

USER'S AND MAINTENANCE HANDBOOK





T.V.Z. S.r.l. Assali & Semiassi

Via Taglie
25013 Carpenedolo (BS)
ITALY

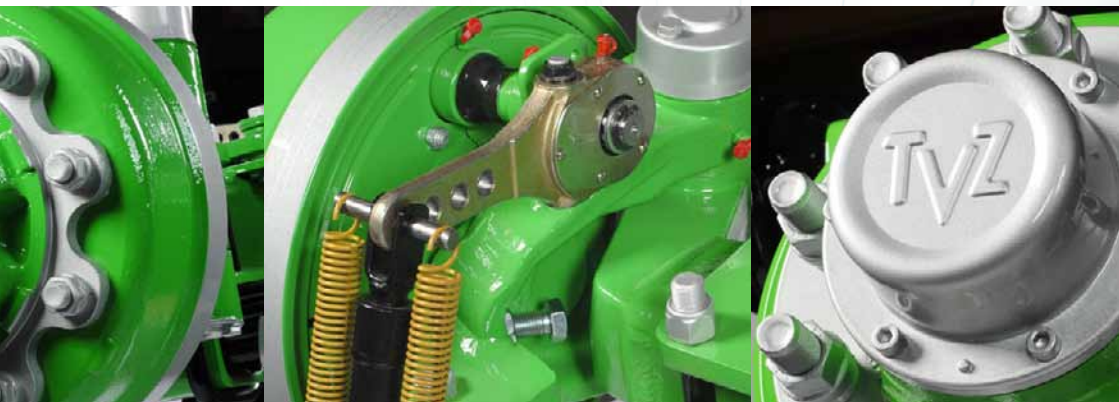
Tel. +39 030 9699211

✉ info@tvzassali.it

www.tvzassali.it



ASSALI & SEMIASSI
AXLES & STUB AXLES



TVZ is a new, young and dynamic company, but its team boasts an extensive experience in the field of axles and suspension groups for farm machinery, an experience gained previously in TI.VI. and TZ. TVZ was formed by the amalgamation of these two companies.

TVZ was founded in 2006, a medium sized company, which while maintaining indisputable flexibility and availability introduces to manufacturers in the field of agricultural machinery, constructional machines and mechanical earth movers, a renewed and adapted range of products according to customer needs; a strong base for rapid growth projected for the future. The synergy, the different experiences and common strategies that result from this amalgamation allow TVZ to offer service, quality and conditions at the top of its customers expectations and expand its operational horizon.





Introduction

We decided to make this user and maintenance handbook in order to give the final user all the information which is required for the installation and maintenance of TVZ products: mechanical and industrial fixed axles, steering axles, suspension and bogie suspensions. This user and maintenance handbook does not explain all the potential dangers that can occur during the maintenance of a vehicle, nevertheless, the user needs to be aware of eventual risks.

IDENTIFICATION:

All products of the TVZ company can be equipped, on customer request, with identification plates, which carry the code, production lot, capacity load with reference to the speed and the configuration of the vehicle and eventual approvals.

SAFETY NOTE:

Any maintenance, repair, etc. ..., must be performed by competent workers who must be appropriately trained.

The staff must work wearing the proper equipment and appropriate protection such as safety shoes, gloves, eyeglasses and helmets, etc...

It is very important to always work in the presence of another person, so that in case of accident, one can act promptly bringing aid or informing the proper authorities.

When working with lifting vehicles, the operator must always ensure that the vehicle is perfectly stable and will be during and after the necessary operations, and that whatever is lifted is completed with suitable facilities and properly sized.

When working on a not lifting vehicle, the operator makes sure that the work takes place on level ground, that the vehicle is completely stationary, that it cannot move and that the wheels are placed perfectly in the right position.

Normally, TVZ axles are connected to pneumatic circuits (braking systems) or to hydraulic braking systems (braking system or readjustment systems).

It is very important, before working on such circuits, to make sure that there is no inside pressure, in order to avoid accidental damages.

The brake gaskets that are mounted on the TVZ axles do absolutely not contain asbestos.





When working on brakes where, because of age, the production date cannot be determined, the operator must treat them as if they contain asbestos, remembering that asbestos powder is hazardous to health.

Be very careful not to touch the parts such as brake drums, which may become hot during use.

When cleaning and removing grease from components, the operator should use products for this purpose that can be easily found on the market, following the instructions on the packaging, paying attention that these products do not come into contact with the skin and avoid breathing any possible smoke or steam.

Because these products are highly flammable, attention should be paid not to smoke or use an open flame, which could cause a serious risk of fire or explosion.

Therefore, it is very important to have a fire extinguisher ready at the work place when operating in order to avert any potential risk.

Every replaceable component must be replaced exclusively by an original part. In order to identify correctly the right components, refer to the TVZ spare parts catalogue.

All TVZ products, during work, support the load of the vehicle. It is therefore very important not to exceed the capacity load and speeds shown on the TVZ drawings or catalogue. Moreover, do not use tires in excess of those specified in the catalogue and in the vehicle documents.

It is also important not to exceed the braking capacity which is indicated on the TVZ catalogue. The failure of structural components and supporting TVZ products can cause serious damage. This handbook is not intended to replace the user and maintenance handbook prepared by the vehicle manufacturer.

TVZ Ltd. disclaims any liability for any whatsoever damages, moral or physical occurred by using interpreted, incorrect or incomplete information, which can be taken from this handbook.



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AXLES & STUB AXLES



1

Chapter 1 Installation



Installation

HANDLING

The handling of the TVZ axles must be performed by trained staff and only with appropriate tools for loading in motion.

POSITIONING ON THE VEHICLE

In order to ensure maximum reliability, durability and safety of all components of the vehicle it is important that the axles are installed properly by trained personnel.

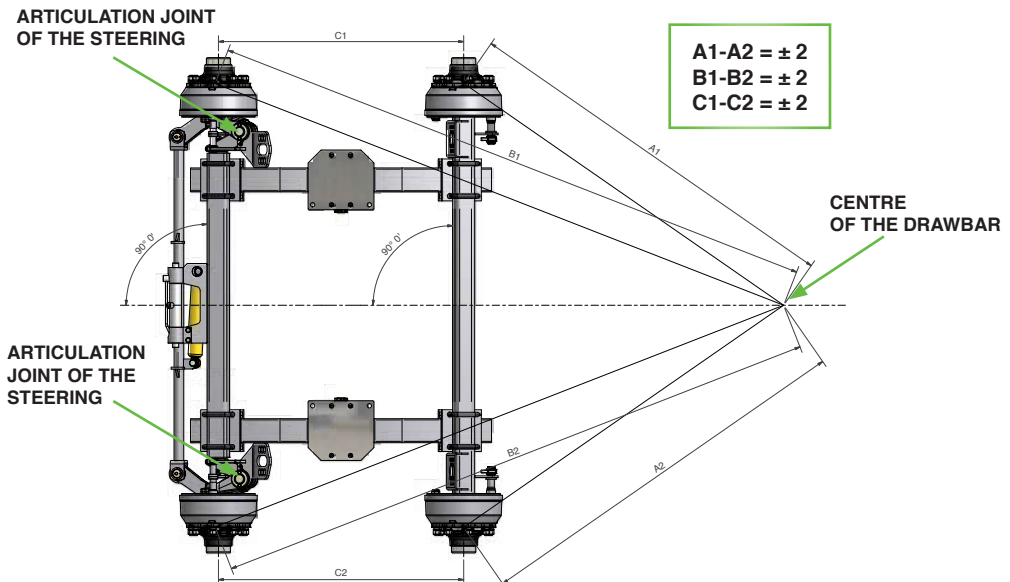
It is important to mount the axle centered with respect to the vehicle, perpendicular to the drawbar and parallel to the axles of the tractor, respecting the value of the expected overhang.

In the case of two or more axles, each axle must be positioned central to the vehicle, perpendicular to the drawbar and parallel to the axle of the tractor, respecting the value of the expected overhang. If there are one or more steering axles, these should be mounted with the front articulation joint of steering in the forward direction and with the recovery ring of the slack of the pivot upwards.

To verify the correct alignment of the axles, these must measure the distance that exists between the centre of each hub of the first axle and the centre of the drawbar, the maximum difference between the two measurements must be less than 2 mm.

In the case there are more axles on the same vehicle, in addition to the measurement described above, it is also necessary to measure the distance between the centers of the hubs on each side of the vehicle, even if these measures may differ by up to 2 mm.

For any malfunction or damages on axles, brakes or tires, arising from incorrect assembly, the complete responsibility lies with the installer.



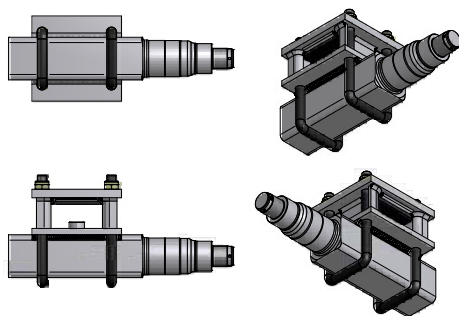
Axles equipped with an inside hydraulic brake must be mounted with camshaft in front or behind the billet in the direction of the ride. It is imperative to check that the oil to be used for the cylinder is compatible with the gaskets mounted insider the cylinder.

The self-steering axles must be mounted with the articulated joint turned towards the forward direction with the ring nuts locking the tapered pivot upwards.

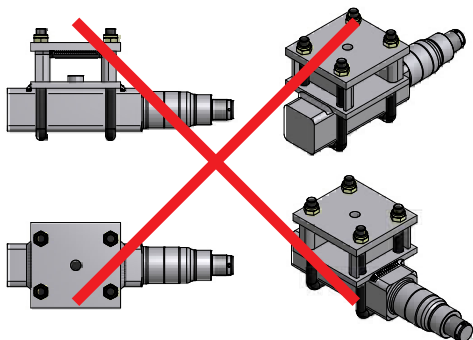
WELDING

All welding operations must be performed by qualified personnel.

