

# **VA / ACME / Calamity Gasket Rubber Expansion Joints**

Trelleborg Ridderkerk BV



## Contents

<b>Introduction</b>	<b>4</b>
<b>Use of expansion joint</b>	<b>5</b>
<b>Dimensions expansion gap</b>	<b>9</b>
<b>Construction expansion gap and mounting</b>	<b>11</b>
<b>Rubberquality</b>	<b>12</b>
<i>Appendix 1. Product drawings VA-profile</i>	<i>13</i>
<i>Appendix 2. Product drawings ACME-profile</i>	<i>14</i>
<b>Calamity gasket</b>	<b>15</b>

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This brochure is composed by Trelleborg Ridderkerk, in case more information is needed please consult our sales or technical department at Ridderkerk (The Netherlands).

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## Trelleborg Ridderkerk BV

### The Company

Trelleborg Ridderkerk is your partner in design and production of engineered rubber products. Our focus is on the markets of civil engineering, offshore oil and gas, dredging and sewage, building and industry.



Our products seal, damp and protect demanding industrial environments worldwide. Since 1879 we have provided our customers with tailor-made solutions based on leading rubber technology and unique applications expertise.

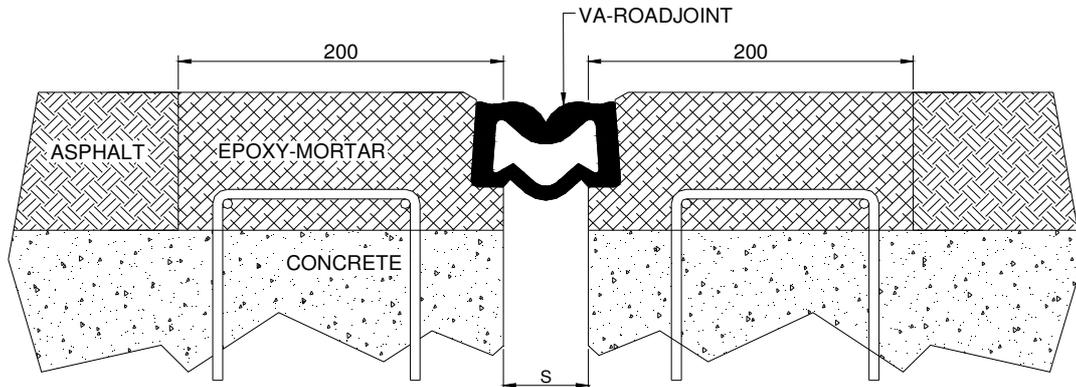
Trelleborg Ridderkerk is a member of the Trelleborg group – a global industrial group offering leading-edge expertise in polymer technology combined with advanced industrial know-how of functional solutions and systems to meet our customers requirements. The Group has approximately 22.000 employees in some 40 countries. The Group's headquarters are located in Trelleborg, Sweden. Trelleborg AB was founded in 1905 and the Trelleborg share has been included in the Stockholm Exchange A-list since 1964

## **Introduction**

As a result of thermal expansion, creep, shrinkage and traffic loading measurements of constructions can vary. To make this movement possible, several joints can be implemented. The dimensions of the joints vary. To create a flat joint at all times and prevent leakage, an expansion joint is applied. Examples where expansion joints are used are; bridges, viaducts, concrete road surfaces, airfield runways and the inner site of tunnels. The expansion joint can be used in old as well in new constructions.

## Use of expansion joint

The expansion joint is often used in bridge structures at road level. The expansion joint can absorb the movement of the bridge as a result of temperature changes without any bulge dip or gap in the top surface. In this application the expansion profile is located between epoxy mortar nosings or prefabricated steelworks.



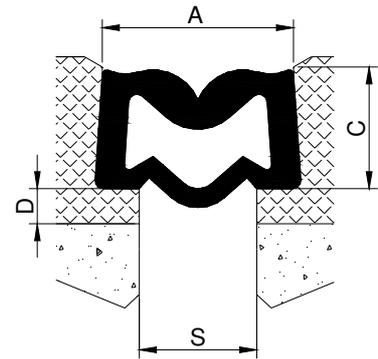
Calatrava brug

Trelleborg Ridderkerk expansion joints are supplied in a variety of forms. The choice for a joint is made by compression capacity and the dimensions of the expansion gaps. In the range of Trelleborg Ridderkerk expansion joints there are two categories.

**VA-profile**

The VA profile is a robust profile used for heavy duty purposes. The joint is carefully designed to ensure that the rubber moves in predetermined directions as the expansion gaps close. Because of its geometry this profile is self conclusive.

