

European Technical Assessment



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European Technical Assessment

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General Part

Technical Assessment Body issuing the European Technical Assessment:
Łukasiewicz Research Network, Institute of Ceramics and Building Materials

Trade name of the construction product

KLEIB W

Product family to which the construction product belongs

04: External Thermal Insulation Composite Systems (ETICS) with renderings

Manufacturer

KLEIB Sp. z o.o.
Pikutkowo 43,
87-880 Brześć Kujawski, POLAND

Manufacturing plants

Pikutkowo 43,
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This European Technical Assessment contains

23 pages including 5 Annexes which form an integral part of this assessment.

Annex No 6 Control Plan contains confidential information and is not included in the European Technical Assessment when that assessment is publicly disseminated.

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

EAD 040083-00-0404 ed. January 2019 – External Thermal Insulation Composite Systems (ETICS) with renderings

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Specific part

1. Technical description of the product

This product KLEIB W is an External Thermal Insulation Composite System (ETICS) with renderings - a kit comprising components which are factory-produced by the manufacturer or component suppliers. The ETICS manufacturer is ultimately responsible for all components of the ETICS specified in this ETA.

The ETICS kit comprises a prefabricated insulation product of mineral wool (MW) to be bonded or mechanically fixed onto a wall. The method of fixing and the relevant components are specified in Table 1. The insulation product is faced with a rendering system consisting of one or more layers (site applied), one of which contains reinforcement. The rendering is applied directly to the insulating panels, without any air gap or disconnecting layer.

The ETICS may include special fittings (e.g. base profiles, corner profiles) to treat details of ETICS (connections, apertures, corners, parapets, sills). Assessment and performance of these components is not addressed in this ETA, however the ETICS manufacturer is responsible for adequate compatibility and performance within the ETICS when the components are delivered as a part of the kit.

Table 1.

	Components	Coverage (kg/m ²)	Thickness (mm)
	Fully bonded ETICS or fully bonded ETICS with supplementary mechanical fixings. National application documents shall be taken into account.		
Insulation materials with associated methods of fixing	<ul style="list-style-type: none"> Insulation product: mineral wool (MW) lamella according to EN 13162 <i>Product characteristics - see Annex No 1</i> 	-	50 to 300
	<ul style="list-style-type: none"> Adhesives: <ul style="list-style-type: none"> - KLEIB C1W Cement based powder requiring addition of 0,20-0,22 l/kg of water - KLEIB C2W Cement based powder requiring addition of 0,21-0,23 l/kg of water 	3,0 to 4,0 (powder)	-
	<ul style="list-style-type: none"> Supplementary mechanical fixings: Plastic anchors covered by relevant ETA 	-	-

Table 1. cont.

	Components	Coverage (kg/m ²)	Thickness (mm)
Mechanically fixed ETICS with supplementary adhesive. National application documents shall be taken into account.			
Insulation materials with associated methods of fixing	<ul style="list-style-type: none"> • Insulation product: mineral wool (MW) standard boards according to EN 13162 <i>Product characteristics - see Annex No 1</i> 	-	50 to 300
	<ul style="list-style-type: none"> • Supplementary adhesives: <ul style="list-style-type: none"> - KLEIB C1W Cement based powder requiring addition of 0,20-0,22 l/kg of water - KLEIB C2W Cement based powder requiring addition of 0,21-0,23 l/kg of water 	3,0 to 4,0 (powder)	-
	<ul style="list-style-type: none"> • Anchors <i>Products characteristics - see Annex No 3</i> 	-	-
Base coat	<ul style="list-style-type: none"> • KLEIB C2W Cement based powder requiring addition of 0,21-0,23 l/kg of water 	3,0 to 4,0 (powder)	3,0 to 5,0
Reinforcement	<ul style="list-style-type: none"> • Standard glass fibre meshes: <ul style="list-style-type: none"> - AKE 145 - 122 (plan Macedonia) - 122 (plant Slovakia) <i>Products characteristics - see Annex No 4</i>	- - -	- - -
Key coats	<ul style="list-style-type: none"> • KLEIB C3 Ready to use liquid to be used with mineral finishing coat 	0,25 to 0,35	-
	<ul style="list-style-type: none"> • KLEIB C3SIL Ready to use liquid to be used with silicone finishing coat 	0,25 to 0,35	-

Table 1. cont.

