

MANUAL

For operation and maintenance

VERDEGRO Blade



VERDEGRO®



READ BEFORE USE!

**ONLY AUTHORIZED PERSONS ARE ALLOWED TO OPERATE 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 Blade should be delivered with original certificate to guarantee the
right performance.*

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1 **Data producer and specific machine:**

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(W) www.blade-tma.com
(E) sales@verdegro.com

Machine number : _____

DLADE release date : _____

Company stamp:



Note: This document is only valid with an original producers company stamp.

2 *Introduction:*

Blade is a Truck Mounted Attenuator (TMA). This is an energy absorbing device attached to the rear of a truck, also known as an attenuator Truck or Lorry mounted crash cushion or utility vehicle.

A TMA is designed to provide a controlled stop of a vehicle impacting the rear of the truck. TMA'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 Manual for Assessing Safety Hardware (MASH) specifically addresses the performance requirements of TMA's. The recommended tests to evaluate TMA crash performance are defined for different Test Levels. BLADE is tested according the highest test level TL-3 and is conducted at 100 kph (62 mph).

The BLADE TMA is also full scale crash tested according the, for the United Kingdom required, 110 kph test TD49/07.

This report presents the manual for the Verdegro BLADE (TMA), at the more demanding MASH TL-3 test conditions.

US Patent Pending No 15/043,232.

The Verdegro Blade TMA has multiple available accessories that are full scale crash tested according the MASH, knowing:

- ✓ *Arrow board bracket*
- ✓ *Truck bracket*

This arrow board bracket can be equipped with a Verdegro approved arrow board or VMS sign.

3 **Keep in mind:**

The Blade TMA must be properly installed to a support truck. The truck including the TMA should have a minimum weight of 16.010 lbs. (7.262 kg) and a maximum weight of 22.120 lbs. (10.033 kg) for the best performance results.

When operating a BLADE TMA always be aware of the support vehicle roll-ahead during or after an impact. Always use more! and never less! distance then the maximum roll-ahead occurred during the full scale crash testing which was 4420mm (100kph with 5000 lbs. test vehicle).

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

The Blade is equipped with multiple safety applications check these daily, when in doubt regards the performances contact your local distributor!

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

This manual is only for the Verdegro Blade TMA. Some drawings, Truck brand / type or colors in this manual can be slightly different from the delivered model which should be recognized as a typical Verdegro Blade TMA.

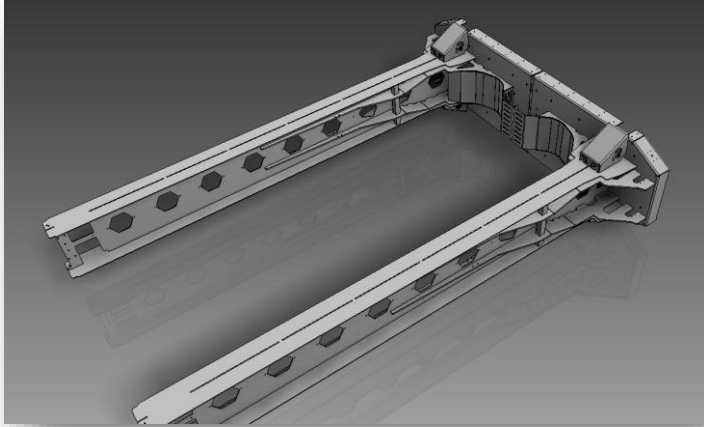
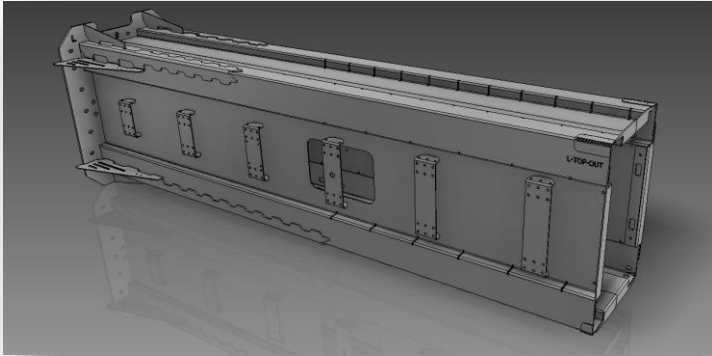
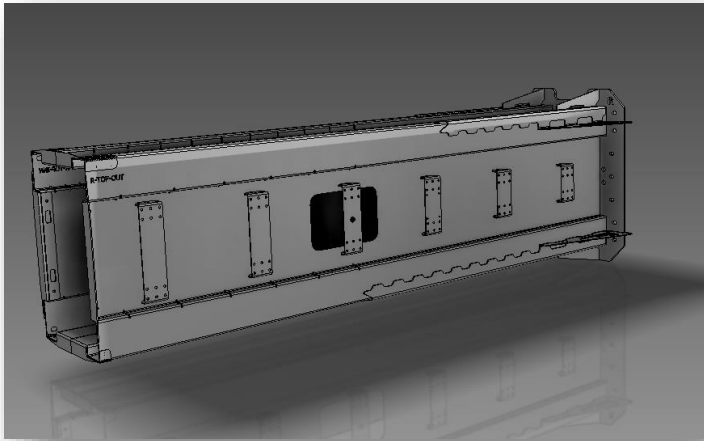
Contact Verdegro for more specifications if needed.

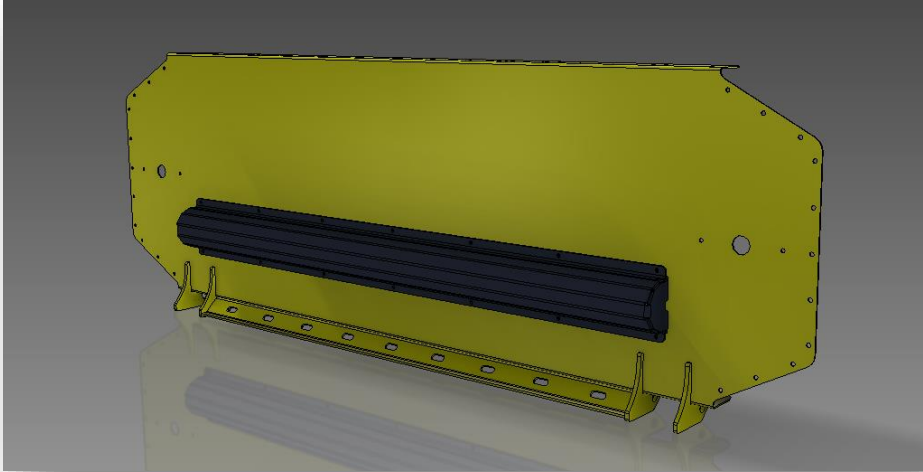
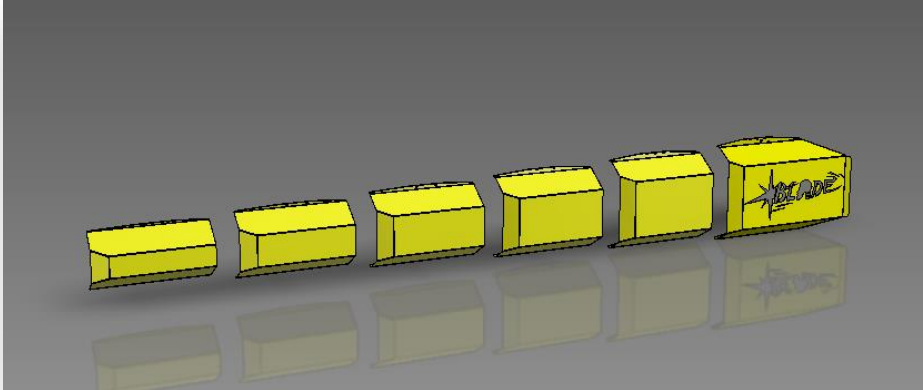
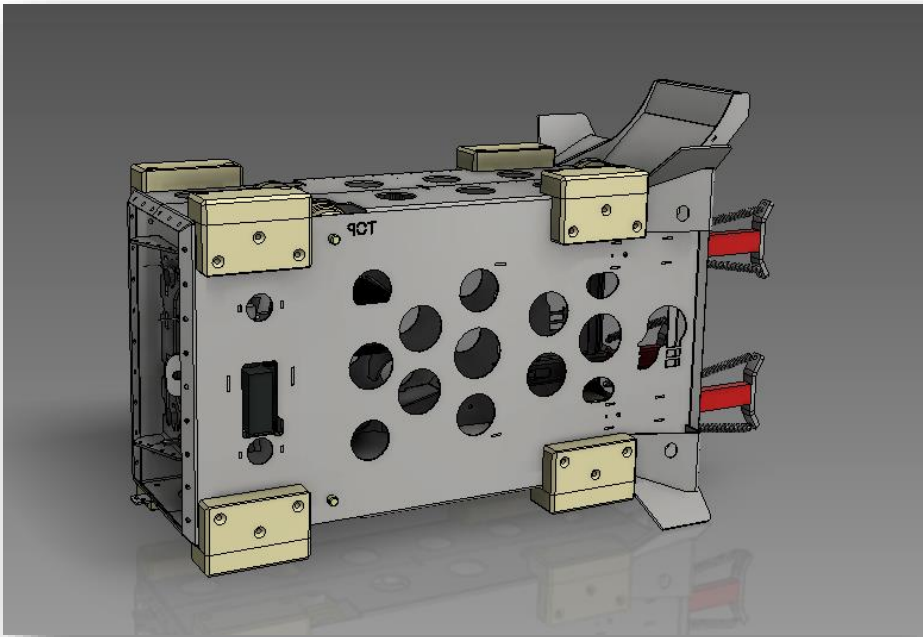


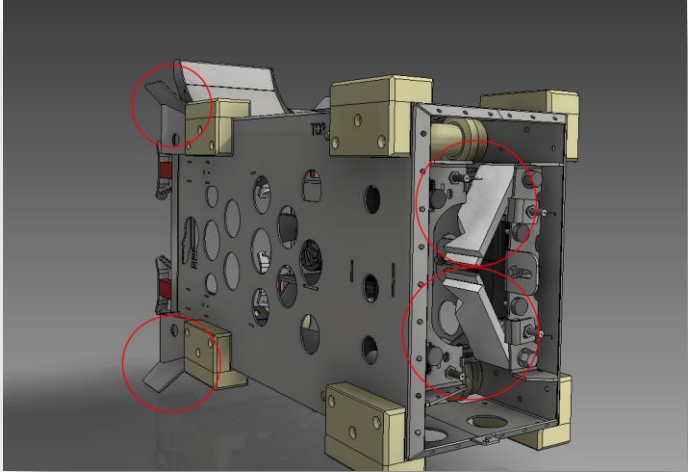
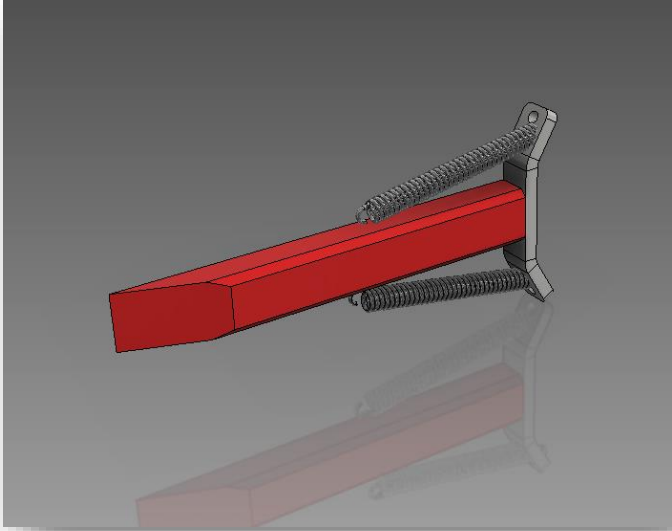
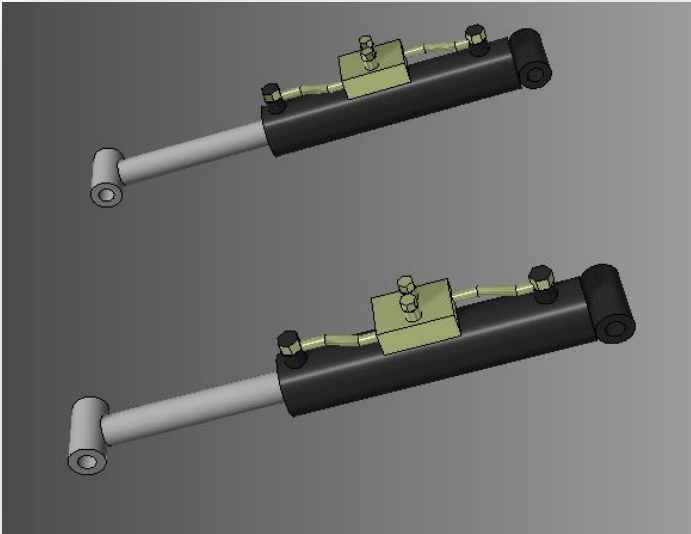
Attention! Before maintenance or checks, operate the TMA to a horizontal down position and disconnected the power during this period of time!

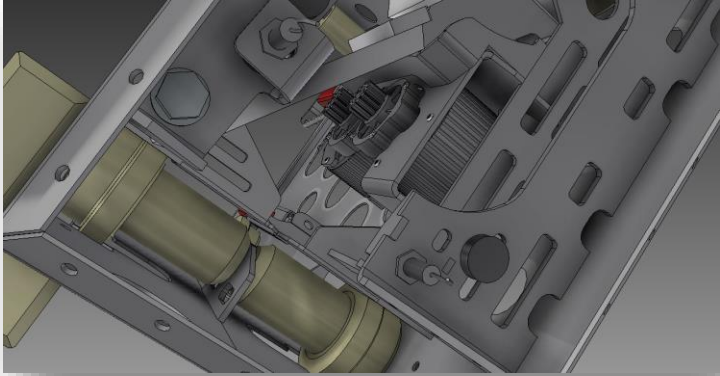
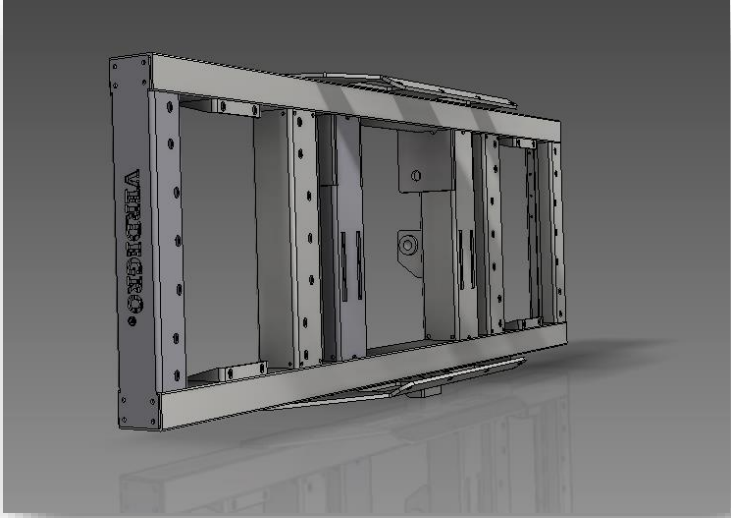
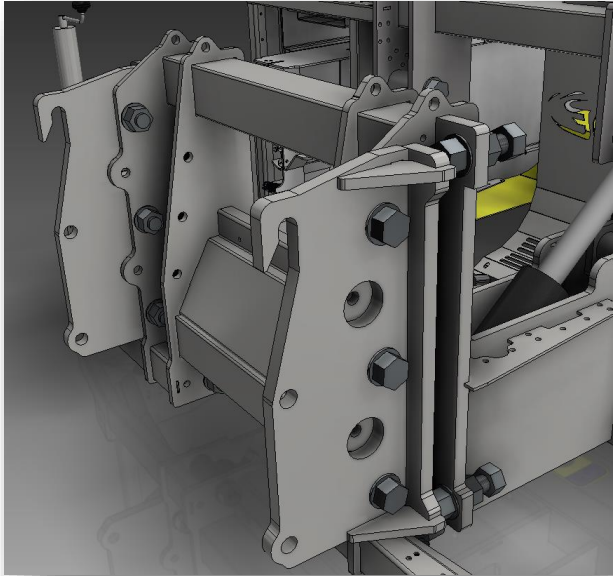
4 Recognition and dimensions

4.1 Common used terms

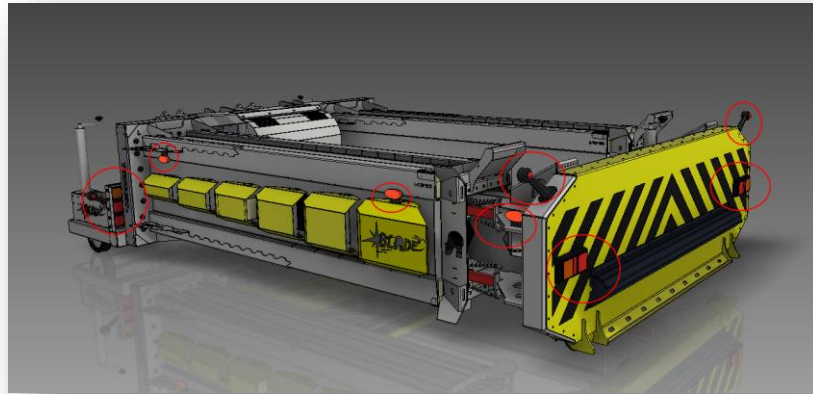
	Image
Aluminium H Beams	
Aluminium Tube L	
Aluminium Tube R	

Aluminium Impact Hood	 A 3D rendering of a yellow aluminium impact hood. It is a rectangular plate with rounded corners, featuring a central longitudinal slot and several mounting brackets along its edges. The hood is shown against a grey background with a reflection below it.
Guards	 A 3D rendering of six yellow rectangular guards of varying lengths, arranged in a row. The longest guard on the right features the 'BLADE' logo. They are shown against a grey background with a reflection below them.
Steel galvanized Cut and Bend units installed in both tubes	 A 3D rendering of a complex steel galvanized cut and bend unit. It is a rectangular metal plate with numerous circular holes and several yellow mounting brackets. The unit is shown against a grey background with a reflection below it.

