Conversion Solutions for Industrial Vehicles

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IVECO ML260 Euro3 Euro5 6x2

Workshop and Maintenance Manual For self-steering tag axle

Version 0

S.T. SYSTEM TRUCK S.p.A.



Trasformazioni e Soluzioni per Veicoli Industriali

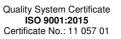
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Inc	dex o	of conversion code 50.01.10.0005	Pag.
1.		NERAL INFORMATION	
	1.1.	Introduction	3
	1.2.	Safety information	3
	1.3.	Warranty	3
	1.4.	Important notes	3
2.	SE	LF-STEERING AXLE	4
:	2.1.	Identifying plate	4
:	2.2.	Lubrication points	5
:	2.3.	Knuckle Removal and mounting	6
:	2.4.	Knuckle bushings removal / mounting	8
:	2.5.	Steering bar removal / mounting	9
:	2.6.	Removal / Mounting of the steering bar elastic bush	10
:	2.7.	Removal / Mounting of the stabilizer levers and air bellow	11
:	2.8.	Removal / Assembly of the steering lock cylinder	12
:	2.9.	Removal / Mounting of the shock-absorber	13
:	2.10.	Axle toe-in and alignment	14
3.	SU	SPENSION	15
;	3.1.	Removal / Mounting of Air Bellow	16
;	3.2.	Removal / Mounting of the shock-absorber	17
;	3.3.	Removal / Mounting of silent-block and spring eye bolt LHS	18
;	3.4.	Removal / Mounting of silent-block and spring eye bolt RHS	19
;	3.5.	Removal / Mounting of U-bolts	20
4.	PN	EUMATIC SYSTEM	21
	4.1.	System description	21
	4.2.	Adjustment of the modulating valve	24
5.	EL	ECTRICAL SYSTEM	24
6.	MA	INTENENCE INTERVALS	26
7.	AX	LE TIGHTENING TORQUES	27
8.	SO	SPENSION TIGHTENING TORQUES	28
9.	BR	AKES PNEUMATIC SYSTEM	29
10		SUSPENSION PNEUMATIC SYSTEM	30

Rev. 0 – 07/2018 Page 2 of 30 Codice: 00_20_01_0136.doc





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1. GENERAL INFORMATION

1.1. Introduction

This workshop and maintenance manual has been prepared to assist repair and maintenance procedures. For information regarding the brakes and rotating units refer to the IVECO - CNH maintenance manual.

1.2. Safety information

- S.T. System Truck can not give all the safety information and evaluate every single dangerous situation for the person who performs the work, so it is essential that those who carry out the maintenance or repair use their specialized knowledge in order to guarantee their own and others safety and to prevent damage to the vehicle. Therefore, all the operations described are to be carried out in compliance with the directives and instructions of the competent authorities on health and safety at work and environmental protection.
- Before starting workshop or maintenance work, secure the vehicle.
- Use only instruments that are not damaged and adequate for the operation to be performed.
- After reassembling the various parts, make sure there is sufficient space between the moving parts, in all operating positions, with all steering angles, travel heights and wear conditions.

1.3. Warranty

1. Warranty period is two (2) years starting from matriculation date.

- 2. Warranty covers damages due to defects in materials, components and parts installed or otherwise attributable to S.T. System Truck. Warranty does NOT cover damages related to consumables such as fuses, light bulbs, brake pads, etc.
- 3. Concerning the operational management of the guarantee, reference is made to the IVECO CNH internal procedures.
- 4. S.T. System Truck is not responsible and consequently does not recognize any warranty or assume any responsibility - for any defects and / or damage resulting from improper use, such as:
 - Incorrect or improper installation
 - Non-compliance with the maintenance instructions
 - Actual overload on the axle (for the maximum load, see the plate applied under the front grille next to the IVECO).

1.4. Important notes

All components are specially designed and manufactured for correct functionality and useful life. Any changes can have a negative effect on the reliability of the product.

Therefore, unless expressly authorized by S.T. System Truck, it is forbidden to perform the following works:

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Rev. 0 - 07/2018



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- welding, heating and straightening, chrome plating and other similar works;
- executing holes or grooves;
- fixing of any brackets or clamps.

Carefully inspect all components that have been (or are suspected to have been) subjected to impact. Replace the components if necessary.

For the tightening torques of the axle bolts refer to paragraph 7. In operation description, the Nm symbol indicates the torque value in Newtonmeter.

2. SELF-STEERING AXLE

2.1. Identifying plate

The axle, built by Tecma company, is equipped with a plate containing the main features and the serial number for identification.

The plate is positioned in the center of the axle body.



Axle Type
Brake Type
Model
Load Capacity
Max speed
Serial Number
Test approval number

Quality System Certificate
ISO 9001:2015
Certificate No.: 11 057 01



Rev. 0 - 07/2018

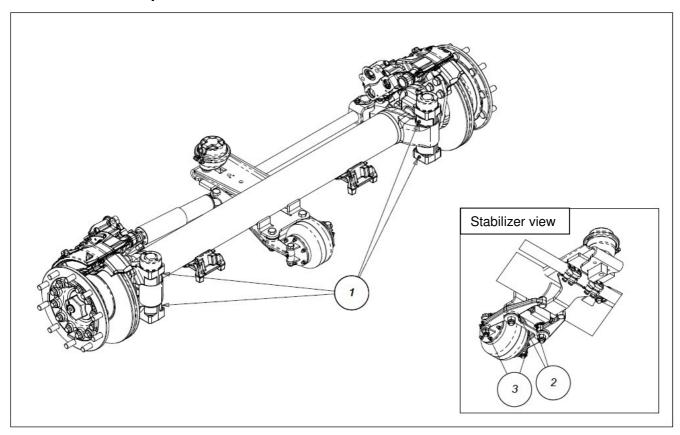
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2.2. Lubrication points



1	Knuckle bushing lubrication	Lubrication of the bushings must be carried out with the axle raised without load. Remove the greaser protection, lubricate with commercial equipment until the grease comes out. Clean the excess of grease and reposition the grease guard. Use multipurpose grease.
2	Bushings of the stabilizer levers lubrication	Remove the greaser protection, lubricate with commercial equipment until the grease comes out. Wipe off excess grease and reposition grease nipple protection. Use multipurpose grease.
3	Lubrication of the air spring joint bushings	Remove the greaser protection, lubricate with commercial equipment until the grease comes out. Wipe off the excess of grease and reposition the grease nipple protections. Use multipurpose grease.

