

# ***Operation and Maintenance VERDEGRO TTMA (100K)***



**VERDEGRO** 



**READ BEFORE USE!**

**ONLY AUTHORIZED PERSONS MAY WORK WITH THE MACHINE  
IMPROPER USE CAN CAUSE SERIOUS INJURIES!**

*All maintenance and repair should be done by the manufacturer or under their supervision by an official distributor. Each TTMA should be delivered with 3 certificates to guarantee the right performance.*

## Index

1	Data producer and specific machine: .....	3
2	Introduction: .....	4
3	Recognition and dimensions .....	5
3.1	Photos of a typical TTMA 100K .....	5
3.2	Drawing TTMA: .....	6
4	Technical data .....	7
4.1	Table .....	7
5	General specifications and instructions .....	8
5.1.1	Performance criteria .....	8
6	Safety .....	9
7	Supporting vehicle and adjustment.....	11
8	Inspection .....	12
8.1	Inspection table.....	12
9	Maintenance.....	13
10	General control points of TTMA .....	14
11	Repairs (by manufacturer or official distributor) .....	14
11.1	Welding .....	14
11.2	Other welding.....	14
12	Warranty.....	15
13	Document delivered by each TTMA .....	16
13.1	TTMA certificate, signed by the Verdegro Group .....	16
13.2	Overall and mounting certificate .....	17
14	CE certification.....	18
15	Maintenance history.....	19

## **1 Data producer and specific machine:**

Verdegro Group  
Munnikenheiweg 59  
4879 NE Etten-Leur  
The Netherlands  
(T) +31(0)76-5017990  
(F) +31(0)76-5019404  
(W) [www.verdegro.com](http://www.verdegro.com)  
(E) [info@verdegro.com](mailto:info@verdegro.com)

Date release : \_\_\_\_\_

Machine number : \_\_\_\_\_

Cushion number : \_\_\_\_\_

Company stamp:



*Note: This document is only valid with an original company stamp of the producer.*



## 2 Introduction:

A Trailer truck mounted attenuator (TTMA) is an energy absorbing device attached to the rear of a truck or utility vehicle. A TTMA is designed to provide a controlled stop of a vehicle impacting the rear of the truck. TTMA's have been used since the mid- 1970's to reduce the severity of impacts between errant motorists and slow moving or stopped shadow vehicles used to protect highway maintenance workers.

The National Cooperative Highway Research Program Report 350 (NCHRP 350) specifically addresses the performance requirements of TTMA's. The recommended tests to evaluate TTMA crash performance are defined for two different Test Levels. The basic Test Level, TL-2, is conducted at a nominal impact speed of 70 kph. TL-3 is the higher test level and is conducted at 100 kph. This report presents the manual for the Verdegro TTMA, at the more demanding NCHRP 350 TL-3 test conditions.

The Verdegro TTMA 100K, in this manual called TTMA is a device with an optional framework for a sign, eventually with LED arrow or LED display. The TTMA must be placed behind a supporting truck with a minimum weight of 8.000 Kg and a maximum weight of 12.000kg<sup>12</sup> for best performance results. The crash cushion mounted on this TTMA is 100K, which means test with the TTMA were done according TL-3 of the Report NCHRP-350.

The TTMA is amply equipped with features that promote safety. By inspect them, the quality, efficiency and safety of the TTMA improved.

Check the condition of the TTMA daily before starting work on the base of the instructions. It is strictly forbidden to use the TTMA when it is damaged, not maintained or inspected.

The Manufacturer reserves the right to the machine construction, parts and maintenance instructions without notice.

This manual is only for the Verdegro TTMA-100K. Some drawings or colors in this manual can be slightly different from the delivered model which should be recognized as a typical Verdegro TTMA - 100K.



**Attention! Before maintenance or checks, disconnected the power!**

<sup>1</sup> For some countries other specifications are mandatory. See chapter "supporting vehicle" for specifications.

<sup>2</sup> If you have a truck which is heavier, contact Verdegro or your distributor.



