



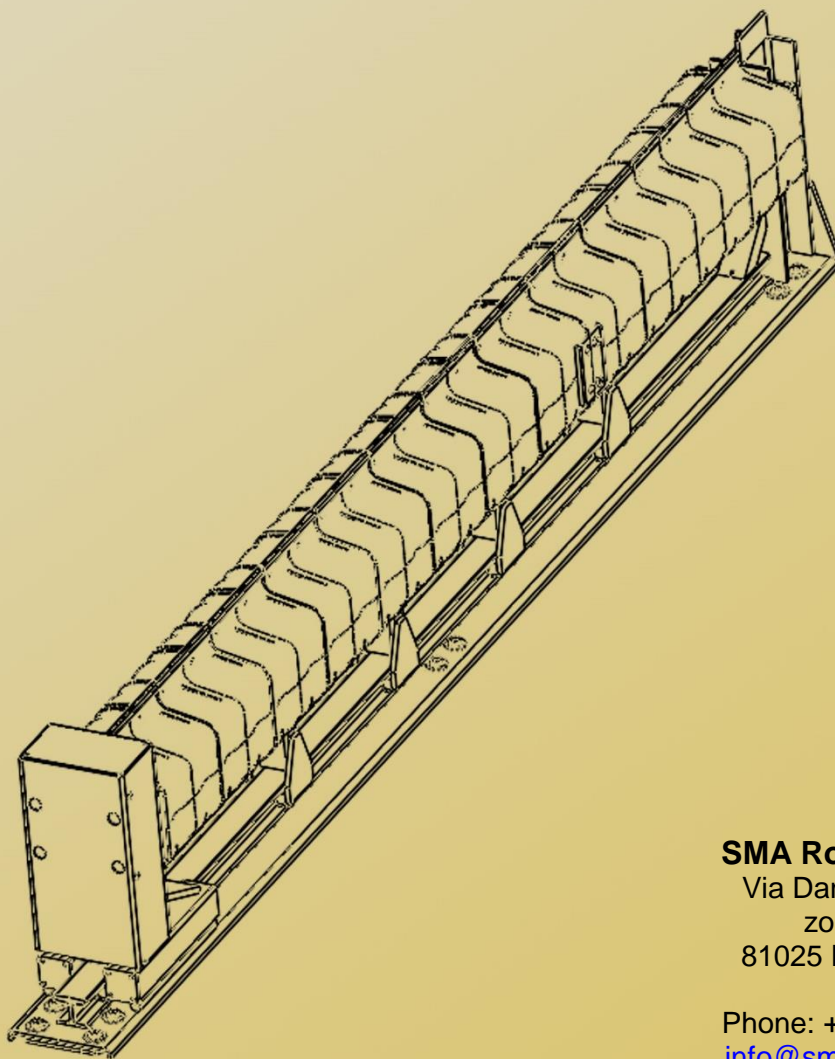
SMA[®]

safety modular absorber

End Terminals

Installation and Repair Manual

SMAT1 – SMAT2 – SMAT4



SMA Road Safety s.r.l.

Via Dante Giacosa snc
zona ASI sud

81025 Marcianise (CE)
Italy

Phone: +39 0823 821 560

info@smaroadsafety.com

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1. GENERAL

1.1 Foreword

The following document represents the SMA® (Safety Modular Absorber) Installation and Repair Manual for the Energy Absorbing (EA) End Terminals SMA T1 - SMA T2 - SMA T4, developed from the Company Industry A.M.S. srl, which has its seat in Marcianise (CE), ITALY.

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1.2 Crash Test

SMA® End Terminals have successfully passed the Crash tests according to the European standard ENV1317-4 and prEN 1317-7.

The crash tests have been performed by the Test Lab of **Certification Security Institute (CSI) S.p.A.**, with its site in Viale Lombardia 20, Bollate (MI), Italy.

The test results are shown in (Tab. 1) below:

Tab. 1: Summary of the test reports, as confirmed by the Certification Security Institute.

Test report code	Test	ASI-1998	ASI-2010	THIV (km/h)	PHD (g)	Lateral Displ.	Exit Box	Standard
0045/ME/HRB/17	TT 2.1.50	0.9	0.9	39	n.a.	D1	Z1	prEN 1317-7
0135/ME/HRB/14	TT 2.1.100	1.3	1.3	43	20	D1	Z1	ENV 1317-4 / prEN 1317-7
0134/ME/HRB/14	TT 4.3.110	1.1	1.1	32	14	D1	Z1	ENV 1317-4 / prEN 1317-7
0137/ME/HRB/14	TT 5.1.100	1.3	1.2	32	7	D1	Z1	ENV 1317-4 / prEN 1317-7
0155/ME/HRB/14	TT 6.3.110	n.a.	1.3	30	n.a.	D1	Z1	prEN 1317-7
0157/ME/HRB/14	TT 3.3.110	n.a.	1.1	40	n.a.	D1	Z1	prEN 1317-7
0154/ME/HRB/14	TT 2.1.80	1.1	1.1	40	18	D1	Z1	ENV 1317-4 / prEN 1317-7
0088/ME/HRB/15	TT 1.2.80	1.3	1.3	40.85	n.a.	D1	Z1	ENV 1317-4 / prEN 1317-7
0095/ME/HRB/15	TT 4.2.80	1.1	1.1	23.99	n.a.	D1	Z1	ENV 1317-4 / prEN 1317-7
0020/ME/HRB/16	TT 6.3.110*	0.9	0.9	20	n.a.	D1	Z1	prEN 1317-7
0056/ME/HRB/16	TT4.3.110**	0.9	0.9	23.37	n.a.	D1	Z1	ENV 1317-4 / prEN 1317-7
0085/ME/HRB/17	TT 1.3.110	1.2	1.2	40.76	n.a.	D1	Z1	ENV 1317-4 / prEN 1317-7
*Test performed on the barrier 5 m before the backstop.								
**Test performed on the device with a slope down connection to the barrier								

1.3 SMA End Terminals: Components

All the components described below are assembled with different size and type of bolts in order to make the installation and/or the repair procedure easier.

1	Collapsible steel beam formed by modular bays;
2	End terminal backstop;
3	Tie rod welded to the collapsible steel beam;
4	Trolley;
5	Lateral plates – for fixing the trolley and the modular bays;
6	Post plates for fixing the terminal rail to the posts;
7	Posts with welded post plate

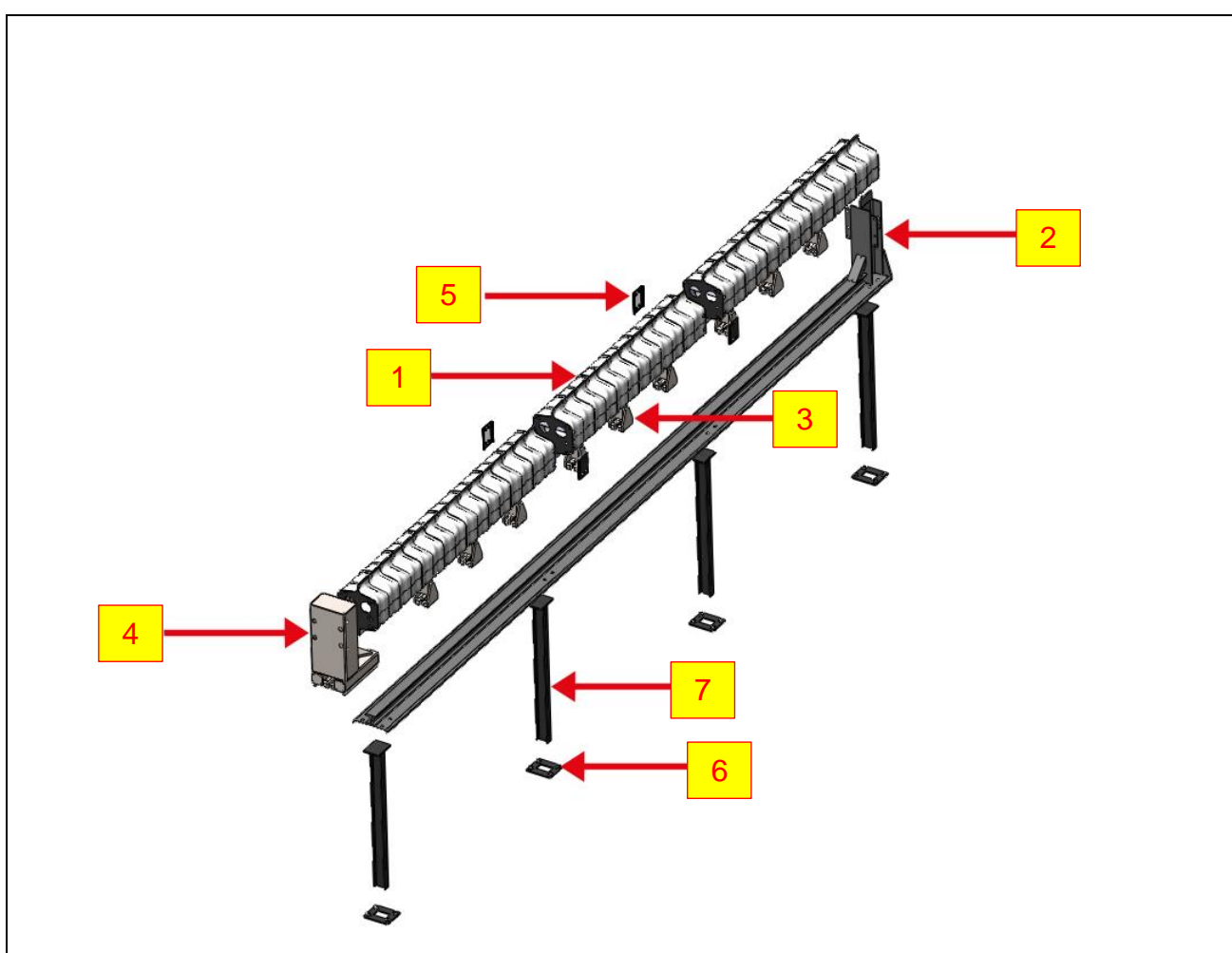


Fig. 1: Components of the End terminal SMA T4

1.4 SMA End Terminals: Family and Dimensions

- **SMA T 1** for speed class 50 km/h (also called “P1” according to the Standard ENV 1317-4 or “T 50” according to prEn 1317-7).
- **SMA T 2** for speed class 80 km/h (also called “P2” according to the Standard ENV 1317-4 or “T 80” according to prEn 1317-7).
- **SMA T 4** for speed class 110 km/h (also called “P4” according to the Standard ENV 1317-4 or “T 110” according to prEn 1317-7).

