



Temporary Safety Barriers

Installation and Maintenance Manual

Documentation for License Partners

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General

The choice which DELTABLOC® system to use depends on the specifications defined by the contracting body according to EN 1317, with regard to the placement situation (location).

For the temporary safeguarding of construction sites on the side of the road and on oncoming-traffic areas, the DELTABLOC® systems DB 50SL and DB 65S are mainly used. They are however also suitable for permanent use, especially where place is reduced, as they only need a small base area due to their small system width.

The installation of the DELTA BLOC® systems DB 80, DB 100 etc. is described in the installation instructions for permanent systems, although they can be used temporarily as well.

Relevant national regulations as well as technical terms of delivery and contract have to be adhered to.

Maintenance terminology

- ▶ **Maintenance** is the combination of all measures carried out to maintain the functionality of a system. It can be divided into the basic steps of *maintenance*, *inspection* and *repair work*.
- ▶ **Maintenance:** Maintenance is a periodically recurring measure to maintain the target state.
- ▶ **Inspection:** Inspection is a measure carried out to ascertain 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 of sound condition. Repair measures are to be initiated wherever necessary.
- ▶ **Repair work:** Measures to restore the target state of an object via refurbishment or replacement of parts on the basis of the inspection results.

Planning

General

In order to achieve the required performance class according to EN 1317-1 and 2 a minimum system length according to the length during the crash test and specified in the test report is required.

At the beginning and end of each DELTABLOC® chain the appropriate terminal elements have to be fixed with anchors in the base (foundation or pavement). For connecting other restraint systems, transition elements have to be used. For the DB 50SL no end anchorage is necessary.

Within reasonable period before starting the construction works the construction site management has to visit the construction site together with the contracting body; the prepared foundation is to be formally accepted and this must be documented in writing.

The installation works are usually carried out based on existing site plans. Important points must be decided on jointly with the construction site management before the beginning of the installation. Continuous marking of the front edge of the system on the contact surface is to be carried out by the site supervisor.

Minimum installation length

The tested and approved minimum installation lengths (system lengths) for DELTABLOC® safety barriers can be found in the data sheet of the respective products.

Foundation

The requirements for the foundation are as follows:

1. load-bearing capacity comparable to the installation conditions as per test report
2. evenness of the ground: $\pm 1\text{cm}$ deviation over a chord length of 6m
3. frost protection: in compliance with national standards and guidelines

Contact area

The area is a road pavement of either asphalt or concrete. Any unevenness resulting in a height offset of more than $\pm 1\text{cm}$ at the butt joints is to be compensated by means of elastomer strips or 5/8 chippings or equally suitable material.

All other contact areas which comply with the requirements for the foundation (load-bearing capacity, evenness, frost resistance), such as compacted graded material, are also suitable.

Curve radii

For curves the below listed minimum radii are to be applied. Smaller curve radii can be achieved using longer special couplings.

System	Element length	Outside radius
DB 50SL	3m	18m
	6m	36m
DB 65S	3m	19m
	6m	38m
DB 80	2m	40m
	4m	80m
	6m	120m

Crests and sags

For crests and sags the following minimum radii are to be applied:

System	Element length	Sag radius	Crest radius
DB 50SL	3m	18m	25m
	6m	36m	48m
DB 65S	3m	22m	32m
	6m	42m	60m
DB 80	2m	25m	87m
	4m	48m	174m
	6m	72m	261m

Installation position

The elements are installed perpendicularly to the subsoil and at the height of the upper edge of the road surface.

Deviations from this installation position are possible on a limited scale. In this case, care must be taken that the height and angle of the elements in relation to the base area are still guaranteed. In this way, DELTABLOC® elements can also be used on lower-lying verges and on roads with a tonnage profile or a horizontal incline.

Water drainage

DELTABLOC® restraint systems feature tested drainage openings. The systems DB 50SL and DB 65S are drained over the whole length under the steel angles.

Installation

General

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 management.

Transportation

The elements are delivered to the construction site by appropriate transport vehicles. For unloading the barriers, a forklift or a crane are usually used.



Unloading with a forklift

Handling equipment

For handling the DELTABLOC® elements a concrete safety barrier grab is used together with a crane or a forklift.

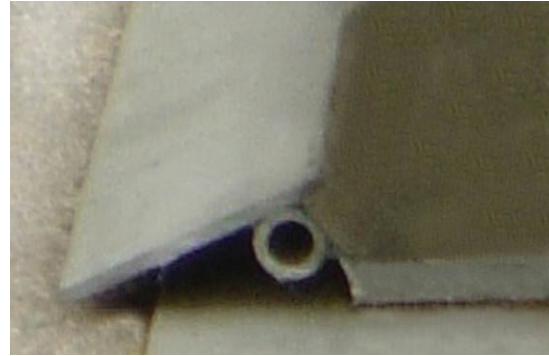


Installation with a concrete safety barrier grab

Installation

DELTABLOC® elements are lifted separately from the transport vehicle. At the butt joint of every element there is a steel core on one side of the steel angle. During the unloading process, the clamping bolts with a hex-nut

have to be inserted into the steel core – two bolts for each butt joint.