Before performing welding on TVZ axles, make sure that the welding areas are free of grease, dirt, paint or other contaminant elements that could degrade the quality of the welding. Before performing welding on the TVZ axles, make sure that the mass is not placed on the hub or by any other party in which the axle bearings are placed between the mass and the welding point, the passage of current through the bearings creates extremely harmful micro-low-sets. The beam forming the body of the axle, as it is stressed, has a bearing on the force which is concentrated at the top and the bottom compared to the ground floor, so welding is permitted in the areas as shown in the following example.



**Welding performed correctly:
the weld follows
the fibres of the axle**



**Welding to avoid:
the weld cuts
the fibres of the axle**

Installation

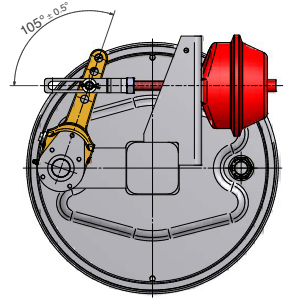
BRAKING SYSTEM

Before proceeding with the installation of the braking system, make sure the vehicle is stationary for the whole duration of operations.

Start by taking the brake lever, turning it in the activation direction, until the gaskets of the brake go into contact with the drum, at this point by acting on the actuator (brake cylinder or linkage) of the lever in order to make sure that the lever has stopped in this position and then released slightly so that the drum is just free to swing without friction. The lever stroke must be as short as possible.

At this point, the angle between the brake lever and the cylinder should be about 105° , as shown in the picture.

To guarantee maximum braking efficiency and durability of the brakes, and to prevent abnormal noise and vibration, the brake levers must have the same rotation direction of the tires.



For maximum efficiency, all drum brakes require a carefully running in, please contact the technical office of TVZ in order to get more information about it.

The braking system is now ready for the use.

ASSEMBLY OF THE WHEELS

First of all, make sure that the vehicle is lifted with suitable equipment, perfectly stationary and stable for the duration of the intervention.

Then make sure that the wheel that you are mounting is compatible with the stud and the nut of the axle as defined according to DIN 74361 to which we recommend reference.

In the case of twin-tire wheels, in order to guarantee a good centering, it is necessary to insert a spherical washer between the flange of the hub and the inner wheel.

Concerning the tightening of the wheel nuts refer to the following schedule. Always perform the cross-tightening of the wheel nuts.

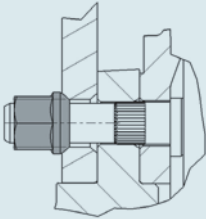
Excessive tightening of the wheel nuts can cause a deformation of the wheel disc or the sudden yielding of the studs or nuts, with the risk of losing the wheel.

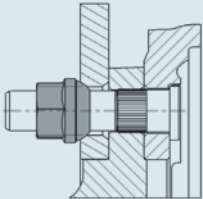
Warning, a loose tightening of wheel nuts can cause a slowing of the fixation and breaking of the wheel studs or serious breakdown risks occurring to the same wheel.

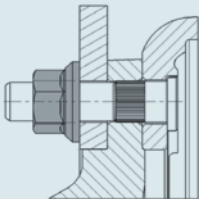
Always use a torque wrench to reach the correct tightening torque. Do not use the impulse wrenches to perform / complete the tightening because the tightening torque can reach extremely high values.





TYPE OF NUT AND WASHER	THREAD	DISHED DISCS	FLAT DISCS IN St.37	FLAT DISCS IN St.52
NUTS WITH SPHERIC COLLAR CONICAL NUTS 			STUD IN CLASS 8,8	STUD IN CLASS 10,9
		Nm		
	M12 x 1,5	90		
	M14 x 1,5	160	160	220
	M16 x 1,5	230	230	330
	M18 x 1,5	310	330	460

TYPE OF NUT AND WASHER	THREAD	DISHED DISCS	FLAT DISCS IN St.37	FLAT DISCS IN St.52
NUTS WITH FLAT COLLAR AND SPHERIC WASHER 			STUD IN CLASS 8,8	STUD IN CLASS 10,9
		Nm		
	M18 x 1,5	210	270	360
	M20 x 1,5		360	450
	M22 x 1,5		460	550

TYPE OF NUT AND WASHER	THREAD	DISHED DISCS	FLAT DISCS IN St.37	FLAT DISCS IN St.52
NUTS WITH FLAT REVOLVING WASHER 			STUD IN CLASS 8,8	STUD IN CLASS 10,9
		Nm		
	M18 x 1,5		260	360
	M20 x 1,5		350	500
	M22 x 1,5		450	650

Bogie suspensions

BOGIES

The bogie suspension is a type of oscillating mechanical suspension with multi-leaf springs which is used in agriculture to fit tandem vehicles. Its main advantage is that vehicles can travel across particularly rough terrain, thanks to the wide oscillation movements which are adapt to the roughness of the ground.

BOGIE RANGE OF TVZ

- | | |
|--|--------------------------------------|
| • Bogie model 1 with capacity load from 08.0 to 13.0 ton. | For wheel base from 920 to 1300 mm. |
| • Bogie model 1B with capacity load from 11.5 to 16.0 ton. | For wheel base from 900 to 1320 mm. |
| • Bogie model 2 with capacity load from 15.5 to 17.5 ton. | For wheel base from 1200 to 1480 mm. |
| • Bogie model 3 with capacity load from 17.5 to 21.5 ton. | For wheel base from 1360 to 1480 mm. |
| • Bogie model 4 with capacity load from 18.5 to 22.0 ton. | For wheel base from 1500 to 1700 mm. |

SUPPLY

The T.V.Z. bogies are either supplied with both axles fixed or with fixed and steering axles, ready to be fitted to the vehicle chassis. On request, the bogies can also be supplied unassembled. On request TVZ can supply the strike plates complete with bolts and nuts for the assembly of the bogie chassis. The bogies can be supplied with normal attitude (the axles are in the leaf springs) or with low attitude (axles are above the leaf springs).

BOGIE ASSEMBLY

In order to ensure maximum reliability, durability and safety of all components of the vehicle it is important that the bogies are installed properly. The alignment of the bogie should be performed by the manufacturer of the vehicle, the axles of the bogie must be parallel to each other and parallel with the tractor, this ensures a good control of the vehicle and a longer life for the tires. Complete responsibility lies with the installer for any malfunction or damages on bogie, axles, brakes or tires, arising from incorrect assemblage.



GENERAL NOTES

- The heights of the bogie and of the suspension shown in the general catalogue refer to the no load or full load conditions, considering always the vehicle horizontal.
- If the suspension is not horizontal this can cause a malfunctioning, in which case is necessary to verify exactly the camber of the vehicle chassis.
- Concerning the axles assembled on the bogie and suspension, please return to the chapter concerning "positioning on the vehicle" on page 8.

Mechanical suspensions

MECHANICAL SUSPENSION

Suspensions are those where the elastic member is a leaf spring, operating by bending and consisting of leaves of elastic material. The mechanical suspension, given its high stiffness, is particularly suitable for heavy vehicles, where the system is particularly lightweight, easy to install and provides good travel comfort even at high speeds.

THE RANGE

The range of T.V.Z. suspensions is composed of:

- Single-axle suspensions from 5 to 12 ton.
- Tandem-axles suspensions from 10 to 24 ton
- Tridem-axles suspensions from 24 to 36 ton.
- For wheel base from 990 to 525 mm.
- For leaf spring from 76 to 80 mm.

PACKING AND CONTENT

The T.V.Z. suspensions are supplied not assembled as a kit, with the subgroups already assembled.

The kit content includes:

Complete central rocker arms, with an open clamping pin.

Fixed torque arms (on industrial suspensions).

Adjustable torque arms (on industrial suspensions).

Support screws holding the leaf springs fitted on the supports.

Kit for the fixing of the axles onto the leaf spring (U-bolts, nuts, plates).

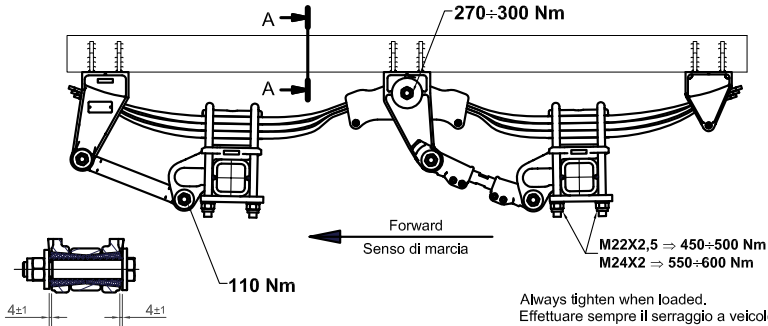
Connections for the torque arm onto the axles (on industrial suspensions).



