Deutsches Institut für Bautechnik

Approval body for construction products and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and Laender Governments

Member of EOTA
www.eota.eu

Designated according to Article 29 of Regulation (EU) No 305/2011 and member of EOTA (European Organisation for Technical Assessment)

European Technical Assessment ETA-16/0080 of 23 February 2016

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	TENDONOL®
Product family to which the construction product belongs	Linear Joint and Gap Seals
Manufacturer	VARIO Baustoffsysteme GmbH Dielinger Straße 60 32351 Stemwede 2 DEUTSCHLAND
Manufacturing plant	1
This European Technical Assessment contains	13 pages including 8 annexes 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	Guideline for European technical approval of "Fire Stopping and Fire Sealing Products", ETAG 026 Part 3: "Linear Joint and Gap Seals", August 2011, used as European Assessment Document (EAD) according to Article 66 Paragraph 3 of Regulation (EU) No 305/2011.

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Specific part

1 Technical description of the product

TENDONOL® is a sealing compound which is used for the execution of linear joint and gap seals.

The maximum lateral stretching capability of TENDONOL® is 7.4 %.

Further product properties of TENDONOL® are presented in Annex A.

Further product properties of the components used for the execution of the tested joint seal (backfilling material) are presented in Annex A.

Details for the design of joint seals executed by using TENDONOL® are presented in Annex B.

Details of the material specifications are deposited with Deutsches Institut für Bautechnik.

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

The joint seal is used for sealing horizontal and vertical linear non-movement joints (structural joints as stepped joints and linear butt joints) between fire resistant rigid walls and floors with a fire-separating function.

The joint seal is intended to maintain or reinstate the fire resistance performance of building components with a fire-separating function where they are interrupted or separated by joints.

The permitted width of the joints depending on the design is presented in Annex B.

The joint seal is not intended for load transmission.

The performances given in section 3 are only valid if the joint seal is used in compliance with

- the specifications and conditions given in Annex B and
- the manufacturer's instructions as stated in section 5.

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of TENDONOL® of at least 10 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

3.1 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Classes in accordance with EN 13501-1 See Annex A
Resistance to fire	Classes in accordance with EN 13501-2 See Annex B

3.2 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Air permeability	No performance assessed
Depth of penetration of water under pressure	water tight up to 1 bar in accordance with EN 12390-8
Content, emission and/or release of dangerous substances	The chemical composition of the product has to be in compliance with the composition deposited with the Technical Assessment Body (DIBt). The product does not contain or release dangerous substances according to EOTA TR 034 (version October 2015) except: • VOC, SVOC No performance assessed. • A Biocide (< 1 wt%), contained active ingredients: 2-bromo-2-nitropropane-1,3-diol; 1,2-benzisothiazol-3(2H)-one and 2-methyl-2H-isothiazol-3-one
Use scenarios regarding to BWR	I A1/I A2

3.3 Safety and accessibility in use (BWR 4)

Essential characteristic	Performance
Mechanical resistance and stability	Pursuant ETAG 026-3, tests to show evidence of impact resistance are not necessary because the joints have a maximum width of 110 mm. No performance assessed.
Resistance to impact/movement	
Adhesion	Adhesion is determined by determination of the movement capability.

3.4 Protection against noise (BWR 5)

No performance assessed

3.5 Energy economy and heat retention (BWR 6)

No performance assessed

3.6 General aspects

The verification of durability is part of testing the essential characteristics.

Durability

TENDONOL® is suitable for use in the following use category specified in ETAG 026-3, with no essential changes in its fire protective properties to be expected:

Type X: intended for use in conditions exposed to weathering.

Durability is only ensured if the specifications on the intended use stated in Annex B and the manufacturer's instructions in section 5 are taken into account.

Mechanical properties

The following mechanical properties were determined in accordance with EN ISO 7389:2003:

Resistance to stretching:	> 95 % after load-release
Resistance to 20 % compression strain:	> 92 % 24 h after load-release (8 % plastic deformation)
Stability at 50° C permanently (without loading):	100 % (no settling/plastic deformation)

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

In accordance with the guideline for European technical approval of "Fire Stopping and Fire Sealing Products", ETAG 026 Part 3: "Linear Joint and Gap Seals", December 2011, used as European Assessment Document (EAD), the applicable European legal act is: 1999/454/EC.

The system to be applied is: 1.

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.

The manufacturer shall provide installation instructions on every construction product according to this ETA containing at least the following information:

- type, properties (minimum thickness, density) and fire resistance of the building components with a fire-separating function in which the joint system may be installed
- description or graphic presentation of the proper installation (depending on the type of the building element, the intended fire resistance and the width of the joints).

