GRANALU

User and maintenance manual

Thank you for using our Granalu user manual.

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GRANALU

1. Semi-trailer

1. SEMI-TRAILER

A semitrailer is basically composed out of 4 principal, simultaneously functioning component groups.

- Chassis
- Body
- Hydraulic loading/unloading equipment (tipping body or moving floor)
- Cargo protection system (tarpaulin, net).

This manual publishes in a detailed manner the user and maintenance instructions of each of these component groups, taking into account as well the semitrailer as a sole element in this guide.

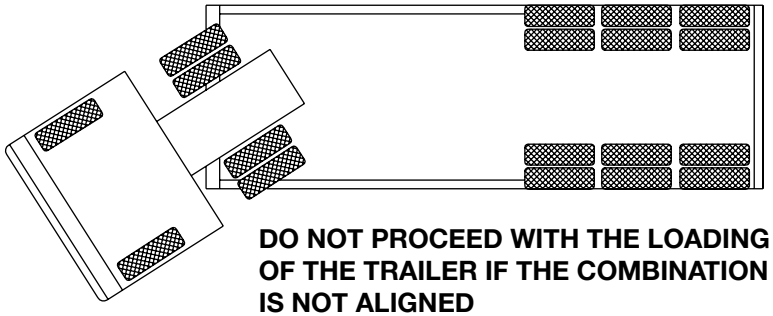
1.1 User instructions

The main function of a semitrailer is to transport cargo, no matter which kind. We can distinguish within five kinds of basic operations:

- Loading a vehicle
- Transport or drive
- Unloading a vehicle
- Couping operation
- Unclouping opertion

1.1.1 Loading operation

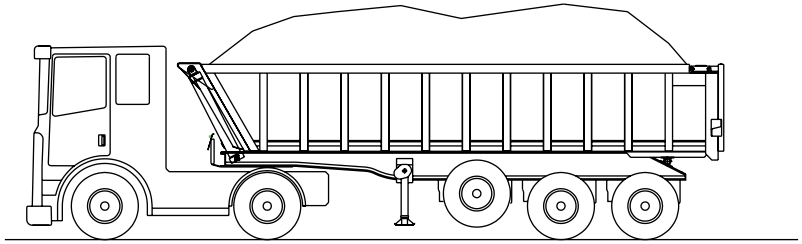
- Only proceed to load once the combination of truck and semitrailer are in a straight position and the brake has been applied.
- Loading has to be performed on a tide and levelled terrain.



DO NOT PROCEED WITH THE LOADING OF THE TRAILER IF THE COMBINATION IS NOT ALIGNED

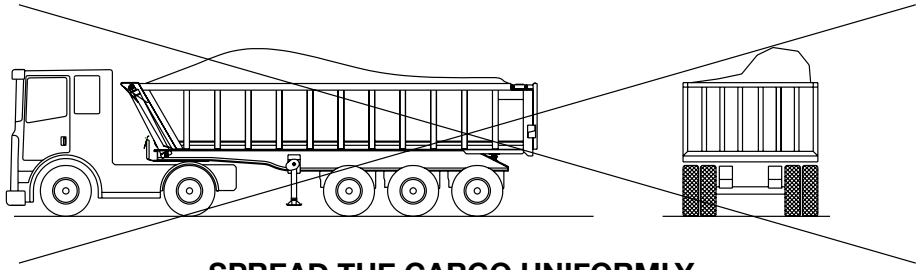
- All axles must have contact to the ground.

- Make sure that the locking of the tail gate is closed correctly before starting the loading.



ALL AXLES MUST HAVE CONTACT TO THE GROUND

- Spread the cargo uniformly.



SPREAD THE CARGO UNIFORMLY

- Avoid cargo compaction during work by shovel or other tools to press the cargo to avoid an uncontrolled overload.

- Do not let fall the cargo from high distances because the effect is like a vertical stroke on your vehicle.

- Don’t overload regarding the legal cargo limit established for this vehicle.

- It is not at all recommended to unload via de grain slide in case of overload by tipping approx. one piston rod until the desired tare weight. This can cause an over pressure on the cylinder and consequently dilate the cylinder pistons of greater diameter. This practice can also cause overpressure on the tail gate and cause damage. And it will happen even more likely if the vehicle is moved before the tipper body has descended completely.

1.1.2 Transport

Regarding the operation instruction we consider two possible situations: circulation with or without cargo.

Driving in loaded condition:

- Always keep all the axles on the ground.

- Make sure the tail gate is accordingly closed.

- Don't drive with elevated tipper body.

- Make sure the cargo protection element (tarpaulin) is closed.

- Check the correct fastening of the anti-vibration hook.

Driving empty:

- If the vehicle is equipped with an axle lift, you can use it if the legislation allows it.

- Make sure the tail gate is accordingly closed.

- It is not necessary to extend the tarpaulin.

- Check the correct fastening of the anti-vibration hook.

1.1.3 Unloading operation

- Perform unloading on a straight and compact ground.

- Maintain truck and semitrailer aligned and apply the brakes.

- The axles must be in contact with the ground.

- Make sure no obstacles are in the tipping way of the body.

- In case of security locks make sure they are open before the tipping.

- Open as well the security lock of the tail gate before tipping.

- If the vehicle is equipped with a pneumatic locking system, open it before tipping to avoid over pressure that can deform the tail gate.

- Open the cargo protection element according to the instructions in this book (cable tarpaulin, side roll covers…).

- Check the correct connection of the hydraulic pressure plug and the hydraulic return plug.

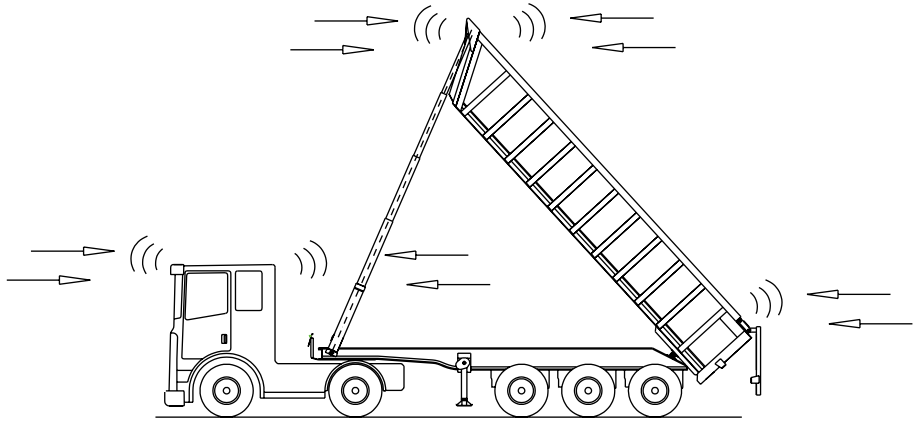
- Don't accelerate during the tipping. This practice can cause pressure peaks that can dilate the cylinder body, this damage is excluded from the warranty.

- Don't leave the tipper body lifted.

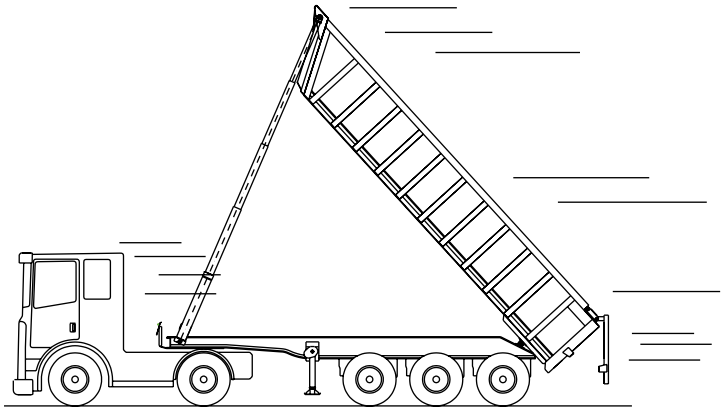
- Don't move the semitrailer while it is tipping, don't use the brakes abruptly to untighten the cargo from the floor. This kind of working procedures cause a high overturning risk and cause lateral pressure on the cylinder that can cause deformation by cylinder piston flexion. This damage is excluded from the warranty.