SMA T 1	Speed class: 50 Km/h		
Dimensions	Length: 2260 mm	Height from the ground: 620 mm	Width: 280 mm

SMA T 2	Speed class: 80 Km/h		
Dimensions	Length: 3542 mm	Height from ground level: 620 mm	Width: 280 mm

SMA T 4	Speed class: 110 Km/h		
Dimensions	Length: 5833 mm	Height from ground level: 620 mm	Width: 280 mm

1.5 Transition Connection Pieces

SMA End terminal has performed the crash tests with the following transition:

Type of barrier	Containment level	Working width
W Beam barrier	N2 or H2	W2 or W3

Industry A.M.S. has designed and manufactured the SMA Transition Piece which permits the connection between the End Terminal and the different longitudinal barrier systems.

It will be supplied together with the End Terminal (see also Section **2.6** for further details).

SMA Transition pieces can be:

Single sided: which is used for connections to barriers in the verge;

Double sided: which is used for connections to barriers in the median or central reserve.

Furthermore Industry A.M.S. supplies SMA Transition Pieces to connect to different types of end/start barrier types. For instance:

Tab. 2: Transition types

TYPE 1	from double wave to double wave
TYPE 2	from double wave to three wave
TYPE 3	connection to New Jersey

1.6 NFC Technology

SMA® End Terminals are supplied with a tag behind the Backstop (Fig. 2) for the NFC (Near Field Communication) technology compatible with tablet and smartphone provided with OS **Android**.

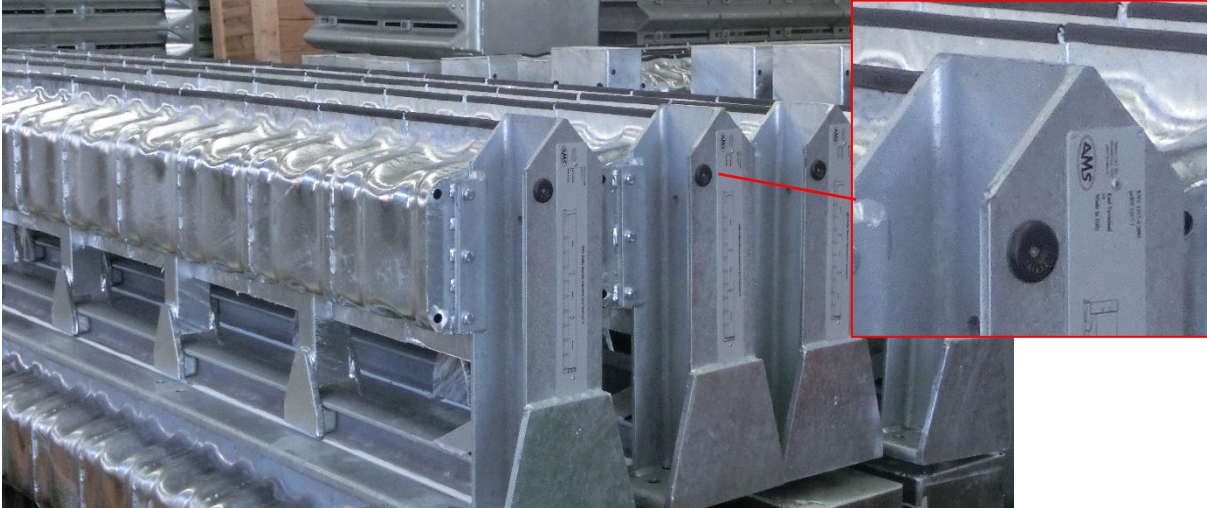


Fig. 2: Tag on the backstop of the End Terminal.

When contacting the tag with a device, an authorization is released by Industry A.M.S. It is then possible to open **SMA Road Safety**, access to the guided procedure for installation and repair.

1.7 Customer service

SMA Road Safety s.r.l. commits to supply customer service at the highest level.

The Company welcomes the comments concerning the quality and the manufacturing of its products, the installation procedure and the supporting documentation.

The clients are invited to contact the Company in the following ways:

- e-mail: info@smaroadsafety.com
- phone: +39 0823 821560

2. INSTALLATION PROCEDURE

2.1 Foreword

The End Terminal is provided already assembled in every part. For this reason, it is only necessary to fit the posts into the ground and attach the terminal to the post plates.

It is mandatory to observe the health and safety norms. **Industry A.M.S. srl** does not accept any liability in case of non-fulfillment of the local standards and norms.

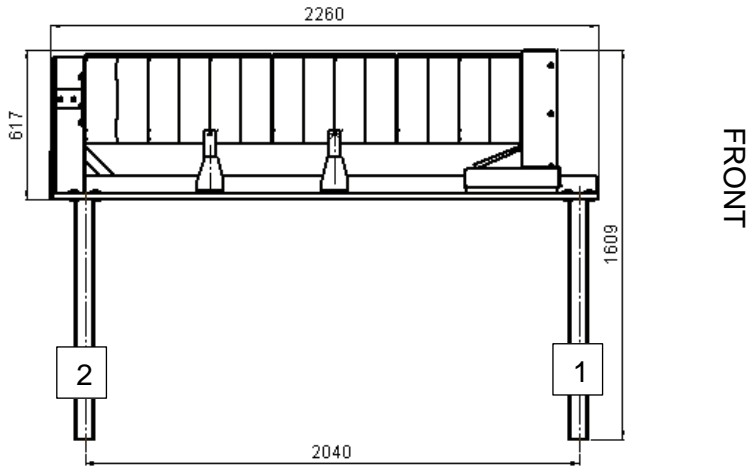


Fig. 3: Side view End Terminal SMA T1.

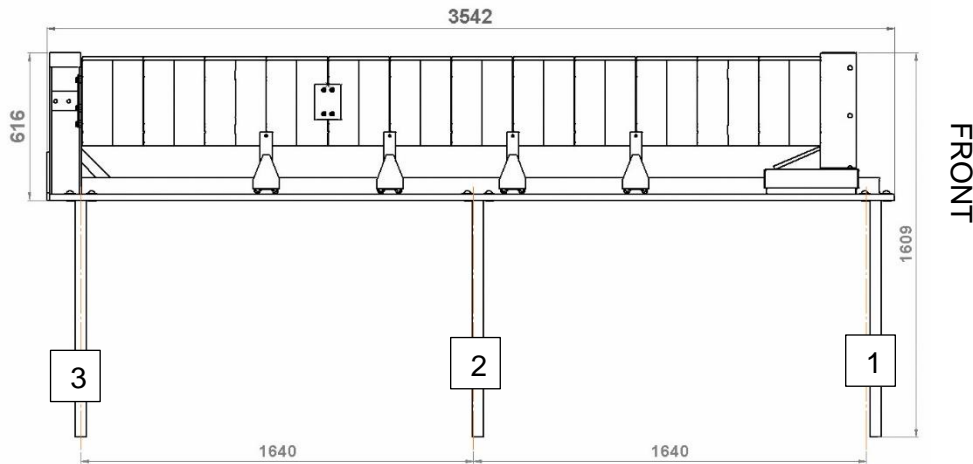


Fig. 4: Side view End Terminal SMA T2.

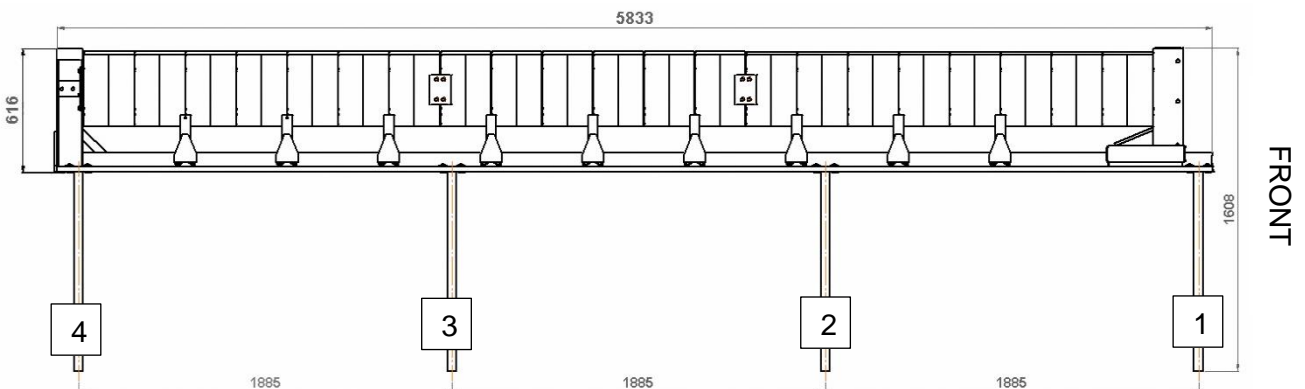


Fig. 5: Side view End Terminal SMA T4.

2.2 Installation tools

- Post template to accurately positioning of posts (supplied on request);
- Fixing plate for the transition;
- Impact wrench and Dynamometric wrench for bolts M16 – M10;
- Handling tools;
- Pile driver;
- Post head piece for post driver.
- Drill or Down The Hole (DTH) hammers (only for harder grounds)

2.3 Positioning of the End Terminal to the barrier

SMA[®] End terminal must be placed parallel to the roadway and perpendicular to the ground, then it must be connected to the barrier with the **SMA**[®] transition (Fig. 5).

2.4 Option 1: Installation by means of rammed posts

SMA[®] End Terminals can be installed in soil and/or on asphalt.

It is mandatory that the ground class is between **3** and **5** according to the Soil Condition Classification **DIN 18300**.

Before starting the installation, it is required to:

- remove debris and adequately level the ground;
- secure the work zone;
- provide safety equipment;
- set-up Traffic Management system.

⚠ If the ground conditions are too soft or there are services in the installation line, proceed as described in Paragraph 2.5 or 2.6.

⚠ If rock is encountered in the subsoil during the works, **Industry A.M.S.** suggests to proceed as indicated at Paragraph 2.5 or 2.6.

Mounting of the connection

Place the connection SMA on the last part of the barrier (see also par. 2.8 and 2.9) corresponding to the holes and screw it (Fig.6).

