

EUROPEAN ASSESSMENT DOCUMENT

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FLEXIBLE PLUG EXPANSION JOINTS FOR ROAD BRIDGES WITH FLEXIBLE FILLING BASED ON A SYNTHETIC POLYMER AS BINDER

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

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1 SCOPE OF THE EAD

1.1 Description of the construction product

A flexible plug expansion joint for road bridges according to this EAD is an in-situ poured joint comprising a specially formulated flexible polymer material, which also forms the surfacing, supported over the deck joint gap by thin metal plates and other suitable components. The material used in the flexible filling mixture is based on synthetic polymer.

This EAD is applicable to the flexible plug expansion joint kit for road bridges which is consisting of the following components:

- Joint filling mixture based on synthetic polymer with additional filling material
- Surface dressing
- Bridging plate
- Debonding strip
- Sliding plate, where relevant
- Anchorage system for bridging plate, where relevant
- Anchorage system for L-brackets, where relevant
- L- brackets, where relevant
- Movement aid (Distribution system) coil springs, where relevant

The product is not covered by a harmonised European standard (hEN).

The product is not fully covered by the following harmonised technical specification:

ETAG 032, Part 3 used as EAD, Edition May 2013, because of the following:

ETAG 032, Part 3 used as EAD, specifies the scope of products in the following way:

“Definition for Flexible Plug Expansion Joint given in part 1, Clause 2.1.2.2 applies. The following definition details the general definition given in cl. 2.1.2.2 of part 1. It is assumed that the binder used in a joint filling mixture is based on bituminous mixture (these are referred to “conventional material”).”

This means that ETAG 032, Part 3, is linked to this “conventional” bituminous based material, especially some of the assessment methods, in particular most of them used for the assessment of the components, are applicable for this material only. ETAG 032 Part 3 does not cover the product according to this EAD.

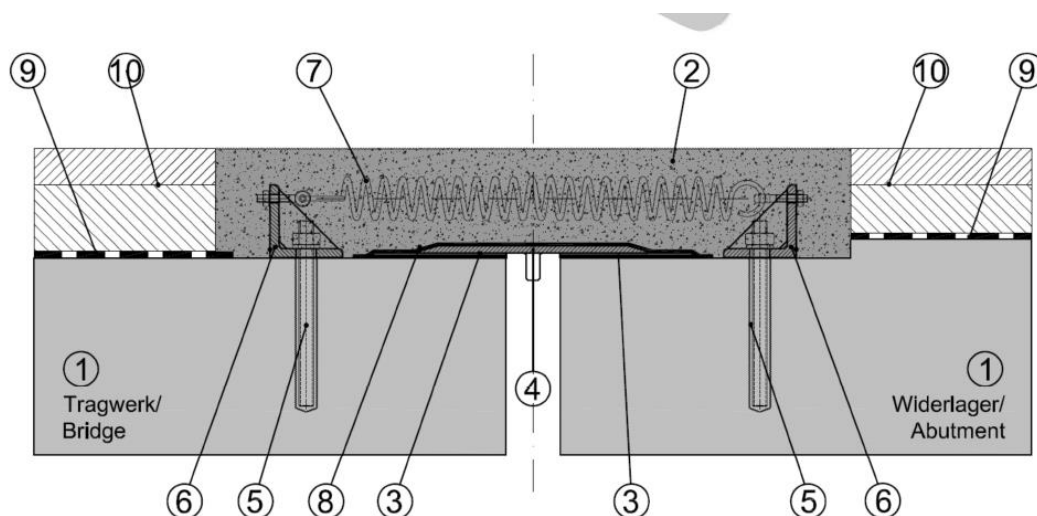


Figure 1: Cross section of the flexible plug expansion joint according to this EAD

Key for Figure 1:

- (1) Bridgedeck / abutment (not part of the kit)
- (2) Joint filling mixture consisting of flexible polymer and additional filling material made of rubber granules
- (3) Sliding plate (where relevant)
- (4) Bridging Plate
- (5) Anchorage system (where relevant)
- (6) L - Brackets (where relevant)
- (7) Movement aid (Distribution system) – coil springs (where relevant)
- (8) Debonding strip
- (9) Bridge deck waterproofing (not part of the kit)
- (10) Adjacent Pavement (not part of the kit)

Surface dressing (not shown in Figure 1).

Note: “Where relevant” means depending on the design

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer’s instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer’s stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

1.2.1.1 Use categories

The use categories, specified with regard to the user and structure considerations according to ETAG 032, Part 1 are as follows:

User categories:

- Vehicles
- Cyclists
- Pedestrians

Action categories:

- Standard action

Flexible plug expansion joints for moveable bridges are not covered by this EAD.

Note: Actions like accidental loads on devices for footpath and collision on kerbs are not considered because such elements are not part of the kit.

1.2.1.2 Operating temperature

ETAG No. 032 Part 1 and Part 3 apply in principle.

