

TTMA-200

Trailer Truck Mounted Attenuator (TTMA), MASH 2016 Test Level 3 · EU version

OPERATION · MAINTENANCE · REPAIR

MASH 2016

TL-3, tests 3-50 to 3-54

FHWA

CC-152

Trafikverket

TRV 2020/78913

EN ISO 1461

Hot-dip galvanised



USER MANUAL

Operation, maintenance and repair guidelines for the TTMA-200 trailer truck mounted attenuator, supplied and adapted by Nordic Traffic Safety to meet European norms and requirements. Read this manual in full before putting the unit into service and keep it available for future reference.

FOREWORD

Thank you for choosing the TTMA-200 Trailer Truck Mounted Attenuator (TTMA) from Nordic Traffic Safety (NTS). The TTMA-200 is an AASHTO MASH 2016 Test Level 3 (TL-3) crash cushion designed for use with a support truck in both stationary and mobile work zones. It has passed all required and optional MASH 2016 crash tests (3-50 to 3-54), holds FHWA Letter of Eligibility CC-152, and is approved by Trafikverket for use in Sweden under decision TRV 2020/78913. The unit is supplied and adapted by NTS to meet European norms and requirements.

The TTMA-200 can be coupled to most support trucks in a fleet within a matter of minutes. Versatility, repairability and ease of use are its key characteristics, and its patented tube-bursting energy absorption keeps all components attached to the trailer during an impact, so no loose parts are thrown towards traffic or workers.

This manual guides operators through the operation, maintenance and repair of the TTMA-200. Read and understand the recommendations contained in it before using the unit. If you have any questions regarding operation or maintenance, contact NTS:

Nordic Traffic Safety GmbH

Friedrichstr. 112, 24837 Schleswig, Deutschland

Telephone: +45 88 63 88 60 · Service: +49 4621 977547 · Fax: +49 4621 3014990

Email: sales@nts.world · service@nts.world · Web: nts.world

DELIVERY SCOPE

SKU	Item
300200013	TTMA-200 Trailer "Sweden"
5250500	TTMA-200 Warning Board "Sweden"

The delivery scope above is an example. The configuration actually supplied is stated on the order confirmation and the delivery note. Market variants differ in trailer registration, draw eye, hitch extension, warning board and light arrow specification.

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Units. This manual gives SI units first. Where the original test data and hardware are specified in imperial units, the imperial value is given in parentheses. Bolt sizes are imperial (UNC) as fitted to the unit.

1 DESIGN AND MAJOR COMPONENTS

The TTMA-200 consists of a hot-dip galvanised open trailer A-frame, a mid-mounted breakaway axle, two first-stage energy-absorbing tubes with bursting mandrels, and an impact head. On impact a tapered mandrel splits each tube into four controlled straps, absorbing energy progressively while all components remain attached to the unit. The major components are listed in Table 1 and shown in Figure 1.

COMPONENT LISTING

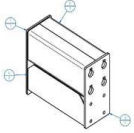
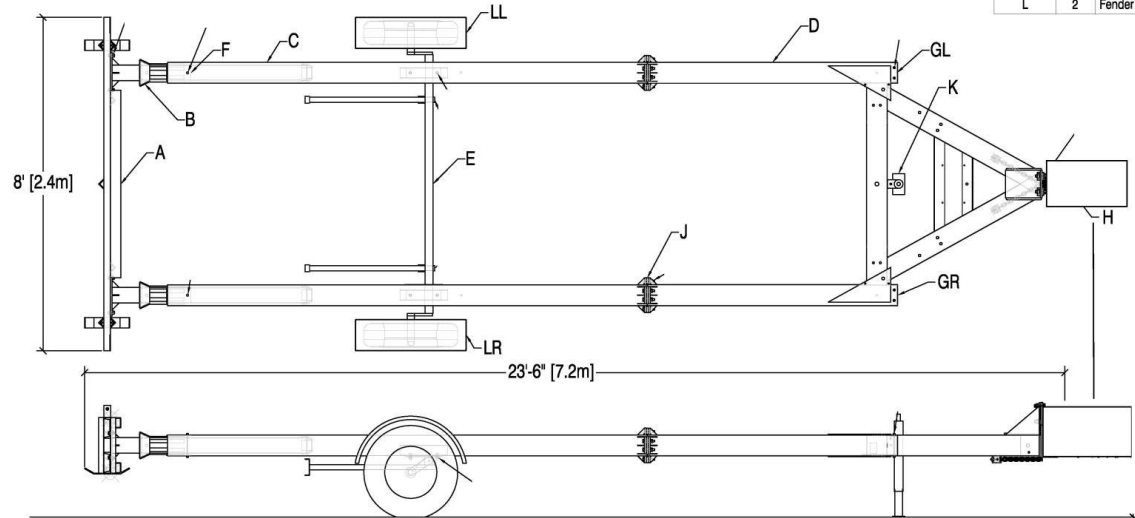
Item	Part no.	Article no.	Qty	Description
A	T-200A	302.35.01	1	Impact head
B	T-200B	302.35.02	2	Bursting mandrel
C	T-200C	302.35.03	2	First-stage energy absorber (bursting tube)
D	T-200D	302.35.04	1	Trailer A-frame
E	T-200E	312.00.44	1	Axle assembly incl. kicker arms
F	T-200F	301.30.40	4	Plastic guide plates
G	T-200G	302.35.06	2	End caps (GL driver side, GR passenger side)
H	T-200HS / HM / HL / XL	312.10.30 to .34	1	Hitch assembly with draw eye
J	T-200J	301.30.41	8	Spacer, A-frame to bursting tube
K	T-200K	312.00.02	1	Jack assembly (jockey wheel)
L	T-200L	312.00.01	2	Fender assembly incl. fender bracket

Table 1. Main components, EU version

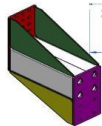
In the schematic, LL and LR denote the left and right trailer lights, GL and GR the driver and passenger side end caps.