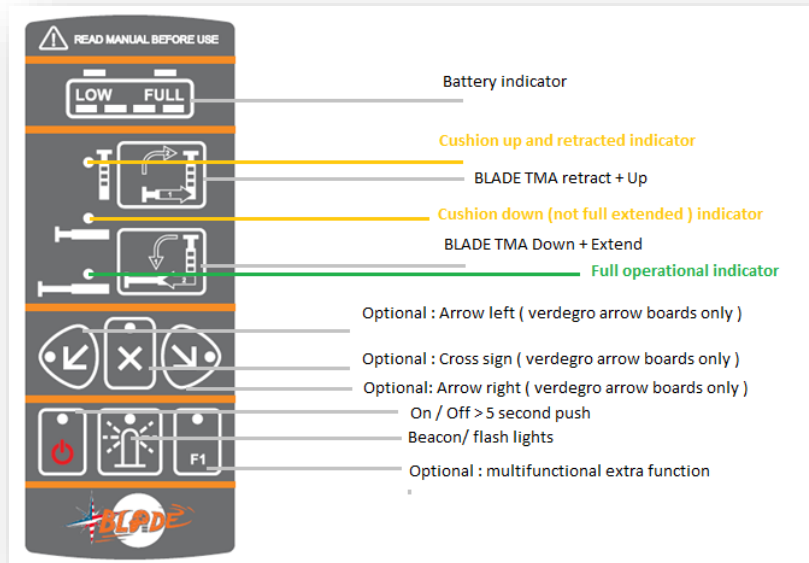
<p>8 pcs steel corner blades + 4 internal rotatable blades</p>	
<p>8 Keys with springs</p>	
<p>Hydraulic cylinders for rotating</p>	

<p>Horizontal extend movement is powered by two electro gear motors on each tube</p>	
<p>Rotator</p>	
<p>Quick connect Leveler, horizontal positioning and easy connection system</p>	

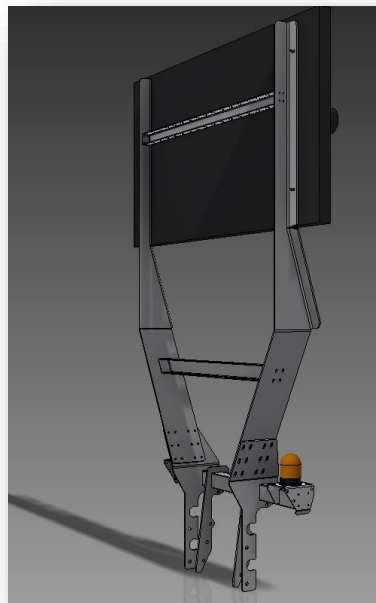
LED driving and side lights

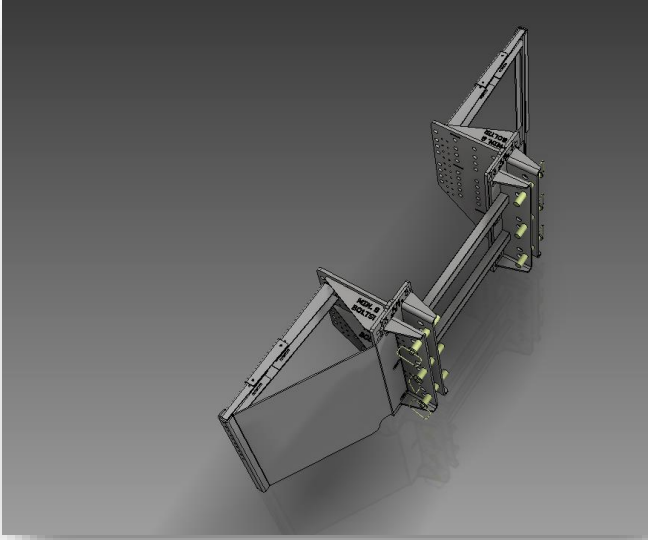
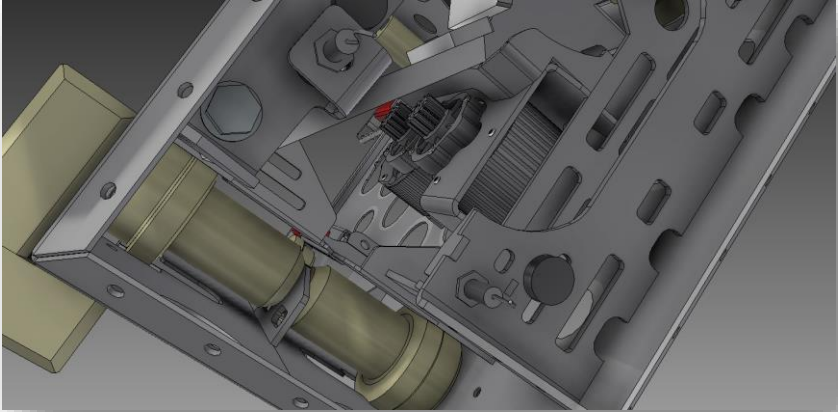
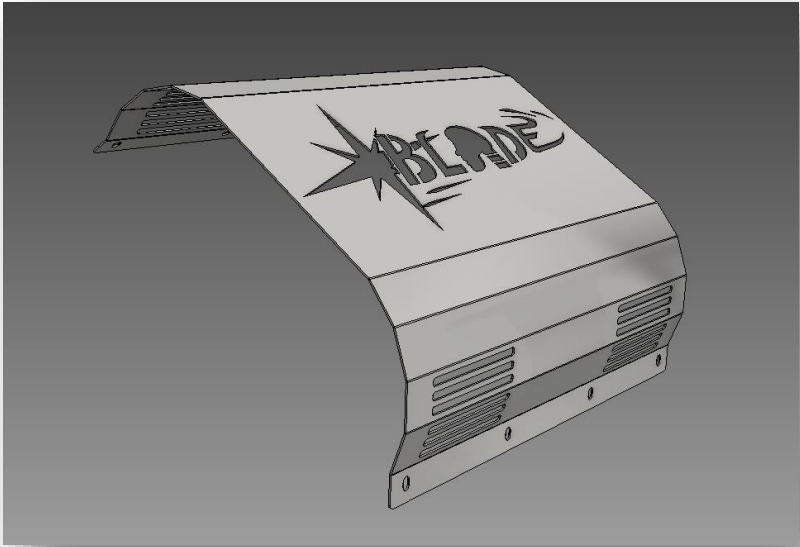



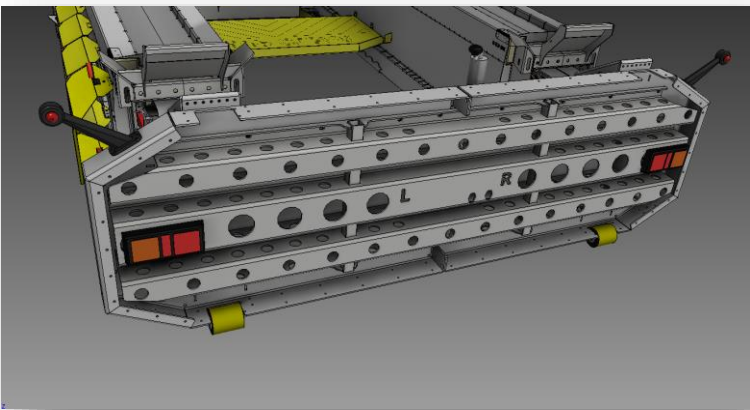
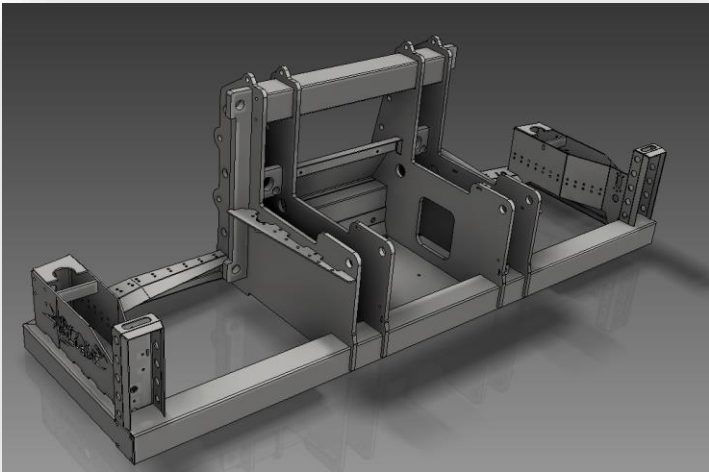
Wired Cabin controller with LED indication lights



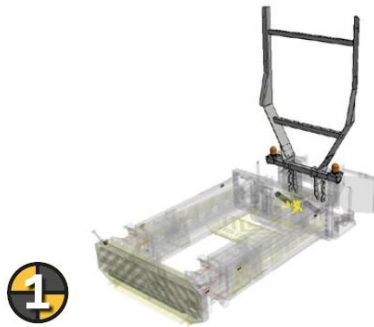
Arrow board bracket



<p>Truck bracket including fenders</p>	
<p>Horizontal extend movement is powered by two electro gear motors on each tube</p>	
<p>Truck stopper</p>	

Foil plate	
Steel backplate	
Framework	

4.2 Official BLADE options



1

Arrow board bracket

- Full scale crash tested
- Modular
- Galvanized
- Standard for several types of VMS and arrow boards
- LED beacons not included



2

Truck bracket

- Full scale crash tested bracket
- Galvanized
- Including fenders (bends away the cutted alu parts during impact)
- Including 6 pieces hitchpins
- All bolts and materials included
- Easy to instal! No welding needed
- Anyone can install a TMA in a couple of hours

Figure 1



3

Foil

- A black 100mm striping on the hood
- 100mm striping and "caution keep clear" on the middle foil plate
- Other foils on request



4

Jockey wheels

- 3 pieces of galvanized jockey wheels
- One is mounted to the rear hood, and 2 pieces are mounted on the steel galvanized structure. All full-scale crash tested