In accordance with ETAG 032 Part 1 for products according to this EAD the following level of minimum and maximum operating temperature shall be considered:

Level of minimum operating temperature: - 20 °C

Level of maximum operating temperature: + 45 °C

The entire assessment methods described in this EAD generally cover the operating temperature range - 20 °C to + 45 °C. For the assessment of the flexible joint filling material clause 2.2.2.1 in this EAD applies.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the flexible plug expansion joint kit for the intended use of 10 years (see working life category 1 in ETAG 032, Part 1) when installed in the works (provided that the flexible plug expansion joint kit is subject to appropriate installation (see 1.1)). These provisions are based upon the assessment of resistance to fatigue and durability aspects according to clause 2.2.1.1.2 and clause 2.2.2.1.5 of this EAD and the current state of the art and the available knowledge and experience for the joint filling mixture, expressed for such type of material in ETAG 005, Part 6.

When assessing the product the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works¹.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

For expansion joint kits according to this EAD there are no components which need to be replaced.

It is likely that the working life of the Flexible Plug Expansion Joint is influenced by the following:

- Adjacent pavement,
- Traffic behaviour (including stationary, rolling, queuing traffic),
- Temperature,
- Slope of pavement.

The aspects stated above have to be given in the ETA in conjunction with the indication about the working life.

1.3 Specific terms used in this EAD (if necessary in addition to the definitions in CPR, Art 2)

For the purposes of this EAD, the specific terms and definitions given in ETAG 032, Part 1, apply.

Additional terminology to ETAG 032, Part 1.

1.3.1 Joint filling mixture

Mixture based on synthetic polymer (2-component polyurethane mixture), supplemented with additional filling material made of rubber granules.

1.3.2 Sliding plate

Device in order to increase the movement capacity.

¹ The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

2.1.1 Essential characteristics of the assembled system

Table 1 shows how the performance of the flexible plug expansion joint kit is assessed in relation to the essential characteristics.

Table 1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Mechanical resistance	2.2.1.1.1	Level (reaction forces)
2	Resistance to fatigue	2.2.1.1.2	Description, level
3	Movement capacity	2.2.1.1.3	Level
4	Resistance to wear	2.2.1.1.4	Description
5	Water tightness	2.2.1.1.5	Description
Basic Works Requirement 4: Safety and accessibility in use			
6	Level differences in the running surface under unloaded conditions	2.2.1.2.1	Level
	Level differences in the running surface under loaded conditions	2.2.1.2.2	Level
7	Skid resistance	2.2.1.3	Level

2.1.2 Essential characteristics of the components of the flexible plug expansion joint kit

2.1.2.1 Joint filling mixture based on synthetic polymer, including additional filling material

Table 1a shows how the performance of the joint filling mixture based on synthetic polymer, including additional filling material is assessed in relation to the essential characteristics.

Table 1a Essential characteristics of the hardened joint filling mixture based on synthetic polymer, including additional filling material, and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Hardness Shore A	2.2.2.1.1	Level
2	Tensile stress	2.2.2.1.2	Level
3	Elongation at tensile stress	2.2.2.1.3	Level
4	Bond strength to support	2.2.2.1.4	Level
5	Durability aspects	2.2.2.1.5	
	Resistance against chemicals (petrol, diesel, de-icing salt, alkali)	2.2.2.1.5.1	Description
	Ageing resulting from accelerating temperature	2.2.2.1.5.2	Description
	Ageing resulting from UV radiation and weathering	2.2.2.1.5.3	Description
	Ageing resulting from ozone	2.2.2.1.5.4	Description
	Resistance against freeze thaw including de-icing salts	2.2.2.1.5.5	Description
Basic Works Requirement 2: Safety in case of fire			
6	Reaction to fire	2.2.2.1.6	Class

For the joint filling mixture as defined in Clause 1.3.1 in this EAD there exist possible variants of the base materials and its composition to be used for the joint filling mixture, including additional filling materials. In order to ensure the equivalence and transparency for the composition of the joint filling mixture of the product subject to the assessment of the performances to be stated in the European Technical Assessment, the relevant parameters of the special joint filling mixture and related filling material are stated in Annex A of this EAD, including related assessment methods. They are considered as confidential and are laid down in the technical documentation deposited by the manufacturer with the Technical Assessment Body.

2.1.2.2 Surface dressing

Table 1b shows how the performance of the surface dressing (made of aluminium oxide with defined grain size) is assessed in relation to the essential characteristics.

Table 1b Essential characteristics of the surface dressing and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 4: Safety and accessibility in use			
1	Type grain and size	2.2.2.2.1	Level, description

2.1.2.3 Movement aid

Table 1c shows how the performance of the movement aid, where relevant for the design, consisting of coil springs made of metal, is assessed in relation to the essential characteristics.

Table 1c Essential characteristics of the movement aid and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Material quality	2.2.2.3.1	Description
2	Dimensions	2.2.2.3.2	Description

2.1.2.4 Sliding plate

Table 1d shows how the performance of the sliding plate, made of Teflon (UHMW-PE), is assessed in relation to the essential characteristics.