TTMA 200 spare part list - EU version

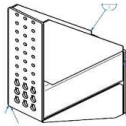
ITEM	QTY	DESCRIPTION
A	1	Impact Head
B	2	Bursting Mandrel
C	2	First Tube
D	1	Trailer Frame
E	1	Axle Assembly
F	4	Plastic Guide Plates
G	2	End Caps
H	1	Hitch Assembly
J	8	Spacer
K	1	Commercial Jack
L	2	Fender Assembly



HS = Hitch extension S (default)
Coupling height: 58 cm - 80 cm



HM = Hitch extension M
78 cm - 105 cm



HS = Hitch extension L
78 cm - 122 cm (all values approx.)



Nordic Traffic Safety GmbH
24837 Schleswig/Germany
+49 4621 977547
sales@nts.world

TTMA-200

Spare parts

Version 2025

Figure 1. Schematic and parts layout of the TTMA-200, EU version. Letters refer to Table 1. The three standard hitch extensions and their coupling heights are shown at the bottom of the drawing.

Item	Qty	Description	Item	Qty	Description
a	6	5/16"-18 x 7" Grade 5 hex bolt	n	16	9/16" heavy lock washer
b	12	5/16" flat washer	o	16	9/16"-12 hex nuts
c	6	5/16" heavy lock washer	p	4	5/8"-11 x 2-1/2" hex bolts
d	6	5/16"-18 hex nut	q	4	5/8" USS flat washer
e	12	5/16" tech screws	r	4	5/8" heavy lock washer
f	8	1/2"-13 x 2" hex bolt	s	4	5/8" hex nuts
g	32	1/2" flat washer	t	4	1-3/8" (1-1/2" OD) plastic locking plugs
h	16	1/2" heavy lock washer	u	2	Square tubing plug
j	16	1/2"-13 hex nuts	v	4	1/2"-13 x 1-1/2" hex bolts
k	16	9/16"-12 x 3" hex bolts	w	4	1/2"-13 x 4-1/2" hex bolts
m	32	9/16" SAE flat washer	x	4	5/8" SAE flat washers

Table 2. Hardware parts list. All hardware Grade 5, zinc coated. Hardware items are listed for reference only and are supplied with each repair part as needed.

A special bolt set for the hitch extensions (14 bolts, article 312.10.39) is available separately.

HOW IT WORKS

Tube bursting technology

The TTMA-200 uses a patented tube-bursting technology to dissipate the energy of the impacting vehicle. When a tapered mandrel with a square cross-section is forced into a square tube with smaller inside dimensions, the mandrel pushes against the inside of the tube. The outward forces concentrate stresses in the corners, creating a controlled cracking of the steel. As the mandrel proceeds forward, the tube is split into four flat straps of metal that are curled outward by the flared portion of the mandrel.

The level of energy dissipation is regulated by the wall thickness of the tubing and by scoring the tube (cutting grooves into the corners). By adjusting the level of energy dissipation and the length of the energy-absorbing tubes, the rate of vehicle deceleration is controlled to bring the impacting vehicle to a gradual and safe stop.

Tube bursting allows the TTMA-200 to use the trailer frame itself as the energy absorber, so no separate energy-absorbing material is needed. The straps of metal have no structural strength and curl up and away from the impacting vehicle. They remain securely attached to the unburst section of the tube, so there are no detached elements that can be thrown forward and endanger workers or adjacent traffic.



Figure 2. The bursting process. Left: tapered and over-sized mandrel inserted into the energy-absorbing tube. Centre: the mandrel cracks the tube at the corners and splits it into four flat straps of metal. Right: close-up of mandrel and energy-absorbing tube.

Draw eye attachment and rotation

A second major feature is the ability of the TTMA-200 to rotate. Competing trailer attenuators use rotational restraints to prevent the attenuator from rotating. The TTMA-200 instead allows the trailer to rotate so that the system stays aligned with the impacting vehicle and energy dissipation is maximised. This approach to energy management is why the TTMA-200 passed the MASH 2016 optional offset and angled tests while attached to a support truck blocked against forward motion.

The principal concern with a rotating trailer is that the impacting vehicle could push the trailer out of its path and strike the rear of the support truck directly. To disengage from the trailer, an impacting vehicle must first slide along the trailer's impact face. The patented impact plate is designed to capture the front of the vehicle and lock the trailer between the impacting vehicle and the tow vehicle. Vertical steel angles prevent the impacting vehicle from sliding horizontally along the face of the trailer, and steel channels with the legs oriented towards traffic prevent vertical motion, eliminating the risk of the vehicle diving under or riding over the attenuator.



Figure 3. TTMA-200 impact head with integrated light bar.

TECHNICAL SPECIFICATIONS

Overall dimensions	
Length incl. hitch extension and draw eye	7,816 mm
Width	2,435 mm
Height to top of impact head	790 mm
Height to top of light bar	885 mm
Ground clearance to bottom of impact head	330 mm (13")
Weight and capacity	
Trailer weight, hitch extension S (without optional equipment)	691 kg
Trailer weight, hitch extension M (without optional equipment)	694 kg
Trailer weight, hitch extension L (without optional equipment)	699 kg
Approximate tongue weight (without optional equipment)	75 kg
Minimum support truck weight (product, per MASH Test 3-53)	4,536 kg GVW (10,000 lb)
Minimum support truck weight, Sweden (Trafikverket TRV 2020/78913)	8,600 kg GVW, excluding the TMA and mounting hardware
Maximum support truck weight	Unlimited
Coupling and hitch	
Hitch	Draw eye (lunette ring), no other structural attachment
Tow coupling capacity rating (minimum), D-value	8.125 kN
Draw eye 40 mm dia.	E24 R55 0254
Draw eye 50 mm dia.	E1 R55 2834
Draw eye VBG 57.5 mm	Article 312.20.28
Ball end coupling	For transport only. Never use in operation
Mounting height, hitch extension S (default)	580 to 800 mm
Mounting height, hitch extension M	780 to 1,050 mm
Mounting height, hitch extension L	780 to 1,220 mm
Mounting height, hitch extension XL (universal)	580 to 1,200 mm
Breakaway axle and wheels	
Rating	750 kg
Tyre size	185R14C
Cold tyre inflation pressure	350 kPa (3.5 bar)
Lighting	
Lighting	Integrated light bar
Lighting standard	EU approved