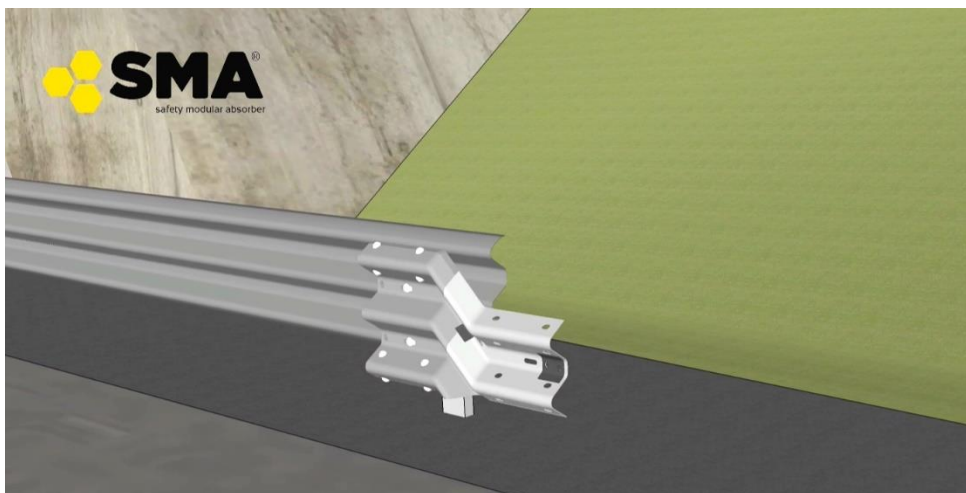


Fig. 6: Positioning of the connection

Positioning of the terminal in front of the obstacle to be protected

1. Place on the ground the installation plates (Fig. 7) parallel to the obstacle (Fig.8).
2. Mount the brackets on the installation plates with the screws (Fig. 9).
3. Place the drilling template close to the connection and screw the fixing plate (Fig.10) to the template (Fig. 11) and to the connection (Fig.12).

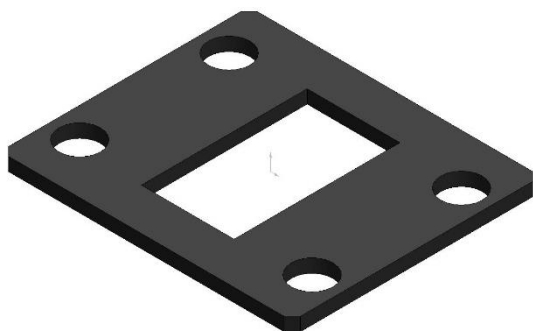


Fig. 7: Installation plate

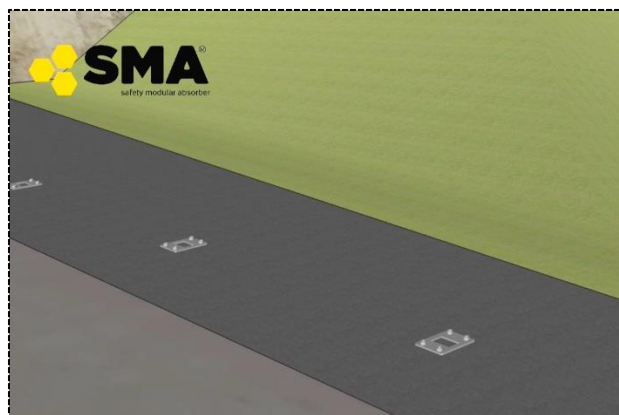


Fig. 8: Positioning of the install. Plates.

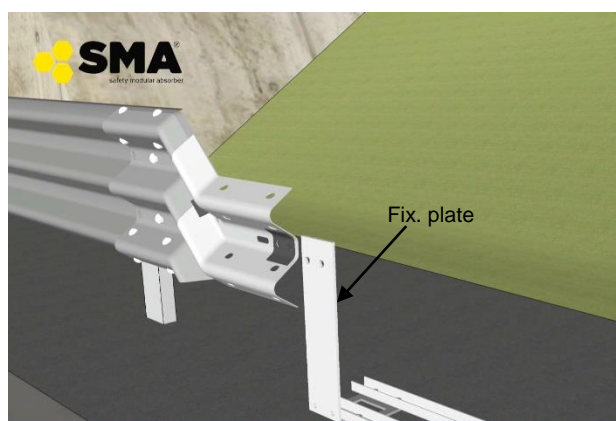
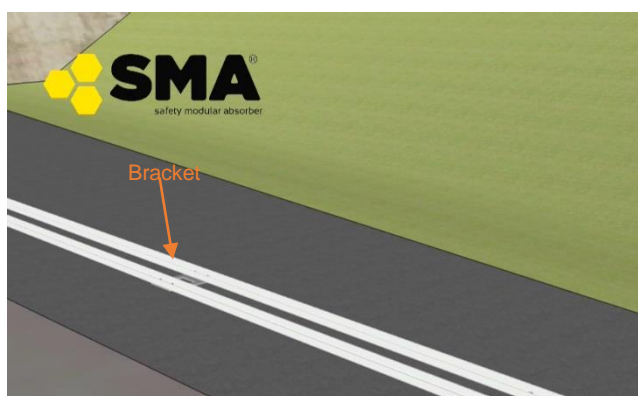


Fig. 9: Positioning of the brackets

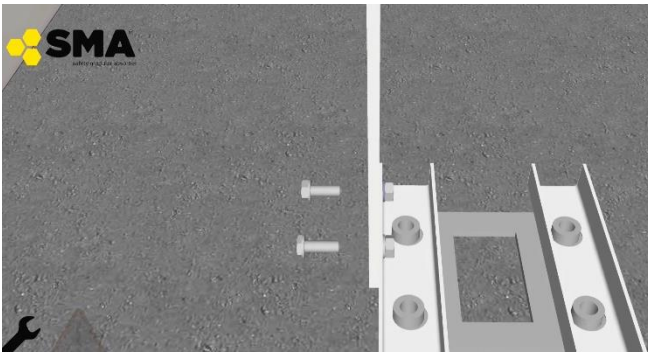


Fig.10. Positioning of the fixing plate

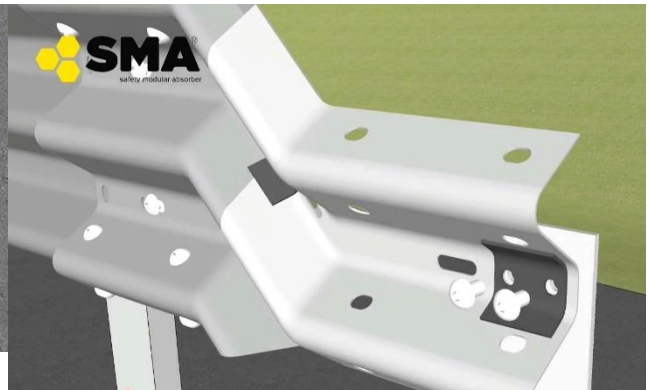


Fig. 11: Screwing of the fixing plate to the bracket

Fig. 12: Screwing of the fixing plate to the connection

Ramming of the posts

1. Ram the posts into the installation plates (Fig.13) by means of the the pile driver according to the sequence illustrated in Fig. 3, 4, 5 (as option it is possible to proceed as in par. **2.5** or **2.6**). It is also available a video which shows the procedure on Youtube channel **SMA Road Safety** at the following link:

<https://www.youtube.com/watch?v=VwH0rrY8skg&feature=youtu.be>

- ⚠ The vertical position of the post is mandatory (Fig. 15).
 - ⚠ They are supplied n.3 additional screws type M16 x 50 mm used for the installation on sloping grounds.
 - ⚠ The post must be rammed for the whole length, in order that the upper plate for the anchoring is at the same level as the ground (Fig. 16).
2. Remove the brackets from the plates (Fig. 17).
 3. Ram the post near the connection (Fig. 18).
 4. Remove the brackets for the positioning (Fig.19).
 5. Clean the plates from dusts and debris to permit the anchoring of the SMA End Terminal.

