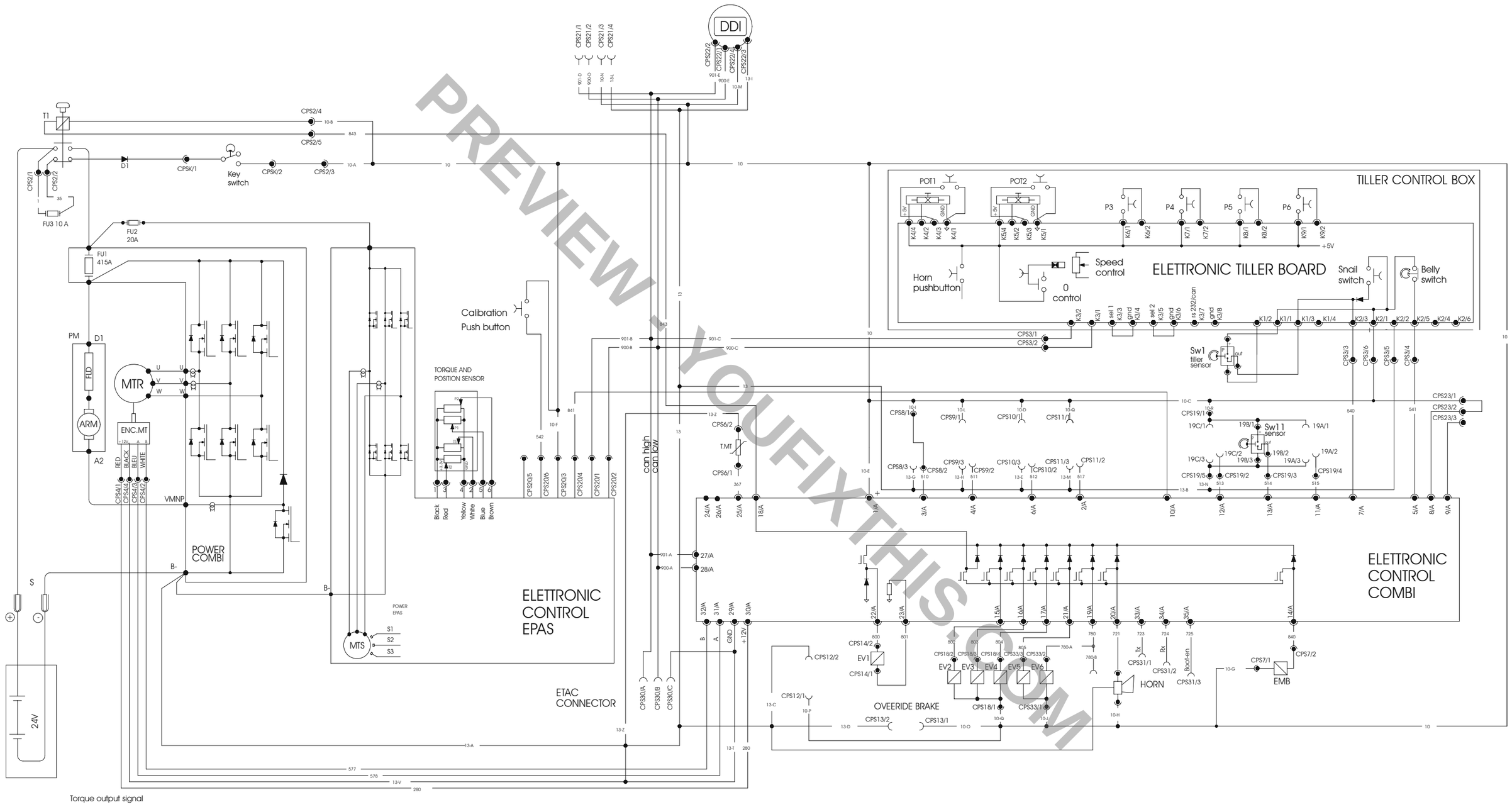
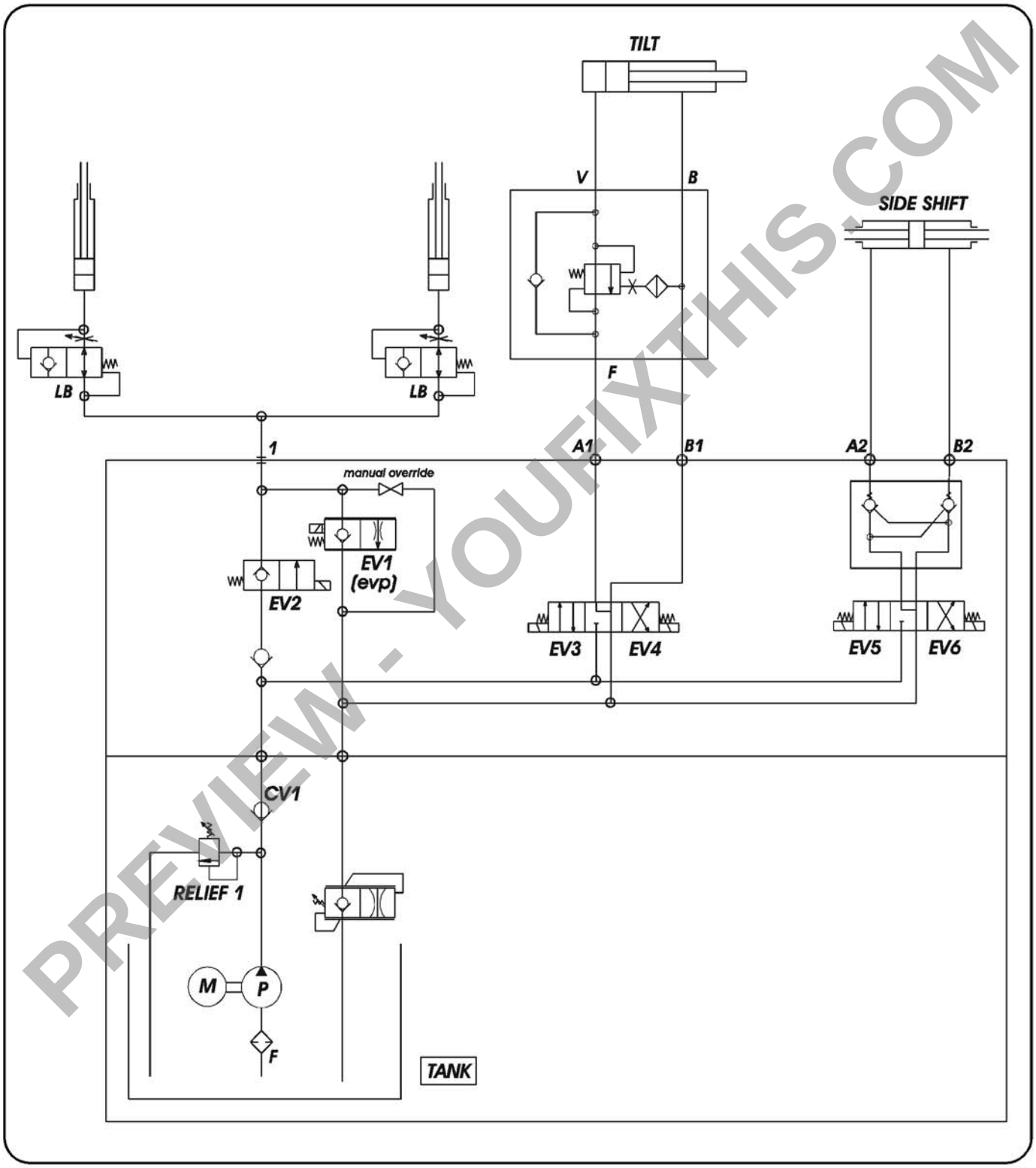
ELECTRIC FUNCTIONAL DIAGRAM
PEDESTRIAN MODEL