System voltage	12 V or 24 V, specified at order
Construction	
Frame	Open design
Energy-absorbing components	Heavy gauge steel
Structural members in the impact system	Fully hot-dip galvanised (EN ISO 1461)
Axle	Mid-mounted breakaway
Fender	Full fender
Safety performance	
Test standard	AASHTO MASH 2016, Test Level 3 (tests 3-50, 3-51, 3-52, 3-53, 3-54, all passed)
MASH 2016 required tests	FHWA approved
MASH 2016 optional tests	FHWA approved
Support truck weight, MASH tests 3-50 and 3-51	Unlimited
Support truck weight, MASH tests 3-52 and 3-53	Unlimited
Energy-absorbing system	Patented bursting tube technology
Testing laboratory	Applus IDIADA KARCO Engineering (IAS TL-371)
FHWA Letter of Eligibility	CC-152 (05/03/2019)
Swedish approval	Trafikverket TRV 2020/78913 (29/10/2020)
Warranty	
Warranty against defects in material and workmanship	Two years

Table 3. TTMA-200 technical specifications, EU version

WIRING AND LIGHTING

The TTMA-200 is delivered fully wired. The trailer-side wiring terminates in the junction box shown in Figure 4; the trailer connector fitted for the tow vehicle is specified at order. The only item that may require the user's attention is confirming that the trailer plug matches the socket on the tow vehicle and that all lights function before the unit is put into service. Table 4 lists the trailer wire colours and their functions.

Function	Trailer wire colour
Common ground	White
Auxiliary	Black
Left turn	Yellow
Brake light	Red
Right turn	Green
Tail and marker lights	Brown
12 V power supply	Blue

Table 4. Trailer wiring, colour and function

Note. If the tow vehicle does not use standard wiring, the plug wiring may need to be adapted. Contact NTS technical support for assistance. Road lighting on the tow vehicle and trailer combination must comply with the vehicle lighting regulations of the country of registration.

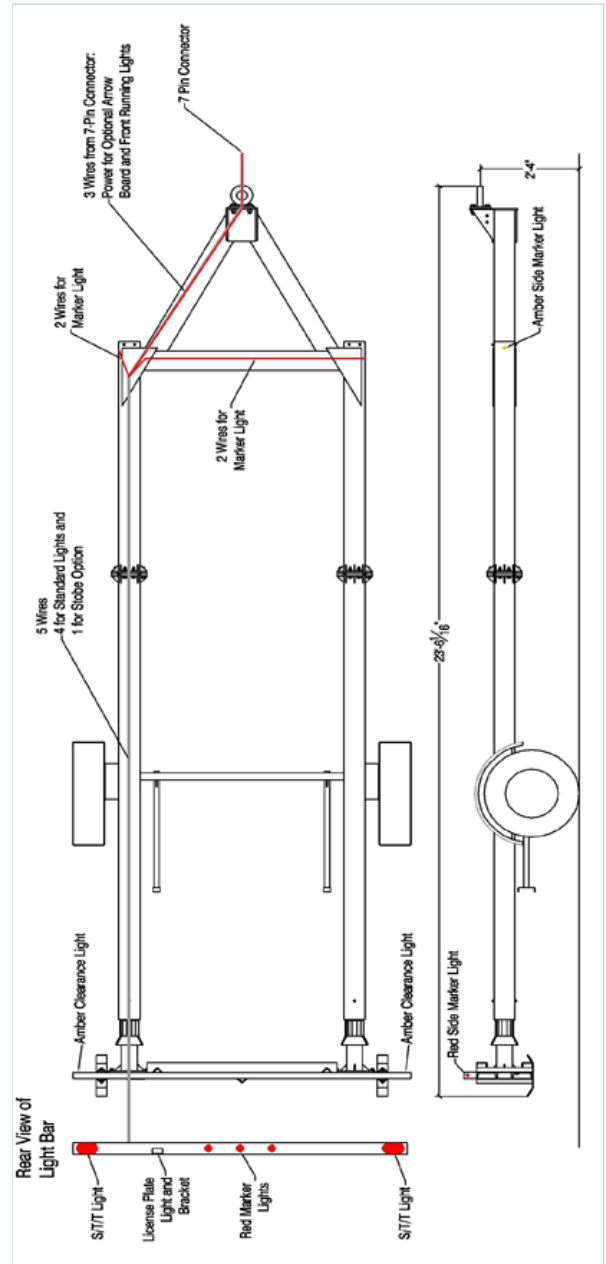
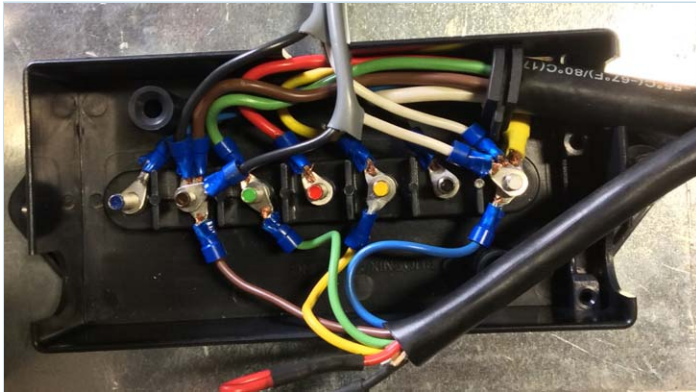


Figure 4 (left). Wiring junction box. Figure 5 (right). TTMA-200 wiring and light layout, for reference only.

2 OPERATION GUIDELINES

INITIAL SETUP

The TTMA-200 is delivered fully assembled. If there are problems with the delivered trailer, contact NTS immediately. Three items require your attention before the trailer is put into use.

1. Bolt check and torque

Check that no bolts are missing and that all bolts are tightened to the specified torque.

Bolt size	5/16" (M8)	1/2" (M12)	9/16" (M14)	5/8" (M16)
Torque (N·m)	20	81	115	156
Torque (ft-lb)	15	60	85	115

Table 5. Torque detail for fasteners

2. Trailer plug and lights

Check that the wiring of the trailer plug matches the tow vehicle (see section 1, Wiring and lighting). Confirm that all lights are functioning properly before putting the TTMA-200 into service.

3. Draw eye mounting

Check that the draw eye is mounted properly. Because frame structures vary widely between tow vehicles, there is no single standard means of mounting the tow coupling assembly to the vehicle frame. The major considerations are the strength of the attachment and the mounting height.