Codice: 00_20_01_0136.doc

Rev. 0 - 07/2018



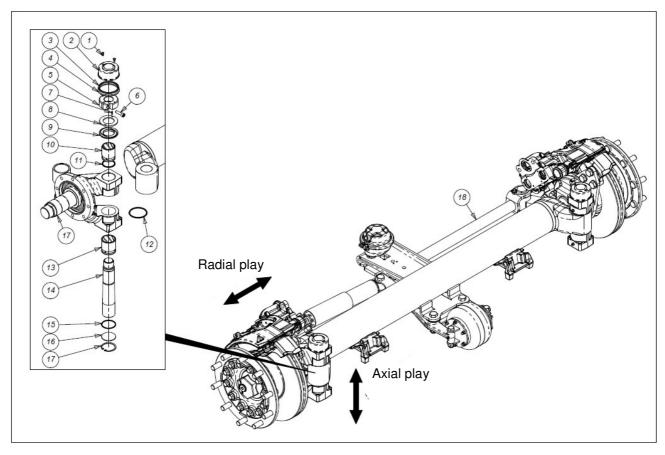
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2.3. Knuckle Removal and mounting



Periodic inspection of the spindle joint

- Check the axial clearance: it must be less than 1 mm. If you need to register the clearance, perform steps 2-8-9.
- Check the total radial clearance: it must be less than 1 mm. If the indicated limit is exceeded, replace the worn parts according to the following operations:

1	Removal of the steering bar	Refer to par. 2.5
2	Removal of the top cover	Unscrew the cover screws (1) and slide the cover (2) upwards, remove the O-Ring (3) and the ring (4).
3	Removal of the bottom cover	Remove the Seeger (17), the cover (16) and the O-Ring (15).
4	Unscrew the adjusting nut	Unscrew the safety screw (6) and loosen the adjusting nut (5) (do not remove it until the kingpin (14) is released).
5	Removal of the kingpin	Release the pin (14) using a mallet and, if necessary, heat the axle body head. Then remove the nut (5), the thrust ring (8) and the pin (14). Remove the bracket (17).
6	Knuckle bushings replacement	Refer to par. 2.4

Codice: 00_20_01_0136.doc

Rev. 0 - 07/2018



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7	Mounting of the knuckle	Assemble the knuckle inserting the O-Ring (12) between the body and the knuckle in the bottom section and the O-Ring (11) in the upper arm of the knuckle. Insert the kingpin (14) and press it with a force of 5000 daN ± 500 daN using a press. If the press is not available, apply a couple of mallet strokes.
8	Adjust of the axial play	Make sure that the axle is lifted from the ground, apply the thrust ring (8) with a layer of multipurpose grease on the surface in contact with the ring (9). Screw the adjusting nut (5) until it stops the knuckle (17) rotation, then unscrew it by 20/30° and check for it to rotate freely. Finally, lock it by tightening the screw (6) at 90 ÷ 110 Nm.
9	Mounting of the top cover	Insert the ring (4) and the O-Ring (3). Insert the top cover (2) and tighten the screws (1).
10	Mounting of the bottom cover	Insert the O-Ring (15), the cover (16) and finally the Seeger (17).
11	Bushings lubrication	Refer to par. 2.2
12	Mounting of the steering bar	Refer to par. 2.5
13	Toe-in check and alignment.	Refer to par. 2.10

Codice: 00_20_01_0136.doc

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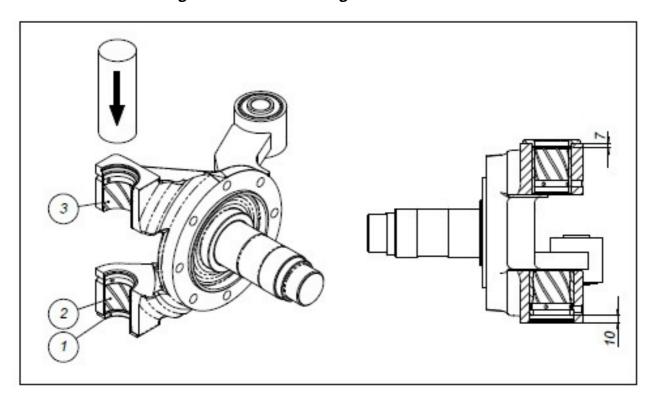
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2.4. Knuckle bushings removal / mounting



1	Extraction of the bushings and the thrust ring	Remove the bushing (3) (external \varnothing 63) using a press, pushing from the outside towards the center of the knuckle. Remove the thrust ring (1) with a chisel. Remove the bushing (2) (outer \varnothing 58) by pushing from the outside towards the center of the knuckle.
2	Knuckle cleaning	Clean the bushings seats and the grease ducts, replace the grease nipples.
3	Mounting of the bushings	Insert the bushings from the outside towards the center of the knuckle paying attention to the position of the grooves. Respect the scheme dimensions.
4	Mounting of the thrust ring	Fit the thrust ring making sure that it is in contact with the knuckle surface.