To prevent water running between joint and rubber profile we advise to use glue to attach profile to the joint.



In table 1 you will find several characteristics for the VA-profile.

**Table 1**

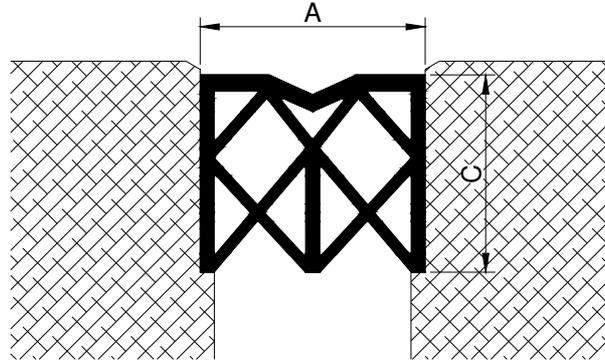
Profile Type	Length span of bridge	Dilat. Area (*)	Joint gap		Minimum Joint depth C	Split gap		Split depth D
			A min (40°C)	A max (-20°C)		S min (40°C)	S max (-20°C)	
<b>VA 10</b>	5 – 14 m	10	25	35	44	0	10	0
<b>VA 30</b>	14 – 42 m	30	35	65	44	16	46	25
<b>VA 45</b>	42 – 63 m	45	48	93	58	21	66	30
<b>VA 60</b>	63 – 84 m	60	57	117	70	25	85	40

\* When the corner between the axis of the road and the joint is not 90° the permissible dilatation can be bigger. In these specific cases you can contact us.

The joint depth (C) is to be determined by the engineer. The VA-profile should not stick out above road level, therefore the minimum joint depth is equal to the profile height. On dimensions of the profile a production tolerance of ± 3 mm has to be taken into account (according to ISO 3302-1 E3)

**ACME-profile**

The ACME profile is a light profile which can easily be pressed in. Because of this it is easy to mount. When using this profile the joint can be straight.



**Ecoduct "Leuserheide"**

In table 2 below you will find several characteristics for the ACME-profile.

**Table 2**

Profile Type	Length span of bridge	Dilat. Area (*)	Joint gap		Minimum Joint depth C	Minimum gap during installation (10°C)
			A min (40 °C)	A max (-20 °C)		
<b>ACME 20A</b>	5 - 27 m	20	20	40	37	30
<b>ACME 30V</b>	27 - 42 m	30	30	60	50	50
<b>ACME 35</b>	33 - 47 m	35	35	70	87	55
<b>ACME 45V</b>	42 - 63 m	45	50	95	83	70
<b>ACME 60</b>	63 - 84 m	60	60	120	100	90

\* When the corner between the axis of the road and the joint is not 90° the permissible dilatation can be bigger. In these specific cases you can contact us.

The joint depth (C) is to be determined by the engineer. The ACME-profile should not stick out above road level, therefore the minimum joint depth is equal to the profile height. On dimensions of the profile a production tolerance of ± 3 mm has to be taken into account (according to ISO 3302-1 E3).

We recommend to chamfer the edges of the joint.  
In appendix 2 and 3 technical drawings of the Trelleborg Ridderkerk expansion joints are shown.



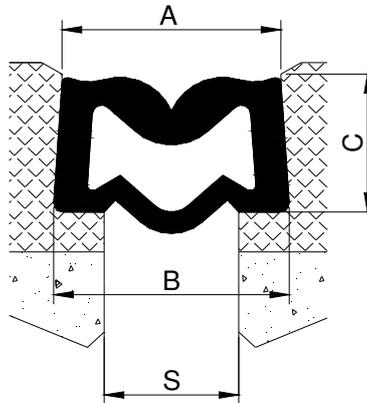
**HSL-lijn Zuid**



**Calatrava brug**

## Dimensions expansion gap

In the figure below the dimensions of the expansion gap are shown for the VA and ACME profile.



To calculate the expansion gap (S) the following formula is used.

$$\text{Expansion gap (S)} = (S_{\text{max}}) - (0,000012 * (t + 20) * L) - (L * K)$$

- S max = Maximum expansion gap at -20 °C (see table page 5)
- L = Working length span of bridge (mm)
- t = Temperature concrete ( °C)
- K = Factor for creep and shrinkage of concrete
  - Concrete between 3 and 12 months K=0,00014
  - Concrete older than 1 year K=0
- Linear expansion coefficient for reinforced concrete:  $12 \times 10^{-6}$ .
- Temperature area from -20 till +40 C ( $\Delta t = 60^\circ\text{C}$ ).

