CRASH ATTENUATOR
Julietta M24100.M.SE-03

SE

NCHRP 350 Test levels TNO 100K -> 3-50, 3-51, 3-52 & 3-53 (100 km/h)

USER MANUAL

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A. Directives

1. Introduction

This manual is a guideline to use the crash attenuator in a safe and effective manner, to maintain it and to solve eventual small problems. It is mandatory that the user or anyone working near or with the crash attenuator should read and understand this manual and follow the instructions within.

Installing and working on the crash attenuator should only be done by qualified and authorised personnel, in accordance with the regulations issued by the competent authorities and with this manual. Said personnel must understand the operation of the equipment and must assume responsibility for the risks and safety issues for the personnel in the working area. The users must apply all standard and additional safety measures to ensure their safety.

If the equipment has been damaged by one or another cause, for instance by a collision, it cannot be put back into use without prior consent of the manufacturer.

The manufacturer cannot be held responsible for direct or indirect damage caused by the use of the equipment, nor for eventual errors in this manual and the subsequent eventual damages.

2. Object and function of the equipment

The truck-mounted crash attenuator (TMA) is a mobile safety equipment used during mobile or temporary road works in order to enhance protection to the work force against surrounding traffic hazards.

The equipment is attached to the rear of a supporting vehicle - mostly a truck - and is positioned upstream of the traffic flow. The objective of the equipment is to prevent as far as possible an upcoming errant vehicle of running into the workers by acting as a buffer and at the same time to attenuate the impact force on the colliding vehicle.

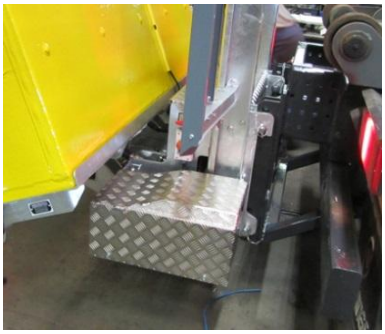
The equipment can only fulfil its function if it is operated and maintained properly. The equipment should only be used as a whole and for the purpose for which it has been built. It is only an additional safety device, and not a working tool. It is not meant to be used as e.g. a lifting gear or a cargo carrier. Loose objects present a liability and should be discarded.

B. Overview

1. Sign board

This structure carries the light arrow with LED luminaries and two flash lights. The assembly is made to comply with the National regulations.
The sign board also carries the main control cabinet.

2. Docking station



The docking station connects the crash cushion to the supporting vehicle. It can be easily mounted to and dismounted from the vehicle. The docking station carries the tilting mechanism for raising and lowering the cushion, the batteries and the electro-hydraulic power unit.

3. Crash cushion

The cushion is a lightweight metal box filled with an energy absorbing material. When a collision occurs, the materials deform and dissipate the collision energy in a controlled way.
The cushion can be tilted and automatically secured in two positions. When active, the cushion is positioned horizontally, and during transport the cushion is tilted upright for better manoeuvrability.