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Rev. 0 - 07/2018



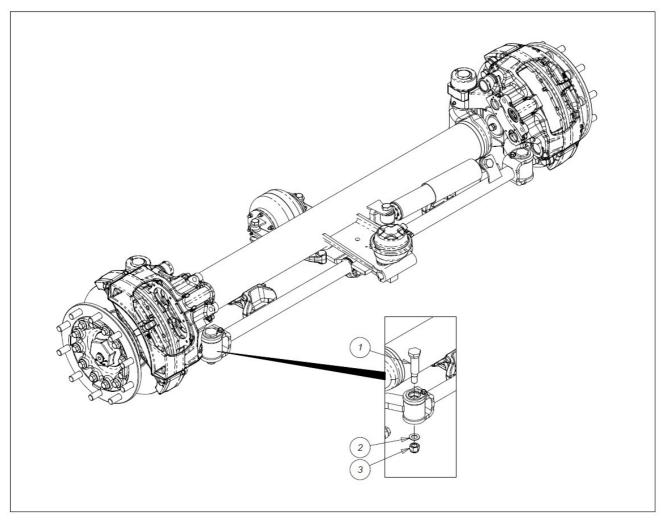
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2.5. Steering bar removal / mounting



1	Brake caliper removal	Follow IVECO – CNH instructions
2	Shock absorber removal	Refer to par. 2.8
3	Eccentric pin removal	Unscrew the nut (3) and remove the eccentric pin (1) using a plastic mallet.
4	Bar removal	Remove the bar by sliding it off to one side
5	Bar mounting	Perform the operations in reverse order, tighten to 290 ÷ 350 Nm
6	Toe-in check and alignment.	Refer to par. 2.10

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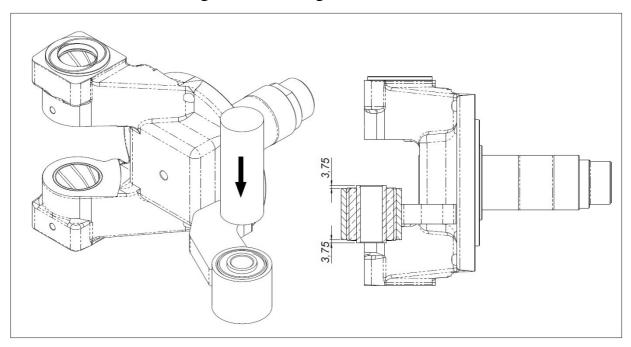
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2.6. Removal / Mounting of the steering bar elastic bush



1	Elastic bush removal	Remove the elastic bush using a press.
2	Elastic bush mounting	Fit the elastic bush by pressing on the outer ring, so as not to damage the rubber. The bushing must be centered with respect to the arm (see dimensions in above figure).

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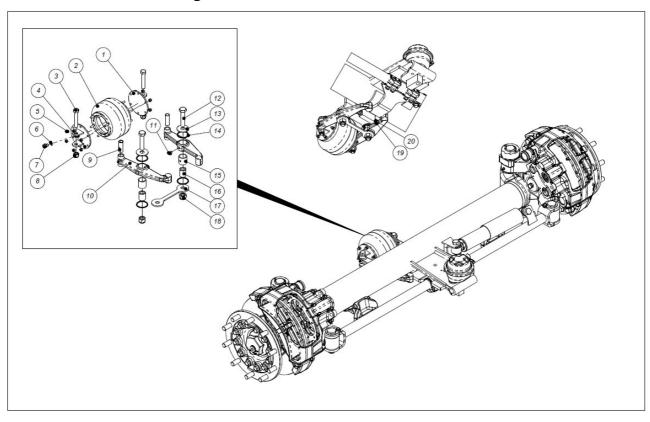
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2.7. Removal / Mounting of the stabilizer levers and air bellow



1	Removal of the air bellow	Remove the connection to the air system by unscrewing the fitting (7). Unscrew the nuts (8) and remove the screws (3).
2	Checking of the air bellow	Check the air spring and if necessary replace it by removing the nuts (5) and brackets (1) and (4). Reassemble the brackets and check for air leaks Nm.
3	Removal of the stabilizer levers	Unscrew nut (18) and remove blade (17). Remove the lever, check the wear of the bushings (9) and (15). If necessary, remove the worn bushings, remove the grease nipples, insert the new bushings and drill them at the grease hole, fit new grease nipples.
4	Mounting of the stabilizer levers	Assemble in sequence: screw (12), washer (13), O-ring (14), lever (10), bush (16), O-ring, blade (17) and nut (18) Nm. Check for the levers to rotate freely.
5	Mounting of the air bellow	Assemble the brackets complete with air bag on the levers, insert the screws (3) and tighten the nuts (8) Nm. Verify that the brackets rotate freely. Connect the supply hoses.
6	Adjustment of the lever stroke	Lock the axle steering, supply air to the stabilizer, adjust the screws (20) so that the levers are both in contact with the steering bar blade, lock the screws with the locknuts (19) Nm.
7	Lubricating	Refer to par. 2.5

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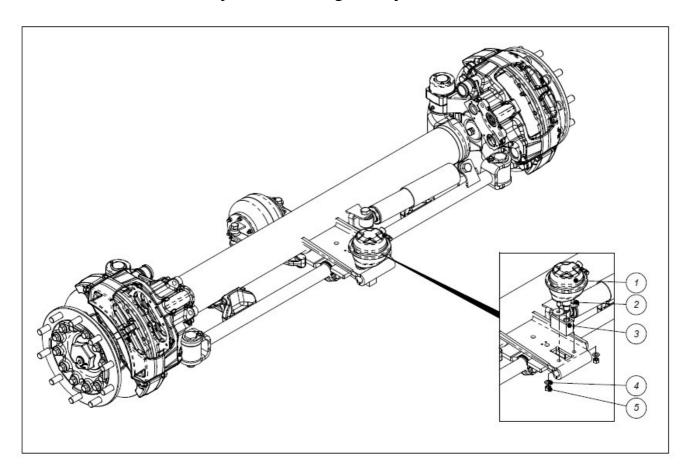
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2.8. Removal / Assembly of the steering lock cylinder