Figure 2

4.3 Photos of a Blade TMA and Arrow board bracket



Figure 3: Typical blade isometric view rear, cushion lowered



Figure 4 Typical BLADE Attenuator truck



Figure 5 Typical blade isometric view rear, cushion up



Figure 6 Typical BLADE Attenuator truck

4.4 Cushion details extended & retracted

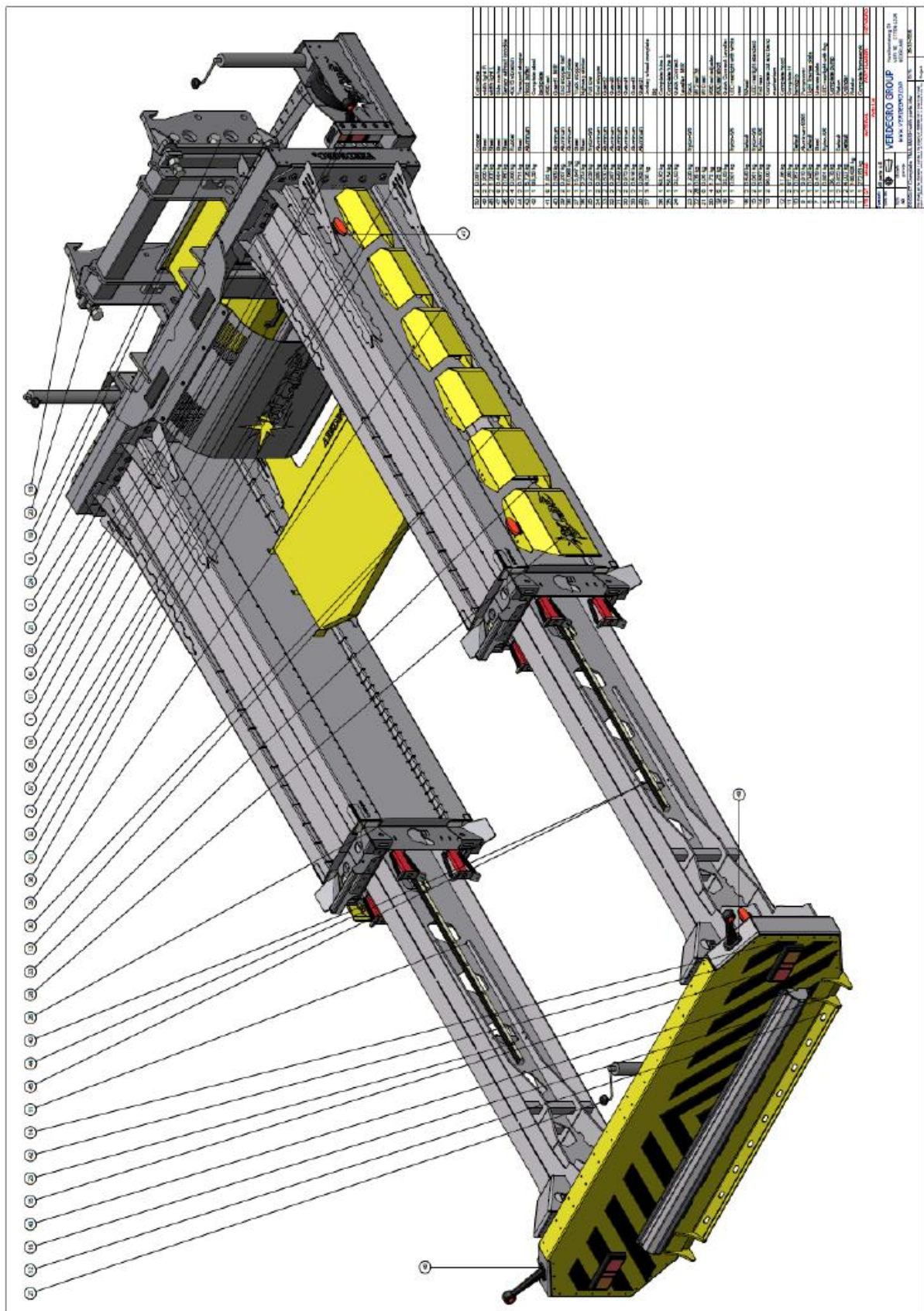


Figure 7: Assembly BLADE extended cushion

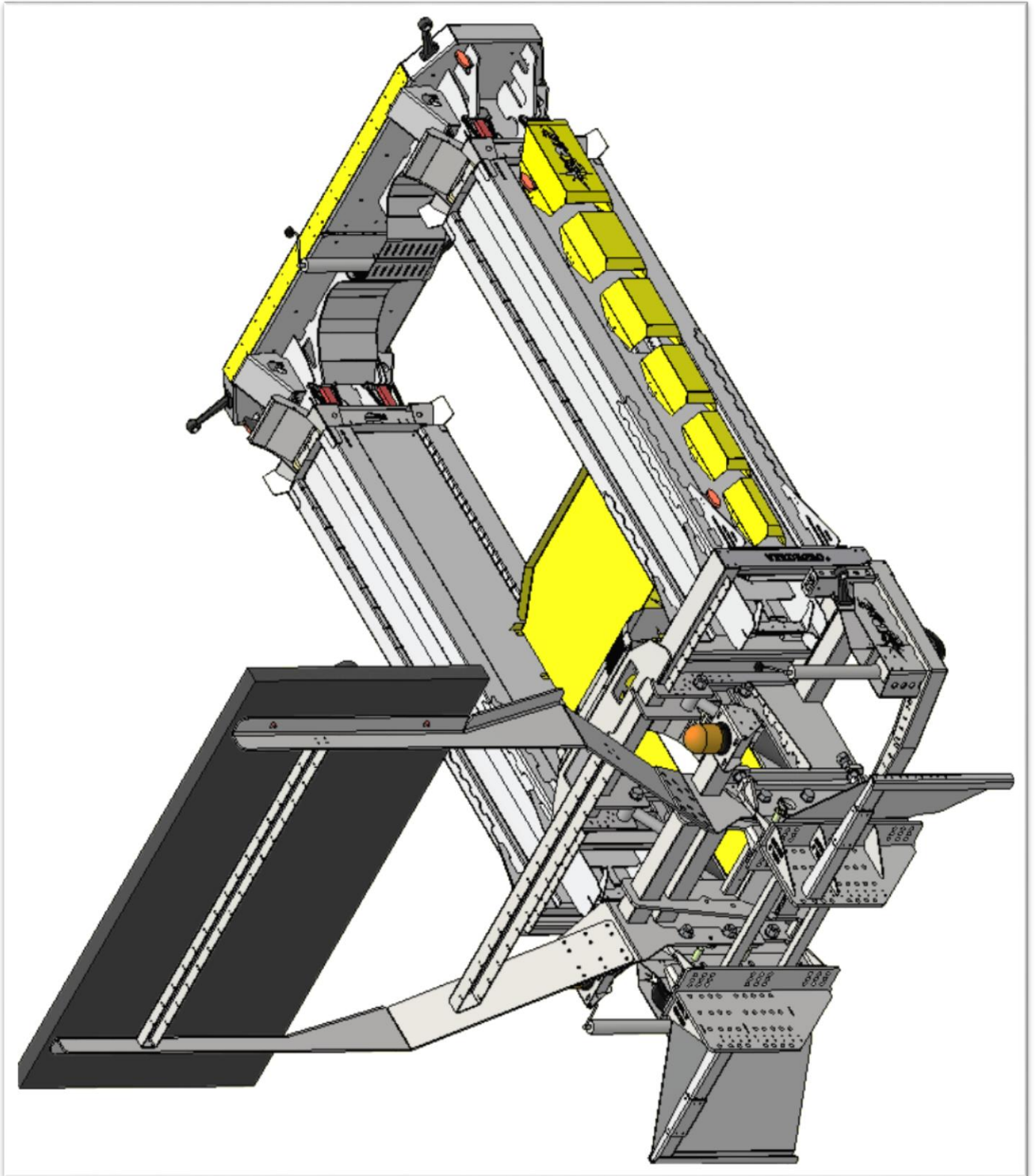


Figure 8 BLADE assembly retracted cushion

4.6 Blade with optional frame for VMS- or arrow board sign:

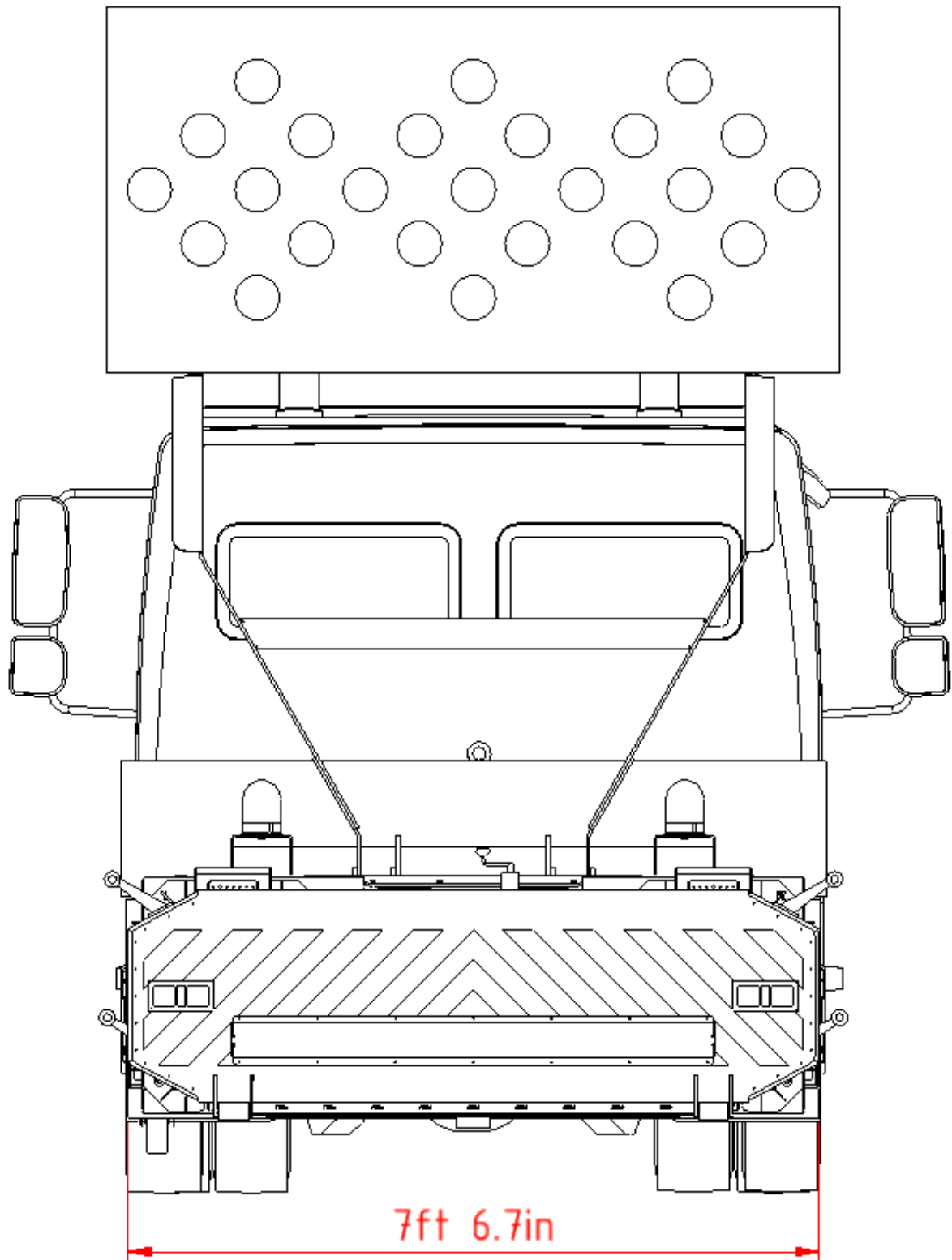


Figure 10

4.7 Transport dimensions

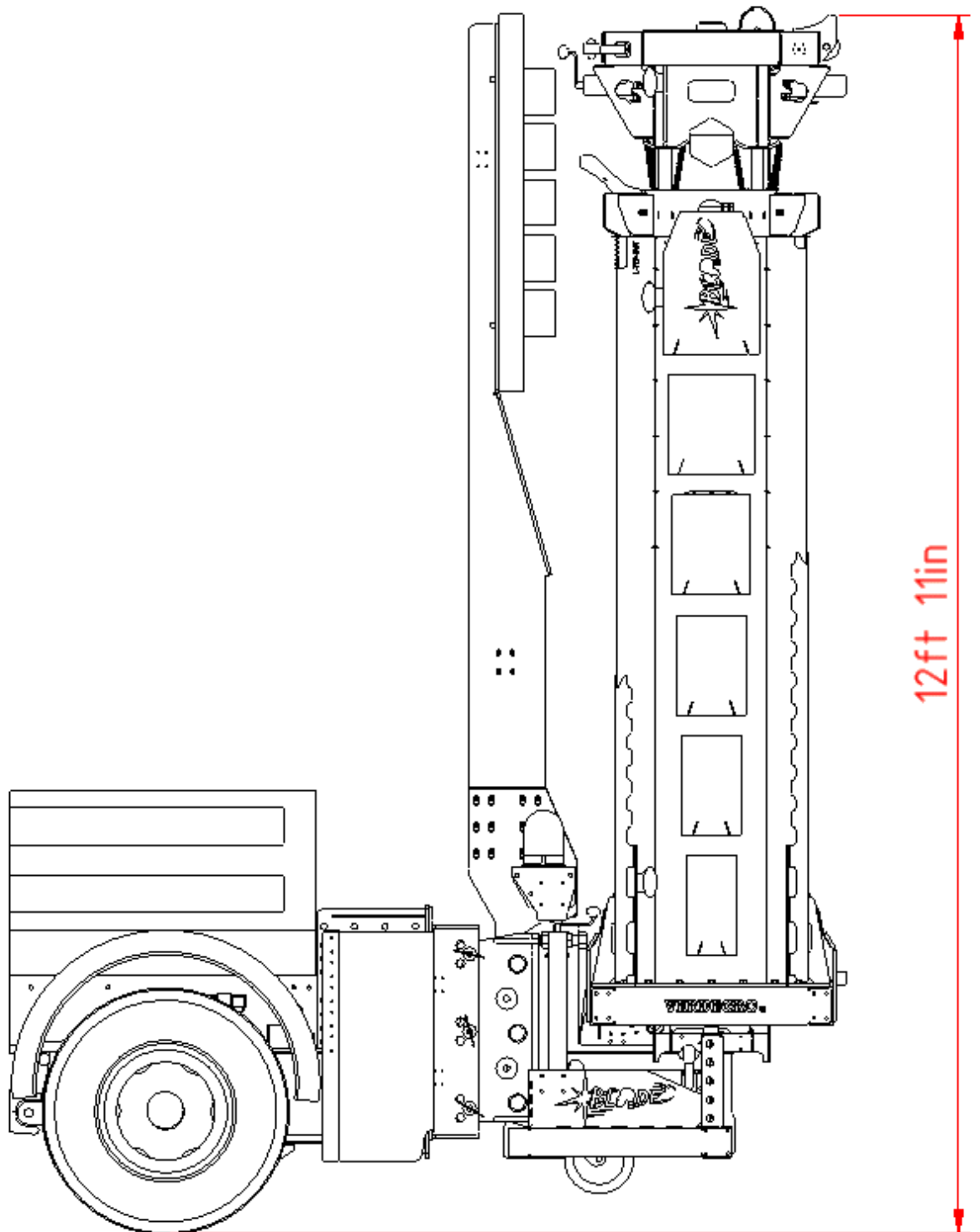


Figure 11

4.8 Operational dimensions

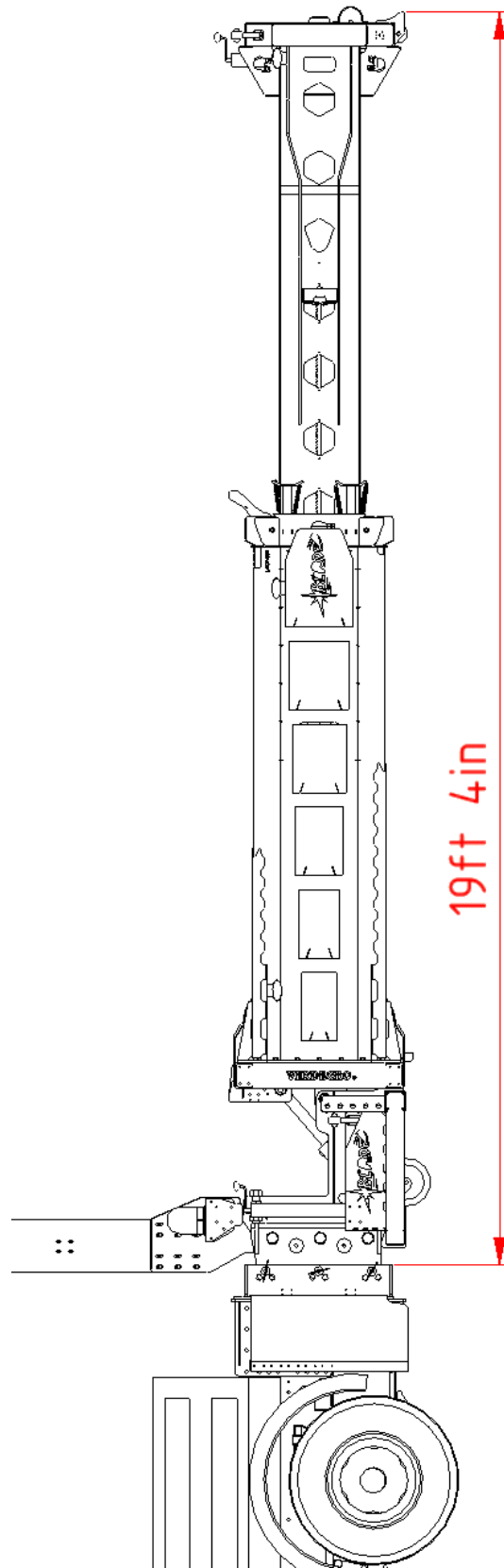


Figure 12

4.9 Typical Blade after full impact:



5 **Technical data**

5.1 *Table with dimensions and values*

<i>Description</i>	<i>Dimension</i>
Cushion Hood to Ground (At marking point horizontal positioned)	12"± 1" 28 – 33cm
Level system fluctuation (For positioning cushion perfectly horizontal)	± 4 degrees
Transport width	7ft.6.7in (230cm)
Transport height	12f.11in (394 cm)
Total weight	Approx. 1100 kg
Hydraulic pressure	150 bar
Hydraulic gear pump (Thermo switch built-in !)	4.2cc
Contents of hydraulic tank	4 L
Power hydraulic pump	12V – 3kW or 24V - 2,2 kW
Hydraulic rotating cylinders:	2, both with security block valves and double acting
Amount of electric gearbox motor	4 in total, 2 in each cut and bend.
Specifications electric gearbox motor	12Vdc or 24Vdc 250W each
Hydraulic pump motor voltage	12Vdc or 24Vdc
LED driving lights	12-24V multi voltage
Battery Bank	Not equipped
Safety fuse hydraulics	200A
Safety fuse at electric controller	12V: 50 A or 24V:25A
Cable from truck to Blade	Min. 2x25mm ²

Table 1. Dimensions and values

5.2 Electrical cabinets

5.2.1 Main control cabinet:

The main control cabinet can be found under the cover in figure 13. After unscrewing (four M6 bolts) and releasing the painted cover the main electric cabinet will appear.

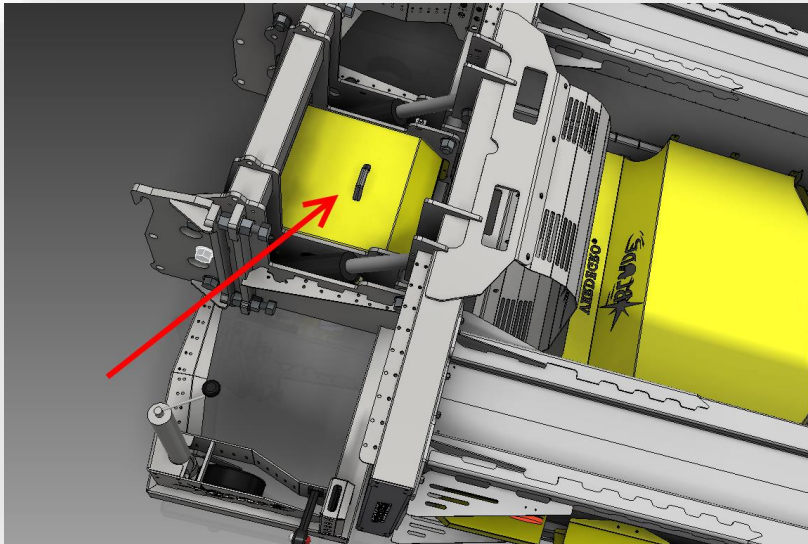


Figure 13

By removing the elastic holders it will give access to the main control cabinet (Figure 14).