The manufacturer shall also provide instructions on processing, packaging, transport, storage and use, maintenance and repair of the construction product.

Issued in Berlin on 23 February 2016 by Deutsches Institut für Bautechnik

Maja Tiemann
p. p. Head of Department

beglaubigt:
von Hoerschelmann

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1 Information on the construction products

Table 1

No.	Designation / specification	Description / properties
Information on the sealing compound TENDONOL®		
	TENDONOL® VARIO Baustoffsysteme GmbH 32351 Stemwede 2 GERMANY	Sealing compound Bulk density: 1700 kg/m³ ± 10 % Reaction to fire class in accordance with EN 13501-1: a) With backfilling in accordance with variant No. 1: Class B-s1, d0 [a)] b) With backfilling in accordance with variant No. 2: Class B-s1, d0 [a)] c) With backfilling in accordance with variant No. 3: Class E [a)] d) With backfilling in accordance with variant No. 4: Class E [b)]
Information on the additional components of the tested joint sealing (backfilling material)		
1	Loose fill mineral wool In accordance with EN 13162 or EN 14303 (Variant 1)	Bulk density: ≥ 50 kg/m³ (apparent density) Thickness of the backfilling: 30 to 90 mm (depth of the filling) Reaction to fire class in accordance with EN 13501-1: Class A1 oder A2-s1, d0
2	Mineral wool board In accordance with EN 13162 or EN 14303 (Variant 2)	Bulk density: ≥ 80 kg/m³ (nominal bulk density) Thickness of the backfilling: 30 mm to 90 mm Reaction to fire class in accordance with EN 13501-1: Class A1 oder A2-s1, d0
3	PE round cord Extruded backfilling material made of polyethylene (PE), closed-cell (Variant 3)	Bulk density: 21 bis 32 kg/m³ (nominal bulk density) Thickness of the backfilling: Ø 10 to 50 mm Reaction to fire class in accordance with EN 13501-1: at least class E
4	Polystyrene In accordance with EN 13163 (Variant 4)	Bulk density: 35 bis 42 kg/m³ (nominal bulk density) Thickness of the backfilling: 30, 60 and 85 mm Reaction to fire class in accordance with EN 13501-1: at least class E
Assessed parameters of the joint execution:		
a)		– In walls / ceilings made of massive mineral construction materials or construction panels; reaction to fire class A1 or A2-s1, d0 in accordance with EN 13501-1 – Width of the joint: see Annexes B2 to B4 – Filling depth of the sealing compound: see Annexes B2 to B4
b)		– In walls / ceilings made of massive mineral construction materials or construction panels; reaction to fire class A1 or A2-s1, d0 in accordance with EN 13501-1 – Width of the joint: see Annex B5 – Filling depth of the sealing compound: 20 to 30 mm

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2 Fire resistance

2.1 Building components with a fire separating function

The joint sealing is used for sealing linear joints between the following separating building elements:

Rigid walls

- made of masonry, concrete, reinforced concrete or aerated concrete with a minimum density of 625 kg/m^3
- minimum thickness c_W 115 mm

Rigid floors

- made of concrete, reinforced concrete or aerated concrete with a minimum density of 475 kg/m^3
- minimum thickness c_D 150 mm

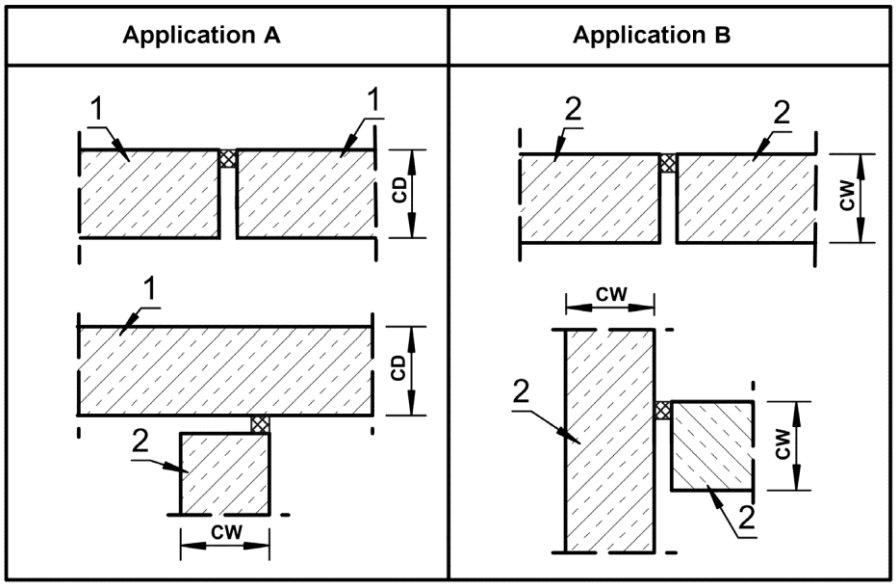
The separating building elements shall be classified according to EN 13501-2 for the required fire resistance period.