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2.01 HYDRAULIC DIAGRAM
MOD. *TWO-STAGE MAST*



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ERROR CODE: 9024

Truck behaviour: traction and hydraulics disabled, main contactor open
LED on DDI: red

Error code	Type of failure	Failure explanation	Troubleshooting
9024	Short-circuit on the traction motor or on a controller part	Traction motor phase U, V or W shorted to B+ or B-, two phases shorted with each other, controller power stage shorted	1. Turn the key to the OFF position and disconnect the battery connector 2. Visually check if there is a short-circuit between the motor phase cable terminals and the controller power terminals B+ or B- (as phase terminals and B+ and B- terminals are close, the cables could be turned in such a way to cause short-circuits with each other) - if there is a short-circuit, remove it and fix the controller terminals by means of screws - if there is not a short-circuit, proceed to point 3 3. Disconnect the motor cables to the controller 4. Check the motor insulation by using a multimeter - the resistance should measure minimum 1 MΩ - if it does not, replace the traction motor - if it does, proceed to point 5 5. Check if the controller phase B+ or B- is short-circuited by using a multimeter (the controller capacitors should be discharged) - if the resistance between the phase terminal and B+ or B- terminal (all three phase terminals should be checked) is lower than 5 kΩ, replace the controller - if the resistance is higher, replace the traction motor after carrying out any check concerning possible mechanical failures of the cables or short-circuits due to these faults and/or short-circuits of the earthing cable of the truck

ERROR CODE: 9088

Truck behaviour: traction and hydraulics disabled, main contactor open
LED on DDI: red

Error code	Type of failure	Failure explanation	Troubleshooting
9088	Short-circuit of the pump motor	Internal short-circuit of the pump motor or external short-circuit between the pump motor cable and B+	1. Switch off the key switch and switch it on after few seconds and check if the alarm appears again 2. Turn the key to OFF position and disconnect the battery 3. Disconnect the pump motor cables from the controller 4. Visually check if there are any motor cable faults or possible short-circuit to B+ - if possible, replace the cable and all other damaged truck leads 5. Check if the P- terminal in the controller is shorted to B+ - if the resistance between P- and B+ terminals measured by using a multimeter is lower than 40 kΩ, replace the controller If the controller and the pump motor cables are OK, replace the pump motor

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DRIVING TORQUE OF SCREWS, NUTS AND CONNECTORS

Before disassembling the various parts, the bolts and the screws, read carefully the instructions below.