	Components	Coverage (kg/m ²)	Thickness (mm)
Finishing coats	<ul style="list-style-type: none"> • White mineral finishing coat KLEIB C4 Cement based powder requiring addition of 0,23-0,25 l/kg of water floated structure max. particles size: 1,5; 2,0 mm • Silicone finishing coat KLEIB C7 Ready to use paste – silicone-acrylic binder floated structure max. particles size: 1,5 mm 2,0 mm 	2,4 to 2,7 2,2 to 2,7 3,0 to 3,4	Regulated by particles size
Decorative coat (paint)	<ul style="list-style-type: none"> • Silicone decorative coat KLEIB Q3 Ready to use pigmented liquid to be used optionally with mineral or silicone finishing coats 	0,25 to 0,35	-
Ancillary materials	Remain under the manufacturer's responsibilities		

2. Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD)

This ETICS is intended to be used on new or existing (retrofit) vertical building walls. The ETICS may also be used on horizontal or inclined surfaces which are not exposed to precipitation.

The ETICS gives the building wall to which it is applied additional thermal insulation and protection from effects of weathering. ETICS are non-load-bearing construction elements. They do not contribute directly to the stability of the building wall on which they are installed.

ETICS are not intended to ensure the air tightness of the building structure.

Concerning product packaging, transport and storage it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport and storage, as he considers necessary in order to reach the declared performances.

The information about installation is provided with the technical documentation from the Manufacturer and it is assumed that the product will be installed according to it or (in absence of such instructions) according to the usual practice of the building professionals.

The performances assessed in this European Technical Assessment, according to the applicable EAD, are based on an assumed intended working life of at least 25 years, provided that the conditions for the packaging, transport, storage, installation as well as appropriate use, maintenance and repair are met. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, 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.

The ETICS belongs to Category S/W2 according to EOTA Technical Report No 034.

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

The tests for performance assessment of KLEIB W were carried out in compliance with EAD 040083-00-0404 according to the test methods reported herein, as well for what concerns sampling, conditioning and testing provisions. The performances of the kit as described in this chapter are valid provided that the components of the kit comply with Section 1 of the ETA and the relative Annexes 1 ÷ 5. The numbering in the following tables corresponds to the numbering of Table 1 of EAD 040083-00-0404.

3.1. Safety in case of fire (BWR 2)

3.1.1. Reaction to fire (EAD 040083-00-0404: clause 2.2.1, EN 13501-1)

3.1.1.1. Reaction to fire of ETICS (EAD 040083-00-0404: clause 2.2.1.1)

Table 2.

Configuration	Max. organic content / Max. heat of combustion	Flame retardant content	Class acc. to EN 13501-1
Adhesive	1,9 % / -	No flame retardant	A2-s1, d0
MW boards <i>density ≤ 130,0 kg/m³</i>	- / -		
Base coat	1,9 % / -		
Glass fibre mesh	- / 8,2 MJ/kg		
Key coat	10,9 % / -		
Finishing coat	8,2 % / -		
Decorative coat	16,2 % / -		

3.1.1.2. Reaction to fire of the thermal insulation material (EAD 040083-00-0404: clause 2.2.1.2)

See Annex No 1

3.1.1.3. Reaction to fire of PU foam adhesive (EAD 040083-00-0404: clause 2.2.1.3)

Not relevant

3.1.2. Façade fire performance (EAD 040083-00-0404: clause 2.2.2)

No performance assessed.

3.1.3. Propensity to undergo continuous smouldering of ETICS (EAD 040083-00-0404: clause 2.2.3)

No performance assessed.

3.2. Hygiene, health and environment (BWR 3)

3.2.1. Content, emission and/or release of dangerous substances – leachable substances (EAD 040083-00-0404: clause 2.2.4, EOTA TR034)

No performance assessed.

Note: There may be requirements applicable to the ETICS falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Regulation (EU) No 305/2011, these requirements need to be complied with, when and where they apply.

3.2.2. Water absorption (EAD 040083-00-0404: clause 2.2.5)

3.2.2.1. Water absorption of the base coat and the rendering system (EAD 040083-00-0404: clause 2.2.5.1)

- Base coat KLEIB C2W on MW standard board:
 - Water absorption after 1 hour = 0,00 kg/m²;
 - Water absorption after 24 hours = 0,10 kg/m².
- Base coat KLEIB C2W on MW lamella board:
 - Water absorption after 1 hour = 0,00 kg/m²;
 - Water absorption after 24 hours = 0,10 kg/m².
- Rendering systems: Table 3.

Table 3.

		Water absorption after 1 hour	Water absorption after 24 hours
		mean value (kg/m ²)	
		MW board acc. to Annex No 1	
Rendering system: Base coat <u>KLEIB C2W</u> + relevant key coat + finishing coat indicated hereafter:	KLEIB C4	0,10	0,40
	KLEIB C7	0,00	0,20
		MW lamella acc. to Annex No 1	
Rendering system: Base coat <u>KLEIB C2W</u> + relevant key coat + finishing coat indicated hereafter:	KLEIB C4	0,10	0,40
	KLEIB C7	0,00	0,30

3.2.2.2. Water absorption of the thermal insulation product (EAD 040083-00-0404: clause 2.2.5.2)

See Annex No 1

3.2.3. Water-tightness of the ETICS: Hygrothermal behaviour (EAD 040083-00-0404: clause 2.2.6)

Hygrothermal cycles have been performed on a rig in hygrothermal chamber. None of the following defects occurred during the testing:

- blistering or peeling of any finishing coat,
- failure or cracking associated with joints between insulation product boards,
- detachment of render,
- cracking allowing water penetration to the insulation layer.