To calculate dimension A and B table 3 can be used.

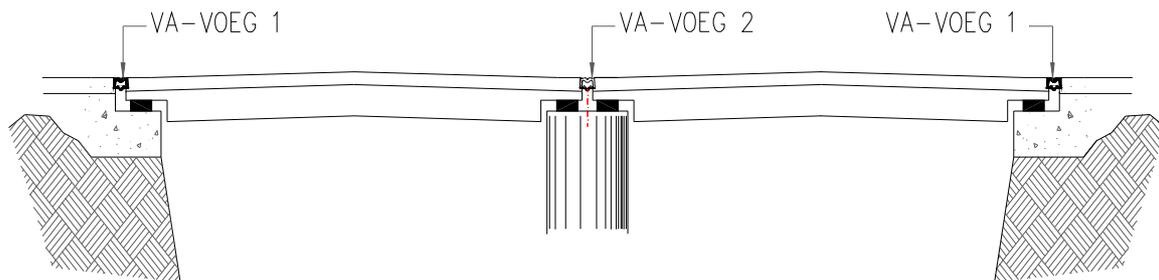
**Table 3**

Measurements	VA 10	VA 30	VA 45	VA 60	VA 80	ACME 20	ACME 30V	ACME 45	ACME 60
<b>A</b>	S + 15	S + 19	S + 27	S + 32	S + 41	S + 20	S + 30	S + 50	S + 60
<b>B</b>	S + 21	S + 25	S + 35	S + 42	S + 55	S + 20	S + 30	S + 50	S + 60

**Example:**

Given:

- Length span: 2x 84 meter
- Temperature concrete while mounting:  $t=10^{\circ}\text{C}$
- Temperature area: -20 till +40 C ( $\Delta t = 60^{\circ}\text{C}$ ).
- Point of time for mounting: 3 months after pouring concrete ( $K=0,00014$ )



There is a difference between the joint at the jetty and the joint at the pier.

Joint 1

Working length :  $\frac{1}{2}$  x length span = 42 meter

Expansion joint: VA 45,  $S_{max} = 66$  (see table page 5)

$$\text{Expansion gap (S)} = (S_{max}) - (12 \times 10^{-6} * (t + 20) * L) - (L * K)$$

$$\text{Expansion gap (S)} = (66 - (12 \times 10^{-6} * (10 + 20) * 42.000) - (42.000 * 0,00014)$$

$$\text{Expansion gap (S)} = 45 \text{ mm}$$

Dimension expansion gap (see table page 8).

$$\text{A (upper part): } S + 27 = 72 \text{ mm}$$

$$\text{B (lower part): } S + 35 = 80 \text{ mm}$$

Joint 2

Working length :  $\frac{1}{2}$  x length span = 84 meter

Expansion joint: VA 60,  $S_{max} = 85\text{mm}$

$$\text{Expansion gap (S)} = (S_{max}) - (12 \times 10^{-6} * (t + 20) * L) - (L * K)$$

$$\text{Expansion gap (S)} = (85 - (12 \times 10^{-6} * (10 + 20) * 84.000) - (84.000 * 0,00014)$$

$$\text{Expansion gap (S)} = 43 \text{ mm}$$

Dimension expansion gap.

$$\text{A (upper part): } S + 32 = 75 \text{ mm}$$

$$\text{B (lower part): } S + 42 = 85 \text{ mm}$$

## **Construction expansion gap and mounting**

Underneath the procedure to make a proper expansion gap with epoxy mortar, is given. One procedure is for a new construction and one for a gap in an existing construction.

