Institut de Tecnologia de la Construcció de Catalunya

Wellington 19
ES08018 Barcelona
T +34 933 09 34 04
qualprod@itec.cat
itec.cat

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European Technical Assessment

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General part

Technical Assessment Body issuing the ETA: ITeC ITeC has been designated according to Article 29 of Regulation (EU) No 305/2011 and is member of EOTA (European Organisation for Technical Assessment)	
Trade name of the construction product	**Techstar SEJ-80 strip seal expansion joint**
Product family to which the construction product belongs	12 – Circulation fixtures: Road equipment
Manufacturer	**D.S. TECHSTAR INC.** 1219 West Main Cross Street Findlay, Ohio, USA 45840
Manufacturing plant(s)	Comprehensive list of manufacturing plants laid down in technical documentation.
This European Technical Assessment contains	12 pages including 1 annex which forms an integral part of this assessment.
This European Technical Assessment is issued in accordance with Regulation (EU) 305/2011, on the basis of	European Assessment Document EAD 120109-00-0107 *Nosing expansion joints for road bridges.*

General comments

Translations of this European Technical Assessment in other languages shall fully correspond to the original issued document and should be identified as such.

Specific parts of the European Technical Assessment

1 Technical description of the product

Techstar SEJ-80 strip seal expansion joint is a nosing expansion joint for road bridges, used to ensure the continuity of the running surface and its load bearing capacity and the movement of the bridges.

Techstar SEJ-80 strip seal expansion joint is a kit consisting of the following components:

- Flexible elastomeric sealing element made of EPDM.
- Edge profiles 'Z' shape steel beam, made of at least steel grade S355J2+N according to EN 10025-2.
- Anchorage system:

  The fixing of the edge profiles to the substructure is done by means of an anchorage system made of an anchor plate and an anchor loop.

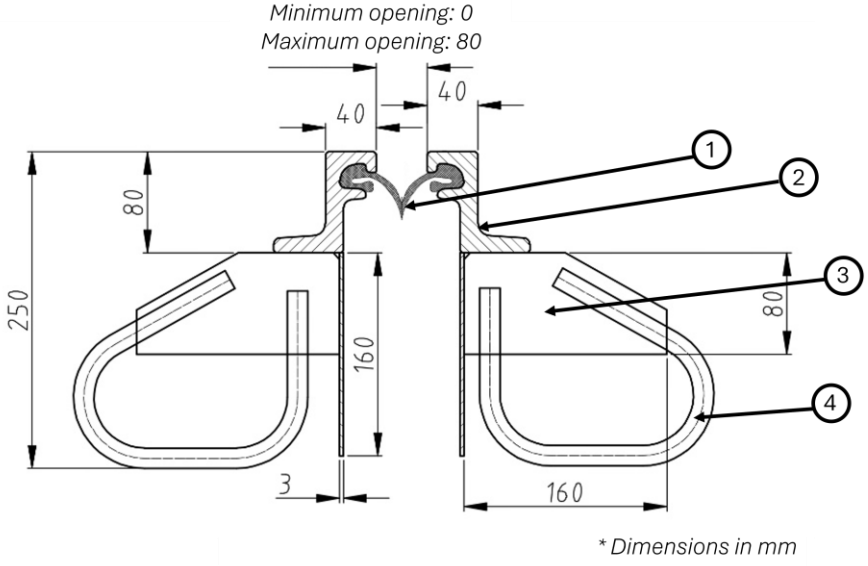
  - Anchor plate of at least steel grade S235JR according to EN 10025-2. Dimensions (mm): 160 x 80 x 14.
  - Anchor loop of at least steel grade S235JR according to EN 10025-2. Dimensions (mm): Ø16 x 460.

Concrete of minimum compressive strength class C50/60 shall be used for recess filling and reinforcement in case of concrete bridges. If an asphalt overlay is to be used, its thickness should exceed 20 mm, as stated in Table 3.3.

Detailed information and data of Techstar SEJ-80 strip seal expansion joint is given in Annex A of this ETA.

A schematic cross-section of Techstar SEJ-80 strip seal expansion joint is shown in the following figure:

Figure 1.1: Schematic cross-section of Techstar SEJ-80 strip seal expansion joint.



Key:

1. Flexible elastomeric sealing element
2. Edge profiles
3. Anchor plate
4. Anchor loop

Provisions for proper installation (installation manual) of Techstar SEJ-80 strip seal expansion joint are provided for each delivered kit.

The following components are not included in the Techstar SEJ-80 strip seal expansion joint kit:

- Noise reducing elements, and its fixations.
- Material used for connecting the joint to the substructure.
- Cover plate and its fixations.
- Waterproofing membrane clamps.

