X_{ct50}(mm)	2,46	2,69	3,17	4,05	4,62	8,49
X_{t50}(mm)	**2,92**	**3,23**	**3,81**	**4,81**	**5,90**	**10,62**

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**			**thickness 320 mm**		
density (kg/m^3)	43,0			44,8		
compressive stress/ deformation acc. EN 826 (kPa / %)	880/4			757/10		
load stage (kPa)	**225**	**250**	**275**	**151**	**227**	**303**
X_0 (mm)	0,60	0,72	0,83	1,40	1,40	2,35
X_{ct} (mm)	0,76	0,84	0,99	1,70	2,34	3,60
X_{ct50}(mm)	2,06	2,20	2,54	3,77	5,61	8,14
X_{t50}(mm)	**2,66**	**2,92**	**3,38**	**5,17**	**7,01**	**10,49**

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

Annex A

2. Creep under shear load test acc. to EAD 040650-00-1201

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**
$X_{\tau 0}$ (mm)	1,53
$X_{\tau ct}$ (mm)	0,63
$X_{\tau ct50}$(mm)	2,65
$X_{\tau t50}$(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**
$X_{\tau 0}$ (mm)	4,09
$X_{\tau ct}$ (mm)	2,29
$X_{\tau ct50}$(mm)	3,76
$X_{\tau t50}$(mm)	**7,85**

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

Annex A

3. Creep under combined compressive and shear load test acc. to EAD 040650-00-1201

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
$X_{\tau 0}$ /X_0 (mm)	1,30	2,49
$X_{\tau ct}$ /X_{ct} (mm)	0,64	1,96
$X_{\tau ct50}$/X_{ct50}(mm)	1,14	4,00
$X_{\tau t50}$/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
$X_{\tau 0}$ /X_0 (mm)	3,34	2,40
$X_{\tau ct}$ /X_{ct} (mm)	1,90	2,03
$X_{\tau ct50}$/X_{ct50}(mm)	3,58	2,45
$X_{\tau t50}$/X_{t50}(mm)	**6,92**	**5,85**