

## Rigid and Semi-rigid Safety Barriers

# Installation and Maintenance Manual

---

Documentation for Licence Partners

General information	2
Planning	3
General installation instructions	6
Installation DB 80AS-E	7
Installation DB 80E	9
Installation DB 80AS-F	11
Installation DB 80F and DB 120S-F	13
Maintenance and inspection	16
Procedure after an impact	17
Occupational safety	18
Tools and equipment	19
Additional information	20

## General information

### Installation

Selection of the DELTA BLOC® system is according to the requirement profile defined by the customer as well as EN 1317-1 and 2, taking the installation conditions into account. The following rigid and semi-rigid DELTA BLOC® systems are available:

- ▶ DB 80AS-E / 6m H2 W1
- ▶ DB 80AS-E / 6m H2 W2
- ▶ DB 80E / 6m H2 W1
- ▶ DB 80AS-F / 6m H2 W3
- ▶ DB 80F / 6m H2 W3
- ▶ DB 120S-F / 6m H4b W3

All these systems make use of the New Jersey profile and are mainly distinguishable from each other by the following:

- ▶ DB 80AS-E: asymmetrical, with thrust bearing
- ▶ DB 80E: symmetrical, embedded
- ▶ DB 80AS-F: asymmetrical, bolted to sub-grade
- ▶ DB 80F and DB 120S-F: symmetrical, rammed with steel spikes on one side

The relevant guidelines and the technical contractual and delivery conditions must be adhered to.

### Maintenance terminology

Definition of **maintenance**:

*Source: Extract from DIN 31051:2003-06*

*"A combination of all technical and administrative measures as well as management methods during the lifecycle of an observation unit to maintain its fully functional state or to return it to such a state, thus making it possible to fulfil the required function."*

*"Maintenance can [...] be divided into the basic steps of maintenance, inspection and repair work [...]."*

- ▶ **Maintenance:** Maintenance is a periodically recurring measure used to maintain the target state.
- ▶ **Inspection:** Inspection is a measure used to determine the current state. It generally refers to an inspection in the sense of a check carried out by an inspector or supervisor. The aim is to determine that an object is in due order. Where necessary, repair measures must be initiated.
- ▶ **Repair work:** Measures to restore the target state of an object, with the restoration or replacement of parts on the basis of inspection results.

## Planning

### General information

To achieve the effect according to EN 1317-1 and -2, a certain minimum system length is required in the longitudinal direction of the road, in accordance with the tested length as shown in the test report (*see below*).

At the start and end of any DELTA BLOC® chain, terminals or transitions to other restraint systems have to be provided.

The installation supervisor must inspect the construction site jointly with the customer at an appropriate time before installation begins; the prepared subgrade is to be formally accepted and this must be documented in writing.

Installation work is usually carried out in accordance with the existing site plan. The major attachment points must be decided on jointly with the site supervisor before installation starts. The site supervisor is to organise the continuous marking of the front edge of the system on the contact surface.

### Minimum installation length

The tested minimum installation lengths for DELTA BLOC® safety barriers may be found in the relevant product data sheet. Shorter installation lengths are non-critical for force-fit connections to other systems.

### Foundation

The requirements for the subgrade are as follows:

1. load-bearing capacity comparable to the installation conditions as per test report
2. Evenness of subgrade:  $\pm 1\text{cm}$  centre deviation for a chord length of 6m
3. Frost protection: according to national regulations and standards

### Contact surface

An unbonded, frost-protected base course in Soil Class 3 or higher (according to DIN 18300) is used as a contact surface for the DB 80AS-E, DB 80F and DB 120S-F. All other contact surfaces that meet the requirements for a substructure (carrying capacity, evenness, frost protection), e.g. compacted grader material, are also suitable and do not have any significant effect on crash behaviour.

As a contact surface, the DB 80E requires a bituminous base course at least 15cm thick. A 5cm deep and 62cm wide strip of this base course is then cut out and the system inserted.

The DB 80AS-F is set up on concrete road surfaces that are at least 20cm thick. Alternatively, the DB 80AS-F can also be installed on concrete foundations with the quality C20/25 without reinforcement, provided that the foundations are at least 40cm thick.