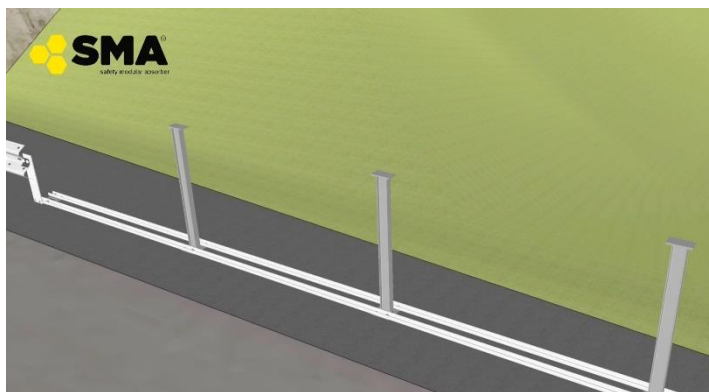


Fig. 13: Post ramming



Fig. 14: Type of post



Fig. 15: Check with the bubble level



Fig. 16: Ramming complete

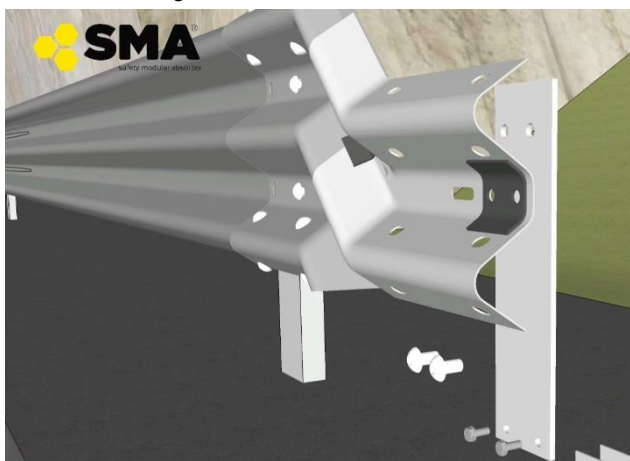


Fig. 17: Fixing plate removal

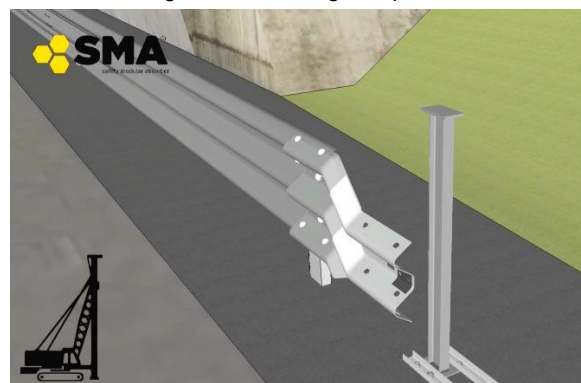


Fig.18: Post ramming near the transition

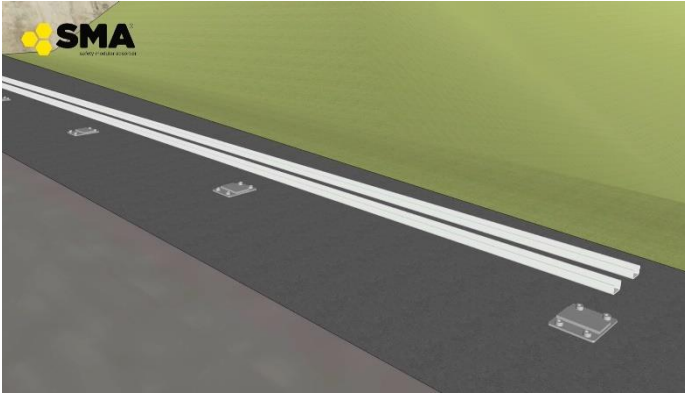


Fig. 19: Bracket removal

Fixing of the End terminal and the transition

1. Fix the **SMA**® End terminal on the fixing plates (Fig. 20) and screw the M16 bolts to the plate (Fig. 21) with a tightening torque 110 Nm (bolts class 8.8).
 - ⚠ N. 3 M16x50mm bolts are used to fix the End Terminal to the two holes closer to the transition piece of the installation plate in the back side (Fig. 23). These longer bolts permit to avoid screwing problems in case of sloped ground.
2. Screw the connection (see also par. 2.6) by means of M16 bolts (Fig. 22) to the backstop with tightening torque 110 Nm (bolt class 8.8). In case of double side connection, the same procedure must be replied.



Fig. 20: End terminal positioning on the plates

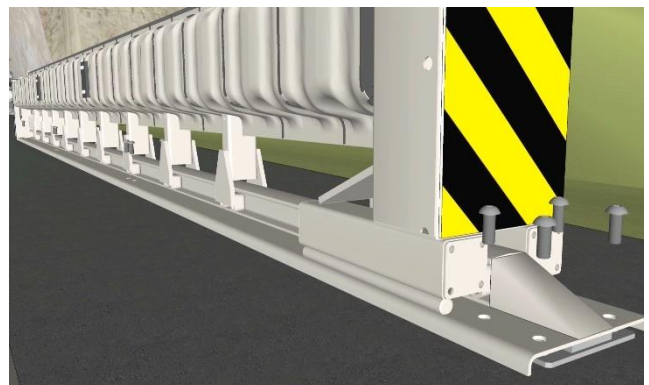


Fig. 21: Screwing procedure

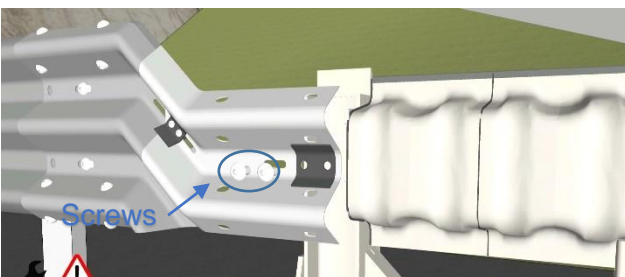


Fig. 22: Fixing of the Connection to the backstop

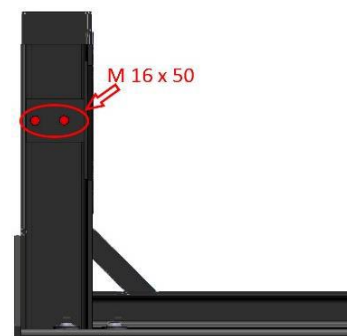


Fig. 23: M16 x50 bolts screwed on the backstop

2.5 Option 2: Installation by means of posts set in concrete

In case of harder soils (class **6** and **7** according to the **DIN 18300**) or as option to the standard procedure, proceed as described below:

1. Drill the soil with the machine for the post insertion (depth **1 mt**; \varnothing **120 mm**)
2. Place the installation plates near the holes.
3. Fill the holes with concrete $R_{CK} \geq 25$ Mpa.
4. Insert the post and ensure that the post plate is at ground level.
5. Wait for the concrete cure time and make sure the post plates are clean.

Proceed as described at paragraph "**Fixing of the End terminal and the transition**" at par. 2.8.

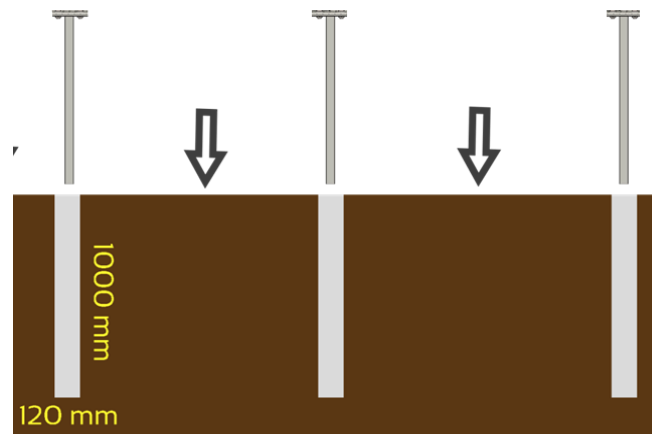



Fig. 23: The picture shows the post insertion of the SMA T2 after filling in the concrete. All the posts must be inserted in the hole before the concrete casting.

2.6 Option 3: Installation by means of concrete plinth

This solution is suitable for softer grounds (classes **1** and **2** according to **DIN 18300**) as well as for harder grounds (classes **6** e **7** according to **DIN 18300**) to impede the post ramming through the pile driver. Such solution can furthermore be used when the device has to be connected to a barrier placed beside a slope.

Procedure

1. Dig a pit with the sizes indicated in Tab 2.
2. Place the metallic wire with welded frame with bushes, supplied by **Industry A.M.S.** (Figg. 24 and 26). The metallic wire will present the dimensions indicated in Tab 2.

 The bushes must be placed at the same level of the ground, for this reason some horizontal brackets are used (Fig. 25) to keep the metallic wire raised from the bottom of the excavation. Such brackets are supplied on request by **Industry A.M.S.**

3. Cast the concrete $R_{CK} \geq 25$ MPa into the pit.
4. Wait for the cure time, then remove the horizontal brackets (Fig. 28).
5. Place the End Terminal in correspondence of the bushes (Fig. 29) and screw the M16 screws with tightening torque 110 Nm (bolts class 8.8).

Tab 2: Dimensions for pit, plinth and metallic wire

	SMA T1	SMA T2	SMA T4
Pit	L = 2810 W= 430 H = 410	L = 4010 W= 430 H = 410	L = 6010 W= 430 H = 410
Concrete plinth	L=2800 W=420 H=400	L=4000 W=420 H=400	L=6000 W=420 H=400
Metallic wire 200X200 Ø 8mm	L=2600 W=400 H=340	L=3800 W=400 H=340	L=5800 W=400 H=340

Tab. 3: Quantity and type of screws

	SMA T1	SMA T2	SMA T4
Qty.	8	12	16
Type	M16	M16	M16
Class	8.8	8.8	8.8

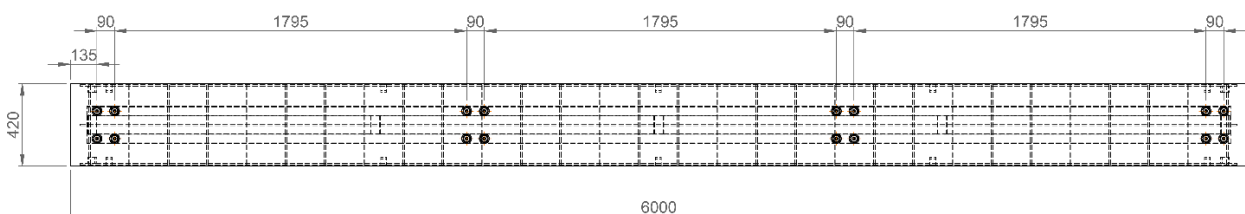


Fig. 24: Top view of the SMA T4 basement with metallic wire with bushes



Fig. 25: Horizontal bracket for the positioning of the metallic wire into the pit. The brackets are screwed to the bushes by means of M16 screws.

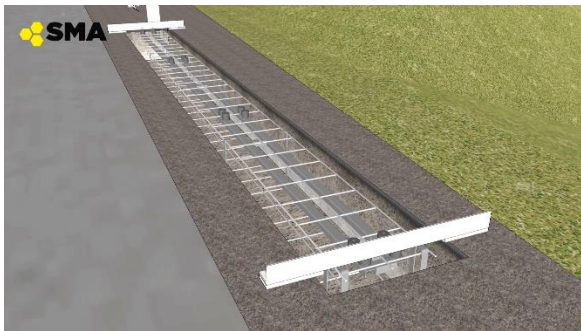


Fig. 26: Positioning of the metallic wire into the pit.

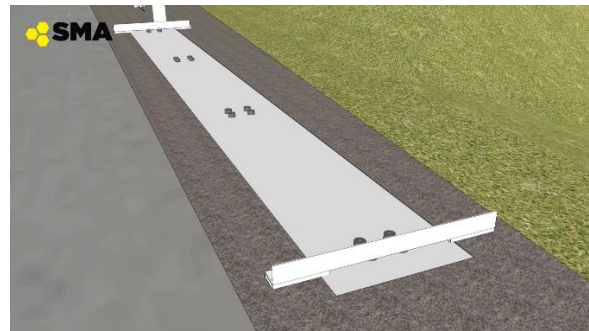


Fig. 27: Casting of the concrete into the pit.