The tow coupling assembly may be welded or bolted to the frame of the tow vehicle. Regardless of the mounting method, the strength of the attachment must exceed the rated capacity of the draw eye with a wide margin of safety. **It is the obligation of the user to ensure that their particular tow coupling attachment meets these strength requirements.**

The mounting position depends on the hitch extension fitted. The nominal coupling heights are 58 to 80 cm (extension S, default), 78 to 105 cm (extension M), 78 to 122 cm (extension L) and 58 to 120 cm (extension XL, universal). All values are approximate.



Figure 6. Mounting positions of the draw eye (lunette ring).

MINIMUM AND MAXIMUM WEIGHT OF THE TOW VEHICLE

The minimum weight of the tow vehicle was established during AASHTO MASH 2016 Test 3-53, which was run without the tow vehicle being blocked against forward movement. The remaining tests were conducted with the tow vehicle blocked against any forward movement, so by these standards there is no specified maximum tow vehicle weight.

Product minimum (per MASH 2016 Test 3-53)	4,536 kg GVW (10,000 lb)
Sweden, Trafikverket TRV 2020/78913	Minimum 8,600 kg GVW, excluding the TMA and mounting hardware
Maximum	No specified maximum

IMPORTANT. National road authority requirements take precedence over the product minimum where they are stricter. In Sweden the tow vehicle must have a gross vehicle weight of at least 8,600 kg, excluding the TMA and its mounting hardware. Check the requirements of the road authority in the country of use before deployment.

ROLL-AHEAD DISTANCES

A major safety concern is the roll-ahead distance of the shadow vehicle when it is struck by an errant vehicle. When an errant vehicle impacts the tow vehicle with a TTMA-200 attached, the tow vehicle will roll forward. Sufficient space must therefore be left between the tow vehicle and the workers so that the roll-ahead does not endanger them. Tables 6 and 7 give the calculated roll-ahead distances for stationary and mobile operation as a function of traffic speed, tow vehicle weight and impacting vehicle weight. The space between the support vehicle and the workers should exceed the roll-ahead distance under the prevailing operating conditions.

To determine the appropriate roll-ahead distance:

1. Assess the nature of the operation. In a mobile operation the tow vehicle moves at low speed, for example 24 km/h (15 mph). In a stationary operation the shadow vehicle is stopped with the parking brake applied. Use Table 6 for stationary operations and Table 7 for mobile operations.
2. Select the weight that best approximates the actual weight of the tow vehicle. Include the weight of items carried on the truck during the operation and the weight of the TTMA-200.
3. Select the range of prevailing traffic speed at the work zone: 70, 90 or 105 km/h (45, 55 or 65 mph).

4. Select the weight of the impacting vehicle to be contained.
5. Read the expected roll-ahead distance from the appropriate table.

Example. A tow vehicle with a gross weight of 6.8 t (15,000 lb) is used as a stopped shadow vehicle where the operating traffic speed is 70 km/h (45 mph) and there are few if any large trucks in the traffic mix. From Table 6 the maximum roll-ahead distance is 3 m (11 ft). This is the distance from the front of the tow vehicle to the work area that should be provided.

Roll-ahead distances are converted from the original calculated values in feet and rounded to the nearest metre. Use the imperial values in parentheses in the headings as the reference where exact figures are required.

Tow vehicle weight	Traffic speed	Impacting vehicle weight			
		2.0 t (4,500 lb)	4.5 t (10,000 lb)	6.8 t (15,000 lb)	10.9 t (24,000 lb)
4.5 t (10,000 lb)	105 km/h (65 mph)	12 m	31 m	46 m	66 m
	90 km/h (55 mph)	8 m	23 m	33 m	47 m
	70 km/h (45 mph)	5 m	15 m	22 m	32 m
6.8 t (15,000 lb)	105 km/h (65 mph)	7 m	21 m	33 m	51 m
	90 km/h (55 mph)	5 m	15 m	23 m	36 m
	70 km/h (45 mph)	3 m	10 m	16 m	24 m
10.9 t (24,000 lb)	105 km/h (65 mph)	3 m	12 m	20 m	34 m
	90 km/h (55 mph)	2 m	8 m	14 m	24 m
	70 km/h (45 mph)	2 m	5 m	10 m	16 m
18.1 t (40,000 lb)	105 km/h (65 mph)	2 m	5 m	10 m	20 m
	90 km/h (55 mph)	1 m	4 m	7 m	14 m
	70 km/h (45 mph)	1 m	3 m	5 m	9 m
27.2 t (60,000 lb)	105 km/h (65 mph)	1 m	3 m	6 m	12 m
	90 km/h (55 mph)	1 m	2 m	4 m	8 m
	70 km/h (45 mph)	1 m	2 m	3 m	5 m
36.3 t (80,000 lb)	105 km/h (65 mph)	1 m	2 m	4 m	8 m
	90 km/h (55 mph)	1 m	2 m	3 m	5 m
	70 km/h (45 mph)	1 m	1 m	2 m	4 m

Table 6. Calculated roll-ahead distances, stationary operation

Tow vehicle weight	Traffic speed	Impacting vehicle weight			
		2.0 t (4,500 lb)	4.5 t (10,000 lb)	6.8 t (15,000 lb)	10.9 t (24,000 lb)
4.5 t (10,000 lb)	105 km/h (65 mph)	36 m	62 m	80 m	101 m
	90 km/h (55 mph)	30 m	48 m	60 m	75 m
	70 km/h (45 mph)	23 m	36 m	44 m	53 m
6.8 t (15,000 lb)	105 km/h (65 mph)	28 m	49 m	64 m	85 m
	90 km/h (55 mph)	24 m	39 m	49 m	64 m
	70 km/h (45 mph)	20 m	30 m	37 m	46 m
10.9 t (24,000 lb)	105 km/h (65 mph)	22 m	36 m	48 m	66 m
	90 km/h (55 mph)	19 m	30 m	38 m	50 m
	70 km/h (45 mph)	16 m	23 m	29 m	37 m
18.1 t (40,000 lb)	105 km/h (65 mph)	17 m	26 m	34 m	47 m
	90 km/h (55 mph)	15 m	22 m	28 m	37 m
	70 km/h (45 mph)	14 m	19 m	23 m	29 m
27.2 t (60,000 lb)	105 km/h (65 mph)	15 m	21 m	26 m	36 m
	90 km/h (55 mph)	13 m	18 m	22 m	29 m
	70 km/h (45 mph)	12 m	16 m	19 m	23 m
36.3 t (80,000 lb)	105 km/h (65 mph)	13 m	18 m	22 m	30 m
	90 km/h (55 mph)	12 m	16 m	19 m	25 m
	70 km/h (45 mph)	12 m	14 m	16 m	20 m