2.2 Application

According to the symbolic representation of table 2, the joint seal is used

- in horizontal joints between fire-resistant separating floors or between walls abutting a floor (A)
- in vertical joints between fire-resistant separating walls (B).

Table 2



① Rigid floor

② Rigid wall

c_D Minimum thickness rigid floor 150 mm

c_W Minimum thickness rigid wall 115 mm

TENDONOL®	Annex **B 1**
Performance of the joint seal Resistance to fire - Details to the building components and overview of the applications -	

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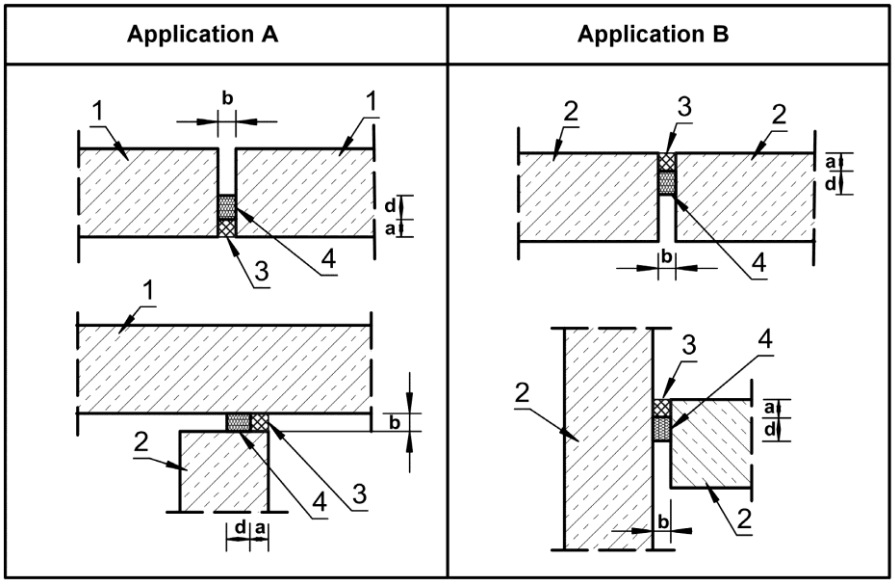
2.3 Variants

2.3.1 Variant 1

- Backfilling with lose mineral wool, stuffed density ≥ 50 kg/m^3
- Sealing one-sided
- The arrangement (top or bottom of the floor or side of the wall) is optional.

Table 3

Application	Joint width b [mm]	Filling depth a TENDONOL® [mm]	Filling depth d backfilling [mm]	Classification
A	15 to 30	30	40	EI 120-H-X-F-W10 to 30 E 120-H-X-F-W10 to 30
B	10 to 30	10	90	EI 120-V-X-F-W10 to 30 E 120-V-X-F-W10 to 30
	50	30	30	EI 90-V-X-F-W50 E 120-V-X-F-W50
	110	30	30	EI 90-V-X-F-W110 E 120-V-X-F-W110



① Rigid floor
② Rigid wall
③ TENDONOL®
④ Backfilling material

TENDONOL®	Annex **B 2**
Performance of the joint seal Resistance to fire - Variant 1 and classification -	

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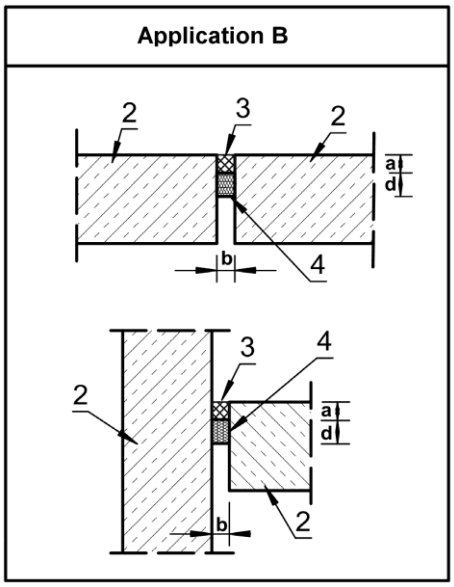
2.3.2 Variant 2

- Backfilling with mineral wool boards, nominal bulk density ≥ 80 kg/m^3
- Sealing one-sided
- The arrangement (top or bottom of the floor or side of the wall) is optional.