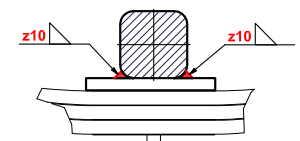
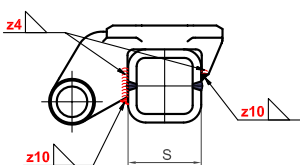
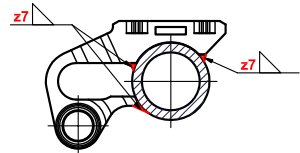
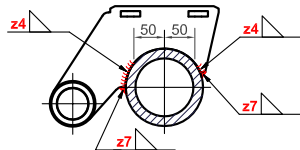
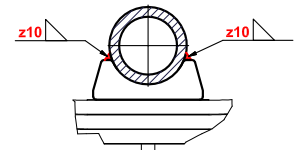
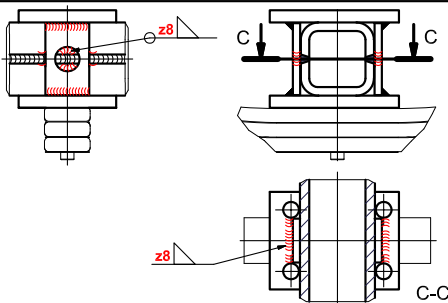
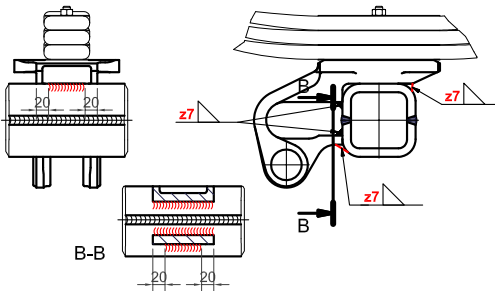
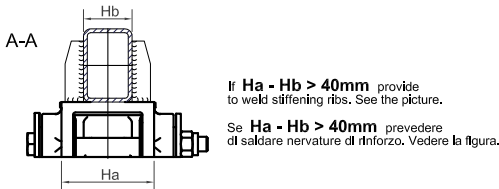
AXLE ASSEMBLY

- In order to avoid structural collapse of the body of the axle, it is extremely important that the welding of the components of the suspension on the axles are carried out avoiding the zones of maximum stress.
- In order to ensure maximum reliability, durability and safety of all components of the vehicle, it is important that the axles are installed properly.
- The alignment of the axles should be performed by the manufacturer of the vehicle. The axles must be parallel to each other and parallel with the tractor which ensures a good control of the vehicle and a longer life for the tires.
- To guarantee maximum braking efficiency and durability of the brakes, and to prevent abnormal noise and vibration, the brake levers must have the same rotation direction of the tires.
- Complete responsibility lies with the installer for any malfunction, damages on suspensions, axles, brakes or tires arising from incorrect assembly.

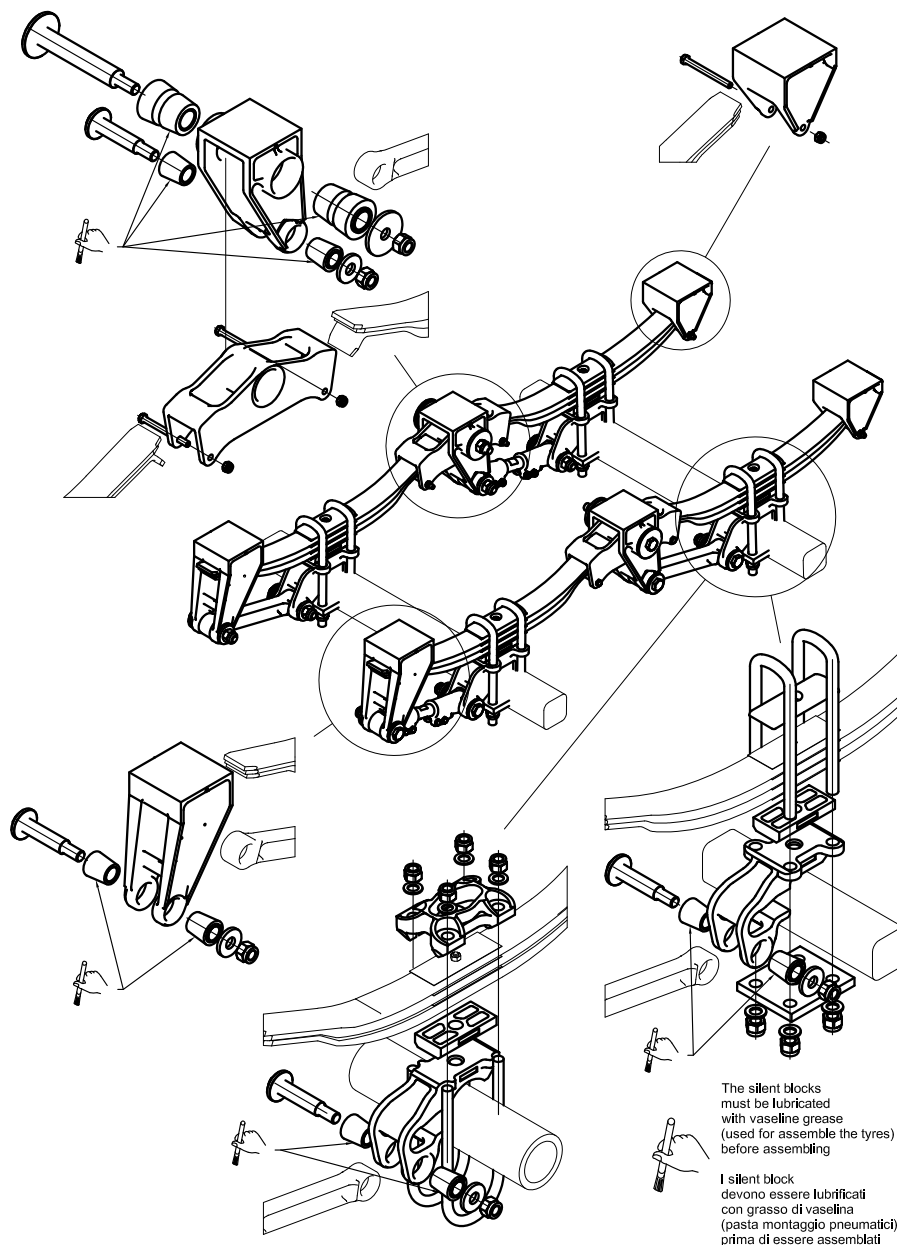
Tightening of nuts and welding



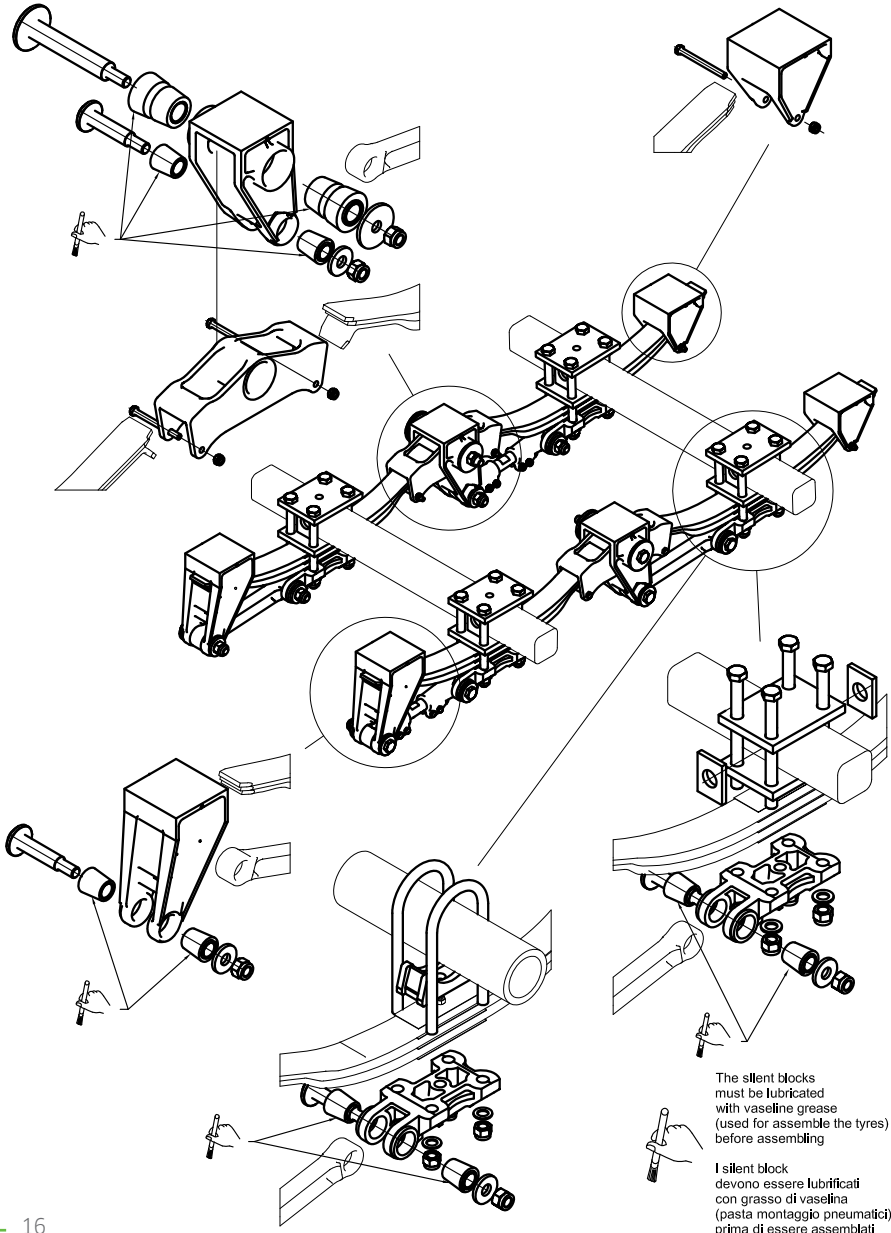
Always tighten when loaded.
Effettuare sempre il serraggio a veicolo carico.



Assembling instructions - Standard execution



Assembling instructions - Underslung execution



2

Chapter 2 Maintenance



Fixed Axles_Maintenance Schedule

GENERAL CHECKOVER

Carry out general checks:

- Before each field
- Every year

Before any operation, make sure that the vehicle is placed on flat land, perfectly still and stable in order to avoid damages to people or things. The following controls should be performed each year:

- Visual inspection of the axle beam, clean perfectly and inspect the beam, look for cracks and / or initiation signals of ruptures.
- Check the straightness of the beam, axles with flex beam for overload, not for the camber, which should be replaced.
- Visual inspection of the camshaft (axles with brakes), clean perfectly and inspect the supports, look for cracks and / or initiation signals of ruptures.
- Visual inspection of the welds of the supports of the brake cylinders (axles with brakes), clean perfectly and inspect the supports, look for cracks and / or initiation signals of rupture.
- Visual inspection of the welds of the axles on the chassis (directly or through plates), clean perfectly and inspect junction area, look for cracks and / or initiation signals of ruptures.
- Control of the correct alignment of the axle in comparison to the chassis. Perform the checks described in Chapter "Installation" on page 8.
- When damages or initiation signs of rupture are noticed, immediately replace the component or the damaged components. In case of signs on the axle beam, it is necessary to proceed with the replacement of the entire axle.