- If the cargo is not flowing, don't move the vehicle with elevated body. First lower the tipping body completely then move the trailer the necessary distance and then continue the tipping process. Avoid the door sticking in the pile meanwhile the tipping process to prevent the tail gate and hinges from any structural damages.

- Don't move the vehicle with a lifted tipping body, always wait until the body has completely descended and the anti-vibration hook is fixed before starting to drive.



DON'T MOVE VEHICLE DURING THE TIPPING



DON'T DRIVE WITH AN ELEVATED TIPPER BODY

1.1.4 Coupling operation

- Make sure the semitrailer is braked.

- Make sure the king pin is correctly greased.

- Before beginning the approximation, check that the distance between ground and king pin plate of the semi-trailer is equal or more to the height of the fifth wheel plate of the truck. The height of the semitrailer is adjustable via the landing legs and the height of the truck is adjustable via the air suspension regulation if available.

- Completely free the fifth wheel hook.

- Carry out the approximation in an adequate velocity until the coupling has happened between the king pin and the fifth wheel hook. Check the fixing is done in an correct way.

- Once the coupling operation is correctly executed the pneumatic plugs (2) have to be coupled, starting with the yellow line. The power plug and the EBS plug have to be connected as well. In case of existing auxiliary plugs (Axle lift, drive system tarpaulin,…) carry out their connection as well.

- Check via truck manometer that the pressure has built up sufficiently for the correct functioning of the semi-trailer components, before you start to drive the vehicle.

1.1.5 Uncoupling operation

- In case of carrying out this operation on an inclined ground it is recommended to place the trailer chock blocks and fasten the parking brake.

- Carry out the uncoupling of the connections between truck and semi-trailer. It is recommended to unplug first the red pressure line because the vehicle then will be braked automatically due to the security valve. It is necessary to check again if the vehicle is correctly braked before going on with the uncoupling operation.

- Extend the landing legs / support device until contacting the ground.

- Free the fifth wheel hook of the truck. Make sure the king pin is free.

1.2 Cargo

- Never load above the maximum authorized loading weight of the current legislation.

- The cargo should not exceed the height of the roof structure.

- Do spread the cargo as equally as possible.

- In case of point load never load it in the front of the semitrailer in the area of the neck of the trailer.

- If the cargo is an absorbing material, it has to be protected with the tarpaulin as it can gain weight considerably in combination with rain.

- Don't perform any abrupt manoeuvre whilst the trailer is loaded.

2. Tipping body

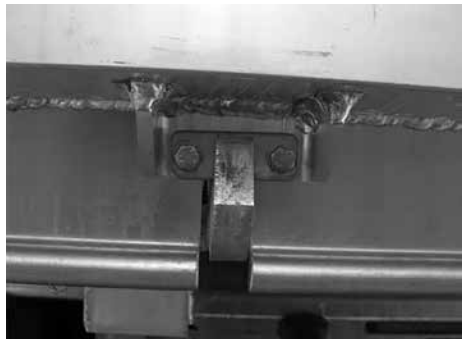
2. TIPPING BODY

In this chapter we describe the components of the tipping bodies, including user and maintenance instructions. The hydraulic components and tarpaulin are excluded and will be respectively treated in chapter 3 and 4.

2.1 User instructions

2.1.1 Tailgate locking system

- All the swinging tail gates are equipped with a locking system consisting of four hooks that engage with an end stop at the bottom profile and avoid its opening.



- The locks dispose of a security closure bolt to avoid any accidental opening. Make sure this bolt is out of the lock before opening the lock. There is a tube to fix the bolt when it is out of the lock.

- We dispose of different opening systems: Auto mechanic and manual pneumatic.

Automatic mechanic lock:

- The opening of the locks will happen automatically as soon as the tipper reaches a certain inclination. Also, the closure happens automatically when the tipper descends.

- The mechanic system installed for the operation of the bar lock consists of a clamp with a spring attached to the dumping shaft and to the lock, pulling at it as soon as the tipping body reaches the necessary inclination. As soon as the vehicle descends, the spring on the clamp ensures that the bar lock is pushed into the top end at the bottom profile.

The tension of the spring can be regulated by means of bolt and nut. It is not advisable to change the position of the bolt and nut to manipulate the port opening position as this is often a reason for problems with the bar lock reaching the end top.

- This opening system is standard in all Granalu tipping vehicles.

Manual pneumatic lock:

- The opening of the locks is carried out by activating the pneumatic system installed. This activation can be performed by means of a switch in the control box or via a pneumatic connection installed at the mounting support of the trailer sockets.

- It is possible to order the vehicle with an electric connection in the cabin to activate the locks.

- The opening of the locks is caused by introducing pressure into the air tank of the system and closure is caused by pressure release. This ensures the system keeps locks closed in case of loss of pressure.

- Due to the manual system, you have to make sure that the security closure plug is open before starting the tipping operation of a loaded vehicle. Of course, it is as important to check the closure of the tailgate before loading the vehicle.

2.1.2 Locks

- Besides the bar locks Granalu vehicles can be delivered with two other types of independent tail gate locks.

Butterfly fasteners

- The butterfly fastener consists of a threaded rod fitted at the frame of the rear door on which a hand lever is mounted to maximise the pressure on the end stop to increase the closure pressure.

- Open the hand lever of this fastener before the tipping operation.

- Make sure, before you close the butterfly fasteners that the washer is correctly positioned on the end stop of the tail gate.

- The closure rod can be taken out of its holder by removing the bar fitted on the spring to avoid damages by the cargo during the unloading procedure.

- This type of locks is usually mounted on vehicles with grain slides.

Lateral locks

- The function of lateral locks is to increase the punctual pressure of the vertical profiles of the tail gate on the frame of the body.

- They can be manipulated with a special key that you will find in the toolbox.

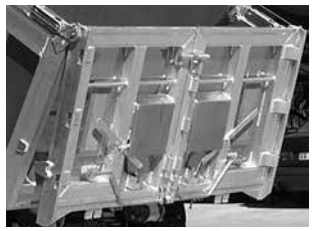
- Meanwhile those locks are open, they can be fixed by a bent rod fitted on the sides.

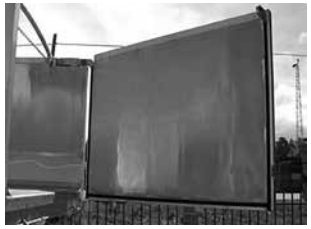
- Make sure the locks are open before starting a tipping operation with a loaded vehicle.

2.1.3 Tale gates

- To satisfy the needs of every vehicle we offer several types of tail gates depending on the turn of the opening.


Swinging tail gate


Combi door (door leaves and swinging tail gate)


Lateral opening


Door leaves


Door leaves with door lintel

Swinging tail gate

- The tail gate opens due to the turn of two hinges fitted on the upper profiles of both sides.

- If the vehicle is equipped with butterfly locks or lateral locks, they have to be opened before starting the tipping.

- The opening of the tail gate will follow the opening of the bar locks mechanically or manually by pneumatic opening system.

Combi doors

- This is the combination of both opening systems: swinging and door leave.

- This kind of tail gates is always delivered with butterfly locks to allow switching between the swinging and the door leaves.

- The swinging opening is similar to the swinging tail gate with the option of opening pneumatically or mechanically.

- In case of a swinging opening it is important to check that the door leaves are closed correctly and the butterfly locks are open.

The opening of de tail gate via door leaves is alike the opening of the door leave tail gate, whether with single of double espagnolette. The main difference is that the butterfly locks need to be closed before starting the tipping if you want to apply the door leaves opening.

