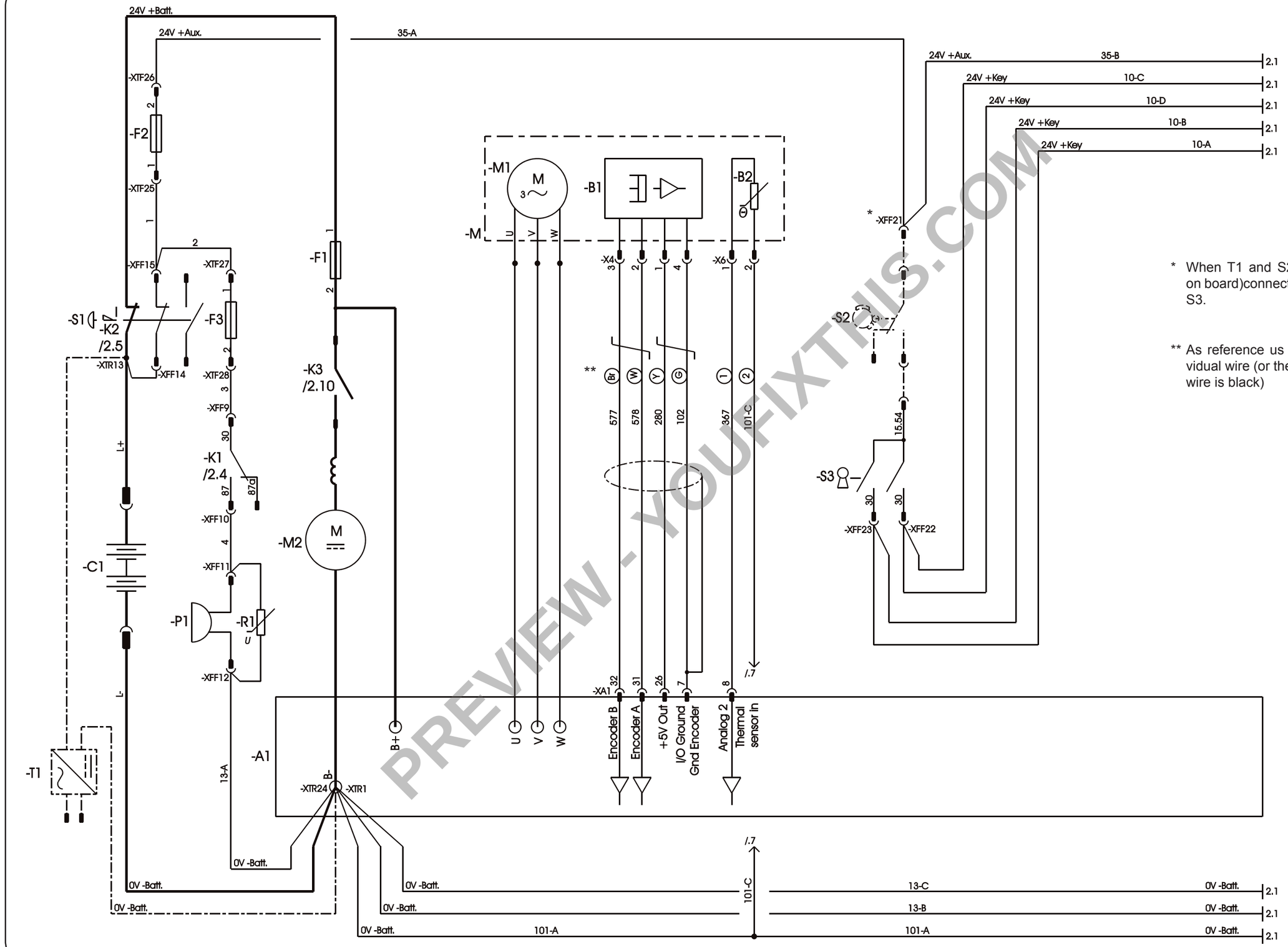


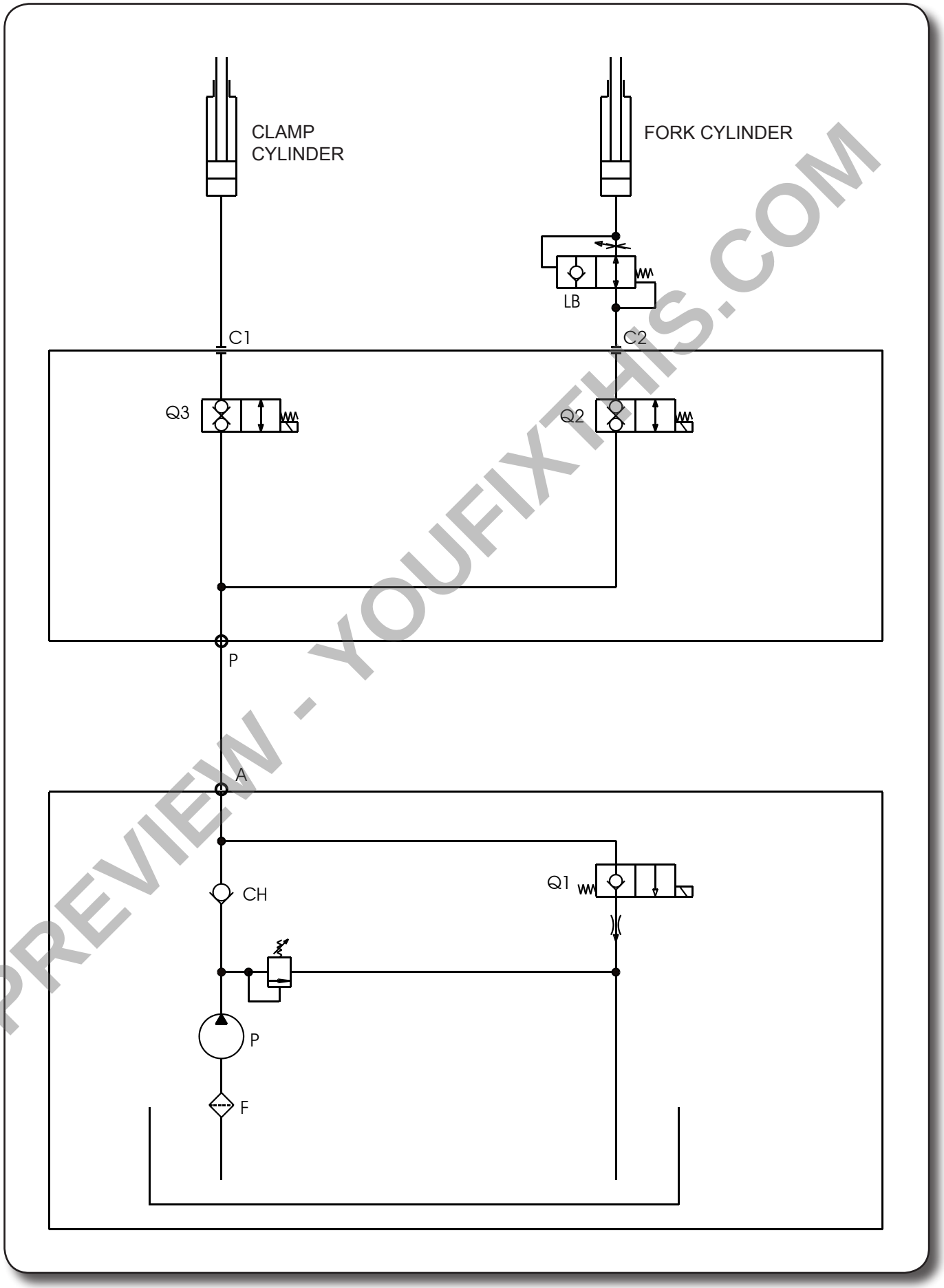
* When T1 and S2 are not present (no load on board)connect XFF21 to terminal 15-54 of S3.

** As reference us the colour (X) of the individual wire (or the number printed on it, if the wire is black)

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MAIN HYDRAULIC DIAGRAM



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TROUBLESHOOTING: MODULE DIAGNOSIS SYSTEM

The module is equipped with two LEDs (one red, one yellow) which, in the event of a fault, will flash the corresponding error code. The red LED flashes once to indicate that the system is about to signal first digit of the error code, then the yellow LED will emit the number of flashes corresponding to this first digit. The red LED now flashes twice to indicate that the system is about to signal second digit of the error code, then the yellow LED will emit the number of flashes corresponding to this second digit.
The two LEDs have four operating modes which are used to signal different type of information.