Table 1d Essential characteristics of the sliding plate and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Ball compressive hardness	2.2.2.4.1	Level
2	Impact strength	2.2.2.4.2	Level
3	Notched impact strength	2.2.2.4.3	Level

2.1.2.5 Anchorage system for L-Brackets

For the anchorage system, consisting of a bolt kit, assessment of this component shall be done in equivalence to ETAG N°032, Part 3, as detailed in clause 2.2.2.5 of this EAD.

2.1.2.6 Anchorage system for bridging plate

For the anchorage system for bridging plate, assessment of this component shall be done in equivalence to ETAG N°032, Part 3, as detailed in clause 2.2.2.6 of this EAD.

2.1.2.7 Bridging plate

For the assessment of this component, see clause 2.2.2.7 of this EAD. Assessment of mechanical resistance is covered by clause 2.2.1.1 of this EAD.

2.1.2.8 L-Brackets

For L-Brackets, assessment of this component shall be done in equivalence to ETAG N°032, Part 3, as detailed in clause 2.2.2.8 of this EAD.

2.1.2.9 Debonding strip

Table 1e shows how the performance of the debonding strip made of elastomer foil is assessed in relation to the essential characteristics.

Table 1e Essential characteristics of the debonding strip and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Dimensions	2.2.2.9.1	Level
2	Tensile strength	2.2.2.9.2	Level
3	Elongation at break	2.2.2.9.3	Level
4	Tear resistance	2.2.2.9.4	Level

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

2.2.1 Methods and criteria for assessing the performance of the assembled system in relation to essential characteristics of the assembled system

2.2.1.1 Mechanical resistance and stability

See ETAG 032 Part 3.

The mechanical resistance of the kit depends mainly on the bridging plate behaviour in the usual range of temperature. Therefore, the mechanical resistance of the filling material in the ULS condition is considered not relevant.

The specific Limit State requirements for this product family are defined in Table 4.1.1 of ETAG 032, Part 3.

2.2.1.1.1 Mechanical resistance

For general aspects see ETAG 032, Part 3, and clause 2.2.1.1 in this EAD.

ETAG 032, Part 3, clause 5.1.1.2, applies with the following deviations/precisions to Annex 3-M of ETAG 032, Part 3:

Test specimen (including the movement aid, where relevant, and additional filling material for the joint filling mixture): Depth according to assembled kit; Full scale assembled joint (see Annex 3-M.6 in ETAG 032, Part 3) is related to criteria given in Table 4.1.1 of ETAG 032, Part 3.

Assessment according to ETAG 032, Part 3, clause 6.1.1.2.

2.2.1.1.2 Resistance to fatigue

For general aspects, see ETAG 032 Part 3 and clause 2.2.1.1 in this EAD.

For the assessment ETAG 032, Part 3, Annex 3-M, applies. The test specimen includes the movement aid, where relevant.

Assessment according to ETAG 032, Part 3, clause 6.1.1.3, including the deviations according to this EAD.

2.2.1.1.3 Movement capacity

The movement capacity is determined by the manufacturer (see ETAG 032, Part 3).

For the assessment of movement capacity, including movement aid where relevant, the assessment method according to ETAG 032, Part 3, Annex 3-N, applies with the following precisions:

The assessment method according to Annex 3.N.7, Method a) in ETAG 032-3, is carried out at two constant temperatures (-20 °C and + 45 °C) in order to cover the operating temperature.

For fast occurring movements, the assessment method according to Annex 3.N.7, Method b) in ETAG 032-3, applies.

When subjected to the assessment as defined above and according to the movement capacity determined by the manufacturer, there shall be no cracking or debonding of the filling mixture (including minor surface cracking of less than 1mm depth and width) and the filling material shall remain watertight.

The reaction forces shall be stated in the ETA.

2.2.1.1.4 Resistance to wear

For wear in the sense of ETAG No 032, Part 1, the assessment is related to wear in the bridging plate and the sliding plate. Wear in these elements shall not lead to de-bonding and/or cracking of the filling mixture. Assessment is covered by the assessment method for the movement capacity.

Resistance to wear shall be described according to ETAG No 032, Part 1.

2.2.1.1.5 Water tightness

ETAG 032, Part 3, clause 4.1.1.8, and ETAG 032, Part 1, clause 5.1.1.8, apply.

The test shall be carried out on one type at maximum opening position after the movement test.

Assessment shall be done according to ETAG 032, Part 3, clause 6.1.1.8.

2.2.1.2 Level differences in the running surface

2.2.1.2.1 Level differences in the running surface under unloaded conditions

For the assessment ETAG 032, Part 3, applies.

2.2.1.2.2 Level differences in the running surface under loaded conditions

For the assessment ETAG 032, Part 3, applies.

For the assessment of level differences under loaded conditions the assessment method for assessment of fatigue according to this EAD shall be used.

In addition, the value of level differences after loading shall be stated in the ETA.

2.2.1.3 Skid resistance

For the assessment ETAG 032, Part 3, applies.

