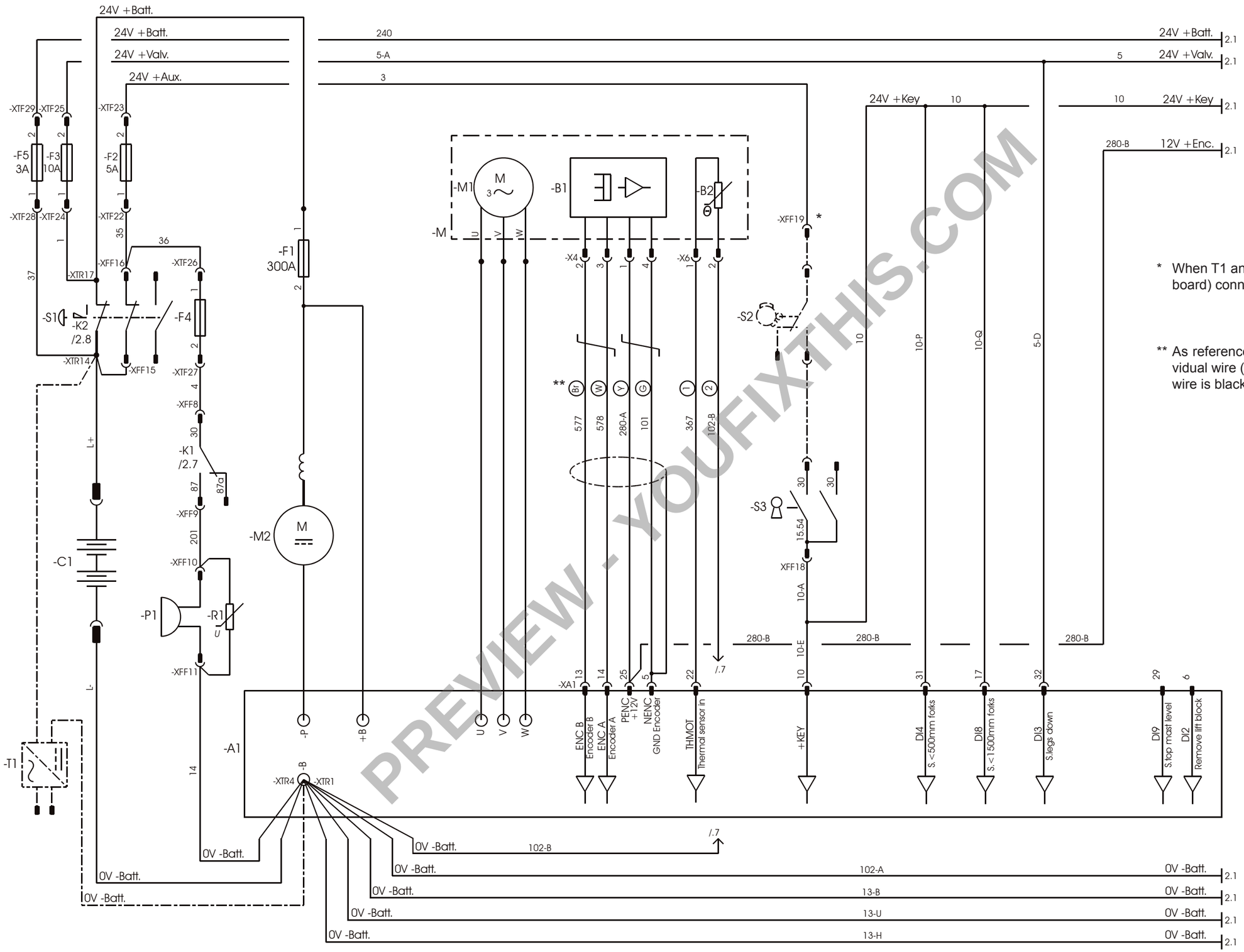
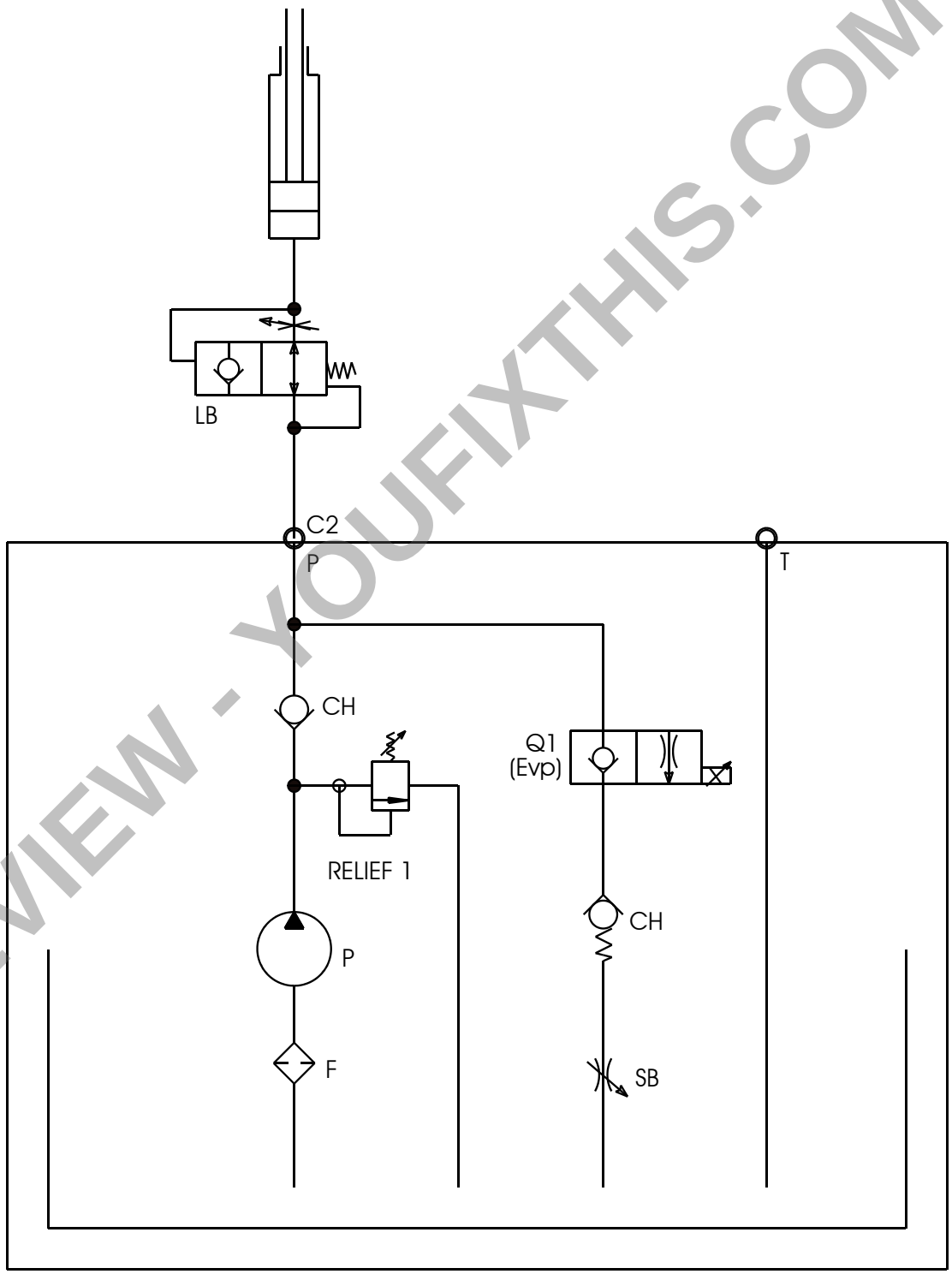


