13

MAINTENANCE

CONTENTS

13.1. GENERAL INFORMATION

Characteristics of the maintenance instructions

All the instructions exclusively refer to the maintenance, lubrication, control and the standard adjustments of the vehicle.

NOTE
To identify the components, refer to the manuals:

- *"MECHANICAL SPARE PARTS";*
- *"HYDRAULIC SYSTEM" ➔ Power Pack;*
- *"HYDRAULIC SYSTEM" ➔ ECO1000 module;*
- *"ELECTRIC SYSTEM".*

13.2. TREATMENT OF WASTE MATERIALS

Disposal of exhausted materials

During maintenance operations, if components or fluids are replaced, waste materials must be disposed of according to environmental regulations.

The used engine oil and the replaced oil filter contain hazardous substances for the environment.
After replacing the oil and the polluting components, contact a centre authorised to dispose of used oil and filters, in compliance with the environmental protection and legal standards in force.

13.3. MAINTENANCE STANDARDS AND WARNINGS

Safety precautions

WARNING
All the operations described in this chapter must be strictly carried out by adequately trained staff.

WARNING
It is absolutely forbidden to allow unauthorized persons to stay close to the vehicle during maintenance operations.

WARNING
Since exhaust gases are dangerous, make sure that you have optimal ventilation, in case you work in an enclosed place.

WARNING
Unless otherwise indicated, the maintenance operations must be carried out with the engine OFF and the battery cut-off disconnected.

WARNING
During maintenance and tuning operations which necessarily require the diesel engine to be running, as well as the operator carrying out the intervention, the presence of a qualified person is necessary to operate the emergency button.

WARNING
It is strictly forbidden to leave the radio control unguarded without firstly SWITCHING OFF the engine and leaving the vehicle in PARK conditions.

WARNING
Adequately support the vehicle during maintenance operations on the hydraulic lifting system.

ATTENTION
Always use spare parts by Cometto S.p.A.

ATTENTION
Use grease and oil recommended by Cometto S.p.A., choosing the viscosity according to the ambient temperature.

ATTENTION
Always use clean oil and grease, ensuring the containers are clean.

ATTENTION
Always check and change the oil in a suitable location, paying attention dirt does not fall into the oil.

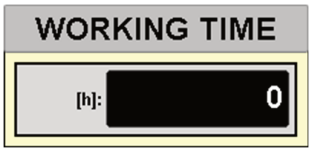
13.4. PERIODIC MAINTENANCE

Characteristics and frequency of the interventions

- The frequency of maintenance operations can be established via the diagnostic display (hour count function) located on the [**EB1**] panel control board.

INDICATIVE FIGURE

Alternatively, use the hour counter available on the engine parameter page of the display on the electric panel [**EB1**]: the "WORKING TIME" box shows the vehicle's actual working hours. To access the page, from the initial screen press the buttons: **F2 ➔ Password ➔ Enter ➔ F1 ➔ F3 ➔ F3**.



- In the event of limited use of the vehicle, instead of referring to the hours displayed on the hour counter, carry out the periodic maintenance operations, as indicated in the table outlined in paragraph 13.7 “General maintenance plan”.
- Appropriate lubrication and good maintenance are essential to avoid any inconvenience and to ensure a long service life of the vehicle.
- The long duration of the vehicle and the reduced operating costs will greatly compensate the time spent and the costs necessary for periodic maintenance.
- If the vehicle is used in difficult environmental and working conditions, it is necessary to reduce the intervals of maintenance operations provided for in this manual.
- Thoroughly clean or wash the vehicle before proceeding with any type of periodic maintenance.

13.5. WARNINGS FOR MAINTENANCE ON ELECTRICAL / ELECTRONIC SYSTEMS

Safety precautions

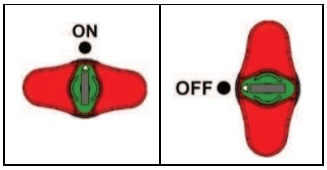
ATTENTION
During cleaning with a pressurised water jet, it is forbidden to direct the water jet on electrical/electronic components.

Welding on the chassis of the vehicle

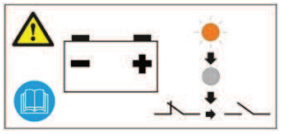
Operating instructions and safety precautions

If welding must be carried out on the chassis of the vehicle, follow the instructions below:

- Disconnect the vehicle batteries ➔ [**+24V**] switch lever in the [OFF] position.



ATTENTION
The Diesel engine batteries can be disconnected only if the yellow light over the switch handle is off.



- ***Indicator light ON: <u>the batteries cannot be disconnected yet</u>.***
- ***Indicator light OFF: the batteries can be disconnected.***

- [**EB1**] panel: Disconnect all the connectors from the X90 control unit.

ATTENTION
Do not disconnect the X90 control unit or any electric/electronic device while the [EB1] panel is powered.

- Ground the welding machine as close as possible to the area where you will have to weld.

13.6. DPF REGENERATION

Preliminary condition

The regeneration of the Diesel engine particulate filter (DPF = Diesel Particulate Filter) is usually automatic. Under these circumstances, the vehicle remains operational and does not require any operator intervention.

However, especially after driving periods characterised by many stops and restarts, the automatic regeneration function may not have the physical time to run and, therefore, the level of clogging of the filter will continue to rise up to a point that it will require the intervention of the operator.
In this case, the machine must be kept at a standstill until the end of the process.

The machine control program will inform the operator about the level of clogging of the DPF and about the operations to be carried out by means of the icons displayed on the screen of the [**EB1**] electric panel, listed below.

DPF not clogged — Level of clogging 0

The filter is free; operator intervention not required.
The following icon is displayed:

	Level of clogging 0.

DPF clogged – Level of clogging 1

At this level of clogging, regeneration takes place automatically; operator intervention not required.
The following icons are displayed:

	Level of clogging 1.
	Regeneration in progress indicator light.

Turn off the Diesel engine only after the regeneration indicator light is no longer displayed.

Continued ➔

Continued ➔

DPF clogged – Level of clogging 2

Operator intervention required for filter regeneration ➔ manual regeneration. The condition is signalled by the following icon:

2 DPF	Level of clogging 2.

Proceed as follows:

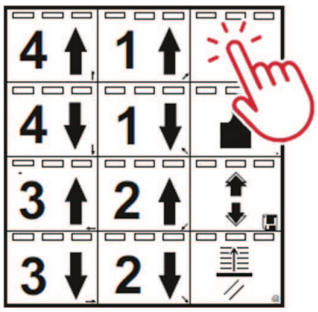
1) Stop the vehicle safely without turning off the Diesel engine. Regeneration is not possible if the engine is off.
2) Engage the parking brake and disengage the gear: operate selector switch Ⓟ (lever down) and set selector switch ⇧ / ⇩ to 0 (Neutral Gear).

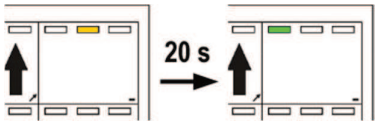
Parking brake selector switch	Travel direction selector switch
	

ATTENTION
If any of the conditions (Diesel engine on, parking brake engaged, Neutral Gear) is not met, manual regeneration is not possible.

ATTENTION
Do not change the travel direction or engage the Neutral Gear while the vehicle is in motion! These manoeuvres can cause serious damage to the motorization system.

3) Enable manual regeneration by pressing the corresponding button located on the lifting/lowering keypad of the control board on [**EB1**]: the yellow light turns on and then, after 20 seconds, it turns off and the green light turns on.





The activation of the function is displayed on screen:

Man	Enabled DPF regeneration indicator light.

Continued ➔

Continued “DPF regeneration” ➔

DPF clogged – Level of clogging 2

4) After enabling the regeneration function, it starts automatically. The following icons are displayed on the control board:

	Regeneration in progress indicator light.
	High exhaust gas temperature indicator light (it is normal if this light is on during manual DPF regeneration).

In the field corresponding to the level of clogging icon are displayed the minutes left until the end of the process.

INDICATIVE FIGURE

	35 minutes left until the end of the manual regeneration cycle.

ATTENTION
Do not attempt to disengage the parking brake or engage any gear during manual regeneration; otherwise, the process will stop.
Do not turn off the Diesel engine.

DPF clogged – Level of clogging 3

The level of clogging is critical; manual regeneration by the operator not possible (even if the start button is pressed, nothing happens). The vehicle CANNOT BE USED until restored.
The condition is signalled by the following icon:

	Level of clogging 3.

Contact the manufacturer or an authorised workshop.

NOTE
See the Diesel engine manual.

13.7. GENERAL MAINTENANCE PLAN

Legend:

(✖)	See Chapter 7 — CHECKS BEFORE START-UP

●	**Check**
■	**Cleaning**
▼	**Replacement or Addition**

OPERATION	Frequency						
	8 hours (✖)	First 10 hours	Every 50 hours	Every 125 hours or 1 month	Every 250 hours	Every 500 hours or 6 months	Every 1000 hours or 1 year
Hydraulic system							
Check for leaks - Check fittings	●			●			
Check oil level in tank	● ▼						
Tap positioning	●						
Hydraulic oil radiator	● ■			● ■			
Oil filters ➔ paragraph 13.7.3							
Oil tank purge filter				● ▼			
Hydraulic accumulators					● ▼		
Hydraulic oil analyses						● ▼	
Hoses ➔ paragraph 13.7.1	●						
Electrical and electronic system							
Check battery - Battery electrolyte liquid				● ▼			
Electrical - electronic system							● ■
Power cabling				● ▼			
Bags of desiccant salts						▼	
Anti-corrosion strips						▼	
Diesel tank							
Diesel tank drainage						● ■	
Mechanical system							
Tightening of wheel nuts		●	●				
Tightening of screws			●				
Greasing the rotation units ➔ paragraph 13.7.4							
Grease				● ▼			
Adjustment of brakes					●		
Axle brake linings						● ▼	
Clearance on axle oscillation pin							● ▼
Tyres							
Check tyre wear	●			● ▼			
Tyre pressure check	●			●			

Continued ➔

Continued “General maintenance plan” ➔

Braked and idle axles	*NOTE* *See the maintenance plan in paragraph 13.7.2.*
Motorized axles	
Wheel gear reducers	*NOTE* *For all information on maintenance, refer to the relevant manual.* *The manual can be found, in PDF format, in the “Enclosed” folder in the attached digital documentation.*
Wheel gear motors	*NOTE* *For all information on maintenance, refer to the relevant manual.* *The manual can be found, in PDF format, in the “Enclosed” folder in the attached digital documentation.*
Diesel engine and SCR system	*NOTE* *Please refer to the attached maintenance manual for all maintenance information.*
Suspensions rotation unit	*NOTE* *See paragraph 13.7.4 and the relevant manual.* *The manual can be found, in PDF format, in the “Enclosed” folder in the attached digital documentation.*

(1) = the SCR system (see paragraph 1.13.6) is available only on vehicles equipped with at least 85 kW maximum power Diesel motors.

13.7.1 Checking the hydraulic pipes and hoses

Visual check

Check the condition of the fittings and the appearance of any anomalies that indicate a state of deterioration of a tube or hydraulic hose.
Possible anomalies:

- Abrasion and tearing of the cover with the casing zones torn or exposed.
- Localised deformations under pressure.
- Sticky or soft areas.
- Leaks.

Replacing flexible tubing: safety precautions

ATTENTION
When one of the above anomalies is found, the damaged hose must be replaced immediately.

ATTENTION
Hydraulic hoses should be replaced according to the SAE J1273 standard.

ATTENTION
If a hose has to be replaced, refer to the code in the "SPARE PARTS – HYDRAULIC SYSTEMS" manual and, in general, the following conditions must be met:

- ***Equal diameter.***
- ***Equal or longer length. If longer, check it does not interfere with the mobile parts of the vehicle.***
- ***Same (or higher) classification / code of relevant conformity with legislation.***
- ***Same (or higher) safety devices (explosion-proof sheaths, anchorage devices against removal, anti-abrasion protection, protection against heat, etc..).***

13.7.2 Braked and idle axle maintenance program

OPERATION	Frequency			
	After the first 5000 km or after the first month	Every 30000 km or every 3 months	Every 90000 km or every 6 months	Every 150000 km or every 12 months
Grease				
Camshaft housing		●		
Brake levers		●		
Change the grease of the wheel hub bearings **(do not mix with other types of grease)**				●
Mechanical checks				
Manual brake levers and camshafts		●		
Clearance of the hub bearings	●		●	
Visual checks				
Deterioration or breakage of wear parts Wear on friction linings Operation of the brake levers	●	●		

ATTENTION

- ***The intervals must be reduced for vehicles used in intense conditions.***
- ***If parked for long periods, before switching back on, activate the brake levers and grease the compartments of the cam shaft; also check the various components overall to check they are working properly.***

Characteristics of grease for bearings

- Lithium soap-based bearing grease with EP additive.
- NLGI 2 consistency.
- Penetration 280 x 10^{-1} mm.
- Temperature range -30°C +130°C.
- Drop point 185°C.