To tighten the screws use the product *LOCTITE 270* in order to ensure the safety of the threaded couplings.

If it is not possible to loosen the screws because this product is used, do not add extensions to the tools, but heat the area (maximum 50° - XXX farehnheit degrees) in oder to eliminate the effect of *LOCTITE 270*.

In the above-mentioned cases use a small quantity of *LOCTITE 270* during the assembly phase (30% of the connection surface).

The driving torque with which the threaded couplings are tightened is very important to ensure the safety of the truck connection.

The bolts and nuts and the corresponding driving torques are shown in the tables on this page.

Nominal diameter	DRIVING TORQUE Nm	
	Class 8	Class 10
M 3	4	5,2
M 4	7	9,15
M 5	12,14	14,8
M 6	17,2	20,9
M 8	31,8	38,1
M 10	50,5	60,3
M 12	74,2	88,5
M 14	101,2	120,8
M 16	138,2	164,9
M 18	176,6	203,5
M 20	225,4	259,7
M 22	278,8	321,2
M 24	324,8	374,2
M 27	422,3	486,5
M 30	516,1	594,7

				Preloading N	DRIVING TORQUE Nm					
					Class 5.8		Class 8.8		Class 10.9	
						💧		💧		💧
M 4	0,7	7	3	2400	1,92	1,44	3,07	2,3	4,17	3,13
M 5	0,8	8	4	3880	3,88	2,91	6,2	4,65	8,43	6,33
M 6	1	10	5	5490	6,58	4,94	10,5	7,9	14,3	10,8
M 8	1,25	13	6	9990	16	12	25,6	19,2	34,8	26,1
M 8	1	13	6	10700	17,1	12,8	27,4	20,5	37,3	27,9
M 10	1,5	16	8	15825	31,7	23,8	51	38	69	52
M 10	1,25	16	8	16700	33,4	25,1	53	40,1	73	55
M 12	1,75	18	10	23025	55	41,4	88	66	120	90
M 12	1,25	18	10	25150	60	45,3	96	72	130	98
M 14	2	21	12	31400	88	66	140	105	190	145
M 14	1,5	21	12	34125	96	72	155	115	210	155
M 16	2	24	14	42850	135	105	220	165	300	225
M 16	1,5	24	14	45600	145	110	235	175	320	240
M 20	2,5	30	17	66875	270	200	430	320	580	435
M 20	1,5	30	17	74250	295	225	475	355	650	485

💧 = with lubricant

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3.00 UNLOADING FROM THE LORRY WITH TRUCK ON THE PALLET

Necessary special tools



lift truck with 4 t carrying capacity

Procedure

Position the truck forks under the pallet, lift it and place it in a safe area supplied with hoist with a carrying capacity of 4t and far from the transit of other motor vehicles and from the passage of pedestrians.

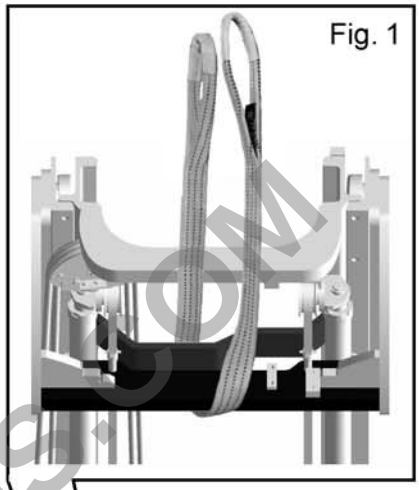


Fig. 1

4.00 TRUCK LIFTING

PEDESTRIAN MODEL

Necessary special tools



hoist with 4000 kg carrying capacity



hanging rope with two arms 3800 kg carrying capacity



nastro di sollevamento portata 3000 kg



Ladder

Procedure

Remove the packing.
Hook the hanging rope to the two arms of the hoist.
Fasten the two hooks of the hanging rope to the two frame side holes suitable for lifting **(ref.A fig.3)**.
By means of a ladder, insert the lifting band under the mast crosspieces as shown in **fig.1**, then hook it to the hoist.