2.2.2 Methods and criteria for assessing the performance of the components of the assembled system in relation to essential characteristics

2.2.2.1 Joint filling material based on synthetic polymer (including filling material)

2.2.2.1.1 Hardness Shore A

The Hardness Shore A of hardened mixture of the joint filling mixture shall be assessed in accordance with EN ISO 868.

2.2.2.1.2 Tensile stress

The tensile stress of the joint filling mixture, without movement aids but with additional filling material, shall be assessed in accordance with EN ISO 527-2, test sample: Type 1B, at the thickness of 8-10 mm, whereas a test speed of 50 mm/min shall be used.

Assessment shall be done on basis of the conditions given in EN ISO 527-2. The related tolerance is considered as a manufacturer declared value, laid down in the manufacturer's technical documentation.

2.2.2.1.3 Elongation at tensile stress

The elongation at tensile stress of the joint filling mixture, without movement aids but with additional filling material, shall be assessed in accordance with EN ISO 527-2, test sample: Type 1B, at the thickness of 8-10 mm, whereas a test speed of 50 mm/min shall be used.

Assessment shall be done on basis of the conditions given in EN ISO 527-2. The related tolerance is considered as a manufacturer declared value, laid down in the manufacturer's technical documentation.

2.2.2.1.4 Bond strength to support

The bond strength between the joint filling and the support shall be assessed in equivalence to EN 13596. The test shall be performed on a Type 1 specimen prepared in equivalence to EN 13375. Instead of steel or concrete support, the epoxy-concrete for the support of the joint may be used.

The mode of failure is expressed as the percentage area and site of fracture in the system under test, in terms of adhesive, cohesive or adhesive/cohesive failure and shall be stated in the ETA.

The mode of failure may be described as follows:

- Cohesive failure of support
- Adhesive failure between support and filling mixture
- Cohesive failure in filling mixture
- Combination of above-mentioned failure modes

2.2.2.1.5 Durability aspects

2.2.2.1.5.1 Resistance against chemicals (petrol, diesel, de-icing salt, alkali)

Assessment of resistance against petrol and diesel shall be done according to EN 13529, whereas the duration of exposure is defined with 3 days in order to cover ordinary and extraordinary situations. Solutions to be used are defined in Annex A of EN 13529. Assessment shall be done on filling mixture without surface layer.

Assessment of de-icing salts (alkali) is covered by clause 2.2.2.1.5.5 in this EAD.

The joint filling material shall retain its functionality following exposure to defined chemicals agents stated above.

2.2.2.1.5.2 Ageing resulting from accelerating temperature

The resistance to ageing by accelerating temperature (70 °C/28d) shall be assessed in accordance with EOTA TR 011. Assessment shall be done on filling mixture without surface layer.

Changes of the bond strength, tensile stress, hardness Shore A, micro hardness according to ISO 48 shall not affect the durability performance of the filling material. E.g. the change of related values before and after ageing can be evaluated in comparison with changes taken place for products already in use (products installed and therefore subjected to field-testing). Changing in appearance (cracking, bubbles, colour) shall be described.

2.2.2.1.5.3 Ageing resulting from UV radiation and weathering

Specimens shall be exposed in accordance with EOTA TR 010 for a total of 2020 hours for a working life of 10 years. Assessment shall be done on filling mixture without surface layer.

The relative change in % related to the unconditioned specimens is of relevance.

Changes of the bond strength, tensile stress, hardness Shore A, micro hardness according to ISO 48 and it shall not affect the durability performance of the filling material. E.g. the change of related values before and after ageing can be evaluated in comparison with changes taken place for products already in use (products installed and therefore subjected to field-testing).

2.2.2.1.5.4 Ageing resulting from ozone

Assessment according to ETAG 032, Part 1. Assessment shall be done on filling mixture without surface layer.

2.2.2.1.5.5 Ageing resulting from freeze/thaw and de-icing salts

The specimens, shall be subjected to 50 cycles in accordance with EN 13687-1, whereas the resistance to alkali is covered in general by using a 1% NaOH solution. The duration of exposure is defined with 3 days in order to cover ordinary and extraordinary situations. Assessment shall be done on filling mixture without surface layer.

The relative change in % related to the respective value of the unconditioned specimens is of relevance.

Changes of the bond strength according to EN 13687-1 and, in addition, tensile stress, hardness Shore A, micro hardness according to ISO 48 shall not affect the durability performance of the filling material. E.g. the change of related values before and after ageing can be evaluated in comparison with changes taken place for products already in use (products installed and therefore subjected to field-testing).

2.2.2.1.6 Reaction to fire

The filling material (without surface dressing) shall be assessed, using the test method(s) relevant for the corresponding reaction to fire class, in order to be classified according to EN 13501-1.

2.2.2.2 Surface dressing

2.2.2.2.1 Type grain and size

The type and grain size shall be stated on basis of the assessment method given in EN 932-3 (visual check and description of grain shape).