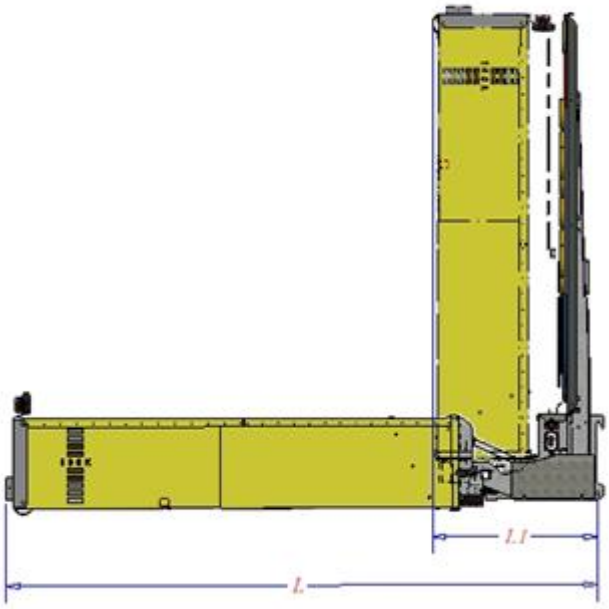
4. Controls

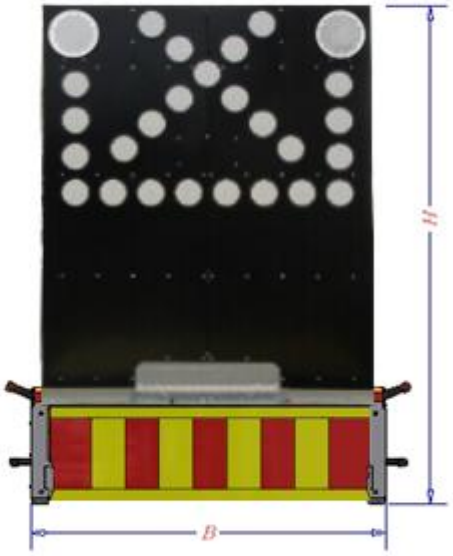
Both the TMA and the signalling board are controlled by means of a single handheld control box located in the cab of the vehicle. The controls are done using the LCD colour screen, function keys and contextual menus.

5. Dimensions

Dimensioning of the TMA

	100K
Height H	3.70 m
Length L in active mode (cushion lowered)	3.84 m
Length L1 in transport mode (cushion raised)	1.12 m
Width B	2.30 m
Total weight	1.120 kg
Voltage	24V DC
Total installed power	2.2 kW
Hydraulic pressure	140 bar – 14 MPa





C. Setting up the equipment

1. Components

The equipment is attached to the supporting vehicle by means of the docking station.
The vehicle must however be adapted at the rear with an attachment frame in order to carry the attenuator.

Other demands may be imposed on the vehicle by the local authorities. These are not regarded in this manual as far as they do not interfere with the operation of the equipment.

☞ The disposition of the attachments is outlined in annex 2, Attachment of the attenuator to the vehicle on page 26

2. Attaching the equipment

☞ Perform these handlings in a safe place, away from the traffic, preferably in a workshop or a parking area

To attach the crash attenuator to the vehicle, the cushion must stand upright.

See
Raising the cushion on p.13

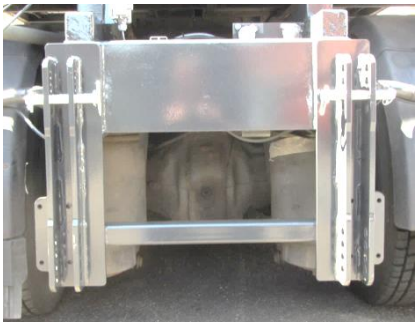
1. Mechanical connections

Verify that the entire unit is on stable ground. Avoid working on a slope.

At the storage place, lift the cushion with a lifting device by inserting the forks in the slots at the bottom of the cushion.

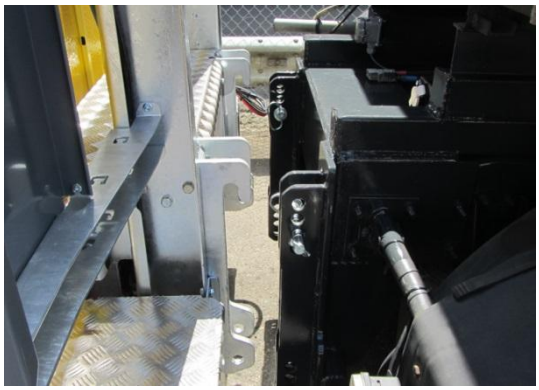
On the attachment frame insert the pins on both sides at the desired height

Put the safety clips

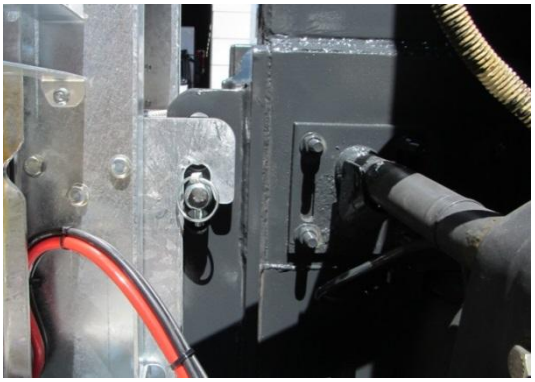


Approach the cushion with the docking station

Align the hooks of the docking station



Engage the hooks by lowering the docking station



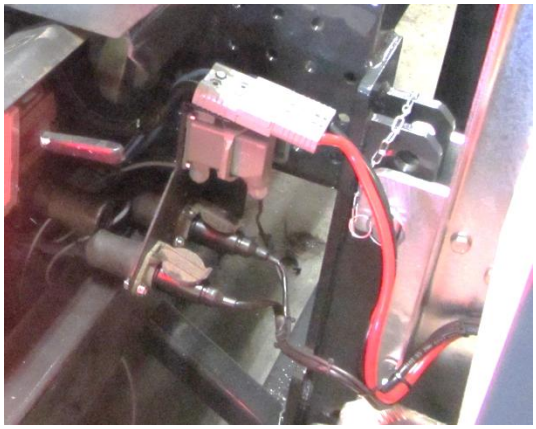
After engagement tilt the docking station as to align the holes at the bottom of the docking station and the frame