RED LED	YELLOW LED	STATUS
Off	Off	The controller is switched off or damaged.
Off	Flashing	The controller is in operation.
On	On	The controller is in Flash Program mode.
On	Off	Watchdog error or software not installed. Turn off and restart the truck or install the software.
Flashing	Flashing	The controller has detected an error. The two digit code is signalled by the flashing of the two LEDs in a cyclical sequence.

ALARMS

ALARM	troubleshooting
12 - "Controller Overcurrent" Possible causes: - External shortcircuit on connections of phases U, V or W to the motor - Motor parameters incorrect - Controller fault Effects: - Main contactor K2 open - All truck functions disabled - Electromagnetic brake activated	• Turn off and restart the truck. • Check the wiring and for a short-circuit or low impedance on the phases U, V and W. • Check the motor parameters are correct. • If no fault is found in the wiring or the parameters but the alarm persists, then the problem lies in the module.
13 - "Current Sensor Fault" Possible causes: - Dispersion of current from phases U, V or W to the truck chassis (short circuit of motor stator) - Controller fault Effects: - Main contactor K2 open - All truck functions disabled - Electromagnetic brake activated	• Turn off and restart the truck. • Check motor insulation • If no fault is found and the alarm persists, then the problem lies in the module.

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TORQUE SETTINGS FOR SCREWS, NUTS AND FITTINGS

Before disassembling the various parts and nuts and bolts, read the following carefully.

To make the threaded matings secure, *LOCTITE 270* is used for tightening the screws.

If it is not possible to unscrew the bolts because this product has been used, avoid applying extensions to the tools, instead slightly heat the area (at most 50°C) so as to eliminate the *LOCTITE 270* effect.

In the cases described, reapply *LOCTITE 270* during installation in a moderate quantity (30% of the mating surface).

The torque setting used for tightening the threaded couplings is extremely important to make the coupling secure and the machine safe.

The tables on this page give the classes of bolts normally used with the relevant torque settings.

Nominal diameter	TORQUE SETTING Nm	
	Class 8	Class 10
M3	4	5.2
M4	7	9.15
M5	12.14	14.8
M6	17.2	20.9
M8	31.8	38.1
M10	50.5	60.3
M12	74.2	88.5
M14	101.2	120.8
M16	138.2	164.9
M18	176.6	203.5
M20	225.4	259.7
M22	278.8	321.2
M24	324.8	374.2
M27	422.3	486.5
M30	516.1	594.7

					TORQUE SETTING Nm					
				Pre-load N	Class 5.8		Class 8.8		Class 10.9	
M4	0.7	7	3	2400	1.92	1.44	3.07	2.3	4.17	3.13
M5	0.8	8	4	3880	3.88	2.91	6.2	4.65	8.43	6.33
M6	1	10	5	5490	6.58	4.94	10.5	7.9	14.3	10.8
M8	1.25	13	6	9990	16	12	25.6	19.2	34.8	26.1
M8	1	13	6	10700	17.1	12.8	27.4	20.5	37.3	27.9
M10	1.5	16	8	15825	31.7	23.8	51	38	69	52
M10	1.25	16	8	16700	33.4	25.1	53	40.1	73	55
M12	1.75	18	10	23025	55	41.4	88	66	120	90
M12	1.25	18	10	25150	60	45.3	96	72	130	98
M14	2	21	12	31400	88	66	140	105	190	145
M14	1.5	21	12	34125	96	72	155	115	210	155
M16	2	24	14	42850	135	105	220	165	300	225
M16	1.5	24	14	45600	145	110	235	175	320	240
M20	2.5	30	17	66875	270	200	430	320	580	435
M20	1.5	30	17	74250	295	225	475	355	650	485

= with lubricant

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UNLOADING THE TRUCK

Equipment and tools



fork lift truck
load capacity
1000 kg



bridge crane
load capacity
1000 kg



2 lifting slings
load capacity
1000 kg

Procedure

Before starting work, ensure that you are wearing suitable protective clothing.



Phase 1

FORKLIFT TRUCK

Pick up the pallet using the lift truck, raise it and carry it to a safe place, away from the transit areas of other vehicles and pedestrians.