NOTE
The warranty is only valid if the instructions provided were complied with and if original spare parts by Cometto S.p.A. were used.

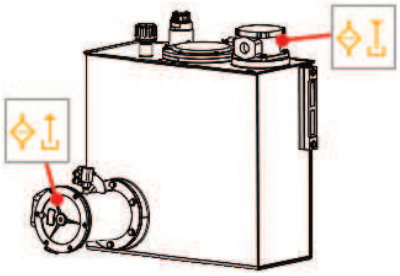
13.7.3 Oil filters – Replacing the cartridge

Preliminary condition

Replace the filter cartridge when the corresponding clogging icons appear on the [**EB1**] electric cabinet and radio control displays.

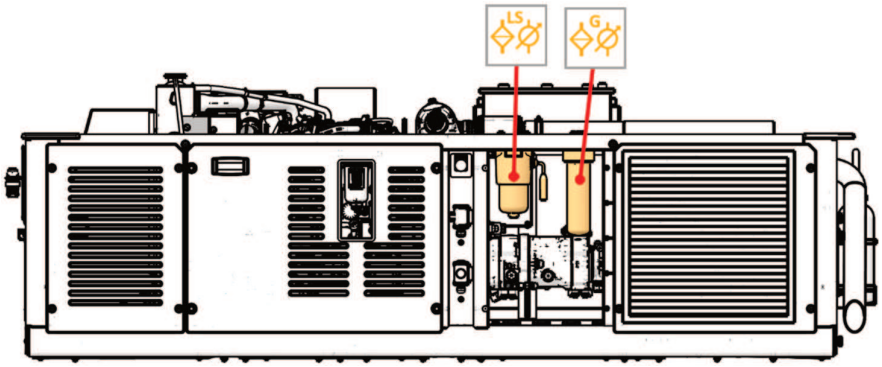
Position of the oil filters

Hydraulic oil tank:



	Tank return filter clogged.
	Hydraulic pump intake oil filter clogged.

Power pack, left side:



LS	Lifting and steering pump filter clogged.
G	Motorization system filter clogged.

General standards and descriptions

ATTENTION
Before replacing the cartridge, carefully clean the filter body and the surrounding area to prevent foreign particles from entering the hydraulic circuit.

ATTENTION
Do not attempt to clean or re-use the clogged filtering element.

ATTENTION
Non-replacement of damaged parts in the filter can cause faults or early wear of the hydraulic system components.

ATTENTION
Do not use hose clamps, hammers or other similar tools to screw in the filter body.

Continued ➔

Continued “Oil filters – Replacing the cartridge” ➔

Oil filters – cartridge replacement

Operating instructions

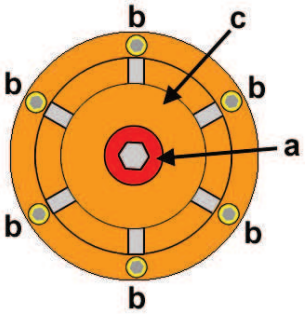
[ ]	Position/code of the oil filter and the relevant cartridge on the general system and identification plate on the vehicle.

Pump intake filter

Oil filter	[**0650664**_01]
Cartridge	[**4040244**_01]

REPLACING THE FILTER CARTRIDGE

1) Completely unscrew the central screw (**a**). With the central screw (**a**) completely unscrewed, the filter cap is closed and the oil does not exit the tank
2) Unscrew the screws (**b**) and remove the cover (**c**) of the filter.



NOTE
The filter container is full of oil.
Recover the oil, which comes out of the filter container, in a clean container.

3) Replace the cartridge.
4) Re-assemble the cover (**c**).
5) Screw the screws (**b**) in.
6) Screw the central screw (**a**) in.

Oil return to tank filter.

Oil filter	[**0650534**_01]
Cartridge	[**4040256**_01]

REPLACING THE FILTER CARTRIDGE

1) Remove the cover.
2) Replace the cartridge.
3) Check the condition of the sealing O-rings and, if necessary, replace them.
4) Close the cover.

Lifting and steering pumps supply filter.

Oil filter	[**0650517**_01]
Cartridge	[**4040245**_01]

Motorization system filter.

Oil filter	[**0650442**_02]
Cartridge	[**4040224**_02]

FILTER CARTRIDGE REPLACEMENT

1) Remove the cartridge container.

NOTE
Recover the oil draining from the pipeline connected to the filter, in a clean container.

2) Remove the used cartridge.
3) Thoroughly clean inside the container.
4) Install the new cartridge.
5) Check the sealing O-rings and, if necessary, replace them.
6) Fit back the container without applying excess locking torque.

13.7.4 Greasing the rotation units

Preliminary information

Depending on the model of rotation unit used on the vehicle, the greasing instructions will vary slightly.
In chapter 2, under the technical data for the ECO1000 vehicle(s) covered by this manual, check whether the ROTATION UNIT is of type **TGB** or **IMO-WD** and apply the appropriate greasing instructions, given below.

Grease type

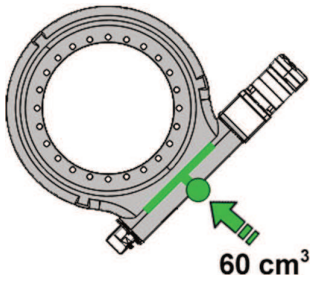
NOTE
Use the grease indicated in paragraph 13.10.4.2.

NOTE
For further information on proper lubrication, please refer to the manufacturer's manual.
The manual is available in PDF format in the digital documentation provided.

13.7.4.1. Greasing TGB rotation units

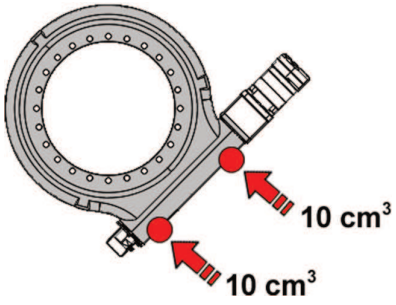
Greasing the worm screw

Grease the worm screw using the corresponding grease nipple. Add **60 cm³ of grease**. Inject the grease and rotate the screw at least 3 full turns.
Grease every 100 hours or every 3 months.



Greasing the external bearings

Grease the external bearings using the two grease nipples. Add **10 cm³ of grease in each**. Inject the grease and rotate the worm screw at least 3 full turns.
Grease every 400 hours or every 12 months.



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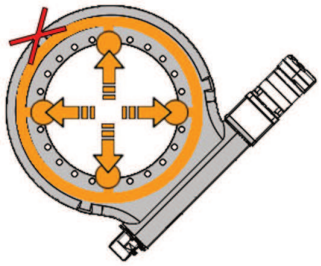
Continued "Greasing TGB rotation units" ➔

Greasing the internal bearing

Grease the internal bearing using the 4 grease nipples ●. Add **10 cm³ of grease for every 250 mm of diameter of the raceway** (diameter = 480 mm ➔ approximately 19 cm³).
Inject the grease into one of the grease nipples and allow the bearing to rotate by at least 180°. Repeat the same steps on the other grease nipples.
When greasing the bearings, open tap ✕ to avoid pressure build-ups inside the raceway.
Grease every 100 hours or every 3 months.



13.7.4.2. Greasing IMO-WD rotation units

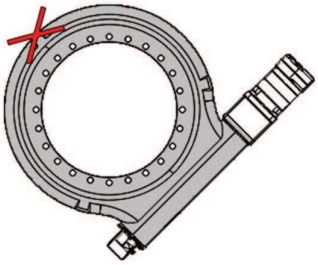
Greasing pressure

ATTENTION
The needed rotation unit greasing pressure is about 3 bar.
Take into account that the greasing pressure may change due to:

- ***room temperature;***
- ***conditions and amount of the grease already inside the rotation unit;***
- ***type of grease;***
- ***the device used to pump the grease inside;***
- ***pumping speed.***

Preliminary information

Before greasing, check whether one or more plugs are present on the part of the rotation unit opposite the worm screw. If so, unscrew them and remove them: this will allow the excess grease to drain through the hole left free. If not, the excess grease will escape through the gap between the inner and outer ring of the assembly.



INDICATIVE FIGURE

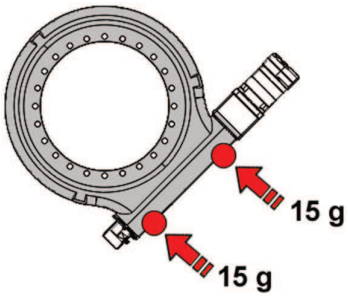
If possible, always remove excess grease and clean the parts that have come into contact.

Continued ➔

Continued ➔

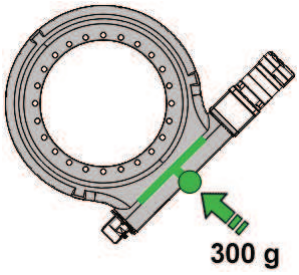
Greasing the external bearings

Grease the external bearings using the two grease nipples 🔴. Add **15 g grease** in each nipple).
Grease every 2 months.



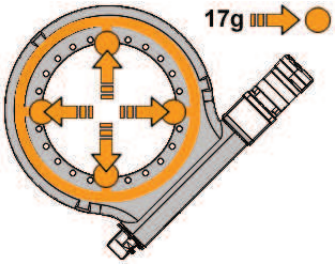
Greasing the worm screw

Grease the worm screw using the corresponding grease nipple 🟢. Add **300 g of grease**.
Grease every 2 months.
If possible, rotate the rotation unit during greasing. Close any grease drain holes with their plugs ✕ when the operation is complete



Greasing the internal bearing

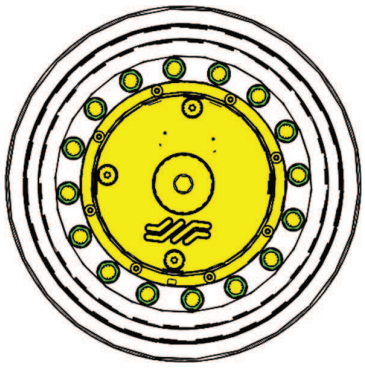
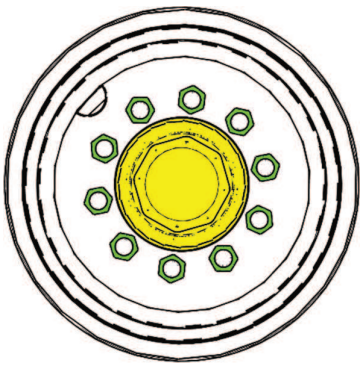
Grease the internal bearing using the 4 grease nipples 🟠. Add **65 g of grease** (around 17 g in each nipple). Grease every 2 months.



13.7.5 After the first 10 hours of work

Tightening of wheel nuts

Use a torque wrench to check the that the wheel nuts are tightened correctly.
MOTORIZED AXLES: **300 Nm**.
BRAKED AND IDLE AXLES: **450** - **550 Nm**.

MOTORIZED AXLE	BRAKED AXLE AND IDLE AXLE
	
 **300 Nm**	 **450-550 Nm**

13.7.6 Every 50 hours of work

Tightening of wheel nuts

Use a torque wrench to check the that the wheel nuts are tightened correctly.

NOTE
For tightening torques, see paragraph 13.7.5.

General check of bolt tightening

NOTA
For tightening torques, see paragraph 13.9.

13.7.7 Every 125 hours / 1 month of work

Batteries

With the batteries resting and cold, check the level of electrolyte liquid is between the "Min" and "Max"; if the level is under the minimum, restore with distilled water.
Check the level more frequently in the summer.
When checking the electrolyte liquid level, also proceed to clean the terminals, if traces of oxidation are found.

SAFETY PRECAUTIONS

WARNING
Avoid using metal funnels to add electrolyte liquid.

WARNING
During charging and operation, inside the battery may form mixes of explosive gases containing hydrogen. In the immediate vicinity of the batteries, avoid use of flames, lit cigarettes, sparks and triggers. Avoid short circuits between terminals. Use anti-static material for cleaning.

FIRST AID INTERVENTION

WARNING
First aid measures are mainly aimed at possible exposure to sulphuric acid (electrolyte) as the other components are solid and do not represent risk factors under the conditions of normal use of the product.
INHALATION: Inhalation is an unlikely means of exposure to the product. Distance the injured party from the polluted zone and bring to fresh air. Seek medical advice immediately.
CONTACT WITH SKIN: Immediately and thoroughly wash skin area with plenty of water. Remove wet clothing. If the irritation persists, consult a doctor.

CONTACT WITH EYES: Wash with plenty of running water for several minutes, keeping the eyelids open. Consult a doctor immediately.

INGESTION: Rinse your mouth with water, drink plenty of water at once, ingest activated charcoal. Do not provoke vomiting. Consult a doctor immediately.

ENVIRONMENTAL CONTAMINANTS

The batteries contain substances which are highly dangerous for the environment.
To replace the battery, contact an equipped and authorised centre for their disposal in compliance with nature and legislative standards.

NOTA
For more information on batteries please refer to the product data sheet, in PDF format, in the provided digital documents..

