SAFEROAD



SafeStar 331

H3 | W3 | A

INSTALLATION INSTRUCTION

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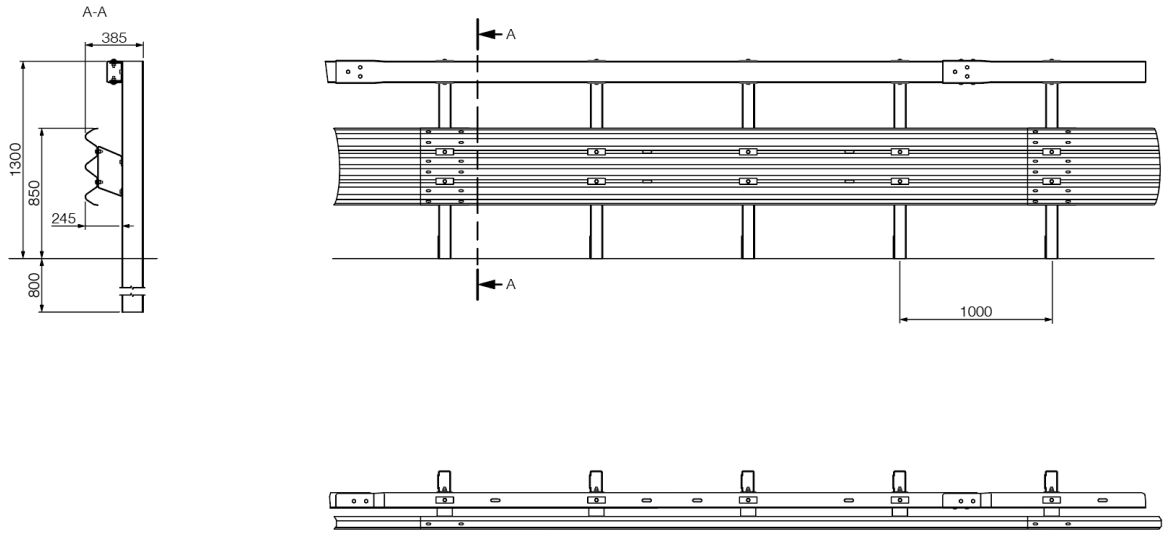
TECHNICAL DATA



Test laboratory	AISICO S.r.L. – Viale Bruno Buozzi 47, 00197 Roma (IT)
Test report no.	2211 (TB11) | 2213 (TB81)
Notified body	AISICO S.r.L. – Viale Bruno Buozzi 47, 00197 Roma (IT)
CE number	2131/CPR/942
Characteristic material of the system	S235JR/S355JR or equivalent
Width [mm]	385
Height [mm]	1300
Post distance [mm]	1000
Containment Level	H3
Normalised working width [m]	1,0
Class of normalised working width Wn	W3
Normalised dynamic deflection [m]	0,9
Class of normalised vehicle intrusion VIn	VI6
Normalised vehicle intrusion [m]	2,0
ASI	A
Test length [m]	58
Installation condition	Driven in ground

GENERAL INFORMATION

Requirements of the assembly personnel

The installation must only be undertaken by trained and qualified personnel. Installation firms obtain a special technical advisor from the manufacturer to support the project.

Usage compliance

The Vehicle Restraint System (VRS) is designed for installation on road traffic areas according to national regulations. It is intended to protect occupants of errant vehicles on the roadway, to protect third parties and objective and can be installed in central reserves and side lanes as well as on verges.

Limits of installation

The test results were achieved under the conditions described in the test report. Due to the fact that not all practical applications can be covered by the test report scenario, these installation instructions define the state-of-the-art boundary conditions for installation under which it can be expected that the functionality of the VRS is guaranteed in practice. If boundary conditions are identified during installation that are not covered by the installation instructions, the manufacturer of the VRS must assess whether CE-compliant installation is possible for the given environment.

To ensure that the performance declared in the certificate of constancy of performance is maintained, the requirements of the installation instructions must be met during installation of VRS. If these requirements are deviated without consulting the manufacturer, the liability for defects for the product is transferred from the manufacturer to the installation company carrying out the work.

Transport

During transport, personal protective clothing must be used. When transporting the systems to the site by truck, secure the load to prevent slippage.

Work protection

Personal Protective Clothing must be used according to national regulations.

TECHNICAL INFORMATION

Bolt connections

Fit nuts manually and then tighten with torque wrench. All fixtures to be fitted vertically to the connecting parts.