Any unevenness resulting in a height offset of more than  $\pm 1\text{cm}$  of the butt joints is to be eliminated by means of elastomer strips, 5/8 chippings or similar material for all the above mentioned systems. Before taking the final decision for the foundation please contact your DELTABLOC contact person.

### Curvature of the longitudinal axis

The following minimum radii are required for bends, crests and sags where the longitudinal axis of a chain has a curvature.

The minimum radii result from the use of standard elements with a length of 6m as restraint systems.

## Curve radii

The following minimum radii should be provided for curves:

System	Element length	Outer radius
DB 80AS-E / K180S	6m	120m
DB 80E / K150S	6m	108m
DB 80AS-F / K120S	6m	120m
DB 80F / K180	6m	120m
DB 120S-F / K280E	6m	120m

Table 1: Bend radii

Deviations of up to 1:20 can be handled without problems. The abovementioned minimum radii must be taken into account here as well.

## Crests and sags

The following minimum radii are required for the formation of crests and sags:

System	Element length	Sag radius	Crest radius
DB 80AS-E / K180S	6m	72m	261m
DB 80E / K150S	6m	98m	336m
DB 80AS-F / K120S	6m	72m	261m
DB 80F / K180	6m	72m	261m
DB 120S-F / K280E	6m	350m	500m

Table 2: Crest and sag radii

## Installation position

The elements are installed perpendicularly to the subgrade and at the height of the upper edge of the road surface. Deviations from this installation position are possible within a limited range.

When deviating from the installation position, care must be taken that the height and angle of the elements in relation to the installation surface are still guaranteed. This means that DELTABLOC® elements can also be used on

lower-lying shoulders and on roads with a tonnage restriction or a horizontal incline.

Strong horizontal inclines or alternating inclines of the installation surface may be compensated by using horizontal-incline compensation sets.

## Minimum working width

The rigid permanent safety barriers DB 80AS-E / 6m H2 W1 and DB 80E / 6m H2 W1 are particularly suitable for applications with a restricted working width. Both systems have been successfully tested for H2/W1 and will not shift at all in the event of a crash.

The DB 80AS-E / 6m H2 W2 with a non-reinforced thrust bearing has a working width of 0.78m and will shift by a maximum of 30cm.

DB 80AS-F and DB 80F have been successfully tested for H2/W3, DB 120S-F for H4b/W3 – all with working widths not exceeding 0.90 m.

## Slopes

Slopes may not extend into the working width of DELTABLOC® elements. Where modules with a thrust bearing are used (DB 80AS-E / H2 W1 or DB 80AS-E / H2 W2), the slope may not extend to the thrust bearing.

## Planning for drain shafts

Where possible, planning should be such that drain shafts are circumvented. For this purpose, short elements with a length of two to four metres may be used to construct small arches.

Where this is not possible, a 90cm expansion element may be used, which has a gap up to 90cm wide under a cover and the hydraulic tension and shock buffer.

Where necessary, shafts can also be covered with DELTA BLOC® standard elements, which subsequently have to be removed using suitable hoisting equipment to open the shaft.

## Fixtures

There are suitable traffic sign brackets that can be placed on top of the DELTABLOC® elements and secured with screws.

The use of additional guide posts will not be required in combination with DELTABLOC® modules, as reflectors can be attached directly to the DELTABLOC® elements at the prescribed height and at any intervals required.

Commonly used, certified anti-glare protection and screens can easily be fitted to all DELTABLOC® elements.

Holes with a depth of up to 6cm can be drilled and fitted with threads for the purposes of installing these and other fixtures.

## Safety

The safety of vehicle passengers is expressed by the ASI value. The various ASI values may be found on the corresponding product data sheets. Due to the closed surface, means that the system also does not pose a danger to cyclists.

Where pedestrians and cyclists are not within the working width of the safety barrier, they will not be exposed to any risk.

## Climbing aids

Climbing aids can be easily realised for all DELTABLOC® systems.



Climbing aid on the lane side



Climbing aid at the back

## General installation instructions

### General information

All national regulations must be adhered to during installation. Where proof of the suitability of the installation company is required (tests or permits), these must be submitted to the customer and the site supervisors.

### Tolerances

DELTABLOC® restraint systems are combined to form a chain. The DELTABLOC® coupling system is used for linking purposes. The gap size between two elements is 1.4cm (+0.0/-1.4).