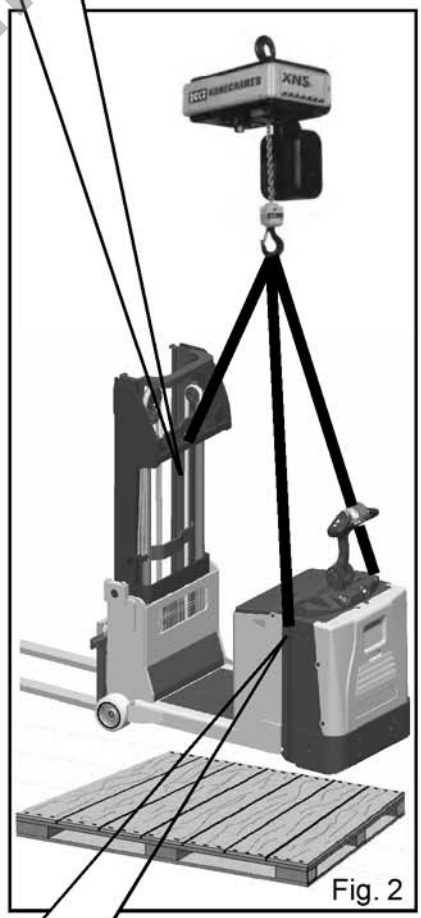


Fig. 2

Make sure the hoist is perpendicular to the truck to be lifted.

Lift slowly and position the truck on the floor with care.

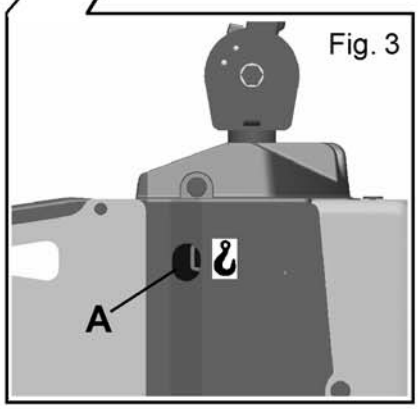


Fig. 3

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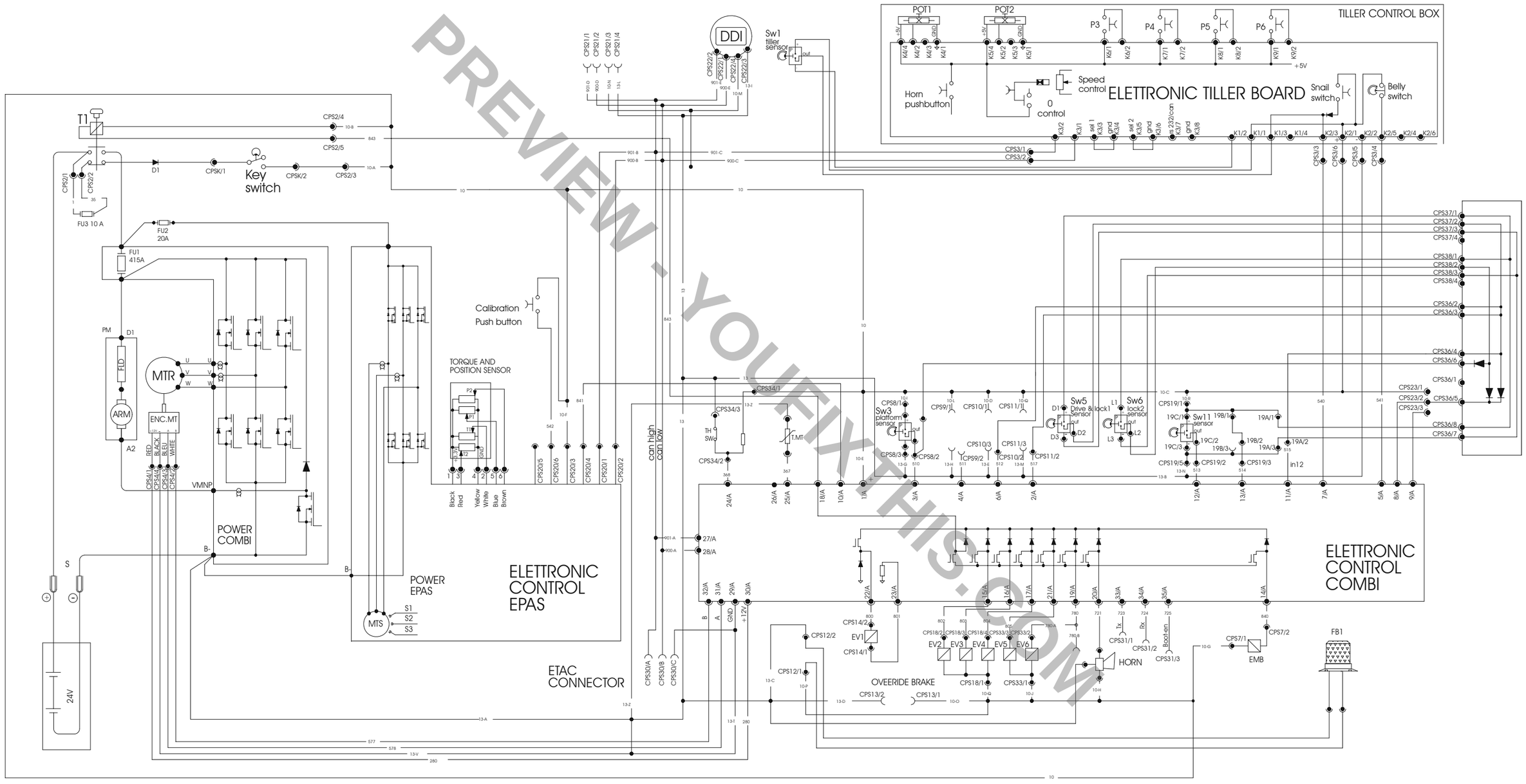
1.00 PLANNED MAINTENANCE TABLE