Table 7. Calculated roll-ahead distances, mobile operation at 24 km/h (15 mph)

ATTACHMENT AND OPERATION

Attachment of the TTMA-200 to the tow vehicle

The TTMA-200 is attached to the tow vehicle by its draw eye. The tow coupling must have a D-value of at least 8.125 kN, and the support vehicle must have a gross vehicle weight of at least 4,536 kg (10,000 lb), which is the minimum qualified under MASH 2016 Test 3-53. National rules may require a heavier vehicle: in Sweden, Trafikverket requires at least 8,600 kg excluding the TMA and its mounting hardware.

- Verify that the tow coupling is properly locked, to avoid accidental release of the draw eye and the TTMA-200.
- Make sure the TTMA-200 lights are connected to the tow vehicle and are operating properly.
- Where safety chains are fitted, ensure they properly secure the TTMA-200 to the tow vehicle.

Operation of the TTMA-200

Operation of the TTMA-200 is similar to that of many other trailers. Special attention should be given to the following points.

Warning. The TTMA-200 has no brakes. All braking depends on the tow vehicle, so allow additional distance for braking and stopping.

Warning. Do not use the TTMA-200 for hauling. Objects on the trailer can become a hazard for vehicles impacting the TTMA-200.

Warning. Attaching the TTMA-200 results in wider turns. Drivers should be aware of the need for a wider turning radius and adjust their driving accordingly.

Warning. Any trailer TMA changes the handling of the tow vehicle when reversing. Drivers should be aware of this and adjust their driving accordingly.

Warning. Tow vehicles should be equipped with head restraints and 3-point safety belts to provide proper crash protection for the driver and passengers. Operators should adjust the head restraint to contact the centre of the head and wear the seat belt at all times.

Warning. Do not attach any item to the trailer or hitch without explicit approval from NTS. Contact NTS technical support with any question regarding attachments to the TTMA-200.

When deployed, the entire TTMA-200 should be horizontal to the ground with the impact head ground clearance at 330 mm $\pm$ 25 mm (13" $\pm$ 1").

This manual does not cover the operation of optional equipment such as warning boards, variable message signs and other approved hitch-mounted equipment. Refer to the operating manuals accompanying those devices.

3 MAINTENANCE GUIDELINES

Proper maintenance of the TTMA-200 is critical to continued safe operation and long-term durability. Even though the unit is galvanised, wash the outside of the TTMA-200 periodically, particularly during winter use, to remove salt and other road contaminants. Wash the inside of the frame annually; the end caps (item G) can be removed to allow rinsing of the inside of the frame. Take care with the wiring of the side marker lights during this process. All critical parts of the TTMA-200 are hot-dip galvanised and require minimal maintenance. The following preventive maintenance schedule is recommended.

Item	Function required	Before each use	Weekly	3 months or 5,000 km	12 months or 20,000 km
Lighting system	Test that all lights are operational	•			
Tow coupling	Check capacity. Verify that the draw eye is properly inserted and locked	•			
Mandrel restraining bolts	Check that the restraining bolts are not missing, bent or broken, and are tightened to the specified torque	•			
Axle and bolt-on push rods	Verify the bolts are tight and the push rods are positioned at 90° to the axle so they engage the impact head during a crash event (see Figure 7)	•			
Tyre inflation	Set to 350 kPa (3.5 bar), cold		•		
Tyre condition	Inspect for cuts, wear, bulging and similar damage. See the tyre wear chart		•		
Wheels	Inspect for cracks, dents, distortion or other signs of wear		•		
Splice bolts (A-frame to bursting tubes)	Check that the splice bolts are not missing, bent or broken, and are tightened to the specified torque			•	
Wheel nuts	Tighten to the manufacturer specified torque values			•	
Wheel bearings and cups	Inspect for corrosion or wear. Clean and repack				•
Frame welds	Check for cracks. Contact NTS immediately for instruction if cracks are detected				•

Table 8. Recommended preventive maintenance schedule

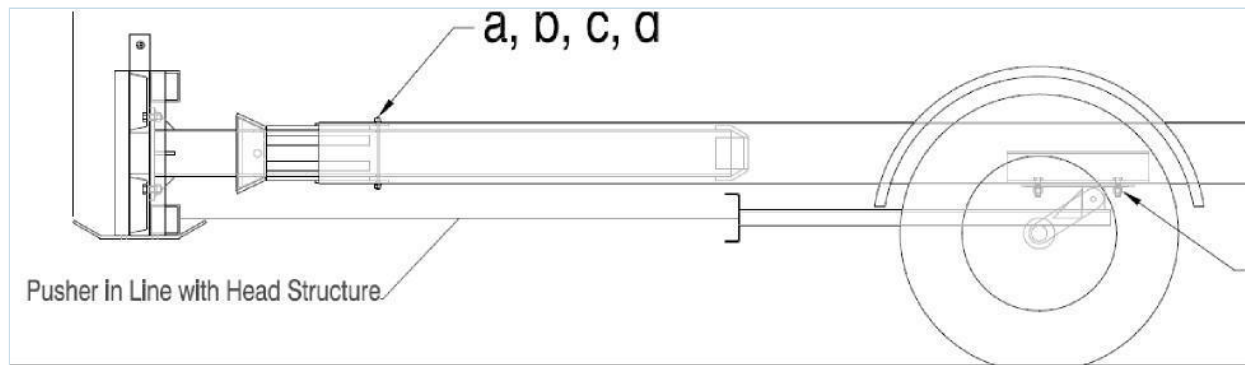


Figure 7. Push rod alignment with the impact head.