1	Locking cylinder removal	Remove the pneumatic supply of the cylinder, unscrew the nut (5) and extract the cylinder upwards.
2	Replacing of the cylinder block	Supply the cylinder with pressurized air, insert a pin into the hole of the cylinder pin so as to block the rotation and unscrew the block (3) from the pin.
3	Locking cylinder mounting	Perform the operations in reverse order. Tighten to 75 ÷ 95 Nm.

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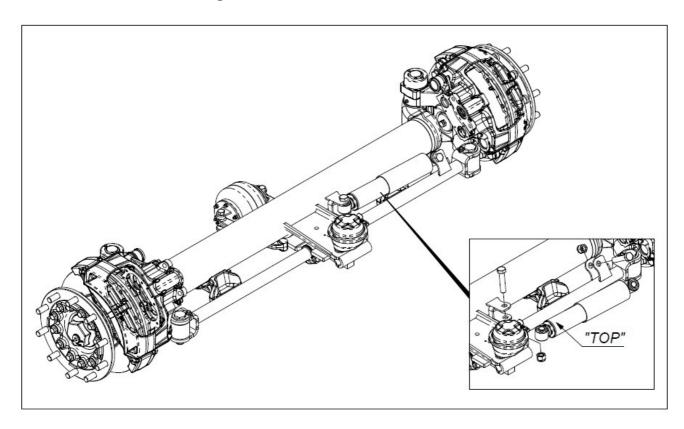
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2.9. Removal / Mounting of the shock-absorber



1	Shock-absorber removal	Unscrew the nuts and remove the screws, then remove the shock-absorber.
2	Shock-absorber mounting	Fit the shock-absorber making sure that the side with the "TOP" writing is upwards. Fit the relative bolts and tighten to 290 ÷ 350 Nm.

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Rev. 0 - 07/2018



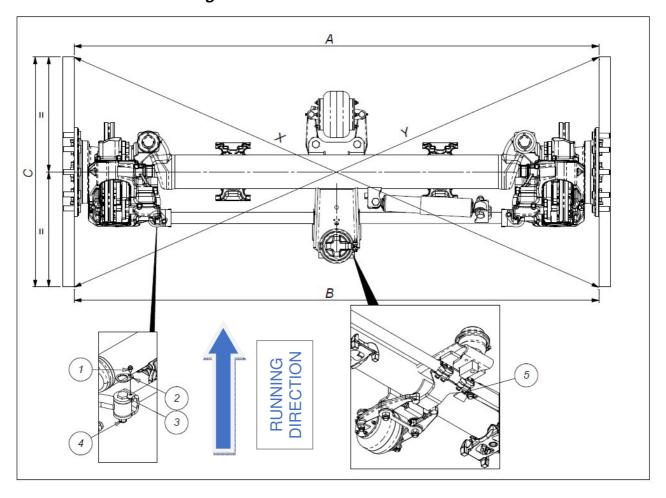
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2.10. Axle toe-in and alignment



For these operations, two rulers of length C = 1000 mm are required. The vehicle must be unloaded and parked on a flat surface.

Place the rulers as shown in the diagram. With the steering bar locked, (locking cylinder inserted), use appropriate equipment to align one of the two wheels of the axle to the vehicle.

The toe-in must be between 1 and 3 mm. If not, proceed with the following steps:

- a) unscrew the screw (1)
- b) remove the stopper (2)
- c) loosen the nut (4)
- d) turn the eccentric pin (3)
- e) adjust the toe-in
- f) mount the stopper (2) and tighten the screw (1) to $45 \div 55$ Nm.
- g) screw the nut (4) to 290 ÷ 350 Nml.

Repeat steps a) to g) to align the other wheel.

The total toe-in B - A must therefore be between 2 and 6 mm.

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ISO 9001:2015
Certificate No.: 11 057 01



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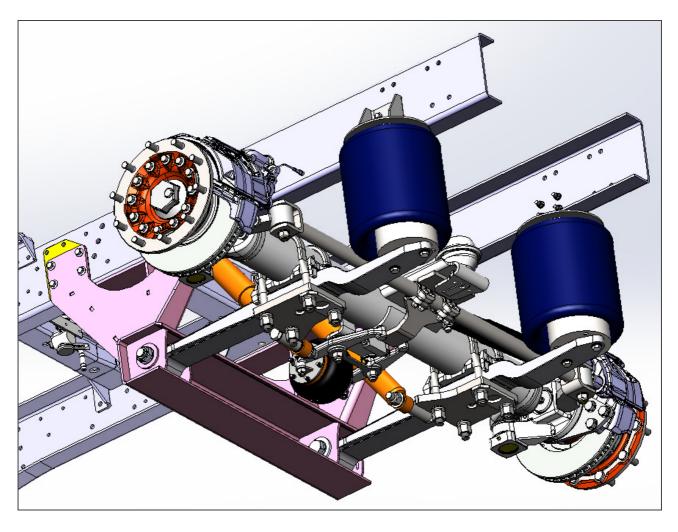
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3. SUSPENSION



The pneumatic suspension unit is built by S.T. System Truck and consists of pneumatic springs (air bellow) anchored to the frame and supported by the same beams on which the axle is bolted.