Door leaves without lintel

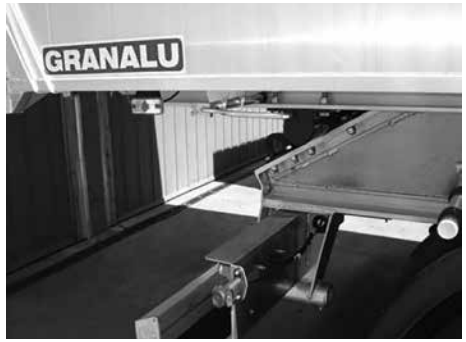
- The opening of this type of doors is via two door leaves that turn around vertical hinges. the espagnolettes that lock the door leaves need to be unlocked manually.

- Open the door leaves completely before starting to tip.

- First remove the safety bolt from the lever lock that fixes the espagnolette on the right-hand side. Press the lever to release the relevant espagnolette. Turn the espagnolette until the upper closure hook gets loose. Open the door leave completely using the door holder element to fix it. This could be a lever lock type or a set of door holders fitted laterally under the floor.

- Once you opened the right-hand door leave please proceed the same way with the left door leave espagnolette.


Latch closure

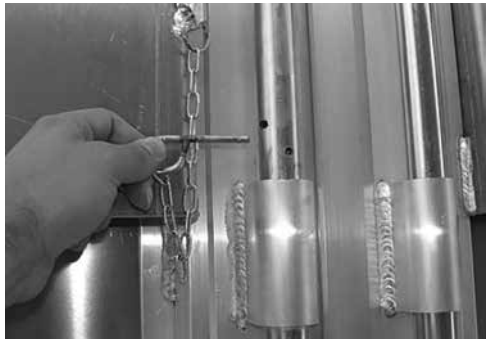


Open-door holders

Door leaves with a door lintel

- Vehicles equipped with a door lintel have a double espagnolette locking system for the door leaves that enables the opening via the door leaves when the lintel is fixed or to open laterally with the left door leave.

- The left espagnolette is equipped with a bolt that is inserted in a double hole in the espagnolette and enables to open both upper and lower locks simultaneously. If this bolt is out of the hole the turn of the espagnolette will only be transmitted to the lower lock and the lintel is forced to accompany the door leave during its trajectory.



- To open it maintaining the lintel fixed at the body, leave the upper lintel lock closed. Then open the right door leave using the espagnolette and once open fix it to the side wall. Open the left door leave by using its espagnolette with the bolt inserted in the hole. Proceed to fix this door leave as well at the side wall.

- If we want to open including the lintel, we need to release the upper lintel lock from the body. Then we open the right door leave like described before. Release the bolt from the left espagnolette, turn it until the lower lock is released then open the door and the lintel will open as well. Turn the espagnolette to its original position and insert the bolt before you fix the door at the side wall to avoid the upper lintel fixation to get loose.

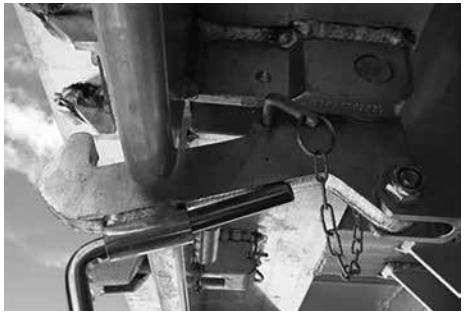
- For the closure of the doors just invert the opening indications.

Lateral opening system

- We offer the possibility to equip the swinging tail gate with a mechanism that allows lateral opening as well. This system consists of two bolts with sleeves on the right-hand side of the door and an extractable bolt mounted on the left upper hinge of the door.

- To open the door laterally we first need to insert the lower bolt in its place.

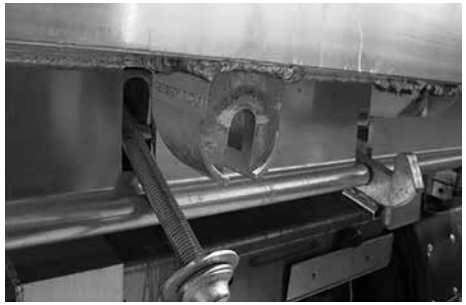
- Then open the lower locking of the door. If you are using a pneumatic system you can activate it. If your opening system is mechanic there is a tube welded at the bottom of the hook to open it by means of a rod until the safety bolt of the lock can be inserted in the open position. The golden key in the tool box can be of assistance.



- Release the pin R fixed over the rear bolt of the left door hinge. Subsequently turn it and remove it.




- Release first the left butterfly fastener and then the right butterfly fastener.




- Push the tailgate that will turn due to the bolts mounted at the right rear of the body allowing the door a lateral opening. The door can turn 270 degrees regarding its original position.

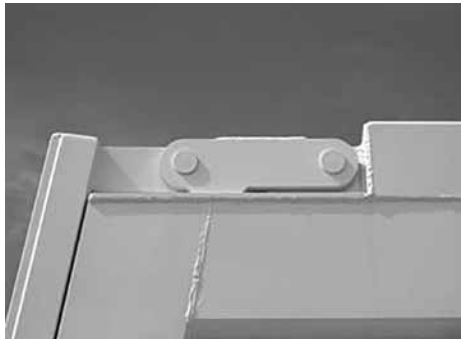
- As soon as the door has been opened it should be fixed to the side walls by means of the set of door fasteners.

- To use the tailgate as a swinging door, insert the bolt into the left upper hinge and remove the right lower bolt of the lateral opening system.

- It is not advisable to use the lateral opening system when the cargo is causing pressure on the door because it will open abruptly as soon as the butterfly fasteners are released.

2.1.4 Swinging door hinge

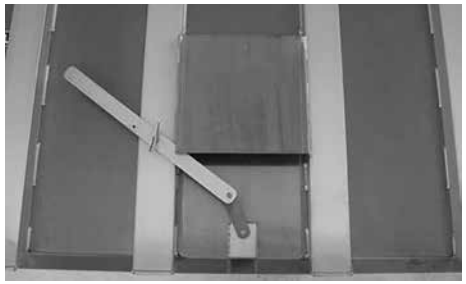
- The swinging doors are equipped with a double turn hinge system.




- During the tipping the pivoting will occur on the rear bolt of the hinge, the closest to the door. If the door faces resistance the second bolt will start to pivot preventing the door from damages. The turn of the second bolt is limited. If the door is stacking in a pile and the vehicle is tipping excessively the door and the hinge can be damaged considerably. It is important to monitor the tipping operation of vehicles equipped with these types of hinges.

2.1.5 Grain hatch

- The grain hatch is a tool to just release a small quantity of cargo without opening the tail gate.



Grain hatch

Butterfly fastener

- All the vehicles equipped with this option are delivered with butterfly fasteners.

- For the manipulation of the grain hatch the butterfly fastener has to be opened first, then pull the lever until the desired opening is achieved and fix by means of the butterfly fastener.

- The lever will be delivered with a drill hole for a padlock or any other security device.

2.1.6 Anti vibration hook

- All the tipping bodies are delivered with a hook in the centre of the floor which is designed to absorb the vibrations produced during the circulation of the vehicle.

- Prior to every tipping it is important to check that the hook has locked correctly.

- If the tipping is being executed on a sloped surface the hook will not be centred causing damages to the floor and to the hook itself.

2.1.7 Dumping shaft

- The dumping shaft is the component which supports the body during the tipping.

- In case of mechanical locking, they are equipped with 4 lugs on which the locking rods are fixed.

2.1.8 Sliding element

<u>Box – Tail gate</u>

- Two sliding blocks have been mounted on each of the tail gate sides as well as two stops on the frame to centre the tail gate after every tipping and to avoid openings of the tailgate during driving.

- A sliding system has been installed to centre the body on the chassis after tipping. There is a pair of sliding blocks screwed on the chassis and a pair of sliding blocks welded on the body.

- Tipping on sloped surfaces causes damages on the cylinder and sliding elements due to lateral pressures.