Wear pattern	Cause	Action
Centre wear	Over-inflation	Adjust pressure to the load per the tyre catalogue
Edge wear	Under-inflation	Adjust pressure to the load per the tyre catalogue
Side wear	Loss of camber or overloading	Make sure the load does not exceed the axle rating. Alignment may be needed
Even wear	Normal tyre wear	Replace tyres
Cupping	Out of balance	Check bearing adjustment and balance tyres
Flat spots	Wheel lock-up and tyre skidding	Avoid sudden stops where possible and adjust the tow vehicle brakes

Table 9. Tyre wear diagnostic chart

4 REPAIR GUIDELINES

IMPACT BY AN ERRANT VEHICLE

The TTMA-200 is designed to reduce the impact severity for both the occupants of the impacting vehicle and the tow vehicle by dissipating the impact energy in a gradual and controlled manner. When the TTMA-200 is impacted by an errant vehicle the following sequence of events occurs. All references to parts are shown in Figure 1 and described in Table 1.

1. For impacts of 8 km/h (5 mph) or less, generally termed nuisance hits, crash testing has shown that there is typically no damage to the energy absorption assembly of the TTMA-200.
2. For higher speed impacts, the shear bolts holding the mandrels (part B) to the energy-absorbing tubes are sheared off, releasing the mandrels to move forward.
3. The mandrels (part B) are pushed forward by the impacting vehicle and engage the ends of the energy-absorbing tubes (part C).
4. As the mandrels are pushed forward, bursting of the energy-absorbing tubes into four strips of metal is initiated, as shown in Figure 8, dissipating the energy of the impacting vehicle.
5. The sequence of events from here on depends on the speed and weight of the impacting vehicle.

Low-speed impact

The impacting vehicle comes to a complete stop before the mandrels (part B) reach the breakaway axle (part E).

Medium-speed impact

- The mandrels (part B) reach the breakaway axle and shear off the bolts connecting the axle assembly to the energy-absorbing tube, releasing the axle.
- The impact head (part A) contacts the axle push rods and moves the axle forward as the bursting process continues.
- The impacting vehicle comes to a complete stop before the mandrels reach the splice connecting the energy-absorbing tubes and the trailer A-frame (part D).

High-speed impact

The mandrels (part B) continue past the splice connecting the energy-absorbing tubes (part C) and the trailer A-frame (part D). The vehicle is eventually brought to a safe stop against the impact head, or disengages from the impact head and spins out before coming to a complete stop.



Figure 8 (left). Bursting of the energy-absorbing tube. Figure 9 (centre). Damage from a medium-speed impact. Figure 10 (right). Damage from a high-speed impact.

TTMA-200 REPAIR

For impacts requiring repair and replacement of parts, NTS offers parts packages matched to the extent of damage sustained by the unit. All parts packages come with specific repair instructions and are available from NTS.

Incident reporting. To help NTS evaluate the in-service performance of the TTMA-200, a rebate equal to 10 percent of the repair parts package is offered, for a limited time, if complete records of the incident are sent to NTS within 30 days of the occurrence. The records comprise a completed incident report (available on request from NTS) and one or more of the following: photographs of the damaged trailer, photographs of the impacting and tow vehicles, and the police accident report if available.

DAMAGE ASSESSMENT AND REPAIR PARTS PACKAGES

Inspect the TTMA-200 to assess the extent of the damage and the necessary repairs. Because of the simple design of the TTMA-200, damage is usually very evident. **The TTMA-200 must always be thoroughly inspected to ensure everything is in proper working order before it is returned to service.**

The extent of damage will vary greatly depending on the nature and severity of the impact. It is not possible to cover every situation that may be encountered in real-world crashes, so the instructions are presented in general terms for the following damage levels:

- **Nuisance impact.** No apparent damage to the TTMA-200 (approx. 8 km/h, 5 mph impact).
- **Level 1 impact.** Energy-absorbing tubes (part C) burst, but the axle assembly (part E) is not detached.
- **Level 2 impact.** Energy-absorbing tubes (part C) burst and the axle assembly (part E) detached, but the bursting does not reach the trailer A-frame (part D).
- **Level 3 impact.** Bursting reaches the trailer A-frame (part D).

Nuisance impact: no apparent damage to the trailer

- Inspect the shear bolts (item a) holding the mandrels (part B) in place in the energy-absorbing tubes (part C). If the shear bolts are bent or broken, replace them.
- Inspect the trailer lighting system for damage. Minor damage such as a broken lens or bulb can be repaired with items from automotive suppliers. Make sure all lights work properly before returning the trailer to service.
- Replacement of the shear bolts and plastic guide plates for the mandrels, and repair of the lights, may be carried out in the field by the user without involving the distributor or manufacturer.

Article no.	Items in package
302.30.42	Kit shear bolts, nuts, washers and plastic guide plates (T-NHRC-200)

Level 1 impact: tubes burst, axle assembly not detached

- Replace the energy-absorbing tubes (part C) and the shear bolts.
- Inspect the trailer lights for damage. Repair minor damage; if the lighting system is severely damaged and no longer functional, replace the entire lighting system.
- Inspect the impact head (part A) and mandrels (part B). For this severity of impact it is unusual for either to be damaged to the extent that it needs replacing. Check that they are not severely bent and are properly aligned with the energy-absorbing tubes.
- Inspect the draw eye and tow coupling. For this severity of impact it is unusual for either to need replacing. Check that they are not severely bent and can be coupled properly.
- It is recommended that repairs at this level are carried out by a manufacturer certified technician, either at the facility of a distributor or at the facility of the user.

Article no.	Items in package
302.35.03	First stage energy bursting tube T-200C (2x)

312.31.01	Trailer back light, driver side
312.31.02	Trailer back light, passenger side
302.30.42	Kit shear bolts, nuts, washers and plastic guide plates

Level 2 impact: axle assembly detached, no damage to the trailer A-frame

- Replace the energy-absorbing tubes (part C) and the shear bolts.
- Inspect the breakaway axle assembly (part E). Replace the axle if visibly bent. If the axle is not damaged but the push rods are bent, straighten the push rods and make sure they are attached to the axle properly. If the axle is not damaged but the fenders are severely bent, replace only the fenders.
- Inspect the trailer lights. Repair minor damage; replace the entire lighting system if it is severely damaged.
- Inspect the impact head (part A) and mandrels (part B). Check that they are not severely bent and are properly aligned with the energy-absorbing tubes.
- Inspect the draw eye and tow coupling. Check that they are not severely bent and can be coupled properly.
- It is recommended that repairs at this level are carried out by a manufacturer certified technician.