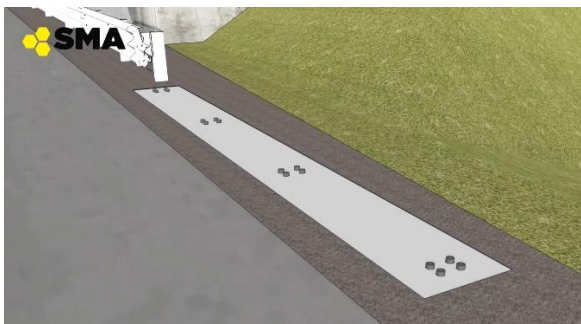


Fig. 28: Removal of the horizontal brackets after the solidification.

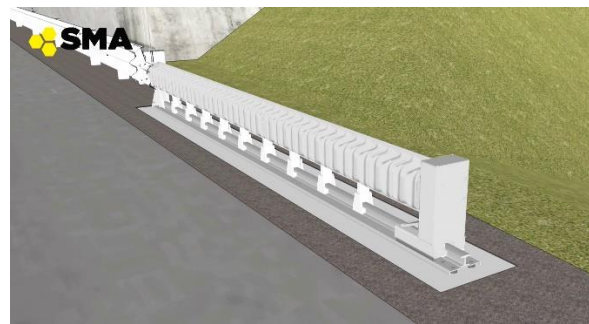


Fig. 29: Positioning of the End Terminal in correspondence of the bushes.

2.7 Option 4: Installation by using posts set in concrete with a square section

Depending on the soil conditions on site, it is possible to install the SMA End Terminals in grounds that are too soft for driven posts (type 1 or 2 according to **DIN 18300**) or where there are services in the actual line of terminal installation.

The installation is possible by setting the posts in concrete individually or by forming a concrete plinth.

The plinth must be manufactured according to the generally recognized rules of practice with concrete $R_{CK}=25$ MPa.

The posts must be inserted in concrete square sections with the sizes indicated in the table below (Tab. 4).

In this case the posts supplied with the End Terminals will have a length of 600 mm.

Tab. 4: Concrete plinths for the installation of the End Terminals

Model	Quantity	Sizes of each plinth (L x W x H in mm)	Type of bolts
T1	2	400 x 400 x 600	M16
T2	3	400 x 400 x 600	M16
T4	4	400 x 400 x 600	M16

2.8 Option 5: Installation on asphalt/concrete by means of chemical anchors

This installation procedure is possible only if:

- the reinforced concrete respects the requirements indicated in Tab. 2, or
- the asphalt respects the characteristics as indicated in Tab. 5

Tab. 5: Asphalt specifications for the installation of the End Terminals

Asphalt Thickness	≥ 200 mm					
LAYER	Stability [daN]			Stiffness [daN/mm]		
Base	>800 (≥1000)			R>250 (≤400)		
Connection	>1000(≥1200)			300<R<400(≤500)		
Wear	>1000(≥1200)			300<R<400(≤500)		
LAYER	Rt [N/mm ²]			CTI= $\pi/2$ / $\left(\frac{Rt}{\epsilon_{rc}}\right)$ [N/mm ²]		
	10°C	25°C	40°C	10°C	25°C	40°C
Wear	1.7÷2.2	0.7÷1.1	0.3÷0.6	≥170	≥70	≥30

Kit for the installation

For the installation with the Fischer resin it is mandatory the usage of the specific installation kit:

- Resin type Fischer V 410C (Fig. 31)
- Sleeve type RG 22 X 160 M16I (Fig. 32)
- Threaded screw with hexagonal head type M16x35 (Fig. 34)
- Washers

Mandatory equipment (not included with the kit)

- Drilling template produced and supplied by Industry A.M.S. (Fig. 30);
- Percussion drilling machine;
- Cartridge gun for Fischer;
- Equipment for the removal of debris from the holes.

Procedure

1. Place the right drilling template on the ground by considering the distance from the needed obstacle to carry out a right installation.
2. Drill the holes with the diameter 24 mm and depth 165 mm (see Tab. 6) with drilling machine.
- ⚠ The holes must be carried out in order to obtain a conic form (Fig. 33). The hole diameter must be 2 – 4 mm greater than the threaded bar.
3. Clean the holes from debris by blowing with air.
4. Insert the resin V 410C in the hole with the cartridge gun.
5. Insert the sleeve **RG 22 x 160 M16 I** in the hole. The excess resin will come out from the hole.
6. Clean the hole border and wait for the cure time as described in Tab. 7.
7. Unscrew and remove the vertical brackets of the drilling template.
8. Place the End Terminal on the ground by taking care of the holes.
9. Place the washers and screw the M16 bolts for a minimum depth of 24 mm and tightening torque of 110 Nm.





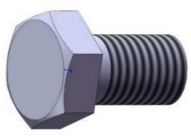
Tab. 6: Quantity and depth of the specific holes for FISCHER

End terminal	SMA T1	SMA T2	SMA T4
Quantity of holes	8	12	16
Quantity of washers	8	12	16
Holes on asphalt: Ø (mm)	24	24	24
Holes on asphalt: depth (mm)	165	165	165
Screw type (Class: 8.8)	M 16	M 16	M 16

Cartridge temp.	Time for processability	External temp.	Time for loading application
		- 5°C — ± 0°C	24 h
		± 0°C — + 5°C	3 h
+ 5°C — + 10°C	9 min.	+ 5°C — + 10°C	90 min.
+ 10°C — + 20°C	5 min.	+ 10°C — + 20°C	60 min.
+ 20°C — + 30°C	4 min.	+ 20°C — + 30°C	45 min.
+ 30°C — + 40°C	2 min.	+ 30°C — + 40°C	30 min.

The times below indicated are applied starting from the contact between the resin and the hardener in the mixer.
To make the installation the cartridge temperature must be at least +5°C. For a longer installation time, e. g. in case of work interruption, the mixer must be replaced.

Tab.7 : External temperature and cure time FISCHER V

	
<p>Fig. 30: Top view of the drilling template SMA T4</p>	<p>Fig. 31: Resin type Fischer V410C</p>
	
<p>Fig. 32: Sleeve type Fischer RG 22 x 160 M16I</p>	<p>Fig. 33: Conic drill</p>
	
<p>Fig. 34: Screw M16 x35</p>	

2.9 Selection of the suitable connection piece

The transition piece will be supplied according to the barrier specifications.

⚠ The customer has to advise the following information:

- Beam profile of the barrier system;
- Height from the ground;
- Dynamic deflection;
- Position of the bolt holes on the beam profile;
- Connection side of the barrier (Fig. 36)

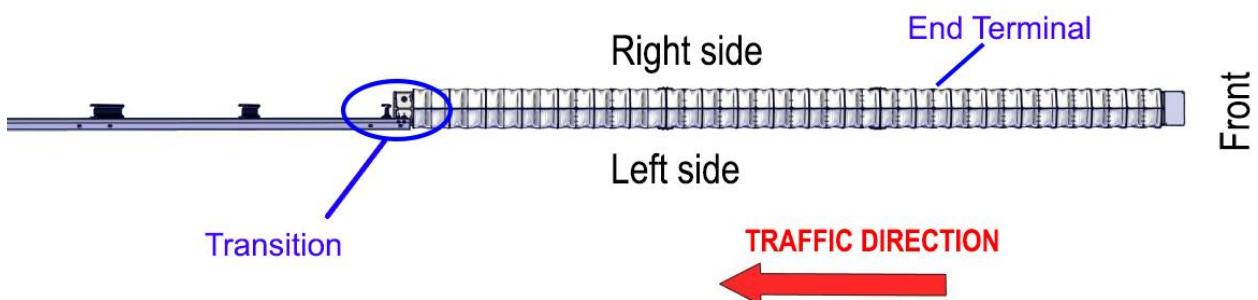


Fig. 36: Top view of the End Terminal connected to the barrier.

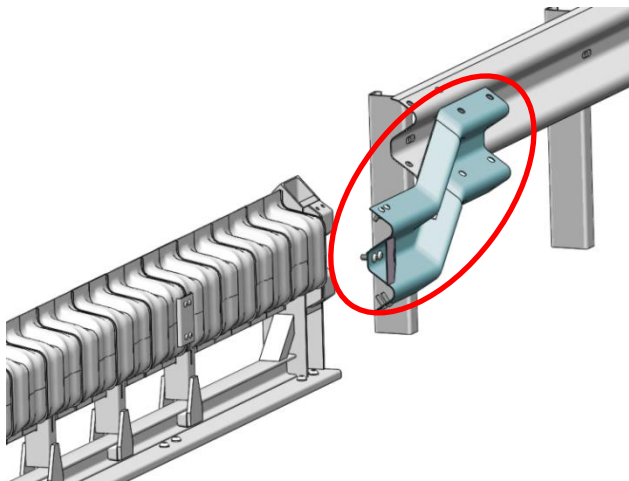


Fig. 37: Example of standard transition piece to two wave beam barrier

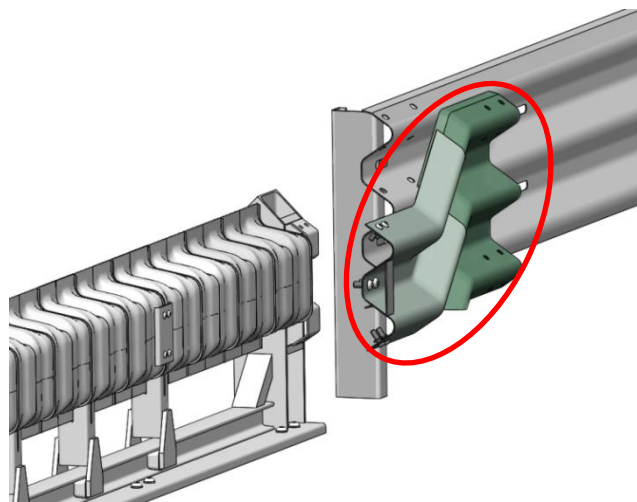


Fig. 38: Example of transition piece to three wave beam barrier

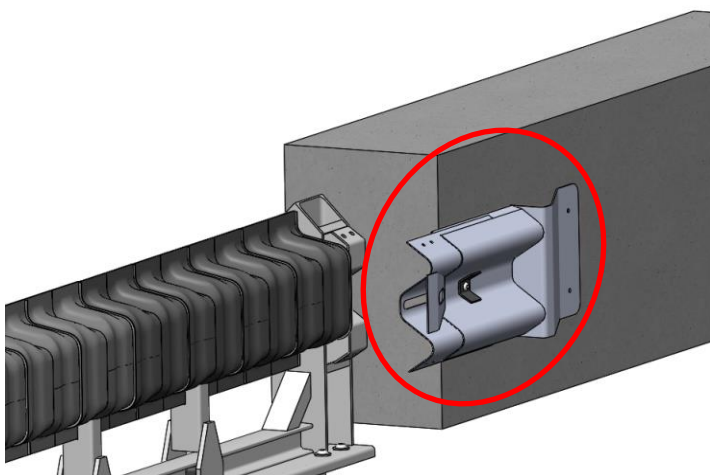


Fig. 39: Example of transition piece to concrete barrier.