Steel angle with steel core for the tensioning bolt



Insertion of the clamping bolts during the unloading procedure

When lowering the elements, the patented coupling is inserted. Close to the base area, the element is to be aligned. When setting down the element, it is important to stretch the element chain by pulling the last element in a longitudinal direction.



Lowering the element and inserting of the patented coupling

The clamping bolts have to be tightened so that the couplings are under tension.



Aligning of the element and tightening the clamping bolts



Detail: tightening the clamping bolts at the base

The terminal elements of the DB 50SL are mounted without anchoring. The terminal elements of the DB 65S have to be anchored into the ground according to plan no. V8273 and V9080. *See chap. Technical drawings.*



Terminal element with anchor plate

Deviating element lengths

DELTA BLOC only recommends the use of tested element lengths. Other element lengths may however be used after discussion with the technical division of DELTA BLOC.

Tolerances

DELTABLOC® restraint systems are combined to form an element chain. The DELTABLOC® coupling system is used for linking. 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.

Conclusion

Within a day (8h) it is possible to install approx. 2300m of the DB 50SL or approx. 2000m of the DB 65S. Therefore a team with 3 workers and one crane operator or forklift driver are necessary.

Example: On the photograph below is shown the safeguarding of a construction site with the DELTABLOC® system DB 65S. The containment level H2 guarantees high protection. The element chain is ready for use at record time.



Safeguarding a construction site with containment level H1

Maintenance and inspection

General

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

Drainage outlets

To guarantee unhindered drainage of water (rain water or melt water), the drainage channels must be inspected once a year and if necessary cleaned using high-pressure cleaning equipment.

Reflectors

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

Inspection

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

Inspection activities

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

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

Completeness of the restraint system

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

- ▶ coupling between successive elements
- ▶ screw connections of anchors for terminals

Table 1: Inspection activities for the entire system

Component	Inspection activity	Measure
entire system	<ul style="list-style-type: none"> ▶ checking the couplings for visible damage ▶ checking for displacement of elements after each impact in the area of 50m before and after the impact point 	where necessary, repair measures must be initiated

Table 2: Inspection activities for individual components

Component	Inspection activity	Measure
restraint element	<ul style="list-style-type: none"> ▶ visual inspection for cracks or spalling ▶ checking the correct positioning of the element 	where necessary, initiate repair measures
coupling	checking for completeness and damage	where necessary, replace elements
clamping bolts	checking for completeness and damage	where necessary, replace elements

Procedure after an impact

Adhering to the following recommendations, the DELTABLOC® systems DB 50SL and DB 65S remain permanently effective, even after impact events. In case of doubt, the system supplier should be consulted for a professional assessment.

The condition of the safety barrier elements after an impact can be categorised as follows:

No displacement of the safety barrier

Damage pattern: No visible cracks or spalling on the concrete elements. No deformations of the ground anchors or the couplings. Tyre abrasion as well as possible scratches or traces of paint are the only signs of a vehicle contact.

Measure: There is no need for action.

Slight displacement of the safety barrier

Displacement < 6cm

Damage pattern: Slight visible damage on the concrete elements, such as small cracks, concrete breaking etc. There are clear signs of vehicle contact. No visible deformations of the ground anchors, clamping bolts and coupling elements.

Measure: Minor damages can be repaired on the spot, using repair mortar. The displaced DELTABLOC® elements can be realigned using suitable lifting equipment. If possible, bolts have to be retightened, otherwise exchanged.

If cracks appear in immediate proximity of the ground anchors or the couplings, the affected DELTABLOC® elements are to be replaced and aligned in accordance with the installation instructions! The installation of new elements is to be carried out as in the initial installation.

Considerable displacement of the safety barrier

Displacement ≥ 6cm

Damage pattern: Significant visible damage on the elements, such as cracks, concrete breaking etc. Visible deformations of the ground anchors, the coupling elements or the clamping bolts.