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

Techstar SEJ-80 strip seal expansion joint is intended to be used for road bridges in the following conditions:

- Operating temperature categories, defined as the shade air temperature according to EN 1991-1-5, Clause 1.5.2:
  - Level of minimum operating temperature: -40 ºC
  - Level of maximum operating temperature: +45 ºC
- Use categories specified with regard to the user and action categories:
  - User category: vehicles
  - Action category: standard action (traffic load action)

The expansion joint system is used in new structures as well as for refurbishment of existing structures. The use in moveable bridges is not covered by this ETA.

The maximum slope in traffic direction for the Techstar SEJ-80 strip seal expansion joint according to this ETA is defined in Table 3.3 of this ETA.

The provisions made in this ETA are based on an assumed working life of at least 50 years for Techstar SEJ-80 strip seal expansion joint. These provisions are based upon the current state of the art and the available knowledge and experience.

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.

The working life of the expansion joint kit is based on the assessment of resistance to fatigue according to the fatigue load model 1 ($FLM1_{EJ}$), meaning the fatigue life may be considered as unlimited according to EAD 120109-00-0107, Annex D, Clause D.2.3.3.

For corrosion protection, the indications given in Clause 3.2.1 of this ETA apply.

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

Performance of Techstar SEJ-80 strip seal expansion joint related to the basic requirements for construction works (hereinafter BWR) were determined according to EAD 120109-00-0107. Essential characteristics of Techstar SEJ-80 strip seal expansion joint are indicated in Table 3.1.

Table 3.1: Performance of Techstar SEJ-80 strip seal expansion joint.

Basic Works Requirement	**Essential characteristic**	**Performance**	
BWR 1 Mechanical resistance and stability	Mechanical resistance	See Clause 3.1.	
	Resistance to fatigue	See Clause 3.1.	
	Seismic behaviour	Not assessed	
	Movement capacity	See tables 3.4 and 3.5 in Clause 3.1.	
	Cleanability	Self-cleanable	
	Watertightness	Watertight	
	Durability	See Clause 3.2.	
BWR 3 Hygiene, health and the environment	Content and/or release of dangerous substances	Not assessed	
BWR 4 Safety and accessibility in use	Ability to bridge gaps and levels in the running surface	Allowable surface gaps and voids	See Clause 3.3.1.
		Level differences in the running surface	See Clause 3.3.2.
	Skid resistance	Not relevant (1)	
	Drainage capacity	Not relevant (2)	

Notes:

(1) According to EAD 120109-00-0107, skid resistant only applies for nosing expansion joints with flat running surfaces larger than 150 mm x 150 mm square and with surface textures less than ± 1,2 mm.

(2) According to EAD 120109-00-0107, drainage capacity only applies if the nosing expansion joint includes a drainage device.

3.1 Mechanical resistance, resistance to fatigue and movement capacity

Anchor forces are given in the table below:

Figure 3.1: Force diagram applied on the anchorage system and forces applied on the joint.

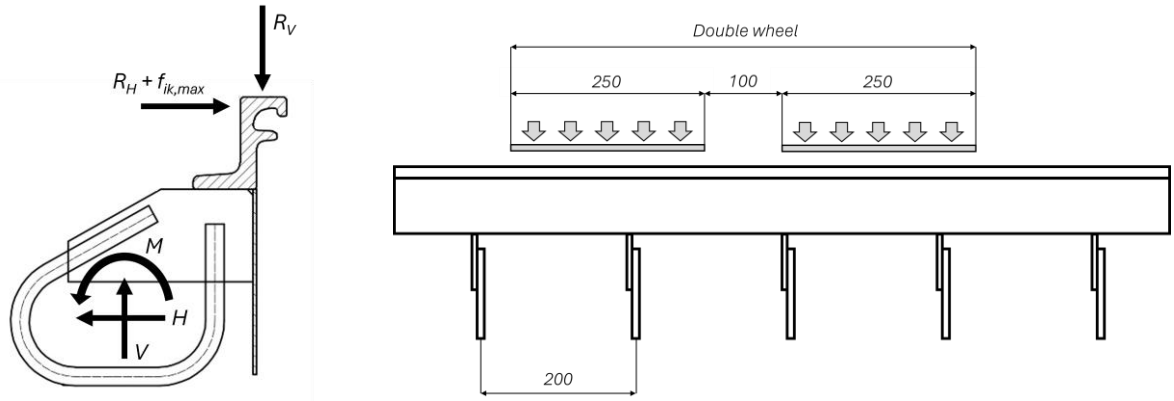


Table 3.2. Anchor forces (envelope approach maximum value (1)).

Limit state	V [kN]	H [kN]	M [kN·m]	$f_{ik,max}$ [kN/m]
ULS	40,50	8,33	6,42	0,60
SLS	30,00	6,15	4,75	0,60
FLS	21,00	5,75	3,62	--

Notes:

(1) The envelope approach, covering al design situations as set out in EAD 120109-00-0107, has been applied to obtain the maximum value of anchor forces for each limit state.

This applies to the product described in Clause 1 of this ETA, considering the following conditions:

Action categories covered by static calculation: Standard action (traffic load action) according to action categories given in Clause 1.2.1.2.2 of EAD 120109-00-0107. Actions defined in Annex D, Clause D.2.3. and D.2.4.

Load distribution and load model according to Annex D, Clause D.2.

For ultimate limit state (ULS), the combination of persistent and transient design situations (fundamental combinations of actions) are considered.

For serviceability limit state (SLS), the characteristic and frequent combinations of actions are considered.

Combination for fatigue limit state (FLS) according to Clause D.2.4.2.4 of EAD 120109-00-0107 is considered, where combination factor $\Psi_{0d} = 0,6$.

Partial factors:

$\gamma_{Ff} = 1,0$ (partial factor for fatigue loads) acc. to EN 1993-2, Clause 9.3.

$\gamma_{Mf} = 1,15$ (partial factor for fatigue resistance) acc. to EN 1993-1-9, Table 3.1.

Anchor forces resulting from FLS are given in the table above.

Loads on footways and accidental loads (vehicle on footways and cycle tracks on expansion joints) are not considered since there are not specific joints of footways and cycle tracks.

Favourable assessment of the minimum operating temperature has been done according to EN 1993-1-10, Table 2.1, and it has been referred to the maximum thickness of metallic parts to avoid brittle failure for the defined minimum operating temperature.

Preconditions for the assessment are given below:

Partial load factors:

γ_{Gi} (unfavourable) = 1,35

γ_{F1} (unfavourable) = 1,20 (consequences of failure are local and/or minor)

γ_{F2} (unfavourable) = 1,50 (consequences of failure are global and/or major)

γ_{Qi} (unfavourable) = 1,35

Partial factors γ_M:

γ_{M0} = 1,0 according to EN 1993-2, Clause 6.1.

γ_{M2} = 1,25 according to EN 1993-2, Clause 6.1.

γ_{M3} = 1,25 according to EN 1993-2, Clause 6.1.

γ_s = 1,15 according to EN 1992-1-1, Table 2.1N.

γ_c = 1,5 according to EN 1992-1-1, Table 2.1N.

γ_{Ff} = 1,0 (partial factor for fatigue loads) acc. to EN 1993-2, Clause 9.3.

γ_{Mf} = 1,15 (partial factor for fatigue resistance) acc. to EN 1993-1-9, Table 3.1.

The boundary conditions of Techstar SEJ-80 strip seal expansion joint are given in the table below:

Table 3.3: Boundary conditions of Techstar SEJ-80 strip seal expansion joint.

Maximum slope perpendicular to the joint axis	Asphalt thickness
6 %	≥ 20 mm

Factor k_1 is chosen equal to 0,85 for the fatigue resistance of concrete under compression according to EN 1992-1-1, 6.8.7.

The assessed nominal movement capacity of Techstar SEJ-80 strip seal expansion joint is given in the table 3.4 below, based on the definition of movement directions according to the figure below:

Figure 3.2: Definition of movement direction in relation to joint axis.

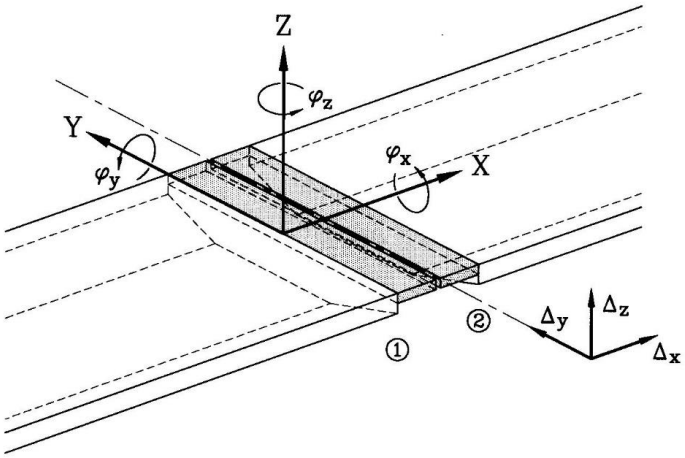


Table 3.4: Movement capacity of Techstar SEJ-80 strip seal expansion joint.

Movement capacity		
Maximum movement perpendicular to the joint axis	Max $u_{joint,x}$	80 mm (1)
Maximum transversal movement	Max u_y	± 30 mm
Maximum vertical movement	Max u_z	± 5 mm
Maximum rotations	φ_x φ_y φ_z	Limitation as given for perpendicular to the joint axis, transversal and vertical movements

Notes:

(1) The minimum opening of Techstar SEJ-80 strip seal expansion joint is 0 mm.

Reaction forces related to the movement capacity of the expansion joint are given in the table below:

Table 3.5: Comprehensive reaction forces resulting from movement capacity tests.

Reaction forces	
Maximum opening force in the longitudinal direction	0,6 kN/m
Maximum closing force in the longitudinal direction	0,4 kN/m
Maximum force in the transversal direction	2,31 kN/m

3.2 Durability

3.2.1 Corrosion

The corrosion protection of Techstar SEJ-80 strip seal expansion joint reaches a C5-M level as defined in ISO 12944.

For all steel surfaces (exposed steel surfaces – edge profiles, and non-exposed steel surfaces – anchor plates and anchor loop bars), the following measures shall be provided as corrosion protection methods:

Hot dip galvanizing with a minimum thickness h of 100 µm according to ISO 1461. Hot dip galvanizing is applied by a third party galvanizer.

3.2.2 Chemicals and loss of performance due to ageing resulting from temperature and ozone

The flexible elastomeric sealing element made of EPDM is durable to chemicals, temperature and ozone.

3.3 Ability to bridge gaps and levels in the running surface

3.3.1 Allowable surface gaps and void

The values for the allowable skew angle β (angle between the traffic direction and the longitudinal axis of the joint) and the values of the nominal movement capacity depending on the skew angle α (angle between the axis perpendicular to the main direction of the movement of the bridge and the longitudinal axis of the joint) are given in the table below:

Table 3.6: Standard geometry of Techstar SEJ-80 strip seal expansion joint in respect to its movement capacity.

User category	β	Minimum gap	Maximum gap	Maximum total movement at α
Vehicles	$90^o \geq \beta \geq 45^o$	0 mm	80 mm	60 mm at $\alpha = 45^o$c

3.3.2 Level differences in the running surface

Without any imposed horizontal deformations and in unloaded condition:

Difference in the levels of the running surface is not greater than 5 mm; steps are not greater than 3 mm.

In loaded condition:

The level differences on the running surfaces under loaded conditions is less than 1 mm.

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

According to the decision 2001/19/EC of the European Commission[1], the system of AVCP (see EC delegated regulation (EU) No 568/2014 amending Annex V to Regulation (EU) 305/2011) given in the following table applies.

Table 4.1: Applicable AVPC system.

Product	Intended use	Level or class	System
Techstar SEJ-80 strip seal expansion joint	In road bridges	---	1

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

All the necessary technical details for the implementation of the AVCP system are laid down in the *Control Plan* deposited with ITeC[2], with which the factory production control shall be in accordance.

Any change in the manufacturing procedure which may affect the properties of the product shall be notified and the necessary type-testing revised according to the *Control Plan*.

Issued in Barcelona on 23 December 2023

by the Catalonia Institute of Construction Technology.

Ferran Bermejo Nualart

Technical Director, ITeC

[1] Official Journal of the European Union (OJEU) L 005 of 10/01/2001.

[2] The *Control Plan* is a confidential part of the ETA and is only handed over to the notified certification body involved in the assessment and verification of constancy of performance.

ANNEX A: Description of Techstar SEJ-80 strip seal expansion joint

Figure A1: Detail of Techstar SEJ-80 strip seal expansion joint.

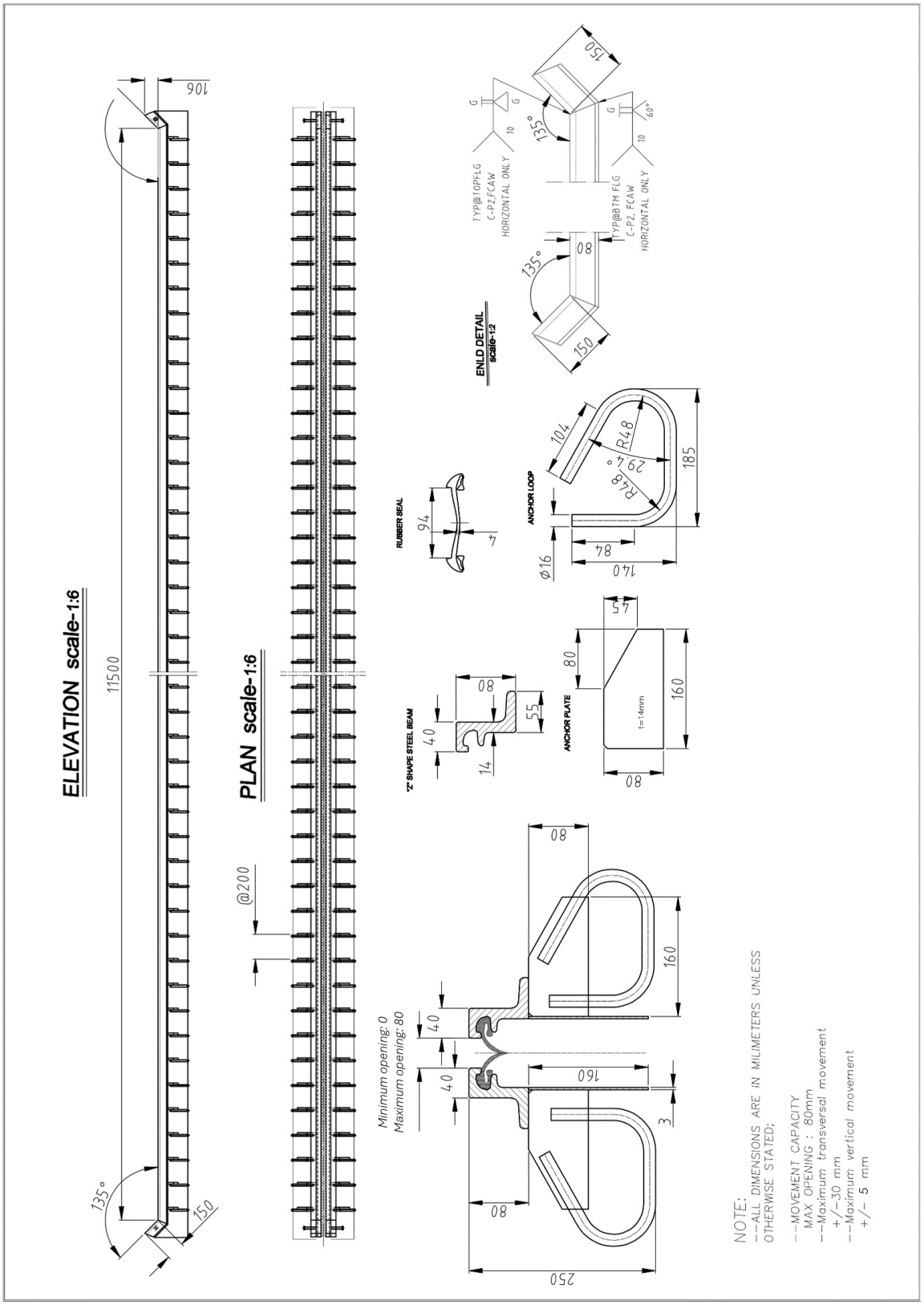


Table A.1: Components list.

Num.	Component	Material	Dimensions
1	Sealing element	EPDM	As indicated in figure A1
2	Edge profile	At least steel grade S355J2+N according to EN 10025-2.	As indicated in figure A1
3	Anchor plate	At least steel grade S235JR according to EN 10025-2.	160 mm x 80 mm x 14 mm
4	Anchor loop	At least steel grade S235JR according to EN 10025-2.	Ø16 mm x 460 mm

Table A.2: Material characteristics of the elastomer sealing elements made of EPDM.

Material characteristic	Technical specification	Nominal values
Density	ISO 1183	1,16 g/cm^3
Hardness	ISO 48-2 or ISO 48-4	60 IRHD
Tensile strength	ISO 37	≥ 9 N/mm^2
Elongation at break	ISO 37	≥ 300 %
Tear resistance	ISO 34-1, method A	≥ 15 N/mm
Compression set	ISO 815-1 24 h and 70 ºC	20% max
Thermogravimetric analysis (TGA)	ISO 9924-1 or ISO 9924-3	As laid down in technical documentation deposited within ITeC.
Brittleness test	ISO 812, method B	≤ -55ºC
Resistance to de-icing agents	ISO 1817	The requirements are met.
Resistance to temperature	ISO 188, 14 days at 70 ºC	The requirements are met.
Resistance to ozone	ISO 1431-1, method A	The requirements are met.