Continued ➔

Continued "Every 125 hours / 1 month of work" ➔

Electrical system ➔ Power cables

Check the power cables, which go from the batteries to the starter engine, are in good condition.

Greasing mechanical parts

Greasing operations should be carried out using specific greasers.

Grease:

- The suspensions.
- The axles.
- The brake levers.

Protect with a layer of grease:

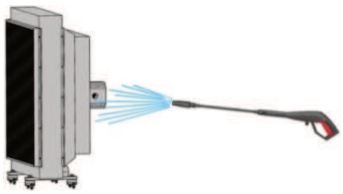
- Hydraulic pullers (where applicable).
- The mechanical matching points.
- All the dismantled unpainted parts, such as screws and nuts.

NOTE
For further information, see paragraph 13.10.5.

Hydraulic oil cooler

Check the radiator fins are not damaged and not dirty (with dust, mud, insects, etc.), otherwise dismantle the radiator protective grate and clean the fins by blowing compressed air or spraying water from the rear of the radiator (in the direction opposite the cooling air flow). The direction of the jet must be parallel to the fins to avoid damaging the latter. Oily or greasy dirt can be removed by steam or hot water jets or even using a non-aggressive detergent. Use a soft brush.

INDICATIVE FIGURE

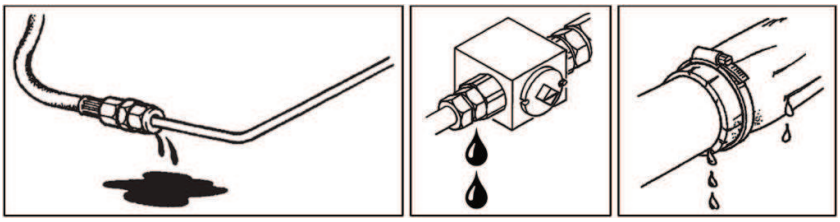


ATTENTION
Do not use water jets or HIGH PRESSURE sprayers because they could bend the radiator fins and therefore may affect air flow necessary for cooling.

WARNING
Wear adequate hand, face and eye protection equipment when using water jets or sprayers.

Hydraulic couplings

When the vehicle has completed an operational phase, check the closure of all fittings. This operation shall be repeated in case of oil leaks from the fittings.



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Tyres

Check the wear status and pressure of the tyres ➔ see paragraph 13.8.1.

Oil tank purge filter

Check and, if necessary, replace the filter cartridge.

	[ ]	Position/code of the oil filter and the relevant cartridge on the general system and identification plate on the vehicle.

Filter (**F**)	[**0650584**_01]
Cartridge (**C**)	[**4040291**_01]

GENERAL RULES AND WARNINGS

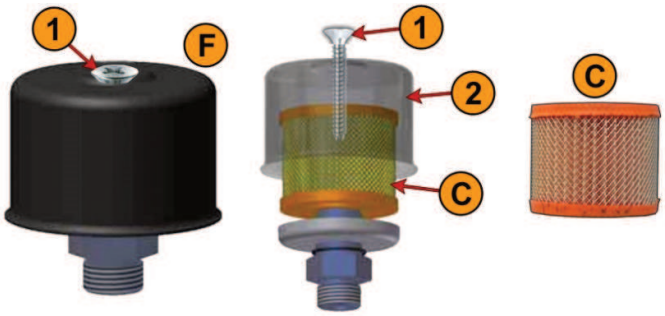
ATTENTION
Before replacing the cartridge, carefully clean the filter and the surrounding area to prevent foreign particles from entering the hydraulic circuit.

ATTENTION
Do not attempt to clean or re-use a clogged cartridge.

ATTENTION
Check the condition of the cartridge and replace it if necessary; if the conditions of use are particularly burdensome, inspect the breather filter more frequently.

REPLACEMENT OF FILTER CARTRIDGE — OPERATING INSTRUCTIONS

1) Loosen the screw (**1**).
2) Remove the cover (**2**) of the filter.
3) Replace the cartridge (**C**).
4) Re-assemble the cover (**2**) and screw in the screw (**1**).



13.7.8 Every 250 hours of work

POWER PACK:

Hydraulic braking control block accumulator

Hydraulic motorization system accumulator

MAINTENANCE

Check and, if necessary, recharge the accumulators, following the pressure indicated on the general hydraulic system.

ATTENTION
The accumulator pressure check shall be carried out with the engine switched off.

INSTRUCTIONS FOR REPLACEMENT

Nitrogen accumulators are normally supplied, as a spare, with 5 bar pressure, which guarantees its correct storage.
Prior to installation and connection to the plumbing system all nitrogen accumulators shall be filled with nitrogen at the pre-charge pressure indicated on the hydraulic diagram.
This can be done in a specialized workshop, or by using the VGU test/inflation tool. This instrument, if not supplied with the vehicle, can be requested to Cometto S.p.A., providing the following code: 553.2244.

ATTENTION
<u>Hydraulic braking control block accumulator</u>
The use of an inflated accumulator with a pre-charge pressure different from that prescribed, in addition to not ensuring the correct operation of the braking system, can cause the immediate breakage of the nitrogen bag.
Check the pre-charge pressure on a monthly basis.

ATTENTION
<u>Hydraulic motorization system accumulator</u>
The use of an inflated accumulator with a pre-charge pressure different from that prescribed, in addition to not ensuring the correct operation of the motorization system, can cause the immediate breakage of the nitrogen bag.
Check the pre-charge pressure on a monthly basis.

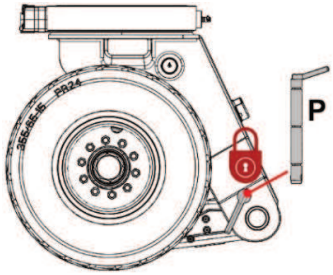
ATTENTION
In some cases, the accumulators can contain a certain amount of hydraulic oil inside the bag, which varies based on use.
It is always advisable to use original Cometto S.p.A accumulators, which, when necessary, are supplied with the expected amount of oil.

NOTE
The position of the accumulators is indicated in paragraph 3.1.

Adjustment of brakes

OPERATING INSTRUCTIONS (to be carried out on all braked suspensions)

1) Start the Diesel engine (see chapter 8).
2) Lower the vehicle completely (see chapter 10).
3) Lock the braked suspension via the respective locking pin (**P**).



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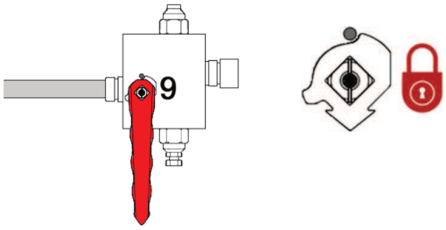
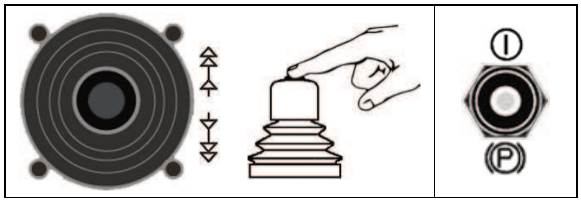
Adjustment of brakes

4) Close the tap **[9]** of the braked suspension.

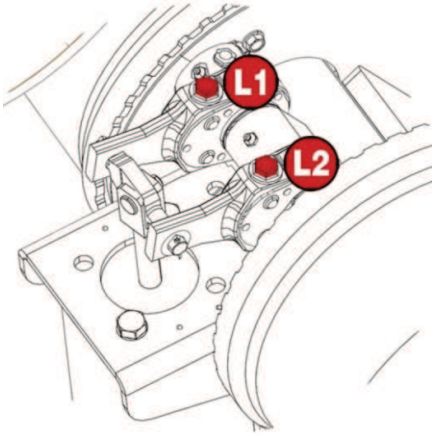


5) Lift the vehicle until the tyres of the braked suspension are no longer in contact with the ground.

6) Release the brake ➔ Press and hold the button on the end of the joystick ⏮ ⏭ ("Dead man's" button) and operate the Ⓟ selector switch (lever down); then release both controls.



7) Unscrew the hex screws **(L1)** and **(L2)** of the brake levers until the wheel is braked.



ATTENTION
Always act alternately on the two hexagon screws; unscrew (make 1 click) first the screw (L1) and then unscrew (1 click) the screw (L2), then unscrew the screw again (L1). Continue the operation until the wheel is braked.

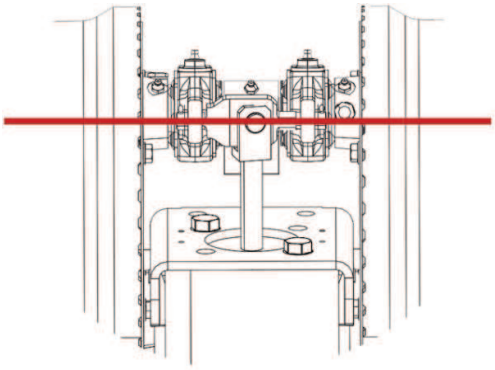
8) Alternatively, **tighten** the hex screws, always one click at a time, until you can freely rotate the suspension wheels.

Continued ➔

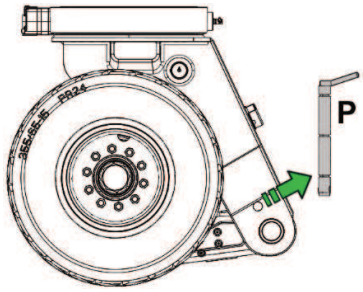
Continued “Every 250 hours of work” ➔

Adjustment of brakes

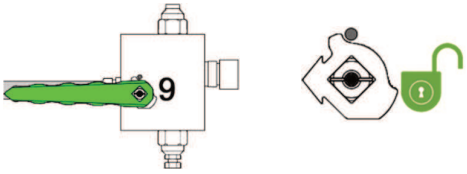
ATTENTION
After adjustment, check the two brake levers are not misaligned, by braking a few times.



9) Lower the vehicle and remove the locking pin **(P)** of the braked suspension.

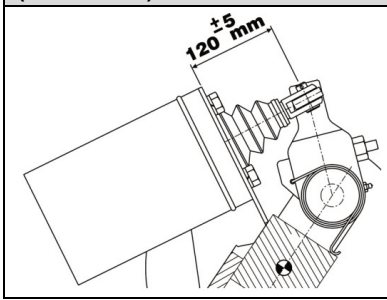
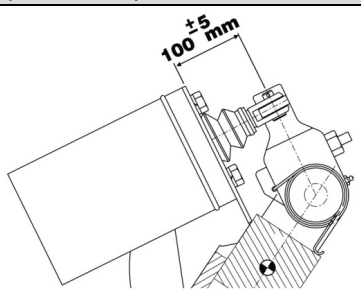
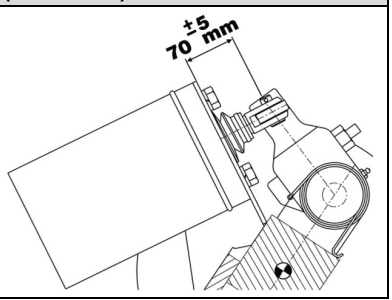


10) Open the tap [**9**].



11) Repeat the operation for all the braked suspensions.
12) Having completed adjustment of the brakes, lift the vehicle to operating height.

ATTENTION
Before re-starting the vehicle, ensure the taps [9] are OPEN.

Vehicle not braked. **(120 ± 5 mm)**	**Correct adjustment – braked vehicle.** **(100 ± 5 mm)**	**The vehicle does not brake, it is necessary to adjust it.** **(70 ± 5 mm)**
		

13.7.9 Every 500 hours / 6 months of work

Diesel tank drainage

Eliminate water in the fuel and any impurities in the tank.

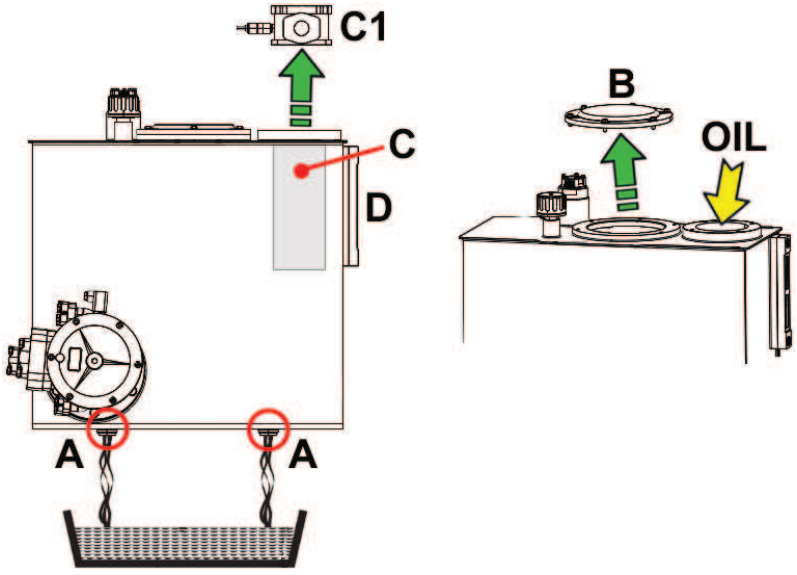
Drainage operations:

1) Position a suitable collection container under the drainage cap.
2) Carefully open the drainage cap and let all the fuel flow out.
3) Close the drainage cap again.