Fig. 40: Connection of the barrier to the End terminal – component view.

2.10 Transition Section and Installation

Connection to double beam profile

It is possible to fix the End Terminal to the double beam barrier with different height (until 800 mm from the ground), changing the angle and the class of deformation.

The deformation class is gradually modified from W4 to W2, by adding some posts in specific sections of the beam, as the example in the pictures shows (Fig.41-42-43).

The barrier in the picture (Fig.41) presents a post interaxle space of 2000 mm. It must be modified to change the barrier in working width W2.

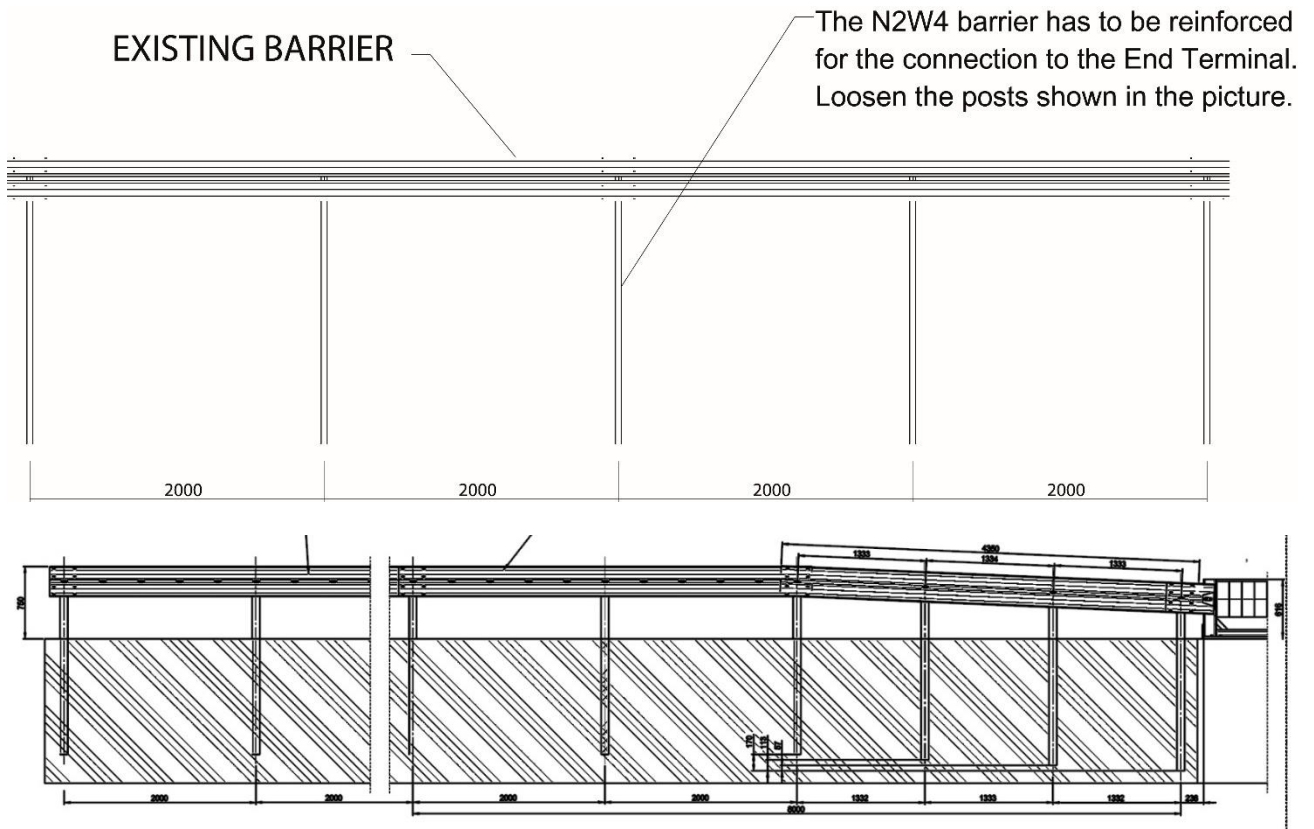


Fig. 41: Side view of the barrier before and after the installation of the transition

In the following picture (Fig. 42) 1 post have been added to the existing barrier, in order that the interaxle is reduced to 1330 mm. The barrier section is sloped down and connected to the backstop of the terminal by means of the transition, as also shown in the exploding view.

Ram the posts with the pile driver in order to connect the barrier to the End Terminal.

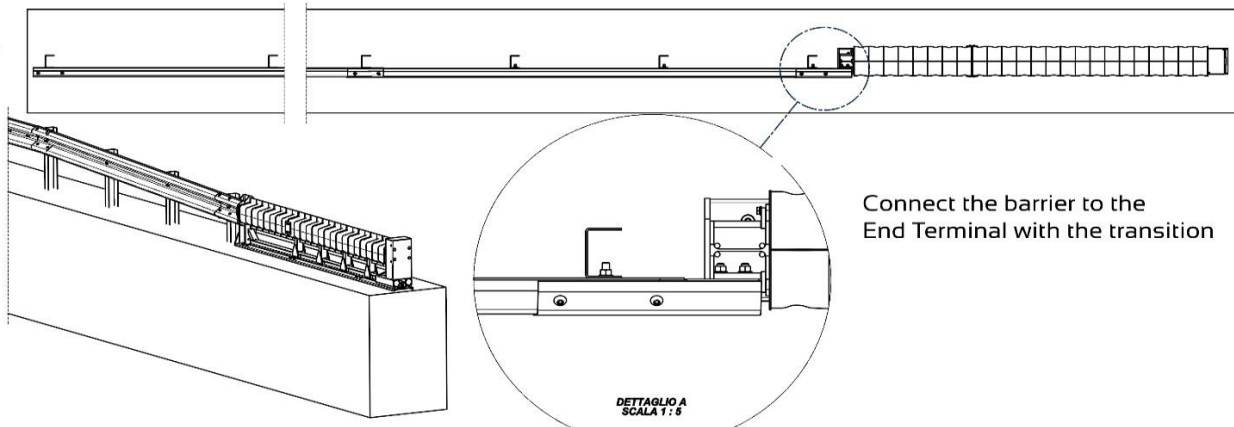
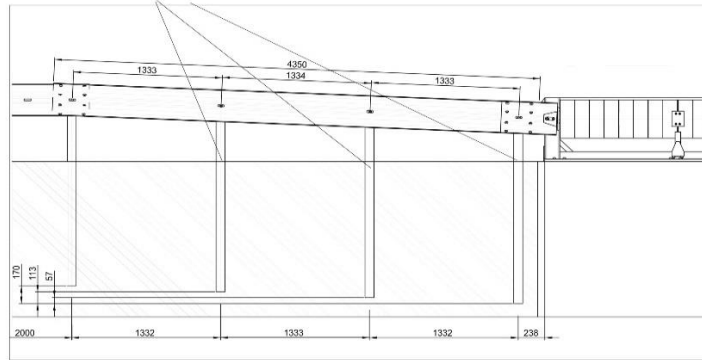


Fig. 42: Connection to the barrier – section and exploding view.

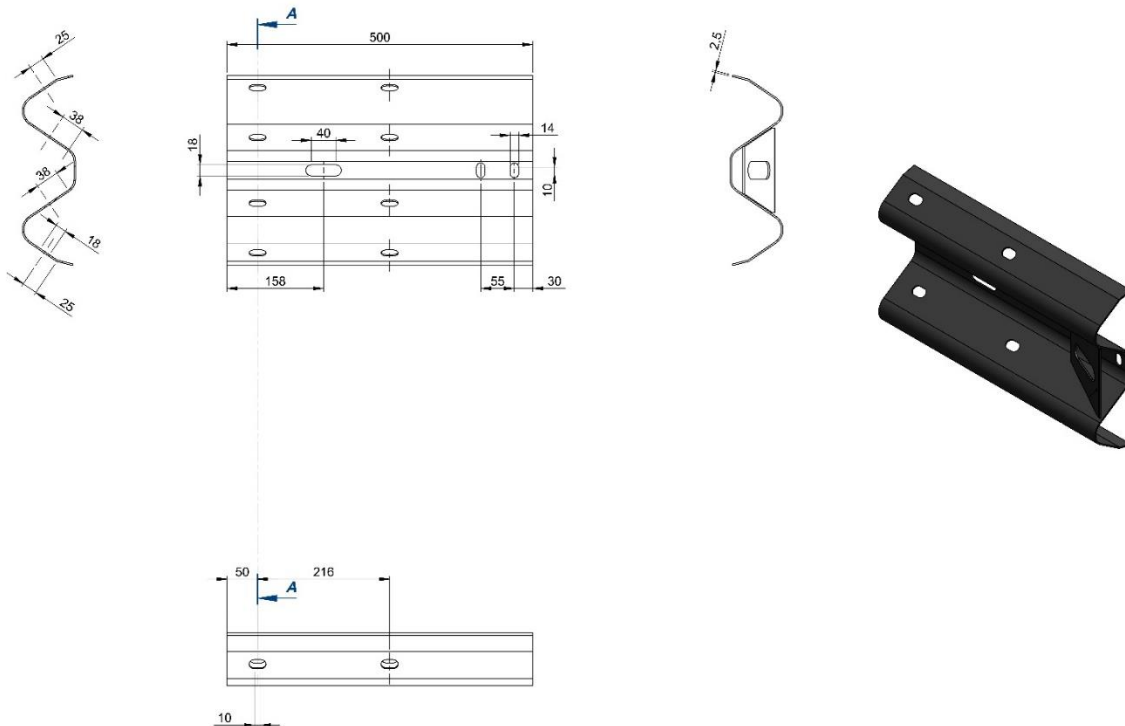


Fig. 43: Connection of the barrier to the End terminal – component view.

The SMA End Terminal has been tested by using a Transition Section between the existing safety barrier system and the new installed EA terminal. This Transition Section consists of 8m of an N2W2 barrier system.

