STUER-EGGHE

SILKE
USERS MANUAL

V 1.02 – 02/23

MASH 2016 Test levels:	3-50, 3-51, 3-52, 3-53
CEN/TS 16786:2018 Test levels:	TMA100-1, TMA100-2, TMA100-3, TMA100-4

CONTENT

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 taken damage, 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. Docking station

The frame connects the attenuator to the supporting vehicle. It carries the tilting mechanism and the electro-hydraulic power unit. The frame can be easily connected and disconnected using a forklift.

2. Motion and controls

The movements are controlled from:

- within the cab using a basic control box (basic model)
  which is supplied with a 15-meter-long (590 in) cable and can be mounted at user's discretion

- within the cab using the control unit

- the rear of the vehicle using the emergency control box

- a smartphone or tablet app via Bluetooth

The controllers activate the hydraulic pistons and the hydraulic motor accordingly.

- The pivoting motion to raise or lower the attenuator is carried out by the hydraulic pistons.

- The sliding motion to open or close the attenuator is carried out by the hydraulic motor.

The hydraulic components are powered by the hydraulic pump, which is electrically powered by the support truck's power supply.

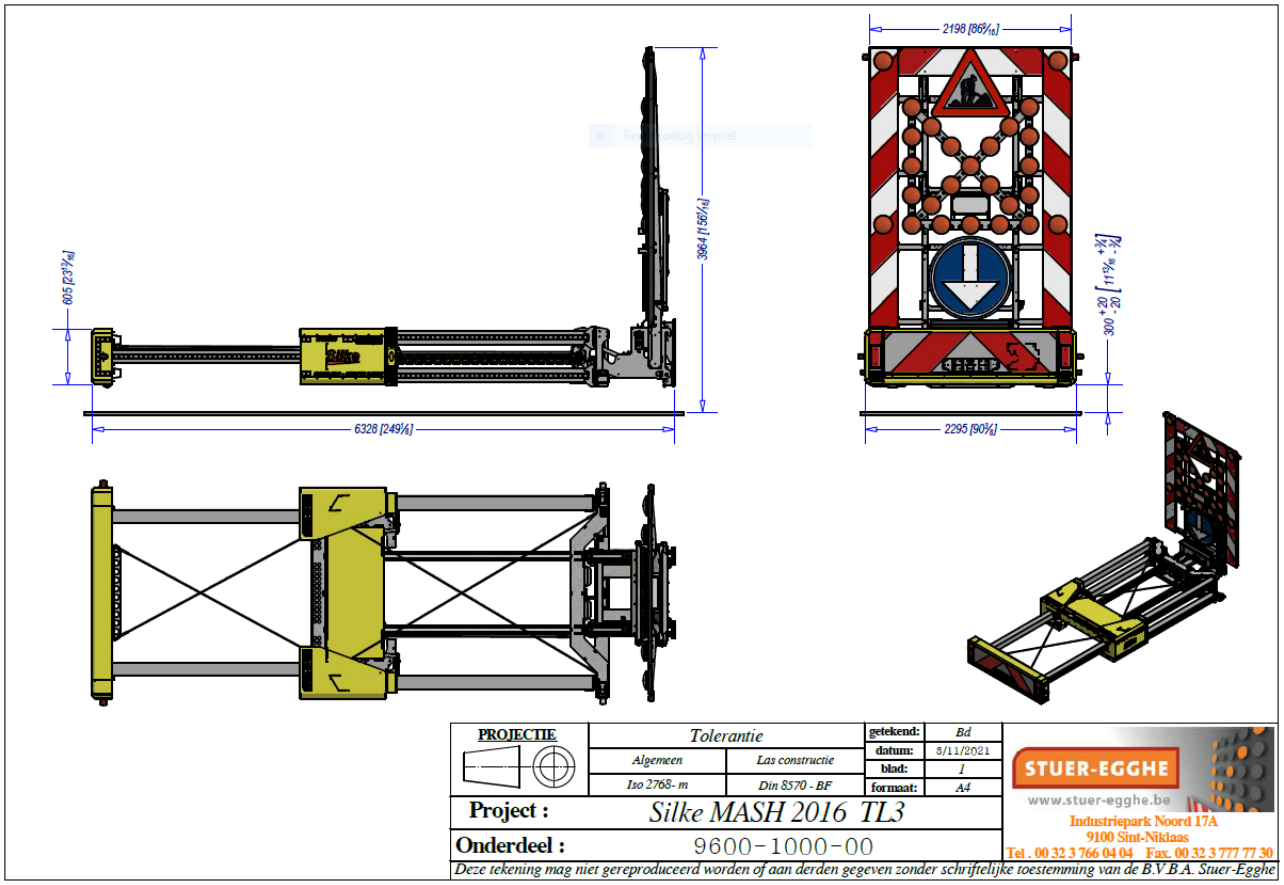
3. Dimensions

Dimensions of the operational equipment attached to standard supporting vehicle:

		Silke
Height	deployed	1.05 m (41,3 in)
	raised	3.95 m (155,5 in)
Length	deployed	6.328 m (249,1 in)
	raised	1.12 m (44,1 in)
Width		2.295 m (90,4 in)
Total weight (Without signalisation)		Approx.1400 kg (3086.4lbs)
Voltage		24 V DC
Total installed power		1.5 kW
Hydraulic pressure		160 bar - 16 MPa - 2320 PSI

The minimum weight of the support truck for the MASH model is 6500kg (14330 lbs) including TMA, there is no upper limit.

The minimum weight of the support truck for the CEN/TS16786 model is 6500kg (14330 lbs) including TMA, and 15000kg (33069 lbs) max.



C. Setting up the equipment

1. Unloading

2. Components

The equipment must be attached to a supporting vehicle. 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 equipment is attached to the supporting vehicle by the docking station.

3. Mounting the equipment

To mount the crash attenuator to the vehicle, the TMA must stand upright.

See Close and raise the TMA on p.16

I. Mechanical connections

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

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