### Installation temperatures

Installation can take place at any environmental temperature. The elements are not temperature-sensitive and are not subject to any significant changes in length when temperatures fluctuate. As the foundations are frost-resistant, there will be no problems with installation at low temperatures.

### Installation limits

DELTABLOC® vehicle restraint systems cannot be used under the following circumstances:

- ▶ where the road surface has a strong horizontal tilt that can no longer be compensated
- ▶ where the road surface has too small crest or sag radii (*see page 3*)
- ▶ where the curve radii are too small and are also not be realised with special elements (*see page 3*)
- ▶ where the installation sections to be secured are too short (*see page 4 and the product data sheets*)

### Fitting elements

Fitting elements are short elements used to close gaps. Installation takes place from both terminals until the gap left in the centre determines the size of the fitting element required. This gap is accurately measured and the fitting element is then made to measure. The gap is temporarily bridged with a steel cover. Alternatively, a temporary safety barrier may be set up in front of the gap. The road can only be open for limited traffic until the fitting element has been installed.

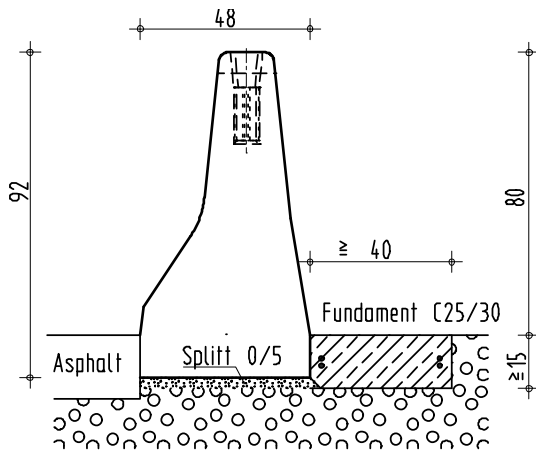
## Installation DB 80AS-E

### Preparation

If possible, the foundation strip on the rear should already be taken into account during general road planning.

### Installation of thrust bearing

The foundation strip on the rear side of the system is used for reinforcement and the absorption of any impact forces by the ground layers behind the system.



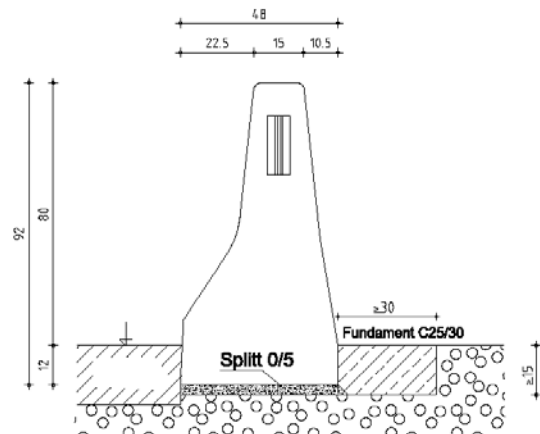
**DB 80AS-E with reinforced thrust bearing (H2 W1)**

The restraint system is usually constructed along an already completed road surface. A section with a minimum width of 90cm and a minimum depth of 15cm must be cut out immediately next to the road surface. The subgrade must have the necessary load-bearing capacity (at least Soil Class 3 according to DIN 18300).

Simple shuttering must be provided on the element side (e.g. square timbers fixed with splice bars) for concreting the foundation strip. A slight backward incline should be provided to prevent water puddles.

The correct installation of the reinforcement for variant H2 W1 takes place with the aid of splice bars, with the Ø14 BSt500 reinforcement rods being attached as follows: 2 continuous rods with standardised transitions or welding, 2 x 3m sections per DB element, fitted next to each element joint.

The thrust bearing for variant H2 W2 does not require reinforcement. For the H2 W2 variant, a thrust bearing with a width of only 30cm is sufficient.



**DB 80AS-E with non-reinforced thrust bearing (H2 W2)**

To compensate for longitudinal expansion, a 1cm wide expansion joint should be provided at least every 30m (please note: rods must be continuous!). The joints must always be in the centre of the DB elements! The continuous rods must be treated with anti-corrosion agent, while the joint requires elastic filling.