## 3 Recognition and dimensions

### 3.1 Photos of a typical TTMA 100K





## 4 Technical data

### 4.1 Table

<i>Description</i>	<i>Dimension</i>
Min. height Cushion from the ground	180 mm
Max. height Cushion from the ground	240 mm
Max. height behind truck	975 mm
Transport width	2,3 m
Transport height	1 m
Total weight	Approx. 700 kgs
Hydraulic pressure	--
Hydraulic gear pump (thermal secure !)	--
Contents of hydraulic tank	--
Power hydraulic pump	--
Equipped with thermo switch	--
Hydraulic rotating cylinders	--
Standard Hydraulic pump motor voltage	--
Standard driving lights	24 V
Battery Bank	--
Safety fuse	--
Cable from truck to TTMA	--
DIN coupling	40 or 50 mm

## 5 General specifications and instructions

- A. Always make sure the system is delivered with the right certificates, stickers and documentation!. **Do not remove the sticker(s)!!**
- B. Make sure the validation time of the certificates is never exceeded!
- C. Never remove safety instructions of the TTMA!
- D. All Verdegro Trailer truck mounted attenuators (Verdegro TTMA) shall be designed and manufactured by the Verdegro Group, in accordance with the specifications.
- E. The Verdegro TTMA is an attenuator system designed for installation at the back of trucks with gross vehicle weight (GVW) ranges between 8000 kg and 12 000 kg<sup>3</sup> (Contact your country for other specifications!).

*Note: Any added ballast must be adequately anchored to the truck so that it will not move during impacts. Because the back end of the truck supports the weight of the rearward protruding TTMA, care must be taken not to exceed the manufacturer's published maximum axle loads. To ensure that the driving characteristics of the vehicle are maintained, the manufacturer's recommended center-of-gravity zone should also be adhered to.*

- F. A truck equipped with a Verdegro TTMA shall have a forward skid distance of less than 10 m during an impact by either an 820 kg or 2000 kg vehicle traveling at a design speed of 100 kph. The minimum forward skid distance is dependent on the truck's transmission being in second gear, and the parking brake set with the truck situated on clean, dry pavement.

### 5.1.1 Performance criteria

- A. The Verdegro TTMA, when mounted to a truck weighing up to 9,000 kg situated on clean dry pavement with the transmission in second gear and the brakes locked shall perform as follows:
  - 1) Vehicles with a mass of 820 kg impacting straight into the rear of the TTMA at 100 kph shall remain upright with the theoretical occupant impact velocity of 12 m/s or less and the occupant ride down acceleration of 20 g's or less per NCHRP 350, Test 3-50 evaluation criteria. The truck shall be placed against a non-moving wall, also called a rigid barrier, during this test.
  - 2) Vehicles with a mass of 2000 kg impacting straight into the rear of the TTMA at 100 kph shall remain upright with the theoretical occupant impact velocity of 12 m/s or less, and the occupant ride down acceleration of 20 g's or less per NCHRP 350, Test 3-51 evaluation criteria.
  - 3) Vehicles with a mass of 2000 kg impacting straight into the rear of the TTMA at 100 kph, and an offset of W/3 with respect to the TTMA centerline, shall remain upright with no significant roll pitch or yaw per NCHRP 350 optional Test 3-52 evaluation criteria.
  - 4) To minimize potential damage to the truck, no portion of the TTMA's structure or energy absorbing elements shall protrude forward of the underride during an impact. Certified test results and associated test reports and films produced in the guideline with NCHRP 350 procedures shall be submitted showing that the TTMA system conforms with all test and performance criteria in this specification.
- B. The Verdegro TTMA cartridges shall successfully perform to accelerated vibration, moisture and corrosion.

---

<sup>3</sup> If you have a truck which is heavier, contact Verdegro or your distributor.



## 6 Safety

1. Read these instructions carefully before using the "TTMA"
2. The TTMA should not be used without knowledge of the operating instructions and safety precautions. Keep the operating instructions, always within easy reach of the machine, the operator's manual should ALWAYS be at or near the machine.
3. The operator of the TTMA must be at least 18 years old and experienced in serving Trailer truck mounted attenuators.
4. The owner/holder of the TTMA must ensure that all users are trained in the use of the machine.
5. Be careful when the machine is used near live power lines.
6. Transport the TTMA only if it is properly secured to vehicle.
7. On the platform are no persons during storage and adjustment of the machine or in transit.
8. Make use at all times during the adverse influences of wind, rain, temperature, brine, thunderstorms, snow, hail and ice.
9. Use the TTMA purely as Trailer truck mounted attenuator, and not as a transport trailer or other device.
10. The wind load of the TTMA does not increase with additional signs or other objects that could catch wind.
11. Inspect the entire machine for loose materials such as bird nests, twigs, leaves, but also tools, bolts, nuts, etc. which may end up on the lanes during mobilization or transport.
12. Do not hoist the TTMA!
13. Before and during operation of the machine always look at / near the machine, no persons are present, guiding also takes into account the rotation range of the machine!
14. For safe and trouble-free operation, the TTMA clean snow and ice held.
15. The TTMA regular inspection and maintenance of service - repair outsourcing to an expert in this field service company.
16. The construction of the TTMA may not be altered without permission and the manufacturer's instructions.
17. Inspect the TTMA every day before work or during use and pass through the machine.
18. Axles control all bolts / nuts: Before each use the principal axes, bolts and nuts.
19. Let the TTMA annual inspect by the manufacturer. The inspection must take place more frequently if welding is done in supporting parts, or other special reasons exist for the device



to be debating. For modification and repair, always contact the manufacturer!. After repair or replacement of parts, the TTMA should always be served a full test facility. **The Verdegro Group can only guarantee the working when repair and service is done by the Verdegro Group or under their supervision by an official distributor.**