For the assembly with all the necessary indications, refer to the table 10.01.10.0013 in paragraph 8

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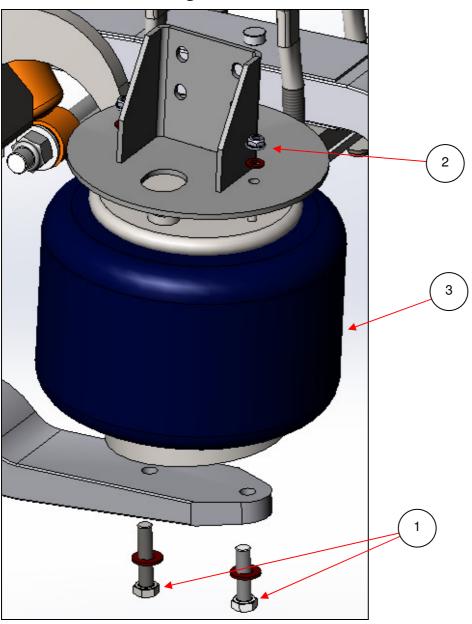
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3.1. Removal / Mounting of Air Bellow



1	Preparation	When the vehicle is empty, place suitable spacers on the mechanical stops of the drive axle suspension
2	Removal of the air bag	Vent the pneumatic system, disconnecting the supply pipe. Unscrew the screws (1), the nuts (2) and remove the air spring (3)
3	Mounting the air bag	Perform the operations in reverse order. Tighten the screws (1) to 126 \div 154 Nm. Tighten the nuts (2) to 36 \div 44 Nm

<u>Warning!</u> Do not weld the steel components of the air bags or the air tank. The air bag can only be inflated with compressed air when it is installed. Danger of injury!

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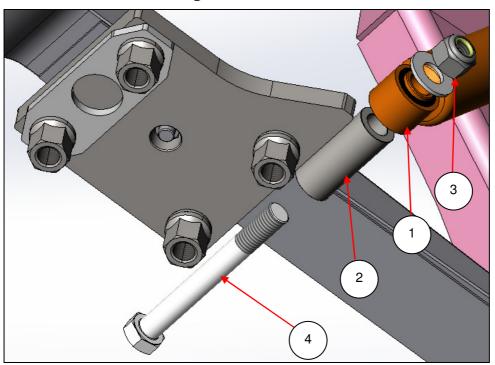
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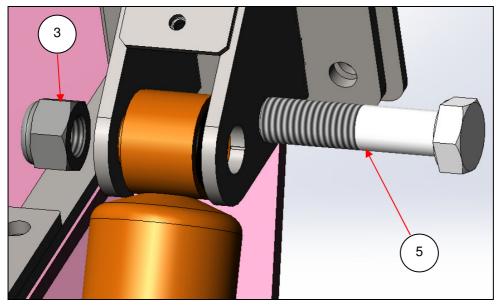
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3.2. Removal / Mounting of the shock-absorber





1	Removal of the shock-absorber	Unscrew the screw (4) to release the shock absorber (1) from the plate (2), unscrew the other screw (5) to release it from the upper support and remove the shock absorber.
2	Mounting of the shock-absorber	Perform the operations in reverse order to fit the shock absorber. Tighten the screws (4) and (5) to 405 ÷ 495 Nm

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Rev. 0 - 07/2018



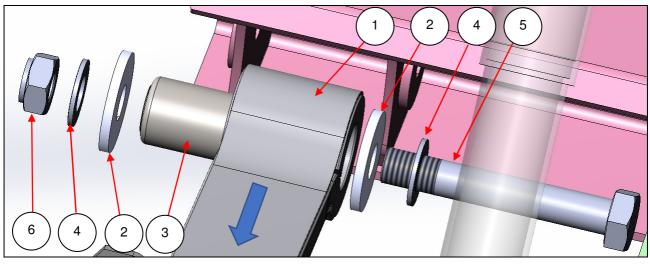
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3.3. Removal / Mounting of silent-block and spring eye bolt LHS



1	Preparation	When the vehicle is empty, place suitable spacers on the mechanical stops of the drive axle suspension		
2	Remove the tyres	Vent the pneumatic supply from the suspension springs by disconnecting the supply pipe.		
3	Remove air bag	Refer to par. 3.1		
4	Remove shock absorber on spring side	Refer to par. 3.2		
5	Remove the U-bolt	Refer to par. 3.5		
6	Remove the spring	Unscrew the screw (5) and the nut (6). With a movement from top to bottom and at the same time pulling in the longitudinal direction (blue arrow), remove the half-leaf (1) from its seat. Remove the shims (2).		
7	Extract the silent-block	With the aid of a press, extract the silent-block from the spring eye		
8	Mounting the silent-block and spring eye bolt LHS	Perform reverse operations. N.B.: When fitting the silent-block in the spring eye, press on the outer ring to avoid damaging the rubber bushings. Tighten the nut (6) to 540 ÷ 660 Nm		
9	Mounting the U-bolt	See par. 3.5		
10	Mounting the shock-absorber	See par. 3.2		
11	Mounting the air bag	See par. 3.1		
12	Mounting the tyres	Tighten the wheel nuts to the stud bolts according to IVECO - CNH instructions. Restore the pneumatic connections to the suspension springs, then start the engine to pressurize the system. Finally, check that there are no air leaks.		
13	Align the axle	Refer to par. 2.10		