Bolt	M_{min}	M_{max}
M16	70 Nm	140 Nm

Durability

The minimum coat thickness for screws and nuts shall be in accordance with EN ISO 10684 at the respective measuring points 40 µm. Galvanizing of bolts and steel per EN ISO 1461.

Expected durability

Approx. 25 years, depending on atmospheric corrosion e.g. maritime air, industrial air, etc.

Installation length

The minimal installation length is 58 m. Any deviation means that the construction would no longer meet the test criteria and therefore is to be regarded as untested. Like any untested construction, the deviating system must be individually agreed on with the client as a special onetime construction.

Assembly temperatures

When the construction is taking place in Germany, the system is not dependent upon the outside temperature at the time of the assembly. In regions where the minimum outdoor temperature is under -24°, the assembly may only take place with the written approval of the manufacturer.

PREPARATORY MEASURES

Allocate and wear protective clothing

Provide the following personal protective clothing and use during installation works:

- reflective clothing
- head, ear, hand and foot protection

Allocate tools

The following tools are required:

- post rammer
- manual rammer w. hose and bracket for chain fixture
- post pully
- drill with drill bits
- level / sledgehammer
- torque key to 140 Nm with sockets

However, you can facilitate the work by using alternative tools, equipment and machinery as necessary.

Traffic management, prepare site and set-up

Set up the traffic management measures usually required by the national regulations. The construction site must have sufficient space for:

- laid-out system components
- post rammer (or equipment e.g. manual rammer)
- truck with telescope crane
- ample space for the assembly crew

Supply, transport, off-loading and delivery check

Bring the system components by truck to the installation section. Off-load and check that the delivery is as per the delivery docket. The carrier or supplier must be notified immediately if there is any transport damage or discrepancies with the delivery.

Dispose of the packaging material according to the applicable local refuse disposals regulations.
Unload the materials with a crane.

FOUNDATION

After determining the position of the system, drive the posts into the hard shoulder according to the post foundation plan. The installation depth is 800 mm.

The ground in front of and under the safety barriers must be compacted so that it is sufficiently strong (to bear the load of passenger cars). Posts are rammed into the ground with a pneumatic or hydraulic ram and a hammer for corresponding post cross section.

Before beginning of the ramming works information must be acquired regarding any utility lines (cables, pipelines, etc.). The instructions regarding protection of cables as issued by the utility companies must be adhered to.

For the ramming of posts the soils are subdivided into the following soil classes:

Ramming posts in soils of homogeneous area O is not permitted. In these cases, special measures must be agreed with the client. The soil may have to be substituted or strip foundations may have to be erected.

In homogeneous area HB1 and HB2 posts must be rammed in accordance to the post foundation plan. In exceptional cases (ramming obstacles) the fixing length of individual posts may be reduced. Minimum fixing length is 0.80 m.

O (1-2)*	Surface soil, also fluid (Humus)
	top soil, fluid to hardly fluid
	Ramming is not possible
HB1 (3-5)*	Ground, easily soluble, heavy
	Coarse grained soil with density $0,65 \geq D > 0,3$ Mixed grained soil with consistence $1,0 \geq I_c > 0,5$ Fine grained soil with consistence $1,0 \geq I_c > 0,5$ Organ genic soil with density $0,65 \geq D > 0,3$ or with consistence $1,0 \geq I_c > 0,5$
	Ramming is possible
HB2 (6)*	Rock easily soluble
	Coarse grained soil with density $D > 0,65$ Mixed grained soil with consistence $I_c > 1,0$ Fine grained soil with consistence $I_c > 1,0$ Share of blocks M.-% > 30
	Ramming is possible
HB3 (7)*	Rock
	uniaxial compressive strength qu > 15 N / mm²
	Not possible; therefore bore, fit, fill, pack

* Soil class acc. to DIN 18300:2012

Tab. 1: Soil class

Any reduction of the length of posts requires the written approval of the client. In case the client does not grant written approval for reducing the length of posts special measures (single dug-in posts or posts with footplate, strip foundations, etc.) must be agreed with the client.

In homogeneous area HB3 and if the soil contains slag the posts must always be inserted in drilled holes. In these cases, the fixing length of the posts may be reduced to 0.80 m. The system can be erected on soil of homogeneous area HB3 only if the thickness of the cover with verge material is at least 20 cm. Drilled holes must be filled with sand and then the posts must be rammed in. The minimum diameter for the boreholes is 17.0 cm.