Hydraulic oil analysis – Replacing the hydraulic oil

Take an oil sample from the hydraulic system to analyse it.
The cleaning level of the oil must be equal to or higher than class ISO 18/16/13 according to the standard 4406:1999; if worse, the oil must be filtered or replaced to bring it to the previously indicated class.
Hydraulic oil replacement:

1) Lower the vehicle completely (see chapter 10).
2) Place a clean container under the oil tank.
3) Unscrew the 2 caps (**A**) for oil drainage.
4) Allow the oil to flow out from the tank.
5) Remove the cover (**B**) and clean inside the tank.
6) Close the cover (**B**).
7) Replace (if necessary) the cartridges of the oil filters. For replacement of cartridges see section 13.7.3.
8) Re-assemble the oil filters.
9) Screw the 2 drainage caps (**A**) back in.
10) Remove the cover (**C1**) of the return oil filter (**C**).
11) Add oil from the return filter up to the maximum level.
    With the vehicle completely lowered, the oil level must reach the maximum point of the control gauge (**D**).
12) Close the cover (**C1**) of the return oil filter (**C**).



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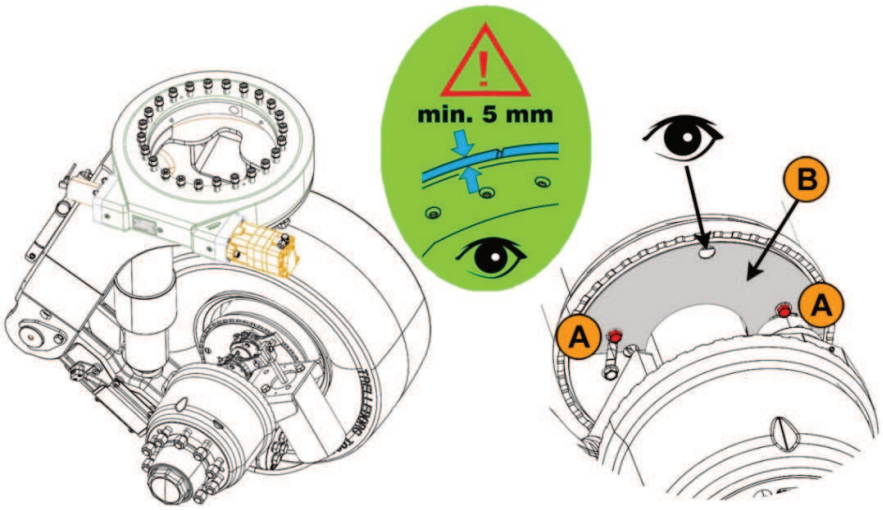
Continued “Every 500 hours / 6 months of work” ➔

Checking thickness of the axial brake lining

The minimum thickness of the brake lining of the axles is 5 mm – 0.2 in.
The brake lining can be checked using the relevant inspection hole or by dismantling the upper casing (**B**) having unscrewed the two screws (**A**).



Replacing the bags of desiccant salts

The desiccant salt bags placed in the electric panels must be replaced every 6 months.
Expired salt will turn a pinkish colour.
To understand if it has expired, examine the bag (which however is always white) against the light.

Bag of desiccant salts	➔ Cometto code: 553.1660

Replacing the anti-corrosion strips

Replace the anti-corrosion strips inside the electric panels, every 6 months.

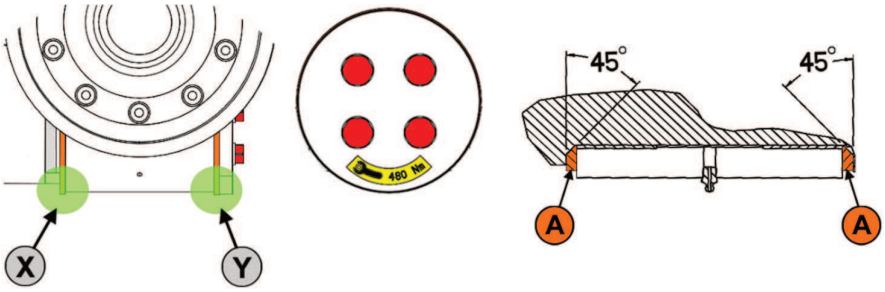
Anti-corrosion strips	➔ Cometto code: 553.2038

13.7.10 Every 1000 working hours or each year

Clearance on axle oscillation pin

Check clearance of the points (**X**) and (**Y**). If clearance is over 0.3 mm, the two washers (**A**) must be replaced.

INDICATIVE FIGURE



Washer (A)	➔ Cometto code: 145.1540

ATTENTION
The washers can be assembled in one direction only.

Electrical / electronic system

- Check the fuses, the relays, any timers, the terminal board and the various connections in the electric and electronic panels.
- Grease the various terminals with Vaseline:
  1) Battery terminals.
  2) Battery cut-off switch terminals.
  3) Alternator terminals.
  4) Starter engine terminals.
  5) Relay terminals.
- Check correct voltage of the alternator load (24V).
- Check tightening of the electrical terminals.
- Check the indicator lights, the switches and all the commands are working.

ATTENTION
During cleaning with a pressurised water jet, it is forbidden to direct the water jet on electrical/electronic components.

13.8. TYRE AND WHEEL MAINTENANCE

13.8.1 Tyres

Type / Code

The following tyre type is mounted on the vehicle:

Trelleborg T-900 355/65-15" 32 PR	➔ Cometto code: 038.0246

Tyres must be fitted only and exclusively on the following rims:

- BRAKED AND IDLE SUSPENSIONS

Cometto 9.75 x 15" off-centre 25 (DIN connector 10 holes)	➔ Cometto code: 054.0273

- MOTORIZED SUSPENSIONS

Cometto 9.75 x 15" off-centre 45 (connector 16 holes)	➔ Cometto code: 054.0274

Precautions for use and safety

WARNING
Never use equipment other than that indicated above.

13.8.1.1. General tyre rules

Preliminary condition

NOTE
For safety instructions on assembly and/or dismantling of the tyres, refer to the link:

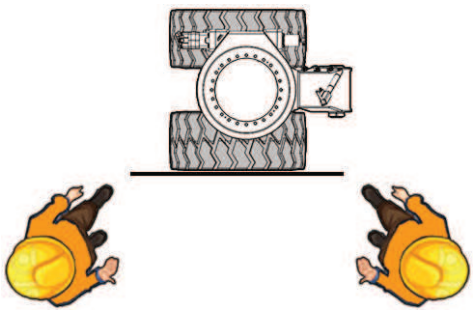
- *For Europe:*
  euwa.org/resources/type/safety-information
  Refer to instructions "EUWA ES-1.09".
- *For the United States of America:*
  osha.gov/sites/default/files/publications/wheel-chart-booklet.pdf
  For more information, go to "osha.gov and type the number of the regulation "1910.177" in the search field.

These instructions should be considered an integral part of this manual.

Precautions for use and safety

ATTENTION
The tyres must be stored and handled with care.

WARNING
Always approach a tyre sideways, in the direction of the tyre shoulder.



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Continued ➔

Precautions for use and safety

NOTE
The pressure check must be carried out with the tyres “cold”, i.e. having been parked for many hours.

WARNING
Do not approach a damaged tyre after a working phase; only approach the tyre having waited for it to cool down.

WARNING
Deflate tyres before removing them from the vehicle. Pay utmost attention during removal of the valves, because they can be ejected at high speed.

NOTE
Avoid deflating the tyres when the vehicle has just concluded the operating phase.

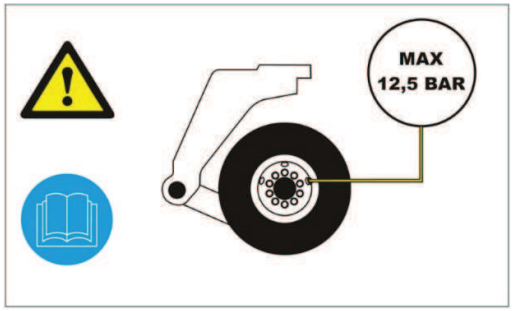
WARNING
Remove tyres from service that have worked with one or more fastening nuts missing.

WARNING
If foreign bodies are inserted in the tyre, avoid removing them when the tyre is inflated.
Deflate the tyre before touching, checking or attempting to remove the foreign body.

WARNING
First inflation of the tyres assembled on the rim must take place in a safety cage, for the purpose of preventing the residual risk of bursting.
After reaching the inflation pressure, leave the tyre inside the safety cage for a few minutes.

13.8.1.2. Tyre pressure

Tyre pressure



Maximum permissible inflation pressure: **12,5** bar.

Precautions for use and safety

ATTENTION
Use of the vehicle with wrong inflation pressure can cause serious damage to tyres and the inflation valve.

13.8.1.3. Inflating tyres on the vehicle

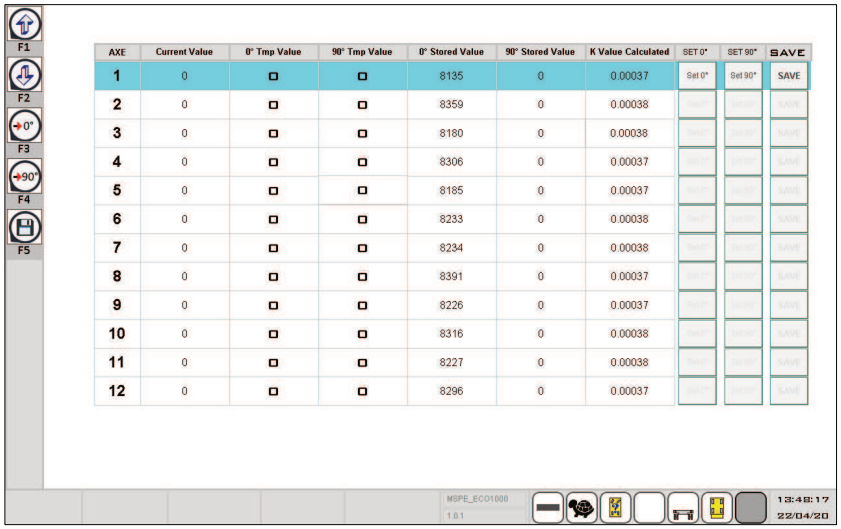
Preliminary condition

NOTE
The figures below represent a suspension positioned on the right hand side of the module.

ATTENTION
The paragraph described two different tyre inflation procedures: one for the INNER tyre and one for the OUTER tyre.

Inflating INNER tyre

1) Start the Diesel engine (see chapter 8).
2) Open the “Reset suspensions” page of the electronic program. From the main page displayed on the [**EB1**] electric cabinet, press the keys in the sequence shown below: **F2 ➔ Password ➔ Enter ➔ Login ➔ Date&time ➔ F4 ➔ F3 ➔ F1**.
3) Use the **F1** and **F2** keys to select on the screen the suspension corresponding to the potentiometer to be replaced.



INDICATIVE FIGURE

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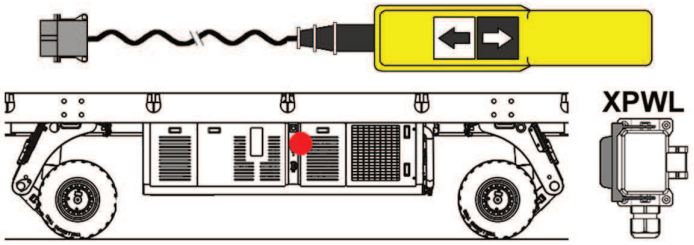
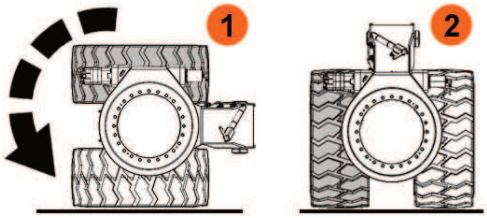
Inflating INNER tyre

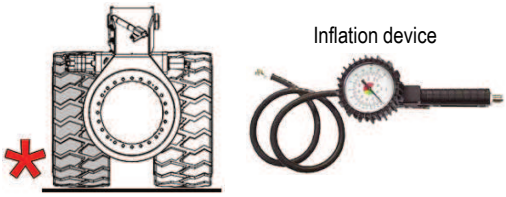
4) Connect the manual steering pushbutton panel to the [**XPWL**] socket.



5) Turn the suspension counterclockwise by 90°.

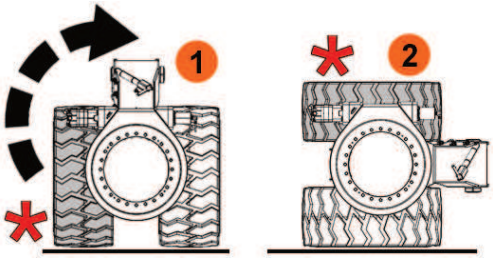


6) Connect the inflation device to the inner tyre.