Table 4

Application	Joint width b [mm]	Filling depth a TENDONOL® [mm]	Filling depth d backfilling [mm]	Classification
B	20 to 40	15	90	EI 120-V-X-F-W20 to 40 E 120-V-X-F-W20 to 40
	30	30	30	EI 30-V-X-F-W30 E 120-V-X-F-W30
	31 to 50	30	30	EI 45-V-X-F-W31 to 50 E 120-V-X-F-W31 to 50
	110	30	30	EI 90-V-X-F-W110 E 120-V-X-F-W110

Application B



① Rigid floor
② Rigid wall
③ TENDONOL®
④ Backfilling material

TENDONOL®	Annex **B 3**
Performance of the joint seal Resistance to fire - Variant 2 and classification -	

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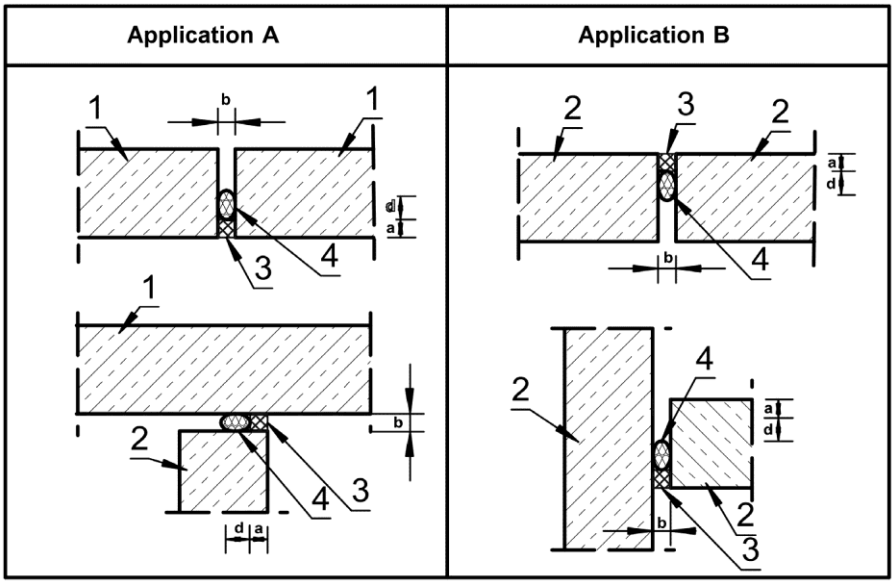
2.3.3 Variant 3

- Backfilling with PE round cord
- Sealing one-sided
- The arrangement (top or bottom of the floor or side of the wall) is optional.

Table 5

Application	Joint width b [mm]	Filling depth a TENDONOL® [mm]	Ø d backfilling [mm]	Classification
A	5	20	10	EI 120-H-X-F-W5 E 120-H-X-F-W5
	6 to 14	20	≥ 1,4 x b	EI 45-H-X-F-W6 to 14 E 120-H-X-F-W6 to 14
B	10	20	20	EI 45-V-X-F-W10 E 120-V-X-F-W10
	10	30	20	EI 120-V-X-F-W10 E 120-V-X-F-W10
	11 to 14	20	≥ 1,07 x b	EI 30-V-X-F-W11 to 14 E 90-V-X-F-W11 to 14
	11 to 20	30	≥ 1,43 x b	EI 60-V-X-F-W11 to 20 E 120-V-X-F-W11 to 20
	21 to 30	30	≥ 1,6 x b	EI 45-V-X-F-W21 to 30 E 120-V-X-F-W21 to 30
	11 to 20	40	≥ 1,5 x b	EI 90-V-X-F-W11 to 20 E 120-V-X-F-W11 to 20
	21 to 30	40	≥ 1,3 x b	EI 120-V-X-F-W21 to 30 E 120-V-X-F-W21 to 30



① Rigid floor
② Rigid wall
③ TENDONOL®
④ Backfilling material

TENDONOL®	Annex **B 4**
Performance of the joint seal Resistance to fire - Variant 3 and classification -	