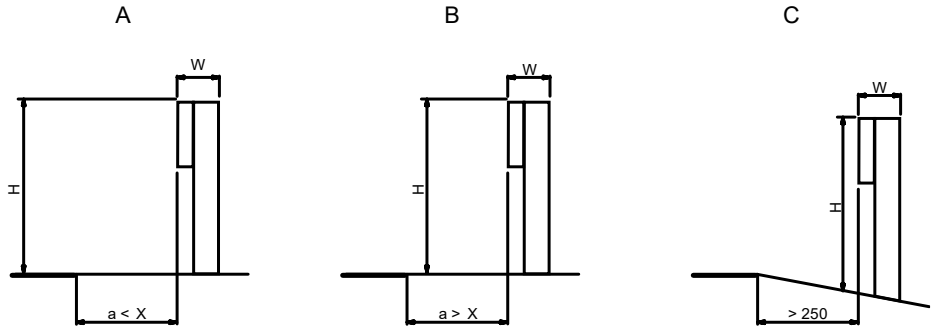
Single obstacles that are found at a depth of up to 50 cm must be removed.

If it is not allowed to ram the post due to local conditions, it is possible to install the system with posts with base plate of a comparable construction system on a strip foundation. Regarding the construction of the strip foundation, the manufacturer should be contacted.

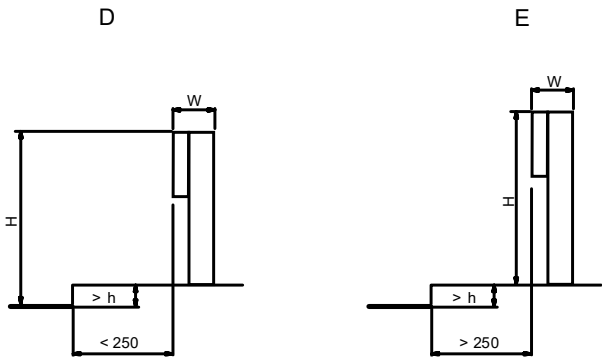
INSTALLATION HEIGHT AND LIMITS OF SHOULDERS IN FRONT OF BARRIERS

As a rule, the installation height (H) of system is 130 mm in relation to the carriageway surface (see case A). The distance of the front edge of system from the edge of the paved area (X) should comply with national regulations.

In deviation from the above the height of the guardrail beam must be measured directly in front of the system in case the front edge of the guardrail beam (1) is assembled at a distance of a > X from the edge of the paved area (see case B) or (2) it is assembled at a distance of a > 250 mm from the edge of the paved area and the verge has a transverse inclination of more than 15% (see case C).



Kerbs with a level difference (h) of more than 150 mm should be avoided. If kerbs cannot be removed, one of the following solutions should be chosen in consultation with the client:



In case the distance from the front edge of the kerb is not more than 250 mm (Case D) the installation height is measured from the carriageway surface. In case the distance from the front edge of the kerb is > 250 m (Case E) the height of the guardrail is to be measured from the top edge of the kerb.

INSPECTION

Checking the assembly

After the installation of the vehicle restraint system, check that all bolt fittings are tight and - if present - the mobility of all removable elements (e.g. pin-wedge connection). Align the system where appropriate. Ensure that the section corresponds with the system drawing.

Maintaining the installation tolerances

Basically, the system must be installed in accordance with the technical documentation (post foundation and assembly drawing). The tolerances listed in the following table should be used only in exceptional cases.

Clear building site, approve system

- Remove all building material and every piece of refuse.
- Carry out a visible inspection even if the installation roadway is perfectly free of objects.
- Remove mobile safety barriers and after Inspection, report completion of the system to the Client.

Post spacing in longitudinal direction	(+/-) 10cm (+/-) 30cm*	
Top of Beam and/or Box profile	(+/-) 5 cm (+/-) 10cm**	height from road surface
Post deviation from alignment	(+/-) 3 cm	on 12 m section
Beam and/or Box profile deviation from alignment	(+/-) 3 cm	
Oblique position of the spacer (if present)	(+/-) 5°	in both directions

* for pile driving obstacles (see paragraph: Adjustment of post spacing) | ** in exceptional cases (e.g. in the transition to other VRS)

Tab. 2: Maintaining the installation tolerances

REPAIRS, INSPECTION AND MAINTENANCE

Repairs

In general, you need to replace only those components that have any residual (plastic) deformation or cracks and flaking in the system.

If there are merely minor deformations in one component that are local in nature, replacement is not necessary. However, if posts are bent, they must be replaced. Minor distortions in the non-deformed posts can be repaired by straightening or turning them, but only if the alignment of the longitudinal section (e.g. guardrail beam) can be restored.