Article no.	Items in package
302.35.03	First stage energy bursting tube T-200C (2x)
312.31.01	Trailer back light, driver side
312.31.02	Trailer back light, passenger side
302.30.42	Kit shear bolts, nuts, washers and plastic guide plates
312.00.44	Axle incl. kicker arms T-200E
312.00.01	Fender set incl. fender bracket T-200L (2x)

Level 3 impact: bursting reaches the trailer A-frame

DO NOT REPAIR. For this high severity of impact it is not advisable to repair the trailer. The cost of the replacement parts approaches the price of a new unit, and extensive assembly would be required, which may pose problems for anyone not familiar with the details of the trailer. It is recommended that the user considers purchasing a new TTMA-200.

5 WARNING BOARD FRAME

The TTMA-200 can be equipped with a heavy-gauge steel warning board frame for use with a variety of warning board panels, light arrow panels or variable message boards. The warning board frame was fitted during each successful test of the AASHTO MASH 2016 programme.

Note. If a warning board and warning board frame are not used on the TTMA-200, a pair of ballast plates must be fitted in their place. The ballast plates provide the tongue weight required by the TTMA-200. Contact NTS for ballast plates.

Note. Move the warning board and frame to the travel position whenever the TTMA-200 is towed above normal mobile work zone operating speeds. This extends the life of the frame connections.

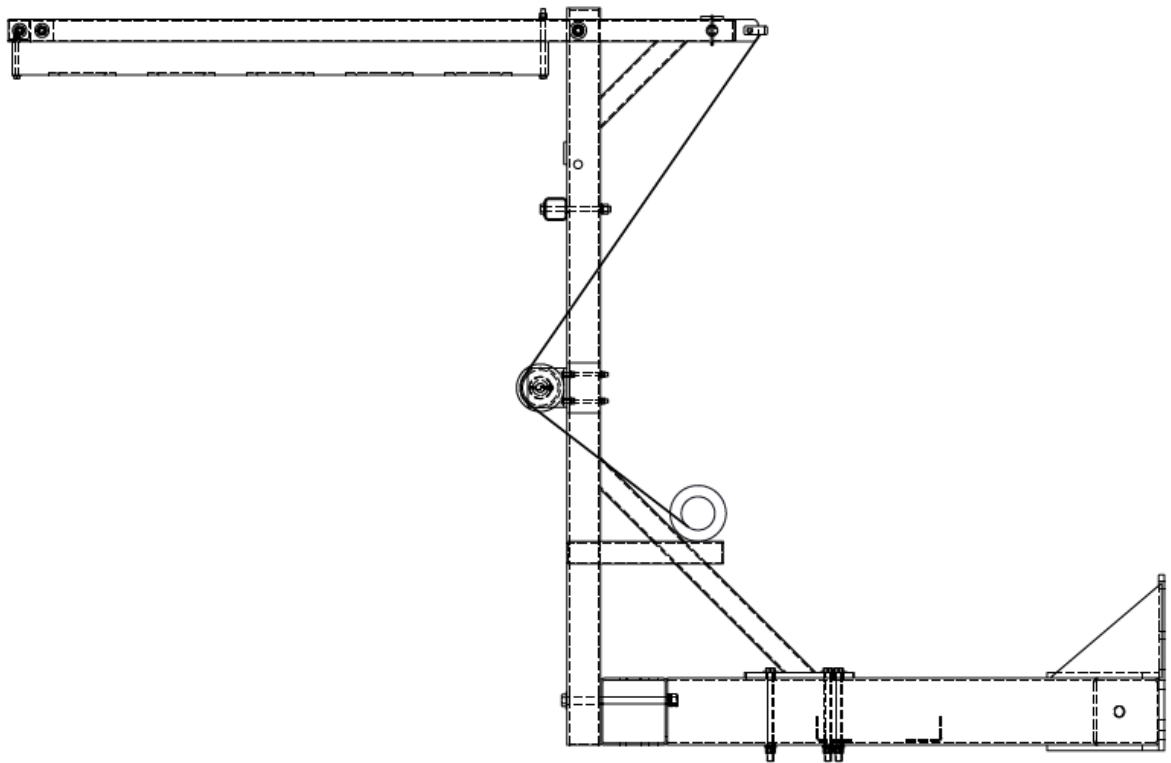


Figure 11. Warning board frame, travel position.