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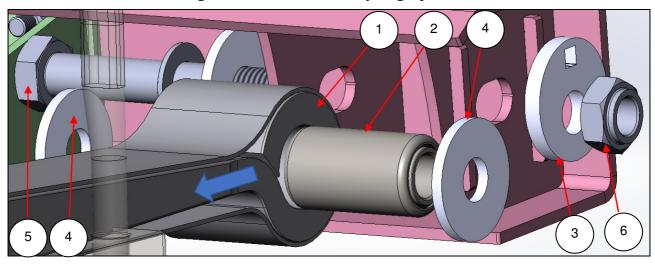
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3.4. Removal / Mounting of silent-block and spring eye bolt RHS



1	Preparation	When the vehicle is empty, place suitable spacers on the mechanical stops of the drive axle suspension			
2	Remove the tyres	Vent the pneumatic supply from the suspension springs by disconnecting the supply pipe.			
3	Remove the air bag	Refer to par. 3.1			
4	Remove shock-absorber on spring side	Refer to par. 3.2			
5	Remove the U-bolt	Refer to par. 3.5			
6	Remove the spring	Unscrew the screw (5) and the nut (6). Remove the eccentric washer (3). With a movement from top to bottom and at the same time pulling in the longitudinal direction (blue arrow), remove the half-leaf (1) from its seat. Remove the shims (4) and extract the silent-block (2).			
7	Extract the silent-block	With the aid of a press, extract the silent-block from the spring eye			
8	Mounting the silent-block and RH spring eye bolt	Perform reverse operations. N.B.: When fitting the silent-block in the spring eye, press on the outer ring to avoid damaging the rubber bushings. Approach the nut (6) as far as it will go, then check the alignment of the axis by acting, if necessary, on the eccentric washer (3) by turning it using a ½ " square key. Tighten the nut (6) to 540 ÷ 660 Nm			
9	Mounting U-bolt	Refer to par 3.5			
10	Mounting shock-absorber	Refer to par 3.2			
11	Mounting air bag	Refer to par 3.1			
12	Mounting the tyres	Tighten the wheel nuts to the stud bolts according to IVECO - CNH instructions. Restore the pneumatic connections to the suspension springs, then start the engine to pressurize the system. Finally, check that there are no air leaks.			
13	Align the axle	Refer to par 2.10			

Codice: 00_20_01_0136.doc

Rev. 0 - 07/2018



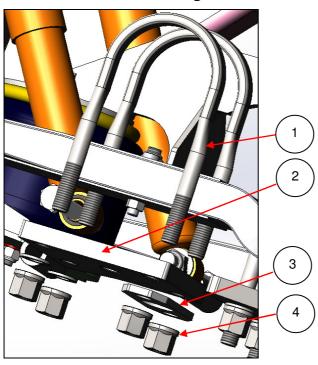
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3.5. Removal / Mounting of U-bolts



1	Preparation	When the vehicle is empty, place suitable spacers on the mechanical stops of the drive axle suspension			
2	Remove the tyres	Vent the pneumatic supply from the suspension springs by disconnecting the supply pipe.			
3	Remove the shock-absorber on spring side	Refer to par 3.2			
4	Remove the U-bolts	Unscrew the nuts (4), remove the washers and the plate (3), remove the plate (2) which was also bolted to the coupling of the shock absorber, remove the U-bolts (1)			
5	Mounting the U-bolts	Perform reverse operations to step 4. Tighten the nuts (4) to 683 ÷ 835 Nm			
6	Mounting the shock-absorber	Refer to par 3.2			
7	Mounting the tyres	Tighten the wheel nuts to the stud bolts according to IVECO - CNH instructions. Restore the pneumatic connections to the suspension springs, then start the engine to pressurize the system. Finally, check that there are no air leaks.			
8	Align the axle	Refer to par 2.10			

Codice: 00_20_01_0136.doc

Rev. 0 - 07/2018



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4. PNEUMATIC SYSTEM

4.1. System description

The pneumatic system necessary for the suspension is a derivation of the existing on the vehicle, with the addition of some components in order to obtain an optimized sizing and an adequate functioning (see tables 9 and 10).

Specifically, the system takes air from a 3-way connection located downstream of the air-dryer (Fig. 4.1).



Fig. 4.1

An additional 20-liter tank ensures the required air flow. At the inlet of the tank there is a non-return valve set at 7 bar, and in series a pressure switch n.c. calibrated at 6.5 bar that feels the pressure in the circuit (Fig. 4.2).





Fig. 4.2 Fig. 4.3

If there was a pressure drop, this would be signaled by a red LED on the dashboard in the cab. At the outlet of the tank there is a pressure relief valve in order to avoid any pressure peaks (Fig.4.3).

The most important component of the system is the modulating valve (Fig. 4.4). The modulating valve has the function of regulating the pressure inside the air bags of the pneumatic suspension as the load conditions of the vehicle vary.

Codice: 00_20_01_0136.doc

Rev. 0 - 07/2018



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Fig. 4.4

To block the axle in position with straight wheels, there is a special solenoid valve controlled by a relay operated by a button placed in the dashboard (Fig. 4.5).



Fig. 4.5

The pneumatic system also controls the axle brakes. To this end, the air signal is taken in derivation from the 2 electro-pneumatic valves for the ABS (Fig. 4.6) and from the single-control relay valve driven by the pneumatic suspension (Fig. 4.7).



Fig. 4.6

Codice: 00_20_01_0136.doc

Rev. 0 - 07/2018

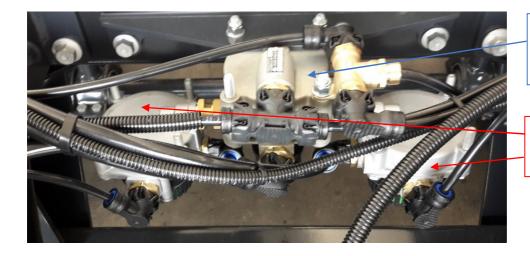


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Single-lever relay valve controlled by suspension

Single-lever relay valves added

Fig. 4.7



On the left air bag there is also a pressure take-off to check the pressure (Fig. 4.8).