If straightening or turning is not possible, and if more than one component is damaged, the system in the damaged section must be replaced completely using the modular sections (4,0 m). In the process, all disassembled connection fittings (screws) must be replaced with new ones. The expanded holes in the posts resulting from this must be filled up and sealed adequately.

Moreover, care must be taken to ensure that the galvanized surfaces do not get damaged. Minor defective spots on the galvanized surface must be attended to by careful preparation with the application of zinc dust coating. Surplus material must be removed completely from the area that has been repaired.

Repair work can easily be undertaken by any contractor. The required components can be purchased on the open market as long as they have the CE Mark of the manufacturer.

Reusability of parts

Damaged, replaced components cannot be reused and must be disposed.

Dispose/recycle of damaged components

Recycle damaged parts according to legal and local waste disposal regulations. There are no hazardous and dangerous substances.

Inspection and maintenance

The system is maintenance free.

NECESSARY REQUIREMENTS AND CONFORMING TO LOCAL CONDITION

Modifications to the tested VRS are not permitted without the written confirmation of the manufacturer.

Cut pieces

Beams can be cut to fit on site. The following conditions must be adhered to during production:

- Minimum length 750 mm on site (beam overlap)
- On installation the post spacing of the guardrail system must not be extended
- Professional cuts using angle grinder or saw
- Professional drilling for bolt holes
- Professional re-work of cuts and drill holes using zinc spray material.

Heat expansion joint

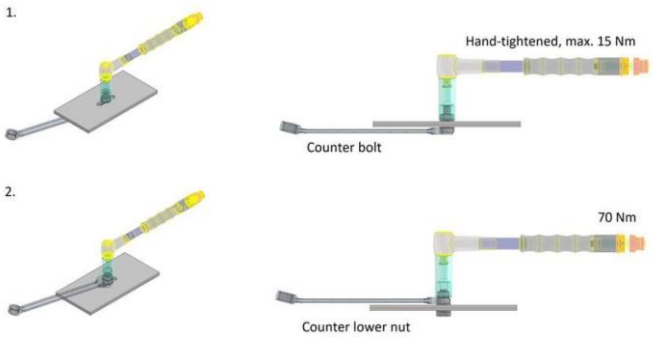
In section of movable road crossings, Heat Expansion Joints have to be installed symmetrically. It is important that the installation of the base-plated posts always starts at the joint. Heat Expansion Joints should always be delivered to site fully assembled and installed on the structure with the correct post spacing.

The middle temperature of the structure at time of installation is taken when setting the Heat Expansion Joints. The bridge movement due to temperature changes must be taken into consideration when installing the posts i.e. the preformed anchors at the joint.

The Zero Position for overlapping the long bolt hole on Heat Expansion Joints is generally set at +10°C.

The bolts in the Heat Expansion Joint may only be tightened to the extent that they do not interfere with the longitudinal movement. The 1st nut must be tightened to a torque of approx. 15 Nm. The 2nd nut must be tightened to a minimum torque of approx. 70 Nm. Make sure that the nuts are properly countered.

For installation lengths less than 30 m heat expansion joint can be omitted.



Additional safety devices

In general, the mounting of attachments is possible. There are connection features on the system for attaching additional road safety devices. If additional safety devices (e.g. traffic signs, pedestrian protection, anti-glare protection) are needed, a written confirmation of the manufacturer is required.

Uneven ground conditions

The position of the system on uneven ground conditions should follow the alignment of the adjacent systems. The underground should be compensated by the customer in such a way that proper assembly of the elements can be ensured.

Radius, minimum radius

In curved road sections of radius r < 30 m, pre-bended radius guardrails must be used. For box profiles with radii between 50 m and 10 m, shorter box profiles (e.g. 2 m) must be used which meet the curvature. For radii < 10 m pre-bended box beams must be used.

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Transitions

It is possible to connect the system to a different safety system. Ask the manufacturer for a suitable transition.

Underground slope

The system has to be installed vertically or perpendicular to the roadway in accordance to the installation tolerances. Change of the inclination of the underground should be compensated by the customer in such a way that proper assembly/ function of the elements can be ensured.

Restricted working width

If the working width is limited due to structural obstructions appropriate measures should be taken in accordance with national regulations and in consultation with the manufacturer.