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COMPLETE HYDRAULIC BLUEPRINT
VERSION WITHOUT INITIAL LIFT

SINGLE STAGE MAST



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DRIVING TORQUE OF SCREWS, NUTS AND CONNECTORS

Before the disassembly of the various parts and of the bolts and 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°C) in oder to eliminate the effect of LOCTITE 270.

In the above-mentioned cases use a small quantity of LOCTITE 270 in 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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BREAKDOWN SEARCH: DIAGNOSIS SYSTEM FOR COMBI MODULE

The diagnosis system is divided into two main groups:

ALARMS

When an alarm is detected, the current to the motors of the modules involved is cut off. The remote-control switch opens and the electromagnetic break is activated.
These alarms are connected to:

- breakdowns in the motors/modules, the power system is no longer able to supply current to the motors.
- breakdowns connected with safety.

WARNINGS

When a warning takes place, the module is working properly but it has detected conditions that lead it to reduce performance or stock the truck, without affecting the power systems.
These warnings are connected to:

- incorrect starting sequences by the operator.
- conditions that require a reduction of performance (as for example high temperatures, ...)

ALARMS

keyboard message	description	effect	state of the truck
WATCHDOG (8)	The auto diagnosis system within the machine's logic system has been triggered.	The general K2 remote-control switch, open power bridge, electromagnetic break activated.	• Start up • Stand-by • During traction
	Re-start procedure: Re-start up of the key.		
WATCHDOG 2 (8)	The auto diagnosis system within the machine's logic system has been triggered.	The main K2 remote-control switch, open power bridge, electromagnetic break activated.	• Start up • Stand-by • During traction
	Re-start procedure: Re-start up of the key.		
LOGIC FAILURE #3 (17)	This fault in the hardware section of the logic card that manages the current hardware protection.	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	On start up, immediately after the closing of the K2 main remote control switch.
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
SMARTDRIVER KO (22)	Smart driver open, cannot supply the positive input to the electric brake on pin 2.	The main K2 remote-control switch open, open power bridge	• Start up • Stand-by • During traction
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		

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TRUCK UNLOADING

Equipment and tools



fork lift truck
load capacity
3000 kg



bridge crane
load capacity
3000 kg



lift belt
load capacity
3200 kg

Procedure

Before starting work, ensure that you are equipped with all suitable safety clothing.



Phase 1

ELEVATOR TRUCK WITH 3000 kg load

Load the pallet using the lift truck, raise it and carry it to a safe place, far from the passage of other vehicles and pedestrian traffic.

Phase 2

BRIDGE CRANE - LIFT BELT

Remove the packaging.
Harness the column with the lift belt **(fig.1)**.