The foundation strip is then filled up with ready-mix concrete. Minimum requirements: C25/30 XC3/XD2/XF2/XA1L or according to the national regulations.

To ensure the function of the system, the top ground layer behind the foundation must have the same material and compaction characteristics as the base course.

### Preparation for the installation of the restraint elements

The remaining bed with a width of 50 cm must be filled up with 0/5 chippings to a depth of approximately 3cm. This surface must be evenly stripped at a depth of 12cm below the upper edge of the road surface. The evenness of the surface may deviate by a maximum of 10mm over a length of 4m.

## Transport

The elements are delivered to the construction site by suitable transport vehicles.



Unloading process

## Hoisting equipment

The DB 80AS-E elements are installed with the aid of a concrete barrier grab.



Moving the elements using a concrete barrier grab

A list of the required tools may be found in the chapter *Tools and equipment*.

## Installation

The DELTA BLOC® elements are lifted individually from the transport vehicle. The DELTA BLOC® coupling can already be used to lower an element. The element is aligned just above the contact surface, using a suitable tool, e.g. a crowbar, after which it is put down in its final position, ensuring that the element chain is tightened in a longitudinal direction by pulling on the last element.



Rapid linking of the elements, using the patented coupling system

## Grouting

The joint between the DB element and the road surface must be professionally sealed, for example with bituminous joint sealer.

Both the joint between the DB element and the foundation strip and the butt joint must be filled with frost-resistant mortar up to the height of the upper edge of the road surface. The instructions of the mortar manufacturer must be closely adhered to.

## Thrust bearing construction after mounting the barrier

In most cases the foundation strip can also be concreted after the DB elements have been mounted. This variant requires no shuttering or separate filling of the joint between the DB elements and the foundation strip.

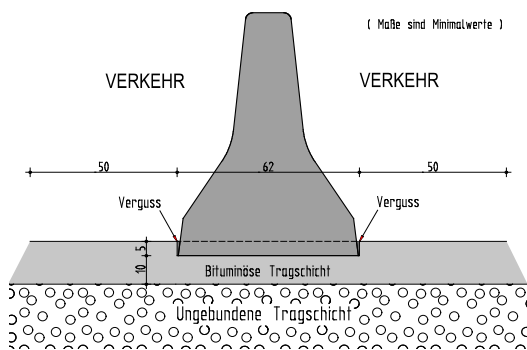


## Installation DB 80E

### Preparation

Usually, the DB 80E is placed on top of the finished base or binder course of an asphalt layer. After moving the elements, the asphalt surface or wearing course is applied on both sides up to a depth of at least 5cm. An asphalt strip at least 15cm thick and at least 50cm wide must be planned on both sides of the barrier to ensure the correct functioning of the system. The bituminous base course below the DB elements must be at least 10cm thick.

Where the restraint system is to be installed after completion of the road surface, a 62cm wide and 5cm deep recess must be produced. Once the assembly has been completed, the floor joint must be sealed with grouting in a longitudinal and horizontal direction.



**The DB 80E in an asphalt recess**

An alternative is to install the system in a prefabricated concrete foundation with a longitudinal recess shaped to fit the system profile. The recess must be 62cm wide and 5cm deep.

Over a length of 4m, the evenness of the contact surface may not deviate by more than 10mm.

### Transport

The elements are delivered to the construction site by suitable transport vehicles.



**Unloading process**

### Hoisting equipment

DELTA BLOC® elements are most efficiently installed with the aid of a concrete barrier grab.



**Moving the elements using a concrete barrier grab**

The elements can also be moved with straps instead of a concrete barrier grab. Steel bolts are inserted through the lifting holes, with the looped straps being attached to the ends of the bolts.



**Moving the elements using straps**

Concrete flaking around the lifting holes can be avoided by ensuring that the bolts fit smoothly into the holes. Alternatively the bolts can be manufactured with a soft sheath.

A list of the required tools may be found in the chapter *Tools and equipment*.