Sliding element door – body

Sliding element chassis - body

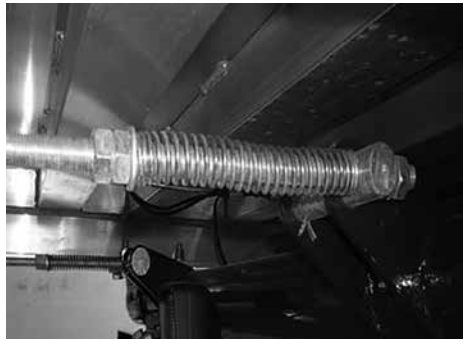
2.2 Maintenance instructions

2.2.1 Tailgate locking system

Automatic mechanic lock

- Check the screws of the mechanic lock are tightly fastened, specially the screws that ensure the spring tension. Fasten after the first month or after having performed 60 tipping operations.

- We advise as well to check the tightness of the locking holder.



Manual pneumatic lock

- Check the tightness of the screws in the pneumatic system after 60 tipping operations or one month time.

- Check there is no air leakage in the circuit.

2.2.2 Tailgates

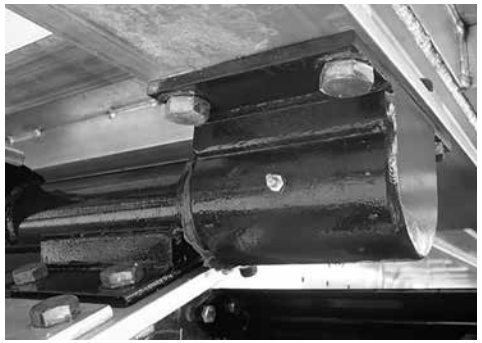
Door leaves

- The door leaves are equipped with greasers at the vertical hinges. Make sure the hinges are greased every 8.000 km or 3 months.

- In case of door leaves with swinging function it is advisable to open the door leaves and move the espagnolettes several times once a week if it won't be used for a period of time. This is important to remove possible particles that could obstruct the espagnolettes.

2.2.3 Dumping shaft

- The screwed sockets at the dumping shaft body have to be greased by means of their greasers every 8.000 km or after 3 months.



- After one month or 5.000 km check the torque of the screws of the dumping shaft, the ones fixed to the box and the ones to the chassis. This should be repeated every 6 months. The correct tightening moment is 425 Nm.

3. Hydraulic

3. HYDRAULIC

This chapter is about the box lifting cylinder and the pressure limiting valve. We also talk about the advisable requirements for a well-functioning tipping body.

3.1 User instructions

Granalu vehicles are equipped with two hydraulic connections that have to be correctly plugged before the tipping. One provides the oil pressure and the other one is for the return. We advise to plug in the connections correctly during the coupling of the trailer. Once connected and after the necessary tests mentioned below, you can proceed with activating the oil pressure supply and start with the tipping operation.

3.1.1 Recommended parameters for hydraulic installations

We describe as follows the recommended characteristics for a correct functioning of our hydraulic installations. In case of special vehicles or cylinders please look up the corresponding characteristics.

- Working pressure of the pump is at most 80l / min

- If present, the pressure relif valve will engage at 190 BAR with a direct return to the tank.

- Connection hoses supply and return have a diameter of 1“.

- Hydraulic connection plugs are type Fasten with 1 “.

- If the capacity of the oil tanks must be between 35% and 40% bigger than the max. working volume of the cylinder. A tank with 160 litre capacity will cover the requirements of all the Granalu standard vehicles.

- In case that the capacity is lower than indicated above, turbulences can occur in the oil and it can overheat. In addition, you run the danger of an air entry in the circuit due to the pump suction accumulating in the cylinder.

- Filter of the oil return.

- Filter at the tank entry.

- Tank cap equipped with an air filter for the necessary air suction.

Indication: In case of an undermount cylinder we don’t install an air limiting valve, but an automatic end stop valve. Only these cylinders need a working pressure of 325 BAR that should never be surpassed.

3.1.2 Hydraulic oil

The properties of the hydraulic oil employed for the hydraulic installation must be the following:

- Viscosity: Csta 40 degrees between 20 and 40.

- Flashpoint at 190 degrees C.

- Freezing point at -20 degrees C.

- Degree of cleanliness NAS between 8 and 9.

Different oils should never be mixed.

3.1.3 Pressure relief valve

- Granalu tipper vehicles are equipped with a pressure relief valve. This valve doesn‘t limit the way but only engages when the way back is initiated and the pressure level reaches 190 Bar.

- The hydraulic connections fitted on the valve are 1“ Fasten type. The male connection is for the pressure supply and the female connection for the return. We advise always this kind of plugs because other systems like the ball type plug didn’t perform correctly when it comes to overpressure. They close during overpressure and can cause a dilatation of the cylinders.

- The correct fitting of the plug is a requirement for a good performance.

- The pressure limiting valve will engage as soon as the supply pressure exceeds 190 Bar. In this case the required quantity of supply oil will be discharged by the return. If the return is not connected, the valve cannot function.

- The max. working pressure is 190 Bar. In case of very high pressures, the system can't release enough flow to protect the cylinder against overpressure.

- The hydraulic installations in the trucks reach sufficient pressure to tip at idle speed. If one accelerates during tipping, the supply is increased as well as the working pressure what can damage the cylinder due to dilatation.

- Never connect a tipping installation without knowledge of the working pressure. The working pressure should always be below the tare value of the valve, which is about 190 Bar to avoid the constant engagement of the return. This value should never exceed 200 Bar. Resulting damages like cylinder dilatation are excluded from warranty claims.

3.1.4 Telescopic cylinder

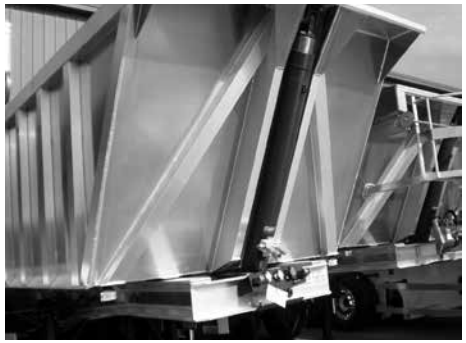
- Granalu vehicles are available with three basic cylinder types depending on the body. Bodies with an oblique front wall are equipped with a front cylinder, that pushes the upper part of the body. Bodies with a straight front wall are delivered with a frontal ram, pushing the front wall. Scrap bodies are equipped with an undermount cylinder that works on the underside of the floor.

- Cylinders should never suffer lateral load, like during a tipping operation on a slope or on an unsteady terrain, due to incorrect loading or by moving the vehicle meanwhile the body is lifted.

- Never leave the vehicle during the tipping operation.

- You have to be particularly careful when you are transporting a sticky cargo. During tipping a partial cargo can suddenly come loose causing overturning. To avoid this, auxiliary equipment can be useful to support the unloading of such kind of cargo. If no cargo emerges at an angle of 20 degrees, the tipping operation should be interrupted. The cargo should be unloaded without tipping because it is blocked.

Front end cylinder with outer cover



Front end cylinder with eye

Undermount cylinder

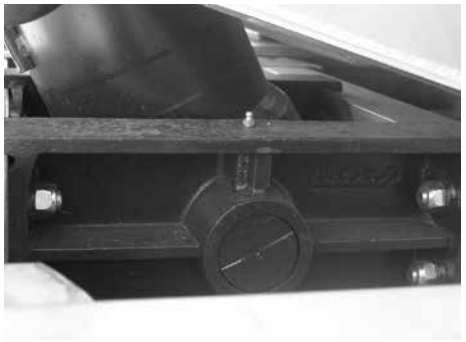
- Cylinder bodies should never be completely dry when they are extending. A thin layer of oil is required to protect the gaskets from the friction with metal

3.2 Maintenance instructions

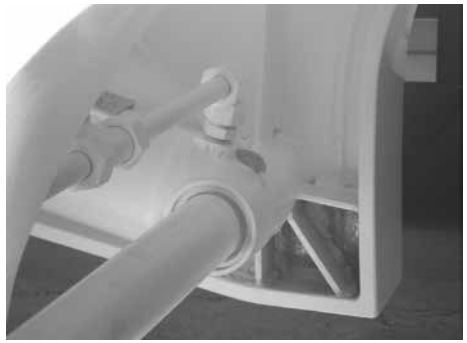
3.2.1 Generalities

- Check the screwed sockets periodically and the hoses that should not show cracks or strong abrasion. In that case they should be immediately exchanged. A rupture can cause severe accidents.