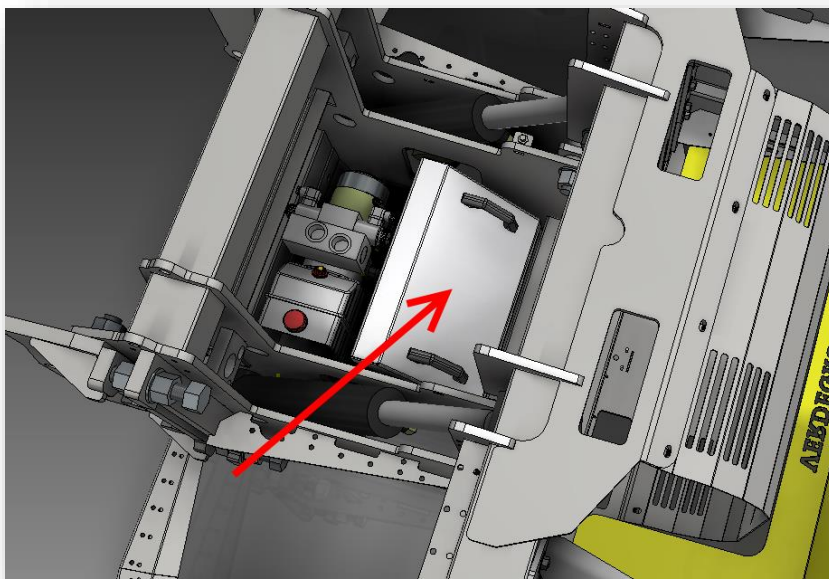


Figure 14

The Main Control cabinet contains the following cables and circuit controllers:

- Main circuit board
- Multiple relays for main controls and optional for pre-assembled arrow board
- Multiple clamp strips for circuit related controls
- Fuses for motor control (30Amps Yellow rectangle in figure 15)
- Optional arrow board (20Amps red rectangle in figure 15)
- Extra sign face lights (15Amps red rectangle in figure 15).

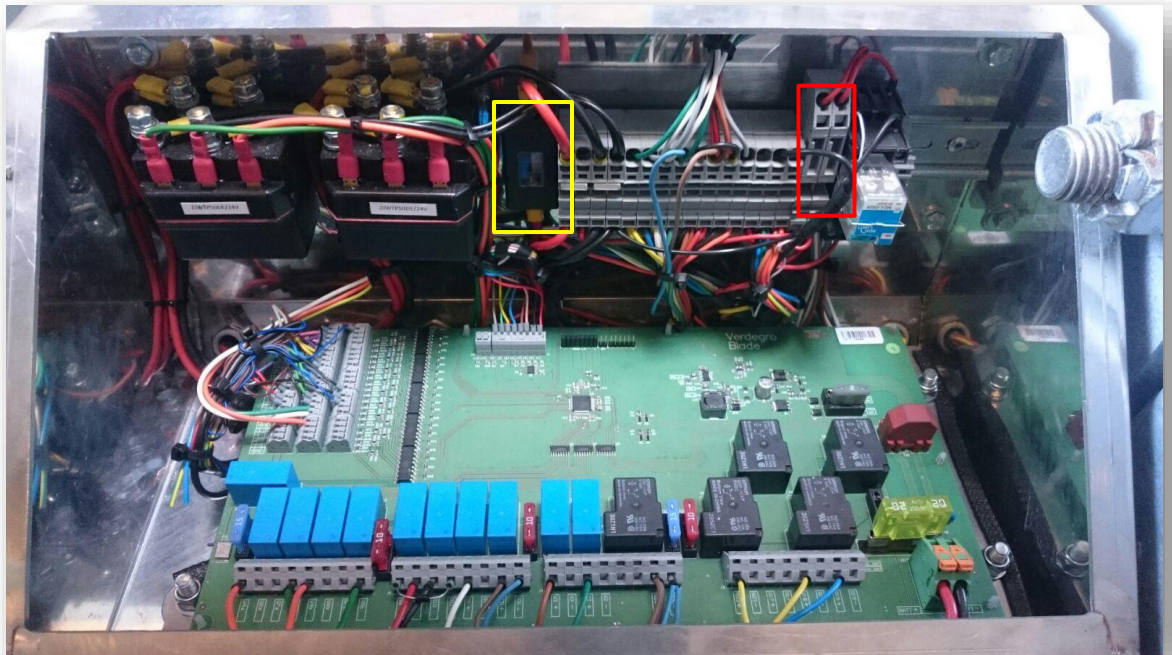


Figure 15

5.2.2 Side Guards Junction boxes:

The side guards junction boxes can be found under the fourth side guard from the main chassis. Unlock the screws holding the side guards to remove the side guards, the cover can be taken off by a screwdriver.



Figure 16

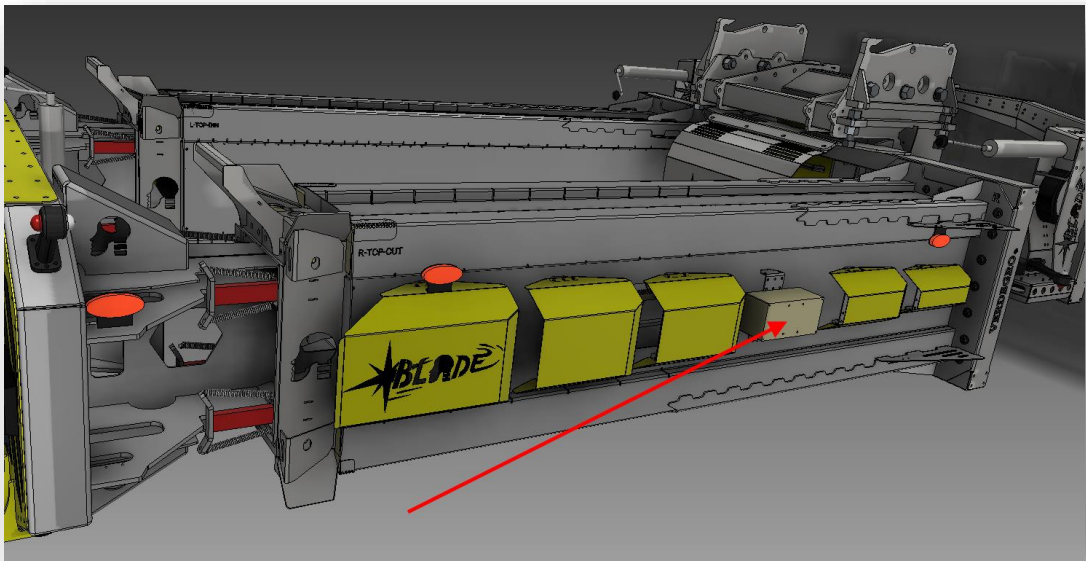


Figure 17

The right hand side junction box (Figure 18) contains cables for:

- Right hand side sensors
- Right hand side extend/retract mechanism
- Hood Driving lights
- Side markers right hand side

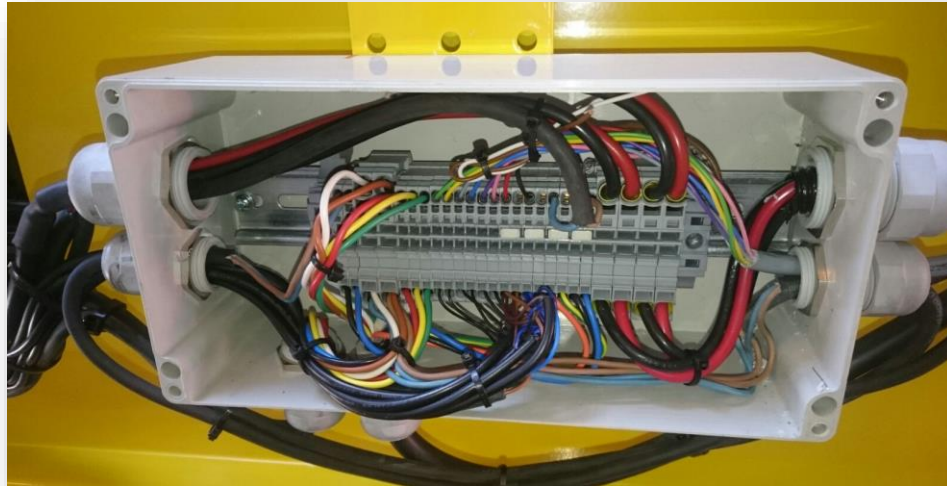


Figure 18

The left hand side junction box (Figure 19) contains cables for:

- Left hand side sensors
- Left hand side extend/retract mechanism
- Side markers let hand side.

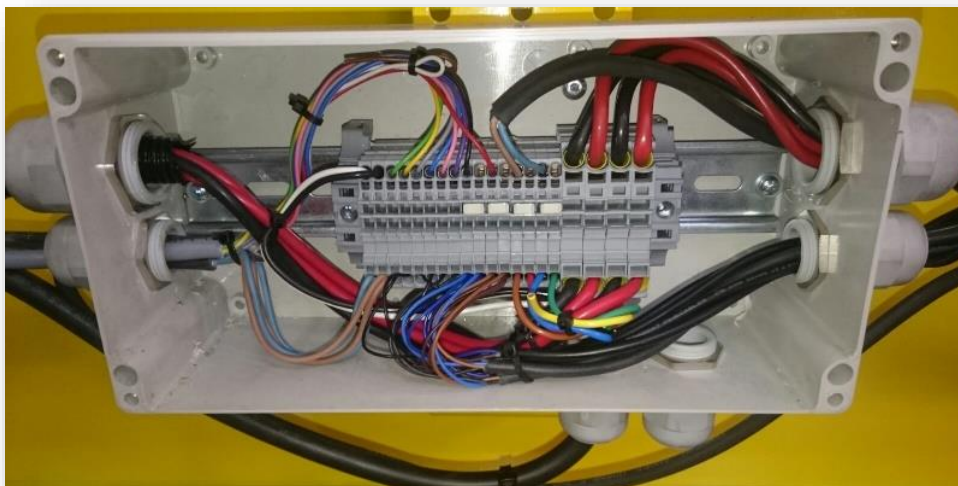


Figure 19

5.1 Electric Data sheets

5.1.1 Main Control cabinet:

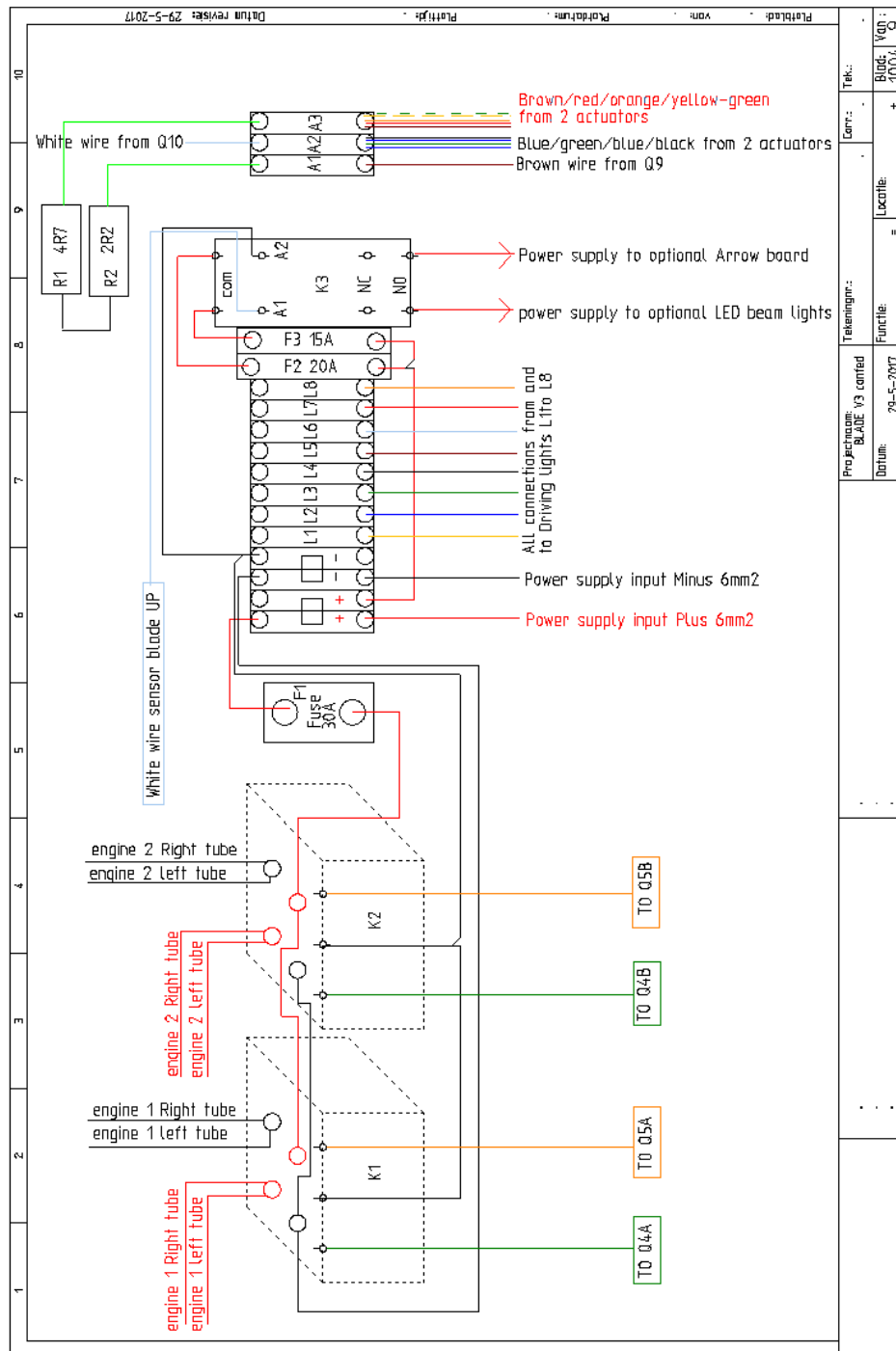


Figure 20

- Connector L1 = Turn signal driver side
- Connector L2 = Fog light
- Connector L3 = Turn signal passenger side
- Connector L4 = Driving lights
- Connector L5 = Driving lights
- Connector L6 = Minus driving lights
- Connector L7 = Brake light
- Connector L8 = Reverse light