Engage the pins

Put the safety clips

Disengage the lifting device

2. Electrical connections



- Road lights (rear, brake and fog lights and indicators) (ISO 1185 + ISO 3731 or ISO 12098)
- Power supply from the vehicle
- connection with the control box in the cab

The socket wiring for the road lighting can be found on page 25

3. Checking the ground clearance of the cushion

Bring the cushion down into horizontal position (see Lowering the cushion on page 10)

In operational position, the cushion should be between 28 and 32 cm above the ground.

Should it be necessary to adjust the height of the cushion, raise the cushion (see Raising the cushion on p.13) and disconnect it (see Dismounting the equipment on p.15).
Relocate the upper pins to the appropriate height.
Mount the TMA again (see above) and lower the cushion (see Lowering the cushion on page 10)
Recheck the height.

4. Checks

Verify:

- all pins with safety clips in place
- height of the cushion above the ground
- functioning of the road lights

In case the cushion must be raised, refer to Raising the cushion on p.13.

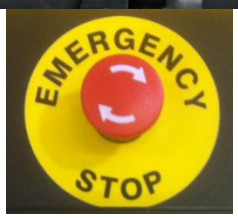
D. Using the equipment

> For safety reasons controlling the equipment can be entirely done from the cab of the vehicle as the automated functioning makes it unnecessary to leave the cab.
> Should for some reason a failure occur then it is strongly recommended to first drive to a safe place and only then try to treat the problem.

1. Activating the system

Turn the main switch into horizontal position

Disengage the emergency stop button on the control box..



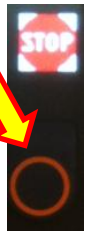
See to it that the other emergency buttons (docking station / signalling frame) are also disengaged.

2. Lowering the cushion

Press for 3 seconds the button under the icon showing a lowered cushion.

The cushion will start moving and will stop when it reaches its end position. An warning signal will sound during the movement.

The movement of the cushion can be stopped at any moment with the button under the STOP icon.



When the movement has stopped, the icons  and  will appear to enable resuming the movement in the desired direction.

The movement of the cushion can also be stopped at any moment with the emergency stop button.

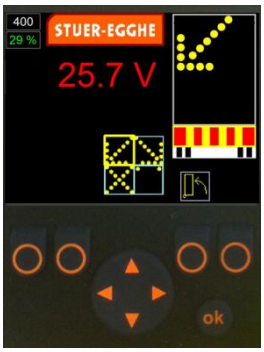
3. Composing the light arrow

- **Light arrow to the left**

Scroll through the icons with the button 

and stop at 

Halting 2 seconds registers the choice. The corresponding image is shown on the screen.

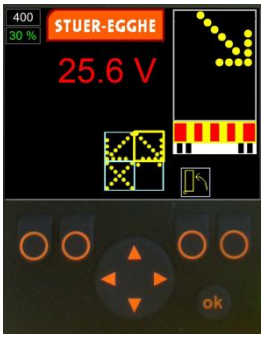


- **Light arrow to the right**

Scroll through the icons with the button 

and stop at 

Halting 2 seconds registers the choice. The corresponding image is shown on the screen.

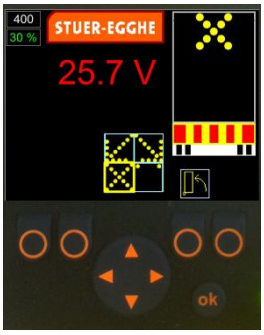


- **Cross**

Scroll through the icons with the button 

and stop at 

Halting 2 seconds registers the choice. The corresponding image is shown on the screen.