The ETICS is so assessed resistant to hygrothermal cycles.

3.2.4. Water-tightness: Freeze-thaw performance (EAD 040083-00-0404: clause 2.2.7)

Water absorption of both, base coat and the rendering systems after 24 hours was lower than 0,5 kg/m² (Tab. 3).

The ETICS is so assessed as freeze-thaw resistant.

3.2.5. Impact resistance tested on the rig (EAD 040083-00-0404: clause 2.2.8)

Table 4.

		Hard body impact		
		Impact energy 3 J	Impact energy 10 J	Impact resistance category
Single layer of standard mesh AKE 145		Impact diameter (mm) / damages		
MW lamella acc. to Annex No 1				
Rendering system: Base coat KLEIB C2W + relevant key coat + finishing coat indicated hereafter:	KLEIB C4, floated 1,5 mm	12 / superficial damages without cracks formation	27 / cracks without reaching the thermal insulation product	II
	KLEIB C7, floated 1,5 mm	16 / superficial damages without cracks formation	26 / cracks without reaching the thermal insulation product	II

3.2.6. Impact resistance not tested on the rig (EAD 040083-00-0404: clause 2.2.8)

Table 5.

		Hard body impact		
		Impact energy 3 J	Impact energy 10 J	Impact resistance category
Single layer of standard mesh AKE 145		Impact diameter (mm) / damages		
MW board acc. to Annex No 1				
Rendering system: Base coat <u>KLEIB C2W</u> + relevant key coat + finishing coat indicated hereafter:	KLEIB C4, floated 1,5 mm	15 / superficial damages without cracks formation	26 / cracks without reaching the thermal insulation product	II
	KLEIB C7, floated 1,5 mm	13 / superficial damages without cracks formation	23 / cracks without reaching the thermal insulation product	II

3.2.7. Water vapour permeability (EAD 040083-00-0404: clause 2.2.9)

3.2.7.1. Water vapour permeability of the rendering system (equivalent air thickness s_d) (EAD 040083-00-0404: clause 2.2.9.1)

Table 6.

		Equivalent air thickness s_d (m)
Rendering system: Base coat <u>KLEIB C2W</u> + relevant key coat + finishing coat indicated hereafter + decorative coat:	KLEIB C4, floated 2,0 mm + KLEIB Q3 <i>thickness of rendering: 7,2 mm</i>	0,2
	KLEIB C7, floated 2,0 mm + KLEIB Q3 <i>thickness of rendering: 7,2 mm</i>	0,2

3.2.7.2. Water vapour permeability of the thermal insulation product (water-vapour resistance factor) (EAD 040083-00-0404: clause 2.2.9.2)

See Annex No 1

3.3. Safety in use (BWR 4)

3.3.1. Bond strength (EAD 040083-00-0404: clause 2.2.11)

3.3.1.1. Bond strength between the base coat and the thermal insulation product (EAD 040083-00-0404: clause 2.2.11.1)

Table 7.

		Bond strength (kPa)	
		mean	min.
MW board acc. to Annex No 1			
KLEIB C2W	initial state	12*	10
	hygrothermal cycles	10*	9
	freeze-thaw cycles	test not required	
MW lamella acc. to Annex No 1			
KLEIB C2W	initial state	81*	74
	hygrothermal cycles (from the rig)	80*	75
	freeze-thaw cycles	test not required	

*cohesive rupture in insulation

3.3.1.2. Bond strength between the adhesive and the substrate (EAD 040083-00-0404: clause 2.2.11.2)

Table 8.

		Bond strength (kPa)	
		mean	min.
KLEIB C1W** Minimal bonded surface area S: 39,5 %	initial state	730*	666
	48 h immersion in water + 2 hours 23°C/50% RH	736*	622
	48 h immersion in water + 7 days 23°C/50% RH	1350*	1100
KLEIB C2W** Minimal bonded surface area S: 38,0 %	initial state	512*	414
	48 h immersion in water + 2 hours 23°C/50% RH	398*	358
	48 h immersion in water + 7 days 23°C/50% RH	875*	800

*adhesive rupture; **thickness of adhesive – about 3 mm

3.3.1.3. Bond strength between the adhesive and the thermal insulation product (EAD 040083-00-0404: clause 2.2.11.3)

Table 9.