Use of weathering steel

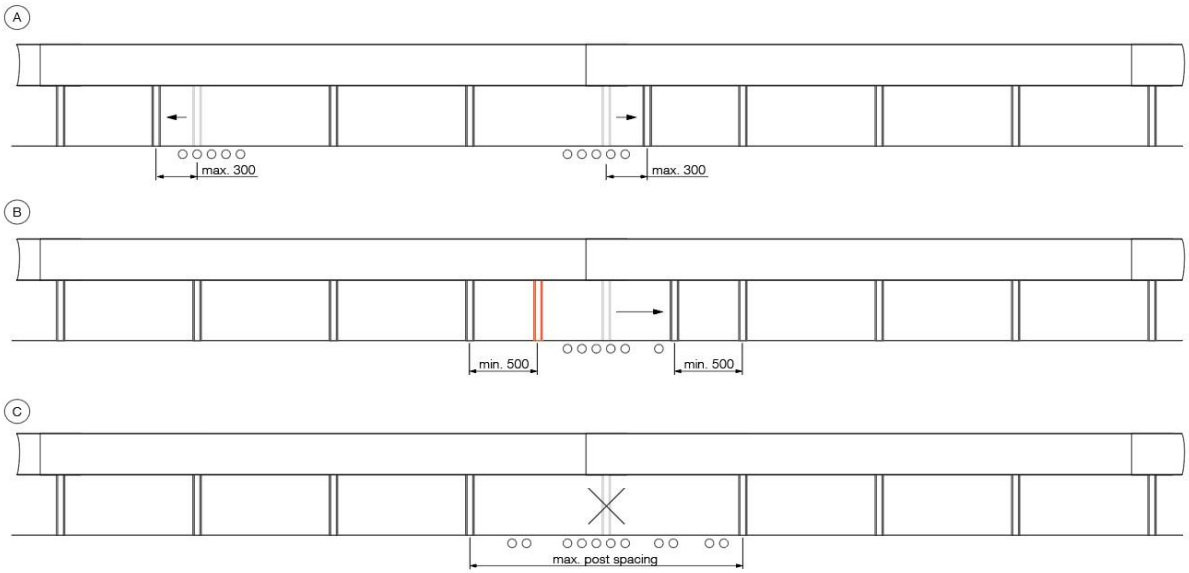
If weathering steel is used, further inspections may be necessary depending on local conditions. The appropriate measures should be taken in accordance with national regulations and in consultation with the manufacturer.

Adjustment of the post spacing

In principle, the distance between the posts is not exceeded. If the site conditions do not allow a regular distance, the post can be shifted by 300 mm. Within the joint area, the post must be moved so that the fixing is not in the overlapping area. (Case A)

If it is not possible to install a post in the intended location, using the tolerance of 300 mm, the post spacing must be reduced with an additional post. The minimum distance between the posts of 500 mm has to be observed. (Case B)

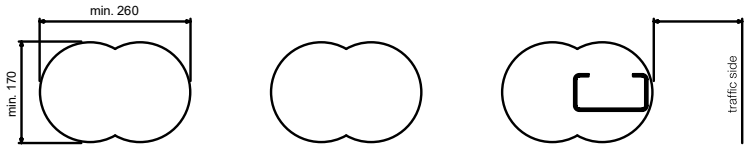
If an additional post due to the structural conditions is not possible (Case C), in exceptional cases the post distance can be extended to 3000 mm.



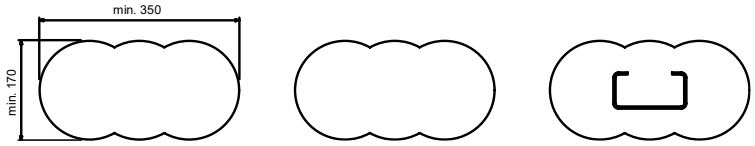
Installation in tarmacked underground

If there are structural conditions where the system must be installed in tarmacked underground, the posts have to be rammed in a double hole (single-sided system) or triple hole (double-sided system).

The double hole is made of two overlapping holes with a diameter of 170 mm, so that the total dimension of the double hole is at least 170 x 260 mm. After backfilling and compaction of the double hole, the post has to be installed in the center of the roadside hole.



The triple hole is made of three overlapping holes with a diameter of 170 mm, so that the total dimension of the triple hole is at least 170 x 350 mm. After backfilling and compaction of the triple hole, the post has to be installed in the center of the hole.



Modification of system components

Modifications to the system's components must be agreed with the manufacturer.

OTHER INFORMATION

Due to shape of the longitudinal element(s) used in the system, it can easily be climbed.

Detailed component drawings of the tested vehicle restraint system can be submitted later.

If aforementioned requirements are not met during installation without consultation with the manufacturer, liability for defects in the construction product passes from the manufacturer to the installer.

Make sure that you are using the latest version of the installation instruction. You can find it on our product finder (https://www.saferoad-rs.de).

Valid legal version is in German language.

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