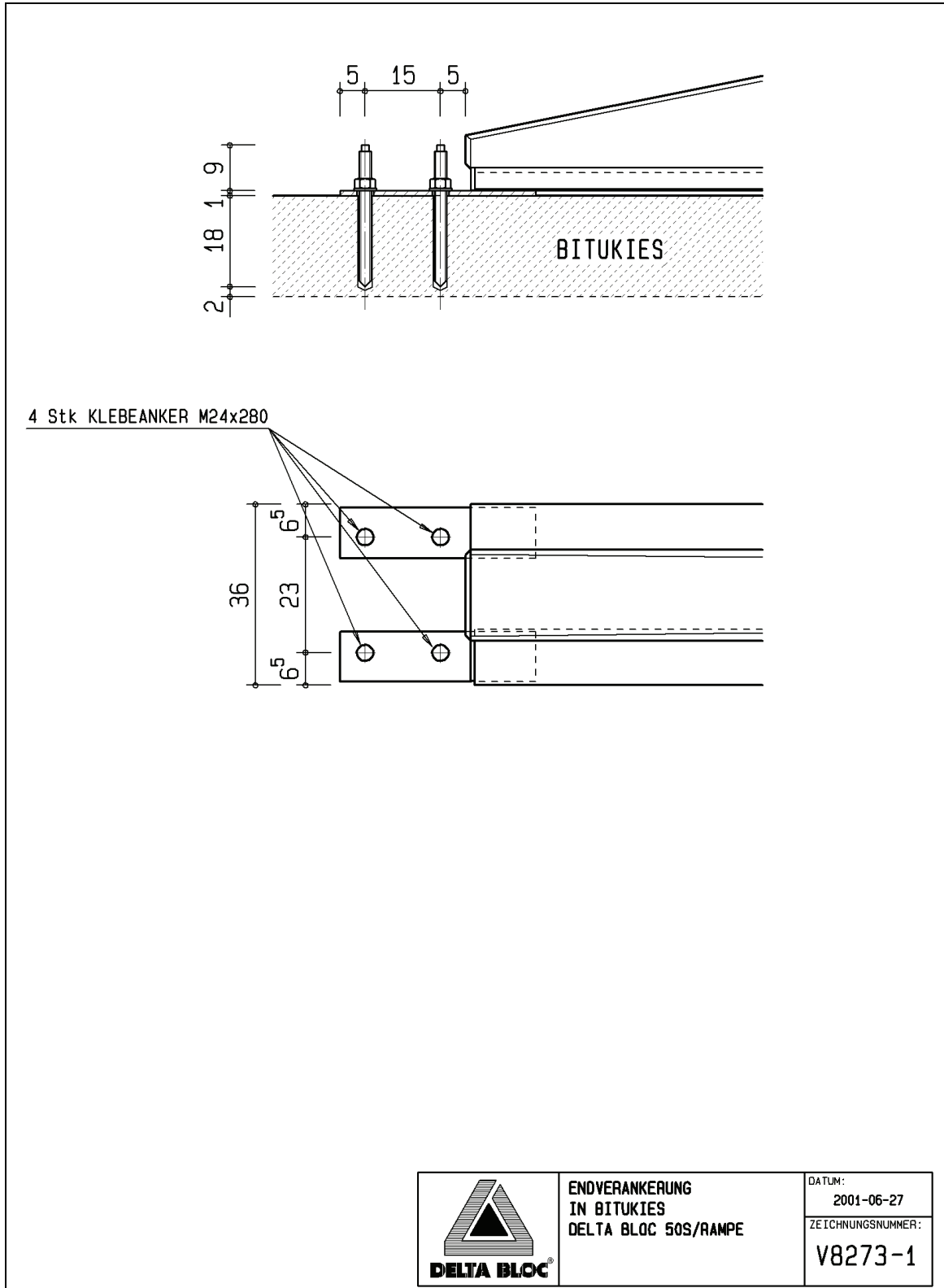
Measure: If only minor damage is evident, the elements can be repaired on the spot, using repair mortar – otherwise they have to be replaced. Clamping bolts and couplings have to be replaced as well, if they are significantly deformed. In case of concrete breaking or cracks in the area of the ground anchors, the affected DELTABLOC® elements absolutely have to be replaced. Installation and alignment of new DELTABLOC® elements have to be carried out in compliance with *chap. Installation*.