The 4m section at the terminal end is sloped down to connect with the back-stop of the EA terminal by means of a connection piece.

This connection piece is screwed by means of n.10 M16 Bolts, 8 units on the barrier terminal side and 2 units on the backstop side.



Industry A.M.S. does not supply this Transition Section but only the component which connects the End Terminal and the barrier.

This 8m Transition Section must be made by installing one of the following approved systems:

- 1) Mega Rail N2W2 system with the post spacing of 1.33m. in the 4m section at the terminal back-up.
- 2) Marcegaglia N2W2 system with the post spacing of 1.33m in the 4m section at the terminal back-up.
- 3) HBB 1.33 N2 W2 barrier system from SGGT
- 4) AS-BLB.F N2 W2 barrier system from Asebal AS
- 5) Vetex VGA320 N2 W2 barrier system from Corus/Tata industry
- 6) Evol GS 1.5 N2 W2 barrier system from Aximum
- 7) FB12b N2 W2 barrier system from Hill & Smith
- 8) BMS1P-N2 W2 barrier from Hiasa Grupo Gonvarri

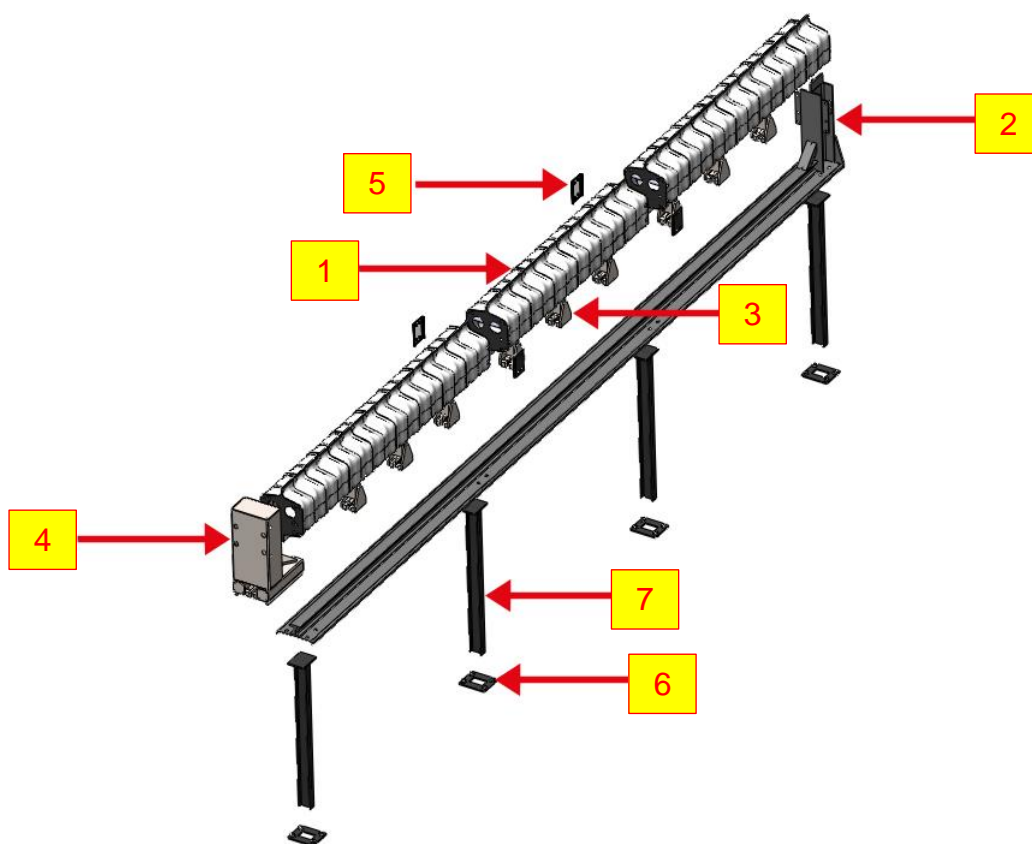
3. INSPECTION - REPAIR

3.1 Foreword

SMA End Terminals don't need maintenance under standard condition of use. If the vehicle impacts according to EN 1317 it can be restored by simply replacing the damaged components with the opportunity to totally recover the remaining part of the structure.

End Terminal components:

1	Collapsible beam made by modules;
2	End Terminal basement;
3	Tie-rod welded to the collapsible beam;
4	Trolley;
5	Plates for the connection of the modules;
6	Installation plates;
7	Posts.



3.2 Component replacement

Each component has a Rif. code with the related drawing number.

They are listed in Section 5: SPARE PARTS

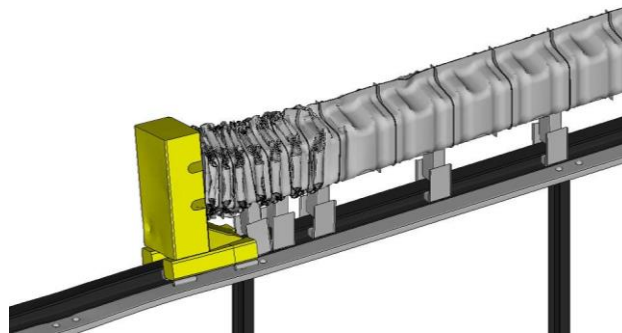


Fig. 44: SMA T 4 head-on impact

Trolley (Rif. S)

1. Remove the reflective sticker (if present) and unscrew the 4 no. M10 screws which connect the Trolley to the collapsible modular bay (Fig. 45).

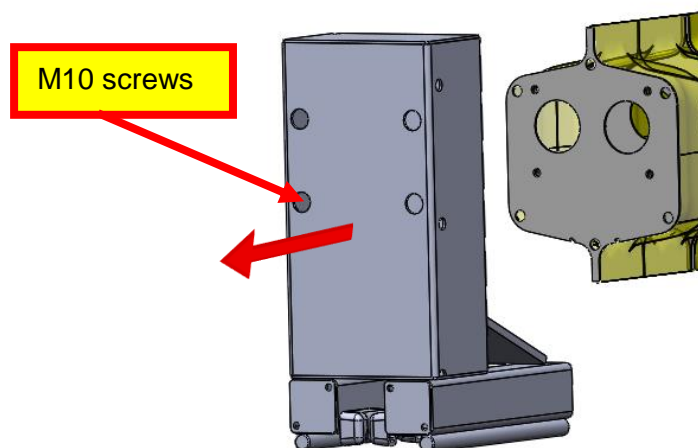


Fig. 45: Trolley

2. Slide the **Trolley** forward along the rail manually and pull the unit out (Fig. 45).
3. Replace the damaged component with the new one by fitting the new **Trolley** onto the rail and sliding the new **Trolley** along the rail until it comes into contact with the collapsible modular bay.
4. Screw the M10 screws (tightening torque of min. 41 and max. 60 Nm for bolts class 8.8).

Modular Bay (Rif. M)

1. Remove the Trolley (as in the previous explanation).
2. Remove the lateral plates which connect the different bays of the collapsible beam

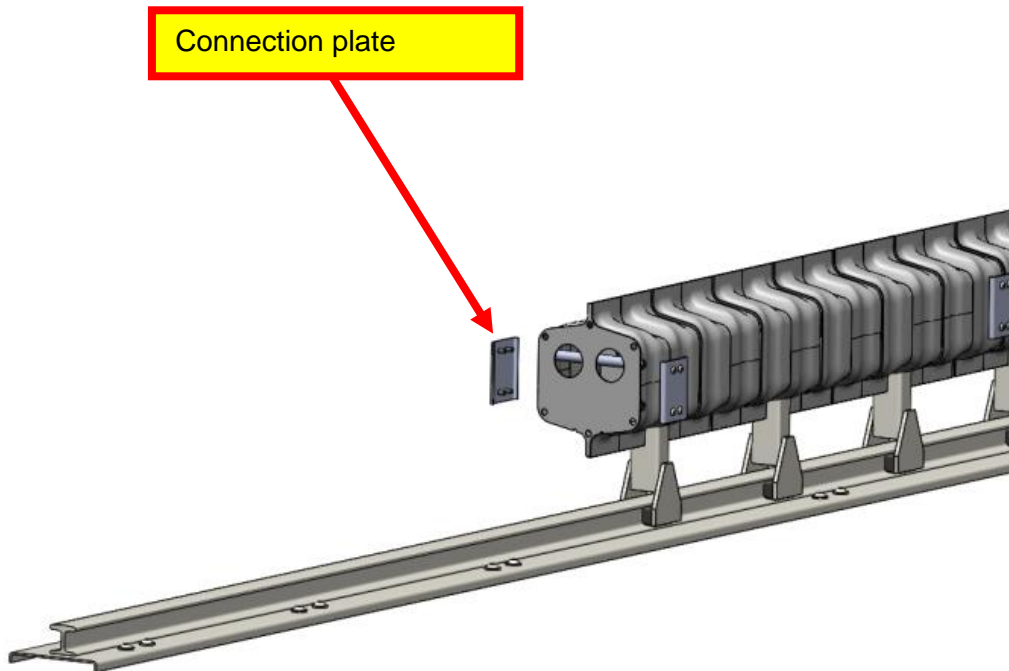


Fig. 46: Removing procedure of the modular bay

3. Unscrew the 4 no. M10 bolts on the 2 no. lateral plates (Fig. 46) which connects the back part of the first modular bay with the front part of the next one.
4. Slide the modular bay forward along the rail manually and remove it.
5. Replace the damaged component with the new one, then slide it back until contact with the next bay or with the backstop of the structure.(Fig. 47)
6. Screw the 2 no. lateral plates with 4 no. M10 bolts, by applying a tightening torque of min. 41 and max. 60 Nm. (bolts class 8.8).