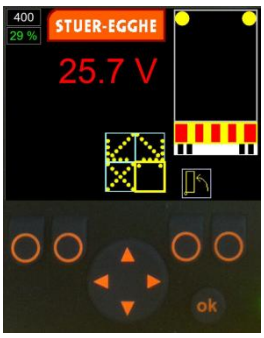


- **Arrow sign only**

Scroll through the icons with the button 

and stop at 

Halting 2 seconds registers the choice. The corresponding image is shown on the screen.



4. Notes

Automatic dimming

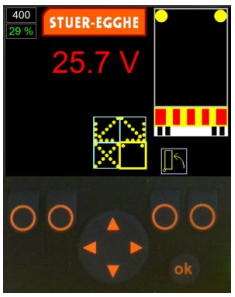
The dimming of the arrow lights goes automatically in function of the surrounding light intensity.
Street lighting and incoming light beams are taken in account.

Vehicle:

☞ Check:
- Signalling functioning correctly
- Cushion at the right ground clearance (28 to 32cm)
- No loose objects

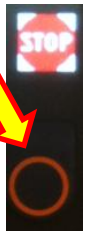
5. Raising the cushion

Press for 3 seconds the button under the icon showing a raised cushion.



The cushion will start moving and will stop when it reaches its end position. An warning signal will sound during the movement.

The movement of the cushion can be stopped at any moment with the button under the STOP icon.



When the movement has stopped, the icons  and  will appear to enable resuming the movement in the desired direction.

The movement of the cushion can also be stopped at any moment with the emergency stop button.

6. Closing down the system

Press the emergency stop button on the control box.

The other emergency buttons (docking station / signalling frame) can also be used.

Turn the main switch into vertical position

☞ Check:
- signalling is switched off
- no loose objects

If the equipment stays behind unattended:

- Take precautionary measures to avoid theft
- See to it that the equipment does not form an obstacle

7. Moving the equipment while in operation

If the TMA must move while in operation, i.e. with the cushion down, pay special attention to the following:

- the highway code is still applicable,
- the cushion forms a cantilever at the rear, which makes manoeuvres close to side structures hazardous.
- when driving up or down slope transitions, the bottom of the cushion may get damaged
- Take in account a working height of 4 m.

8. Operating the TMA with wireless handheld device (Bluetooth) (optional)

If this option is fitted, the TMA can be operated with a smartphone or a tablet provided the appropriate software and app have been loaded.

Refer to the specific user guide.

E. Dismounting the equipment

The equipment may be taken off the vehicle only if the cushion is in vertical position. In no case the equipment should be disengaged from the vehicle while the cushion is in lowered position.

Choose a place where the ground is stable and plane. Avoid working on a slope.

> ☞ Perform these handlings in a safe place, away from the traffic, preferably in a workshop or a parking area

1. Raising the cushion

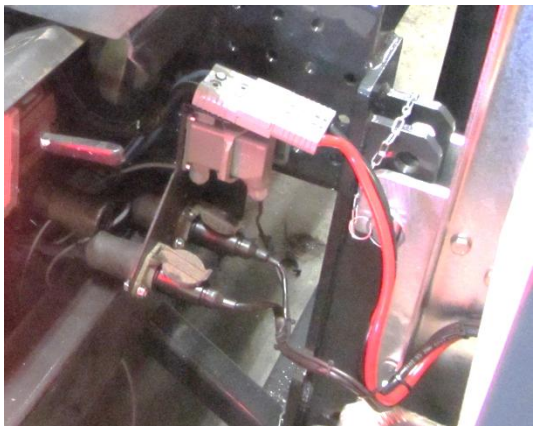
Refer to Raising the cushion on p.13.

> ☞ See to it that nothing or nobody stands in way of the movement of the cushion!
>
> 
>

2. Electrical connections

Disconnect:

- Road lights
- Power supply from the vehicle
- Connection with the control box in the cab

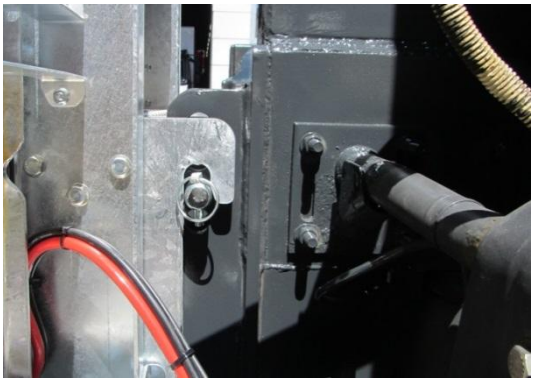


3. Mechanical connections

Engage the cushion with a lifting device by inserting the forks in the slots at the bottom of the cushion.