5.1.3 Junction box right hand side:

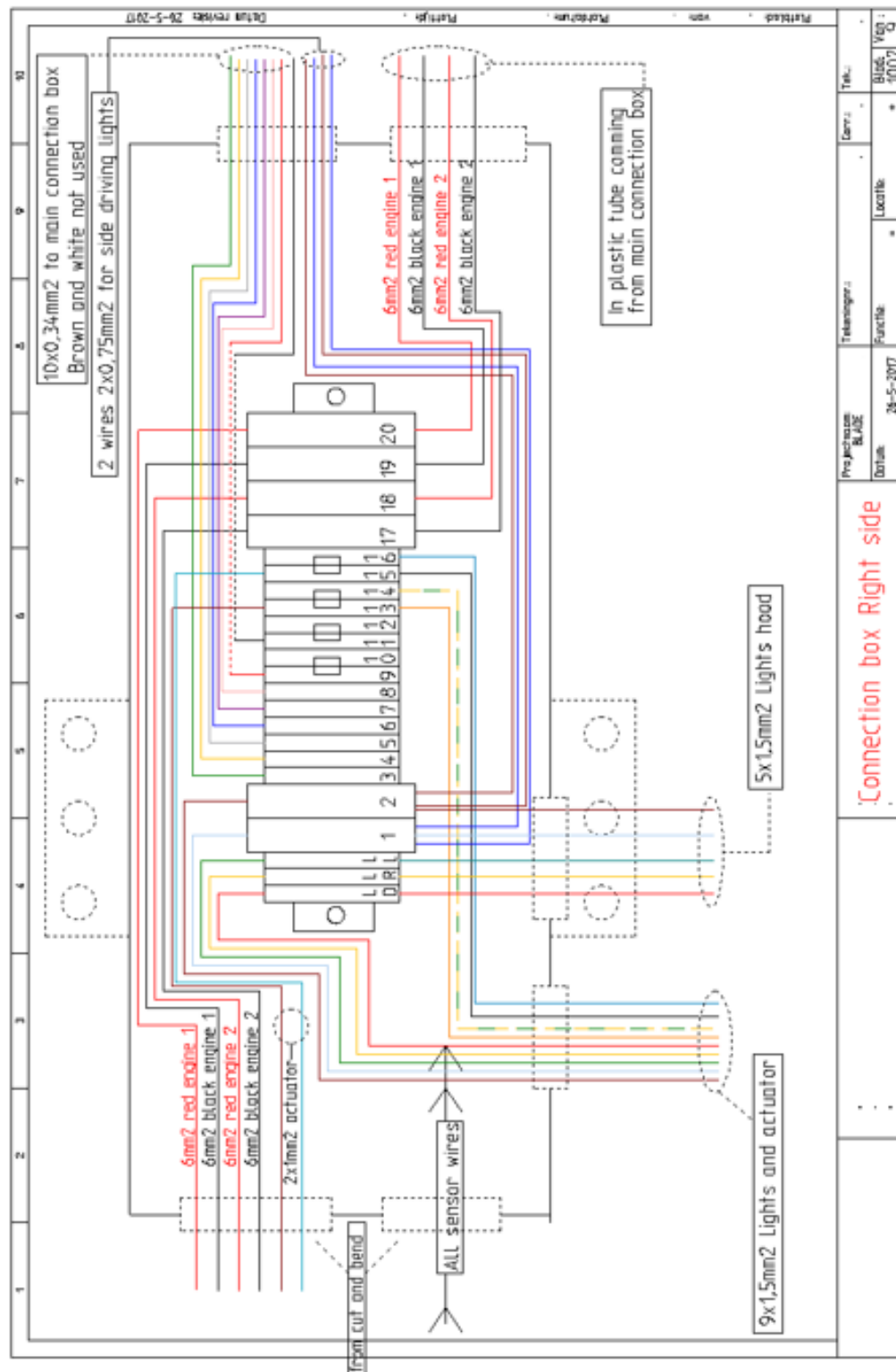
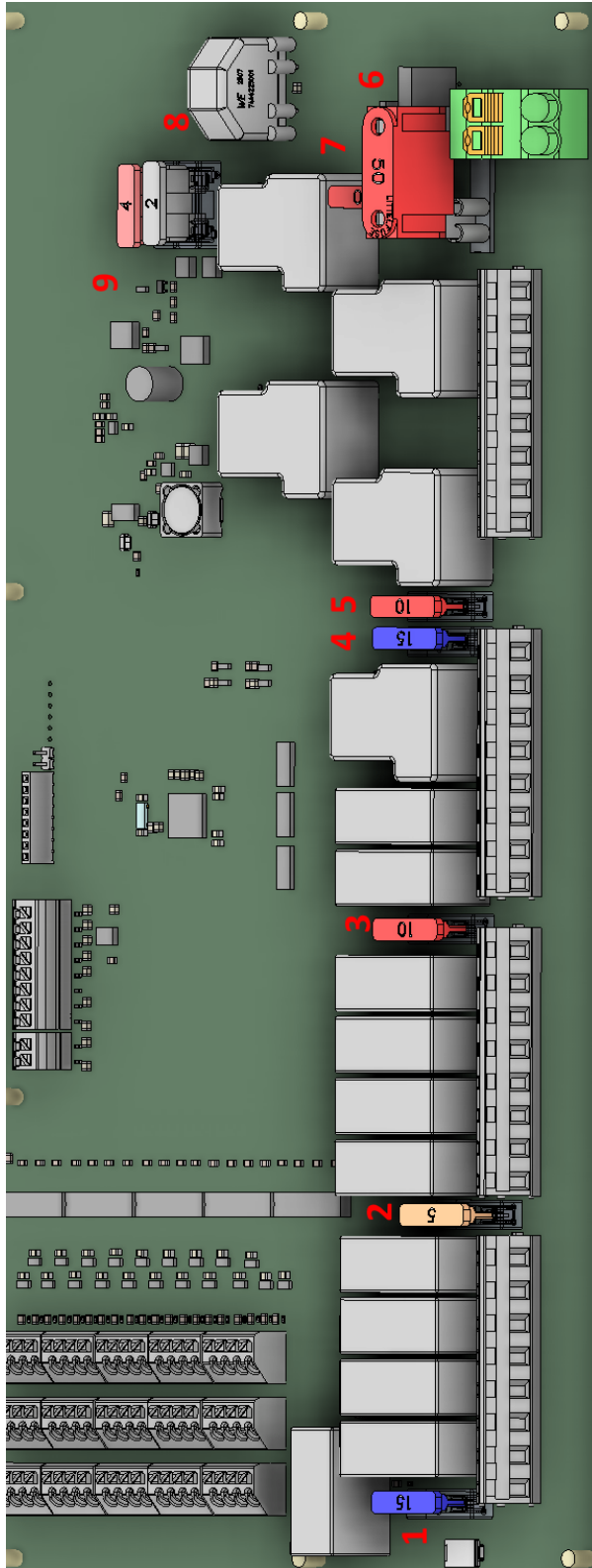


Figure 22

Connector LD = Brake light
 Connector LR = Turn signal driver side
 Connector LL = Turn signal passenger side
 Connector 1 = Minus for driving lights passenger side
 Connector 2 = Plus for driving lights passenger side

5.2 Fuse board



1. Extend/Retract: F10, 15A, Fast Acting
2. Actuators, Hydraulic pump, Beeper, F5, 10A, Fast Acting
3. TMA Up/Down: F9, 10A, Fast Acting
4. Optional Beacons: F7, 15A, Fast Acting
5. Function Button 1: F8, 10A, Fast Acting
6. Main Fuse: F12, 40A (12V) Slow Blow, 20A (24V) Slow Blow. Model: MAXI
7. Optional Arrow Board: F6, 10A, Fast Acting
8. Voltage Selector Fuse: F4, 2A, Fast Acting
24V Only
9. Voltage Selector Fuse: F3, 4A, Fast Acting
12V Only



**Voltage Selector Fuses: Always double check before placing.
Never use two fuses at once!**

5.3 Hydraulic Data Sheet

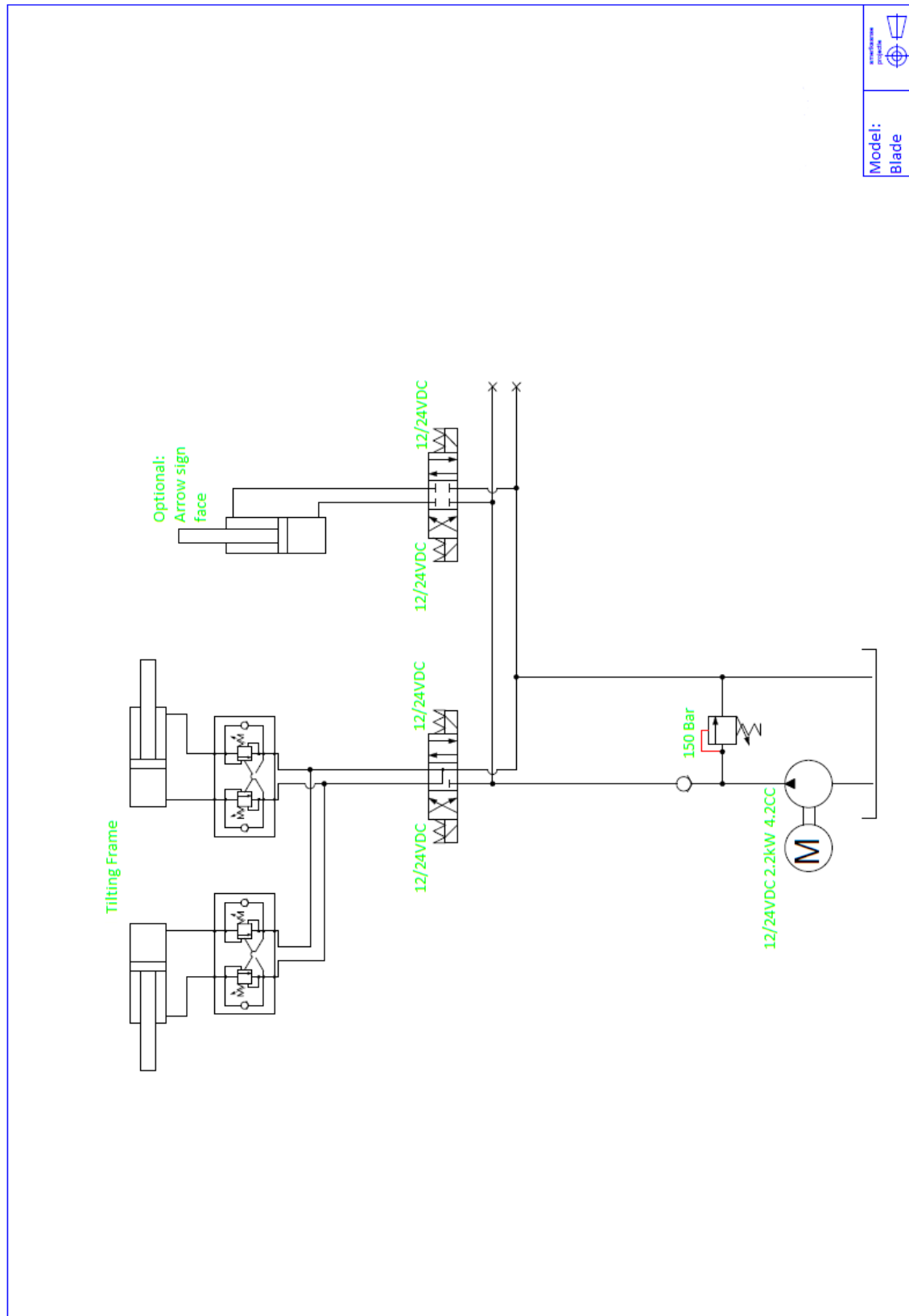


Figure 23

5.4 Warning signs on TMA

Note: without these stickers, it is prohibited to use BLADE!

5.4.1 Location : At the back (impact hood)

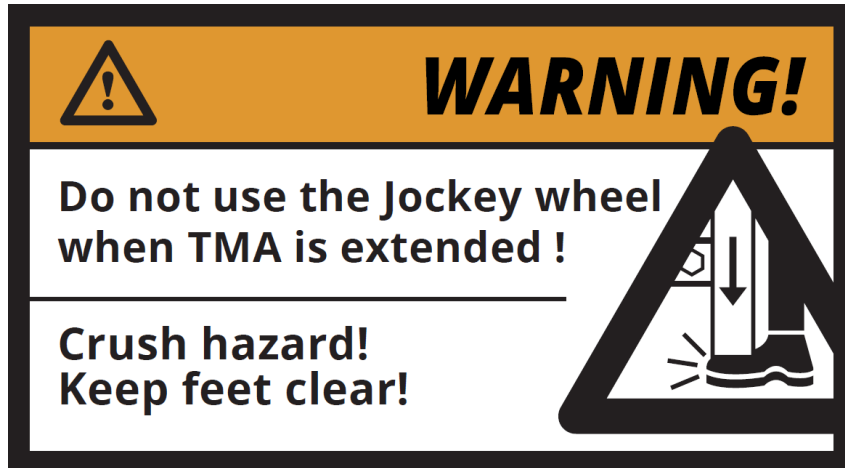


Figure 24



Figure 25



Figure 26

5.4.2 Location: On / Near the Guards each side of the TMA



Figure 27

SAFETY INSTRUCTIONS

ALWAYS READ MANUAL BEFORE INSTALLING OR OPERATING THIS VERDEGRO BLADE TMA.

1 In down position the TMA must be 12" ± 1" positioned horizontal above the ground (view warning stickers at the back).
2 Check if all 6 pins 1,1" are properly secured, and all bracket mounting bolts are tightened.
3 Make sure all TMA connectors are correctly plugged into the support truck.
4 The crash cushion must be lowered in the maximum down and fully extended position when the truck is used as safety vehicle. Check the safety light on the cabin controller.
5 All persons and objects shall be clear from the TMA before and during operation.
6 Do not change or remove the instructions and warning signs.
7 When damaged contact Verdegro directly and do not use the TMA !
8 If the operator of this TMA is not sure of proper installation, operation, or maintenance. Do not use this TMA and contact Verdegro directly !
9 After a vehicle impact with this TMA, please check the vehicle TMA width before transporting -either remove the damaged cartridge by using the jacks and removing the six 1,1"pins.
10 Provide proper maintenance and cleaning acc. the maintenance manual.

!

Figure 28

6 General specifications and instructions

6.1 Be aware

- A. Always make sure the system is delivered with the right certificate, warning stickers and documentation!. **Do not remove the original sticker(s)!!**
- B. Make sure the validation time of the certificate is never exceeded!
- C. Never remove safety instructions of the Blade!
- D. All Verdegro Truck Mounted Attenuators (BLADE TMA) shall be designed and manufactured by the BLADE BV, in accordance with the specifications.
- E. The Verdegro Blade is an attenuator system designed for installation at the back of trucks with gross vehicle weight (GVW) ranges between minimum weight of 16.010 lbs. (7.262 kg)and a maximum weight of 22.120lb (10.033 kg) ¹ (Contact the Verdegro Group for other specifications!).

Note: Any added ballast must be adequately anchored to the truck so that it will not move during impacts. Make sure the manufacturer's published maximum axle loads will never be exceeded, because the back end of the truck supports the weight of the rearward protruding Blade. To ensure the driving characteristics of the vehicle are maintained, the manufacturer's recommended center-of-gravity zone should also be adhered to.

¹ If you have a truck which is heavier, contact Verdegro or your distributor.

6.2 Description of system

- A. The Verdegro Blade shall consist of the following basic components:
- Two steel galvanized CUT and BEND mechanisms
 - Two aluminum energy absorbing Tube sections
 - Two aluminum H-beams with an impact plate
 - A steel Support Structure to hold and rotate the cushion
 - A Support Frame for attaching the system to the truck. The support frame also includes a hydraulic pump and two cylinders (to raise the structure vertical)
 - A multi bracket with fenders to attach BLADE to the truck.

When the system is in horizontal position, the frame assembly shall be capable of collapsing when impacted by an errant vehicle. To prevent tire or support truck damage during an impact always install the original BLADE fenders (Truck bracket). The complete Verdegro Blade is designed to make attachment or detachment from the truck simple and fast using the jockey wheels or a forklift.

- B. The Verdegro Blade shall have a standard LED trailer lighting system. This system shall include brake lights, taillights and turn signals. The wiring for the rear lights shall be routed and secured on the articulating frame. This system also has additional side marking lights on the cartridge so that the lighting system meets the standards, whether the system is in its horizontal or vertical orientation. LED trailer lights can cause malfunctions on the support truck contact your truck supplier for help if needed.
- C. At the back of the rotating frame are two forklift sprockets to lift the complete system with a forklift, for example to mount on the truck, or to storage the unit (sprockets are red marked at figure 29) double check both sprockets are trough front and back flense before lifting!



Figure 29

- D. The rear impact surface of the extendable H beams, when in the horizontal position, shall display a red / white or yellow / black striping (Preferred reflective) ask your government for detailed prescriptions.
- E. All welding is done by, or under the direction of a certified welder. Metal work shall only be done by Blade BV.
- F. All exposed steel surfaces on the Blade TMA shall be powder coated or galvanized.
- G. The Blade shall be assembled with original Quality bolts.
- H. The hydraulic system shall consist of a pump with a 12 or 24 (standard) volt DC motor, cylinders, hoses, switches, wiring, and necessary subcomponents to tilt the frame assembly to a 90° position from horizontal. The complete hydraulic system, including the pump and hoses, shall be factory assembled.
- I. The complete hydraulic system shall be factory assembled and mounted to the Blade. Once assembled, each system shall be operated through ten (10) complete cycles (horizontal, tilted to 90° position and lowered back to horizontal is one cycle) to ensure proper operation of the pump and tilting mechanism. The hydraulic system shall be shipped assembled.
- J. The H beams automatically extend or retract using electric gear motors and sensors, these motors and sensors shall be factory assembled and mounted to the cut and bend structure.
If any malfunction happens contact Blade customer service for help at Service@verdegro.com or call.
- K. Inside the cut and bend mechanism are two blades installed, these automatically blades will open or close using electric actuators and sensors, this mechanism shall be factory assembled and tested, if any malfunction happens directly contact Blade customer service, don't use the TMA if malfunctions are detected, check this function every month !
- L. If any strange or un known situation happens on the cabin controller indication LED's directly contact BLADE customer service.

6.3 Performance criteria

- A. The Verdegro Blade TMA , when mounted to a truck minimum total weight of 16.010 lbs. (7.262 kg) and a maximum weight of 22.120 lbs. (10.033 kg) situated on clean dry pavement with the transmission in second gear and parking brakes activated shall perform as follows:
- 1) Vehicles with a mass of 1100 kg (impacting straight into the rear of the Blade 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 20,49 g's or less per MASH, Test 3-50 evaluation criteria.
 - 2) Vehicles with a mass of 2270 kg impacting straight into the rear of the Blade 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 20,49 g's or less per MASH, Test 3-51 evaluation criteria.
 - 3) Vehicles with a mass of 2270 kg impacting straight into the rear of the Blade at 100 kph, and an offset of W/3 with respect to the Blade centerline, shall remain upright with no significant roll pitch or yaw per MASH Test 3-52 evaluation criteria.
 - 4) Vehicles with a mass of 2270 kg impacting at 10 degrees into the rear of the Blade at 100 kph (62 mph) and an offset of W/4 at an angle of 10 degrees with respect to the Blade centerline, shall remain upright with the theoretical occupant impact velocity of 12 m/s or less and the occupant ride down acceleration of 20,49 g's or less per MASH, Test 3-53 evaluation criteria.
 - 5) Certified test results and associated test reports and films produced in the guideline with MASH procedures shall be submitted showing that the Blade system conforms with all test and performance criteria in this specification. The Verdegro Blade TMA evaluation report is available on special request
- B. The Verdegro Blade TMA shall successfully perform to normal accelerated vibration, moisture and corrosion.