*	Inflation device connection

7) Turn the suspension 90° clockwise.



8) Inflate the tyre.

WARNING
The shape of the tyre to inflate must not exceed the loading surface.

9) After inflating the tyre, wait a few minutes before disconnecting the inflation device..

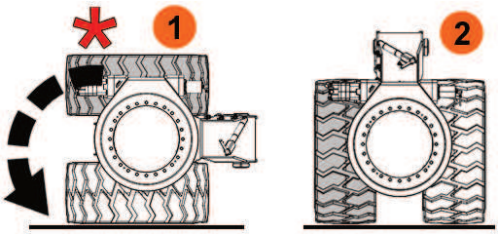
Continued ➔

Continued “Inflating tyres on the vehicle” ➔

Inflating INNER tyre

Use and safety precautions

10) Turn the suspension counterclockwise by 90°.

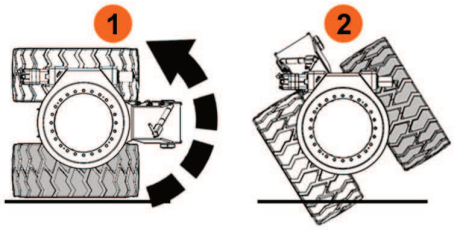


11) Disconnect the inflation device.
12) Change the steering type: in this way, the suspension will align itself with the other vehicle suspensions (see paragraph 9.2).
13) Return the vehicle to normal running condition.

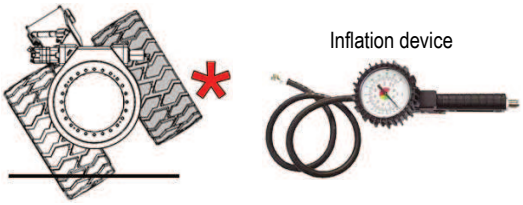
Inflating OUTER tyre

Repeat the operations described in points 1) - 4) of the inner tyre inflation procedure described in the same paragraph and then:

1) Turn the suspension counterclockwise by 120°.

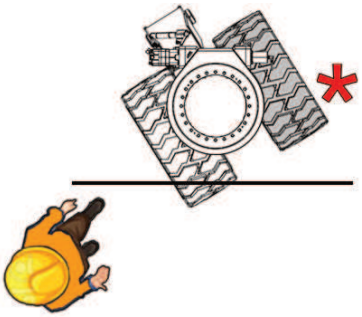


2) Connect the inflation device to the outer tyre.



*	Inflation device connection

WARNING
The operator should remain in an oblique position relative to the tyre to be inflated.



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Inflating OUTER tyre

3) Inflate the tyre.

WARNING
The shape of the tyre to inflate must not exceed the loading surface.

4) After inflating the tyre, wait a few minutes before disconnecting the inflation device.
5) Change the steering type: in this way, the suspension will align itself with the other vehicle suspensions (see paragraph 9.2).
6) Return the vehicle to normal running condition.

13.8.2 Wheel replacing procedures

Preliminary information

The wheel replacing procedures reported in the following paragraphs differ depending on the position of the wheel (whether inner or outer) and the ECO1000 vehicle type.

- The ECO1000 2/2 are equipped with four suspensions only, therefore four supporting points. A jack and additional supports are required to avoid the overturning of the vehicle while replacing the wheel.

  WARNING
  Danger of overturning: for the ECO1000 2/2 vehicles it is mandatory to follow the wheel replacing instructions described at paragraph 13.8.2.2.

- The other ECO1000 vehicle types are equipped with enough suspensions to keep the vehicle stable even when one of them is lifted from the ground to replace the wheel. See paragraph 13.8.2.1.

13.8.2.1. Replacing the wheel

Precautions for use and safety

WARNING
Strictly follow the instructions provided on the following pages and pay utmost attention to the following operations:

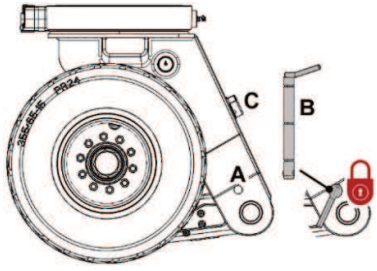
- **To avoid possible back injuries, roll the wheels on the floor and use mechanical lifting systems.**
- **Check the condition of the tyres before using them.**

WARNING
Perform the replacement of a wheel with the vehicle completely empty.

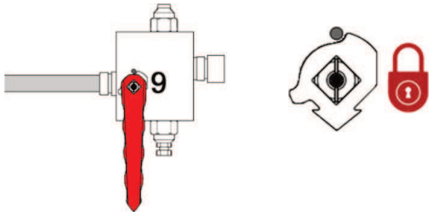
ATTENTION
The paragraph describes two different wheel replacement procedures: one for the OUTER wheel and one for the INNER wheel.

Replacing the OUTER wheel

1) Start the Diesel engine (see chapter 8).
2) Completely lower the vehicle (see chapter 10).
3) Loosen the locking nuts, of the wheel to be replaced, without unscrewing them completely.
4) Lock the suspension: insert the lock pin (**B**) in the seat (**A**).



5) Close the tap [**9**] of the suspension on which the wheel must be replaced; thus the suspension is isolated from the hydraulic circuit.



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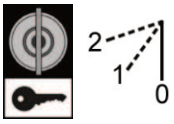
Replacing the OUTER wheel

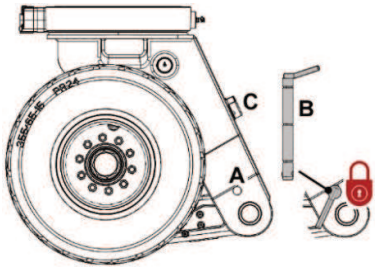
6) Lift the vehicle to a height that allows insertion of a pallet truck under the wheel to replace.
7) Turn off the Diesel engine and the vehicle: or turn the general key to position 0.



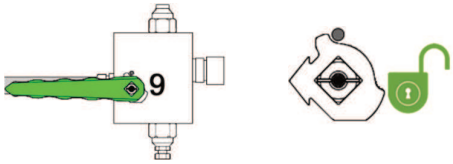
8) Insert a pallet truck under the wheel to replace.
9) Loosen the locking nuts completely and replace the wheel.

INDICATIVE FIGURE

10) Assemble the new wheel. Tighten the wheel locking nuts slightly so that the wheel touches the hub.
11) Remove the pallet truck.
12) Start the Diesel engine again.
13) Lower the vehicle and remove the locking pin (**B**) putting it in its "housing" (**C**).



14) Tighten the wheel nuts according to the instructions in paragraph 13.8.3.
15) Open the tap [**9**].



16) Lift the vehicle to the operating height.

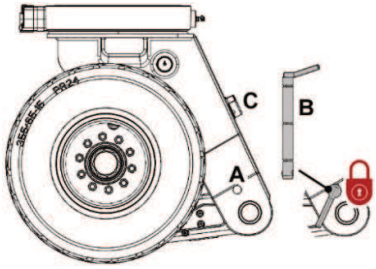
ATTENTION
Before restarting the vehicle, make sure that the tap [9] is OPEN.

Continued ➔

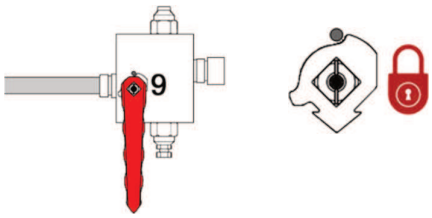
Continued “Replacing the wheel” ➔

Replacing the INNER wheel

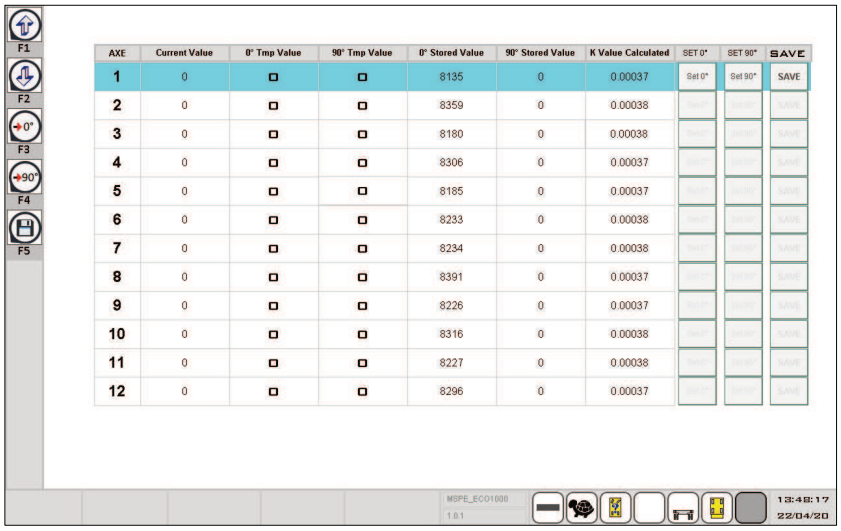
1) Start the Diesel engine (see chapter 8).
2) Completely lower the vehicle (see chapter 10).
3) Lock the suspension: insert the lock pin (**B**) in the seat (**A**).



4) Close the tap [**9**] of the suspension on which the wheel must be replaced; thus the suspension is isolated from the hydraulic circuit.



5) Lift the vehicle to a height that allows insertion of a pallet truck under the wheel to replace.
6) Open the “Reset suspensions” page of the electronic program. From the main page displayed on the [**EB1**] electric cabinet, press the keys in the sequence shown below: **F2 ➔ Password ➔ Enter ➔ Login ➔ Date&time ➔ F4 ➔ F3 ➔ F1**.
7) Use the **F1** and **F2** keys to select on the screen the suspension and the wheel to be replaced.



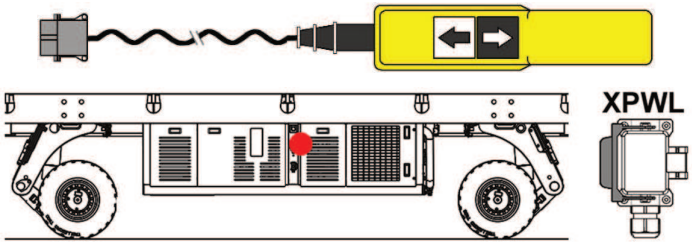
INDICATIVE FIGURE

Continued ➔

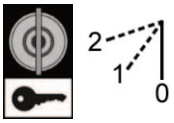
Continued ➔

Replacing the INNER wheel

8) Connect the manual steering pushbutton panel to the [**XPWL**] socket.



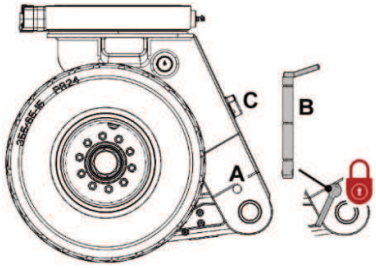
9) Act on the pushbutton panel to steer the suspension until the wheel can be replaced.
10) Turn off the Diesel engine and the vehicle: turn the general key to position 0.



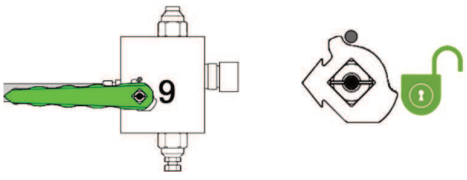
11) Insert a pallet truck under the wheel to replace.
12) Loosen the locking nuts completely and replace the wheel.

INDICATIVE FIGURE

13) Assemble the new wheel. Tighten the wheel locking nuts slightly so that the wheel touches the hub.
14) Remove the pallet truck.
15) Start the Diesel engine again.
16) Lower the vehicle and remove the locking pin (**B**) putting it in its "housing" (**C**).



17) Tighten the wheel nuts according to the instructions in paragraph 13.8.3.
18) Open the tap [**9**].



19) Lift the vehicle to the operating height.

Continued ➔

Continued "Replacing the wheel" ➔

Replacing the INNER wheel

20) Change the steering type: in this way, the suspension will align itself with the other vehicle suspensions (see paragraph 9.2).

ATTENTION
Before restarting the vehicle, make sure that the tap [9] is OPEN.

13.8.2.2. Replacing the wheel – ECO1000 2/2

Preliminary information

ECO1000 2/2 vehicles are supported on four suspensions only, therefore a jack and additional supports are required to put the vehicle in safety conditions to replace the wheel.

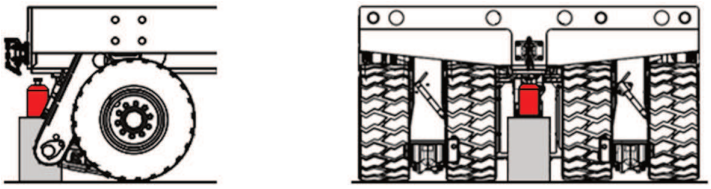
Wheel replacing support kit (Cometto code: 666.2785)	
Frame support for wheel replacing	➔Cometto code: 171.6754
Hydraulic bottle jack	➔Cometto code: 328.0015

Recommendations for using the jack and supports

Following the procedures for replacing the inner and outer wheel on the following pages, remember to:

- Put the jack close to the axle line of the wheel to replace. Put it on an suitable support, as the following image suggests.