Fig. 4.8

Another 20 It additional tank located downstream of the single-control valve (Fig. 4.9) ensures (through an amplifier valve) the capacity necessary to supply the 2 brake-chambers installed on the axle (Fig. 4.10). The latter, being powered by dedicated single-control valves in series with the ABS valves (Fig. 4.7), work with pressure proportional to that supplied to the brakes of the drive axle.



Fig. 4.9

Codice: 00_20_01_0136.doc

Rev. 0 - 07/2018



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Fig. 4.10

4.2. Adjustment of the modulating valve

The modulating valve is basically a pressure regulator to stiffen the air springs of the suspension depending on the load. To adjust the modulating valve according to the load, please refer to the instructions in the box at the top left of the pneumatic suspension diagram - see par. 10. The diagram shows the dimensions to be respected and the pressure values corresponding to the load on the suspension: from 0 bar (incipient valve opening) for the chassis vehicle up to 4.5 bar (8 tons ground weight).

5. ELECTRICAL SYSTEM

The electrical system basically consists of 2 wiring harnesses, a cabin wire and a wire installed in the frame connected to each other.

The wiring installed in the cabin consists of the addition of:

- 1 control relay for the solenoid valve (black, with S.T. System Truck label, Fig. 5.1);
- 2 LEDs, one red to indicate low pressure, one yellow to signal the inserted axle locking (Fig. 5.2);



Rear axle locking switch

Red LED → low pressure in the circuit of the Suspension

Yellow LED →
Axle locking inserted

MANUAL SUSPENSION CIRCUIT LOW AIR PRESERING AXLE LOCKING

SUSPENSION CIRCUIT LOW AIR PRESERING AXLE LOCKED

Fig. 5.1

Fig. 5.2

Quality System Certificate
ISO 9001:2015
Certificate No.: 11 057 01



Rev. 0 - 07/2018

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The chassis harness allows to control the locking solenoid valve, the pressure switch, the proximity sensor placed near the axle locking cylinder.

A cable connected in series with the one for signaling brake wear on the drive axle, allows brake wear control of the rear axle (Fig. 5.3)

Harness added in series





Fig. 5.3

In fig. 5.4 is the axle locking cylinder and the locking signal sensor inserted.





Fig. 5.4

Rev. 0 – 07/2018 Page 25 of 30

Codice: 00_20_01_0136.doc



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6. MAINTENENCE INTERVALS

	AFTER FIRST 5.000 KM OR	EVERY 30.000 KM OR EVERY THREE	EVERY 90.000 KM OR EVERY 6	EVERY 150.000KM OR EVERY 12				
	AFTER THE FIRST MONTH	MONTHS	MONTHS	MONTHS				
GREASE								
KING PIN JOINTS AND STABILIZER ARMS		х						
OIL IN THE HUB BEARINGS	REFER TO IVECO MANUAL							
MECHANICAL CHECKS								
WHEEL NUT TORQUE								
CAUTION: ALSO AFTER THE FIRST 50 KM AND 150 KM. ALSO AFTER EVERY DISASSEMBLY OF THE WHEELS	X		X					
PLAY IN THE HUB BEARINGS	REFER TO IVECO MANUAL							
VISUAL CHECKS								
DETERIORATION OR BREAKING OF THE PARTS SUBJECT TO WEAR	х	x						
TYRE WEAR	x	х						

⁻ For vehicles used in heavy duty conditions the intervals must be reduced.

Page 26 of 30

Codice: 00_20_01_0136.doc

Rev. 0 - 07/2018



⁻ After long periods of stopping, before starting up, perform a general check on the correct functioning of the various components.

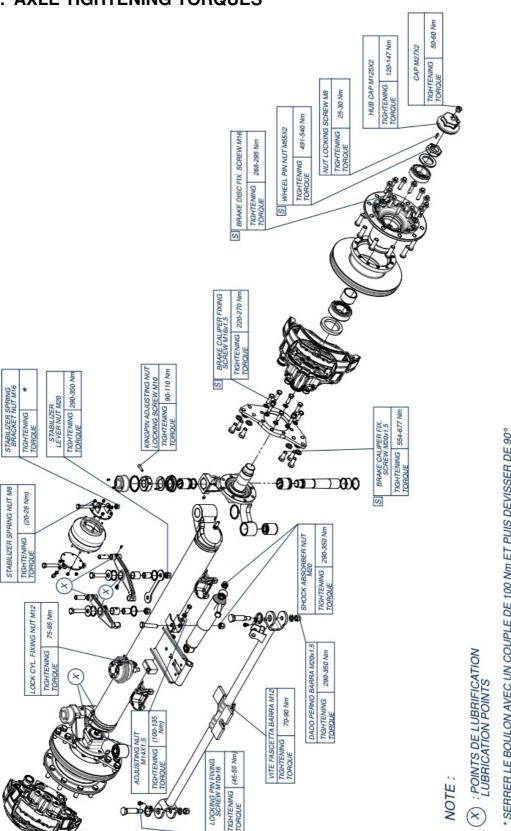
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7. AXLE TIGHTENING TORQUES



* SERRER LE BOULON AVEC UN COUPLE DE 100 Nm ET PUIS DEVISSER DE 90°. TIGHTEN THE NUT WITH A TORQUE OF 100 Nm AND THEN UNSCREW IT OF 90°. ATTENTION: MARQUEZ LES FENÊTRES INDIQUÉES AVEC LE SYMBOLE "S" APRÈS LE SERRAGE CHAQUE VIS AVEC UN SIGNE POUR CONFIRMER L'ÉVÉNEMENT DE SERRAGE.
ATTENTION:THE BOLTS INDICATED WITH SYMBOL "S" MUST BE MARKED WITH A HIGLIGHTER / MARKER AFTER TIGHTENING, TO CONFIRM THE CORRECT TORQUE.