7 *Safety*

1. Read these instructions carefully before using the “Blade”.
2. The Blade should not be used without knowledge of the operating instructions and safety precautions. Keep the operating instructions, always within range of the machine, the operator's manual should ALWAYS be at or near the machine.
3. The operator of the Blade must be at least 18 years old and experienced and trained in serving Truck Mounted Attenuators.
4. The owner/holder of the Blade must ensure that all users are trained in the use of the machine, have read this manual and have taken notice on all warning signs at the machine.
5. Be careful when the machine is used near live power lines. Don't touch the TMA structure if the machine is within 50 meters of power lines.
6. Transport the Blade only if it is properly secured to the truck using the standard truck bracket.
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 Blade purely as Truck Mounted Attenuator, and not as a lifting mechanism or any other device.
10. The wind load of the Blade does not increase with additional signs or other objects that could catch wind.
11. Operate the machine in a smooth continuous motion to avoid distraction or shock effects to passing people.
12. 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.
13. The Blade has to be cleaned regularly, this to make sure dirt, salt, twigs or leaves, are washed off (each month or more , do not high pressure wash).
14. Do not hoist the Blade!
15. The safety devices are not deactivated during use, if malfunction occurs must The Blade be repaired by a qualified repair service company or by the Verdegro Group before the unit can be used again.
16. Make sure no one is near the machine before or during operating. Guiding the machine or the operator is also not allowed in the rotation range of the machine! Always keep your sight on the machine while operating.

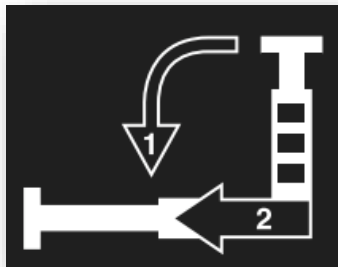
17. For safe and trouble-free operation, the Blade must be held clean from snow and ice .
18. Be careful with fuels, lubricants, hydraulic oils and greases of the Blade. Avoid skin contact with these substances. Exposure Danger !
19. The Blade's regular inspection and maintenance of service - repair outsourcing to an expert in this field service company.
20. The construction of the Blade may not be altered without permission and the manufacturer's instructions.
21. Inspect the Blade every day before work or use.
22. Axles control all bolts / nuts: Before each use the principal axes, bolts and nuts.
23. Let the Blade annual inspect by the manufacturer or authorized distributor . 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 Blade should always be served a full operating test. **BLADE BV can only guarantee a properly working machine when repair and service is done according the time schedule by manufacturer or under their supervision by an official distributor.**
24. If you leave the Blade, put it somewhere where it does not preclude others. Keep the whole machine in transport position. Close all hatches well for unauthorized persons, turn the cabin controller off, and take your keys with you.
25. The operator of the machine may not be under the influence of alcohol or narcotic drugs.
26. Follow the maximum speed limits at all times.
27. Disconnect all power connectors when transporting a Blade TMA unit in an air plane.

8 *Operation*

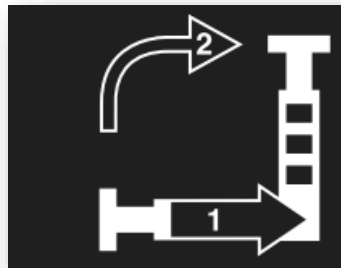
8.1 *How to use your BLADE*

The operation of the machine must be done using the Blade wired cabin controller.
Operating the BLADE TMA is only been done using this 2 buttons shown below:

Rotate down and extend the cushion:



To retract and rotate the cushion up:



Always Complete The Full Cycle “Up” or “Down”. Do not start and stop within its full cycle up or down !

8.2 Cabin controller

Picture with short description from cabin controller;

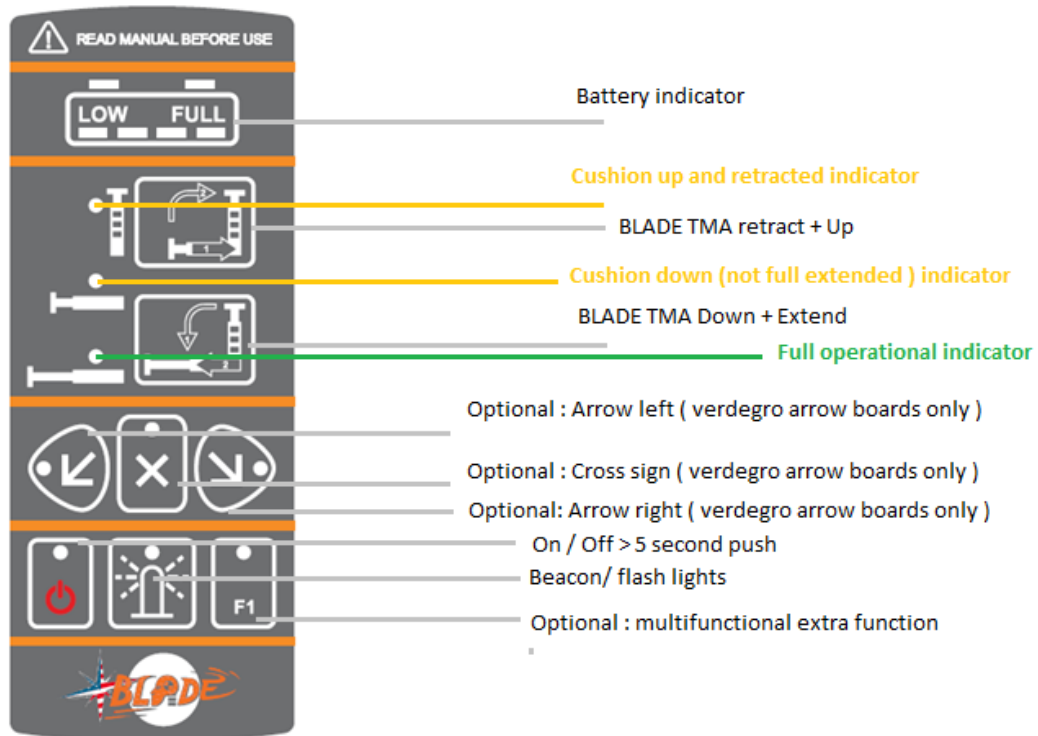


Figure 30

8.3 Speed limits with mounted Blade:

The speed limits below are under ideal circumstances These speed limits should never be exceeded during use of the unit.

When ideal circumstance are not reached the driver has the responsibility to evaluate the lower speed limit, for example bumpy roads, height difference in surface of the road will evaluate this decision.

It is forbidden to use your BLADE on Off-road use.

8.3.1 Truck suspension type

We advise to use Trucks equipped with Air suspension. If a spring suspension truck is used; this can decrease the expected life time of the BLADE TMA and extra frequently TMA inspection will be necessary !

8.3.2 Maximum speed table:

Operating the extended BLADE TMA at maximum speed limits is only allowed when operating at:

- Flat road surface
- Short periods
- Lower your speed as soon as possible, but always take care of the current traffic circumstances.

Lowering the cushion or horizontal position : 56mph (90 km/h)
Extended cushion : 50 mph (80 km/h)

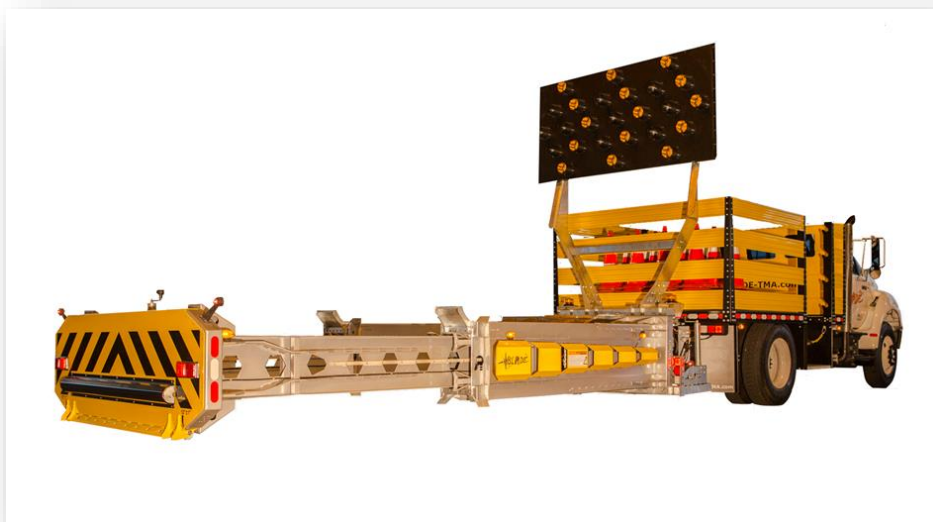


Figure 31

8.4 Jockey wheels Operation (Optional)

Next information is an optional feature on the TMA, when ordered will the constructor mount three jockey wheels, these wheels can be used for storage on a flat hardened surface. **Use on leveled and unhardened surface is forbidden.**

8.4.1 Location jockey wheels:

Two wheels on the galvanized frame, one at the driver side, one at the passenger side. These are the main wheels which will lift the TMA out its locking position behind the truck. The third wheel is on the back side of the TMA hood. Always extend this wheel first and retract as last..

This wheel is Forbidden to be used when TMA is extended, this will create chance of failure and major damage.

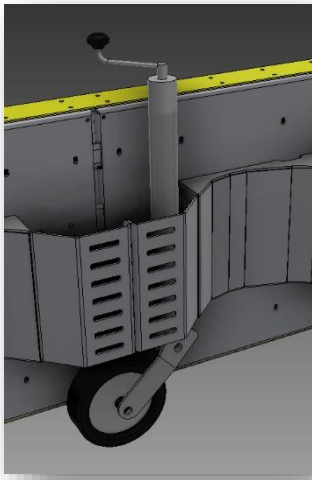


Figure 33

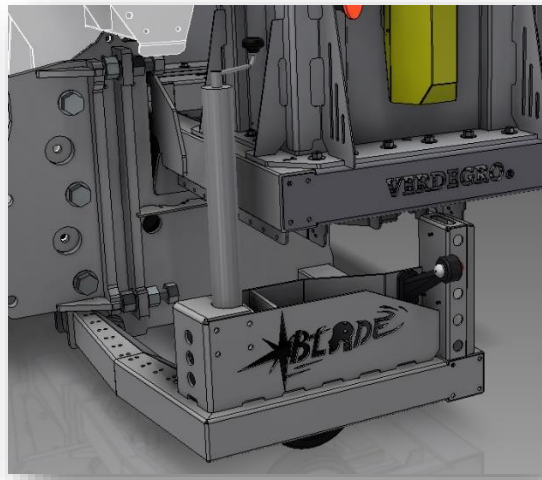


Figure 32

8.4.2 Main use jockey wheels:

To lower the Jockey wheel: Rotate the handle on top of the Jockey wheel anti clockwise to lower its wheel.

To raise the Jockey wheel: Rotate the handle on top of the Jockey wheel clockwise to raise its wheel.



Figure 34

	<p>Never use the Jockey wheel when the TMA is extended! Forbidden to extend the Jockey wheel beyond its limit.</p>
--	---

9 Supporting vehicle adjustment





The supporting vehicle, also known as an attenuator truck or impact protection vehicle, must be adjusted correct for your BLADE.

It is important that the Blade is mounted correctly behind the supporting vehicle like it has been tested. Mounting the Blade to the Truck chassis can be easily done using the available TRUCK BRACKET.

9.1 Before TMA installation:

- Start with ballast the truck chassis
 - Bring Truck weight up to min- 12.500 and maximum 18.500 lbs. using ballast equally divided to the truck chassis length (measure the truck weight before you start installation)
- Add extra ballast at the end of the truck chassis with an extra temporary TMA ballast weight (±3400 Lbs.)
- Place the truck at a horizontal floor
- Connect the TRUCK BRACKET to the truck chassis using 8pieces M20 bolts & nuts on each chassis beam side, so16 pcs in total.
- The bracket is connected to the Blade TMA using 6 pcs hitch pins 1.1”diameter each (Only use original parts).
- Make sure the connection with the truck is done exactly like it has been tested.

It is possible that a country overrules the specifications of the supporting vehicle weights! Check your Government association and contact Verdegro before you make changes!

	<p><i>Make sure the hitch pins (if present) are correctly installed. Only use pins delivered from Verdegro</i></p> 
	<p><i>Make sure the Blade is bolted correctly to the truck chassis beams. Only use bolts & nuts that are delivered with the Truck Bracket</i></p> 

9.2 Specifications for truck mounting

The Blade Truck bracket is full scale crash tested (one Truck Bracket survived all required tests without necessary exchange or repair !). We require it to use this standard bracket. Other connections are available on request and have to be reviewed by Blade B.V. or it will be responsibility of the installation company.

The Blade Truck bracket contains 2 pieces “Multi Bracket” (one Left & one right) and 1 “fixed width bracket”.

The multi brackets can be assembled to “each” truck chassis with a width of 750mm – 900 mm and the bracket installation height is laser cutted at the steel bracket part (detail circle) !

Always install the mud flaps and tire protection, this will fit directly to the bolts and nuts connection.

Do not install any electric wiring or connectors at the mud flaps/ tire protect !

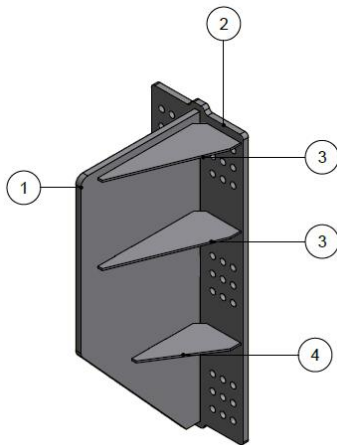


Figure 37

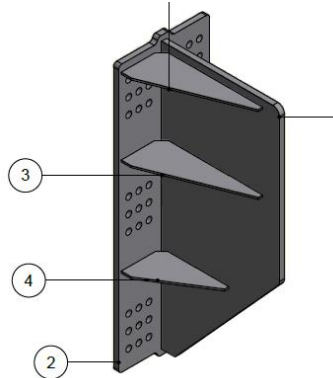


Figure 36

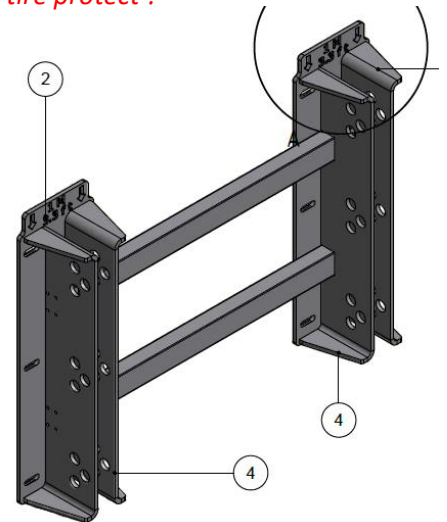


Figure 35

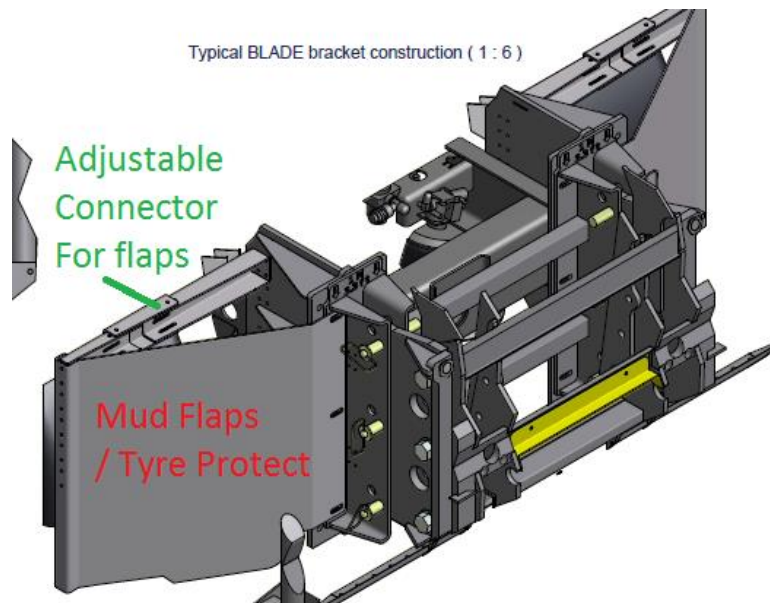


Figure 38

9.3 Center of Gravity

Below information can be used to calculate if the truck chassis can stand the weight of the Blade TMA.