Disengage the bottom pins on both sides.

Lift the cushion until the upper pins are clear



Bring back the cushion.

The attenuator can now be stored.

4. Storage

In the storage area the batteries can eventually be recharged using a charging device. This could be useful if a track & trace system needs to remain active.

In case the equipment should stay behind unattended:

- Take all measures to prevent theft or pillage
- Remove all loose objects from the equipment.
- Position the equipment so it does not form an obstacle

F. Maintenance

The equipment can perform faultlessly as long as elementary rules of proper operation and preventive maintenance are observed. Guidelines specifically for this equipment are set out hereafter.

Damage occurred through an accident or improper operation must be submitted without delay to the manufacturer.

1. Batteries

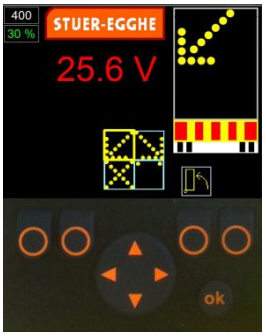
Battery type: Wet traction 12 V DC, 230 Ah

- if 24V execution: 2 batteries

Check liquid level
Clean the battery clips

Remark
After a long standstill (e.g. 1 month) it is recommended to recharge the batteries by running the engine of the vehicle during 3 or 4 hours or else by using a battery charger.

The available voltage of the batteries is displayed on the screen of the control box..
Voltage must at least be 23 V.

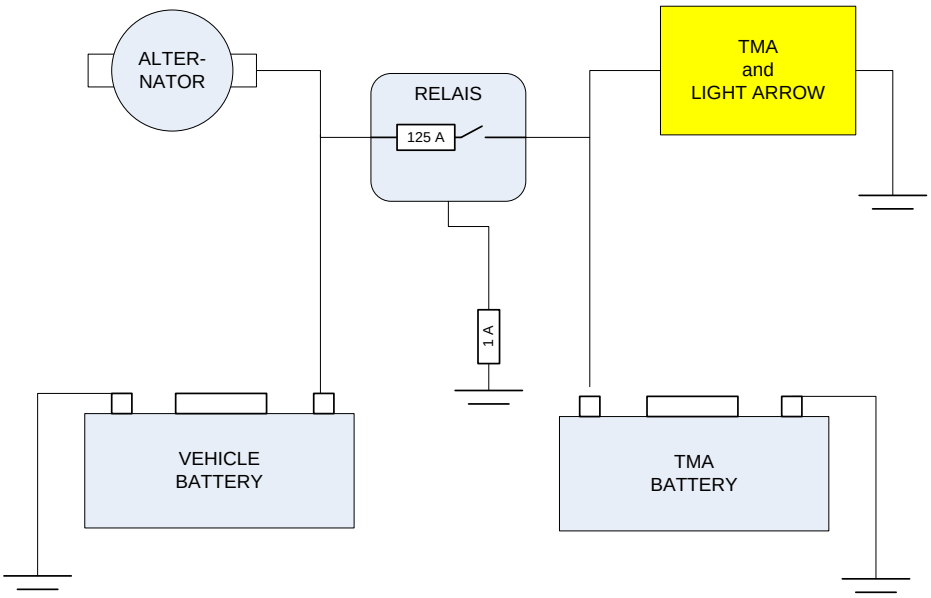


☞ Always shut down the equipment before changing a battery

2. Battery separator (optional)

The batteries of the TMA are charged by the generator of the vehicle with the engine running.

In option a separator relais can be provided to prevent the functioning of the TMA from draining the batteries of the vehicle. This way the vehicle should always be able to start.