### **Procedure for applying a joint of epoxy concrete in a new construction**

1. The joint is made on the spot after the asphalt concrete has been applied in sufficient thickness, and rolled over. To this end, the joint between the pier and the concrete coat must be sealed temporarily by wood or hard foam. The major advantage of this procedure is that the asphalt machines do not have to make any breaks at the point of the joint to be applied later on and can go on working one behind the other. The asphalt concrete can also be sealed better by this procedure at the point of the joint.
2. After the asphalt concrete has cooled, the joint is outlined by chalk lines. Using a sawing machine, a cut is made in the asphalt concrete along these chalk lines in order to obtain a good joint.
3. The asphalt concrete remaining, between the saw cuts, is picked out until the underlying concrete of the work is reached. The reinforced steel is bend in the right direction.
4. After removal of the asphalt concrete, the concrete surface and the reinforcing steel is cleaned thoroughly by means of gritblasting. Everything is then blown clean by means of dry compressed air, not containing any oil.
5. The formwork is then applied so that the necessary recess for the rubber expansion profile is obtained. This must be done with the necessary care in order to obtain the correct width of the recess at the temperature then prevailing.
6. The correct width of the recess must be determined in close co-operation with the builders, making use of the formula mentioned before.
7. When the formwork has been adjusted to the correct width, a two-component epoxy primer is applied to the cleaned concrete, reinforcement and asphalt concrete. This primer ensures optimum adhesion between the foundation and the epoxy concrete. Good adhesion can be obtained even on moist and wet bases.
8. After application of the epoxy-primer, the epoxy mortar is applied directly into the wet primer. All compounds from this epoxy mortar are thoroughly mixed with a reverse current blender. This epoxy concrete has a grain size between 0,015 and 16 mm. The epoxy concrete is applied in one or two layers of 60 mm maximum per layer, and finished to the same height as-the adjoining asphalt concrete.
9. After neatly finishing this epoxy concrete to the correct height, corundum or calcinated bauxite is strewn over the surface in order to increase stiffness and match the colour.
10. After the epoxy material has hardened, the formwork is removed, and the rubber expansion profile can be applied. This expansion profile is glued into the recess by means of Trelleborg Ridderkerk S40 glue. This glue gives very good adhesion to concrete, rubber and steel. It also provides a good glide while mounting. After application of the rubber profile, the road can be opened to traffic immediately.

**Procedure for applying a joint of epoxy concrete in a existing construction**

1. The steel joint-frame must be removed. To obtain a decent joint a cut is made in the asphalt concrete. The asphalt concrete and steel is removed.
2. After removal of the asphalt concrete, the concrete surface and the reinforcing steel is cleaned thoroughly by means of sandblasting
3. To apply reinforcement, holes are made in the concrete on both sides of the joint. The holes are 200 mm deep and  $\varnothing 17$  mm every 200 or 250 mm a hole is made.
4. In these holes reinforced steel  $\varnothing 12$  mm is put and fixed with epoxy mortar. To this reinforcement length reinforcement  $\varnothing 12$  mm is attached.

For the next steps see the procedure for applying a joint of epoxy concrete in a new construction step 5 till 10.

The mounting of the expansion profile can be done by a Trelleborg Ridderkerk engineer

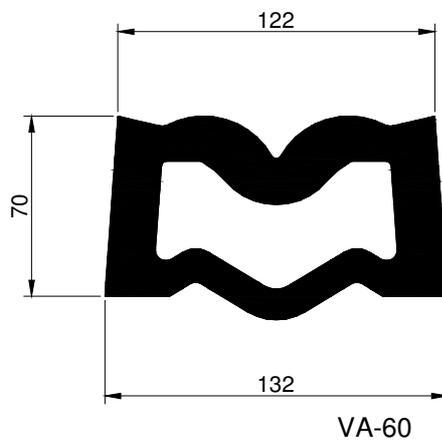
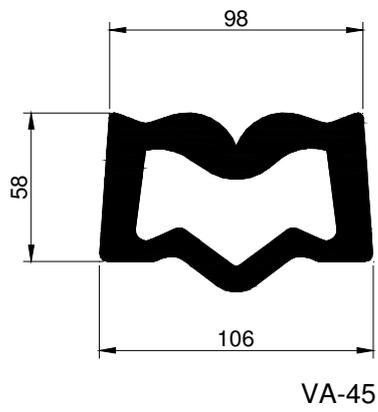
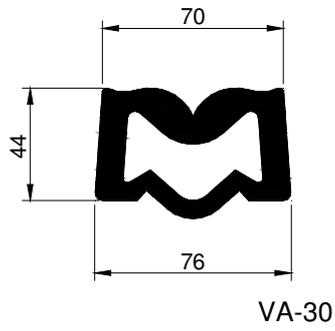
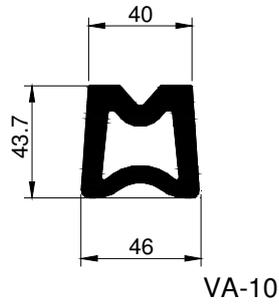
## **Rubber-quality**

The expansion profiles are manufactured under strict quality standards. Our production procedures are certified according to ISO 9001 standard.

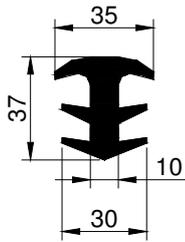
Standard the expansion profiles are made in rubber quality EPDM 60-70 degrees Shore A. On request quality certificates can be shown.