Remark on the repair mortar to be used

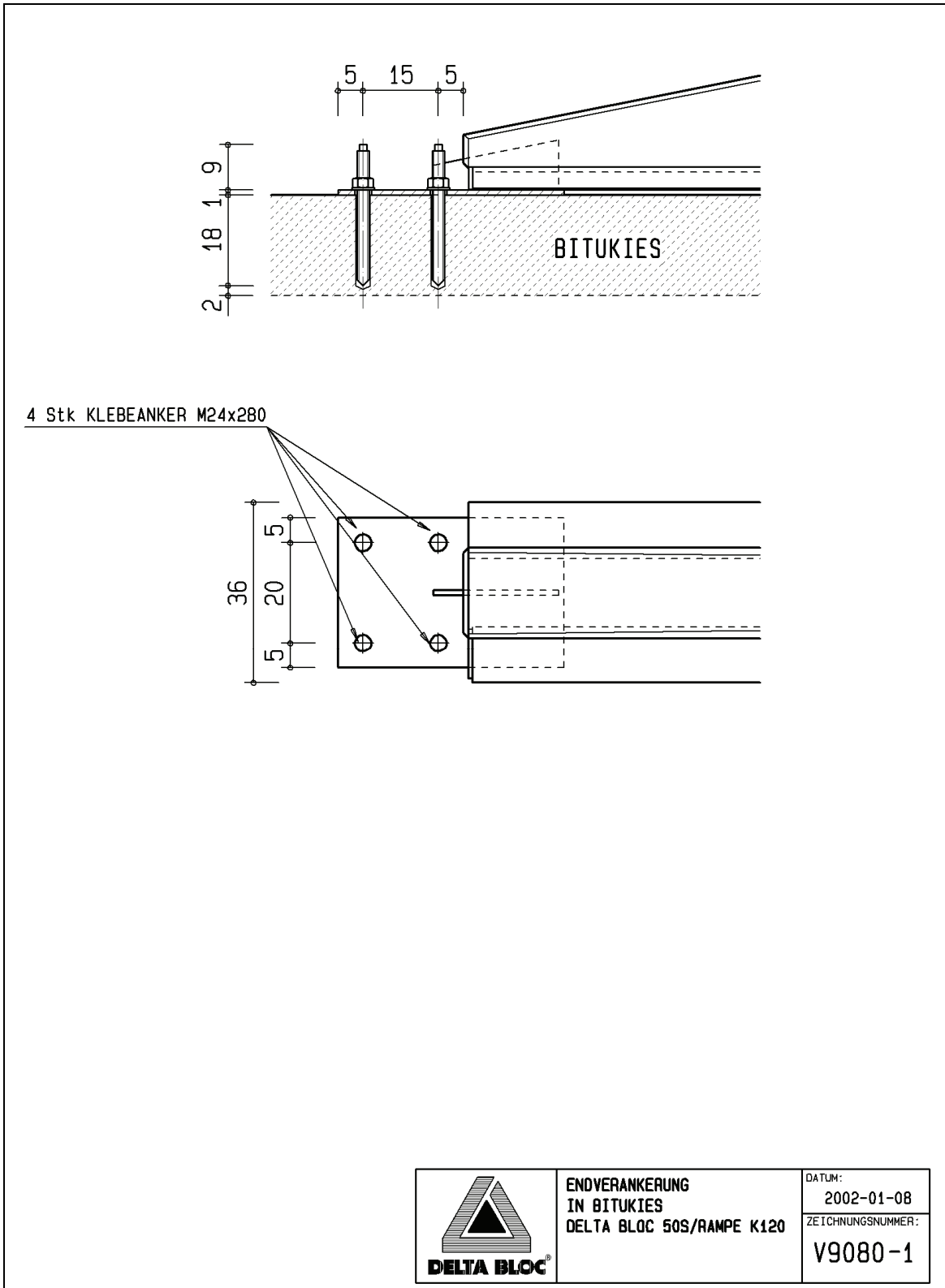
Commercial repair mortars are to be used for the repair of minor damages. They are hydraulically hardening, polymer-modified dry mortars. Preparation of the surface and application of the mortar must be carried out in accordance with the processing instructions of the mortar manufacturer.

Technical drawings

V8273 - Anchoring of the terminal element



V9080 - Anchoring of the terminal element



Operational safety

General

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 they are used for.

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 pass 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! Before loosening the straps that are securing the load, it must be ensured that the load is still stable.

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 lifting equipment has been tested 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, helmet, high-visibility jacket, 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 are to be worn when cleaning DELTABLOC® elements, thus avoiding injuries caused by small airborne 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 in order to avoid accidents with passing traffic. Any waste and dirt on the construction site must be removed.

Tools and equipment

Required equipment

1. Lorry with loading crane or mobile crane, excavator or forklift
2. Concrete safety barrier grab
3. Crowbars and lifting rods
4. 24mm spanner
5. Drill (with drill head)
6. Electricity supply
7. Tape measure or distance meter

Material

1. Elements, terminals, transitions
2. Bolts and nuts M16 for terminal anchoring
3. Clamping bolts M16
4. Couplings
5. Reflectors (if required)
6. Mechanical anchor for terminals or resin-bedded anchor

Transport

1. Suitable lorries
2. Load-securing straps

Additional information

Other relevant documents

- ▶ Product Information DB 50SL
- ▶ Product Information DB 65S
- ▶ Product Information DB 80

Normative references

- ▶ European Standard EN 1317 part 1 "Terminology and general criteria for test methods"
- ▶ European Standard EN 1317 part 2 "Performance classes, impact test acceptance criteria and test methods for safety barriers"

Internet

- ▶ For further information, photos and videos of crash tests please visit www.deltabloc.com



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