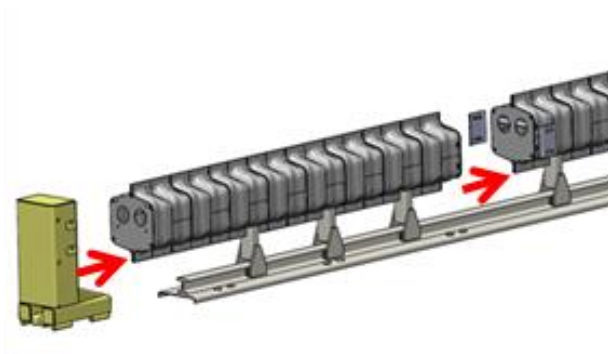


Fig. 47: Assembling of the new components

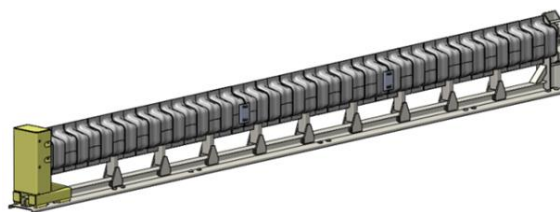


Fig. 48: Repaired End Terminal

Transition Piece (Rif. T)

1. Unscrew the M16 screws on the End Terminal junction;
2. Remove the damaged transition piece;
3. Fit the new transition piece;
4. Screw the M16 bolts (tightening torque: 90 - 110 Nm for bolts class 8.8).

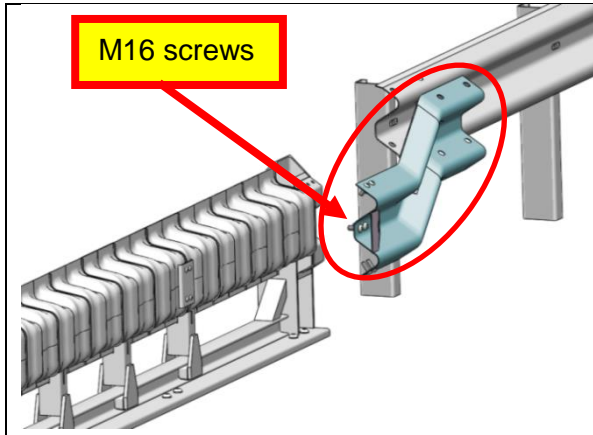


Fig. 49: Universal Transition Piece to double beam profile

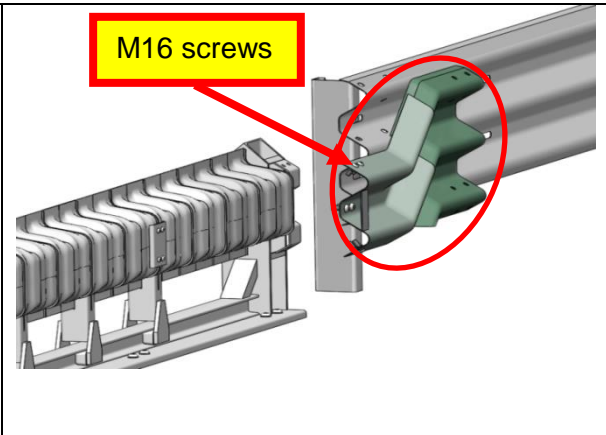


Fig. 50: Universal Transition Piece to three wave beam profile



Fig. 51: Slope down connection piece from the barrier to the End terminal – component view.

4. PLAN OF THE COLLAPSIBLE BEAM MODULES

SMA End Terminals are supplied with collapsible beams split into modules.

The beam components are mounted according to the plan as also shown on the tag on the back side of the structure.

The modular bays have different dimensions depending on their respective position on the rail and type of system. During assembly it is important to make sure that the correct module is fitted.

4.1 Details of the module

The positioning of the module bays in each single device is shown below. Each module presents a colored tag on the side (models produced by June 2018). The modules are connected through 4 no. bolts that fasten 2 connection plates to ensure the stability.

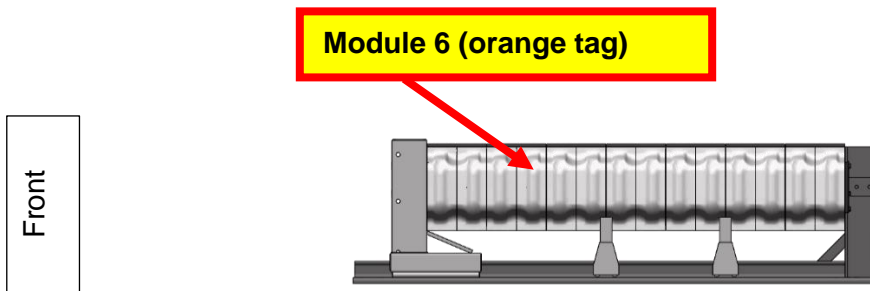


Fig. 51: Collapsible beam SMA T 1

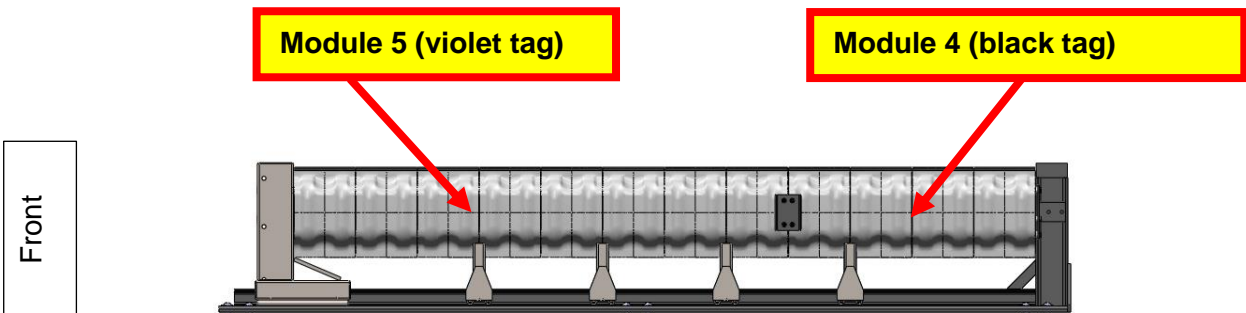


Fig. 52: Collapsible beam SMA T 2

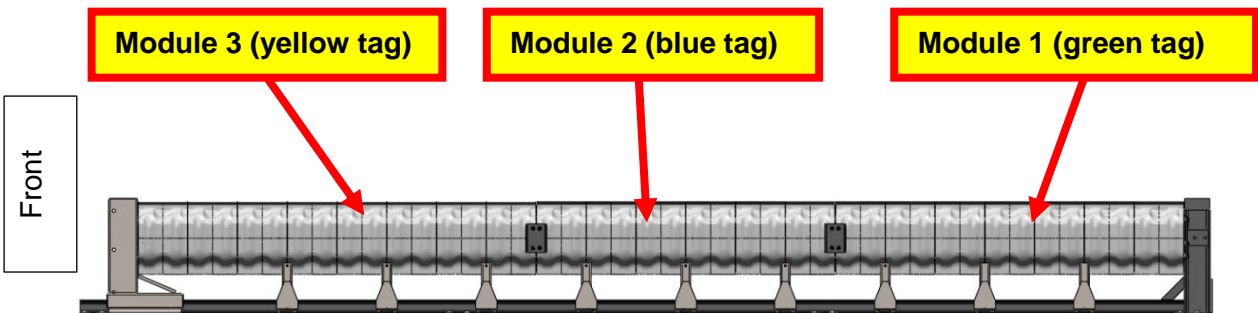








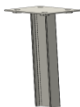








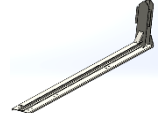
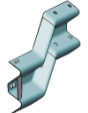

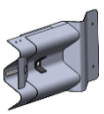



Fig. 53: Collapsible beam SMA T 4

5. SPARE PARTS

Rif.	Description	No.	Drawing number
SMA T 1 - D54750000			
S	 Trolley	1	D43760002
M6	 Module 6	1	D54750200
p	 Post	4	D43760501
a	 Installation Plate	4	D52210401 D43760038
b	 Backstop with Rail	1	D54750100

Rif.	Description	No.	Drawing number
SMA T 2 – D52220000			
S	 Trolley	1	D43760002
M1	 Module 5	1	D52220400
M2	 Module 4	1	D52220300
p	 Post	3	D43760501

a		Installation plate	3	D52210401
b		Backstop with Rail	1	D53140100
SMA T 4 – D5314 0000				
S		Trolley	1	D43760002
M3		Module 3	1	D52210800
M4		Module 2	1	D52210700
M5		Module 1	1	D52210300
p		Post	4	D43760501
a		Installation plate	3	D52210401
b		Backstop with Rail	1	D43760017
TRANSITION PIECES				
		Transition piece to two wave beam barrier single / double sided	1 / 2	D41922606
		Transition piece to three wave beam barrier single / double sided	1 / 2	D41922811
		Transition piece to concrete barrier single / double sided	1 / 2	D41924800
		Transition piece to two wave beam barrier single/ double sided	1 / 2	D41920029

6. DURABILITY

The structure and the main parts are treated with hot-dip galvanized process according to UNI 1461 and galvanized according to ISO 2081.

The SMA devices are guaranteed for 10 years against the corrosion.

7. STORAGE

In order to fit the Crash Cushion/End Terminals in the containers, they are loaded in groups of 3x3 or 3x4.

8. TECHNICAL REFERALS AND NORMATIVES

UNI EN 1317 /2010	End Terminals
UNI EN 22768: 1996	Tolerances
UNI 1461	Hot-dip galvanized process
UNI 2081	Electrolytic galvanizing

9. LIMITATION AND WARNINGS

SMA End Terminals have been tested to meet the requirements and guidelines of the P2 and P4 performance classes using the EN criteria described in European Standard ENV1317-4 and prEN 1317-7 (Terminals and Transitions).

The required tests are not intended to represent the performance of products when impacted by every vehicle type or every impact condition.

Industry A.M.S. srl does not represent nor warrant that the results of these controlled tests show that vehicle impacts with the products in other conditions would necessarily avoid injury to person(s) or property. Impacts that exceed the tested specifications of the product may not result in acceptable crash performance as outlined in ENV 1317-4 and prEN 1317-7, relative to structural adequacy, occupant risk and vehicle trajectory.

Industry A.M.S. srl expressly disclaims any warrant or liability far injury or damage to persons or property resulting from any impact, collision, or harmful contact with products, other vehicles, or nearby hazards or objects by any vehicle, object or person, whether or not the products were assembled in consultation with Industry A.M.S. or by third parties.

SMA End Terminals may be connected directly to W-Beam barrier with a containment level of N2 and a working width of W2. For connections to barriers having different containment levels and/or

different working widths, appropriate connections according to local regulations and manufacturers recommendations should be used.

For further information , please contact our office.

10. ANNEX

10.1 Attached A – Connection of SMA End Terminal to N2W2 barrier