EPDM has a good resistance against a.o. weather influences and salt.

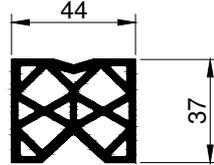
*Appendix 1. Product drawings VA-profile*



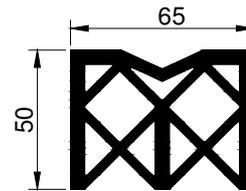
Appendix 2. Product drawings ACME-profile



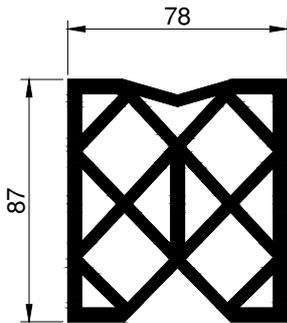
ACME 10T



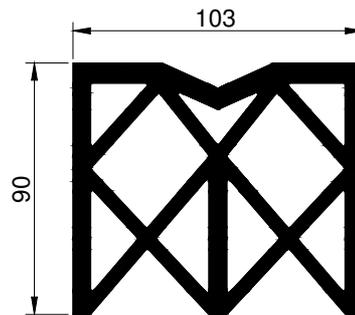
ACME 20A



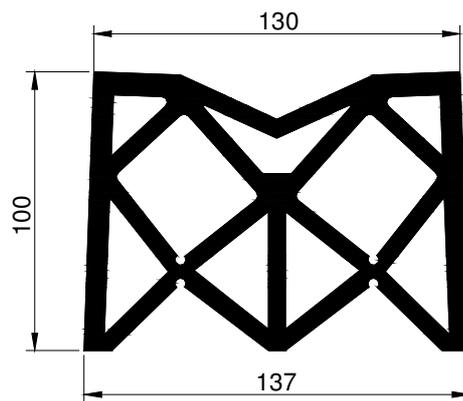
ACME 30V



ACME 35



ACME 45



ACME 60

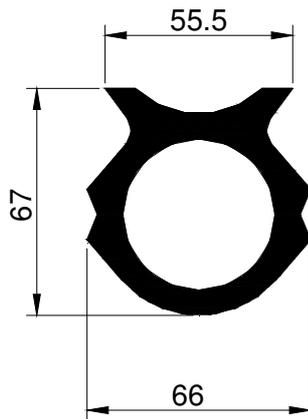
## Calamity Gasket ECS-series

The calamity gaskets protects the permanent rubber tunnel-gaskets against aggressive fluids in case of a calamity in the tunnel

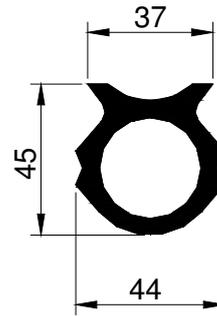
The calamity-gasket is made of special chemical resistant rubber compound. For a short period of time, this rubber also resists high temperatures that occur during the application of asphalt (165°C)

The gasket is applied directly beneath the road-deck and can be replaced easily



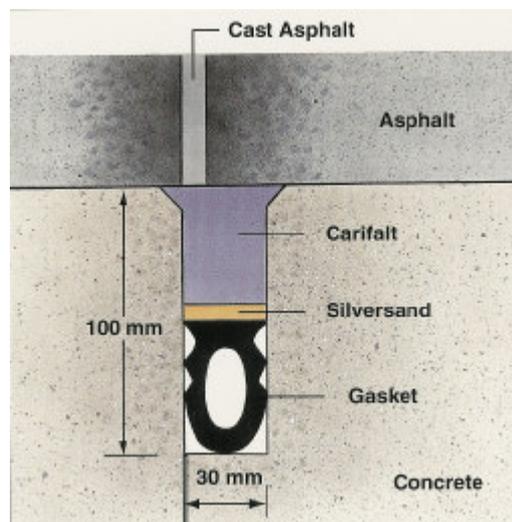


**Calamity Gasket**  
**Type TB ECS-67/66 CJ**



**Calamity Gasket**  
**Type TB ECS-45/44 CJ**

The gasket is placed in a gap of 100mm deep and 30mm wide. The gasket is covered with silversand. The remaining gap is filled with *Carifalt*. Due to deformations of the concrete construction, the gap can widen. After widening to 37mm and 10 years of use, the gasket still seals against a pressure of 6 meters watercolumn.



For the installation of the gasket, Trelleborg Ridderkerk supplies special bonding and filling materials.

**Notes/remarks**

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