- The holder of the cylinder has to be greased every three months or 8.000 Km.



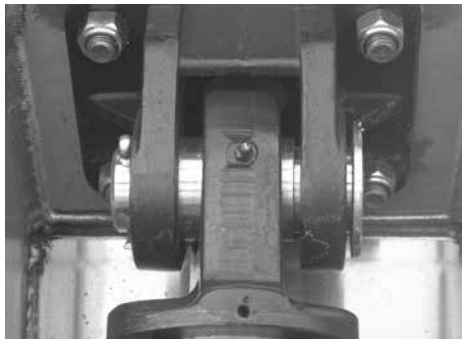
Lower pivot bearing of the front end cylinder



Lower pivot bearing of the undermount cylinder

During the process rests of fat and grease need to be removed. Grease nipples are available fitted above at the holder.

- The upper pivot bearings have to be cleaned and greased in the same time frame.



Upper pivot bearing of the front end cylinder

Upper pivot bearing of the front end cylinder

- The tight sitting of the screws of the lower cylinder holder should also be controlled after 5.000 km or within one month, later on every 6 months. If the screws get loose, the holders could lightly shift, decentralize the cylinder and cause major damages. The correct torque value is 210 Nm (M16).

Upper pivot bearing of the undermount cylinder

- The tight sitting of the screws of the upper cylinder holder should be controlled as well. The correct torque value is 210 Nm (M16).

- The tight sitting of the screws of the upper front end cylinder holder should be controlled as well annually. The correct torque value is 210 Nm (M16)

- Check the condition of the cylinder visually, possible oil loss, the appearance of scratches, the accurate cleansing of the cylinder body makes sure the lifting and lowering will happen in a controlled and even way.

- The cylinder is a primary component when it comes to tipping and that is why it is extraordinarily important to service it well and control it frequently.

3.2.2 Hydraulic oil

- Clean the supply and return filter of the hydraulic installation monthly .

- Keep the hydraulic oil clean (recommended degree of cleanliness NAS between 7 und 8).

3.2.3 Pressure relief valve

- Check and clean the connections of the hydraulic installation accurately prior to every coupling because that is the greatest dirt source for the hydraulic oil.

- We recommend to check the tare function and the correct performance of the valve one month after commissioning.

- Don’t manipulate/adjust the pressure controlling valve without authorization of the manufacturer.

3.2.4 Guide of incidences

Problem description	Actions to follow
In loaded condition the cylinder doesn't extend completely.	If the tare function of the valve is lower than the working pressure, the tare function has to be approximated to the working pressure value. Always below 180 Bar.
	If the value of the pressure relief valve is equal to the working pressure value, the vehicle is overloaded.
Rising correctly but during lowering always the same cylinder section suffers irregularities.	Check the nominal size in the centre of the tube. Possible expansion of the tube, due to high working pressure, water hammer, or improper use of the relief valve.
	If the measurement is the nominal one, the tube may be bent, due to excessive lateral loads.
Cylinder loses oil.	Check if the cylinder tube is broken, oil loss will then happen suddenly.
	If all the cylinder tubes are intact, probably the tightness is worn out. Oil will then appear gradually.
	If oil is appearing at a determined point of the cylinder tube, it is possibly a pore.
If during the descent the tubes do not follow the logical order (first the one with the smallest diameter) some of them are retained and a strong blow is produced when they are released.	There is a strong friction between the cylinder tubes due to poor greasing.
	Cylinder tube dilatation because of too much working pressure.
	Cylinder body bent due to excessive lateral load.
During lifting the body is always swivelling to one side.	The lower cylinder holders have come loose entailing a misalignment of the body.
	Cargo is not evenly spread with a constant one-sided overload.
The backflow of the pressure release valve doesn't work.	If the pressure of the tipping installation is lower than the tare function of the pressure release valve: System is functioning perfectly because the valve only engages in case of excessive pressure on the pressure release valve.
	Incorrect connection of the backflow screw joints.

4. Tarpaulins

4. Tarpaulins

Granalu vehicles are available with various types of tarpaulins, according to the customer's request .

4.1 User instructions

4.1.1 Generalities

- The tarpaulin has to be opened before unloading to prevent it from damages. This applies specially to vehicles with a double hinge system.

- If the tarpaulin is not opened, suction can occur during the unloading, damaging cross bows and side walls as well.

- Make sure the tarpaulin is correctly fixed before starting to drive.

4.1.2 Side roll cover tarpaulin

This type of tarpaulin opens and closes manually. It is equipped with a square rod, that is riveted into a tarpaulin pleat, rolls up the tarpaulin during its turning and opens the tarpaulin completely. There are tensioners fitted under the body that fix the tarpaulin once it is extended. There are several roof bows in the body to simplify the carriage of the rod from one side of the body to the other.

To roll up the tarpaulin

- Loosen the belts of the corresponding tensioners, that are located at the left underside of the body. Some tarpaulins dispose of longitudinal belts that are fixed with tensioners at the tail gate. In this case proceed as follows:

- Push the safety device of the fastener to the belt to loosen them and turn them into a horizontal position. In this position the tarpaulin belt will be loosen.

- Once loose, you can retrieve the belt completely.

- Also loosen the rubbers at the front wall and tail gate.

- Insert the crank handle located at the front wall into the tarpaulin rod and turn against clockwise direction.

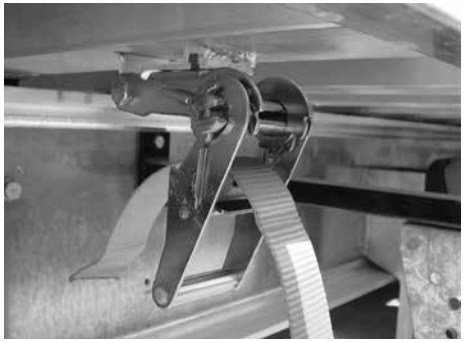
- Keep on rolling in the tarpaulin until it rests correctly on the 4 tarpaulin holders that are fitted at the right-side wall.

- Finally, the belts are also rolled in. Then return the crank handle to its holder.

To extend the tarpaulin

- Insert the crank handle into the tarpaulin rod and turn in clockwise direction until the tarpaulin is completely extended.

- Check that no pleats remain in the tarpaulin.



- Continue fastening the belts. It is important to avoid tarpaulin pleats on the cross bows because the tarpaulin rod can twist during the lashing. It is considerably more difficult to open and close the tarpaulin with a twisted tarpaulin rod.

- The fastening is explained with pictures as follows:

- For the fastening please proceed like on the pictures.

- Insert the belt in the back of the tensioner and pull until fastened. The remaining belt should be folded and clamped under the body to protect it from friction with the body. Apply the tensioner by pulling it until the required tension. Close the ratchet.

- Finally fix the rubbers at the front wall and the tail gate.

4.1.3 Cable tarpaulin

- The tarpaulin cable system consists of a tarpaulin with rods that glide on two cables. It disposes of two front sheaves, two front tensioners and two fasteners at the rear of the vehicle.

- A further option is a net chained up in the cables, movable with a single rod.

- The two logging winches in the front are to tension the cables.

- There is a hole in the last rod to place a chain or a string to move the tarpaulin.

- The front side of the tarpaulin, is mounted at the front wall by a rubber system to be able to disassemble it any moment.