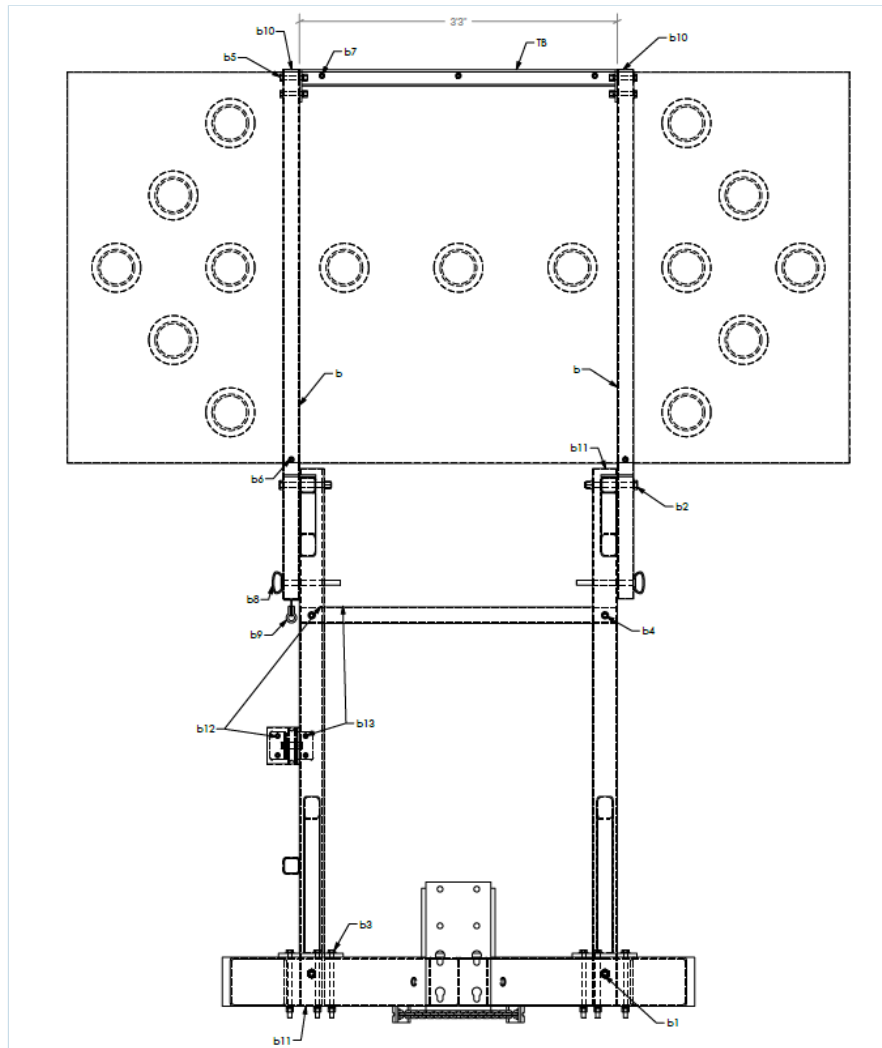


Figure 12. Warning board frame, deployed position.

The operation of the light arrow system, its control unit and remote control is described in the separate operating manual supplied with that equipment.

6 REPLACEMENT PARTS AND COMPONENTS

Table 10 lists the replacement parts and their article numbers for the EU version of the TTMA-200. Refer to these article numbers and the legends in Figure 1 when ordering spare or repair parts. This is not a complete parts list; contact NTS for a complete parts list and pricing.

Part no.	Article no.	Description	Weight
T-200A	302.35.01	Impact head	105.0 kg
T-200B	302.35.02	Bursting mandrel	41.0 kg
T-200C	302.35.03	First stage energy bursting tube	53.0 kg
T-200D	302.35.04	Trailer A-frame	250.0 kg
T-200E	312.00.44	Axle incl. kicker arms	41.0 kg
T-200F	301.30.40	Plastic guide plates (2 per package)	0.5 kg
T-200G	302.35.06	End caps	0.8 kg
T-200HS	312.10.30	Hitch extension S (default), 58 cm to 80 cm	42.5 kg
T-200HM	312.10.31	Hitch extension M, 78 cm to 105 cm	44.0 kg
T-200HL	312.10.32	Hitch extension L, 78 cm to 122 cm	51.5 kg
T-200XL	312.10.34	Hitch extension XL (universal), 58 cm to 120 cm	60.0 kg
T-200HB	312.10.39	Special bolt set for hitch extensions (14 bolts)	0.3 kg
T-200J	301.30.41	Spacer between A-frame and bursting tube (package of 8)	5.4 kg
T-200K	312.00.02	Jack assembly (includes hardware)	7.0 kg
T-200L	312.00.01	Fender incl. fender bracket	4.5 kg
	312.00.03	14" wheel	8.0 kg
	312.20.18	Draw eye 40 mm	10.0 kg
	312.20.17	Draw eye 50 mm	11.2 kg
	312.20.28	Draw eye VBG 57.5 mm	19.2 kg
	312.30.01	Trailer light set 24 V incl. wiring harness	10.0 kg
	312.30.02	Wiring harness for 12/24 V trailer lights	5.0 kg
	312.31.01	Trailer back light, driver side	1.0 kg
	312.31.02	Trailer back light, passenger side	1.0 kg
T-NHRC-200	302.30.42	Kit shear bolts, nuts, washers and plastic guide plates	0.9 kg

Table 10. Replacement parts, EU version

7 TECHNICAL ASSISTANCE, LIMITATIONS AND WARRANTY

TECHNICAL ASSISTANCE

For questions regarding inspection and assessment of damage to the trailer or the required repair parts, contact NTS:

Nordic Traffic Safety GmbH

Friedrichstr. 112, 24837 Schleswig, Deutschland

Telephone: +45 88 63 88 60 · Service: +49 4621 977547 · Fax: +49 4621 3014990

Email: sales@nts.world · service@nts.world · Web: nts.world

To allow technical support to assess the TTMA-200 and the required repair parts, please send photographs by email showing the overall damage, the VIN tag, and the damage to the specific areas or parts in question.

LIMITATIONS AND WARNINGS

The TTMA-200 Trailer Truck Mounted Attenuator has been tested and evaluated per the recommendations of the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH) 2016. The TTMA-200 is a Test Level 3 (TL-3) tested device capable of decelerating and stopping lightweight vehicles (1,100 kg, 2,425 lb) and heavyweight vehicles (2,270 kg, 5,004 lb) in accordance with the criteria of MASH tests 3-50, 3-51, 3-52 and 3-53 at 100 km/h (62.14 mph). FHWA Letter of Eligibility CC-152.

Impacts that exceed the design capabilities described in this manual (vehicle weight, speed, impact angle) may not result in acceptable crash performance as described in AASHTO MASH 2016 in terms of structural adequacy, occupant risk and vehicle trajectory.

TWO-YEAR LIMITED WARRANTY

The TTMA-200 is warranted to the purchaser against defects in materials and workmanship. Should the TTMA-200 prove to be defective in materials or workmanship during the warranty period, the defective product will be repaired or replaced free of charge. The warranty period commences on the date the purchaser puts the unit into service and remains in effect for a period of two years.

This warranty does not cover any failure of the TTMA-200 caused by misuse, abuse or material alteration of the unit, or by any negligence in connection with the installation, service or use of the product. For proper installation, maintenance and use of the product, refer to this manual and the maintenance schedule.

Nordic Traffic Safety GmbH represents the TTMA-200 outside the USA and Canada. This manual supersedes the TTMA-200 User Manual Rev. 2.1 of 17/09/2026 and is based on the manufacturer manual Ver. EU 2026, corrected against the manufacturer general specification of April 2019 and the hitch extension data sheet.