		Bond strength (kPa)	
		mean	min.
MW board acc. to Annex No 1			
KLEIB C1W**	initial state	10*	10
	48 h immersion in water + 2 hours 23°C/50% RH	10*	9
	48 h immersion in water + 7 days 23°C/50% RH	12*	11
KLEIB C2W**	initial state	10*	10
	48 h immersion in water + 2 hours 23°C/50% RH	10*	10
	48 h immersion in water + 7 days 23°C/50% RH	10*	10
MW lamella acc. to Annex No 1			
KLEIB C1W** Minimal bonded surface area S: 39,5 %	initial state	82*	76
	48 h immersion in water + 2 hours 23°C/50% RH	80*	77
	48 h immersion in water + 7 days 23°C/50% RH	81*	80
KLEIB C2W** Minimal bonded surface area S: 38,0 %	initial state	80*	79
	48 h immersion in water + 2 hours 23°C/50% RH	80*	79
	48 h immersion in water + 7 days 23°C/50% RH	80*	79

*cohesive rupture in insulation; ** thickness of adhesive – about 3 mm

3.3.2. Fixing strength (transverse displacement test) (EAD 040083-00-0404: clause 2.2.12)

Test not required because the ETICS fulfils the following criteria: $E \cdot d < 50\,000 \text{ N/mm}$.

3.3.3. Wind load resistance of ETICS (EAD 040083-00-0404: clause 2.2.13)

3.3.3.1. Pull-through test of fixings (EAD 040083-00-0404: clause 2.2.13.1)

Table 10.

Anchors (fixed through insulation product) for which the following failure loads apply		Anchors according to Annex No 2*	
		Plate diameter (mm)	≥ 60
Characteristics of the MW boards for which the following failure loads apply		Thickness (mm)	≥ 50
		Tensile strength perpendicular to the faces (kPa) under dry conditions	≥ 13,3
		under wet conditions 28 days	≥ 7,1
Failure loads (kN)	Anchors not placed at the panel joints (<i>Pull-through test</i>) dry conditions	R_{panel}	individual values: 0,420; 0,285; 0,304; 0,279; 0,309
			mean: 0,319
	Anchors not placed at the panel joints (<i>Pull-through test</i>) wet conditions	R_{panel}	individual values: 0,161; 0,167; 0,154; 0,184; 0,241
			mean: 0,181
	Anchors placed at the panel joints (<i>Pull-through test</i>) dry conditions	R_{joint}	individual values: 0,120; 0,166; 0,203; 0,207; 0,185
			mean: 0,176
	Anchors placed at the panel joints (<i>Pull-through test</i>) wet conditions	R_{joint}	individual values: 0,192; 0,146; 0,128; 0,148; 0,169
			mean: 0,157

*plate stiffness of anchors shall be equal or higher than 0,5 kN/mm

Load / Displacement Graphs see Annex No 3.

3.3.3.2. Static foam block test (EAD 040083-00-0404: clause 2.2.13.2)

Not relevant

3.3.3.3. Dynamic wind uplift test (EAD 040083-00-0404: clause 2.2.13.3)

Not relevant

3.3.4. Tensile test perpendicular to the faces of thermal insulation product (EAD 040083-00-0404: clause 2.2.14)

See Annex No 1

3.3.5. Shear strength and shear modulus of elasticity test of ETICS (EAD 040083-00-0404: clause 2.2.15)

See Annex No 1

3.3.6. Render strip tensile test (EAD 040083-00-0404: clause 2.2.17)

No performance assessed.

3.3.7. Bond strength after ageing (EAD 040083-00-0404: clause 2.2.20)

3.3.7.1. Bond strength after ageing of finishing coat tested on the rig (EAD 040083-00-0404: clause 2.2.20.1)

Table 11.

		Bond strength after hydrothermal cycles (kN/m ²)	
		mean	individual values
MW lamella acc. to Annex No 1			
Rendering system: Base coat <u>KLEIB C2W</u> + relevant key coat + finishing coat indicated hereafter:	KLEIB C4	80*	82; 79; 78; 80; 81
	KLEIB C7	80*	80; 77; 80; 81; 82

*cohesive rupture in insulation

3.3.7.2. Bond strength after ageing of finishing coat not tested on the rig (EAD 040083-00-0404: clause 2.2.20.2)

Table 12.

		Bond strength after hydrothermal cycles (kN/m ²)	
		mean	individual values
MW board acc. to Annex No 1			
Rendering system: Base coat <u>KLEIB C2W</u> + relevant key coat + finishing coat indicated hereafter:	KLEIB C4	10*	10; 10; 10; 10; 10
	KLEIB C7	10*	11; 10; 10; 10; 10

*cohesive rupture in insulation

3.3.8. Mechanical and physical characteristics of the mesh (EAD 040083-00-0404: clause 2.2.21)

3.3.8.1. Tensile strength and elongation of the glass fibre mesh in the as-delivered (EAD 040083-00-0404: clause 2.2.21.1)

Table 13.

	Average tensile strength in the as-delivered state (N/mm)		Average elongation in the as-delivered state (%)	
	warp	weft	warp	weft
AKE 145	45,7	39,3	4,81	4,74
122 (plan Macedonia)	47,0	49,0	3,90	3,40
122 (plant Slovakia)	44,0	46,0	3,90	3,50

3.3.8.2. Tensile strength and elongation of the glass fibre mesh after ageing state (EAD 040083-00-0404: clause 2.2.21.2)

Table 14.

	Average tensile strength after ageing (N/mm)		Residual strength after ageing (%)		Average elongation after ageing (%)	
	warp	weft	warp	weft	warp	weft
AKE 145	24,8	20,8	54,3	52,9	2,74	2,39
122 (plan Macedonia)	27,0	36,0	57,4	73,5	2,30	2,50
122 (plant Slovakia)	23,0	29,0	52,3	63,0	2,10	2,10

3.4. Protection against noise (BWR 5)

3.4.1. Airborne sound insulation of ETICS (EAD 040083-00-0404: clause 2.2.22)

3.4.1.1. Airborne sound insulation of ETICS (EAD 040083-00-0404: clause 2.2.22.1)

No performance assessed.

3.4.1.2. Dynamic stiffness of the thermal insulation product (EAD 040083-00-0404: clause 2.2.22.2)

No performance assessed.

3.4.1.3. Air flow resistance of the thermal insulation product (EAD 040083-00-0404: clause 2.2.22.3)

No performance assessed.

3.5. Energy economy and heat retention (BWR 6)

3.5.1. Thermal resistance and thermal transmittance of ETICS (EAD 040083-00-0404: clause 2.2.23)

The additional thermal resistance provided by the ETICS (R_{ETICS}) to the substrate has been assessed by calculations on the basis of the thermal resistance of the thermal insulation product ($R_{insulation}$) and from either the tabulated (R_{render}) value of the render system [about 0,02 in ($m^2 \cdot K$)/W].

$$R_{ETICS} = R_{insulation} + R_{render}$$

as described in EN ISO 10456.

Table 15.

Thermal resistance R_{ETICS} with minimum thickness of MW* [($m^2 \cdot K$)/W]	Thermal resistance R_{ETICS} with maximum thickness of MW* [($m^2 \cdot K$)/W]
1,13	6,69

*at maximum value of thermal conductivity 0,045 W/(m · K)

The thermal transmittance of the substrate wall covered by the ETICS is calculated in accordance with the standard EN ISO 6946:

$$U_c = U + \chi_p \cdot n$$

where:

$\chi_p \cdot n$ has only to be taken into account if it is greater than 0,04 W/(m²·K)

U_c : corrected thermal transmittance of the entire wall (W/ (m²·K))

n : number of anchors (through insulation product) per 1 m²

χ_p : point thermal transmittance value of the anchor (W/K). The values listed below can be taken into account if not specified in the anchor's ETA:

= 0,002 W/K for anchors with a plastic screw/nail, stainless steel screw/nail with the head covered by at least 15 mm plastic material, or with a minimum 15 mm air gap at the head of the screw/nail;

= 0,004 W/K for anchors with a galvanized carbon steel screw/nail with the head covered by at least 15 mm plastic material, or with a minimum 15 mm air gap at the head of the screw/nail;

= 0,008 W/K for all other anchors (worst case);

U : thermal transmittance of the current part of the covered wall (excluding thermal bridges) (W/ (m²·K)) determined as follows:

$$U = \frac{1}{R_{insulation} + R_{render} + R_{substrate} + R_{se} + R_{si}}$$

where:

$R_{insulation}$: thermal resistance of the insulation product (according to declaration in reference to EN 13162) in (m²·K)/W

R_{render} : thermal resistance of the render (about 0,02 in (m²·K)/W or determined by test according to EN 12667 or EN 12664)

$R_{substrate}$: thermal resistance of the substrate wall in (m²·K)/W

R_{se} : external surface thermal resistance in (m²·K)/W

R_{si} : internal surface thermal resistance in (m²·K)/W

The value of thermal resistance of each insulation product shall be given in the manufacturer's documentation along with the possible range of thicknesses. In addition, the point thermal conductivity of anchors shall be given when anchors are used in the ETICS.

3.5.2. Thermal resistance of the thermal insulation product (EAD 040083-00-0404: clause 2.2.23.1)

See Annex No 1

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

In accordance with the European Assessment Document EAD No. 040083-00-0404, the applicable European legal act is: Decision 97/556/EC. The system(s) of assessment and verification of constancy of performance (AVCP) is 2+.

In addition, with regard to reaction to fire for products, the applicable European legal act is Decision 97/556/EC, as amended by Decision 2001/596/EC. The system of assessment and verification of constancy of performance (AVCP) is 2+.