INDICATIVE FIGURE

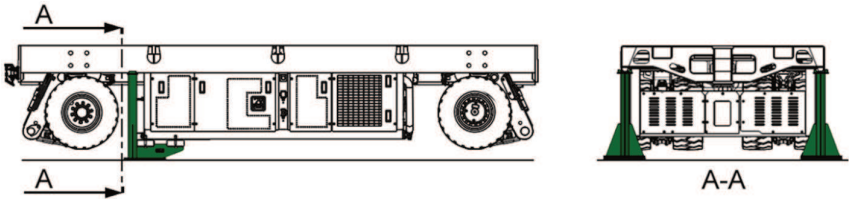


WARNING
The jack support must withstand the weight to lift and must be enough stable not to tilt during operation.

NOTE
The support must raise the jack at a height of 450 mm above the ground.
The support is not provided in the kit.

- Place the supports on the side of the axle line of the wheel to replace, as the following image suggests:

INDICATIVE FIGURE



Precautions for use and safety

WARNING
Strictly follow the instructions provided on the following pages and pay utmost attention to the following operations:

- **To avoid possible back injuries, roll the wheels on the floor and use mechanical lifting systems.**
- **Check the condition of the tyres before using them.**

Continued ➔

Continued ➔

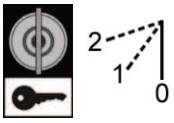
Precautions for use and safety

WARNING
Perform the replacement of a wheel with the vehicle completely empty.

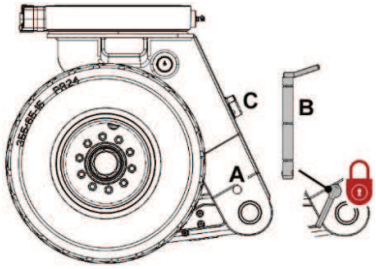
ATTENTION
The paragraph describes two different wheel replacement procedures: one for the OUTER wheel and one for the INNER wheel.

Replacing the OUTER wheel

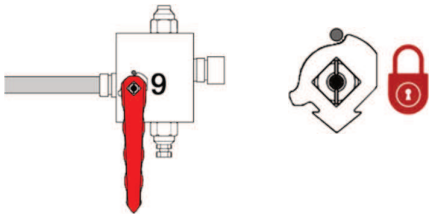
1) Start the Diesel engine (see chapter 8).
2) Completely lower the vehicle (see chapter 10).
3) Turn off the Diesel engine and the vehicle: or turn the general key to position 0.



4) Loosen the locking nuts, of the wheel to be replaced, without unscrewing them completely.
5) Lock the suspension: insert the lock pin (**B**) in the seat (**A**).

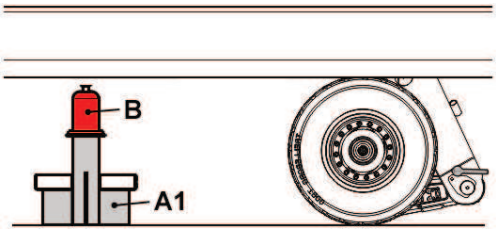


6) Close the tap [**9**] of the suspension on which the wheel must be replaced; thus the suspension is isolated from the hydraulic circuit.



7) Place the support (**A1**) and the hydraulic jack (**B**) under the frame, as indicated on the previous page under the section "**Recommendations for using the jack and supports**".

INDICATIVE FIGURE



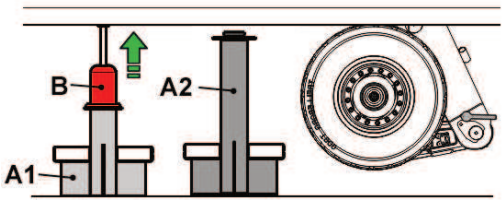
Continued ➔

Continued “Replacing the wheel – ECO1000 2/2” ➔

Replacing the OUTER wheel

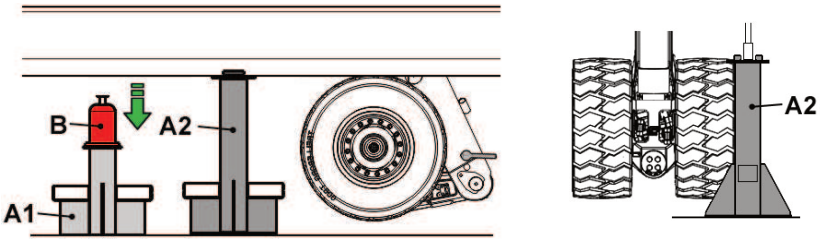
8) Lift the vehicle with the hydraulic jack (**B**) until both supports (**A2**) can be inserted under the frame, as indicated on the previous page under the section “**Recommendations for using the jack and supports**”.

INDICATIVE FIGURE



9) Lower the vehicle by releasing the pressure in the hydraulic jack (**B**) until the frame and the supports (**A2**) are in contact.

INDICATIVE FIGURE



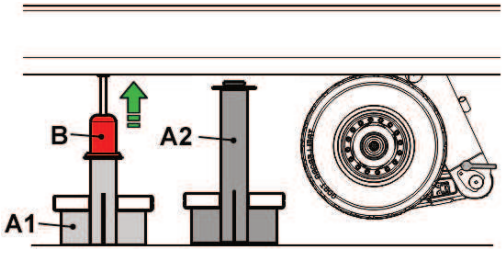
ATTENTION
Make sure not to damage any vehicle components or wiring while placing the supports.

10) Insert a pallet truck under the wheel to replace.
11) Loosen the locking nuts completely and replace the wheel.

INDICATIVE FIGURE

12) Assemble the new wheel. Tighten the wheel locking nuts slightly so that the wheel touches the hub.
13) Remove the pallet truck.
14) Lift the vehicle with the hydraulic jack (**B**) until the supports (**A2**) can be removed.

INDICATIVE FIGURE



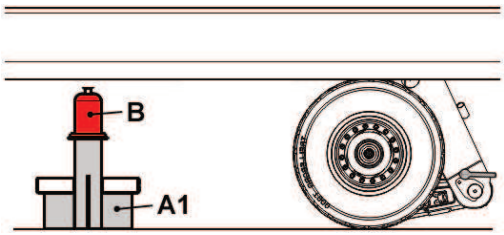
Continued ➔

Continued ➔

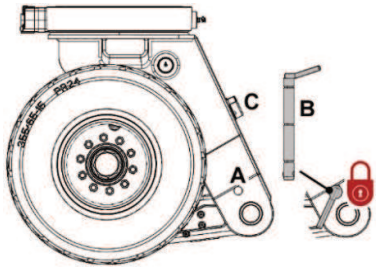
Replacing the OUTER wheel

INDICATIVE FIGURE

15) Lower the vehicle by releasing the pressure in the hydraulic jack (**B**), then remove it and its support (**A1**).

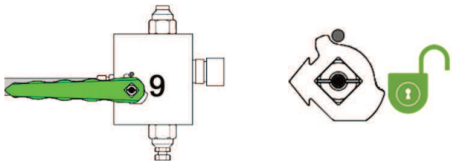


16) Remove the locking pin (**B**) putting it in its "housing" (**C**).



17) Tighten the wheel nuts according to the instructions in paragraph 13.8.3.

18) Open the tap [**9**].



19) Start again the engine and lift the vehicle to the operating height.

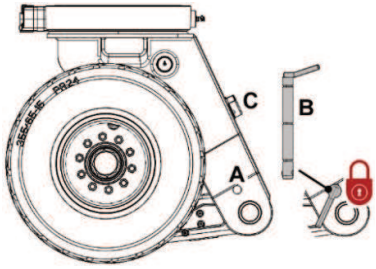
ATTENTION
Before restarting the vehicle, make sure that the tap [9] is OPEN.

Continued ➔

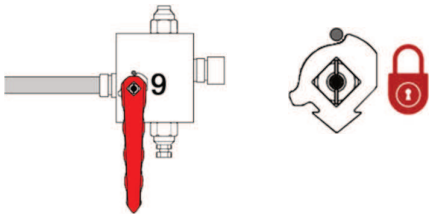
Continued “Replacing the wheel – ECO1000 2/2” ➔

Replacing the INNER wheel

1) Start the Diesel engine (see chapter 8).
2) Completely lower the vehicle (see chapter 10).
3) Lock the suspension: insert the lock pin (**B**) in the seat (**A**).

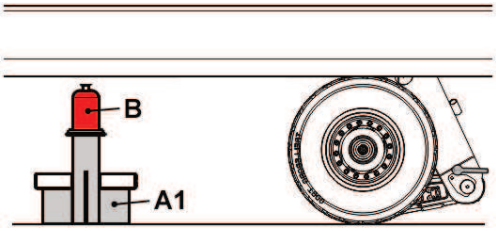


4) Close the tap [**9**] of the suspension on which the wheel must be replaced; thus the suspension is isolated from the hydraulic circuit.



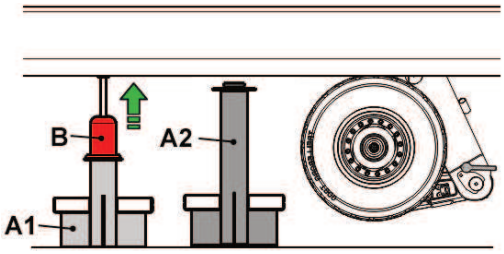
5) Place the support (**A1**) and the hydraulic jack (**B**) under the frame, as indicated under the section “**Recommendations for using the jack and supports**”.

INDICATIVE FIGURE



6) Lift the vehicle with the hydraulic jack (**B**) until both supports (**A2**) can be inserted under the frame, as indicated under the section “**Recommendations for using the jack and supports**.

INDICATIVE FIGURE



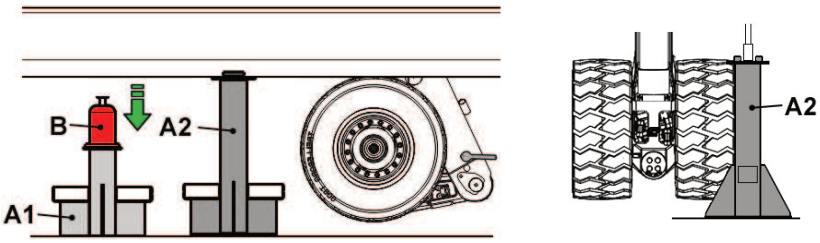
Continued ➔

Continued ➔

Replacing the INNER wheel

7) Lower the vehicle by releasing the pressure in the hydraulic jack (**B**) until the frame and the supports (**A2**) are in contact.

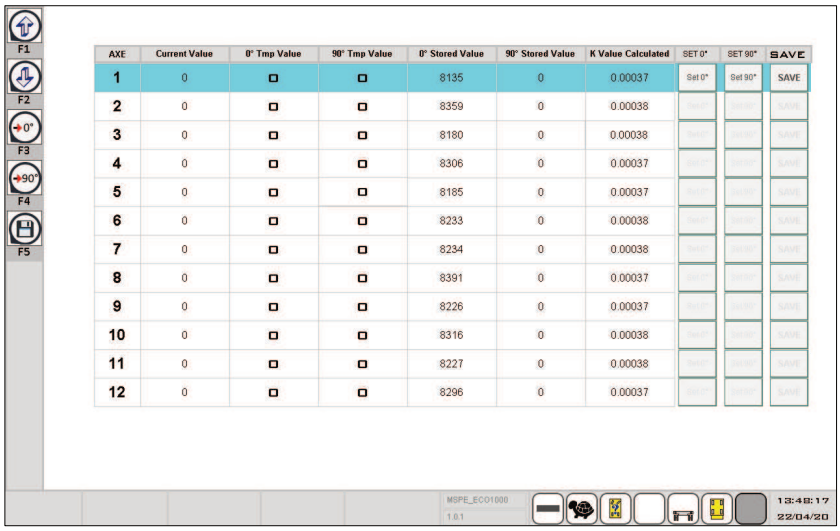
INDICATIVE FIGURE



ATTENTION
Make sure not to damage any vehicle components or wiring while placing the supports.

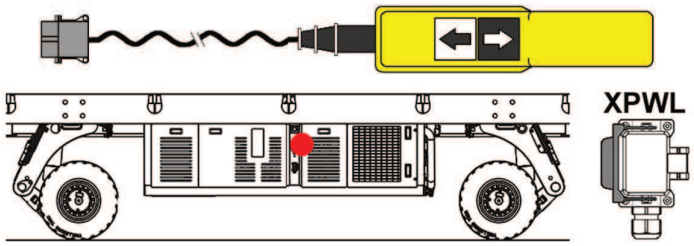
8) Open the “Reset suspensions” page of the electronic program. From the main page displayed on the [**EB1**] electric cabinet, press the keys in the sequence shown below: **F2 ➔ Password ➔ Enter ➔ Login ➔ Date&time ➔ F4 ➔ F3 ➔ F1**.