In addition, the technical data sheet, including information of chemical composition, forms part of the manufacturer's technical documentation, deposited with the Technical Assessment Body.

2.2.2.3 Movement aid

2.2.2.3.1 Material quality

Material quality shall be stated according to the relevant technical specification.

For the assessment EN 10025-2 applies.

2.2.2.3.2 Dimensions

Assessment shall be done by means of gauge.

2.2.2.4 Sliding plate

2.2.2.4.1 Ball compressive hardness

Assessment according to the ISO 2039-1.

2.2.2.4.2 Impact strength

Assessment according to the EN ISO 179-1.

2.2.2.4.3 Notched impact strength

Assessment according to the ISO 11542-2.

2.2.2.5 Anchorage system for L-Brackets

Due to non-dynamic loading of the anchorage bolts, which are used for the anchorage of the L-Brackets, for the assessment of the anchorage bolts and related ancillaries as far as relevant the essential characteristics given in Table 2.1 of EAD 330232-00-0601, or equivalent technical specification, apply.

2.2.2.6 Anchorage system for bridging plate

Due to non-dynamic loading of the anchorage bolts, which are used for the anchorage of the bridging plate, for the assessment of the anchorage bolts and related ancillaries as far as relevant the essential characteristics given in Table 2.1 of EAD 330232-00-0601, or equivalent technical specification, apply.

2.2.2.7 Bridging plate (without fixing)

For the bridging plate the following parameters shall be assessed according to the relevant standard, as indicated in ETAG 032, Part 3:

- Yield point,
- Tensile strength,
- Elongation at rupture,
- Chemical composition (C-eq.)

For corrosion ETAG 032, Part 3 applies.

2.2.2.8 L-Brackets

For the L-Brackets the following parameters shall be assessed according to the relevant standard, as indicated in ETAG 032, Part 3:

- Yield point,
- Tensile strength,
- Elongation at rupture,
- Chemical composition (C-eq.)

For corrosion ETAG 032, Part 3 applies.

2.2.2.9 Debonding strip

2.2.2.9.1 Dimensions

Assessment of the thickness shall be done according to ISO 2286-3.

2.2.2.9.2 Tensile strength

Assessment shall be done according to ISO 37.

2.2.2.9.3 Elongation at break

Assessment shall be done according to the ISO 34-1.

2.2.2.9.4 Tear resistance

Assessment shall be done according to the ISO 37.

In addition, the technical data sheet forms part of the manufacturer's technical documentation, deposit with the Technical Assessment Body.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is: Decision 2001/19/EC (EU)

The system is: 1

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the flexible plug expansion joint kit in the procedure of assessment and verification of constancy of performance are laid down in Table 2 to 2i.

In case of components manufactured by separate manufacturers, the FPC as indicated in the tables below is related to the manufacturer of the flexible plug expansion joint kit.

Table 2 Control plan for the flexible plug expansion joint kit; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Incoming material	Purchasing of raw materials and components Batch identification and traceability Acceptance test or supplier's declaration of performance			Each Delivery
2	Finished component and in-process tests	Sales order processing Work instructions Quality control Reject / rework			Each Batch / Production run
3	Storage and dispatch	Stock control			Each order

Table 2a Control plan for the joint filling material based on synthetic polymer (without additional filling material); cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Viscosity	A.1.1	Declared value + related tolerance	Each batch	
2	Density	A.1.2		Each batch	
3	Isocyanate content comp. B	A.1.3		Each batch	
4	IR- spectroscopy comp. A/B and hardened joint filler	A.1.4	No change	Each batch	
5	TGA of hardened joint material	A.1.5	Acceptable change in slope; change in residual content at 125 °C/550 °C/900 °C	At least once a year	
6	DMA	A.1.6	Acceptable change in slope for relevant dynamic elastic characteristics	Once a year	

Table 2b Control plan for the joint filling material based on synthetic polymer (with additional filling material); cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Hardness Shore A of hardened mixture	2.2.2.1.1	Change not more than ± 5	Each batch (batch means production unit)	
2	Tensile stress of hardened mixture	2.2.2.1.2	+/- 20 %	Each batch	
3	Elongation at tensile stress of hardened mixture	2.2.2.1.3	+/- 30 %	Each batch	

Table 2c Control plan for the additional filling material as supplement to synthetic polymer; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Type and grain size	A.2.1	MDV *)	Each batch	
2	Moisture content	A.2.2	MDV *)	Each batch	

*) MDV Manufacturers declared value established by the manufacturer of the kit in relation to the performances of the kit

Table 2d Control plan for the surface dressing; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Type and grain size	2.2.2.2.1	2.2.2.2.1	Each delivery	1
2	Chemical composition	Each delivery: Confirmation with technical data sheet			

Table 2e Control plan for the movement aid; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Material quality	2.2.2.3.1	2.2.2.3.1	Each delivery:	Confirmation with technical data sheet
2	Dimensions	Each delivery: Confirmation with technical data sheet			