TIGHTENING OF THE WHEEL NUTS

Before any operation, make sure that the vehicle is placed on a flat surface, perfectly still and stable to avoid damaging people or things. When the nuts are tightened the first time, it often happens that, after a short time they can loosen as a result of the adjustments of the wheel. For this reason it is necessary to check the tightness of the nuts after the first loaded journey. The same procedure is to be done each time the wheel is disassembled and reassembled on the hub. To tighten the nuts the use of dynamometri keys is required in order to respect the driving torque listed in this handbook on page 11 or in the general catalogue of the products of TVZ on page 17. You can use also pneumatic screwdrivers, in both cases it is good to make sure that the torque applied is correct in order to avoid to damage the wheel or the stud/nuts thus to avoid serious damages such as the disjunction of the wheel and the consequent loss of control of the vehicle. Absolutely to avoid are the impulse wrenches for nuts tightening, you can use them only when the wheel is removed.

Perform a check and a tightening of wheel nuts:

- After the first use
- After the first trip loaded
- After the first month
- Every 6 months or every 500 working hours

It is important that lubricants are not used on the studs or on the nuts of the wheel.

CHECK OF THE FIXING OF HUB CAPS

It is very important that the hub caps are always intact and correctly placed in order to avoid that the contaminated agents (dirt, ground, etc. ...) may come into contact with the grease in the hub, thus reducing significantly the life of the bearings.

As regards the pressure caps it is good to check that they are in the right place, intact and perfectly triggered on the hub before and after each use.

As regards the cups fastened with the screws, check the tightening of the screws at least every 4 months.

CHECK OF THE BEARING CLEARANCE

It 's good to know that the bearings, being mechanical parts subjected of wear, they have a term that depends on the working conditions: load, speed, their regulation and greasing.

Check bearing clearance in the hub:

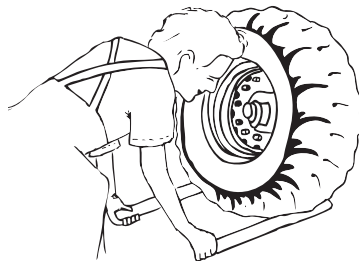
- Before each field
- After the first month
- Every 6 months of every 500 working hours

To detect a problem in the hub depending on the bearings, you should do the following:

1. Lift the wheel from the ground making sure that you are working safely.
2. Turn the the wheel in one direction and one in the other in order to detect the most resistant points.
3. Finally, give the wheel a quick rotation in order to hear noise, vibration and shocks.

If it finds the deterioration of a bearing, it is good to change the set of bearings and seals, and using only original spare parts TVZ.

On the contrary, to verify the clearance between the bearings, using only a equipment suitable and properly dimensioned lift the axle until the wheel touches the ground. After releasing the brake, having previously made sure that the vehicle stands still and stable for the whole duration of the operation, by using two levers between the tire and the ground, rock the tire.



Make sure the clearance does not come from the suspension or the articulation of the steering axle (if there is any).

When you notice the presence of clearance, lift the axle until the wheel touches the ground, using only equipments suitable and properly sized, by proceeding as shown on the next page.

Proceed as follows:

1. Place in safety the vehicle on which you are working
2. Lift the axle until the tires touch the ground.
3. Disassemble the cap from the hub.
4. Place the cap in a clean place where it not going to be contaminated with dirt.
5. Remove the elastic pin from the crown nut.
6. Place the pin in a clean place where it not going to be contaminated with dirt.
7. Screw the crown nut (right thread) in order to recover all the indoor clearance.
8. At this point the rotation of the crown nut is slightly braked.
9. Vibrate slightly the hub with the aid of a rubber hammer in order to release any forcing assembly.
10. Turn the hub, making sure that the turning is slightly braking.
11. Unloose the crown nut until you do not feel the friction of crown nut on the bearing.
12. Screw the crown nut in order to recover all the indoor clearance.
13. At this point the rotation of the crown nut is slightly braked.
14. Make sure the hole for the elastic pin on the spindle registers to a notch of the crown nut.
15. Turn the hub, making sure that the turning is slightly braking.
16. Replace the pin.
17. Replace the cap. If the cap has clamping screw, remembering to tighten the nuts crosswise by using the correct driving torque of 20-25 Nm.

It is recommended that, after removing the inserted cap to replace it as it could have lost the interference with the hub, with the risk that it slips off.

Note:

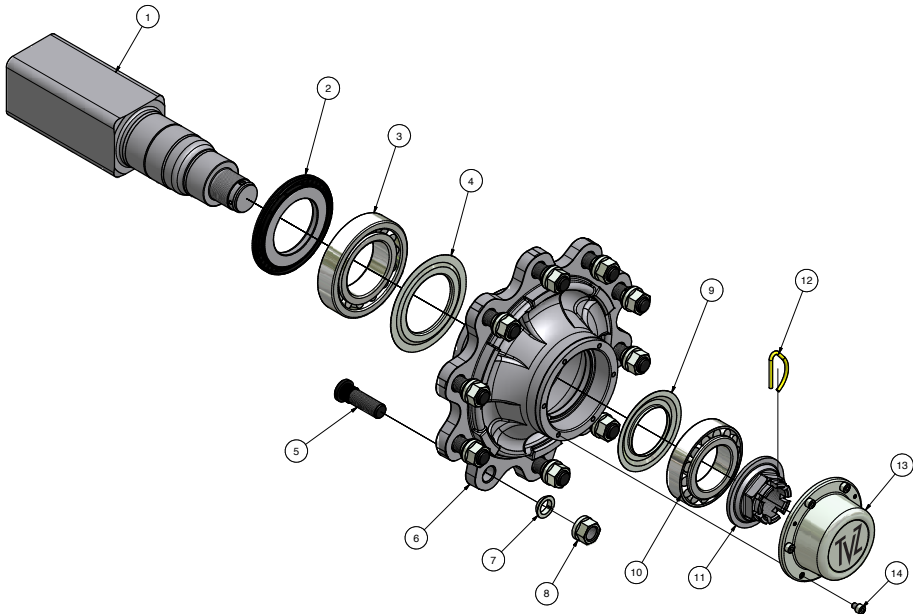
Some versions have an inserted cap.

Until the column M18x1.5, the standard nut is flanged without a washer.

If the hub is for twin-tire wheels, besides the washer there is also a closed washer. Some types of hubs have the agricultural seal.

Some types of hubs do not have the crown nut and the elastic pin but assembled with a self-locking nut.

If on the hub there is a grease nipple there will be no Nilos rings



POSITION	DESCRIPTION
1	Spindle / turned bar
2	Seal ring
3	Internal bearing (biggest)
4	Nilos for internal bearing
5	Stud
6	Hub
7	Washer limes (where foreseen)
8	Nut for stud
9	Nilos for outer bearing
10	Outer bearing (smallest)
11	Crown nut
12	Elastic pin
13	Cap
14	Screw for cap (where required)

GREASING OF THE BEARINGS

Under normal conditions make the greasing of the bearings:

- Every 2 months or every 1000 working hours
- At each change of the brake



In severe conditions of use you should reduce these intervals.

Use only lithium soap grease (recommended grease type MR180 / 2), never mix different grease in order not to endanger the life of the bearings.

All components of the axle involved in the operation (hub, spindle, crown nut, elastic pin, cap) must be completely degreased before reassembling the system.

The greasing of the bearings must be performed in a clean place and proper equipment because even the slightest impurity can lead to premature wear of the bearings, of the seals and the turned shaft.

During disassembly of the drums for greasing, check also the state of the soles of the brakes and of the return springs.

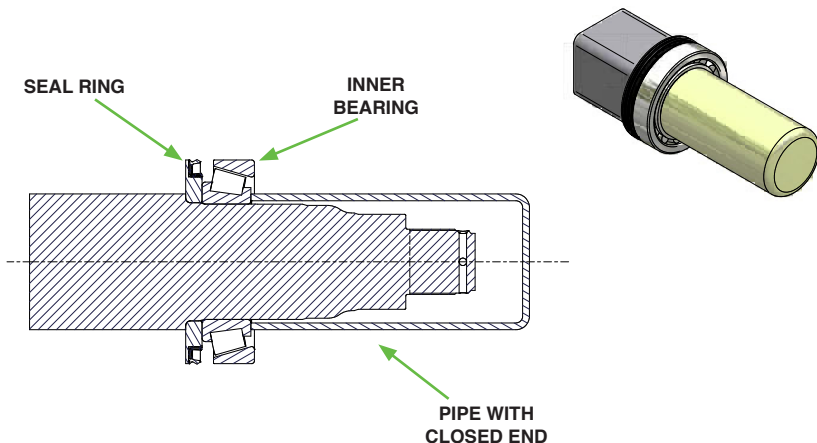
Operation for the disassembly:

1. Place in safety the vehicle on which you are working.
2. Lift the axle until the tier touch the ground.
3. Remove the wheel.
4. Release the brake.
5. Disassembly the cap.
6. Remove the elastic pin from the crown nut.
7. Remove the hub / hub and drum by using, if required a puller. The bearing races, internal sealing screens (Nilos) if foreseen, the kern with the outer bearing cage come all out together. Check this pieces.
8. Withdraw from the spindle the kern with the inner bearing cage by using a puller if necessary.
9. Check the condition of the seal ring ledge on the bar of the spindle, replace it if necessary. Note the position of the lip of the seal before you remove it, then reassemble it correctly.
10. Inspect the bearing housing and the seal on the spindle, thread for the crown nut and reface with a cloth any burrs or dents.
11. Check that the surface of the crown nut with the external bearing is clean and in good condition.