## Installation

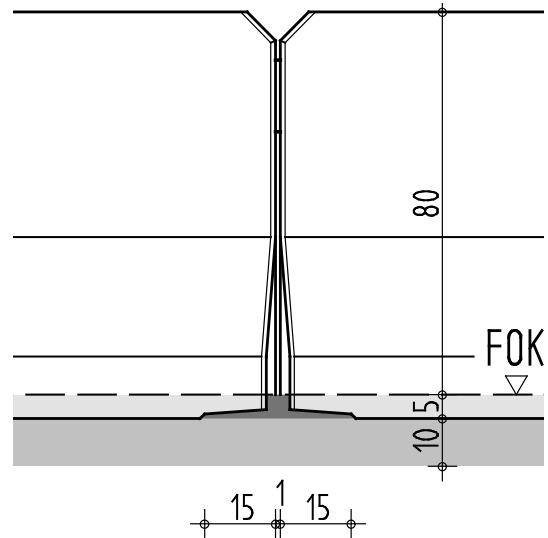
The DELTA BLOC® elements are individually lifted by the transport vehicle. The DELTA BLOC® coupling can already be used to lower an element. The element is aligned, using a suitable tool such as a crowbar, just above the contact surface. It is then finally positioned in the asphalt recess, with care being taken that the element chain remains under tension by pulling the last element in a longitudinal direction.



**Rapid linking of the elements, using the patented coupling system**

## Grouting

The joint between the elements and the road surface and the joints between the facing sides of the elements must be filled with suitable grouting material (PCI grouting mortar or equivalent) to the height of the upper edge of the road surface. When grouting the horizontal joints, special care must be taken that the recesses at ground level are filled without gaps.



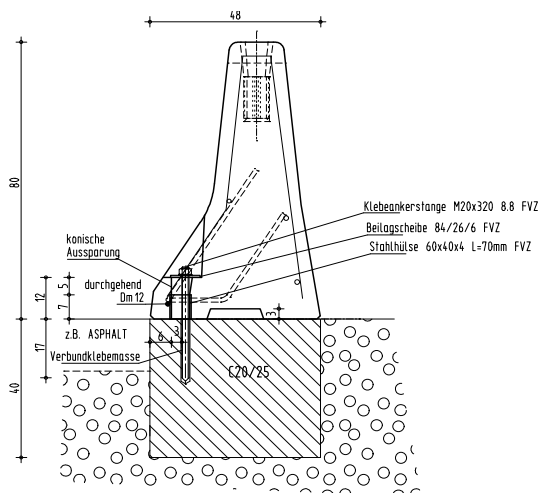
**Joint grouting of the base recess**

The longitudinal joints can be additionally sealed, depending on the local requirements.

## Installation DB 80AS-F

### Preparation

Where the DB 80AS-F is not to be placed onto a concrete road surface, the contact surface must consist of a non-reinforced concrete foundation, with a width of at least 48cm and a depth of at least 40cm.



DB 80AS-F on concrete foundation

### Installation of foundation strip

The foundation strip below the system is used as a contact surface and retainer for the concrete bolts used to attach the DB 80AS-F.

Simple shuttering must be prepared to concrete the foundation strip. It is not necessary to reinforce the foundation.

The foundation strip is then filled up with ready-mix concrete. Minimum requirement: C20/25.

To ensure the function of the system, the top ground layer behind the foundation must have the same material and compaction characteristics as the base course.

### Transport of elements

The elements are delivered to the construction site by suitable transport vehicles.



Unloading process

### Hoisting equipment

The elements are installed with the aid of a concrete barrier grab.



Moving the elements using a concrete barrier grab

A list of the required tools may be found in the chapter *Tools and equipment*.

### Installation

The elements should only be mounted when the foundation has hardened completely. The DELTA BLOC® elements are individually lifted by the transport vehicle. The DELTA BLOC® coupling is to be inserted while lowering the element. The element is aligned, using a suitable tool such as a crowbar, just above the contact surface. It is then finally positioned, with care being taken that the chain

remains under tension by pulling the last element in a longitudinal direction.



**Rapid linking of the elements, using the patented coupling system**

## Bolting of elements

Once the elements have been aligned and placed under tension, a concrete drill for M20 chemical anchors is to be used to drill holes with a depth of 17cm into the concrete road surface or the foundation through the 4 vertical recesses of each element. To ensure that the drill hole depth is not exceeded, it is recommended to make use of a spacer set to 29cm (17cm drill hole depth + 12cm height of recess = 29cm).