4.1.4 Cabriolet type tarpaulin (Cramaro)

- It is a tarpaulin system that glides on the interface of the body by means of a mechanism consisting out of cables and wheels. It is operable manually by a rod, with a dual drive system or electrically by means of a switch at the chassis or using a remote control.

- Opening and closing of the tarpaulin are handled from the ground, no more climbing is required.

- The tarpaulin is equipped with hooks to be fastened laterally at the body by means of rubbers during the transport what we highly recommend if the tarpaulin is extended..

4.1.5 Tarpaulin on rails (Botero)

- It is a tarpaulin system which glides principally over the body by gliding cross bows on a laterally mounted rail system.

- The tarpaulin is moved with a crank handle mounted at the front.

4.2 Maintenance instructions

4.2.1 Side roll cover tarpaulin

- The only maintenance work required is keeping it in an acceptable clean condition.

- We recommend to renew the tarpaulin rod if it is twisted.

- Keep the belts well stowed between the ratchet during transport because the belts wear out due to the airstream

4.2.2 Cable tarpaulin

- Keep the cables tight to ensure its correct functioning.

4.2.3 Cabriolet type tarpaulin (Cramaro)

- Check the oil level of the upper drive in case of manual tarpaulins and also the lower drive if you are using a dual drive system every 3 months or after every 10.000 km.

- Keep the tarpaulin tight by means of the tensioner pulley fitted at the frontal holders. A loose tarpaulin can cause cable breakage because of clamping when it is pulled back.

- We recommend to retighten the system every 3 months or if the tarpaulin doesn't glide evenly on both sides.

- The cable tension has to be equal on both sides.

- In case of shocks on the roof bow system or twisted roof bows, they have to be exchanged as fast as possible to avoid clamping in the cable.

4.2.4 Tarpaulin on rails (Botero)

- Grease the frontal axle bearings every 6 months.

- The equal tension of the cable on both sides of the body should be checked If you face any abnormalities during the gliding or every 3 months. You can adapt the pressure by means of the tension pullies at the rear of the vehicle.

5. CHASSIS

Granalu builds two different types of chassis::

- Chassis out of aluminium.

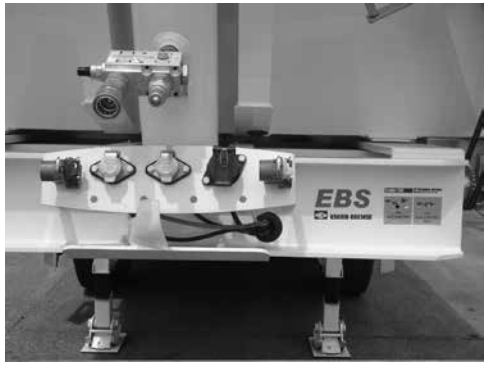
- Chassis out of aluminium with an undermount cylinder for the scrap transport.

Chassis out of aluminium

Chassis with an undermount cylinder

5.1 User manual

5.1.1 Connections



The vehicle is equipped with several system relevant installations that work pneumatically or electrically:

- Electric installation lights

- Electric installation acoustical warning system

- Electric installation brake anti blocking system (ABS/EBS)

- Pneumatic brake installation

- Pneumatic air suspension installation

- Electrical support installations (Brake wear, axle lift system, closure of tail gate, etc.)

- Pneumatic support installations (operation axle lift, closure of tail gate, etc.)

The trailer doesn't produce any electricity nor air, these are delivered by the truck which has to be equipped with connections accordingly.

Pneumatic connections:

- The chassis only has one entrance for compressed air supply (red coupling head).

- It is equipped with one further air entrance for the signal during brakes (yellow coupling head).

- Eventually there can be other air entrances for further support installations.

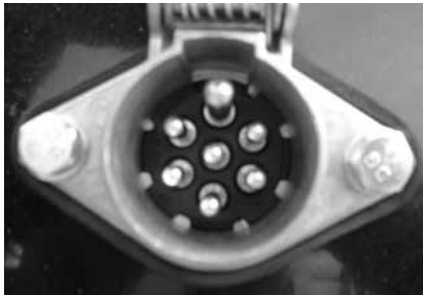
- If the connections are uncoupled, the entrance has to be blocked by folding down the closure cap to avoid dust or other objects from entering and causing damages to the system.

- Always connect the yellow coupling head first.

- Check it is connected correctly, there is no air leak and the pressure has built up correctly.

Electric connections :

- The vehicle is equipped with two power inputs with 7 PIN each and one more for the connection of EBS, ABS with 5 or 7 PIN accordingly.



- The black connector plug (24N-ISO 1185) takes care of supplying the brake lights, indicator, parking light, etc.

- The white connector plug (24N-ISO 3731) takes care of supplying the fog lights, reversing lights, support installations.

- The black connector plug ISO 7638 is applied to deliver power for the ABS or EBS Brake anti blocking system depending on the configuration. With 5 PIN it serves an ABS and with 7 PIN an EBS system.

- Other connections are possible for support systems like an electric roof.

- If they are not being used it is important to apply the spring fasteners, which are equipped with a sealing ring to keep those connections water tight. This is important to avoid sulphation.

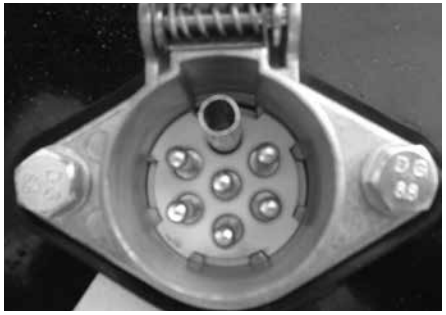
5.1.2 Electrical installation

- The electrical installation consists of plugs that are mounted on the socket plate, the respective cables, a connection box, the rear lights, the lateral, rear and front illumination.

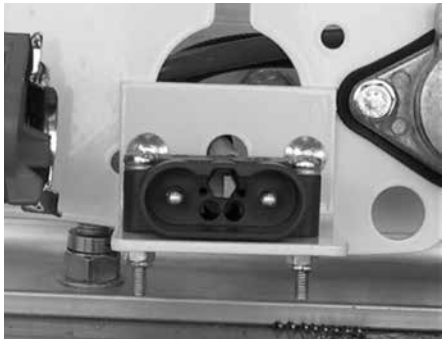
- In addition, support elements as electric lift axle or similar, which can be operated in the cabin by means of plug 24S ISO 3731.

- All tipping vehicles are equipped with an acoustical warning system which engages automatically during the tipping.

- The correct function lights has to be reviewed during every coupling.



Plug EBS (ISO 7638 – 7 pin)



Connection for an electrical cover

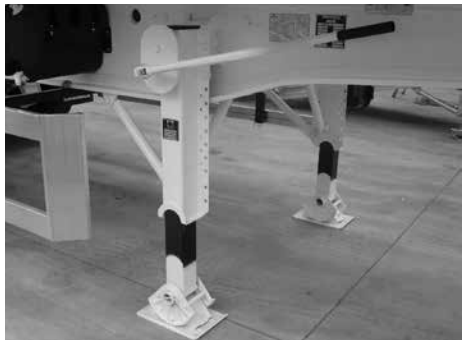
5.1.3 Landing legs

- All the vehicles are equipped with two height-adjustable landing legs to stabilize the trailer and reach the required height to couple / uncouple trailer and truck.

- Granalu vehicles are available with two different types of landing legs:

Out of aluminium and hand-driven or completely out of steel with a crank.

Aluminium landing legs



Landing legs out of steel

- The landing legs out of steel are operated by means of a crank fitted at the right-hand side producing the lifting and lowering by turning.

This mechanism offers two crank velocities.

- High velocity: pull the crank outside
- Slow velocity: push the crank inside

- Important note: Never use aluminium landing legs with a loaded vehicle.

5.1.4 Pneumatic brake installation

- The brake installation is supplied with the required air pressure by means of the red coupling head and stores it in the corresponding air tanks. The brake receives the signal to perform via the yellow coupling head. There is also power supply for the (ABS,EBS) brake support, depending on configuration, via connection ISO 7638.