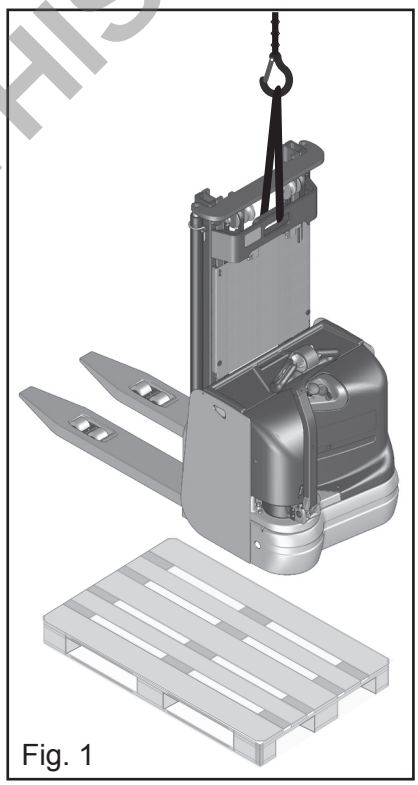


Fig. 1

Ensure that the bridge crane is positioned at right angles to the truck to be lifted.

Hook the belt to the bridge crane, lift and position the truck gradually off the ground.

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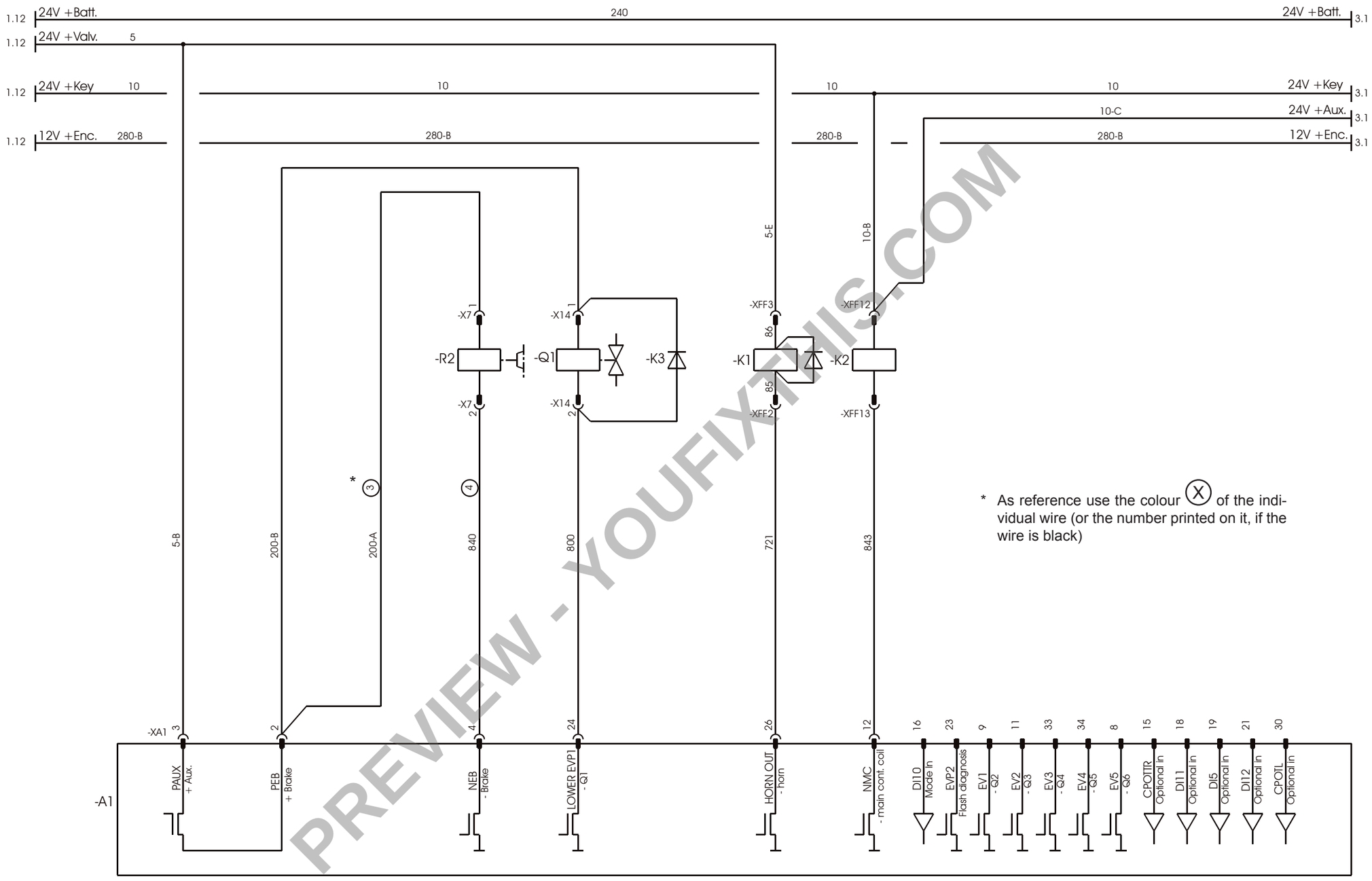
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PLANNED MAINTENANCE

	● = check and maintenance ■ = operator check x = replacement	Maintenance intervals				
	Operation description	every 8 hours 1 day	every 500 h 6 months	every 1000 h 12 months	every 2000 h 24 months	every 3000 h 36 months
TRUCK BASE	Check welded joints					●
	Lubrification of tiller gudgeon					●
	Grease tie rod pins					●
	Lubrication of linkage pivot pins-forks-carriage (3)					●
	Check efficiency of tiller gas spring	■				
	Check tiller control housing	■				
	Check steering thrust block bearing	■		●		
	Lubrification of steering thrust block				●	
	General cleaning					●
BRAKING SYSTEM	Check the efficiency of the electromagnetic brake coil	■		●		
	Check brake lining wear (1)			●		
	Check release braking	■		●		
	Check reverse braking	■		●		
	Check emergency braking	■		●		
	Check parking mode braking	■		●		
	General cleaning			●		
MOTORS	Check motor insulation			●		
	Check cable connections			●		
	Check fastening bolts			●		
	General cleaning with compressed air			●		
HYDRAULIC SYSTEM	Check for oil leaks at pump connections	■		●		
	Check for oil leaks at cylinder head connections	■		●		
	Check for oil leaks at motor housing distributor connections	■		●		
	Check for oil leaks in pipe connections on mast	■		●		
	Check hydraulic pipes				●	
	Check flexible pipes (2)				●	
	Replace oil in hydraulic tank					x
	Oil filter cleaning					●
	Check valve operation	■				
REDUCER	Reducer oil replacement				x	
	Visual oil leak check	■		●		
	Check general condition of reducer			●		
	Check steering crown gear and steering pinion wear					●
	General cleaning			●		
MAST	Check lifting chain link and pin wear (2)			●		
	Check chain elongation (2)			●		
	Check chain tensioner (2)	■		●		
	Clean chains (3)			●		
	Lubricate chains (3)		■			
	Lubricate mast profiles			●		
	Check chain slip bearings			●		
	Check cable slip bearings			●		
	Lubrification of chain and pipe bearing pins			●		
	Check guide bearing wear			●		
	Check mast bearings					●
	Check tightening of mast fastening bolts	■		●		
	General cleaning					●

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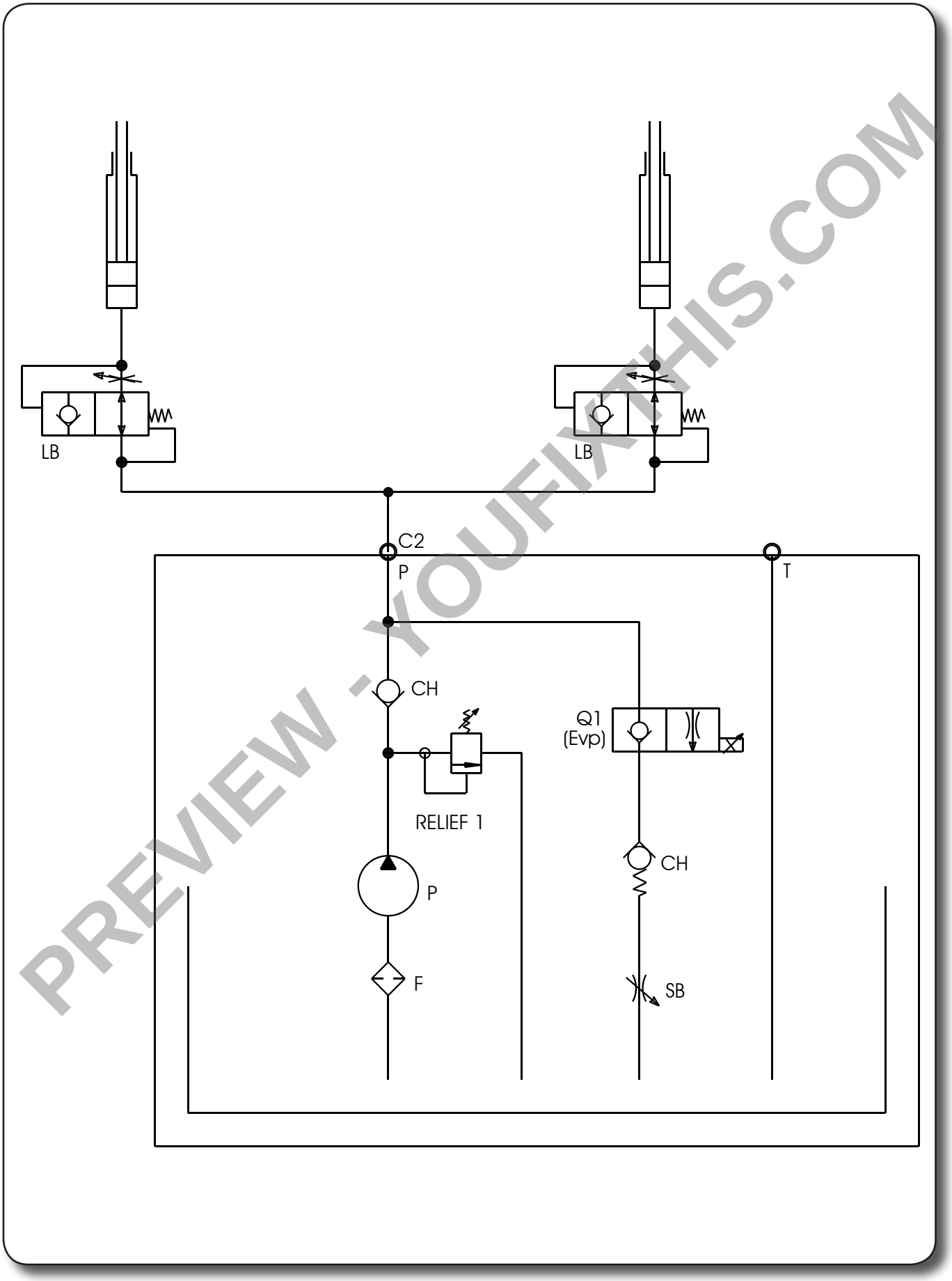


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1.12 0V -Batt. 102-A 0V -Batt. 3.1
1.12 0V -Batt. 13-B 0V -Batt. 3.1
1.12 0V -Batt. 13-U 0V -Batt. 3.1
1.12 0V -Batt. 13-H 0V -Batt. 3.1

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TWO STAGE MAST



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CORRECT 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 TORQUE

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	45	38 - 52
	10		
M 18x1,5	10	51	43 - 85
	12		
M 20x1,5	12	58	50 - 65
M 22x1,5	14	74	60 - 88
	15		
M 24x1,5	16	74	60 - 88
M 26x1,5	18	105	85 - 125
M 30x2	20	135	115 - 155
	22		
M 36x2	25	166	140 - 192
	28		
M 42x2	30	240	210 - 270
M 45x2	35	290	255 - 325
M 52x2	38	330	280 - 380
	42		

ROTARY METRIC 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 to galvanized steel connectors. Different values correspond to connectors of different materials.

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keyboard message	description	effect	state of the truck
PUMP VMN LOW (28)	Low voltage on the pump motor power capacitors.	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Start up • Stand-by • During lifting/ lowering
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
PUMP VMN HIGH (29)	High voltage on the pump motor power capacitors.	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• During lifting/ lowering
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
VMN HIGH (31)	Incorrect voltage on one of the outputs of the 3 power phases, a fault in the power section or in the motor coils/connections.	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Start up • During traction
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
AUX DRIV. SHRT. (40)	The electromagnetic break semiconductor has shorted out.	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Start up • Stand-by • During traction
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
WRONG BATTERY (41)	The battery voltage is not correct: - Vbatt < 80% Vbatt nom - Vbatt > 120% Vbatt nom	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Start up • Stand-by (immediately after the closing of the K2 main remote control switch)
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
AUX DRIV. OPEN (42)	The driver of the electromagnetic break coil is damaged.	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Stand-by • During traction
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		

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TOPPING UP THE OIL SUMP

Before topping up the oil in the hydraulic fluid tank make sure that the forks are completely lowered.

Equipment and tools



funnel | oil protecting gloves | large Philips screw driver

Procedure

Before starting work, ensure that you are equipped with all suitable safety clothing.
Move the carriage to a safe place, away from areas of transit of other vehicles and the pedestrian route. Set the key switch to OFF and disconnect the battery.



Phase 1

LARGE PHILIPS SCREW DRIVER

Use the Philips screwdriver to unscrew and remove the fastening screws on the motor compartment cover **(ref.A fig.1)**.
Open the engine cover.

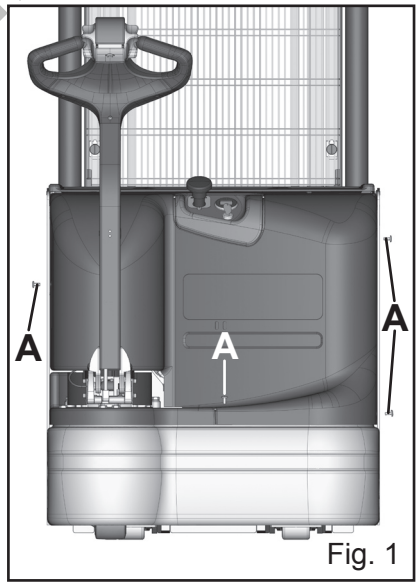


Fig. 1

Phase 2

OIL PROTECTING GLOVES - FUNNEL

Unscrew the oil sump cap **(ref.B fig.2)**, place the funnel in the filler hole and top up the oil level.
Make sure the tank is not too full.
At the end of the operation screw the tank cap back on.

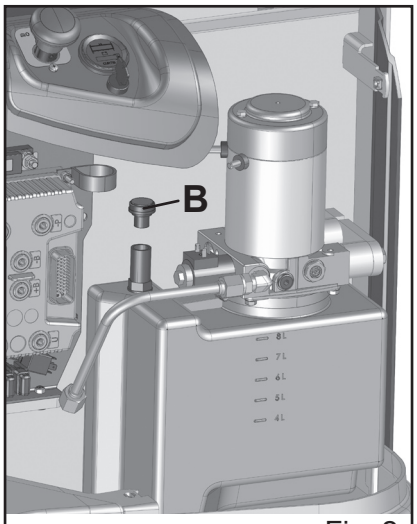


Fig. 2

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	● = check and maintenance ● = check by operator x = replacement	Maintenance intervals				
	Operation description	every 8 hours 1 day	every 500 h 6 months	every 1000 h 12 months	every 2000 h 24 months	every 3000 h 36 months
SMALL MAST AND FORK BASE PLATE	Check link and pin wear on lift chains (4)			●		
	Check chain elongation (4)			●		
	Check chain tensioner (4)	■		●		
	Clean chains (3)			●		
	Chain lubrification (3)		■			
	Bearing check					●
	Check state of forks (7)	■				●
	Check fork heel wear (8)	■				●
	Check fork point alignment (9)	■				●
	Check that forks are parallel	■				●
	Check aperture angle (10)	■				●
	General cleaning					●
PLANT ELECTRICAL	Check all electrical connections			●		
	Check the condition of electric cables			●		
	Sensor check			●		
	General cleaning of electrical panel, remote-control switches and contacts using dry air at low pressure			●		
WHEELS	Check traction wheel wear (1)			●		
	Check the tightening of traction wheel fastening nuts			●		
	Check tightening of pivoting wheel fastening nuts			●		
	Check load bearing wheel wear (1)			●		
	Check load bearing wheel bearings (1)			●		
BATTERY	Check cable connections	■				
	Check for liquid leakage	■				
	Check battery insulation			●		
	Check electrolyte density	■				
	Check electrolyte level (5)	■				
	General cleaning (6)			●		
Check all machine functions using activation controls		■				

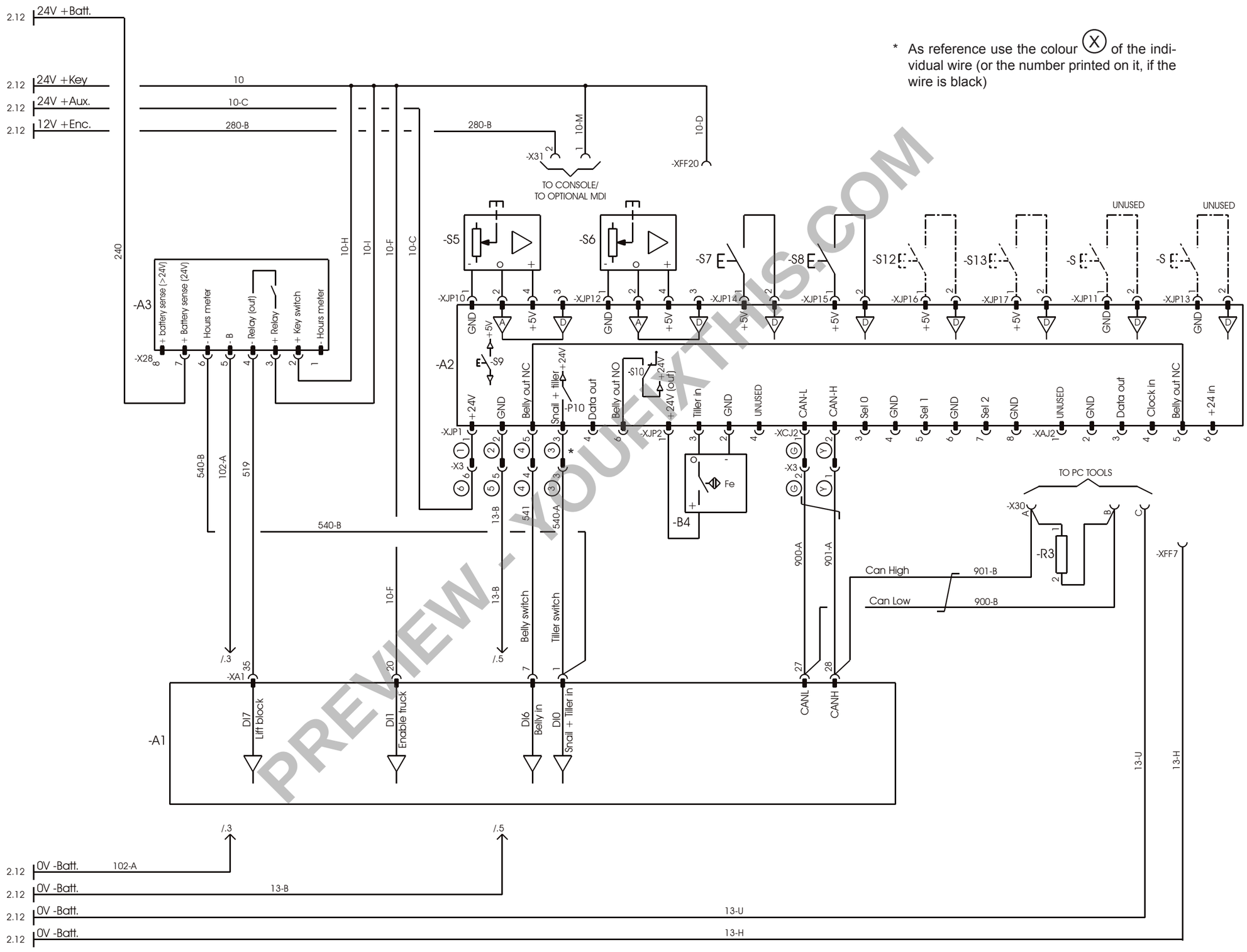
(1) replace if it is necessary

(2) replace in the following situations:
- movement of the pipe fittings;
- damage, cuts, 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.

(3) the chains must be cleaned with paraffin, petrol, gas oil or oil of turpentine.
Lubricate with spray can (see oil and lubricants table)
Usually a universal grease layer is applied on the chains for the cold room or in wet environments.

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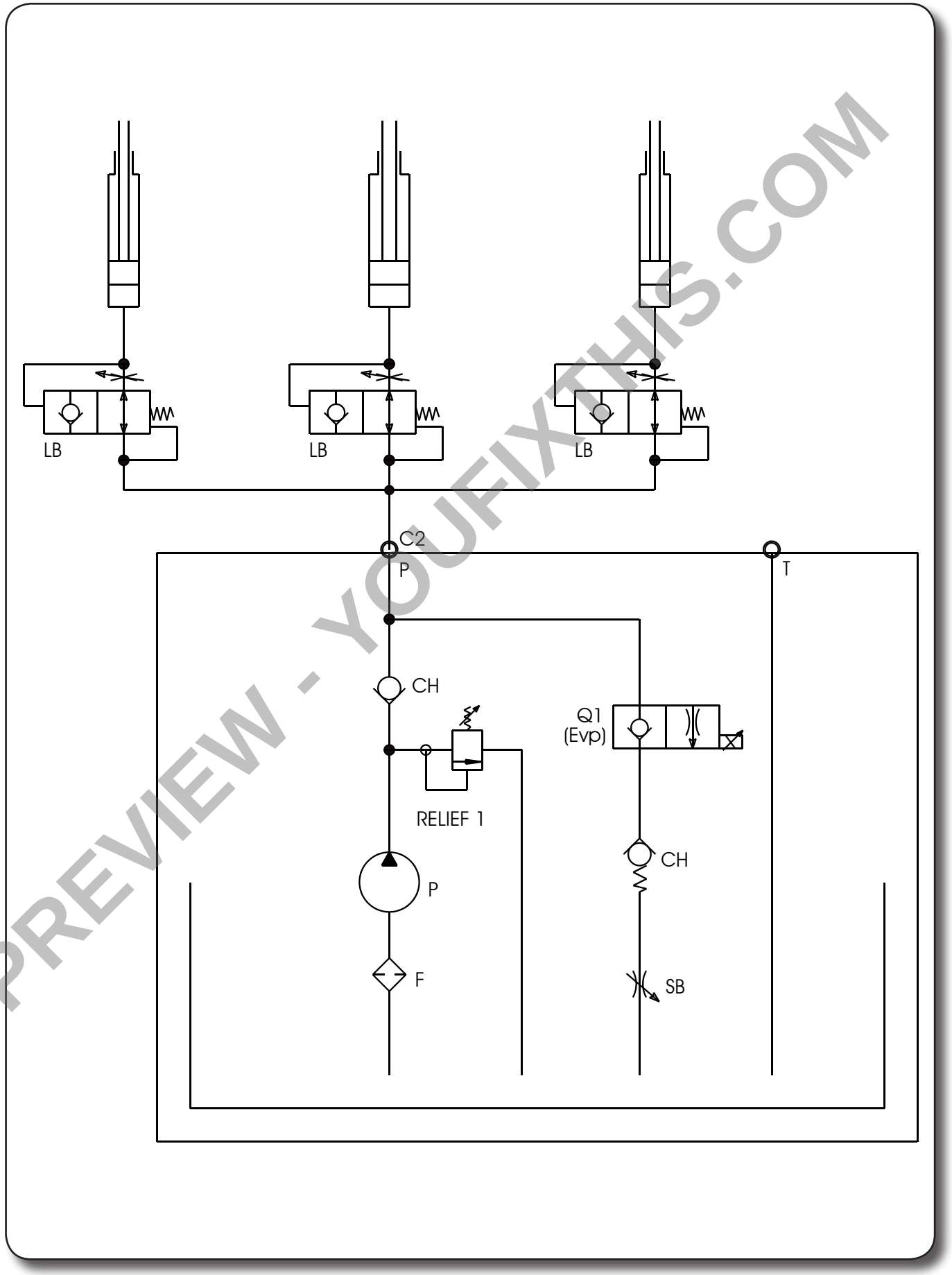
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THREE STAGE MAST



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keyboard message	description	effect	state of the truck
EVP2 NOT OK (47)	-	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Start up • Stand-by
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
EVP1 NOT OK (48)	The proportional electrovalve EV1 output has shorted out.	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Start up • Stand-by
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
EVP1 COIL OPEN (50)	EV1 proportional valve coil missing.	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Start up • Stand-by • During traction
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
EVP2 COIL OPEN (51)	-	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Start up • Stand-by • During traction
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
STBY I HIGH (53)	Incorrect output voltage of the "hall effect" sensor.	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Start up • Stand-by
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
WRONG ZERO (53)	The motor voltage is not correct (> 3 Volt or < 2 Volt)	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Initialisation
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		
LOGIC FAILURE #1 (54)	The overvoltage detected by the module, appears on the power capacitors.	The main K2 remote-control switch open, open power bridge, electromagnetic break activated.	• Start up
	Re-start procedure: Re-synchronisation of the system: • release all requests (traction and hydraulic) • forward a traction or a hydraulic request or both		

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BATTERY INSTALLATION

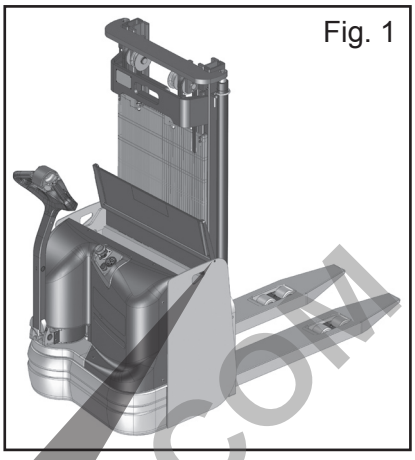
Equipment and tools


bridge crane load capacity 1000 kg


spacer bar


hexagonal "T" section spanner 5 mm


fixed spanner 10 mm


Fig. 1

Procedure

Before starting work, ensure that you are equipped with all suitable safety clothing.
Move the carriage to a safe place, away from areas of transit of other vehicles and all pedestrians.



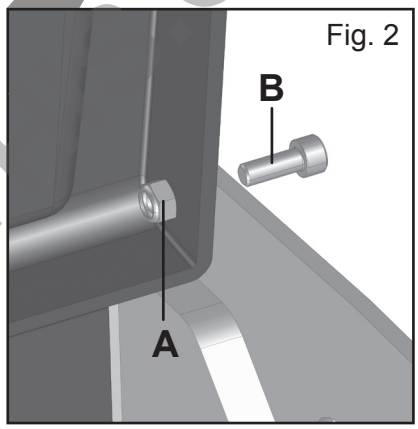
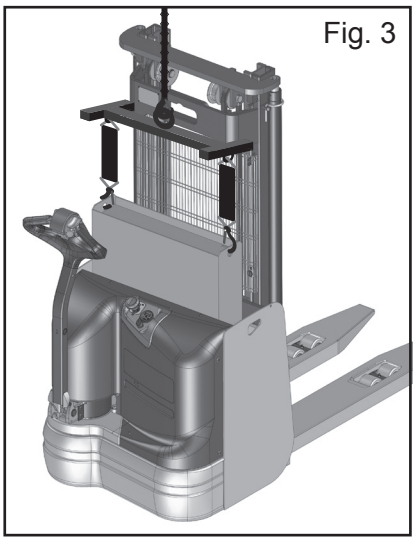


Fig. 2

Phase 1

5 MM HEXAGONAL "T" SECTION SPANNER - FIXED 10 mm SPANNER

Open the battery compartment **(fig.1)**
Using the fixed gauge spanner hold the nut firm **(ref.A fig.2)**, with the hexagonal "T" section spanner loosen and remove the fastening screw of the battery compartment **(ref.B fig.2)**. Perform the same operation on the other compartment screw.
Remove the battery compartment cover.


Fig. 3

Phase 2

BRIDGE CRANE - SPACER BAR

Hook the spacer bar to the bridge crane.
Hook up the spacer bar to the battery, lift by means of the bridge crane and position on the battery compartment.
Lower the battery very cautiously into the truck compartment **(fig.3)**.
Unhook the spacer bar from the battery.

Phase 3

LARGE PHILIPS SCREW DRIVER

Use the Philips screwdriver to unscrew and remove the fastening screws on the motor compartment cover **(ref.C fig.4)**.
Open the engine cover.
Insert and tighten the battery catch.

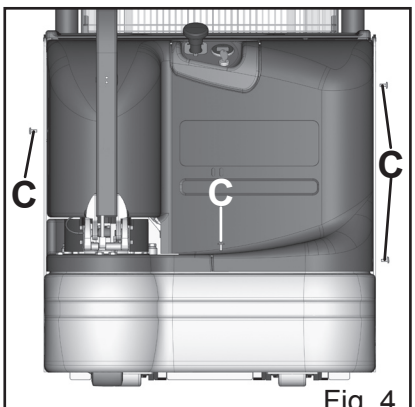


Fig. 4

On the initial lift version, before securing the battery in position, connect the battery and raise the straddle legs to the maximum height so that they clear the slots located on the truck base.

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SECTION INDEX

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GENERAL SAFETY STANDARDS

PERSONAL SAFETY

- Always use the personal protective equipment when it is required.
- Pay attention to the squashing risks due to moving parts, oscillations, not correctly fastened materials when lifting operations are carried out or when the loads are moved.
- Do not wear rings, watches, jewels, unbuttoned or hanging clothes such as scarves, unbuttoned jackets or smocks with open zips that can get entangled in the moving parts.
- Never carry out cleaning, lubrication or maintenance operations when the battery is connected.
- IIf you use compressed air to clean the parts, wear glasses with lateral guards. The air pressure must not be higher than 1 bar.

SAFETY IN THE WORKPLACE

- Make sure that all working tools are perfectly efficient and ready to use. Keep the working surfaces clean and free from the deposits that settle on the truck parts and cause damage.
- Keep sparks, free flames and cigarettes at a distance from fuels or flammable materials such as the gas of the batteries.
- Make sure that the working area is well ventilated, illuminated, dry and clean. Remove any water puddles or oil spots.
- Make sure that the lifting equipment, devices or machines can bear the load.
- ver use petrol, gas oil or other flammable liquids as detergents: use commercial non-toxic and non-flammable solvents.
- In case the interventions are carried out of the workshop, lay the truck flat and block it. If it is necessary to carry out the work on slopes, block the truck and bring it in a flat area as soon as possible within a certain safety limit.
- Disconnect the batteries and label all controls in order to indicate that an intervention is in progress. Block the truck and any equipment to be lifted.
- Do not carry out any intervention on the truck when the operators are controlling it, except that they are qualified operators and help to carry out the intervention.
- During towing operations use only the prescribed attachment points and make sure that the pins and/or bolts are tightly secured. Lift and move all heavy components by means of a lifting device of proper carrying capacity. Use the proper eyebolts. Make sure that nobody stays near the load to be lifted.
- Do not twist chains or metal ropes.
- Do not use damaged or bent chains or ropes: do not use them during lifting or towing operations. While handling them always wear safety gloves.
- Do not accumulate cloths soaked with grease or oil: they represent a risk of fire. Always put them in a closed metal container.
- The oil must be collected and not be let off in the drain pipes; the industrial oils must be disposed of by specialized companies under the protection of the law in force in every Country.
- When welding operations are carried out, it is necessary to use proper accident-prevention protections: protective glasses, helmet, overalls, shoes. The protective glasses must be worn also by the people who do not carry out the works if they stay near a welding area.

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