FAKT

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Rev. 0 - 07/2018

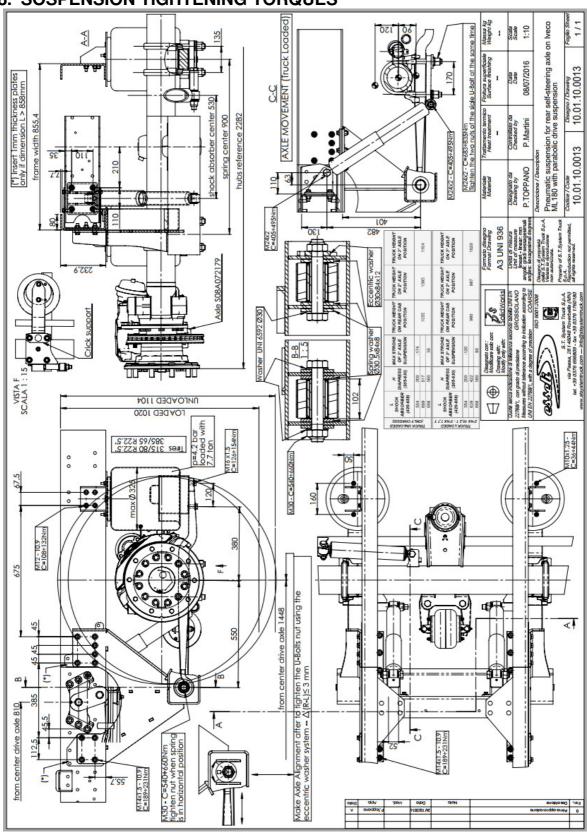
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8. SOSPENSION TIGHTENING TORQUES



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Rev. 0 - 07/2018



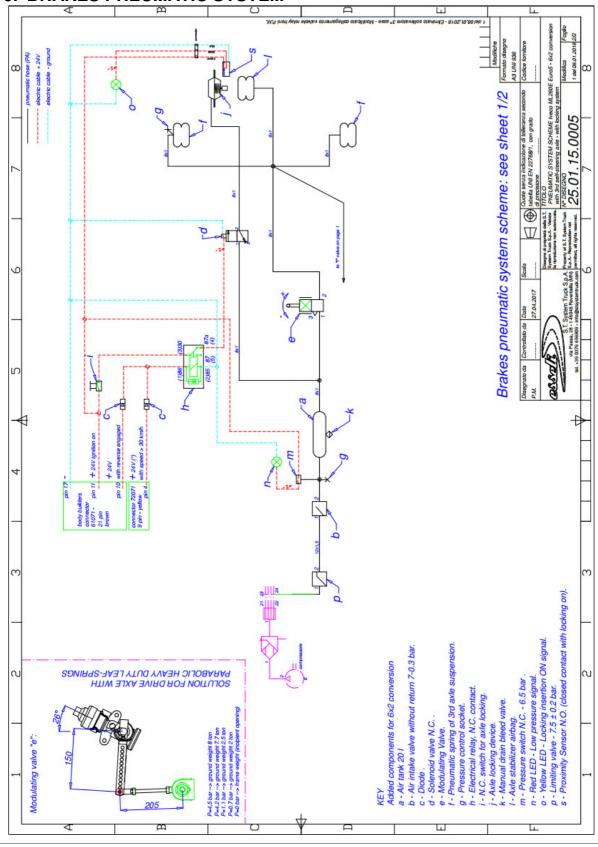
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9. BRAKES PNEUMATIC SYSTEM



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Rev. 0 - 07/2018

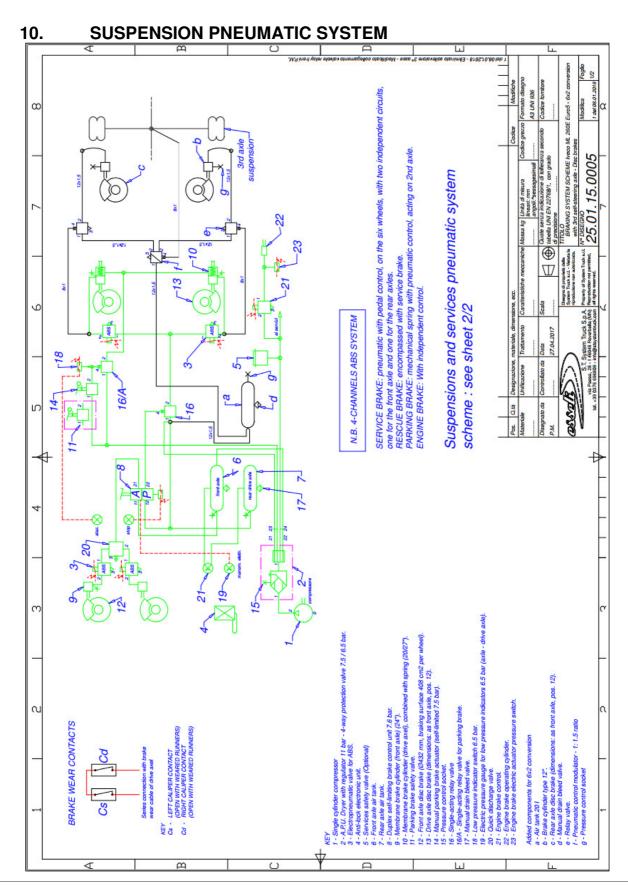


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