	● = Check and maintenance x = Replacement	MAINTENANCE OPERATION				
	INTERVENTION DESCRIPTION	On delivery	500 hours/ 3 months	1500 hours/ 9 months	2500 hours/ 15 months	3500 hours/ 21 months
FRAME MECHANICS	WELDING CHECK		●	●	●	●
	CHECK OF THE BONNET GAS SPRINGS	●	●	●	●	●
	GENERAL CLEANING		●	●	●	●
BRAKING SYSTEM	CHECK OF THE ELECTROMAGNETIC BRAKE COIL OF THE DRIVE WHEEL	●	●	●	●	●
	CHECK OF THE LINING WEAR (1)		●	●	●	●
	CHECK OF THE EFFICENCY OF THE PEDAL FOR MAN PRESENCE	●	●	●	●	●
	RELEASE BRAKING CHECK	●	●	●	●	●
	INVERSION BRAKING CHECK	●	●	●	●	●
	EMERGENCY BRAKING CHECK	●	●	●	●	●
	PARKING BRAKING CHECK	●	●	●	●	●
	GENERAL CLEANING	●	●	●	●	●
MOTORS	ISOLATION CHECK		●	●	●	●
	CABLE CONNECTION CHECK	●	●	●	●	●
	LOCKING BOLT CHECK	●	●	●	●	●
	BEARING NOISE CHECK	●	●	●	●	●
	PUMP MOTOR BRUSH CHECK					
	GENERAL CLEANING WITH COMPRESSED AIR		●	●	●	●
HYDRAULIC SYSTEM	OIL LEAK CHECK FROM MOTOR PUMP CONNECTIONS	●	●	●	●	●
	OIL LEAK CHECK FROM CYLINDER CONNECTIONS	●	●	●	●	●
	OIL LEAK CHECK FROM THE MOTOR COMPARTMENT VALVE UNIT CONNECTIONS	●	●	●	●	●
	OIL LEAK CHECK FROM THE PIPE CONNECTIONS ON THE MAST	●	●	●	●	●
	OIL LEAK CHECK OF THE FORK CARRIAGE PLATE PIPE CONNECTIONS					
	TANK OIL LEVEL CHECK		●	●	●	●
	TANK OIL REPLACEMENT			x		x
	GENERAL CLEANING		●	●	●	●
REDUCTION GEAR	DRIVE WHEEL LOCKING BOLT ADJUSTMENT	●	●	●	●	●
	ADJUSTMENT OF THE STEERING SHAFT LOCKING BOLTS		●	●	●	●
	GEARBOX OIL REPLACEMENT			x		x
	OIL LEAK VISUAL CHECK		●	●	●	●
	REDUCTION GEAR GENERAL CONDITION CHECK		●	●	●	●
	CHECK OF THE WEAR OF THE STEERING CROWN GEAR AND OF THE STEERING PINION		●	●	●	●
	GENERAL CLEANING		●	●	●	●
MAST	OIL LEAK CHECK FROM THE CYLINDER HEADS	●	●	●	●	●
	LIFTING CHAIN AND CHAIN TIGHTENER WEAR CHECK (2)		●	●	●	●
	GREASING OF THE SIDESHIFT PLATE SLIDING BLOCKS		●	●	●	●
	CHAIN PULLEY CHECK		●	●	●	●
	CHAIN GREASING		●	●	●	●
	CABLE PULLEY CHECK		●	●	●	●
	CHECK OF THE TIGHTENING OF THE MAST LOCKING BOLTS		●	●	●	●
	HOOSE CHECK (3)		●	●	●	●
ELECTRIC SYSTEM	CHECK OF ALL CONNECTIONS	●	●	●	●	●
	CABLE LOCKING NUT CHECK	●	●	●	●	●
	PLANT CHECK AND CLEANING	●	●	●	●	●
WHEELS	CHECK OF THE DRIVE WHEEL WEAR (1)		●	●	●	●
	CHECK OF THE LOADING WHEEL WEAR (1)		●	●	●	●
	CHECK OF THE LOADING WHEEL BEARINGS (1)		●	●	●	●
	GENERAL CLEANING		●	●	●	●
BATTERY	CABLE CONNECTION CHECK	●	●	●	●	●
	FLUID LEAK CHECK	●	●	●	●	●
	BATTERY ISOLATION CHECK	●	●	●	●	●
	ELECTROLYTE DENSITY CHECK	●	●	●	●	●
	ELECTROLYTIC LEVEL CHECK (4)	●	●	●	●	●
	GENERAL CLEANING (5)		●	●	●	●
ENABLING CONTROLS						
	CHECK OF ALL MACHINE OPERATIONS BY MEANS OF THE ENABLING CONTROLS LOCATED ON THE CONSOLE		●	●	●	●