LEAN AND GREASE ALL THESE PIECES WITH A SUITABLE PRODUCT

Operation for the reassembling:

1. Spread a layer of suitable grease on the spindle of the axle.
2. Reassemble the seal ring respecting the correct direction, the use of a closed tube at one end facilitates the positioning of the seal if this is of the industrial type.
3. Fill the seal ring with grease, if it is an industrial type.
4. Grease the core with the inner bearing cage (the biggest one), making sure that the grease penetrates between the rollers and the cage below.
5. Push in contact the sealing with the core of the inner bearing, it is important to prevent damage to the bearing cage, it is necessary to use a tube with a closed end as shown in the picture, the pin must be applied only on the race of the bearing, not on cage or on the rollers.
6. Spread a layer of grease of 15/20 mm on the ring nut of both bearings remained planted in the hub.
7. Fill also the inner shields (Nilos) if any.
8. Insert the hub / spindle in the hub + drum into the brake group keeping the all the assembly perfectly centered and well aligned, paying attention to insert the seal ring properly without damaging it.
9. Grease the core with the inner bearing cage (the smallest one), making sure that the grease penetrates between the rollers and the cage below.
10. Insert the core of the smallest bearing in the spindle by inserting it in the ring.
11. Screw the crown nut and proceed with the adjustment as described in paragraph adjustment of bearing clearnace on p. 20.
12. Lock the crown nut by inserting the pin.
13. Replace the cap.



REPLACING OF THE BEARINGS

The bearings which are not operating properly usually show easily recognizable symptoms such as:

1. Overheating
2. Noise during rotation
3. Vibration
4. Unrecoverable clearance
5. Difficult hub rotation

Whenever it is suspected that a bearing is not working properly, it is advisable to check and if necessary replace it.

A damaged bearing must always be replaced with another of the same type and size!

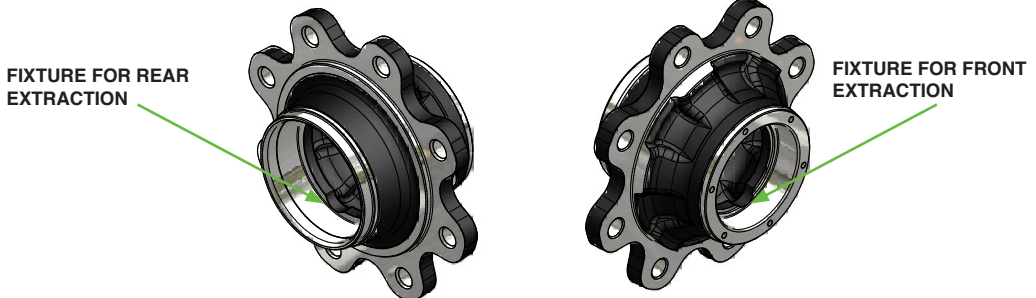
For axles that have the shielding between the bearings (Nilos rings), provide them with new shields, as the Nilos damage themselves by pulling the rings of the bearings fixed to the hub.

Remove the new bearings from the packing at the last moment and never mix them.

Remove the rings from the hub:

In order to perform the replacement of the bearings, it is necessary to proceed as for the lubrication of the bearings by disassembling the hub, and continue in the following way by removing the bearing ring from the hub:

1. The outer rings, mounted forcibly into the hub, can be pushed out from the fixtures with the help of a hammer and tool made of mild steel, using the housings provided on the hub as shown in the diagram.

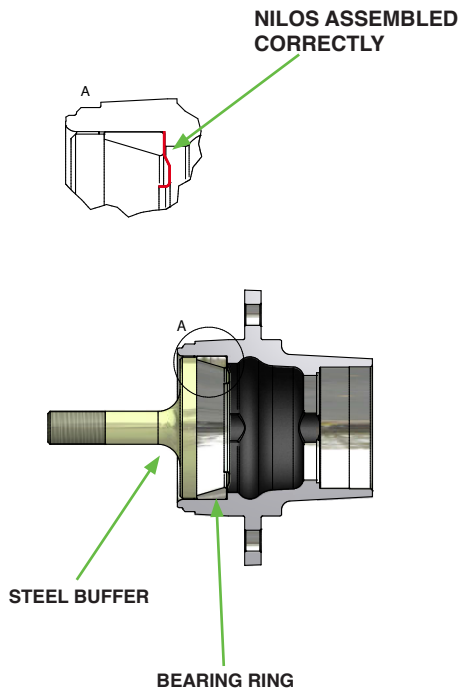


Reassemble the rings into the hub:

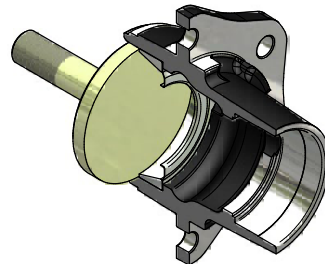
Pay attention to follow the orientation of the rings and the grease shielding (Nilos).

WARNING: Never insert the rings of the bearings into their fixtures by pushing on the cone section.

1. When the axle requires inner shields for the bearings, first place the Nilos into their fixtures, respecting the direction of the fitting, making sure that they are well centered and remain focused during the whole reassembling process of the rings. Check the alignment after placing the bearing rings.
2. Position and place the bearing rings with the help of a steel buffer as shown in the picture.



WARNING: The bulge of the Nilos should always face towards the inside of the hub, as shown in the diagram.



THE BRAKE BEARING RING - MAINTENANCE AND TUNE UP

Carry out a functional check of the brakes:

- After the first loaded trip
- Check the tightening of the nuts belonging to the blocking pin, the fixture of the elastic pins and the retaining pin strains, the attachment of the spring pins and snap rings.
- Check the mounting of the (actuators) activators of the brake levers and any return springs, check both the cylinder forward and backward stroke, making sure that the service brakes and those for parking are working.
- Look for oil leaks or air in the braking systems

CLEARANCE CONTROL AND BRAKE CONSUMPTION

- Brake wear is detectable when the cylinder stroke increases significantly.
- Check the thickness of the brake linings (see schedule for the minimum thickness of the gasket on page 28). The brake shoes must be changed when the linings have reached the minimum thickness.
- Check the cleanliness and good brake function.
- Grease the brake bearing camshaft inside the supports provided with grease nipple. Also grease in order to prevent grease coming into contact with the linings and drums.

Perform the same checks once on the road and after the first loaded route.

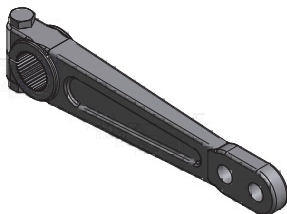
BRAKE ADJUSTMENT

Perform the brake adjustment:

- Before each field
- Every 6 months or every 10.000 km

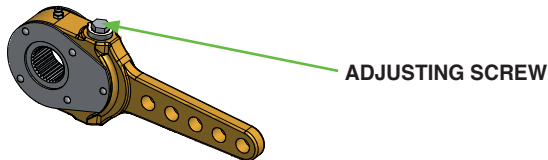
BRAKE ADJUSTMENT EQUIPPED WITH FIX LEVERS

For maximum brake system efficiency, the stroke line of the lever must be minimal in order to pull the brake.



The adjustment must be made when, pushing the brake lever in driving direction, an angle greater than 10° is made. To perform this adjustment, turn the lever with a cam of 1 or more teeth, so that the brake lever lowers compared to the attachment point of the cylinder, in such a way as to reinsert it into the cylinder, the shoes are opened, resuming the clearance. At this point, make sure that the brake shoes are not in contact with the drum, and the tire can rotate free (risk of brake overheating). It is very important not to change the position of the cylinder on the lever without the permission of the vehicle manufacturer because the vehicle was approved with this adjustment and the brake levers have more holes. Please respect the original position.

BRAKE ADJUSTMENT EQUIPPED WITH ADJUSTABLE LEVERS



For the maximum efficiency of the braking system, the stroke lever of the lever must be minimal in order to pull the brake. The adjustment must be made when, pushing the brake lever in driving direction, an angle greater than 10° is made.

To perform this registration turn the cam in comparison to the lever, by acting on the adjusting screw which is located on the lever being adjusted.

Verify that the brake lever lowers in comparison to the attachment point of the cylinder, in this way, not being able to move the cylinder, the lever rotates the cam by opening the caps, thus resuming the clearance.

At this point, make sure that the brake shoes are not in contact with the drum, and the tire can rotate free (risk of brake overheating).

It is very important not to change the position of the cylinder on the lever without the permission of the vehicle manufacturer as the vehicle was approved with this adjustment as the brake levers have more holes. Please respect the original position.

CHECKING AND REPLACING THE BRAKE MASSES

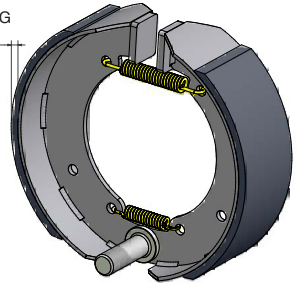
Carry out the wear and tear check of the brakes:
Every 2 months of every 1000 working hours

The brake shoes must be changed when the minimum thickness of the lining is reached.

Take advantage of this operation to renew the grease in the hub bearings (in accordance with paragraph concerning greasing the bearings, p. 22).

See paragraph: Adjusting the clearance of the hub and the greasing of the bearings for the disassembly and reassembly of the wheel hub including the greasing and clearance adjustment of wheel bearings.