9.3.1 Upwards:

- 660mm from center middle hitch pin to horizontal center of the gravity point
- 1035mm from center middle hitch pin to vertical center of the gravity point

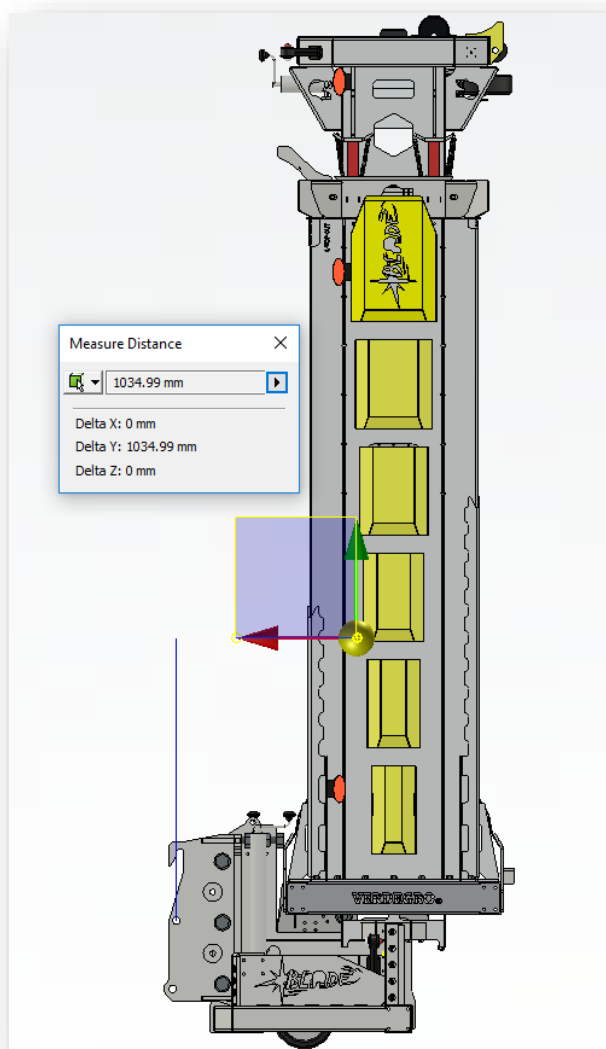


Figure 40

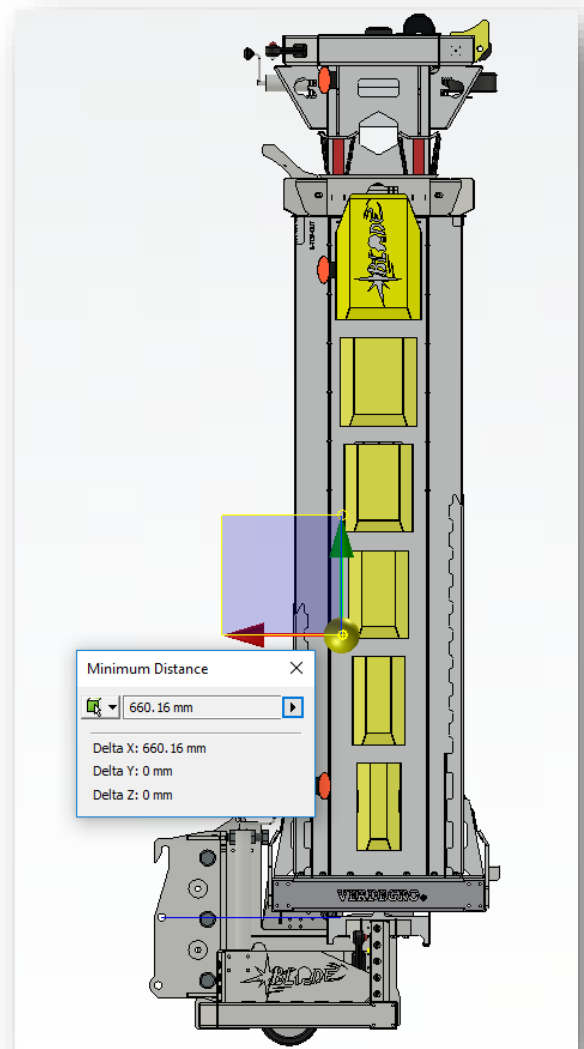


Figure 39

9.3.2 Extended

- 1940mm from center middle hitch pin to horizontal center of the gravity point.
- 74mm from center middle hitch pin to vertical center of the gravity point

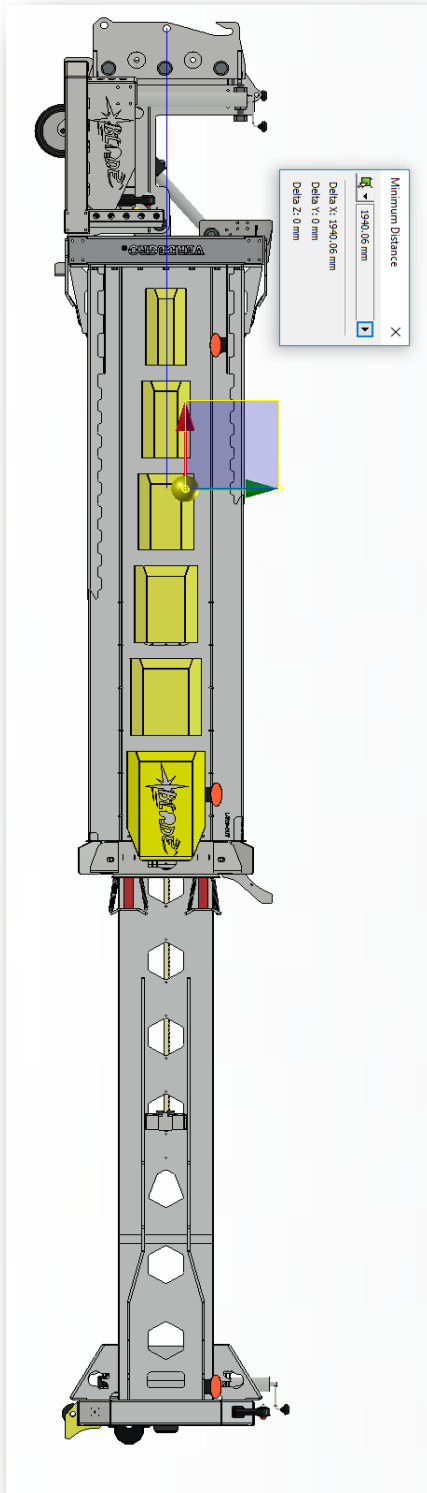


Figure 41

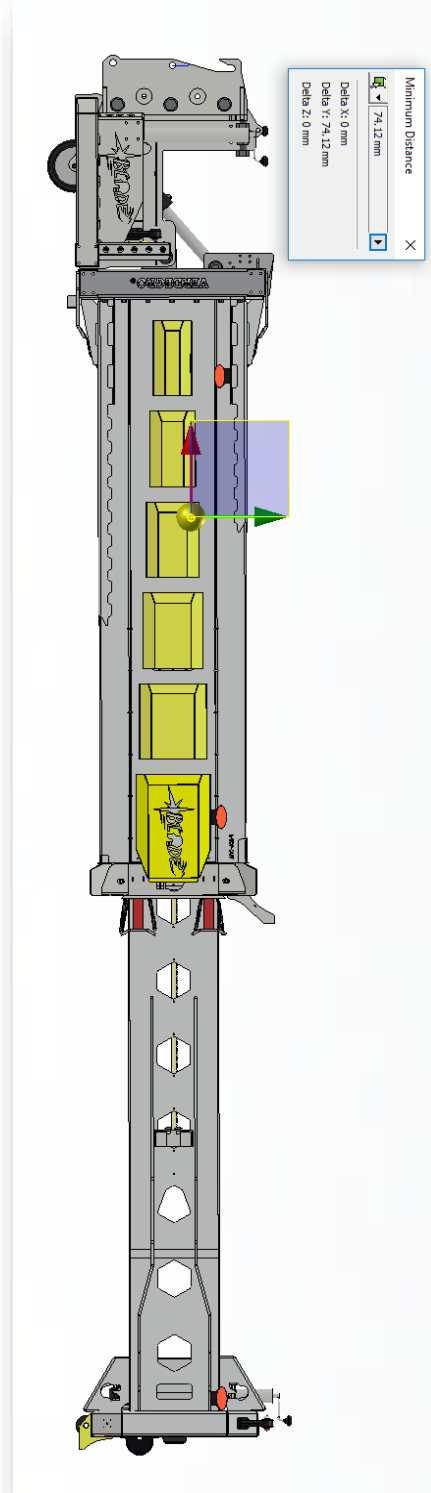


Figure 42

10 Bracket dimension

The dimension from the back of truck chassis to the center of the hitch pins is 145mm horizontal.

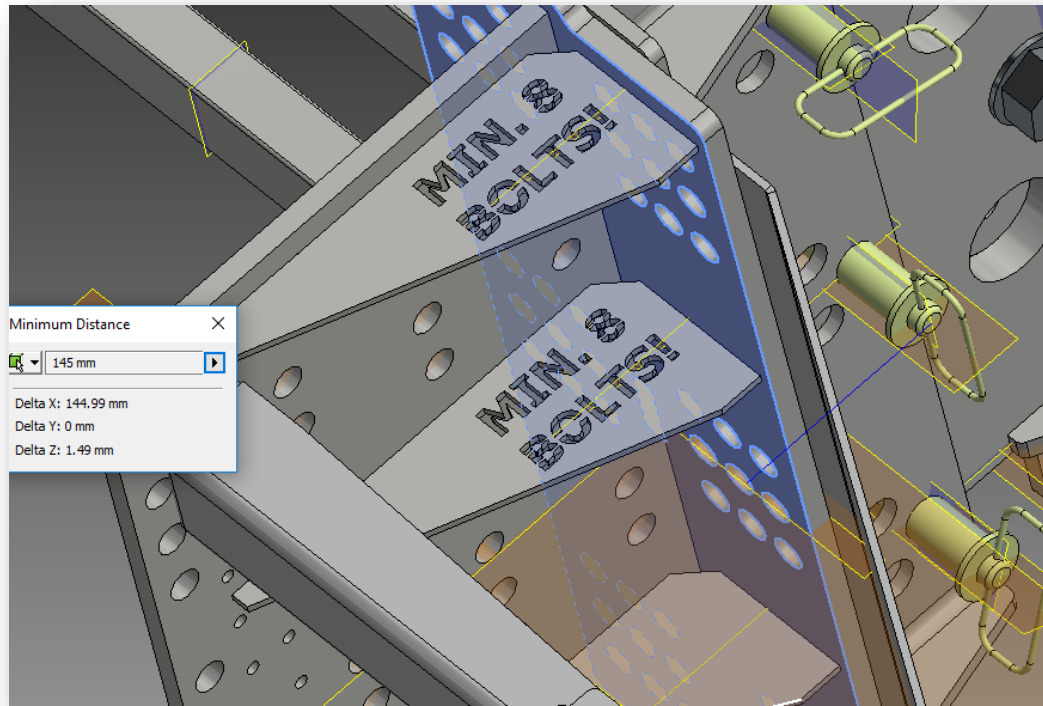


Figure 43

10.1 Levelling your *BLADE*

Your *BLADE* is delivered with a unique levelling device to adjust the horizontal position of the cushion). When the TMA is connected to the correctly installed truck bracket you can adjust the cushion position using the level device. How to do this:

- Loosen the bolted (No.1) connection on left and right (6pcs in total). The bolts must stay in the chassis and nuts must stay on the bolt!
- For adjustment of the horizontal position of the cushion use the bolt/nuts marked as No.2; do this to on the left and right side of the TMA.
- To adjust the cushion up you can also use the jokey / swivel wheel at the center end of the cushion. (only use it retracted don't push it hard, it's only a help not a truck jack !).
- After setting the cushion in proper horizontal position you can fasten (look at max Nm in table Par. 13.4) all bolts and nuts !

Image of the Blade level device on the Blade:

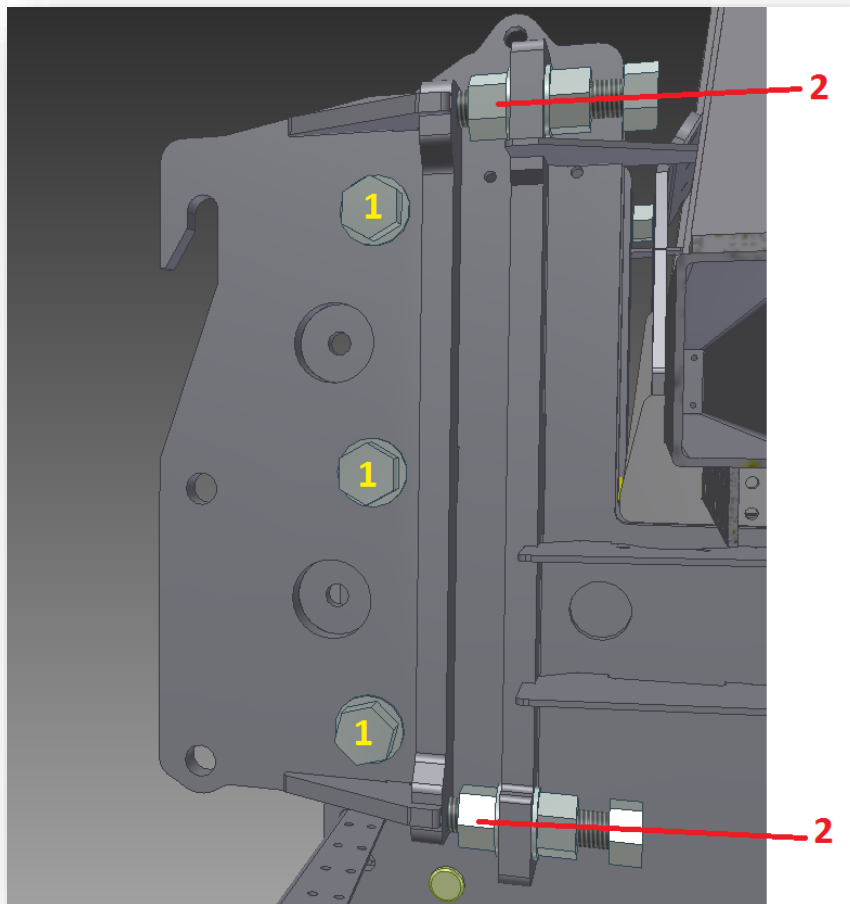


Figure 44

10.2 Arrow Board Frame to TMA:

We advise to install the Blade Arrow board Frame to the TMA at a vertically stored TMA (before its connected to the truck). It's also possible to do it when TMA is already connected to the truck.

The frame must be Fitted to the TMA using a total of : 8 pcs M20 Bolts and nuts + 4 pcs M16 bolts and nuts; more exactly 4 pcs M20 To the left connection and 2 pcs M16 to the left, same on right side.

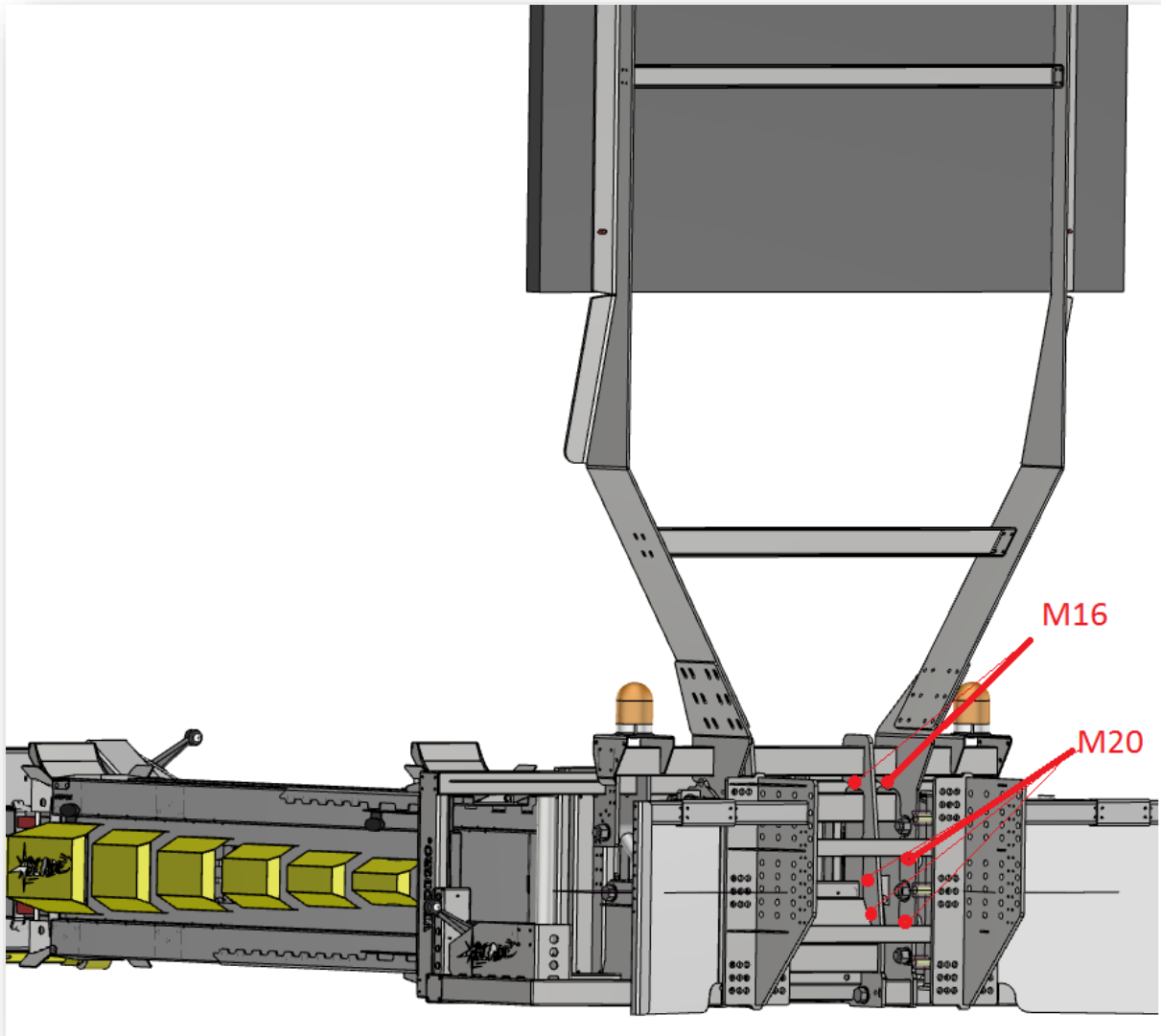


Figure 45 Bolted connections

11 Post impact protocol

There are too many different types of impact that can happen during roadworks on the highway, so the protocol listed below is for overall crashes. Be aware that if the law or Government prescribes other action, or if some actions are prohibited, you have to follow their rules; this is just a guideline.