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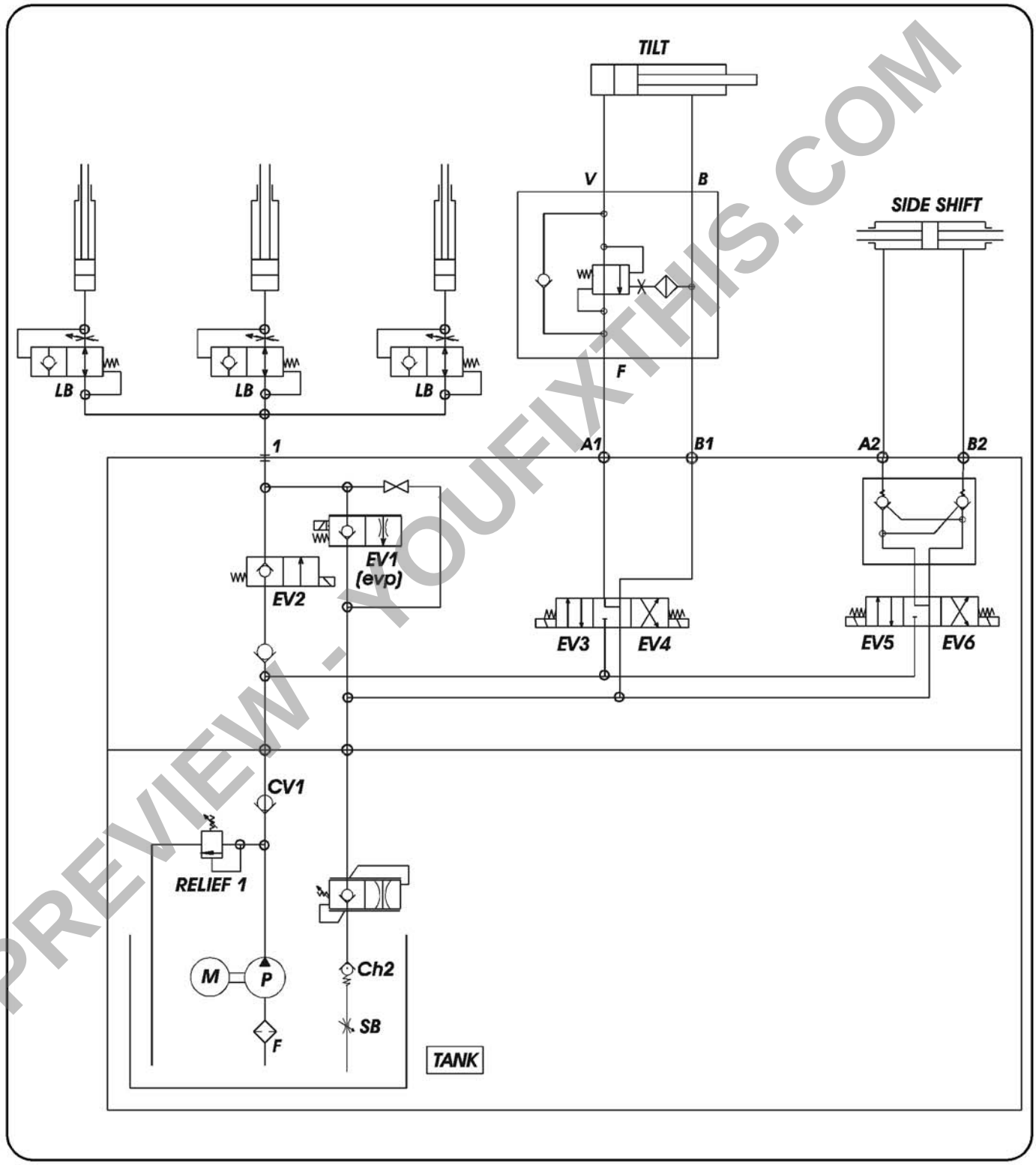
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ELECTRIC FUNCTIONAL DIAGRAM
Models with swing over tiller



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2.02 HYDRAULIC DIAGRAM
MOD. *THREE-STAGE MAST*



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ERROR CODE: 9089

Truck behaviour: traction enabled, hydraulics disabled
LED on DDI: red

Error code	Type of failure	Failure explanation	Troubleshooting
9089	Pump motor connection opened Pump motor short-circuited with B-	The pump motor is not connected to the controller terminal P- because of a motor internal failure or a loss of power wire connection of the motor or the controller The pump motor cable is short-circuited with B-	1. Tighten the screws on the controller and on the motor side and switch off and on the key switch at intervals of few seconds to see if the error code appears again 2. Turn the key to OFF position and disconnect the battery 3. Check if there is a short-circuit between the motor cable and the controller terminal B-. - If there is, disconnect the pump motor leads from the controller 4. Visually check if the pump motor leads are not interrupted and if the cable and the pump motor terminals are without evidence of arcing or oxidation. - If there is an anomaly, replace the motor leads or just clean the leads, the motor and the controller terminals 5. Visually check the motor lead for any damage and possible short-circuit to B- - If there is an anomaly, replace the lead and all other damaged truck leads 6. Check if the P- terminal in the controller is short-circuited with B- - if the resistance measured between P- and B- terminals by using a multimeter is lower than 40 kΩ replace the controller 7. Check if the pump motor is in open condition. If the resistance measured between the two motor terminals disconnected from the cables is higher than 0,5Ω, replace the pump motor

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RIGHT METHOD TO APPLY THE FEMALE CONNECTORS

To ensure an optimum connection between the female connectors and the adapters mentioned in this manual, it is necessary to carry out the following procedure, which is different from the one for the assembly of the rigid pipes.

Female connectors without gasket (metal/metal connection)

Screw the nut manually and then tigthen 1/4 turn by means of a spanner.

Female connectors with O-RING

Screw the nut manually and then tighten 1/4 turn by means of a spanner.

In any case make sure that the pipe is correctly aligned before tightening the nut to the adapter.

DRIVING TORQUES



ROTARY METRIC FEMALE CONNECTOR

Thread UNF	External diameter of the pipe	Driving torque Nm	
		Nominal torque	min. / max.
M 12x1,5	6	20	15 -25
M 14x1,5	8	38	30 - 45
M 16x1,5	8 10	45	38 - 52
M 18x1,5	10 12	51	43 - 85
M 20x1,5	12	58	50 - 65
M 22x1,5	14 15	74	60 - 88
M 24x1,5	16	74	60 - 88
M 26x1,5	18	105	85 - 125
M 30x2	20 22	135	115 - 155
M 36x2	25 28	166	140 - 192
M 42x2	30	240	210 - 270
M 45x2	35	290	255 - 325
M 52x2	38 42	330	280 - 380



ROTARY FEMALE CONNECTOR jic 37°

Thread UNF	Dimension	Driving torque Nm	
		Nominal torque	min. / max.
7/16-20	-4	15	9 - 21
1/2-20	-5	20	13 - 27
9/16-18	-6	30	18 - 42
3/4-16	-8	50	30 - 70
7/8-14	-10	69	44 - 94
1.1/16-12	-12	98	63 - 133
1.3/16-12	-14	118	73 - 163
1.5/16-12	-16	140	90 - 190
1.5/8-12	-20	210	135 - 285
1.7/8-12	-24	290	200 - 380
2.1/2-12	-32	450	300 - 600



ROTARY FEMALE CONNECTOR BSP

Thread UNF	Driving torque Nm	
	Nominal torque	max.
G1/4	20	15 - 25
G3/8	34	27 - 41
G1/2	60	42 - 76
G5/8	69	44 - 94
G3/4	115	95 - 135
G1	140	115 - 165
G1.1/4	210	140 - 280
G1.1/2	290	215 - 365
G2	400	300 - 500



ROTARY FEMALE CONNECTOR ORFS

Thread UNF	Dimension	Driving torque Nm	
		Nominal torque	max.
9/16-18	-4	14	16
11/16-16	-6	24	27
13/16-16	-8	43	47
1-14	-10	60	68
1.3/16-12	-12	90	95
1.3/16-12	-14	90	95
1.7/16-12	-16	125	135
1.11/16-12	-20	170	190
2-12	-24	200	225
2-1/2-20	-32	460	490

The values shown in the tables refer to galvanized steel connectors. Different values correspond to connectors of different materials.

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6.00 BATTERY INSTALLATION

Necessary special tools



hoist with 1000 kg carrying capacity



hanging rope with two arms 1400 kg carrying capacity

Necessary tools



13 mm open ended spanner

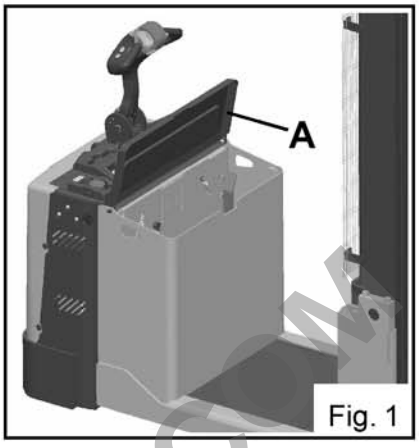


Fig. 1

Procedure

Before starting to work wear the proper accident prevention clothes.

Park the truck in a safe area, far from the transit of other motor vehicles and from the passage of pedestrians.

Step 1

HOIST - HANGING ROPE WITH TWO ARMS

Open the upper bonnet of the battery compartment **(ref.A fig.1)**. Remove the two battery retainers located in the battery compartment **(ref.B fig.3)**.
Hook the hanging rope to two arms to the hoist.
Fasten the two hooks of the hanging rope to the two battery side holes suitable for lifting.

Make sure the hoist is perpendicular to the battery.

Lift the battery, position it over the battery compartment and insert it with care **(fig.2).**

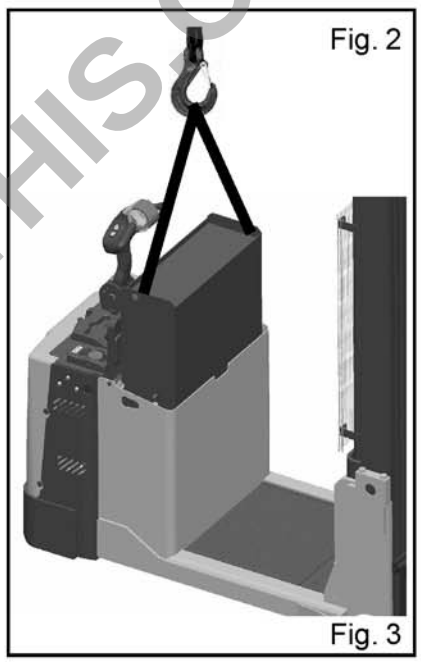


Fig. 2

Fig. 3

Step 2

13mm OPEN ENDED SPANNER

Position the two battery retainers and by means of the open ended spanner screw the check nuts **(ref.C fig.3)**.

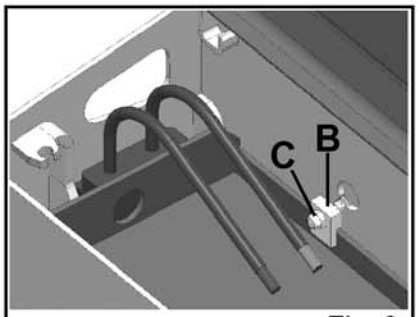


Fig. 3

Step 3

Connect the battery plug cables supplied to the positive and negative pole of the battery (see “CABLE CONNECTION TO THE BATTERY”).
Connect the battery plug **(ref.D fig.4)** and lower the bonnet on the battery compartment.

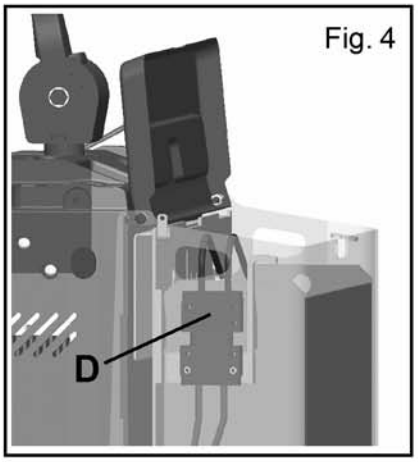


Fig. 4

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(1) replace, if it is necessary
(2) replace, if the chains have undergone a stretching higher than 2% or if the links, the hinge pins or of the chain tightener are worn and therefore they need to be replaced.
(3) replace in the following cases:

- movement of the pipe fitting;
- damage, cut or abrasions on the surface layer;
- hardening or stiffness of the pipe, presence of burnings or cracks due to heat;
- cracks, damage or corrosion on the pipe fitting;
- leaks on the pipe or on the pipe fitting;
- permanent folds, squashings, flattenings or twists on the pipe;
- blisters, softening or wear of the external layer.

(4) top up whenever the electrolyte level decreases to 5-10 mm from the plate unit
(5) keep the battery clean and dry by using, if possible, antistatic clothes.

For trucks working in cold room, maintenance operation must be carried out every 500 hours.

TIME REQUIRED (check-cleaning-greasing): 2 HOURS required for the presence of a TECHNICIAN + TRAVEL
Further hours for possible component replacement are not included in the total hour count.

2.00 LUBRICANT TABLE

DESCRIPTION	LUBRICANT	SPECIFICATIONS
Hydraulic lifting system	SHELL TELLUS OIL T32 ❄ *AEROSHELL 41*	DIN 51524 (Part 2) ❄ MIL-H-5606 G
Drive unit reduction gear	SHELL SPIRAX 80 W 90 ❄*SHELL TRANSAXLE 75 W 90*	API GL5 MIL-L-2105 D ❄ API GL4-API GL5
Lifting chains and external reduction gear	ADVANCE TEFLON CHAIN SPRAY	
Rolling track on masts	SUPER GREASE EP-0	
Bearings of the mast column and fork carriage	Grease ALBIDA EP-2 ❄ *AEROSHELL GREASE 6*	❄ MIL-G-24139 A
Pulley bearings	SUPER GREASE EP-0	
Greasing points	Grease ALBIDA EP-2 ❄ *AEROSHELL GREASE 6*	❄ MIL-G-24139 A
Battery pole isolation	Pure vaseline	

❄: lubricant for truck working in cold room

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