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

The manufacturer shall perform a permanent internal factory production control based on the Control Plan.

The Control Plan for the manufacturer is specified in clause 3.2 of EAD 040083-00-0404 *External Thermal Insulation Composite Systems (ETICS) with renderings*.

The manufacturer and Łukasiewicz Research Network, Institute of Ceramics and Building Materials TAB have agreed a Control Plan which is deposited at Łukasiewicz Research Network, Institute of Ceramics and Building Materials TAB in documentation which accompanies ETA.

Issued in Krakow on 24.02.2023

By

Paweł PICHNIAŁCZYK

Director of Łukasiewicz Research Network, Institute of Ceramics and Building Materials

Annexes:

Annex No 1 – Insulation products characteristics

Annex No 2 – Anchors characteristics

Annex No 3 – Load-displacement graphs

Annex No 4 – Glass fibre meshes characteristics

Annex No 5 – Alternative trade names of KLEIB W system components

Annex No 1 – Insulation products characteristics

		Factory made mineral wool (MW) products according to EN 13162	
		MW board	MW lamella
Reaction to fire / EN 13501-1		Class - A1 max. density: 130 kg/m ³	
Thermal conductivity (λ _D) / EN 12667 / EN 12939		≤ 0,042 W/(m · K)	
Thermal resistance		Defined in the CE marking in reference to EN 13162 (m ² ·K)/W	
Thickness / EN 823		- 1 % or - 1 mm [EN 13162 - T5]	
Dimensional stability under specified conditions	EN 1604	1 % [EN 13162 - DS(70,-)]	
	EN 1604	1 % [EN 13162 - DS(70,90)]	
Short-term water absorption (partial immersion) / EN 1609		EN 13162 - WS	
Long-term water absorption (partial immersion) / EN 12087		EN 13162 - WL(P)	
Water vapour diffusion resistance factor (μ) / EN 12086		EN 13162 - 1	
Tensile strength perpendicular to the faces in dry conditions / EN 1607		[EN 13162 – TR10] ≥ 10 kPa	≥ 80 kPa [EN 13162 – TR80]
Shear strength / EN 12090		-	≥ 25 kPa
Shear modulus / EN 12090		-	≥ 1000 kPa

Annex No 2 – Anchors characteristics

Anchor trade name	Plate stiffness (kN/mm)/ diameter (mm)	Characteristic resistance in the substrate
LMX-10	0,50 / 60	ETA-16/0509

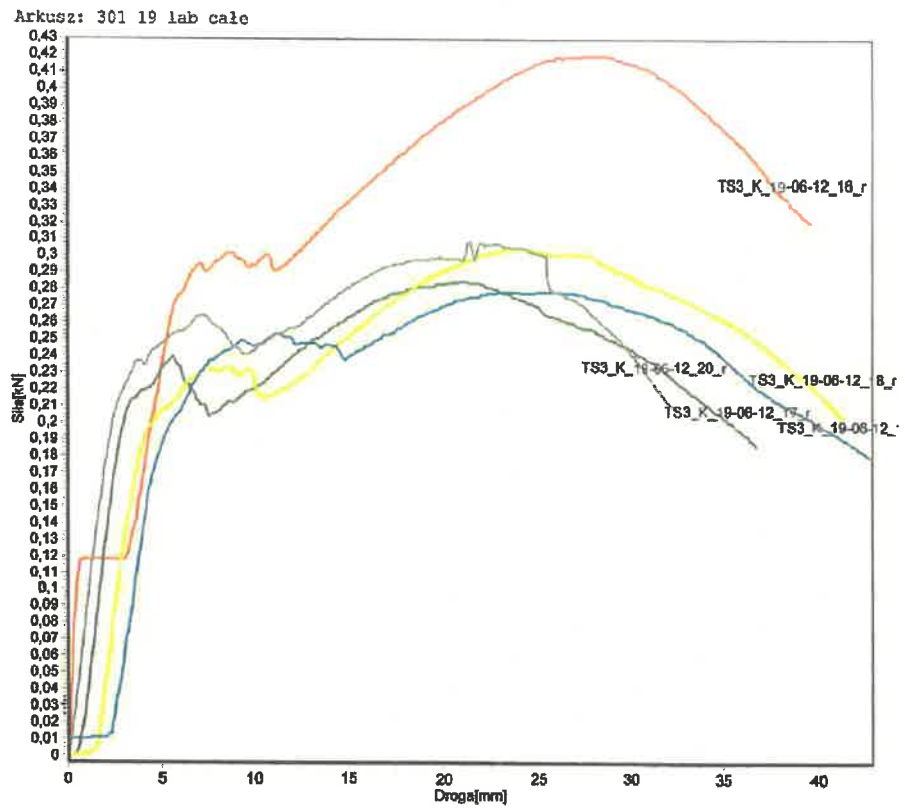
Additionally, other anchors covered by relevant ETA can be used, provided that they meet the following requirements:

	Requirement
Plate diameter	≥ 60 mm
Plate stiffness	≥ 0,5 kN/mm

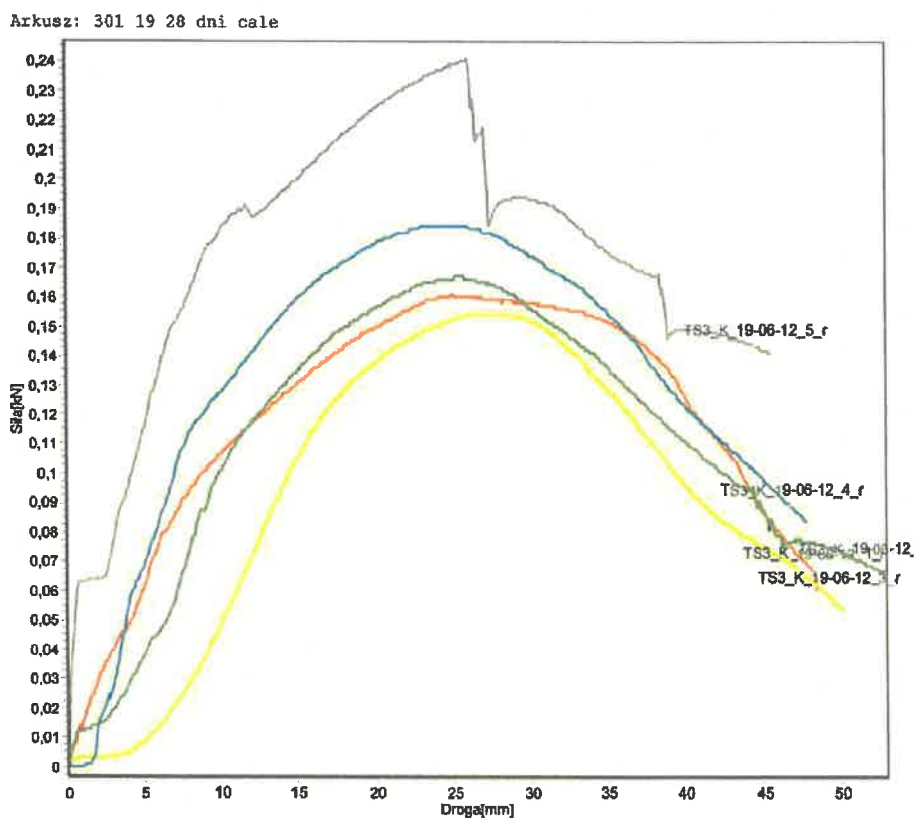
Annex No 3 – Load-displacement graph

Load-displacement graph

Anchors not placed at the panel joints (*Pull-through test*) dry conditions

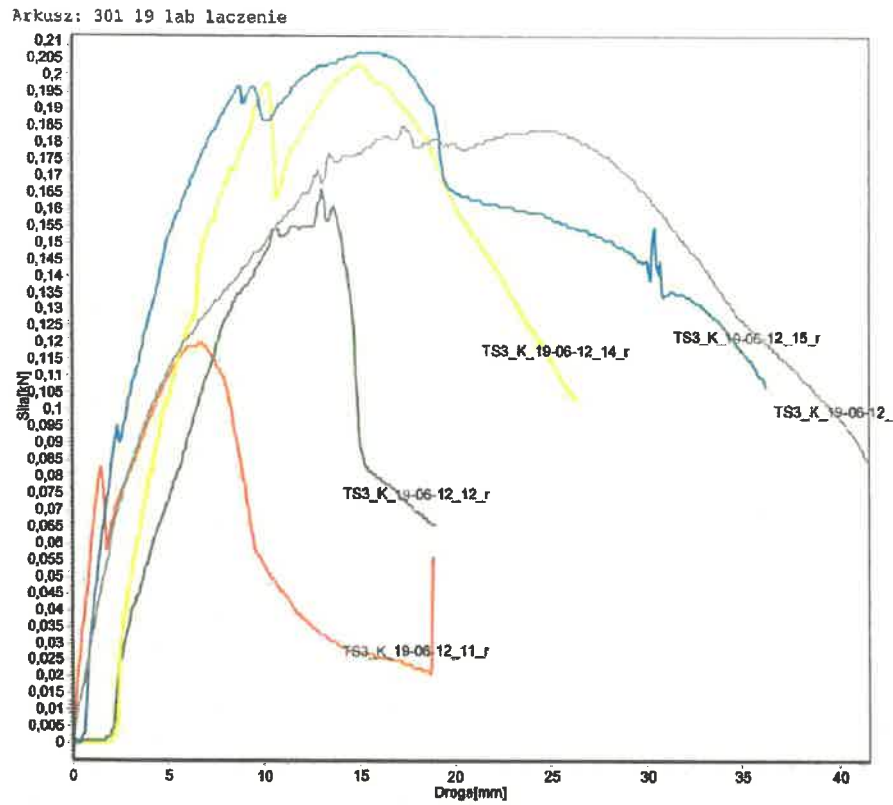


Anchors not placed at the panel joints (*Pull-through test*) wet conditions

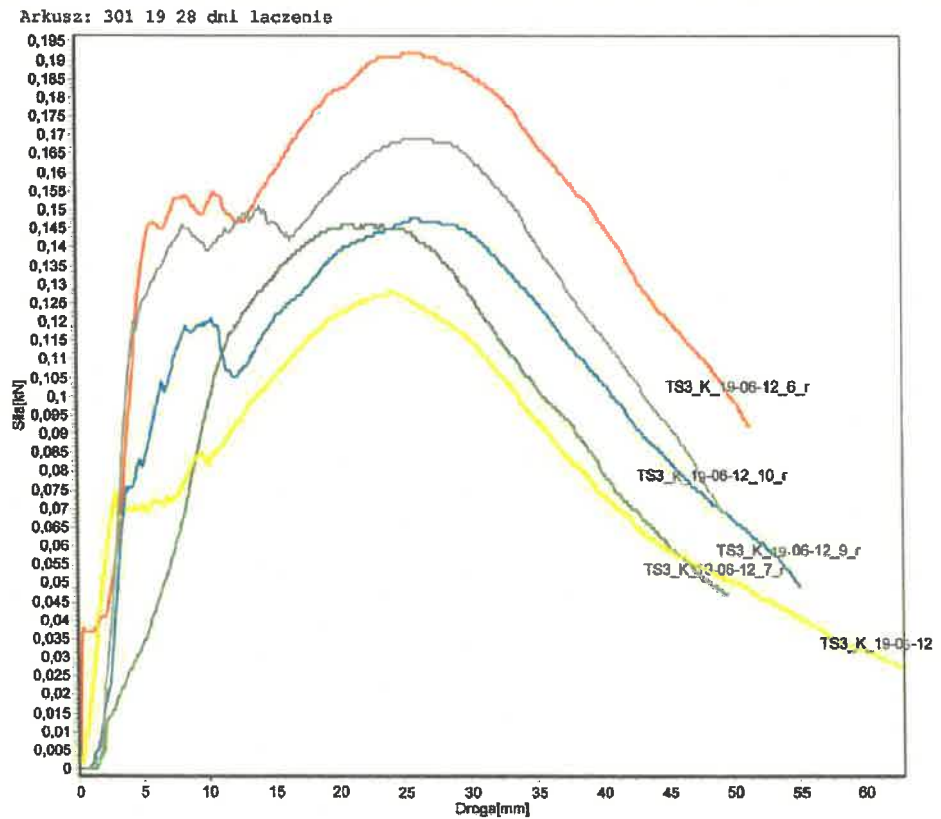


Annex No 3 – Load-displacement graph cont.

Anchors placed at the panel joints (*Pull-through test*) dry conditions



Anchors placed at the panel joints (*Pull-through test*) wet conditions



Annex No 4 – Glass fibre meshes characteristics

Mesh trade name	Description	Alkalis resistance	
		Residual resistance after ageing (N/mm)	Relative residual resistance: % (after ageing) of the strength in the as delivered state
AKE 145	Mass per unit area: 145 g/m ² Mesh size: 4,0 x 4,5 mm	≥ 20	≥ 50
122 (plan Macedonia)	Mass per unit area: 160 g/m ² Mesh size: 3,5 x 3,9 mm	≥ 20	≥ 50
122 (plant Slovakia)	Mass per unit area: 165 g/m ² Mesh size: 3,5 x 3,9 mm	≥ 20	≥ 50

Annex No 5 – Alternative trade names of KLEIB W system components

Component	Trade name	Alternative trade name
Adhesives	KLEIB C1W	- FASAKOL F1W - KLM-11
	KLEIB C2W	- FASAKOL F2W - KLM-22
Base coat	KLEIB C2W	- FASAKOL F2W - KLM-22
Key coats	KLEIB C3	- FASAKOL F3 - GP-30 - MAJSTER C3
	KLEIB C3SIL	- FASAKOL F3SIL - GP-30SIL - MAJSTER C3SIL
Finishing coats	KLEIB C4	- FASAKOL F4 - MP-40W - MAJSTER C4
	KLEIB C7	- FASAKOL F7 - SP-70 - MAJSTER C7
Decorative coat	KLEIB Q3	- FASAKOL Q3 - SF-30 - MAJSTER Q3