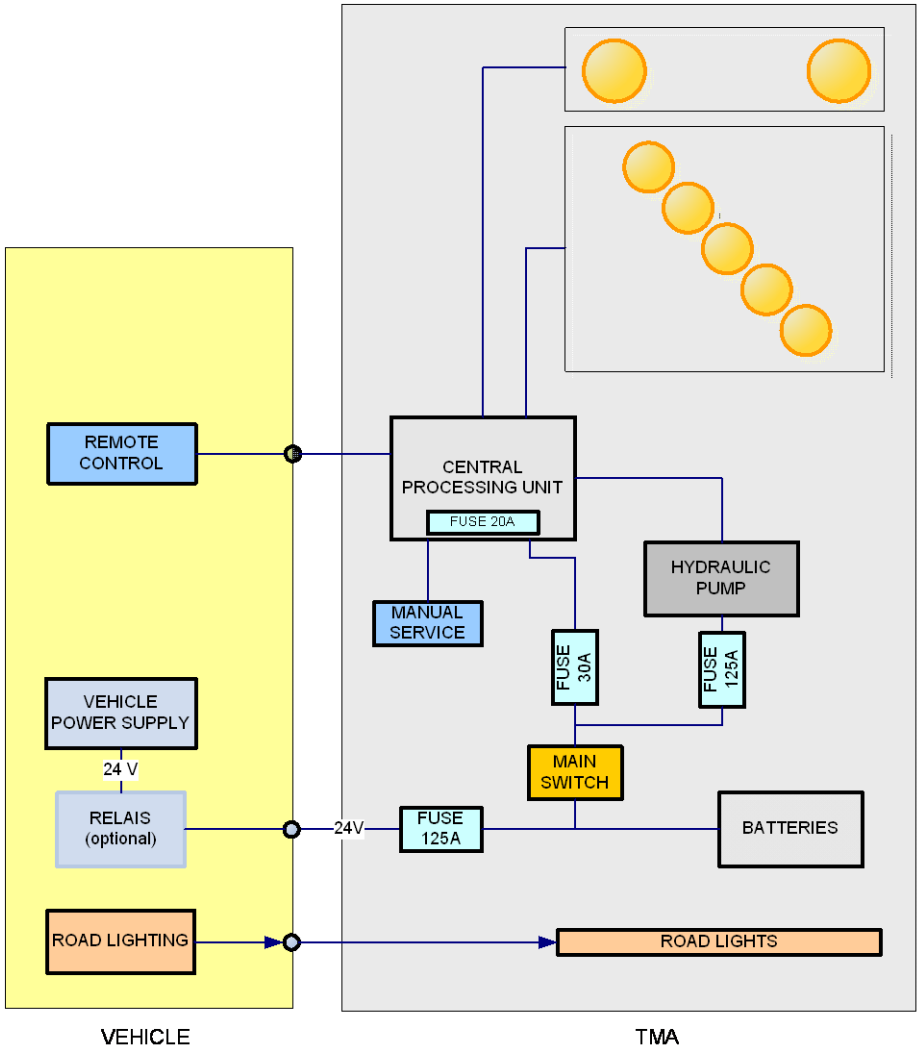
3. Luminaries

Operating voltage 24 V DC.
Luminaries:

Standard execution: Flash lights: Ø 300 LED (EN 12352 class L9H)
Arrow lights: LED Ø 200 (EN 12352 class L8H)

The luminaries are controlled through a unit in the main control cabinet. This unit contains nu user serviceable parts. The cabinet can be cleaned in a usual manner, but **not with a high pressure** hose**..**

4. General diagram



5. Fuses

The system is secured by a fuse on the hydraulic unit (see diagram on p. 21)

6. Hydraulics

The hydraulic unit supplies the jacks of the hooks and the cushion. The unit consists of a motor, pump, reservoir and valve unit. The pump motor is supplied electrically by the batteries.

Normal maintenance

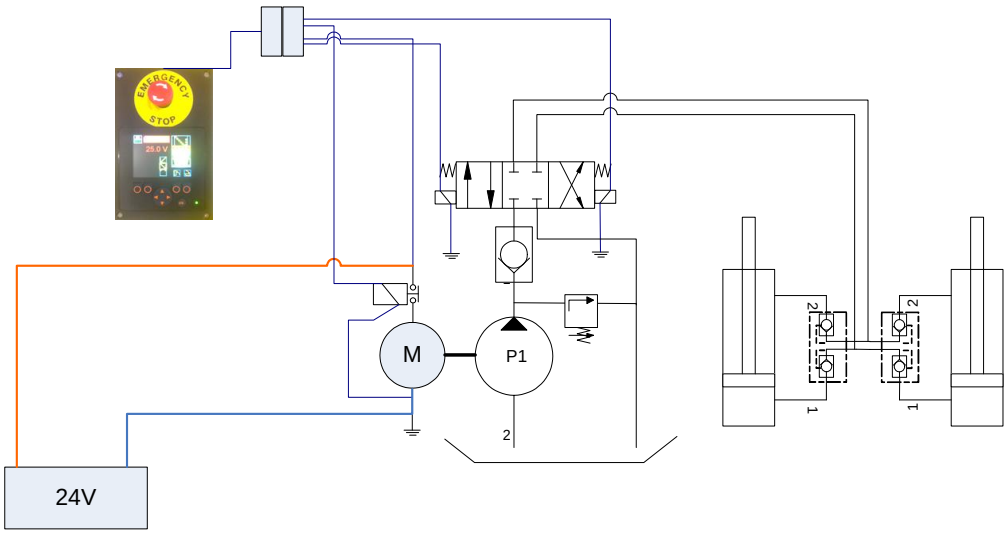
- Oil:

Type	HLP22 DIN 51524
Qty	approx. 5 litres


Oil level only to be checked with cushion raised (vertical position)

- Oil level check:
  The level can be checked by looking into the filler mound. The oil level must just cover all elements inside.
- Check the connections for leakage or faults.

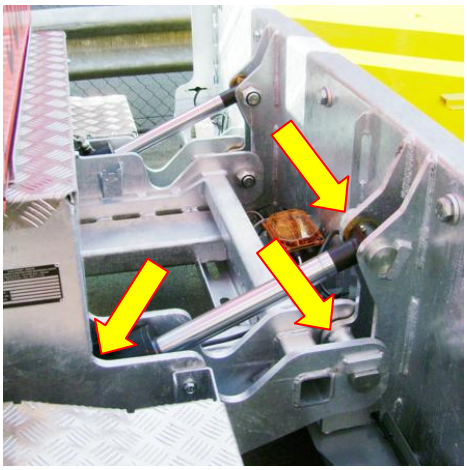
Diagram



7. Lubrication

Grease all pivots and hinges with regular machine grease

The cylinder pivots are fitted with grease nipples.



8. Tools

No special tools are needed, only a lifting device to mounting and dismounting the TMA

9. Maintenance scheme

maintenance

Part	To do	Every 100 hours of operation	Every year
Hydraulic unit	Check oil level and top up if necessary	**X**	
Batteries	Check liquid level and top up if necessary	**X**	
Pivots	Lubricate	**X**	
Hydraulic unit	Change oil		**X**

Rem.: After a long standstill (> 1 month): additionally

Batteries	Check liquid level and top up if necessary. Charge using vehicle engine or battery charger

10. Checklist

Before each use

Ground clearance of the cushion (28 to 32 cm)	
Functioning of the arrow lights	
Functioning of the flash lights	
All locking pins in place	
Batteries: liquid level	
Connections: road lights, 24V supply, remote control	
Cushion: free of damages	

11. Manual operation

Operating the equipment can be necessary to check the functions and movements, or in case the control box fails.

On the emergency stop box a knob is provided to operate the cushion.

OPEN : the cushion lowers
CLOSE : the cushion raises

The movement only continues as long as the knob is held in position.
In any case the movement stops when the cushion reaches its end position.

G. Troubleshooting

1. *Nothing works*

- Check the position of all the emergency stop buttons
- Check the fuse (p.20)

2. *Flash lights don't work*

- If one of the lights doesn't work, look for a wire rupture
- If none of the lights work, contact the manufacturer

3. *Arrow lights don't work*

- If one of the lights doesn't work, look for a wire rupture
- If none of the lights work, contact the manufacturer

4. *Cushion won't move*

- Check for obstacles
- If the pump motor is not running:
    - Check the batteries. Charge if necessary
    - Check the fuse

5. *Road lights faulty*

- The road lights are completely independent from the cushion operation. Check the connections, bulbs and the supply from the vehicle.

H. Safety

1. *Main safety risks*

- Collision danger
- Moving parts
- Electrical parts
- Insufficient knowledge of operation and instructions

2. *Safety measures*

- Operation from within the cab
- Instructions in user manual
- Emergency stops
- Simple operation
- Low operation voltage (24V)
- Warning pictograms