Important note: the relevant plug for this function is ISO 7638 which has to be always connected to ensure a correct function of the brakes.

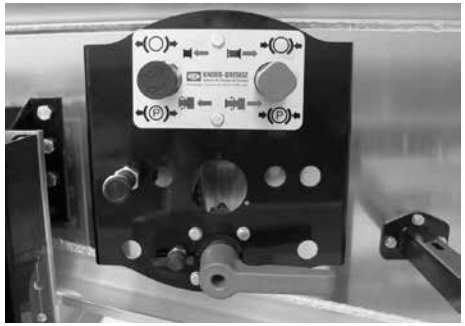
- When the driver activates the brakes, the signal is sent via the yellow coupling head and when required the brake support is activated.

- The brake force is controlled via the pneumatic drive and is proportional to the loaded cargo quantity

- If the pressure supply via the red coupling head is interrupted, it will be detected by the brake system which will cause an emergency braking.

- If the yellow Brake signal supply is interrupted, the air shortage will be detected by the truck and the chassis will suffer an emergency breaking.

- During the uncoupling of the red coupling head, the vehicle will be mechanically braked. By pushing the black button in the control box the air valve can be released without connecting the red coupling head.



Control box for the park brake and release.

Parking brake

- If the vehicle is parked the parking brake has to be always applied.

- To activate the parking brake you have to pull out the red button in the control box completely.

- If you want to release it you need to push in the red button completely. If there is a shortage of air pressure in the tank, the brake cannot be released.

Pressure connections

- The air pressure can be checked at two points of the air suspension system by means of a manometer:

  - Air tank pressure

  - Brake chamber pressure

5.1.5 Air suspension installation

- Every vehicle equipped with an air suspension installation has to dispose of the necessary air pressure to function correctly.

- The air for the air suspension is stored in an air tank, which is fed via the air tanks of the brake installation. In case of shortage of air pressure in the brake system, the air tanks of the air suspension will not be filled.

- The working height is determined by a levelling valve. If the working height has to be changed, then only in a workshop previously expelled by Granalu and only in the recommended height range.

Height levelling valve

- If vehicles are equipped with this valve you can adjust the air suspension height for small manoeuvres operating the control of the valve.

- The air suspension has to be always returned to its working height before you start to drive. We offer the option of a system that returns the vehicle to working height level as soon as you reach a certain velocity (reset to ride).

Pressure connection

- The pressure in the air bellows can be monitored by connecting a manometer to a pressure connection of the air suspension.

5.1.6. Axle lift

- The axle lift system is a mechanism that uses air from the air suspension to lift and lower one or more axles.

- You can activate it by means of a marked button in the control box or via the cabin if the truck is equipped with the option.

- In a loaded condition you should only use the axle lift for very low speed, never exceeding 10 km per hour.

- You can drive with a lifted axle lift once the vehicle is empty.

- If the vehicle is equipped with two axle lifts you should only lift one of them at time. If you drive with a lifted axle lift it should always be the first.

- We offer the option of two axle lifts controlled automatically via EBS depending on the loading condition of the vehicle. When the vehicle is being loaded the axle lift will lower automatically and stays down until it is unloaded. As soon as it is unloaded the axle lift lifts automatically and stays up until it is loaded again. The axle lift is manually operable depending on the manoeuvre, to support the traction and mobility. If the vehicle is loaded and the brake pedal is pushed three times in a row, the first axle lift will lift, after three more times pushing the brake pedal, it will lower again. If the vehicle is unloaded and the brake pedal is pushed three times in a row, all the axle lifts will lower, after three more times pushing the brake pedal, they will all lift again.

5.1.7 Lateral protection device

Our whole vehicle range is equipped with lateral protection devices, according to guideline 89/297/EC, which pursuits the security of unprotected traffic participants (pedestrians, bicycle drivers motor cycle drivers) protecting them from getting under the vehicle laterally.

Foldable lateral protection device

Firmly mounted lateral protection device

We offer two types of lateral protection devices:

- **Firmly** mounted to the chassis by means of two holders and four loops.

- **Foldable**, that can be fold down after removing two locating pins, to have a better access to the tool box.

5.1.8 Rear protection device

Granalu vehicles are delivered with a rear under ride protection device, according to guideline 2006/20/EC.

Telescopic underride protection

Foldable underride protection

Rigid underride protection

Depending on the type of vehicle we can deliver it with under ride protections in telescopic, manually foldable, automatically foldable and rigid execution.

Important note: If your vehicle is equipped with a telescopic underride protection, it is mandatory to extend it during driving. During the tipping it must be retracted to avoid a collision between the body and the protection.

Important note: If you are working with an automatic foldable underride protection it has to be folded up completely before the tipping because incomplete folding can cause a collision between the protection and the body and can cause considerable damages.

5.2 Maintenance instructions

5.2.1 Connections

- Whenever the pneumatic connections are uncoupled it is important to close them with the relevant protection caps to avoid the entrance of impurities that could prolong the braking time.

- Power connections have to be kept dry.

5.2.2 Electric Installation

- The electric installations don't need any specific maintenance. To be on the safe side, lights and possible support installations if available should be checked periodically to make sure they are working.

- Make sure the power connections are clean and dry to avoid the electric elements to sulphate.

- Whenever the connections are unplugged to check their condition or to exchange a part, verify they are correctly and completely plugged in to avoid any humidity in the system.

5.2.3 Pneumatic brakes and air suspension

- Clean the filters of the red and yellow coupling heads every 6 months.

- The pneumatic installation can get humid because of condensed water. The condensed water can be released periodically by means of the condensation drain, in form of a screw under the air suspension and brake installation tank. Water in the system can cause malfunction regarding the valves.

- Check the pneumatic circuit periodically to make sure there is no air loss, mind as well that no connections are damaged or twisted and that all the screw connections are connected well.

- Dirt can assemble on the pistons due to the wavering movements of the bellows during driving. This dirt works on bellows like sandpaper and leads to cracks and breaks. To avoid that, the bellows should be cleaned once a month by lifting the air suspension to its highest point and reaching the pistons easily.

5.2.4 Adjustment of the braking system

- This operation consists of verifying the difference between the brake signal via the yellow coupling head from the truck to the trailer and the pressure of the signal that is returned to the drive axle of the truck.

- The basic value for this variable depends on the brake system of the truck and the trailer.

- The regulation always has to take place in the truck and carried out by workshops, that are authorized by the manufacturer of the truck.

- A wrong regulation will lead to an excessive wear of the trailer brakes and even to a prolongation of the braking distance. You could conclude the trailer is pushing the truck.

5.2.5 Disc brakes

Regarding the disc brakes, we refer to the maintenance instructions of the axle manufacturer. Hereafter, a few basic specifications for the service of axles equipped with disc brakes.

- The brake lining wear should be checked every 6 months. Driving with a worn-out brake lining can damage the brake disc severely.

- The wear of the brake disc has to be checked once a year, make sure there are no cracks. The brake disc change has to be performed as recommended by the manufacturer.

- The motion path of the brake calliper has to be checked every 6 months.

- For greasing the hubs and exchanging sealings properly we refer to the recommendations of the respective axle manufacturer.

Important note: There is no braking loss during brake disc heating up, because a dilatation only nears the discs to the brake lining. That is why it's so important to check the brake linings of disc brakes.

5.2.6 Drum brakes

- We would like to refer to the maintenance instructions of the axle manufacturer as before. But hereafter some basic handlings for the maintenance of drum brakes.

- The brake lining wear should be checked every 6 months.

- The wear of the brake drum has to be checked once a year and proceeded as recommended by the manufacturer.

- The slag adjuster and the bearings of the camshaft have to be greased monthly.

5.2.7 Tightening Torque

- Several elements within the chassis components are mounted with screw connections. Check the tightness of all the screwed elements periodically, specially of the running gear system (axle and air suspension). We refer to the respective manufacturer.