20. If you leave the TTMA, put it somewhere where it does not preclude others. Keep the whole machine in transport position. Close all hatches well for unauthorized persons. Take your keys with you.
21. The operator of the machine may not be under the influence of alcohol or narcotic drugs.

## 7 Supporting vehicle and adjustment

It is important that the TTMA is mounted correctly behind the supporting vehicle. Mounting the TTMA behind the vehicle can be done with a DIN connector and Rockinger. Make sure the connection with the truck is done or checked by Verdegro or a distributor, and that a certificate is given. Also make sure the bumper of the truck is correctly installed. The TTMA is tested with a 40mm DIN coupling, so a 50mm will also be correct.

It is allowed that a country overrules the specifications of the supporting vehicle, for example (valid for the Verdegro TTMA):

- Sweden: Lower limit weight of the truck 9.000 kgs, upper limit by manufacturer<sup>4</sup>
- Belgium: Lower limit weight of the truck 8.000 kgs, upper limit 9.440 kgs

	<p><b>Make sure the DIN coupling is correctly installed. Only use couplings certified or delivered by Verdegro</b></p> 
	<p><b>Make sure the ROCKINGER and bumper are correctly installed!!!</b></p> 

<sup>4</sup> If you have a truck which is heavier, contact Verdegro or your distributor.

## 8 Inspection

### 8.1 Inspection table

<i>General inspection points (If they are in bad condition, use of the TTMA is forbidden)</i>	<i>Every application</i>	<i>Weekly</i>	<i>Monthly</i>
<i>Visual inspection of shafts, bolts and structural bearings</i>		X	
<i>Inspection LED display control (errors) / arrow configuration(s)</i>	X		
<i>Visual inspection loose machine parts</i>	X		
<i>Cracks</i>			X
<i>Damage on the cushion</i>	X		

## 9 Maintenance

Scheduled maintenance keeps the TTMA in safe and reliable condition. From the maintenance schedule and checklist for the annual inspection shows what measures are required. Read for the maintenance of the TTMA the entire manual carefully!. If in doubt about the maintenance work it is better that it is carried out by the manufacturer. If not, than it must be done under supervision of the manufacturer, for example by an official distributor. Distributors can be found on the website [www.verdegro.com](http://www.verdegro.com)

Term	Actions
Each 1000 h of latest 6 months	Check of total TTMA
Every 12 months	Annual inspection. + Full service preventive done by Verdegro or distributor
Cushion	Check daily for damages

Dimensions thread	Of torque for bolt with thread in hermetically ISO Nm		
	Hex bolt Class 8.8	Hex bolt Class 10.9	Hex bolt Class 12.9
<b>M4</b>	2,8	4,0	4,9
<b>M5</b>	5,7	7,9	9,5
<b>M6</b>	9,7	13,7	16,2
<b>M8</b>	23,5	33,3	39,2
<b>M10</b>	47,1	65,7	79,4
<b>M12</b>	81,4	114,7	137
<b>M14</b>	130	181	216
<b>M16</b>	196	280	333
<b>M18</b>	270	382	461
<b>M20</b>	382	539	647
<b>M22</b>	519	730	873
<b>M24</b>	662	932	1118
<b>M30</b>	1324	1863	2236



## ***10 General control points of TTMA***

- Chassis:
  - Corrosion
  - Welds (no cracks visible)
  - Permanent deformation
- Elektrical system:
  - Condition and suspension of cables
  - Condition of connectors
- Crash Cushion:
  - Control of cracks and dents or cracks

## ***11 Repairs (by manufacturer or official distributor)***

### ***11.1 Welding***

If parts of the TTMA are repaired with welding, it should be noted in the report under "Remarks"

- Welded points
- Date of welding
- Make sure when welding the manufacturer's instructions are followed

### ***11.2 Other welding***

If other repairs are made to supporting parts (example cylinders), make a note under "Remarks"

- Maintenance points
- Date
- Contractor
- Ensure that the repair to the manufacturer's instructions are followed

## 12 Warranty

Verdegro strives by various internal and external inspections and final inspections that the delivered TTMA system is free from error into operation. We provide the following warranty for any defects in materials or workmanship.