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

Apply copper grease to the pins

Place the safety clips (outer side)

Note that the pins should be inserted from the centre, pointing outward

Approach the support truck with the TMA

Align the hooks of the docking station with the attachment frame on the truck which should fit between the hooks of the docking station

Engage the hooks by lowering the docking station

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

Engage the pins
(From the centre to the outside)
Place the safety clips

Disengage the lifting device

II. Electrical connections

- Road lights (rear, brake and fog lights and indicators).
- Power supply from the vehicle to the electro-hydraulic pump unit.

The socket wiring for the road lighting can be found on page 29

- The connection with the control box is to be added by the user

III. 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.

Check:

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

The unit is now ready for use.

In case the TMA must be raised, refer to Close and raise the TMA on p.16

In case the right height above the ground can't be obtained by mounting the TMA on a higher or lower position on the mounting pads, further levelling can be done according to Levelling the (deployed) attenuator on p. 18.

D. Using the equipment

1. Before first use (except basic models)

- Loosen the four bolts of the hydraulic pump's cover plate and remove the cover.
- Remove the oil plug at the top of the oil reservoir and replace it with the vent plug (which can be found in the plastic bag attached to the hydraulic cables near the valves)
- Place back the cover plate and tighten its screws.

⚠ 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.

2. Before departure

Check the 24V connection with the vehicle

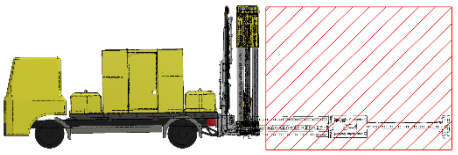
Disengage the emergency stop button on the control box to activate the system.
The red light (button) should be lit (basic model) or the display should show a lowered attenuator.

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

On the moment the emergency button is disengaged, the pump is activated for 2 seconds to pressurize the hydraulic pistons. This is normal and necessary to prevent damage.

3. Deploying the attenuator

⚠ Make sure that no obstacle or person blocks the path of the moving TMA!
(↔5,5m clearance)

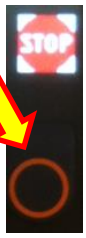


Press and hold the button under the icon showing a lowered attenuator for 3 seconds.

The cushion will start moving and will stop when it reaches its end position. A 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 TMA has stopped somewhere in the middle, manually or by a malfunctioning, both icons and will appear to enable resuming of the movement in the just selected direction.



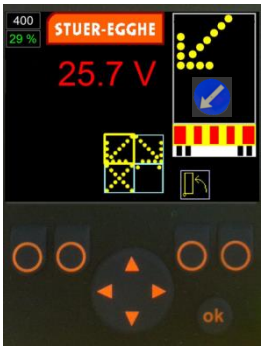
The movement of the cushion can also be stopped at any moment with the emergency stop button.

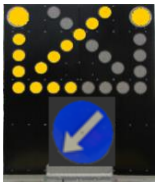
4. Composing the light arrow

- **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.

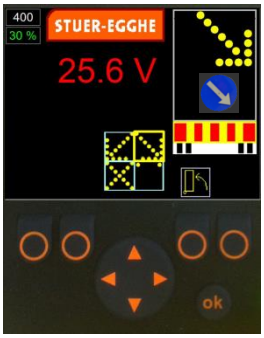




- **Light arrow to the right**

Scroll through the icons with the button and stop at

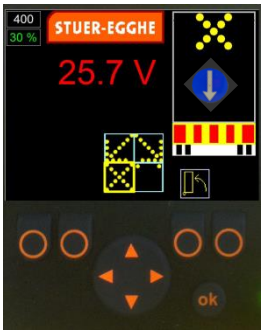
Halting 2 seconds registers the choice. The corresponding image is shown on the screen.



- **Cross**

Scroll through the icons with the button  and stop at 

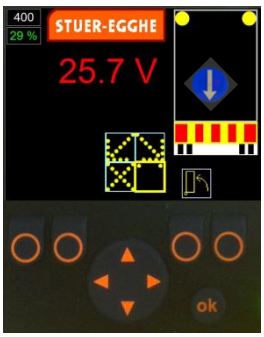
Halting 2 seconds registers the choice. The corresponding image is shown on the screen.

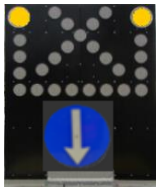


- **Arrow sign only**

Scroll through the icons with the button  and stop at 

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





5. Notes

Automatic dimming

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

Selection of light signs

The attenuator should be fully deployed to be able to select a light sign.

Display images

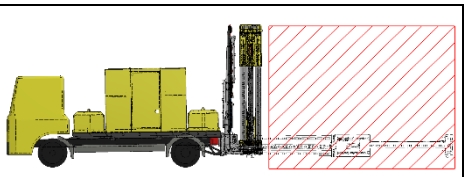
Display images may vary depending on country. (Regards striping, arrow and lights composition)

Vehicle:

⚠ Check (At the depot):
- Signalling functioning correctly
- Attenuator at the right ground clearance (28 to 32cm)
- No loose objects

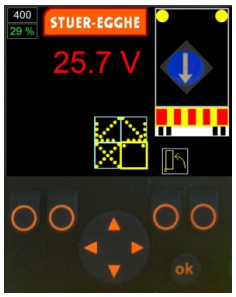
6. Raising the attenuator

⚠ Make sure that no obstacle or person blocks the path of the moving TMA!
(↔5,5m clearance)



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

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



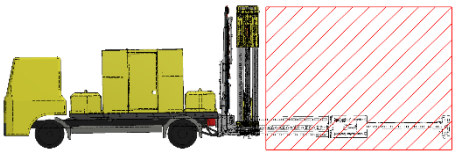
The movement of the cushion can be stopped at any moment with the button under the STOP icon.

When the TMA has stopped somewhere in the middle, manually or by a malfunctioning, both icons  and  will appear to enable resuming of the movement in the just selected direction.

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

7. Deploying the attenuator: basic model

⚠ Make sure that no obstacle or person blocks the path of the moving TMA! (↔5,5m clearance)

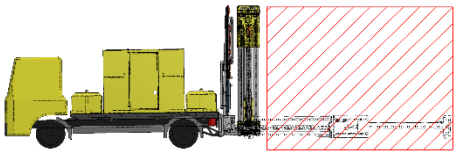


- Press the GREEN button next to “OPEN” for three seconds to deploy the TMA.
- When “OPEN” is pressed, the TMA will be lowered and after that it will slide open.
- Once the TMA is fully deployed, the green light (button) will be lit for 10 seconds and afterward blink every ten seconds, signalling the TMA is fully deployed.
- If the TMA is stopped during deployment or it fails to lock itself in the deployed position, both red and green lights (buttons) will blink every second, signalling the TMA has stopped somewhere between the raised and the deployed position. Either “OPEN” or “CLOSE” can be activated at this point. When they both blink without being stopped by the user, something went wrong and further attention is needed, see *Troubleshooting*.
- Under no circumstances the TMA may be used when it is not fully deployed!

⚠ In case of emergency, press the emergency button on the side of the control box.

8. Close and raise the attenuator: basic model

⚠ Make sure that no obstacle or person blocks the path of the moving TMA! (↔5,5m clearance)



- Press the RED button next to “CLOSE” for three seconds to close and raise the TMA.
- When “CLOSE” is pressed, the TMA will close and then raise automatically.
- Once the TMA is fully raised, the red light (button) will be on and stays on, signalling the TMA is fully raised.
- If the TMA is stopped during the raising, both red and green lights (buttons) will blink every second, signalling the TMA has stopped somewhere between the raised and the deployed position. Either “OPEN” or “CLOSE” can be activated at this point. When they both blink without being stopped by the user, something went wrong and further attention is needed, see *Troubleshooting.*

9. Manual emergency operation (outside)

The emergency operation controls are intended for post collision direct control.
(The automatic programs shouldn’t be used post collision)

- Plug in the manual control box on the side of the control unit mounted on the attenuator
- Turn the upper knob to “OPEN” to lower the TMA
- Turn the upper knob to “CLOSE” to raise the TMA
- Turn the lower knob to “OUT” to extend the TMA
- Turn the lower knob to “IN” to retract the TMA

⚠ The movement stops instantly upon release of the (spring loaded) knobs

10. Deactivating the system

Press the emergency stop button to deactivate the system after usage.

Remark:
When deactivating the system before driving or storage, make sure the TMA is in the raised position.

In case the equipment should stay behind unattended:

- Take all measures to prevent theft or pillage
- Position the equipment so it does not form a hazardous obstacle.

⚠ Avoid leaving loose objects on and in the vehicle. Unfastened objects represent a serious hazard in case a collision occurs.

11. Moving the equipment while in operation

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

- the highway code is still applicable,
- keep speed to a minimum, preferably creeping speed
- consider carefully which signalling to bear
- the TMA forms a cantilever at the rear, which makes manoeuvres close to side structures hazardous.
- when driving up or down (steep) slope transitions, the bottom of the TMA may get damaged.

12. Levelling of the (deployed) attenuator

In case the attenuator sits lower than the recommended hight, levelling of the equipment is needed. (Support truck's suspension can set over time)

- Close and raise the attenuator (p.16)
- Detach the TMA from the support truck (Dismounting the equipment p.19)
- Unbolt the lower pads from the truck
- Insert (a) spacer(s) between the pads and their fitting

- Bolt the pads back to the truck
- Attach the TMA back to the support truck
- Measure the height again
- Repeat the process if necessary

13. Dismounting the equipment

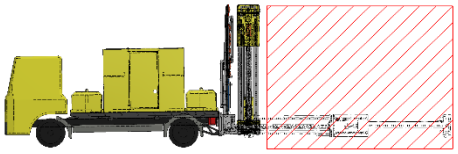
The equipment may only be picked off the vehicle if the TMA is in vertical position. In no case the equipment should be disengaged from the vehicle with the TMA in horizontal position.

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

I. Closing and raising the attenuator

- See the section Close and raise the TMA on p.16

> ⚠ Make sure that no obstacle or person blocks the path of the moving TMA! (↔5,5m clearance)



II. Disengaging the electrical connections

- Road lights (rear, brake and fog lights and indicators).
- Power supply from the vehicle to the electro-hydraulic pump unit.
- Connection with the control box (and close the lid)

III. Disengaging the mechanical connections

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

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

Disengage the bottom pins on both sides.

Lift the TMA until the upper pins are clear

Reverse with the TMA.

The attenuator can now be stored.

IV. Precautions

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 that it does not form an obstacle

E. 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. General diagram

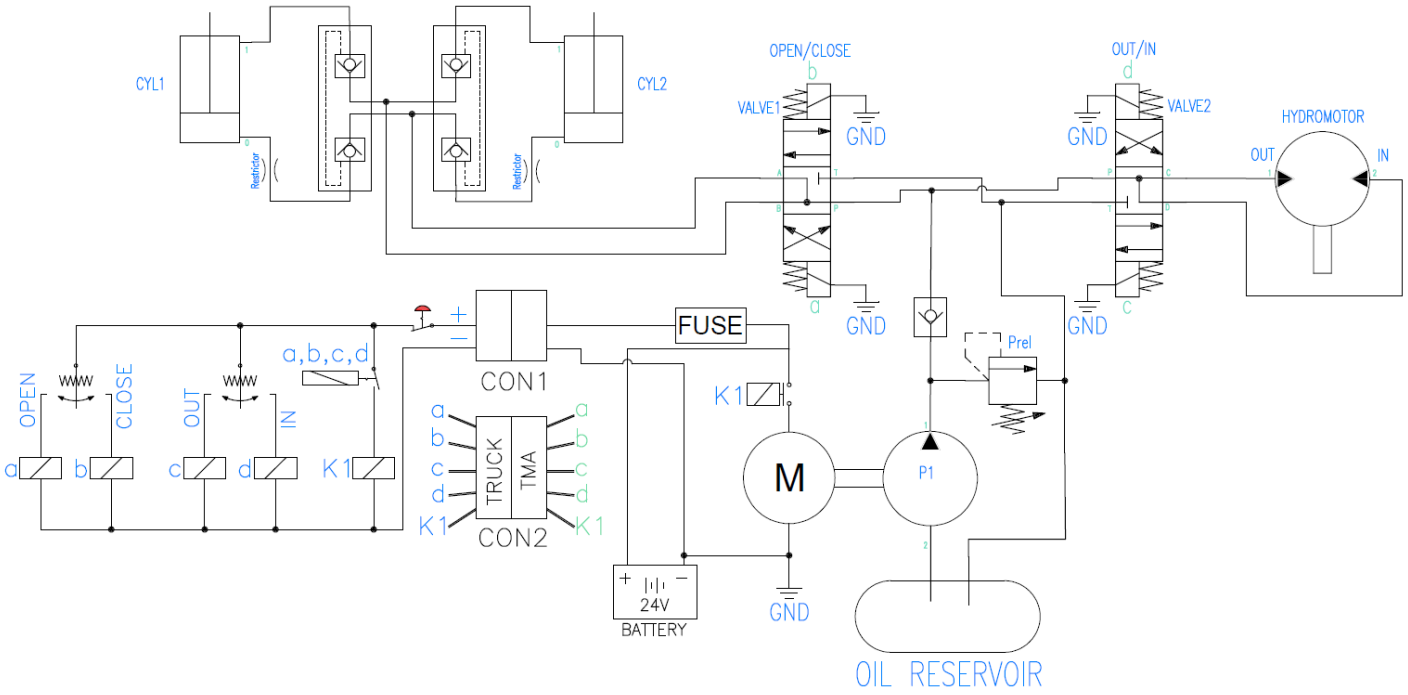
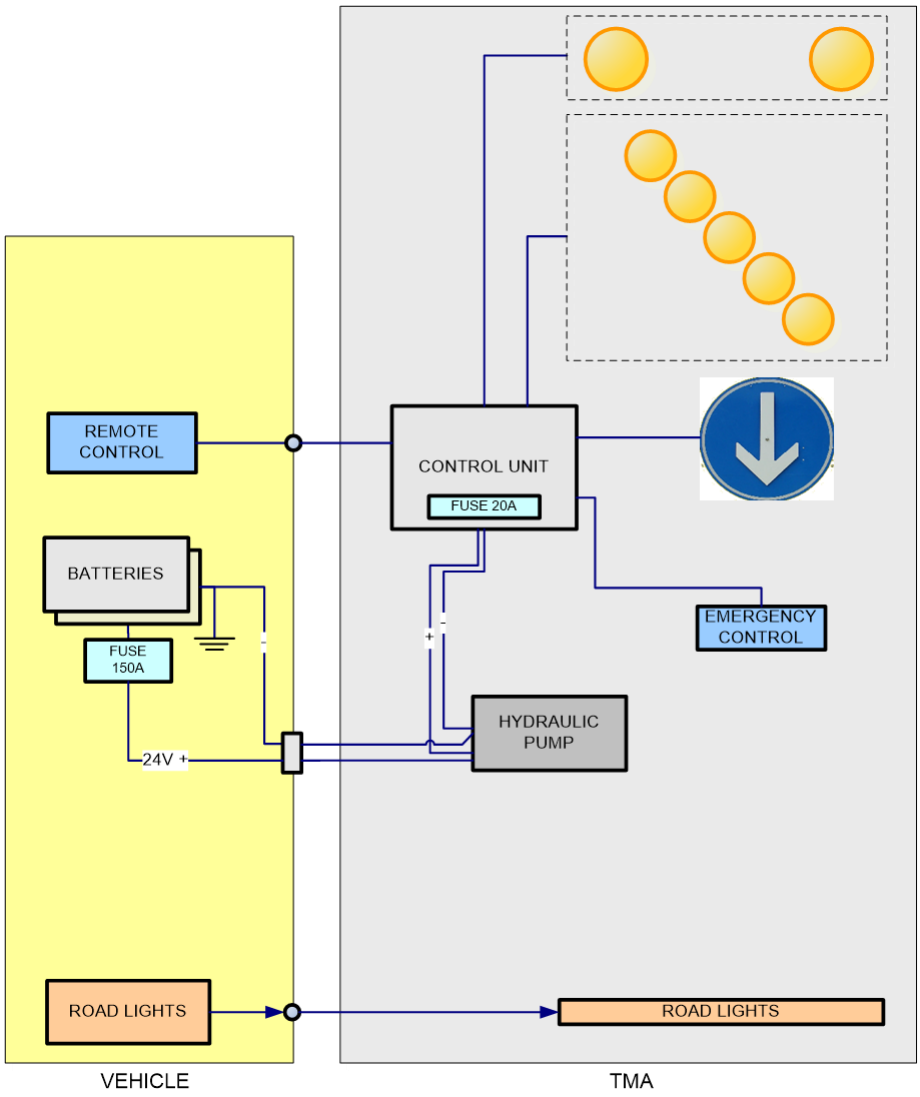