9) Use the **F1** and **F2** keys to select on the screen the suspension and the wheel to be replaced.



INDICATIVE FIGURE

10) Connect the manual steering pushbutton panel to the [**XPWL**] socket.



Continued ➔

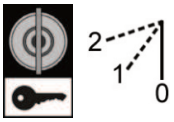
Continued “Replacing the wheel – ECO1000 2/2” ➔

Replacing the INNER wheel

11) Act on the pushbutton panel to steer the suspension until the wheel can be replaced.

WARNING
Pay utmost attention while steering the suspension: if the support is too close to the suspension, it can be bumped and possibly dislodged from its position in the manoeuvre. When necessary, interrupt the procedure and reposition the support using the jack.

12) Turn off the Diesel engine and the vehicle: turn the general key to position 0.

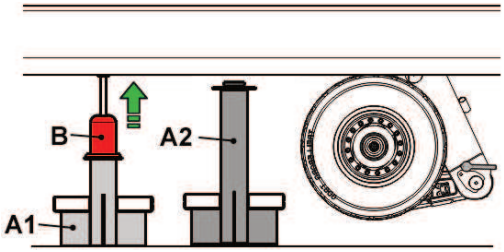


13) Insert a pallet truck under the wheel to replace.
14) Loosen the locking nuts completely and replace the wheel.

INDICATIVE FIGURE

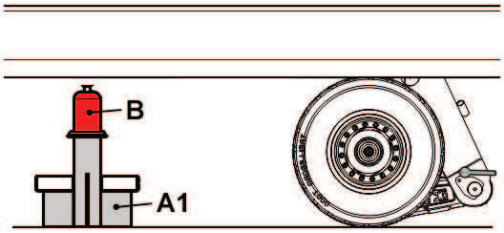
15) Assemble the new wheel. Tighten the wheel locking nuts slightly so that the wheel touches the hub.
16) Remove the pallet truck.
17) Lift the vehicle with the hydraulic jack (**B**) until the supports (**A2**) can be removed.

INDICATIVE FIGURE



18) Lower the vehicle by releasing the pressure in the hydraulic jack (**B**), then remove it and its support (**A1**).

INDICATIVE FIGURE

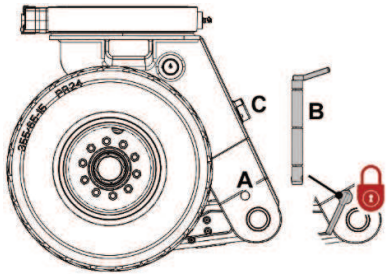


Continued ➔

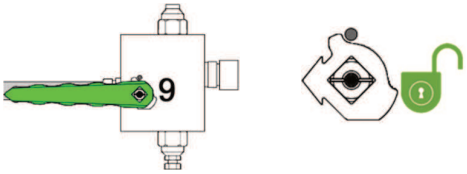
Continued ➔

Replacing the INNER wheel

19) To Remove the locking pin (**B**) putting it in its "housing" (**C**).



20) Tighten the wheel nuts according to the instructions in paragraph 13.8.3.
21) Open the tap [**9**].



22) Start again the engine and lift the vehicle to the operating height.
23) Change the steering type: in this way, the suspension will align itself with the other vehicle suspensions (see paragraph 9.2).

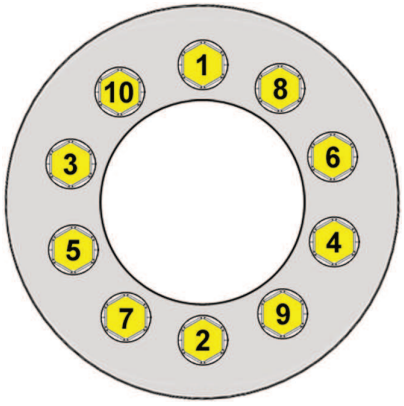
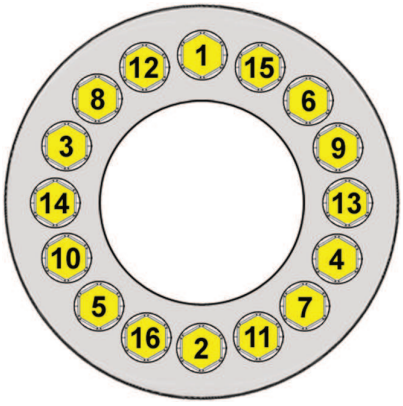
ATTENTION
Before restarting the vehicle, make sure that the tap [9] is OPEN.

13.8.3 Tightening of wheel nuts

Operating instructions

Having replaced or assembled a new wheel, tighten the relevant nuts in 3 PHASES and TRANSVERSALLY, as follows:

1) Slightly tighten the wheel nuts so it is held against the hub.
2) Tighten the wheel nuts to half the stated tightening torque.
3) Tighten the wheel nuts to the stated tightening torque value (see next page).

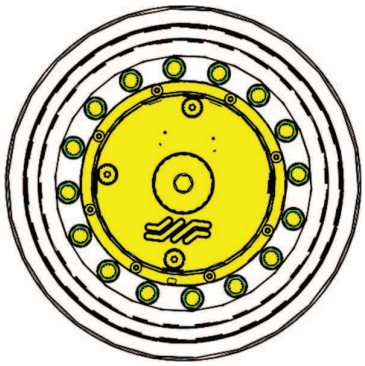
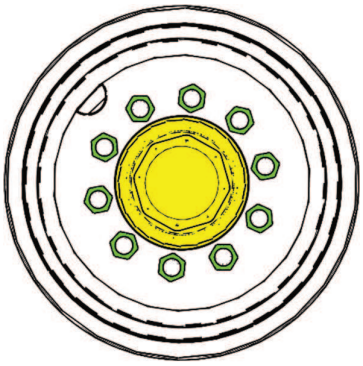
TIGHTENING SEQUENCES	
	
WHEELS WITH 10 HOLES	**WHEELS WITH 16 HOLES**

Tightening of wheel nuts Timeframe

Continued ➔

Continued ➔

Tightening torque

MOTORIZED AXLE	BRAKED AXLE AND IDLE AXLE
	
  **300 Nm**	  **450-550 Nm**

13.9. TIGHTENING TORQUE FOR ISO SCREWS

Preliminary condition

The value of the tightening torque is used to adjust the torque wrench and to avoid breaking the screws due to stress.

The following tables outline the tightening torque values relating to the various nominal diameters of the screws with metric threading.

They are guide values, for new and lubricated screws.

Precautions for use and safety

ATTENTION
Every 50 hours, conduct an overall check of the tightening torque on all the bolts.

ATTENTION
The values outlined in the tables must only be used when there are no specific provisions on the drawings outlined in the "MECHANICAL SPARE PARTS" manual.

ATTENTION
In case of assembling configurations (in longitudinal or lateral combination), re-check all the tightening torques of all the coupling elements after making a short " settling".

Continued ➔

Continued ➔

Nominal diameter screw 	Wrench 	RESISTANCE CLASS COARSE PITCH METRIC THREADING (name in brackets relating to nuts)		
		8.8 (6S)	10.9 (8G)	12.9 (12)
		N·m	N·m	N·m
M 6	10	10	14	17
M 8	13	25	35	42
M 10	17	50	70	84
M 12	19	85	120	144
M 14	22	135	190	228
M 16	24	205	288	346
M 18	27	283	398	478
M 20	30	400	562	675
M 22	32	532	744	898
M 24	36	691	970	1166
M 27	41	1010	1420	1705
M 30	46	1370	1920	2313

Nominal diameter screw 	Wrench 	RESISTANCE CLASS FINE PITCH METRIC THREADING (name in brackets relating to nuts)		
		8.8 (6S)	10.9 (8G)	12.9 (12)
		N·m	N·m	N·m
M 8 x 1	13	26	36	44
M 10 x 1.25	17	52	74	88
M 12 x 1.25	19	91	128	154
M 14 x 1.5	22	143	201	241
M 16 x 1.5	24	214	300	361
M 18 x 1.5	27	308	433	520
M 20 x 1.5	30	431	606	728
M 22 x 1.5	32	570	800	962
M 24 x 2	36	730	1020	1232
M 27 x 2	41	1070	1500	1806
M 30 x 2	46	1480	2080	2498

Conversion table from N·m
1 N·m = 0,102 kg·m
1 N·m = 0,738 lb·ft
1 N·m = 8,851 lb_f·in
1 N·m = 141,61 oz·in

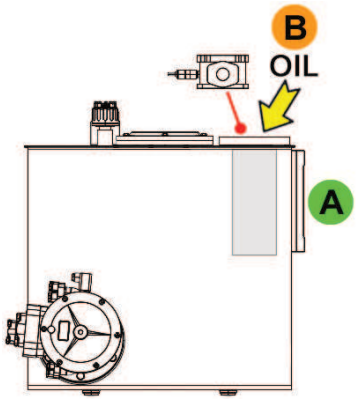
13.10. MATERIALS

13.10.1 Hydraulic oil and lubricants (type and quantity)

POSITION	TYPE	QUANTITY
HYDRAULIC OIL TANK	**AGIP ARNICA ISO VG 46** Code: 277.0065	**175** litres (approx.).
MOTORIZED AXLE Wheel and motor gear code➔ 108.0313	**MOBIL SHC™ GEAR 220** Code: 277.0075	**1.8** litres for wheel gear. (**3.6** litres for motorized axle)
DIESEL ENGINE Code: 110.0267	**SHELL RIMULA R4 L 15W-40** Code: 277.0094	**8,9 - 9,4** litres (approx.). Check the level indicated by the dipstick.

NOTE
See all the specific information in the attached Diesel engine instruction manual.

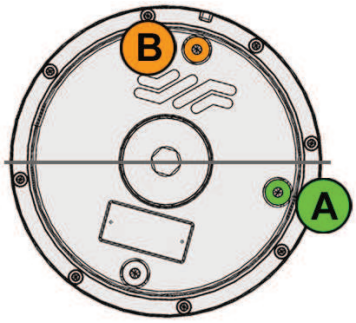
Hydraulic oil tank



A	Oil level indicator.
B	Oil insertion.

NOTE
Also see paragraph 13.7.9.

Motorized axle



A	Oil level cap – M18x1.5.
B	Oil filling and drain plug – M18x1.5.

To change the oil in the gearbox of the motorised wheel, use the caps (**A**) and (**B**), letting it run out of them (carefully rotate the gearbox as required).
For filling operations, proceed as follows:

1) Carefully rotate the wheel gear until the cap (**A**) is placed at about 15° below the centreline of the wheel gear reducer as shown in the figure.
2) Loosen the caps (**A**) and (**B**).
3) Add oil through the hole (**B**) until the oil flows out from the hole (**A**).
4) Replace caps (**A**) and (**B**).
5) Turn the wheel gear a few turns so as to eliminate any air pockets, and then loosen again cap (**A**) and check the oil level again.
6) If the oil arrives flush with the hole (**A**), filling is complete and you can screw the plug (**A**) back in. Otherwise, repeat steps from 2) onwards.

13.10.1.1. ISO VG 46 Oil

Specifications and regulations

ATTENTION
La classe di viscosità di riferimento dell'olio idraulico da utilizzare è la ISO VG 46.

The hydraulic oil has to comply with at least one of the following specifications and regulations:

- DIN 51524.
- ISO 6743.
- ISO 11158.

The hydraulic oil should belong to one of the following categories:

- ISO regulations: types HV or HM.
- DIN regulations: types HVLP or HLP.

ATTENTION
The hydraulic oil viscosity index must be greater than 150 (VI > 150).

Warnings

ATTENTION
Before using other oil types, ensure they belong to the viscosity class ISO VG 46 and that they are perfectly mixable with the hydraulic oil already in operation.

NOTE
The use of an unsuitable oil will lead to the immediate decay of the warranty on all hydraulic system parts.

13.10.1.2. Oil Mobil SHC™ Gear 220

Preliminary condition

ATTENTION
Before using other types of oil, ensure they have the same characteristics as Mobil SHC™ Gear 220 and that they are perfectly mixable.

NOTE
The use of an unsuitable oil will lead to the immediate decay of the warranty of axle and its parts.