THICKNESS
OF THE LINING



MINIMAL THICKNESS OF THE LINING

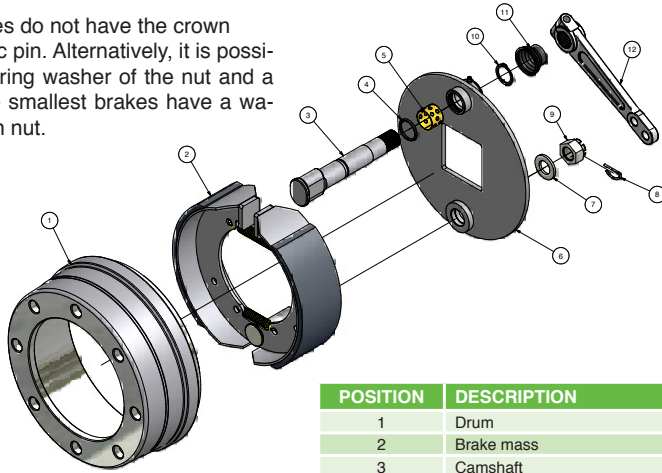
Brake type	Dimension (Diameter - width) of the brake mass	Minimal thickness of the lining
20M	200x40	2
25M	250x60	2
30M - 30G	300x60	2
35G	350x60	2
35S	350x80	2
30S	300x90	2
310S	300x100	5
314S	300x135	5
40G	400x80	2
406A	406x120	5
414A	406x140	5

During the audit, every part of the brake should be inspected:

- Check and wear of the drums.
- Check the camshaft and brake levers.
- Check the flange brass (depending on the model).
- Check the guards (depending on the model).
- Check the return springs of the jaws.
- Check and fixing of the blocking pins (depending on model).
- For the shoes equipped with rollers, control the rotation and moderately lubricate the axis of the roller.

Worn pieces or malfunctioning must be replaced.

Note: Some brakes do not have the crown nut with the elastic pin. Alternatively, it is possible to find a securing washer of the nut and a hexagon nut. The smallest brakes have a washer with hexagon nut.



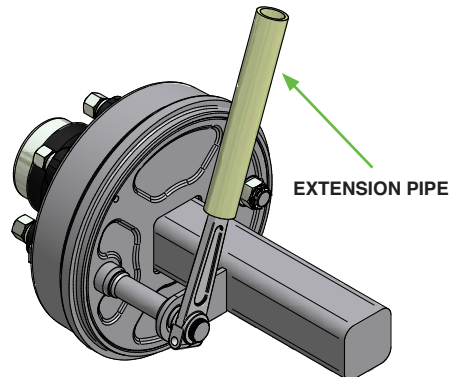
Warning: is extremely important not to vary the type of break lining, including both material and fixture of the brake shoe to the shoe (glued or riveted). variation of brake shoes can compromise the vehicle approval

POSITION	DESCRIPTION
1	Drum
2	Brake mass
3	Camshaft
4	Internal seal ring (where foreseen)
5	Bearing brass (where foreseen)
6	Flange shoe holder
7	Washer for the blocking pin
8	Elastic pin for the blocking pin
9	Crown nut for blocking pin
10	Seeger ring
11	Guard (where foreseen)
12	Brake lever

During the reassembling, spread the supporting surfaces of camshaft and the shoes lightly with graphite grease, paying attention that grease does not come into contact with the drums and the lining of the brake blocks. During these operations it is advisable to wear new, uncontaminated gloves. For brakes equipped with block pin, proceed with the centering of the (shoes) before locking the nut of the pin: after fitting the hub with drum and the brake, leaving the nut of the pin loose, manually set the brake lever in the correct direction (thrust direction of the cylinder). In order to facilitate this operation, use a braided hose on the lever as shown in the diagram, so that the shoes make contact with the drum.

At this point tighten the nut of the V-brake, keeping the brake lever pulled.

Finally, insert the elastic pin that prevents the loosening of the nut.



Steering Axles_Maintenance Schedule

The tire wear represents, in percent, the highest share of operating costs. The responsibility of this wear must be assigned to last axle of the suspension that, if fixed at every bend, must follow the trailer trajectory forcing the tires to raze the asphalt. In addition during the bend, the chassis and the suspension stiffen excessively and involves increased wear to the whole vehicle.

This is avoided thanks to the use of one or two (tridem suspension) self-steering axles, in which case the wheels and also the tires rotate perfectly, the suspension steers around a corner and follows the trajectory of the tractor.

Compared to a fixed axle, the steering axle is composed of a beam fixed onto the frame either directly or through a suspension by two hinges, which rotate around a pivot.

It is equipped with one or more dampers which have the function to eliminate the parasitic motions and to stabilize the vehicle, and a steering bar that allows the adjustment of convergence of the tires that is carried out, depending on the model, with the bar rotation (connection bar with the right and left threaded ends on SQR axle) or with the symmetrical rotation of the eccentric pins which fix the steering bar with the hinge (SQR light axle), of one or two cylinder clamps which if operated straight prevent the axle steering before making the reverse motion.

MAINTENANCE AND ADJUSTMENT

All the maintenance mentioned for the axles remains valid to which must be added the following:

GENERAL CHECKOVER

Carry out general checks:

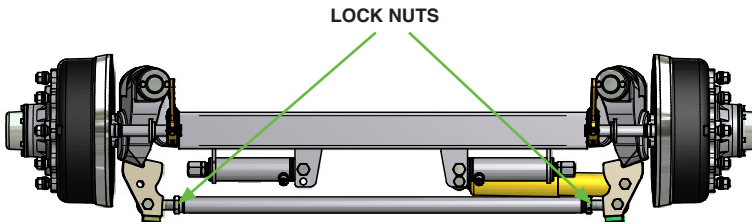
- Before each field
- Every year
- Grease all points provided with lubricator.
- Check the tightening of nuts on all components fastened onto the steering axle (braking cylinders, cylinder clamps, shock absorber, steering bar, etc. ...).
- Check the blocking of the lock nut of the cylinder clamps (where present).
- Check the clamp of the steering bar.
- Check the status of the silentbloc of the steering bar and the shock absorber.
- Check that the steering bar has not been accidentally bent, as this would cause the non-convergence of the wheels.
- Check the correct position and the locking of the adjusting screw of the steering angle.
- Check the clearance of the tapered pivots as shown in relevant paragraph.
- When the axle becomes unstable you should check the shock absorber. The presence of oil traces is not a sign of damage, however a copious oil leak, makes it unusable. To check the shock absorber, it is necessary to disassemble it manually and move it by hand for its entire stroke. On opening and closing, if the resistance is weak, it should be replaced. The shock absorber should be replaced even if it is heavily dented and even if there is no oil leak.

- Observe the orientation of the shock absorber which are an indication of the part that must be turned upwards through an special label.
- Look for and correct any leaks in the braking system and in shock absorbers. Warning: Before working on the hydraulic or pneumatic circuits, take all necessary precaution, because the oil or air may be under pressure.

CHECK OF CONVERGENCE

Carry out the check of convergence:
Every 6 months or every 500 working hours

Steering axle with tie rod adjustable in length (SQR axles)



Before making this adjustment verify that the silencers of the steering bar are in good condition, otherwise replace them.

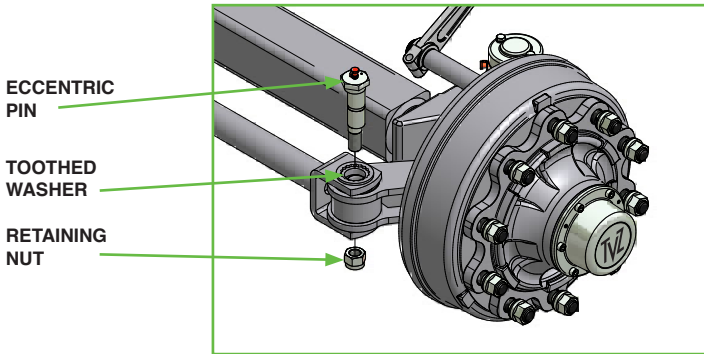
Put the vehicle and the steering axle in line on a flat and perfectly level surface. This operation should be done with the reentered cylinder clamps (rod back into the casings of the cylinders).

- Measure the distance between the front tires and then the rear ones, in comparison with the driving direction: find the same value or the measurement forward which can be up to 3-4 mm less than the one at the back. Never have the front tire distance greater than that at the rear.
- Make a quarter turning of the wheels on the vehicle and check again (this to discover any deformation of the wheels or tires). If the adjustment is not correct, proceed as follows:
- Place the vehicle on which you are working in a safe position.
- Lift the axle until the tire touches the ground.
- Make sure that the cylinder clamps have the stems in their original position.
- Loosen the two lock nuts of the steering bar.

Turn the connecting rod to open or close the wheels until the correct value is obtained.

- Tighten the lock nuts vigorously once the setting is achieved, then proceed with the adjustment of the cylinder clamps as described in the paragraph on p. 32.

Steering axle with tie rod with eccentric pins (axles SQR light)



In this case, the convergence adjustment is made by turning the eccentric pins placed at the ends of the tie bar, so that they are in a symmetrical way to each other and reinserting in the special toothed washer which fixes the position, once the adjustment is performed.

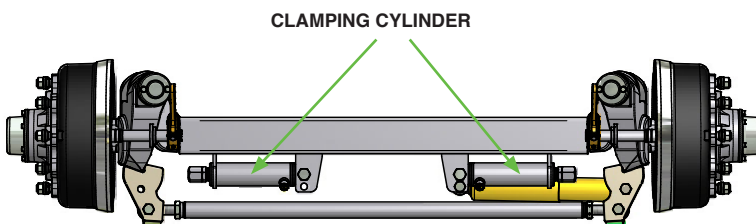
To do this, loosen the retaining nut of the centric pin before removing it and are able to turn it. Proceed with the adjustment as mentioned in the above paragraph. Make sure that you fix the nuts once the correct setting is obtained.

ADJUSTMENT AND MAINTENANCE OF CYLINDER CLAMPS

Carry out the adjustment and the maintenance of the cylinders:
Every 6 months of every 500 working hours

ADJUSTMENT AND MAINTENANCE OF CYLINDER CLAMPS ON SQR AXLES

The cylinder clamps, when activated, straighten and prevent the steering of the axle before carrying out any rear movement. These are also useful when travelling on gradients or very irregular roads



Periodically check the tightness of the nut and lock nut.