3. *Indications*

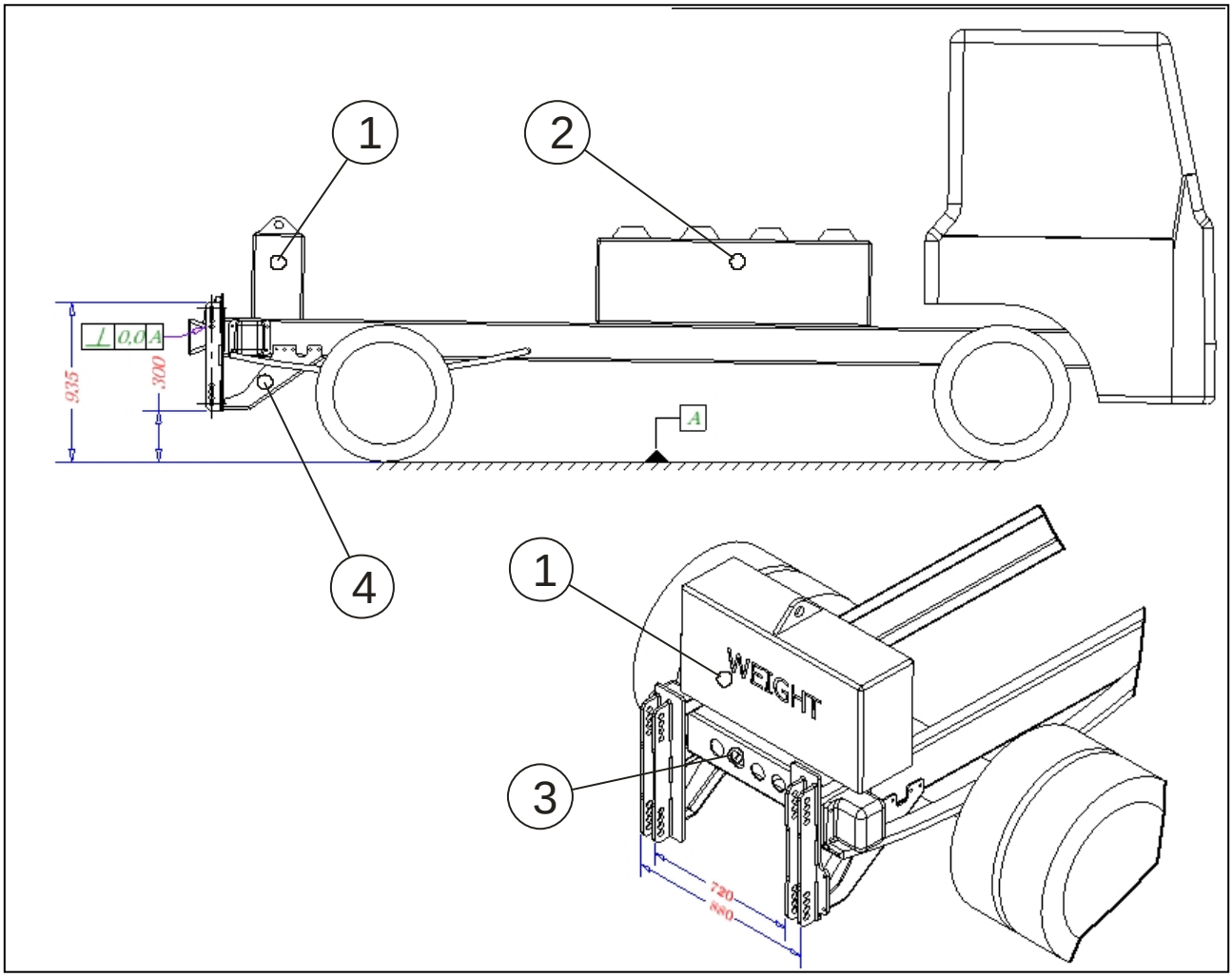
	Keep clear of the cushion

I. Annexes

1. Road lighting: socket wiring

	Colour	Function
	WHITE	ground
	BLACK	position lamp left
	BROWN	position lamp right
	YELLOW	direction indicator left
	RED	stop lamp
	GREEN	direction indicator right
	BLUE	fog lamp
	GRAY	reversing lamp

2. Attachment of the attenuator to the vehicle



Make sure the truck is weighted to the desired mass before mounting the attachments.
Ballast ①: approx. 1200 kg as a surrogate for the TMA to be mounted later
Ballast ②: to ballast the truck to the intended total weight. Take in account the load limits on the front and rear axle.
It might be necessary to connect ③ the longitudinal girders in order to stiffen the chassis regarding torque.

The ground clearance of the attachments should be as indicated on the diagram (300 mm ± 2 cm).

For mounting purposes the supplied attachments are connected by two square tubes (not shown on the diagram) which can be disposed of after welding the attachments to the truck

Provide extra support ④ and stiffening of the lower ends of the attachments by adding adequately dimensioned structural elements (not supplied) to the truck chassis

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