Oil Mobil SHC™ Gear 220 – comparative table

Produttore *Manufacturer* Hersteller Marque *Fabricante* Produtor	Oli sintetici polialfaolefine (PAO) *Poly-alpha-olefin (PAO) synthetic oils* Synthetische Poly-Alpha-Olefin-Öle (PAO) Huiles synthétiques polyalphaoléfines (PAO) *Aceites sintéticos de polialfaolefinas (PAO)* Óleos sintéticos polialfaolefinas (PAO)		
	ISO VG 150	ISO VG 220	ISO VG 320
ADDINOL	Eco Gear 150 S	Eco Gear 220 S	Eco Gear 320 S
AGIP	–	Blasia SX 220	Blasia SX 320
ARAL	Degol PAS 150	Degol PAS 220	Degol PAS 320
BP	Eversyn EXP 150	Eversyn EXP 220	Eversyn EXP 320
CASTROL	Alphasyn EP 150	Alphasyn EP 220	Alphasyn EP 320
CEPSA	Energranajes HPX 150	Energranajes HPX 220	Energranajes HPX 320
CHEVRON	Tegra Synthetic Gear 150	Tegra Synthetic Gear 220	Tegra Synthetic Gear 320
DEA	Intor 150	Intor 220	Intor 320
ERG	–	–	–
ESSO	Spartan S EP 150	Spartan S EP 220	Spartan S EP 320
FUCHS	Renolin Unisyn CKC 150	Renolin Unisyn CKC 220	Renolin Unisyn CKC 320
LUBRITECH	Gearmaster SYN 150	Gearmaster SYN 220	Gearmaster SYN 320
KLÜBER	Klübersynth EG 4-150	Klübersynth EG 4-220	Klübersynth EG 4-320
LUBMARINE	–	Epona SA 220	Epona SA 320
MOBIL	Mobilgear SHC XMP 150	Mobilgear SHC XMP 220	Mobilgear SHC XMP 320
MOLIKOTE	L - 1115	L -1122	L - 1132
NILS	Acrol Synt 150	Acrol Synt 220	Acrol Synt 320
OMV	–	Gear SHG 220	Gear SHG 320
OPTIMOL	Optigear Synthetic A 150	Optigear Synthetic A 220	Optigear Synthetic A 320
PAKELO	Gearsint EP ISO 150	Gearsint EP ISO 220	Gearsint EP ISO 320
PENNZOIL	–	–	–
Q8	El Greco 150	El Greco 220	El Greco 320
ROLOIL	–	–	–
ROYAL PURPLE	Synergy 150	Synergy 220	Synergy 320
SHELL	Omala HD 150	Omala HD 220	Omala HD 320
SINCLAIR	–	–	–
SUNOCO	Duragear 150	Duragear 220	Duragear 320
TAMOIL	–	–	–
TEXACO	Pinnacle EP 150	Pinnacle EP 220	Pinnacle EP 320
TOTAL	Carter SH 150	Carter SH 220	Carter SH 320
TRIBOL	1510/150	1510/220	1510/320

13.10.2 Diesel engine coolant

Type / Code

The cooling water contains the antifreeze here reported:

Fuchs Maintain Fricofin DP	➔ Cometto code: 277.0105

Specifications and references

NOTE
See all the specific information in the attached Diesel engine instruction manual.

13.10.3 AdBlue® Additive (1)

Type / Code

The SCR system uses the following additive:

AdBlue®	➔ Cometto code: 275.0076

Specifications and references

Only use **AdBlue®** according to DIN 70070/ ISO 22241.

NOTE
See all the specific information in the attached Diesel engine instruction manual.

(1) = the SCR system (see paragraph 1.13.6) is available only on some of the Diesel motor equipped vehicles.

13.10.4 Grease

13.10.4.1. Vehicle greasing - Type of grease to use

Type of grease to use

Molykote® DX	➔ Cometto code: 275.0028

Precautions for use

ATTENTION
Use the specified grease or equivalent.
Before using other types of grease, ensure they have the same characteristics as Molykote® DX grease and that they are perfectly mixable.

NOTE
The use of incorrect greases leads to the lapse of the warranty of all mechanical components that need to be lubricated with Molykote® DX grease.

Greasing points

- Suspensions.
- Axles.
- Brake levers.
- The rod of the hydraulic puller (where applicable).
- Mechanical connection points (hinges).
- All unpainted detachable parts, such as screws and nuts.

13.10.4.2. Greasing rotation units – Type of grease to use

Preliminary information

The grease to be used varies according to the model of rotation unit installed on the vehicle.
In chapter 2, under the technical data for the ECO1000 vehicle(s) covered by this manual, check whether the ROTATION UNIT is of type **TGB** or **IMO-WD** and use the appropriate grease.

TGB rotation unit

Characteristics	
Recommended grease type	Mineral or synthetic *
For extreme pressure (EP)	Yes
NLGI consistency (ISO 2137)	Class 2
Oil separation	< 3 %
Corrosion protection and water resistance	Yes
Allowed thickeners	Calcium, lithium or aluminium sulphates
Operating temperature	-20 °C / +125 °C
Base oil viscosity (40 °C)	> 125 mm^2/s
Weld load	> 200 kg

* = when using synthetic grease, make sure that it is 100% compatible with any mineral grease.

NOTE
For more information, see the attached instruction manual of the rotation unit.

IMO-WD rotation unit

Total Ceran MS	➔ Cometto code: 275.0041

Precautions for use

ATTENTION
Use only greases that meet the specifications herein.

NOTE
The use of incorrect greases leads to the lapse of the warranty of all mechanical components lubricated with the wrong grease.

13.10.5 Greasing points

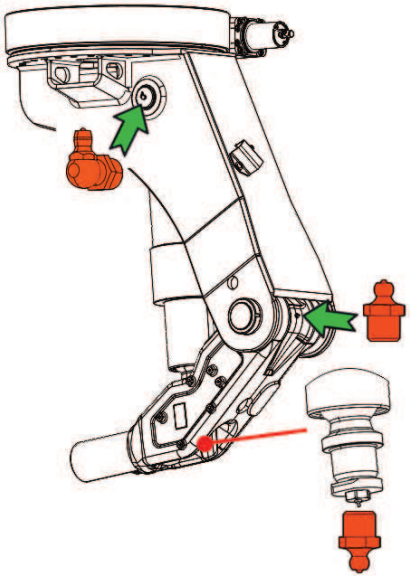
Preliminary condition

Greasing operations must be carried out using the special grease nipples.

Grease points with grease nipple	Type of grease to use
Suspensions.	**Molykote® DX**
Axles.	**Molykote® DX**
Brake levers.	**Molykote® DX**
Rotation units.	**See paragraph 13.10.4.2**

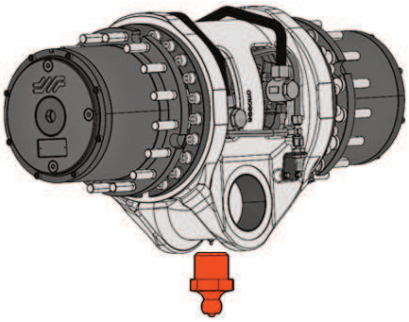
Grease points with grease nipple

Suspension



ATTENTION
Greasing operations should be carried out with the suspension fully extended.

Motorized axle



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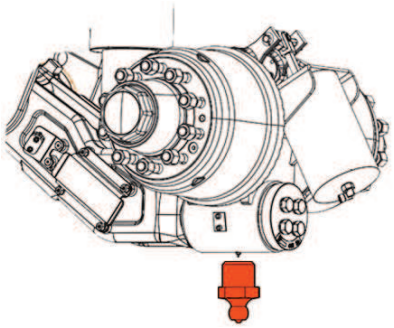
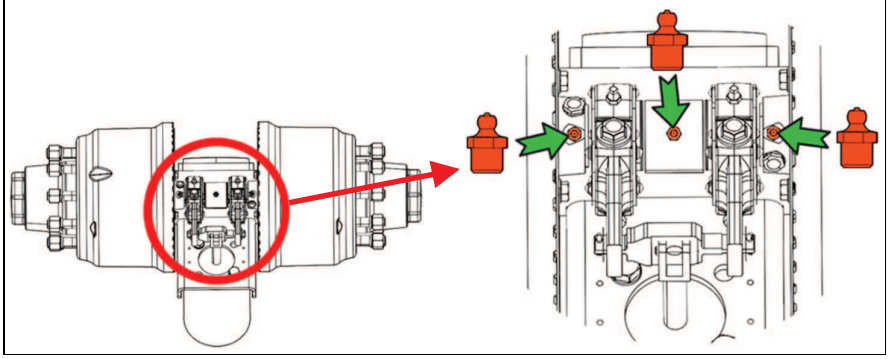
Continued “Greasing points” ➔

Greasing points with greaser

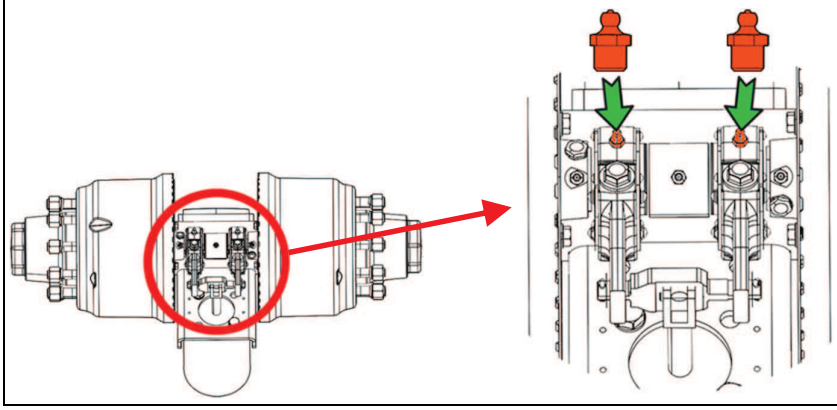
Braked axle and idle axle



Braked axle



Brake levers (on braked axle)



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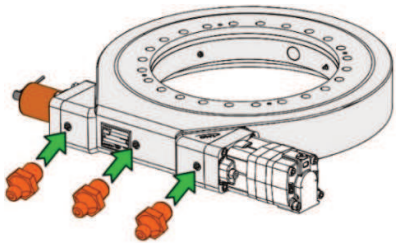
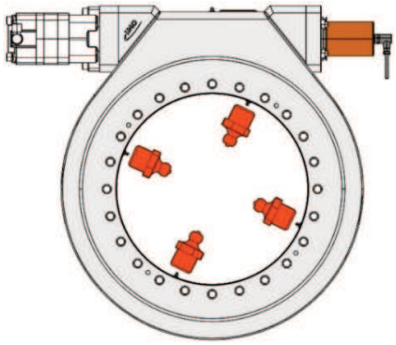
Greasing points with greaser

Rotation unit





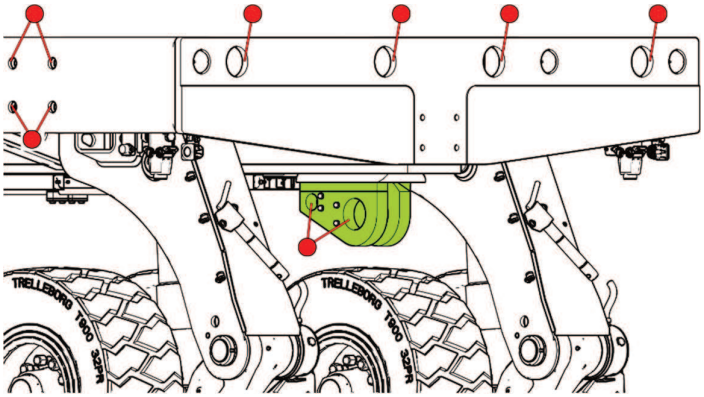
Components to be protected with a layer of grease

GREASE

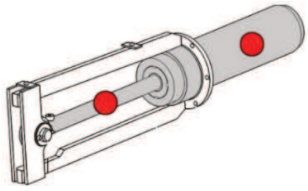
Also, protect with a layer of grease:

- All unpainted detachable parts, such as screws and nuts.
- The parts shown below (when provided).

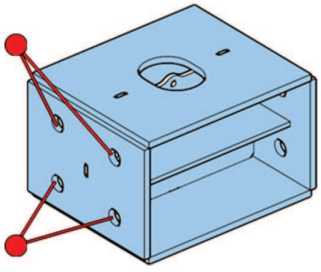
Coupling combs and holes

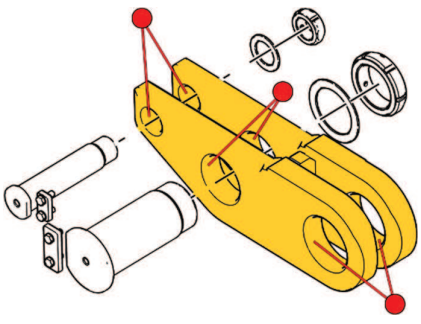


Hydraulic puller cylinders (if included in the supply)



Coupling hinges and boxes (if included in the supply)





13.10.6 Bleeding of the motorized axle pilot valve

Preliminary information

A valve is committed to motorized axle piloting ➔ Cometto code: 188.2004.
If traveling in fast mode results unstable, the valve needs to be bled.

Operating instructions

1) Ensure the valve is electrically connected.
2) Start the engine (see chapter 8) and let it idle.
3) Remove the bleeding screw (**A**).
4) Wait for some minutes, until the hydraulic oil pours without air bubbles.

ATTENTION
Avoid to manually operate the button (B).

5) As the last air bubble comes out, wait 30 seconds more to ensure the oil flows out smooth and without air.
6) Keep the engine on while you replace the bleeding screw (**A**).