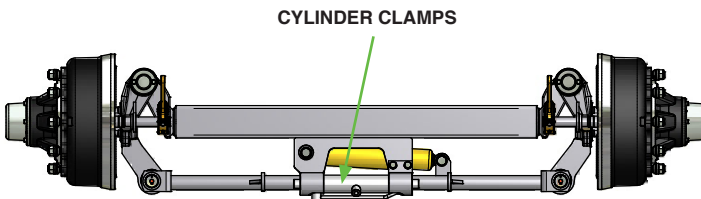
For the adjustment of the cylinders follow the following instructions:

- Tighten the lock nuts and nuts on the rod so that they may go as close as possible to the body of the cylinder.
- Put the vehicle and the steering axle in line on a flat and perfectly level surface.
- Put and keep the pressure in the cylinders, at this point the rods can come out.
- Keep on unscrewing the nuts on the rod, so that they go without forcing against the hinge of the steering.
- Bring the lock nuts against the nuts.
- Tighten the lock nuts vigorously.

The maintenance of the cylinders clamps consist in keeping them clean, especially the surface of the cylinder rod.

In case of leakage from the seals, the cylinders must be replaced.

Warning: Before working on the hydraulic or pneumatic circuits, take all necessary precaution, because the oil or air may be under pressure.



ADJUSTMENT AND MAINTENANCE OF CYLINDER CLAMPS ON AXLES SQR LIGHT

The maintenance of the cylinders clamps consisting in keeping them clean, especially the surface of the cylinder rod.

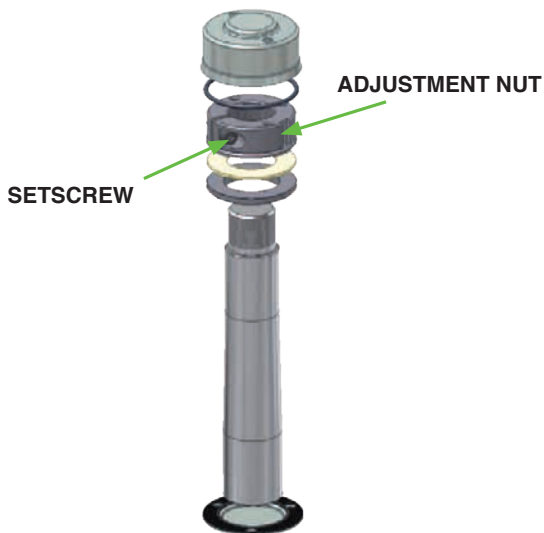
In case of leakage from the seals, the cylinders must be replaced.

Warning: Before working on the hydraulic or pneumatic circuits, take all necessary precaution, because the oil or air may be under pressure.

CLEARANCE TAKING UP OF THE TAPERED PIVOT

Carry out the clearance adjustment of the tapered pivot:

- Before each field



Every year and before every field:

- When the clearance is not between 0.5 and 2 mm check it and restart.
- Remove the two screws, the washers and the top cap.
- Loosen the setscrew of the adjustment nut.
- Adjust the clearance by acting on the adjustment nut.
- Lock the adjustment nut with the setscrew and replace the top cap.

NOTE

Driving torque for adjustment nut: 240 Nm

Driving torque for setscrew: 70 Nm

Driving torque for cap screw on the steering SQR Light (M8x1.25): 20-25 Nm

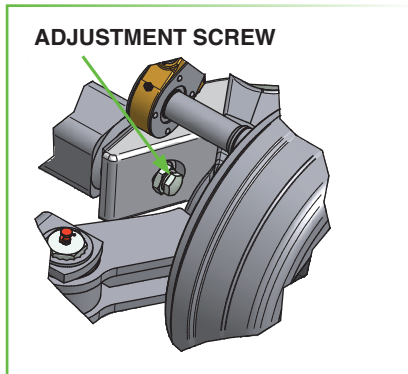
Driving torque for cap screw on the steering SQR (M10x1.5): 40-50 Nm



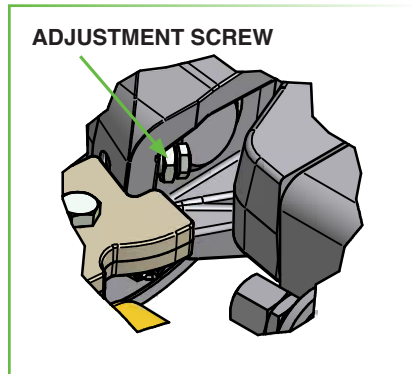
ADJUSTING THE STEERING ANGLE

Carry out the adjustment of the steering angle:

- Before each field



ON THE SQR LIGHT AXLES



ON THE SQR AXLES

Keep control of the steering angle of the axle act on the adjusting screws, thus avoiding that the tires (sometimes large in size) knock the chassis of the vehicle.

To verify this registration of the axle, steer in depth both right and left, making sure that the tires do not touch with any part of the trailer or suspension.

To reduce the steering angle, unscrew the adjusting screws; to increase the steering angle, in which case, the screws, instead should be screwed.

Check that the lock nuts are always well tightened.

Bogie_Maintenance Schedule

NUT TIGHTENING + GREASING

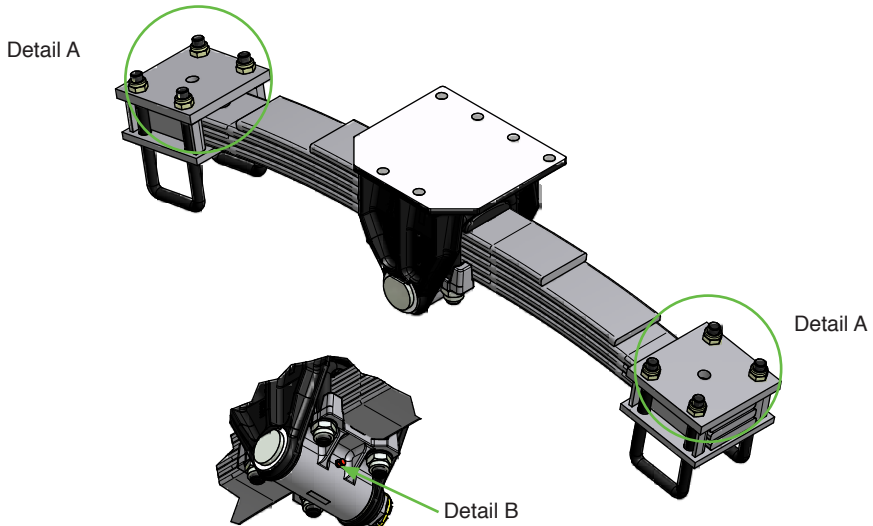
Carry out a check of tightening and grease:

- After the first loaded trip
- Before each field
- Every 6 months or every 500 working hours

Check:

- The driving torque of the nuts of the U-bolts or screws as shown in the table on p. 42. Tighten the nuts following the diagonals. (see detail A)
- In the case in which the saddle of the bogie is fixed on the frame by nuts (not welded), check for tightness.
- Grease the central pins placed under the saddle. (see detail B)

In the case of hard, intensive working conditions, or in a contaminated environments, reduce the time between these controls.



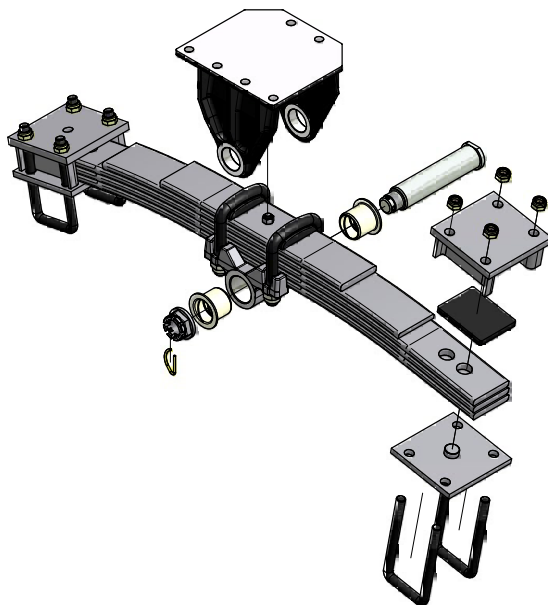
GENERAL CHECKOVER

Carry out general checks:

- Before each field
- Every year

In addition to what has been previously described, every year the following check should be performed:

- Check the clearance between the bushings and the pins of the central support, and for cases of excessive clearance worn components should be replaced.
- Visual inspection of the general state of the leaf spring, should be perfectly clean and inspected for eventual cracks.
- Visual inspection of the general state of the central supports, should be perfectly clean and inspected for cracks.
- When clearance is noted in the fixing area between the leaf springs and axles, check the status of U bolts / screws, rubber inserts and tie plates welded with the axle or of the welded housing that surround the leaf spring.
- After the last operation described, tighten the nuts of the U-bolts to the specified torque, see schedule on p. 42, following the diagonals.
- In case any damages are noticed, immediately replace the component or the damaged components.



Agricultural Suspensions_Maintenance Schedule

NUT TIGHTENING + GREASING

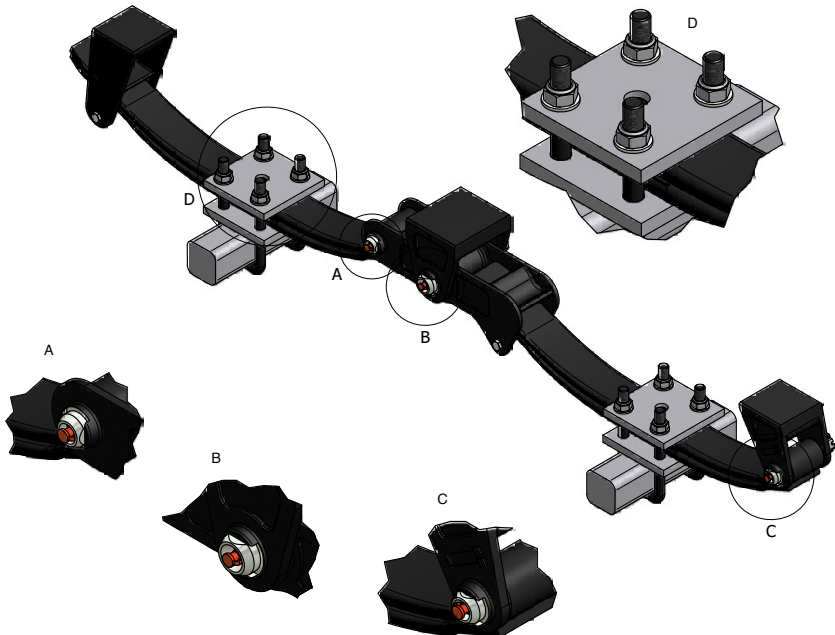
Carry out a check of tightening and grease:

- After the first loaded trip
- Before each field
- Every 6 months or every 500 working hours

Check:

- The driving torque of the nuts of the U-bolts as shown in the table on p. 42. Tighten the nuts following the diagonals. (see detail D)
- Check the tightness of all nuts in the suspension: supports, rockers and leaf springs.
- Grease the pins of the rockers and bolts of leaf springs. (see detail A-B-C)

In the case of hard, intensive working conditions, or in a contaminated environment, reduce the time between these controls.