Please always be sure you keep your mind at your work, even if you are shocked.

If your TMA truck is hit by another vehicle then:

- Look around and check if it is safe to get out of your truck as soon as possible, in case of a possible fire.
- Call the alarm number
- BLADE cuts aluminum into pieces, so there can be sharp edges
- There can be glass around from the impacting vehicle
- Take a look at the driver of the car and tell him not to panic and that emergency services are on their way
- Once you have a green light to leave the accident scene, try to fold up the TMA (100% up is good but not required). Retracting it might not be possible
- Check if there are no parts of BLADE touching the ground or the moving parts of your truck
- Drive with hazard lights on, or under supervision, to the nearest by parking
- Couple off your blade by using the jacks
- Wait at your BLADE until it is picked up with a crane. If you are not able to wait, set a marker on it to aware other people of the sharp edges!
- Drive away with your truck, if it is able to safely drive on the road, note that the driving height may be altered after impact (TMA can be extended and can create more height).

*Always take care of sharp edges on the impacting vehicle or BLADE!
This is a guideline, and no requirements
The law will always overrule this guideline*

12 Inspection

12.1 Inspection table TMA installed to air suspension trucks

<i>General inspection points (If they are in bad condition, use of the Blade is forbidden)</i>	<i>Every application</i>	<i>Weekly</i>	<i>Monthly</i>
<i>Level hydraulic oil</i>		X	
<i>Condition hydraulic cylinders</i>	X		
<i>Leakage hydraulic</i>	X		
<i>Condition of the hydraulic hoses</i>	X		
<i>Inspection of blades inside the cut and bend mechanism (opened and closed)</i>		X	
<i>Visual inspection of both racks, no damage or were out is shown</i>		X	
<i>Operate the Blade fully down & extend, fully retract and up, check all functions and check all led's on cabin controller are working well</i>			X
<i>Visual inspection of shafts, bolts and structural bearings</i>		X	
<i>Operation-end position defectors</i>	X		
<i>Always check if green LED is shown at cabin controller in operation position fully down and extended !</i>	X		
<i>Visual inspection loose machine parts</i>	X		
<i>Cracks</i>			X
<i>Damage on the cushion</i>	X		
<i>Horizontal position, cushion down</i>		X	

Table 2

12.2 Inspection table TMA installed to spring suspension trucks

<i>General inspection points (If they are in bad condition, use of the Blade is forbidden)</i>	<i>Every application</i>	<i>Weekly</i>	<i>Monthly</i>
<i>Level hydraulic oil</i>		X	
<i>Condition hydraulic cylinders</i>	X		
<i>Leakage hydraulic</i>	X		
<i>Condition of the hydraulic hoses</i>	X		
<i>Inspection of blades inside the cut and bend mechanism (opened and closed)</i>		X	
<i>Visual inspection of both racks, no damage or were out is shown</i>	X		
<i>Operate the Blade fully down & extend, fully retract and up, check all functions and check all led's on cabin controller are working well</i>	X		
<i>Visual inspection of shafts, bolts and structural bearings</i>		X	
<i>Operation-end position defectors</i>	X		
<i>Always check if green LED is shown at cabin controller in operation position fully down and extended !</i>	X		
<i>Visual inspection loose machine parts</i>	X		
<i>Cracks</i>	X		
<i>Damage on the cushion</i>	X		
<i>Horizontal position, cushion down</i>		X	

Table 3

12.3 Control position Crash Cushion

Verify proper operation / adjustment of the cushion on a straight road surface without any height differences. After unfolding the cushion, the Blade cushion tubes and beams should be horizontal.



If the machine is not leveled horizontal, directly contact the installer or manufacturer; use prohibited!

12.4 Use of the machine in cold

- Take into account delays in cold (-5° or colder)
- Ensure that there is no snow, ice or dirt on the safety switches.
- Ensure that there is no snow, ice or dirt on the frame and cushion.
- Protect the machine from the snow and ice when not in use.

12.5 High voltage

Not use or touch this machine within:

- 50 Meters at power Lines on steel towers
- 25 Meters at low voltage lines on wooden poles
- 5 Meters in contact Lines of railway and tramway etc.

13 Maintenance

Scheduled maintenance keeps the Blade in safe and reliable condition. From the maintenance schedule and checklist for the annual inspection shows what measurements are required. Read for the maintenance of the Blade 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 / www.Blade-tma.com

13.1 Checking hydraulic oil

The Blade has an oil level in the tank.

- Open the hydraulic compartment
- Make sure the machine is reasonably flat
- Before opening the cap or around the filling is clean, clean it if necessary.
- Add the oil with a special pump with filter. The use of the oil directly from the can to pour.

13.2 Service schedule

Term	Actions
Daily or before any start up	<i>Check level Hydraulic oil</i>
	<i>Check bearings parts</i>
	<i>Check hydraulic hoses and cylinders, pipes and fitting</i>
	<i>Check operation of emergency and safety devices</i>
	<i>Piston rods outrigger daily check for debris, leaks or damage. If severely polluted or clean brine is presents.</i>
	<i>Try all in normal position</i>
Each 500 hours or at latest each month	<i>Lubricate all bearings and sliding surfaces</i>
	<i>Turntable bolts tightened</i>
	<i>Level device bolts tightened</i>
	<i>Check condition of cylinders and outrigger</i>
Each 1000 h of latest 6 months	<i>Check of total Blade</i>
Every 12 months	<i>Annual inspection. + Full service preventive replacement valves and seals.</i>
Cushion	<i>Check daily for damages</i>

Table 4

13.3 Maintenance details

HYDRAULIC

Oil volume :10,0 liter

Oil quantity :(applications of -10° to + 50°) UNIVIS 32

GUIDED BEARINGS

Multi duty grease EP2 (example Shell alvania EP2/ Esso beacom EP2)

SLIDEWAYS Racks

Only clean

Slideways Tubes inside

Only clean the surface

TURNTABLE

Multi duty grease EP2 (example Shell alvania EP2/ Esso beacom EP2)

13.4 Torque index Tension

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
M4	2,8	4,0	4,9
M5	5,7	7,9	9,5
M6	9,7	13,7	16,2
M8	23,5	33,3	39,2
M10	47,1	65,7	79,4
M12	81,4	114,7	137
M14	130	181	216
M16	196	280	333
M18	270	382	461
M20	382	539	647
M22	519	730	873
M24	662	932	1118
M30	1324	1863	2236

Table 5

14 *General BLADE control points*

- Chassis:
 - Corrosion
 - Welds (no cracks visible)
 - Permanent deformation
- Turn table:
 - Bolts / nuts security linch pins
 - Welds
 - Sufficient fat is present in wreath
 - Corrosion
- Turn section:
 - Assessment of hinge shafts and cylinders
 - Welds / corrosion
 - Cracks and other damage
 - Cable and pipe installation
 - Cylinders
 - Security linch pins at cylinder bolts & nuts
- Hydraulic system:
 - Condition hoses (replaced by the least damage or leaks)
 - Piston rods for damage
 - Control for leaks or damage
 - Bolt connection outriggers control
- Cut and bend mechanism
 - Inspect if all brake bolts are installed well 4 pcs M8 each cut and bend like pictured with red circle)
 - Inspect if inner blades rotate and close well when cushion is full extended
- Electrical system:
 - Condition and suspension of cables
 - Condition of cable carrier/ chain and inside wiring
 - Condition of connectors
 - Operation of end position detectors
 - Installation and wiring of Gearbox motors

- Crash Cushion:
 - Control of cracks and dents or cracks in tubes and H beams structure
 - Brake bolts are tightened to cut and bend / Tube section M8 class 8.8 (4 pcs each side)
 - Inspection of inner Tubes, has to be clean surface (no mud or sand etc..)

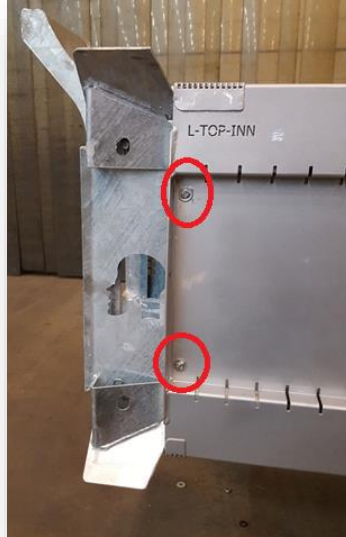


Figure 47

- Test running
 - Set up the entire machine as defined
 - Try all labor movements, which are not allowed to shock. After the test it must be properly monitored or stressed parts do not exhibit cracks or permanent deformation.

15 *Repairs (by manufacturer or official distributor)*

15.1 *Welding*

If parts of the Blade are repaired with welding, it should be noted in the report under "Remarks" and it has to be registered by certified repair body (Certified by Blade BV).

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

15.2 *Other Repairs*

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

- Maintenance points
- Date
- Contractor
- Ensure that during the repairs to the machine the manufacturer's instructions are followed

16 **Warranty**

Verdegro strives by various internal and external inspections and final inspections that the delivered Blade 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 invoice of the machine to the consumer on all Blade TMA components and parts. The guarantee applies only to a new Blade 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 Blade TMA's occurred in accordance with this warranty for free part repair or replacement components (no labor costs). The warranty repair or replacement component will be send back to the buyer as soon as possible (shipping costs not included).

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 financial consequential loss or damage to property or persons or companies due to a defective Blade TMA, neither revenue, driving costs to the repair company, renting cost of replacements or delivery cost etc.

Warranty applies can be done with the Verdegro warranty form, this form can be requested at Service@verdegro.com and contains necessary information for applying a warranty claim.

The warranty will terminate immediately in full if the Blade 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 Blade, or when the settings of the Blade are changed by unauthorized persons.

17 Documents delivered with your BLADE

17.1 BLADE TMA MASH certificate



CERTIFICATE OF COMPLIANCE

WE HEREBY CERTIFY THAT THE BLADE TRUCK MOUNTED ATTENUATOR
HAS BEEN SUCCESFULLY TESTED AT TTI PER MASH 20616 TEST LEVEL III.
ALL TESTS DEMONSTRATED A GOOD AND ACCEPTABLE PERFORMANCE.

Serial Number : _____

Date : _____ of _____ 20____

Name : _____

Signature : _____

Delivery was including* : ☐ Approved Truck Bracket

☐ Approved Arrow Bracket

☐ Approved Jockey wheels

TYPICAL BLADE TMA



*Strike through if not applicable

VERDEGRO®
A BRAND BY

Figure 48

17.2 Chassis registration sticker

Note: Without this sticker, the Blade is not allowed to use!

Sticker can be found at Left hand side on galvanized part of the TMA.

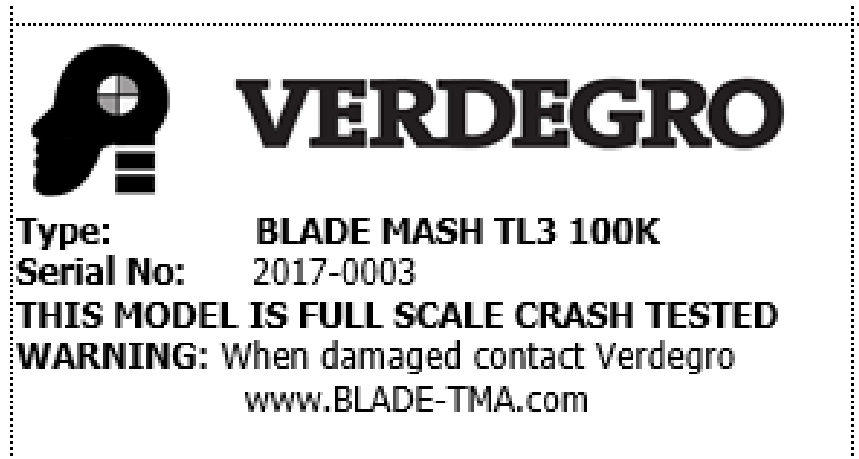


Figure 49

Pictured Serial No. will be different from the delivered No.

18 CE certification



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

Blade BV

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

BLADE TMA

NL

Is geproduceerd conform de normen en normatieve documenten overeenkomstig de bepalingen van de EG-richtlijnen 2006/42/EG, de MASH(2016) TL3 en de 110 km/u test TD49/07.

En

Is manufactured in conformity with the EG 2006/42/EG, the MASH(2016)TL3 end the 110 kph test TD49/07.

Other applied standards	
MASH (2016) TL3 for TMA's	TD49/07 110 kph
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

19 Example of a warranty request form

The digital warranty form can be provided by VERDEGRO GROUP.

VERDEGRO®
Warranty Request *BLADE TMA*.
We only proceed the warranty requests when the form is completely filled in and the requested pictures must be attached. The warranty is valid for the first buyer, 12 months after the delivery date. In case of an extended warranty, add a copy of the contract. Verdegro is not responsible for any costs during the request.

Warranty protocol:
Defect parts or products will be send to Verdegro Group. When received Verdegro Group checks the defect and contact the applicant with the result. When the failure is accepted as a warranty the part / product will be repaired, or a new one will be send. We do not send any free of charge products in advance!

Customer information:
Company : _____ Date : _____
Invoice n° : _____ Delivery date : _____
There are _____ picture(s) / document(s) attached. Please note we need minimum 6 pictures of the complete TMA. |
(Left side, right side, front, back, bottom and top!, including ID tag!)

Contactperson warranty applicant:
Name : _____
Tel. N° : _____ Email: _____

Product information:
Machine number : _____ Cartridge number : _____
Product failure date : _____ Warranty exp. Date : _____

Type of defect: *Short explanation of the problem / complain*

How did it occur: *What happened, how did you notice, and how many times does it occurs*

Any additional comments:

Contact information Verdegro:
Email: Service@verdegro.com Telephone number: +31 (0) 76 50 17 990
VERDEGRO WARRANTY NUMBER: _____ (Filled in by Verdegro!)
NOTE: Please just send only one (1) warrantyform with picures in a mail.

20 *Maintenance and repair history*

NOTE: Must be filled in for a valid warranty request

<p>Date:.....</p> <p>Blade / Truck :</p> <p>Remarks :</p> <p>Stamp:</p>	<p>Date:.....</p> <p>Blade / Truck:.....</p> <p>Remarks :</p> <p>Stamp:</p>
<p>Date:.....</p> <p>Blade / Truck:.....</p> <p>Remarks :</p> <p>Stamp:</p>	<p>Date:.....</p> <p>Blade / Truck :</p> <p>Remarks :</p> <p>Stamp:</p>
<p>Date:.....</p> <p>Blade / Truck:.....</p> <p>Remarks :</p> <p>Stamp:</p>	<p>Date:.....</p> <p>Blade / Truck:.....</p> <p>Remarks :</p> <p>Stamp:</p>
<p>Date:.....</p> <p>Blade / Truck:.....</p> <p>Remarks :</p> <p>Stamp:</p>	<p>Date:.....</p> <p>Blade / Truck:.....</p> <p>Remarks :</p> <p>Stamp:</p>