Table 2f Control plan for the sliding plate; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Ball compressive hardness	2.2.2.4.1	MDV *)	Each delivery: Confirmation with technical data sheet	
2	Impact strength	2.2.2.4.2			
3	Notched impact strength	2.2.2.4.3			
4	Dimensions	Each delivery: Confirmation with technical data sheet			

*) MDV Manufacturer declared value established by the manufacturer of the kit in relation to the performances of the kit

Table 2g Control plan for the anchorage system of the bridging plate and the L-Brackets; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Parameters laid down in control plan according to clause 2.2.2.5 and 2.2.2.6 in this EAD	Laid down in control plan based on Clause 2.2.2.5 and 2.2.2.6 in this EAD			

Table 2h Control plan for the bridging plate and L-Brackets; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Yield point	2.2.2.7/2.2.2.8		Each delivery: Inspection document Type 3.1 according to EN 10204	
2	Tensile strength	2.2.2.7/2.2.2.8			
3	Elongation at rupture	2.2.2.7/2.2.2.8			
4	Chemical composition	2.2.2.7/2.2.2.8			
5	Dimensions (thickness, width)	Measurement by gauge		1 Sample for each order	

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
6	Corrosion protection	2.2.2.7/2.2.2.8		Each delivery: Inspection document Type 3.1 according to EN 10204	

Table 2i Control plan for the debonding strip; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Dimensions	2.2.2.9.1	MDV*)	Each delivery: Confirmation with technical data sheet	
2	Tensile strength	2.2.2.9.2			
3	Elongation at break	2.2.2.9.3			
4	Tear resistance	2.2.2.9.4			

*) MDV Manufacturer declared value established by the manufacturer of the kit in relation to the performances of the kit

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the procedure of assessment and verification of constancy of performance for the flexible plug expansion joint kit are laid down in Table 3 to 3i. The tasks of the notified body are referred to assessment and verification of constancy of performance on the level of the flexible plug expansion joint kit manufacturer as detailed in the tables thereafter.

Table 3 Control plan for the notified body for the flexible plug expansion joint kit; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Items indicated in Table 2 of this EAD	Control of documentation of FPC		1	
Continuous surveillance, assessment and evaluation of factory production control					
2	Items indicated in Table 2 of this EAD	Control of documentation of FPC			At least once a year

Table 3a Control plan for the notified body for the joint filling mixture based on synthetic polymer (without additional filling material); cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Parameters according to Table 2a of this EAD	Control of devices and equipment and documentation of FPC			1
Continuous surveillance, assessment and evaluation of factory production control					
2	Parameters according to Table 2a of this EAD	Control of documentation of FPC			At least once a year

Table 3b Control plan for the notified body for the joint filling mixture based on synthetic polymer (including additional filling material); cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Parameters according to Table 2b of this EAD	Control of devices and equipment and documentation of FPC			1
Continuous surveillance, assessment and evaluation of factory production control					
2	Parameters according to Table 2b of this EAD	Control of documentation of FPC			At least once a year

Table 3c Control plan for the notified body for the additional filling material as supplement to synthetic polymer; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Parameters according to Table 2c of this EAD	Control of devices and equipment and documentation of FPC			1
Continuous surveillance, assessment and evaluation of factory production control					
2	Parameters according to Table 2c of this EAD	Control of documentation of FPC			At least once a year

Table 3d Control plan for the notified body for the surface dressing; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Parameters according to Table 2d of this EAD	Control of devices and equipment and documentation of FPC			1
Continuous surveillance, assessment and evaluation of factory production control					
2	Parameters according to Table 2d of this EAD	Control of documentation of FPC for the component			At least once a year

Table 3e Control plan for the notified body for the movement aid; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Parameters according to Table 2e of this EAD	Control of devices and equipment and documentation of FPC			1
Continuous surveillance, assessment and evaluation of factory production control					
2	Parameters according to Table 2e of this EAD	Control of documentation of FPC for the component			At least once a year

Table 3f Control plan for the notified body for the sliding plate; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Parameters according to Table 2f of this EAD	Control of devices and equipment and documentation of FPC			1
Continuous surveillance, assessment and evaluation of factory production control					
2	Parameters according to Table 2f of this EAD	Control of documentation of FPC			At least once a year

Table 3g Control plan for the notified body for the bolt kits for the bridging plate and L-Brackets; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Parameters according to Table 2g of this EAD	Control of devices and equipment and documentation of FPC			1
Continuous surveillance, assessment and evaluation of factory production control					
2	Parameters according to Table 2g of this EAD	Control of documentation of FPC for the component			At least once a year

Table 3h Control plan for the notified body for the bridging plate and L-Brackets; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Parameters according to Table 2h of this EAD	Control of devices and equipment and documentation of FPC			1
Continuous surveillance, assessment and evaluation of factory production control					
2	Parameters according to Table 2h of this EAD	Control of documentation of FPC for the component			At least once a year

Table 3i Control plan for the notified body for the debonding strip; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Parameters according to Table 2i of this EAD	Control of devices and equipment and documentation of FPC			1
Continuous surveillance, assessment and evaluation of factory production control					
2	Parameters according to Table 2i of this EAD	Control of documentation of FPC			At least once a year

4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment, is of relevance.