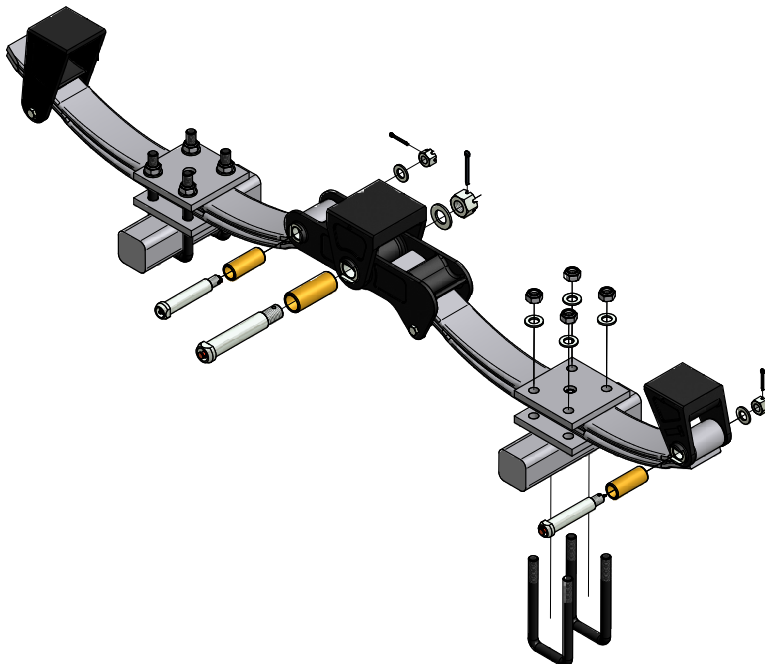
GENERAL CHECKOVER

Carry out general checks:

- Before each field
- Every year

In addition to what has been previously described, every year the following check should be performed:

- Check the clearance between the bushings and the pins of the rockers, in case of excessive clearance replace worn components.
- Check the wear of the supports and rockers in friction areas of the leaf spring, replacing the worn parts.
- Visual inspection of the general state of the leaf spring which should be perfectly clean and inspected for cracks.
- When the clearance is noted in the fixing area between the leaf spring and the axle, check the status of the U bolts / screws, that tie plates welded to the axle and the welded plates the are placed over the leaf spring.
- After the last described operation, tighten the nuts of the U-bolts to the specified torque, see schedule on p.42, following the diagonals.
- In case any damage is noticed, immediately replace the component or the damaged components.



Industrial Suspensions_Maintenance Schedule

NUT TIGHTENING + GREASING

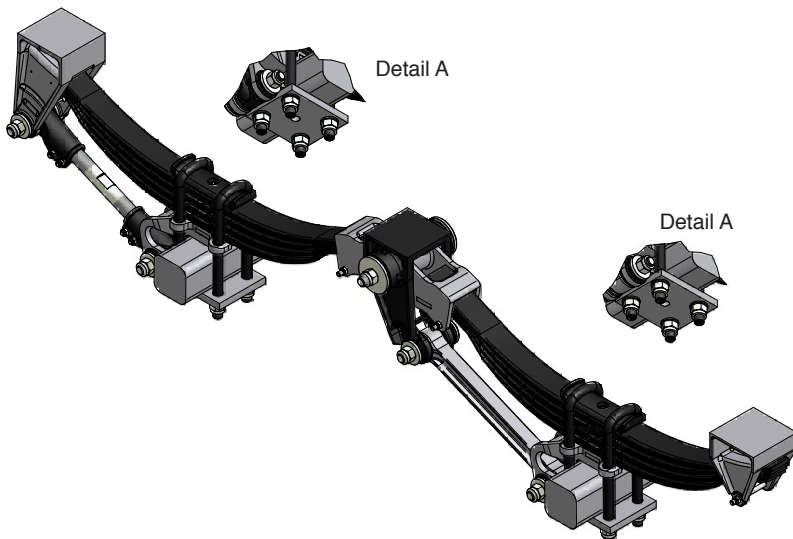
Carry out a check of the tightness and apply grease afterwards:

- After the first loaded trip
- Before each field
- Every 6 months or every 500 working hours

Check:

- The driving torque of the nuts of the U-bolts as shown in the schedule on p.42. Tighten the nuts following the diagonals. (see detail A)
- Check the tightness of all nuts in the suspension: supports, rockers, leaf springs and torque arms.
- Check the tightness of the torque arms by checking the correct position of the axles between them and between the trailer.
- Check the tightness of the conical silencer torque arms because the thrust washers should not touch the support. If there is any contact, the conical silentbloc need to be replaced.

In the case of hard, intensive working conditions, or in a contaminated environment, reduce the time between these controls.



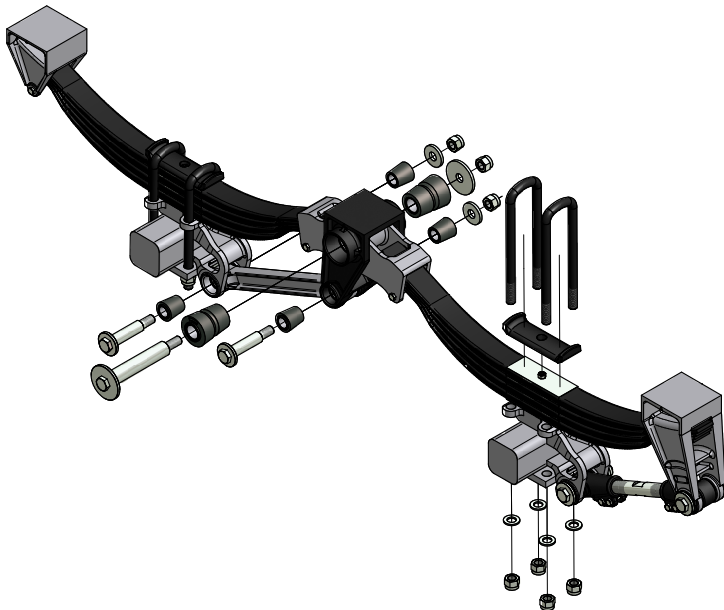
GENERAL CHECKOVER

Carry out general checks:

- Before each field
- Every year

In addition to what has been previously described, every year the following check should be performed:

- Check the clearance between the bushings and the pins of the rockers, in case of excessive clearance replace worn components.
- Check the wear of the supports and rockers in friction areas of the leaf spring, replacing the worn parts.
- Visual inspection of the general state of the leaf spring which should be perfectly clean and inspected for cracks.
- When the clearance is noted in the fixing area between the leaf spring and the axle, check the status of the U bolts / screws and tie plates.
- After the last operation described, tighten the nuts of the U-bolts to the specified torque, see schedule on p. 42, following the diagonals.
- In case any damages are noticed, immediately replace the component or the damaged components.



Driving Torque_Suspensions



U BOLT TYPE (mm)	DRIVING TORQUE (Nm)
18	230 - 280
22	450 - 500
24	550 - 600
27	600 - 650

WARNING:

The use of an impulse wrench is allowed only to disassembly the nuts. Absolutely avoid tightening the nuts with this kind of key because the torque cannot be controlled



Maintenance Schedule



		AFTER THE FIRST USE	AFTER THE FIRST LOADED TRIP	BEFORE EACH FIELD	AFTER THE FIRST MONTH	EVERY 6 MONTH OR 500 WORKING HOURS	EVERY YEAR	EVERY 2 YEARS OR 1000 WORKING HOURS
FIXED AXLES + STEERING AXLES	GENERAL CHECKOVER			X			X	
	TIGHTENING OF THE WHEEL NUTS	X	X		X	X		
	CHECK OF THE BEARING CLEARANCE			X	X	X		
	GREASESING OF THE BEARINGS							X
	GREASE COMPONENTS WITH LUBRICATOR			X	X	X		
	BRAKES MAINTENANCE AND TUNE UP		X					
	BRAKE ADJUSTMENT			X		X		
	CHECK OF THE BRAKE WEAR							X
STEERING AXLES	GENERAL CHECKOVER			X			X	
	CHECK OF CONVERGENCE					X		
	ADJUSTMENT AND MAINTENANCE OF CLAMPING CYLINDER					X		
	CLEARANCE TAKING UP OF THE TAPERED PIVOT			X				
	ADJUSTING THE STEERING ANGLE			X				
BOGIES	NUT TIGHTENING + GREASING		X	X		X		
	GENERAL CHECKOVER			X			X	
SUSPENSIONS	NUT TIGHTENING + GREASING		X	X		X		
	GENERAL CHECKOVER			X			X	



NOTES

T.V.Z. S.r.l. Assali & Semiassi

Via Taglie
25013 Carpenedolo (BS)
ITALY

Tel. +39 030 9699211

✉ info@tvzassali.it

www.tvzassali.it



ASSALI & SEMIASSI
AXLES & STUB AXLES

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ASSALI & SEMIASSI
AXLES & STUB AXLES

Agility
is our strenght