Concrete bolts of the type MKT composite anchor V A4 M20 / 170 or equivalent are to be used.

## Installation DB 80F and DB 120S-F

### Transport

The elements are delivered to the construction site by suitable transport vehicles.



Unloading process

### Hoisting equipment

The installation of DELTABLOC® elements is most efficient when using a concrete barrier grab operated from a transport crane.



Installation using a concrete barrier grab

The elements can also be moved with straps instead of a concrete barrier grab. Steel bolts are inserted through the lifting holes, with the looped straps being attached to the ends of the bolts.



Moving the elements using straps

Concrete spalling around the lifting holes can be avoided by ensuring that the bolts fit smoothly into the holes.

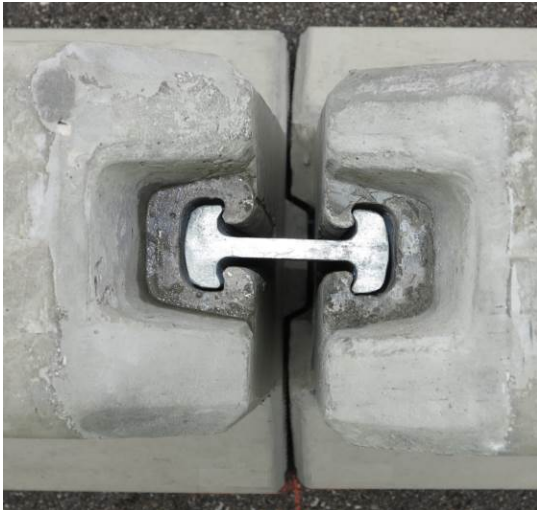
A list of the required tools may be found in the chapter *Tools and equipment*.

### Installation

The DELTABLOC® elements are lifted individually from the transport vehicle. The DELTABLOC® coupling is already to be inserted while lowering an element. The element is aligned, using a suitable tool such as a crowbar, just above the contact surface. It is then finally positioned, with care being taken that the element chain remains under tension by pulling the last element in a longitudinal direction.



Rapid linking of the elements, using the patented coupling system



**Coupling top view and T&G joint of DB 120S-F**

When lowering the element, the coupling must be inserted into the metal tension bar claws in the joint front. Ensure that tongue and groove slip into the correct position. Just before completely setting the element down it must be aligned (e.g. along markings on the ground) and then – without loosening the coupling – placed in the final position (e.g. using a crowbar).

When installing the butt joint inserts, care must be taken that they are accurately positioned in the joints between the elements. The rubber loop that holds the butt joint inserts together can be pulled to the other side, using a hook.



**Installation of butt joint inserts**



**A working stands on either side of the element. Pulling the rubber loop through using a metal hook**

## Ramming

Once the elements have been shifted and aligned, the steel spikes are placed into the provided holes as vertically as possible, with the longer end of the bevelled tip facing backwards.

The steel spikes have an I80 mounting with a total length of 1010mm, including the weld-on plate. They are made of S235JR steel and have a hot-galvanised surface. A hydraulic hammer is used to ram the steel spikes into the subgrade until the weld-on plate is flush with the concrete frame of the opening. The chisel used must have a tip with the greatest possible contact surface and a centred locating pin.



**Steel spikes used for the DB 80F**



**A skid loader with a hydraulic hammer is used to ram the spikes into the subgrade**



**Detailed view of hydraulic hammer and steel spike**



**The steel spike is rammed until the weld-on plate is flush with the concrete frame**

## Function of T&G link (DB 120S-F)

Standard elements of DB 120S-F measure 6m, with a precise grid dimension of 6.038m. This system does not require butt joint inserts.

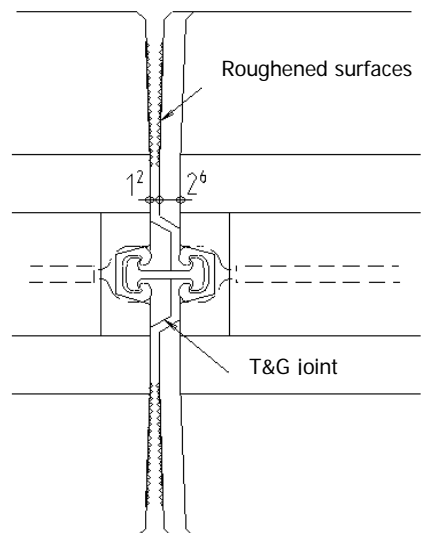
For the transmission of lateral forces the system features:

coupling

tongue and groove link lock, and

roughened surfaces in the pressure zones.