- CPR Regulation (EU) No 305/2011 of the European Parliament and of the of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC
- EAD 330232-00-0601 Mechanical fasteners for use in concrete
- ETAG 005 Liquid applied roof waterproofing kits. Part 6: Specific stipulations for kits based on polyurethane.
- ETAG 032 Guideline for European Technical Approval of Expansion Joints for Road Bridges. Part 1: General
- ETAG 032 Guideline for European Technical Approval of Expansion Joints for Road Bridges. Part 3: Flexible Plug Expansion Joints
- EOTA Technical Report TR 010: Exposure procedure for artificial weathering
- EOTA Technical Report TR 011 revised: Exposure procedure for accelerated ageing by heat
- EN 932-3 “Tests for general properties of aggregates - Part 3: Procedure and terminology for simplified petrographic description”
- EN 933-1 “Tests for geometrical properties of aggregates — Part 1: Determination of particle size distribution — Sieving method”
- EN 1242 “Adhesives - Determination of isocyanate content”
- EN 1767 “Products and systems for the protection and repair of concrete structures - Test methods - Infrared analysis”
- EN 10025-2 “Hot rolled products of structural steels – Part 2: Technical delivery conditions for non-alloy structural steels”
- EN 10204 “Metallic products - Types of inspection documents”
- EN 13375 “Flexible sheets for waterproofing - Waterproofing of concrete bridge decks and other concrete surfaces trafficable by vehicles - Specimens preparation”
- EN 13501-1 “Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests”
- EN 13529 “Products and systems for the protection and repair of concrete structures - Test method - Resistance to severe chemical attack”
- EN 13596 “Flexible sheets for waterproofing - Waterproofing of concrete bridge decks and other concrete surfaces trafficable by vehicles - Determination of bond strength”
- EN 13687-1 “Products and systems for the protection and repair of concrete structures - Test methods; Determination of thermal compatibility - Part 1: Freeze-thaw cycling with de-icing salt immersion”
- EN 14770 “Bitumen and bituminous binders - Determination of complex shear modulus and phase angle - Dynamic Shear Rheometer (DSR)”
- EN ISO 179-1 “Plastics – Determination of Charpy impact properties. Part 1: Non-instrumented impact test
- EN ISO 527-2 “Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics”
- EN ISO 868 “Plastics and ebonite - Determination of indentation hardness by means of a durometer (Shore hardness)”
- EN ISO 2811-1 “Paints and varnishes - Determination of density - Part 1: Pycnometer method”
- EN ISO 3219 “Plastics - Polymers/resins in the liquid state or as emulsions or dispersions - Determination of viscosity using a rotational viscometer with defined shear rate”
- EN ISO 6721-1 “Plastics - Determination of dynamic mechanical properties - Part 1: General principles”
- EN ISO 6721-2 “Plastics - Determination of dynamic mechanical properties - Part 2: Torsion-pendulum method”
- EN ISO 6721-3 “Plastics - Determination of dynamic mechanical properties - Part 3: Flexural vibration - Resonance-curve method”
- EN ISO 11358 “Plastics - Thermogravimetry (TG) of polymers - General principles”
- EN ISO 12570 “Hygrothermal performance of building materials and products — Determination of moisture content by drying at elevated temperature”
- ISO 34-1 “Rubber, vulcanized or thermoplastic -- Determination of tear strength -- Part 1: Trouser, angle and crescent test pieces”
- ISO 37 “Rubber, vulcanized or thermoplastic -- Determination of tensile stress-strain properties”

ISO 48	“Rubber, vulcanized or thermoplastic - Determination of hardness (hardness between 10 IRHD and 100 IRHD)”
ISO 2039-1	“Plastics - Determination of hardness Ball indentation method”
ISO 2286-3	“Rubber- or plastics-coated fabrics -- Determination of roll characteristics Method for determination of thickness”
ISO 4664-1	“Rubber, vulcanized or thermoplastic - Determination of dynamic properties - Part 1: General guidance”
ISO 4664-2	“Rubber, vulcanized or thermoplastic - Determination of dynamic properties - Part 2: Torsion pendulum methods at low frequencies”
ISO 11542-2	“Plastics - Ultra-high-molecular-weight polyethylene (PE-UHMW) moulding and extrusion materials Preparation of test specimens and determination of properties”

ANNEX A – PARAMETERS FOR THE SPECIAL JOINT FILLING MIXTURE

A.1 Joint filling material based on synthetic polymer (without additional filling material)

Table A.1 - Joint filling material based on synthetic polymer (without additional filling material)

No	Characterisation parameter	Assessment method	Tolerances
1	Viscosity	A.1.1	MDV ¹⁾
2	Density	A.1.2	MDV ¹⁾
3	Isocyanate content comp. B	A.1.3	MDV ¹⁾
4	IR- spectroscopy comp. A/B and hardened joint filler	A.1.4	--
5	TGA of hardened joint mixture	A.1.5	Relative deviation in mass: MDV ¹⁾
6	DMA Temp Sweep	A.1.6	G'; G'' similar course over temperature (no significant changes) $T_g \pm 5^\circ\text{C}$ but $T_g < -50^\circ\text{C}$

¹⁾ Manufacturer declared value with acceptable tolerance

A.1.1 Viscosity

The viscosity of the base materials for the joint filling mixture shall be assessed in accordance with EN ISO 3219.

A.1.2 Density

The density of the base materials for the joint filling mixture shall be assessed in accordance with EN ISO 2811 Part 1 (pycnometer method).

A.1.3 Isocyanate content (Component B)

The Isocyanate content of the concerned base material for the joint filling mixture shall be assessed in accordance with EN 1242.

A.1.4 Infrared analysis (Component A/B and hardened joint filling mixture)

The infrared analysis of the hardened joint filling mixture and its base materials shall be assessed in accordance with EN 1767, Procedure 7.1, is applicable.

The position and the relative intensity of the peaks shall be in accordance with the reference spectrum.

A.1.5 TGA Analysis

TGA-Analysis of the hardened joint filling mixture shall be assessed in accordance with EN ISO 11358.

Confirmation by comparison of the initial test and position and maximum relative deviation in mass at 125 °C, 550 °C and 900 °C, to be given.

A.1.6 DMA Temp.-sweep

Assessment of dynamic-mechanical characteristics versus temperature:

Basis of the investigation are the rules of ISO 4664. A test method according to EN ISO 6721 (solid specimen) or according to EN 14770 (cured specimen) shall be used with the following precisions.

The dynamic-mechanical behaviour shall be assessed over a temperature range from -60 °C up to +250 °C (temperature sweep) if possible. The interpretation of the results is according to EN ISO 6721. Temperature sweeps at constant frequency and constant deformation amplitude or constant shear force inside linear-viscoelastic range shall be used for the measurement of the dynamic-mechanical behaviour of the binder mass. During the measurement all parameters (controlled parameters, measured parameters) shall be documented. Depending on the binder material (for instance the dimension of the filling materials) and the test equipment a plate-plate measuring device (e.g. diameter of 12,5 mm, 25 mm or 50 mm) or solid rectangular fixture device shall be used as the measuring geometry. The gap between the plates to fill in the test material shall have a minimum distance of 2 – 3 times the dimension of the filler materials. By using a plate-plate test geometry the specimen has to be cured inside the test geometry before testing. By use of SRF test geometry specimen can be prepared from pre-prepared sheets. Free length of SRF specimen shall be 25 mm. The measurement frequency shall be 1 Hz. The tests shall be performed with falling temperature under normal force control.

First, in a preliminary test, the deformation range resp. the shear load range in which the structure of the investigated binder material remains unmodified (reversible loading = linear viscoelastic range), shall be assessed by a so-called "amplitude sweep" for the limits of the temperature range. Resulting from this test, the loading conditions ensuring linear-viscoelasticity range are assessed. (A deformation amplitude between 0,0001 – 0,001 has been shown to be expedient in most cases.) During "amplitude sweep" pre-testing as well as during "temperature sweep" test modulus the complex modulus, storage modulus, loss modulus and loss angle shall be assessed over the band of deformation/shear load resp. band of temperature.

The dynamic elastic characteristic values shall be calculated from the following equations:

$$G' = [T_0/\gamma_0] \times \cos \delta \quad \text{storage modulus } G'$$

$$G'' = [T_0/\gamma_0] \times \sin \delta \quad \text{loss modulus } G''$$

$$G^* = [(G')^2 + (G'')^2]^{1/2} \quad \text{complex modulus}$$

$$\tan \delta = G''/G' \quad \text{loss factor}$$

T_0 = shear-force amplitude in Pa

γ_0 = deformation amplitude

f = angular frequency in s^{-1}

$|G^*|$ = complex modulus in Pa

G' = storage modulus in Pa

G'' = loss modulus in Pa

δ = loss angle

and monitored over the relevant temperature range of -60 °C to 250 °C and serve as a rheological fingerprint for the relevant binder material.

From the course of the G'' the glass transition temperature is assessed at G''_{\max} .

A.2 Additional filling material (in addition to synthetic polymer) of joint filling mixture

Table A.2 - Filling material

No	Characterisation parameters	Assessment method	Tolerances
1	Type and grain size	A.2.1	MDV ¹⁾
2	Moisture content	A.2.2	MDV ¹⁾
¹⁾ Manufacturer declared value with acceptable tolerance			

A.2.1 Type and grain size

Assessment shall be done according to EN 933-1.

A.2.2 Moisture content

Assessment shall be done according to EN ISO 12570 (gravimetric method) at 105 °C to constant weight.

In addition, the technical data sheet forms part of the manufacturers technical documentation, deposit with the Technical Assessment Body.