- The following table shows the appropriate torque for the screwed chassis components:

TORQUE POINT	TIGHTENING TORQUE	PERIODICITY
Holder of Fixing block (M16)	210 Nm	**6 months**
Mounting of the axle lift (M12)	120 Nm	**6 months**
Screw connection of the king pin plate to the chassis (M12)	120 Nm	**6 months**
Screw connection of trailer base to the king pin plate (M14)	190 Nm	**6 months**
Screws for tire mounting (M22)	600 Nm	**6 months**

- Besides the periodicity and maintenance of the axles and air suspension we recommended to check all the screw connections after the first month working or after 5.000 km.

- We also recommend to check the tightening torque of the wheel screws after the first 50 km.

5.2.8 Axis alignment

- The axis alignment has to be checked every 3 months or 8.000 km.

- If you notice an increased wear of the wheels you should check as well the axis alignment. If the wear is normal, the alignment has to be checked only once a year.

- Every time you exchange leaf springs, brackets or similar parts, that influence the axle position, an alignment must be carried out.

5.2.9 Wheels

- The wheel pressure should correspond the pressure recommended by the manufacturer. Pressure values below or above the pressure value recommended by the manufacturer can lead to excessive wear, cause a brake prolongation or an increased fuel consumption.

- The wheel pressure should be checked regularly and it should be 9 Bar.

5.2.10 King Pin

- The king pin plate and the trailer base must be held in a suitable cleansing condition and have to be greased in appropriate manner.

- Make sure the screw connections of the trailer base are tightened every half a year. The appropriate tightening torque is 190 Nm (M14).

6. Moving floor vehicles

6. Moving floor vehicle

Standard moving floor

Moving floor with lifting roof

Moving floor with side doors

Moving floor for garbage transport

Vehicles equipped with a moving floor are employed to load and unload most diverse modalities such as pallets, bulk and solid residential waste.

Loading and unloading of this vehicle is based on the friction between cargo and the floor, consisting of easy gliding floor profiles.

Three hydraulic cylinders with double effect are responsible for the movement of the floor profiles, each cylinder moves a third of the floor profiles.

6.1 User instructions

Besides the general user activities there are some more instructions to follow for this type of vehicle.

- The hydraulic installation of the truck must be appropriate to ensure the moving floor works correctly. It has to correspond the requirements of the manufacturer. (Behold manual of the moving floor installation).

- It is important to never exceed the maximum conceded pressure value (210 Bar) and the maximum oil flow volume of (110 L/min).

- The minimum absorption capacity of the oil tanks is 150 L and they should be 80%/90% full. That means a minimum quantity of 120 L oil in the tank.

- A high-quality hydraulic oil has to be employed, suitable for a pressure of 210 Bar. The ISO viscosity must be 46, during low temperature periods 32.

- The hydraulic system of the truck must be equipped with a pressure limiting valve tared on 210 Bar. If these settings are under the value probably your vehicle is not performing correctly during loading and unloading. If these settings are over the value the installation could suffer damages.

- The quick couplings for this installation at the trailer are male for pressure connection and female for the return. That is why trucks must have a female connection for the pressure and male for the return.

User instructions for the moving floor installation

- The vehicle doors have to be opened before the pump is engaged.

- Check that nobody is under the vehicle before and during the manoeuvre.

- Make sure that nobody is in the loading/unloading area during the activity.

- The switch of the installation should be controlled during loading/unloading activities.

- Service and review activities may only be executed if the pump has been previously turned off.

- The pump should be turned off during driving or when the installation is not being used.

Commissioning the installation

- Open the doors of the trailer.
- Connect the supply and return quick pressure couplings.
- Turn on the position lamps of the truck to feed the installation with electricity.
- Turn on the power take of gear of the truck.
- Operate the button in the control box

Manual for incidences:

If you have any problems during operation of the equipment, this chapter can help you to solve them:

Description of the incidence	Action to follow
The floor doesn't move when you turn it on	Check if the position lamps are turned on, it delivers the electricity of the installation.
	Check if the power take of is working.
	Check the oil quantity in the tank.
The operation cycle starts but stops again directly.	Check if the mechanical stop of the threaded rod, that activates the shuttle valve is correctly adjusted.
	Check if the pump pressure is correct and if the valve, which influences commissioning and operation stop allows oil supply to the installation.
The moving floor works perfectly with no or little cargo but not with heavy cargo.	Check if the pump pressure is correct and if the valve, which influences commissioning and operation stop allows oil supply to the installation.
	Check if the mechanical stop of the threaded rod, that activates the shuttle valve is correctly adjusted.
The moving floor starts to move when the power take of gear is turned on, even before operating the switch.	Check if the hydraulic quick connection between truck and trailer is correctly connected. Pressure with pressure and return with return.

6.2 Maintenance instructions

The first service hast to be performed 6 hours after commissioning, then every 6 months or in case of frequent application, after 150 working hours.

- General Service of installation and floor:
    - Check the installation is not damaged.
    - Examine for oil leakage
    - Check if the installation is working evenly without any jerky impacts.
    - Verify the temperature. No part may be hotter than 70 degrees C. (You must be able to touch everything with your hand).
- Oil filter exchange:
    - Filter in the return line of the hydraulic installation.
    - Optional filter in the pressure line.
- Check the tightness of the cylinder holders:
    - The tightening torque of the screws must be 200 Nm regarding the cylinder holders.
    - The tightening torque of the flange screws of the threaded rod pro longation is 170 Nm.

For more detailed information over the function and operation as well as miantenance of the installation we refer to the instruction manual of the manufacturer, delivered with the vehicle.

7. Basic safety notions

7. Basic safety notions

- Security of the vehicle during the transport or the tipping operation is the user's responsibility. He is responsible as well for the execution of the required service activities to prevent the vehicle from damaging sooner and the vehicle guarantee from expiring.
- Before tipping make sure that no objects are in the tipping way. If the tipping body hits an electricity cable, the vehicle has to be left immediately without touching floor and vehicle at the same time.
- Don't start the tipping operation if you assume the vehicle is not in balance or could lose balance.
- If the vehicle loses balance, don't try to step out of the vehicle. It is recommended to stay in the cabin, on the driver's seat and hold to the steering wheel tightly.
- Put special attention on cargo with varying density because cargo with high density tends to unload faster than light ones. These stay longer at the floor and can cause a turning over.
- Never work under a tilted body without a support element to avoid sudden lowering.
- Don't try to move the body abruptly to shake the cargo out.
- Respect the common driving regulations

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8. General maintenance activities

8. General maintenance activities

In this manual we have talked about several testing and maintenance activities for different components of the vehicle, which have to be performed to ensure a correct function and prolonging the durability of the wear parts. In the following table we combine all the critical points of trailer maintenance. (The maintenance plan for axles and air suspension is exhibited in the manufacturer manual delivered with the trailer.

Part	First check	Following check	Activity
Dumping shaft	5.000 Km – 1 month	6 months	Check tightening torque
Dumping shaft	8.000 Km – 3 months	8.000 Km – 3 months	Grease
Cylinder bracket	5.000 Km – 1 month	6 months	Check tightening torque
Cylinder bracket	8.000 Km –3 months	8.000 Km – 3 months	Grease
Door hinge at door leaves	8.000 Km – 3 months	8.000 Km – 3 months	Grease
King Pin plate	5.000 Km – 1 month	6 months	Check tightening torque
5th wheel plate	5.000 Km – 1 month	6 months	Check tightening torque
Ensemble 5th wheel plate and King Pin plate	8.000 Km – 3 months	8.000 Km – 3 months	Grease
Bracket air suspension	5.000 Km – 1 month	3 months	Check tightening torque
Active suspension elements	5.000 Km – 1 month	6 months	Check tightening torque
Wheels	50 Km	6 month	Check tightening torque
Axles	8.000 Km – 3 months	12 months	Axis alignment

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