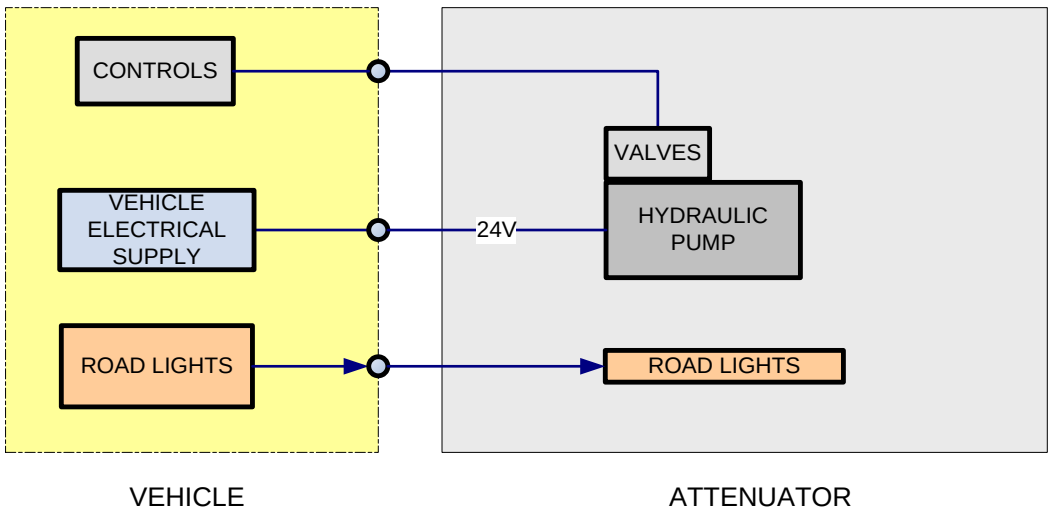
diagram E1

2. Wiring

I. General



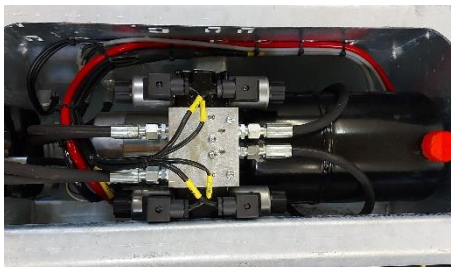
II. Basic model



3. Hydraulics

The hydraulic unit drives the hydraulic jacks for the TMA. Motor, pump, reservoir and valves are integrated in one assembly.
The motor is powered from the vehicle's battery.

See also the General diagram on page 22



- Oil:

Type	HVLP22 (Valvoline)
Qty	approx. 5 litres (1.1 UK Gallons or 1.32 US Gallons)

⚠ Oil level must be checked with attenuator 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.

4. Lubrication

- Grease all pivots, bearings and hinges.
  Use regular machine grease.

5. Batteries

The power supply is taken from the batteries of the vehicle

- 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

6. Luminaries

Operating voltage 24 V DC.
Luminaries:

Standard model: Flashing lights: 4x LED Ø 200 (EN 12352 class L8H)
Arrow lights: 22x LED Ø 200 (EN 12352 class L8H)

The luminaries are controlled through a unit in the main control cabinet. This unit contains no user serviceable parts. The cabinet can be cleaned in a usual manner, but **not with a high-pressure** hose.

7. Tools

No special tools are needed, only a lifting device to mount and dismount the TMA.

8. Maintenance scheme

maintenance

Part	To do	Every 100 hours of operation	Every year
Hydraulic unit	Check oil 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

9. Checklist

Height of the TMA above the ground (28 to 32 cm or 11 to 12.6 in)	
Functioning of the road lights	
Attachment to the vehicle: all locking pins in place	

G. Troubleshooting

1. *TMA won't move*

- Check the power supply and connections
- Check the fuse
- If the pump goes in overload (higher pitched whine), something is obstructing the movement. Check for obstacles.

2. *The pump ticks but doesn't engage*

- Check the battery voltage of the support vehicle or the (optionally) installed battery pack.

3. *Road lights faulty*

- The road lights work separately from the crash attenuator.
  Check the connections, bulbs, and the power supply from the support vehicle.

4. *Both red and green lights are blinking*

- The TMA has stopped somewhere in the middle, retry opening or closing the attenuator.

5. *Not able to select light signs*

- The TMA has stopped somewhere in the middle, retry opening or closing the attenuator.

H. Safety

1. *Main safety risks*

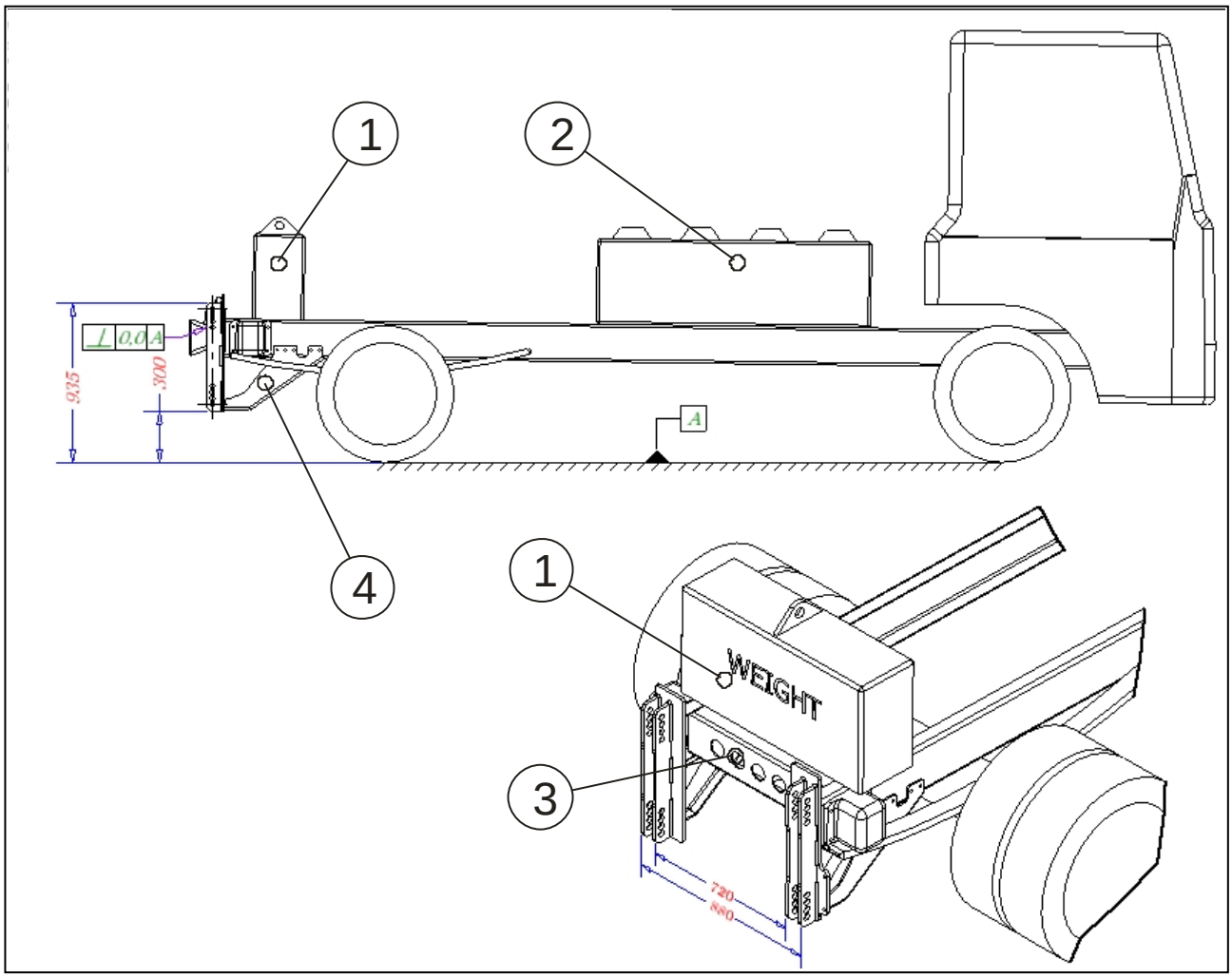
- Collision
- Distraction by surroundings (traffic, works, ...)
- Insufficient knowledge of operation
- Moving parts

2. *Safety measures*

- Instructions in user manual
- Simple operation
- Low voltage (24V)
- Emergency stop

I. Appendices

1. Attachment of the attenuator to the vehicle



Make sure the truck is weighted to the desired mass before mounting the attachments.

Ballast ①: approx. 1600 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 ± 20 mm).

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

2. Road lighting: socket wiring

Road lights wiring diagram

	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

J. Index

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