Phase 2

BRIDGE CRANE - 2 LIFTING SLINGS

Remove the packaging.

Attach the two lifting slings to the lifting attachments on the truck base **(fig.1)**.

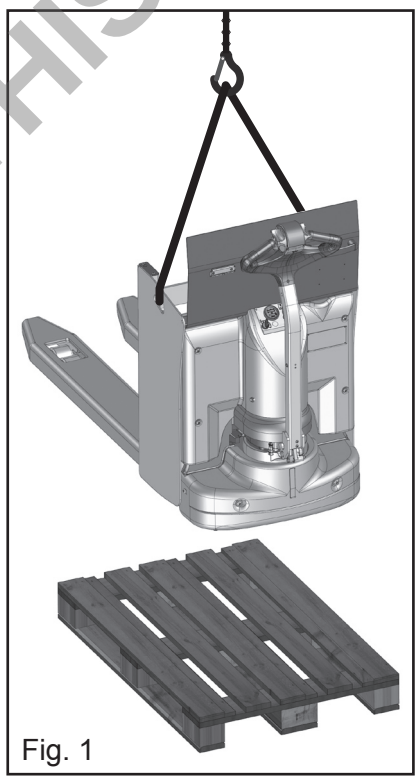


Fig. 1

Ensure that the bridge crane is positioned vertically above the truck to be lifted.

Attach the lifting slings to the bridge crane, lift the truck off the pallet and slowly lower it to the ground.

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	GENERAL SPECIFICATIONS			
CHARACTERISTICS	1.2	model		**P2.0HL**
	1.3	power: battery, diesel, LPG, petrol, electric		battery
	1.4	steering: tiller, pedestrian, standing, sitting		tiller
	1.5	load capacity, load	Q (t)	2.0
		load capacity, load with fork lifting	Q (t)	0.7
		load capacity, load with clamp lifting	Q (t)	2.0
	1.6	centre of gravity	c (mm)	600
	1.8	load distance from load wheel axle	x (mm)	906 (1)
	1.9	wheelbase (WB)	y (mm)	1380 (1)
WEIGHTS	2.1	unladen weight	kg	615
	2.2	load per axle when loaded (front/rear)	kg	780 / 1835 (2)
	2.3	load per axle when unladen (front/rear)	kg	440 / 175
WHEELS AND CHASSIS	3.1	tyres: full rubber, polyurethane, vulkollan (front/rear)		polyurethane / vulkollan
	3.2	front wheel size		ø 230 x 75
	3.3	rear wheel size		ø 85 x 74
	3.4	additional wheels (size)		ø 100 x 40
	3.5	wheels: quantity, (x= traction) (front/rear)		1x+4 / 2
	3.6	front track width	b 10 (mm)	470
	3.7	rear track width	b 11 (mm)	375
DIMENSIONS	4.4	lifting	h3 (mm)	560
	4.6	initial lifting	h5 (mm)	130
	4.9	height of tiller in operating position (min/max)	h14 (mm)	735 / 1200 (2)
	4.15	fully lowered forks height	h13 (mm)	92
	4.19	total length	l1 (mm)	1843
	4.20	length to fork heel	l2 (mm)	650
	4.21	total length	b1/b2 (mm)	700
	4.22	fork size	s/e/l (mm)	70 / 190 / 1190
	4.25	width over forks	b5 (mm)	570
	4.32	ground clearance at wheelbase centre	m2 (mm)	20
	4.33	working aisle for pallet length 800 x 1200	Ast (mm)	2054
	4.34	working aisle for pallet width 800 x 1200	Ast (mm)	2044
	4.35	turning radius	Wa (mm)	1560 (1)
PERFORMANCE	5.1	travel speed with/without load	km/h	6 / 6
	5.2	lifting speed with/without load	m/s	0.043 / 0.043 (3)
	5.3	lowering speed with/without load	m/s	0.072 / 0.072 (3)
	5.8	maximum gradeability with/without load	%	8 / 20
	5.10	service brakes		electromagnetic
ELECTRIC MOTORS	6.1	traction motor, S2 60 minutes	kW	1.2
	6.2	lift motor, S3 6%	kW	1.4
	6.3	battery BS, DIN 43531/35/36 A,B,C, no		no
	6.4	battery voltage/nominal capacity	V/Ah	24/200
	6.5	battery weight (+/- 5%)	kg	185
	6.6	consumption second VDI cycle	kWh/h	0.44
	8.1	type of control		AC ~ Mosfet

(1) With a load section at 100mm of lift: -31mm

(2) Tiller in vertical work position (first gear)

(3) Initial lifting

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TILLER BOARD: CONFIGURATION AND CALIBRATION

CONFIGURATION

When should this procedure be carried out?

- When the tiller board is replaced.

In order to avoid accidentally operating the horn microswitch during the configuration operation, it is advisable to carry out the procedure before inserting the card in the tiller casing.

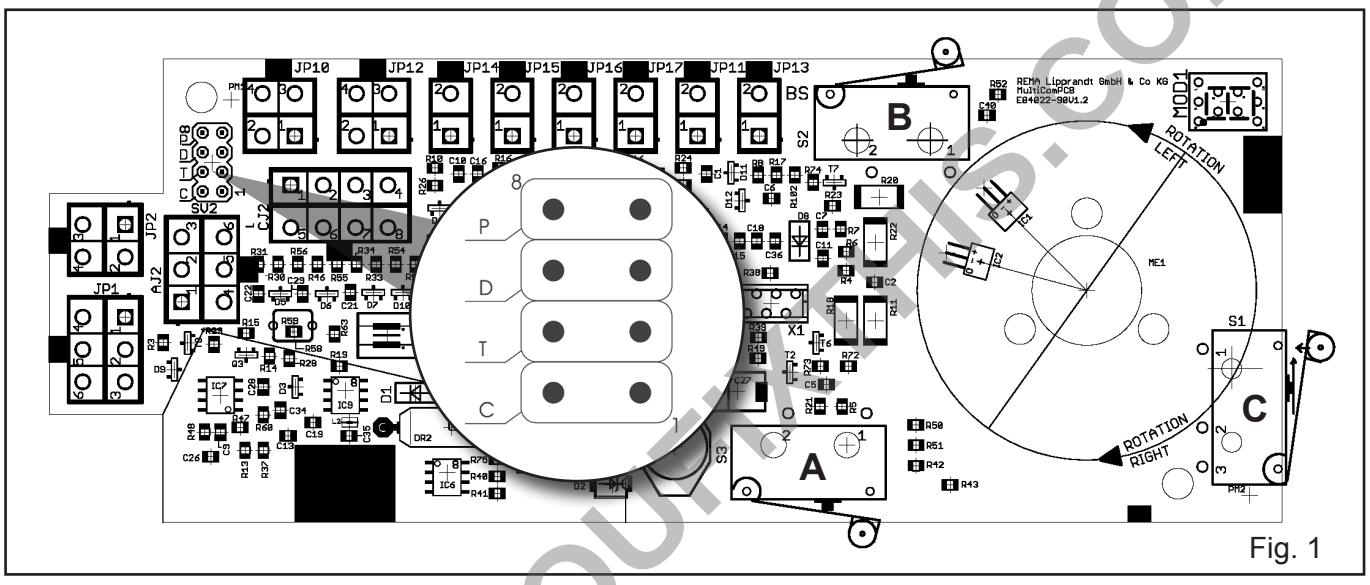


Fig. 1

Procedure

Turn the keyswitch to OFF and disconnect the battery.

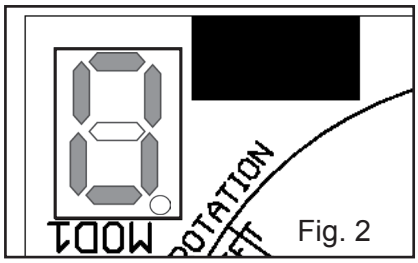


Fig. 2

Phase 1

Move the jumper on the tiller board from position **P** (Parking) to position **C** (Configuration) (**fig.1**).

Connect the battery and turn the starter key to ON.

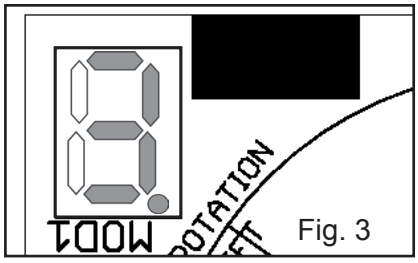


Fig. 3

Phase 2

The LED display shows 0 (no configuration) or a number identifying the type of configuration saved on the board (**fig.2**).

Press the Snail microswitch (**ref.B fig.1**) to increase the value until the configuration number 3 (trucks with proportional lifting and lowering buttons) appears on the LED display.

To decrease the value, press the horn microswitch (**ref.A fig.1**).

Phase 3

Confirm the configuration by pressing the Bellyswitch microswitch (**ref.C fig.3**). On the LED display a decimal point appears after the configuration number (**fig.3**).

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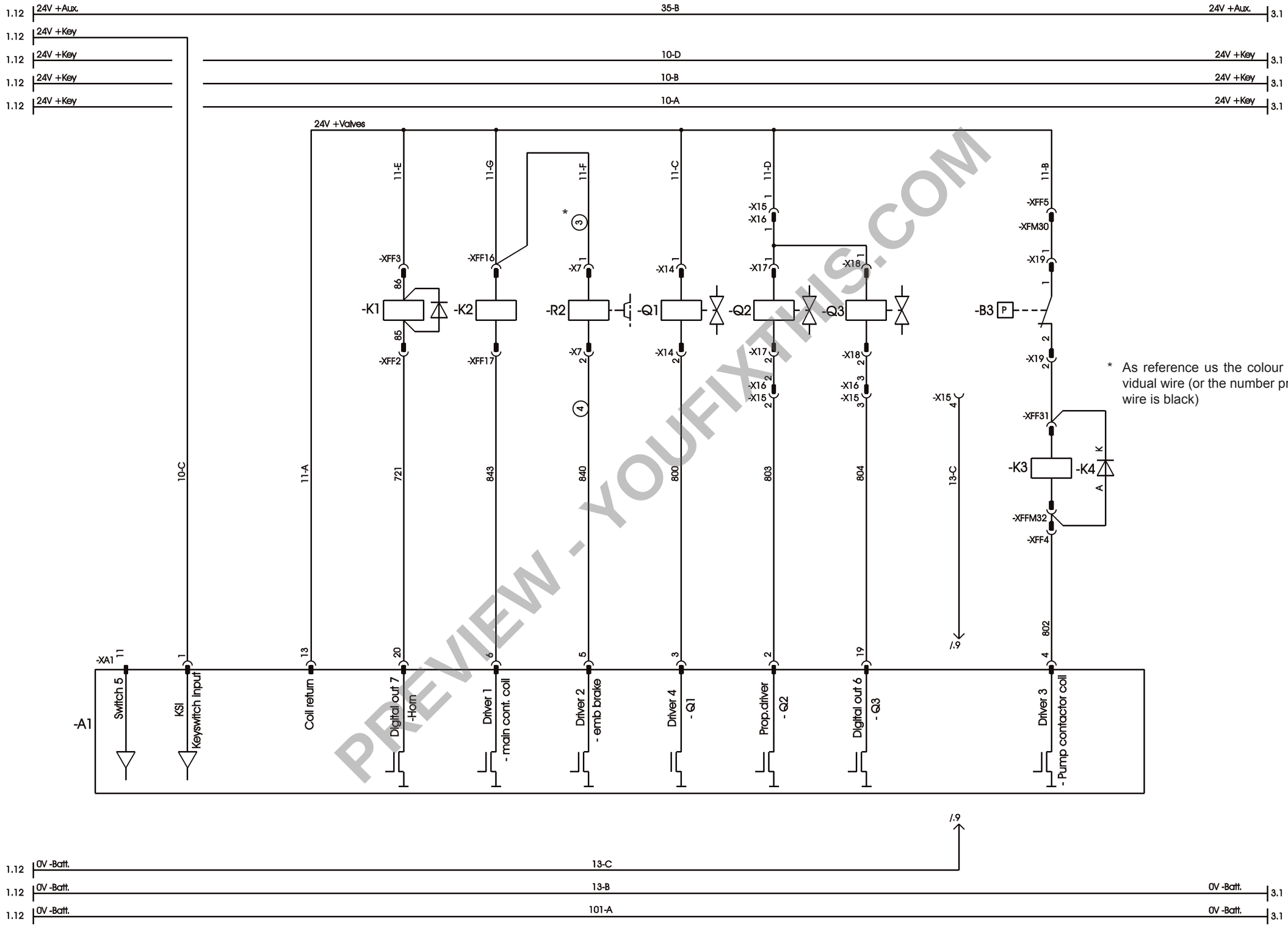
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SCHEDULED MAINTENANCE

	● = check and maintenance ■ = operator check x = replacement	Maintenance intervals				
	Operation description	every 8 hours 1 day	every 500 hours 6 months	every 1000 hours 12 months	every 2000 hours 24 months	every 3000 hours 36 months
TRUCK BASE	Check welded joints					●
	Lubrication of tiller pin					●
	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 bearing	■		●		
	Lubrication of steering thrust bearing				●	
	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 end cap connections	■		●		
	Check for oil leaks at motor housing control valve connections	■		●		
	Check hydraulic pipes				●	
	Check flexible hoses (2)				●	
	Change the oil in the hydraulic tank					x
	Oil filter cleaning					●
	Check valve operation	■				
REDUCER	Reducer oil change				x	
	Visual oil leak check	■		●		
	Check general condition of reducer			●		
	Check steering crown gear and steering pinion wear					●
	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 (9)		■	●		
	Check wear of pivot wheels (9)		■	●		
	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)			●		

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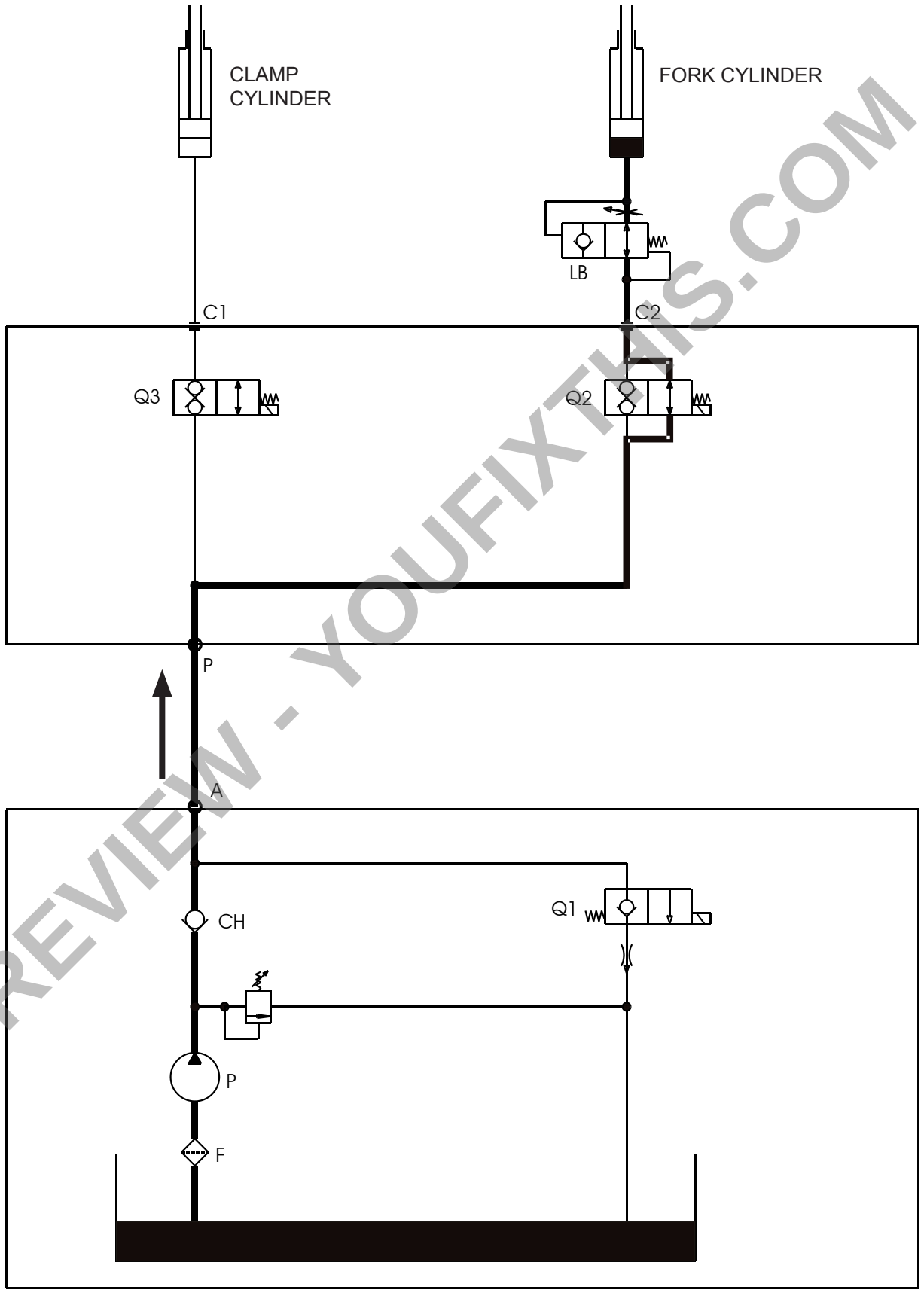


* As reference us the colour (X) of the individual wire (or the number printed on it, if the wire is black)

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HYDRAULIC DIAGRAM FOR FORK LIFTING



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ALARM	troubleshooting
14 - "Precharge failed"	• Release all the tiller controls. • Check the value of the parameter MAIN MENU MONITOR / Battery / **Capacitor Voltage** • If no fault is found and the alarm persists, then the problem lies in the module.
Possible causes: - External load on capacitor bank (connected to B+) preventing capacitors from charging	
Effects: - Main contactor K2 open - All truck functions disabled - Electromagnetic brake activated	
15 - "Controller Severe Undertemp"	• Check the value of the parameter MAIN MENU MONITOR / Controller / **Temperature** • Bring the temperature to above the lower limit of -40°C, release all tiller controls, turn off and restart the truck. • If no fault is found and the alarm persists, then the problem lies in the module.
Possible causes: - The controller is operating in too low temperature conditions (below -40°C)	
Effects: - Main contactor K2 open - All truck functions disabled - Electromagnetic brake activated	
16 - "Controller Severe Overtemp"	• Check the value of the parameter MAIN MENU MONITOR / Controller / **Temperature** • Return the temperature to below the maximum limit of 95°C, release all the tiller controls, remove all loads from the truck, turn off and restart the truck. • Check that the module is installed correctly. • If no fault is found and the alarm persists, then the problem lies in the module.
Possible causes: - The controller is operating in too high temperature conditions (above 95°C) - Truck overloaded - Controller incorrectly installed	
Effects: - Main contactor K2 open - All truck functions disabled - Electromagnetic brake activated	
17 - "Severe Undervoltage"	• Check the value of the parameter MAIN MENU MONITOR / Battery / **Capacitor Voltage** • Return the capacitor voltage to above the minimum critical value. • Check the battery parameters. • Check the battery wiring. • Check the fuses • Check the status of the main contactor. • If no fault is found and the alarm persists, then the problem lies in the module.
Possible causes: - Incorrect battery parameters - Battery resistance too high - Battery disconnected during truck operation - Loss of capacitor charge to below critical limit - Fuse on positive feed to key switch disconnected or blown - The main contactor did not close	
Effects: - Drive reduced	

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CORRECT METHOD FOR APPLYING FEMALE FITTINGS

To assure a reliable seal between female fittings and the adapters in this manual, it is necessary to observe the following procedure, which differs from the one for assembling rigid pipes.

Female fittings without a gasket (metal/metal joint)

Screw on the nut by hand and then, with the aid of a wrench, tighten by another quarter turn.

Female fittings with O-ring

Screw on the nut by hand and then, with the aid of a wrench, tighten by another half turn.

In every case make sure that the pipe is properly aligned before tightening the nut on the adapter.

TORQUE SETTINGS

METRIC REVOLVING FEMALE			
UNF thread	Outside diameter of the pipe	Torque setting 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		

REVOLVING FEMALE jic 37°			
UNF thread	Size	Torque setting 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

REMOVING FEMALE BSP		
UNF thread	Torque setting 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

REVOLVING FEMALE ORFS			
UNF thread	Size	Torque setting 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 given in the tables refer to galvanized steel fittings. Fittings of other materials have other values.

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