The roughened surfaces become effective only in the event of an impact. As soon as neighbouring elements are shifted at an angle to each other the roughened surfaces come into contact and because of their increased friction restrict slippage of the front surfaces against each other.



**DB 120S-F / 6m K280E joint top view**

## Maintenance and inspection

### General information

The DELTABLOC® restraint system is maintenance-free with regard to its function as a traffic restraint system according to the requirements of EN 1317.

### Drainage opening

To ensure that rain or melt water drains off unhindered, the drainage channels of DB 80AS-F, DB 80F and DB 120S-F should be inspected once a year and cleaned with a high-pressure cleaning device where necessary.

### Reflectors

To ensure proper functioning, the reflectors fitted will have to be regularly cleaned, depending on the environmental conditions at the site. This can also be done with the aid of high-pressure cleaning equipment.

### Inspection

An inspection of the entire system will be required in the event of a collision event (accident). Depending on the intensity of the collision, repair measures may have to be initiated (see *chapter Procedure after an impact*).

### Inspection activities

The inspection of DELTABLOC® restraint systems is to take place in two steps:

1. Inspection of total system: see *Table 1*
2. Inspection of individual components: see *Table 2*

### Completeness of restraint system:

When inspecting the DELTABLOC® restraint system for completeness, the presence of the following individual components must be checked:

- ▶ coupling between consecutive elements
- ▶ screw connections of anchors for terminals
- ▶ elastomer inserts on both sides at the joint between elements (only for DB 80F)
- ▶ elastomer ring to fix the elastomer inserts (only for DB 80F)

**Table 1: Inspection activities for total system**

Component	Inspection activity	Measure
chain	<ul style="list-style-type: none"> <li>▶ checking the couplings for visible damage</li> <li>▶ displacement of elements after each impact event up to a distance of 50m before and after the impact point</li> </ul>	where necessary, repair measures must be instituted

**Table 2: Inspection activities for individual components**

Component	Inspection activity	Measure
restraint element	<ul style="list-style-type: none"> <li>▶ visual inspection for cracks or spalling</li> <li>▶ checking the correct positioning of the element</li> </ul>	where necessary, repair measures must be instituted
coupling element	checking for completeness and damage	where necessary, replace elements
butt joint inserts (only for DB 80F)	checking for completeness and damage	where necessary, replace elements
elastomer ring (only for DB 80F)	checking for completeness and functionality	where necessary, replace elements



## Procedure after an impact

The effectiveness of the DELTABLOC® restraint system can be guaranteed even after an impact, provided that the following instructions have been adhered to. When in doubt, the system supplier should be approached for an expert assessment!

The state of the safety barrier elements after a collision event may be categorised as follows:

### No visible damage to the safety barrier

**Damage pattern:** No visible cracks or spalling on the concrete elements and no deformation of the soil anchors or coupling elements. Tyre particles, scratches and traces of paint are the only signs of vehicle contact.

**Measure:** There is no need for action.

### Slight damage to the safety barrier

**Damage pattern:** Slight but visible damage to the concrete elements, such as cracks, concrete chipping etc. as well as clear signs of contact. No deformation of the soil anchors or the coupling elements.

**Measures:** Minor damage not occurring in the vicinity of the coupling elements can be repaired on site, using repair mortar. The affected DELTABLOC® elements must be aligned according to the installation instructions, using suitable hoisting equipment. Where cracks have occurred near the couplings or the coupling elements have become deformed, the affected elements must be exchanged and aligned according to the installation instructions.

### Clear damage to the safety barrier

**Damage pattern:** Clearly visible damage to elements, such as cracks, concrete chipping, etc., as well as clearly visible deformation of the soil anchors and/or the coupling elements.

**Measures:** Where damage is slight, the elements can be repaired on site, using mortar. In the event of visible damage and deformation, the affected DELTABLOC® elements and linking components must be exchanged. The DELTABLOC® elements are to be moved and aligned according to the chapter *Installation*.

### Remark on the mortar to be used for repair work

Commercial mortar is to be used to repair minor damage. The type of mortar to be used is hydraulic-setting, plasticised dry mortar. Preparation of the subgrade and processing of the mortar must be in accordance with the processing instructions of the mortar manufacturer (*technical data sheet*).

### Recycling

The entire restraint system can be recycled completely, just like reinforced concrete.

No hazardous or toxic substances are used to produce or install the DELTABLOC® restraint system; thus no monitoring or special recycling process is required.

## Occupational safety

### General information

Please refer to all the relevant national regulations regarding occupational safety. The information below should be regarded as an addition to these national regulations.

### Material, tools and equipment

Care must be taken that all materials, tools and equipment correspond to the safety regulations and are suitable for the purpose for which they are to be used.

### Securing the construction site

Safe access to the construction site must be guaranteed.

The construction site must be secured against unauthorised access by third parties by putting up the corresponding signs and barriers. Care must be taken that the general traffic can safely circumvent the construction site. Sources of danger should be identified while setting up the construction site, with suitable measures being taken.

A suitable traffic control plan is to be developed in good time and implemented at the site. All site employees should be constantly aware of the risks posed by the traffic flow and must wear high-visibility vests.

### Loading and unloading

The driver is responsible for securing the load! It must be ensured that the load is still stable before the straps securing the load are loosened.

Lifting equipment such as cranes, concrete barrier grabs, straps, ropes, chains etc. must be maintained in a good condition. It must be ensured that all hoisting equipment has been checked and certified.

There may be no people in the danger zone of the hoisting equipment.

It must be ensured that all employees are wearing suitable work clothing, including their personal protective equipment (safety

shoes, helmets, high-visibility jackets, gloves).

### Crane

Cranes may only be operated by suitably trained staff.

The crane must be set up in accordance with the requirements. Special care must be taken that there are no power cables within the operating range of the crane. All overhead cables should be regarded as high-voltage cables and both the crane and the load should be kept at a safe distance. In the event of problems with overhead cables, work must be discontinued and the responsible authorities are to be contacted.

### Cleaning

Protective goggles and a dust mask ought to be worn when cleaning DELTABLOC® elements, thus avoiding injuries caused by small, air-borne particles.

### Clearing the construction site

High-visibility vests must also be worn when leaving or clearing the construction site. When removing traffic lights and signs, corresponding precautionary measures must be taken to avoid accidents with passing traffic. Any waste and dirt on the construction site must be removed.

## Tools and equipment

### Equipment required

1. Lorry with loading crane or mobile crane, excavator or fork lift
2. Concrete barrier grab
3. Crowbars and lifting rods
4. Spanner for M16 nuts
5. Tape measure or distance meter
6. Power drill and M20 concrete drill (only for DB 80AS-F)
7. Skid loader with hydraulic hammer (only for DB 80F and DB 120S-F)

### Material

1. Elements, terminals, transitions
2. M16 bolts and nuts to anchor the terminals
3. Couplings
4. Reflectors (where required)
5. Mechanical anchors for terminals or resin-bedded anchors
6. Concrete bolts (only for DB 80AS-F)
7. Steel spikes (only for DB 80F and DB 120S-F)

### Transport

1. Suitable HGVs
2. Load-securing straps

## Additional information

### Other relevant documents

- ▶ DB 80AS-E product data sheet
- ▶ DB 80E product data sheet
- ▶ DB 80AS-F product data sheet
- ▶ DB 80F product data sheet
- ▶ DB 120S-F product data sheet

### Internet

- ▶ For detailed information, photos and videos of crash tests please visit [www.deltabloc.com](http://www.deltabloc.com)



### **DELTABLOC International GmbH**

Industriestrasse 28

2601 Sollenau

Austria

Tel: +43 57715 / 470 473

Fax: +43 57715 / 470 474

[office@deltabloc.com](mailto:office@deltabloc.com)

[www.deltabloc.com](http://www.deltabloc.com)

DELTABLOC® is a registered trademark of DELTA BLOC International GmbH | © 2017 DELTA BLOC International GmbH