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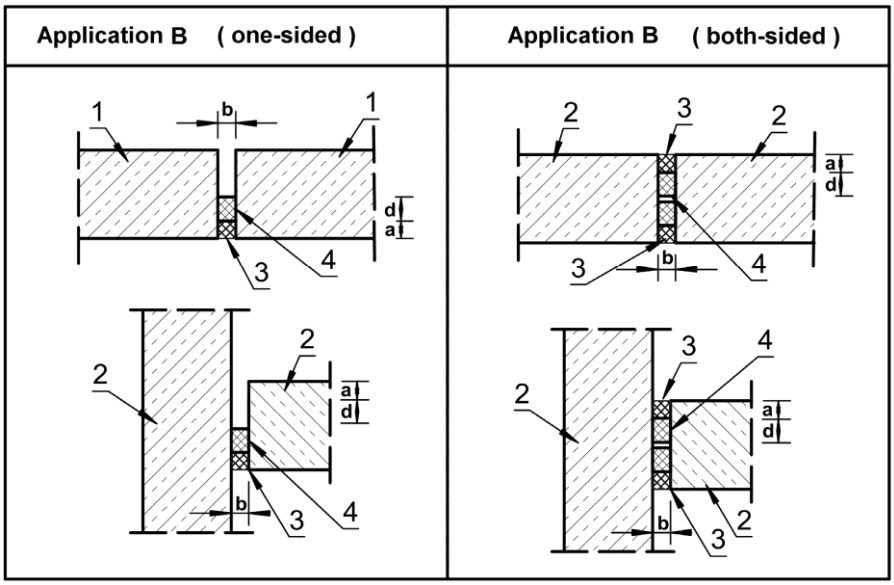
2.3.4 Variant 4

- Backfilling with Polystyrene
- Sealing one-sided or both-sided

Table 6

Application	Joint width b [mm]	Filling depth a TENDONOL® [mm]	Filling depth d backfilling [mm]	Classification
B	10	20 (one-sided)	30	EI 120-V-X-F-W10 E 120-V-X-F-W10
	11 to 14	20 (one-sided)	60	EI 45-V-X-F-W11 to 14 E 90-V-X-F-W11 to 14
	11 to 30	30 (one-sided)	30	EI 45-V-X-F-W11 to 30 E 120-V-X-F-W11 to 30
	30	2 x 15 (both-sided)	85	EI 120-V-X-F-W10 to 30 E 120-V-X-F-W10 to 30



① Rigid floor
② Rigid wall
③ TENDONOL®
④ Backfilling material

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2.6 Installation of the joint seal

The joints and surfaces TENDONOL® will be applied in or on have to be cleaned of loose debris or dirt. If necessary, the edges of the joints have to be pretreated with TENDONOL®.

The backfilling material and TENDONOL® are inserted into the joint. For the dimensions verified, Annexes B 2 to B 5 shall be taken into account.

Already existing rests of material inside the joint do not need to be removed provided that the minimum thickness of the sealing compound will be maintained in accordance with Annexes B 2 to B 5.

The ETA is issued under the assumption that the installation of the construction product is in accordance with the manufacturer's installation instructions.

TENDONOL®	Annex **B 6**
Performance of the joint seal Resistance to fire - Installation details of the verified joint sealing -	

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Standards

EN 13501-1	Fire classification of construction products and building elements, part 1: Classification using data from reaction to fire tests
EN 13501-2	Fire classification of construction products and building elements, part 2: Classification using data from fire resistance tests, excluding ventilation services
EN 1363-1	Fire resistance tests – Part 1: General requirements
EN 1366-4	Fire resistance tests for service installations – Part 4: Linear joint seals
EN 13823	Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item
EN ISO 11925-2	Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2010)
EN 13162	Thermal insulation products for buildings - Factory made mineral wool (MW) products - Specification
EN 14309	Thermal insulation products for building equipment and industrial installations - Factory made products of expanded polystyrene (EPS) - Specification
EN 12390-8	Testing hardened concrete - Part 8: Depth of penetration of water under pressure

Other documents

ETAG No 026-1 (Edition September 2012)
Guideline for European Technical Approval for Fire Stopping and Fire Sealing Products – Part 1: General

ETAG No 026-3 (Progress file August 2011)
Guideline for European Technical Approval for Fire Stopping and Fire Sealing Products – Part 3: Linear joint and gap seals

TR 024	Characterisation, Aspects of Durability and Factory Production Control for Reactive Materials, Components and Products (Edition November 2006, amended July 2009)
TR 034	General BWR 3 Checklist for EADs/ETAs - Dangerous substances (October 2015)