The guarantee is effective up to 12 months from the date of delivery of the machine to the buyer. The guarantee applies only to a new TTMA sold in possession of the first owner, and officially delivered by Verdegro or an official distributor.

Verdegro is based on an obligation to guarantee the absence of TTMA occurred in accordance with this warranty for free repair. The warranty repair is performed only during normal working hours by a technician authorized by Verdegro BV.

Verdegro decides whether parts and labor are under warranty or not.



The warranty does not cover defects caused by neglect of the use - and safety instructions in the operations manual, or mainly due to improper or inadequate use, installation or maintenance unauthorized persons, or resulting from normal wear or deterioration quality or caused by an accident.


Verdegro does not reimburse any damage to property or persons / companies due to a defective TTMA, neither revenue, driving costs to the repair company etc.

**The guarantee will terminate immediately in full if the TTMA is repaired or serviced by another company / person than the Verdegro Group or an official distributor, when strange or inappropriate components are mounted on the TTMA, or when the settings of the TTMA are changed by unauthorized persons.**

## 13 Document delivered by each TTMA

### 13.1 TTMA certificate, signed by the Verdegro Group



# VERDEGRO

# Official declaration

**VERDEGRO Crash systems BV, Etten-Leur The Netherlands**

**Declares that the Trailer Truck Mounted Attenuator with number:**

Construction year 20.....

OK

Is exactly the same model used at the tests of the Verdegro TTMA. Results are in report 20130821 Rev 1.0.  
Full scale tests were according the NCHRP-350 testlevel TL3, 100K.  
The weight of the truck was about 9000 kg during the tests, conform standards of the NCHRP-350.

DATE: \_\_\_\_\_ - \_\_\_\_ -20\_\_\_\_


Company stamp

Verdegro Crash Systems BV Etten-Leur

This Certificate is valid for one year, the equipment needs a control the first month, after 6 months and one year after above mentioned release date (Done by Verdegro). These control turns (appointment required) are mandatory and free of charge for the first year. The certificate of conformity can be renewed every year.

## 13.2 Overall and mounting certificate

Note: This certificate can be signed by the distributor and then will be their responsibility



**Official declaration**

**VERDEGRO Crash Systems BV, Etten-Leur The Netherlands**  
*Declares that the following equipment meets the specifications and standards of full scale tests.*

Truck Mounted Attenuator:	Truck:
Producer: Verdegro BV Number TTMA: Number Cushion: Delivered with signalization on TTMA: YES / NO	Producer: Type: License plate: Chassis number: Construction year: Color: Truck weight in kg (without TTMA):

**Company stamp**  
 Verdegro Crash systems BV Etten-Leur

DATE: \_\_\_\_ - \_\_\_\_ - 20\_\_

This Certificate is valid for one year, the equipment needs a control the first month, after 6 months and one year after above mentioned release date (Done by Verdegro). These control turns (appointment required) are mandatory and free of charge for the first year. The certificate of conformity can be renewed every year.

## 14 CE certification



CE Verklaring van conformiteit  
CE Declaration of conformity  
CE Konformitätserklärung  
Déclaration CE de conformité

### **The Verdegro Group**

verklaart hiermee, dat het produkt  
hereby declare, that the product  
erklären hiermit, daß das Produkt  
déclare par la présente, que l'outil

# TTMA (100K)

NL

Is geproduceerd conform de normen en normatieve documenten overeenkomstig de bepalingen van de EG-richtlijnen 2006/42/EG en de NCHRP report 350-TL3.

GB

Is manufactured in conformity with the EG 2006/42/EG and the NCHRP report 350-TL3.

Other applied standards	
Machinerichtlijnen / CE- markering 2006/42/EG	NEN-EN-IEC 60068-2
NEN-EN 12966-1/2/3	2002/49/EG
IEC-EN 60529	NEN-12899-1
IEC-60950-1:2006 (2006/95/EG)	CROW 96a/96b
NEN 60068-2-47	RDW
NEN 72/245/EEG (EMC)	ISO 2813
NEN-3381	NEN-EN-ISO 3506-1/2
NEN-1010	Arbo-wet
NEN-EN 1050	ARAB/CODEX/AREI



## 15 Maintenance history

Date:..... Hours:..... Stamp:	Date:..... Hours:..... Stamp:
Date:..... Hours:..... Stamp:	Date:..... Hours:..... Stamp:
Date:..... Hours:..... Stamp:	Date:..... Hours:..... Stamp:
Date:..... Hours:..... Stamp:	Date:..... Hours:..... Stamp: