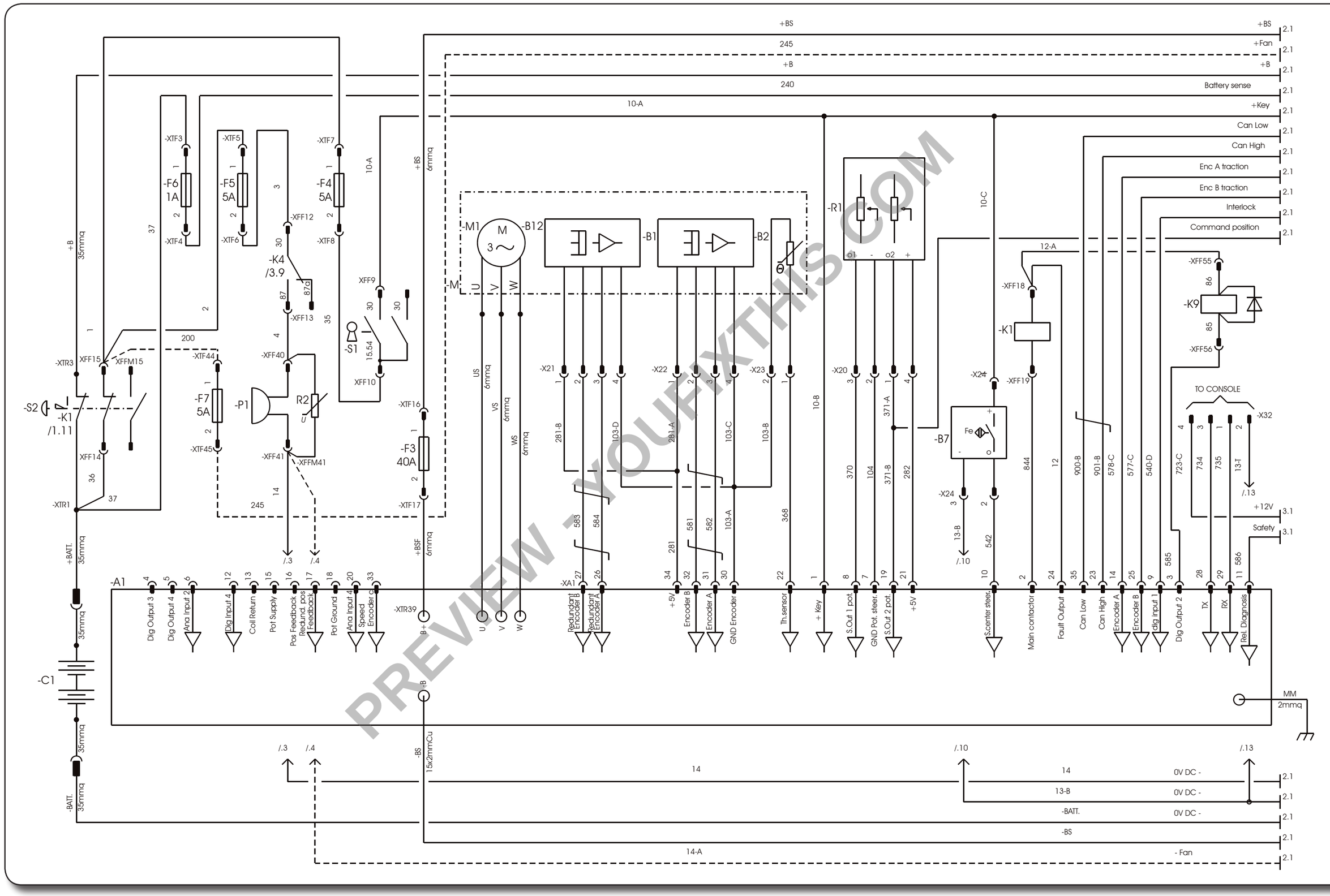
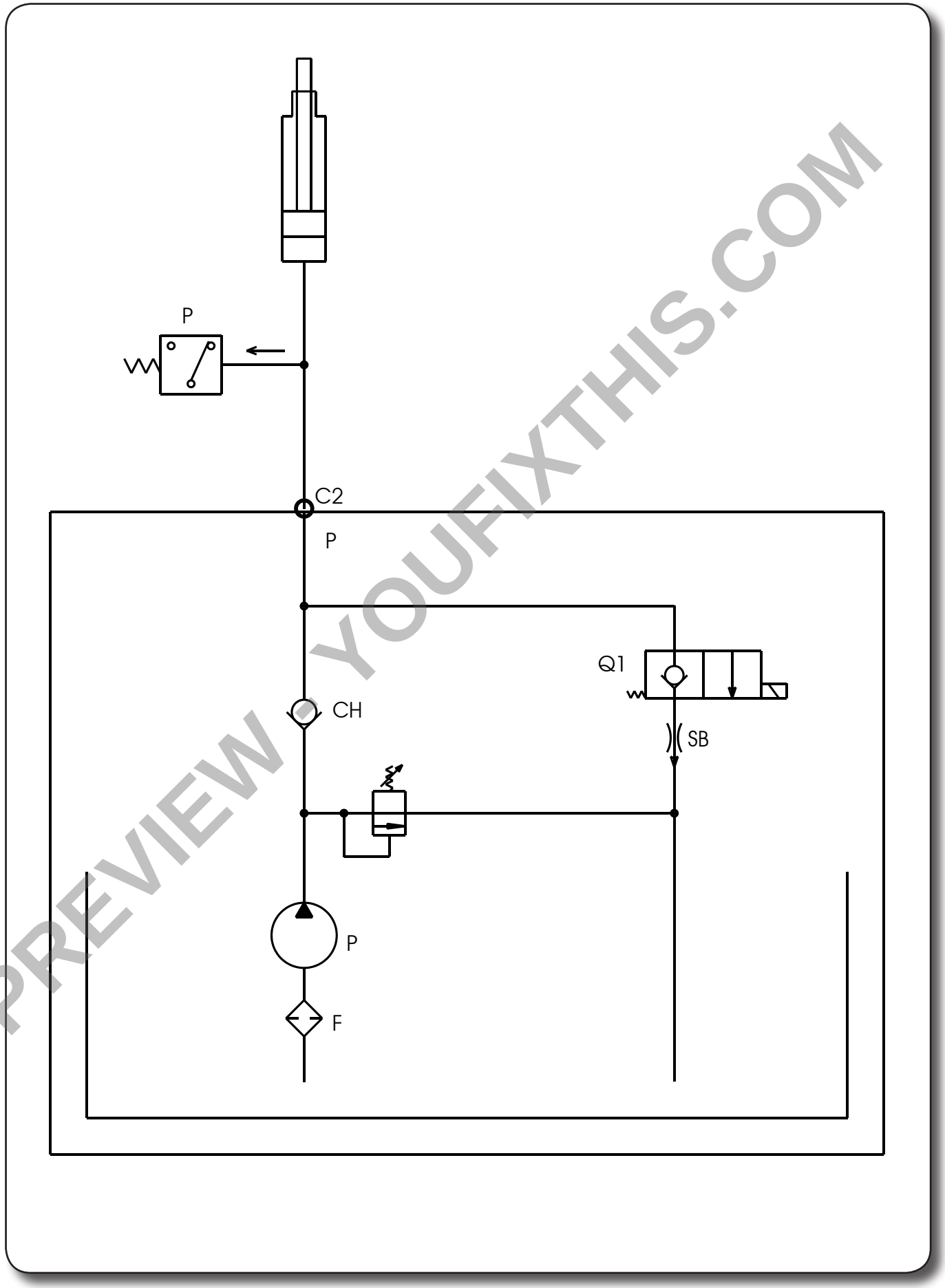



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## MAIN HYDRAULIC DIAGRAM




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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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## TROUBLESHOOTING: MODULE DIAGNOSIS SYSTEM

The modules are 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 control is 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. |

### "TRACTION" MODULE ALARMS

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

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## UNLOADING THE TRUCK

### Equipment and tools



fork lift truck
load capacity
3000 kg



bridge crane
load capacity
3000 kg



double arm lift belt
load capacity
2800 kg

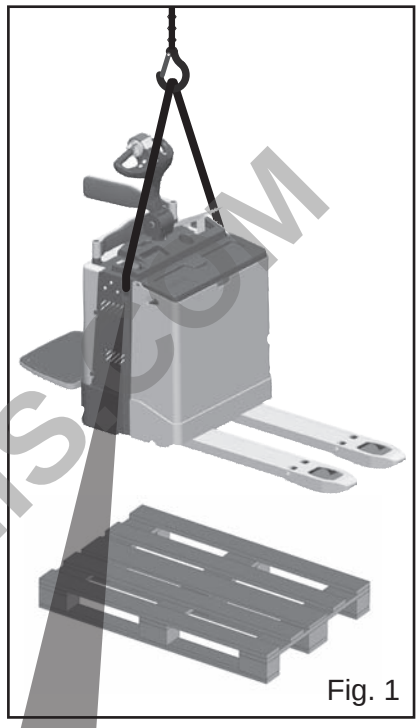


Fig. 1

### 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.

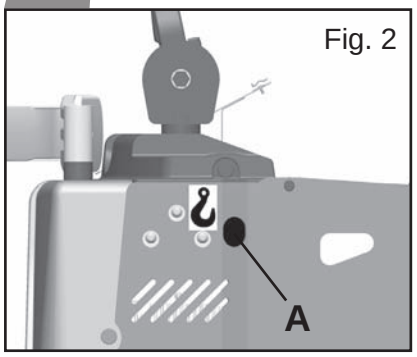



Fig. 2

#### Phase 2

BRIDGE CRANE - 2 LIFTING SLINGS

Remove the packaging.
Hook the double arm lift belt to the tackle.
Hook the two hooks of the lift belt to the two side holes of the truck base made for lifting **(ref.A fig.2)**.

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

Slowly raise and carefully position the truck on the ground.

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| | | GENERAL SPECIFICATIONS | | | | |
|---|---|---|---|---|---|---|
| CHARACTERISTICS | 1.2 | manufacturer's type designation | | P2.0S | | |
| | 1.3 | motor unit: battery, diesel, LPG, petrol, electric | | battery | | |
| | 1.4 | driving: manual, on ground, standing, seated | | on ground / standing | | |
| | 1.5 | load capacity/rated load | Q (t) | 2.0 | | |
| | 1.6 | load centre of gravity | c (mm) | 600 | | |
| | 1.8 | load distance from load wheel axle | x (mm) | 1004 (1) | | |
| | 1.9 | wheelbase (WB) | y (mm) | 1485 | 1525 | 1575 |
| WEIGHTS | 2.1 | weight with no load (including battery) | kg | 950 (1) | | |
| | 2.2 | load on axle with load (front/rear) | kg | 1150 / 1800 (1) | | |
| | 2.3 | load on axle with no load (front/rear) | kg | 750 / 200 (1) | | |
| WHEELS | 3.1 | tyres: full rubber, polyurethane, vulkollan (front/rear) | | vulkollan / vulkollan | | |
| | 3.2 | front wheel size | | ø 254 x 90 | | |
| | 3.3 | rear wheel size | | ø 85 x 94 (2) | | |
| | 3.4 | additional wheels (size) | | ø 125 x 50 | | |
| | 3.5 | wheels: quantity, (x= traction) (front/rear) | | 1x+4 / 2 | | |
| | 3.6 | front track width | b 10 (mm) | 526 | | |
| | 3.7 | rear track width | b 11 (mm) | 390 (1) | | |
| DIMENSIONS | 4.4 | lifting height | h3 (mm) | 130 | | |
| | 4.9 | height of tiller in driving position (min/max) | h14 (mm) | 1220 / 1460 | | |
| | 4.15 | fully lowered forks height | h13 (mm) | 88 | | |
| | 4.19 | overall length (driving on ground) | l1 (mm) | 1922 | 1962 | 2012 |
| | 4.19 | overall length with platform lowered (driving on machine) | l1 (mm) | 2368 | 2408 | 2458 |
| | 4.20 | length at front of forks (driving on ground) | l2 (mm) | 739 | 779 | 829 |
| | 4.20 | length at front of forks with platform lowered (driving on machine) | l2 (mm) | 1185 | 1225 | 1275 |
| | 4.21 | total length | b1/b2 (mm) | 780 | | |
| | 4.22 | fork size | s/e/l (mm) | 170 / 55 / 1183 | | |
| | 4.25 | outer width (min/max) | b5 (mm) | 560 (1) | | |
| | 4.32 | ground clearance at wheelbase centre | m2 (mm) | 30 | | |
| | 4.33 | aisle for pallets length 1000 x 1200 crossways (driving on ground) | Ast (mm) | 1939 | 1979 | 2029 |
| | 4.33 | aisle for pallets length 1000 x 1200 crossways (driving on machine) | Ast (mm) | 2386 | 2426 | 2476 |
| | 4.34 | aisle for pallets length 800 x 1200 lengthways (driving on ground) | Ast (mm) | 2139 | 2179 | 2229 |
| | 4.34 | aisle for pallets length 800 x 1200 lengthways (driving on machine) | Ast (mm) | 2586 | 2626 | 2676 |
| | 4.35 | radius of curvature (driving on ground) | Wa (mm) | 1743 | 1783 | 1833 |
| | 4.35 | radius of curvature (driving on machine) | Wa (mm) | 2190 | 2230 | 2280 |
| PERFORMANCE | 5.1 | traverse speed, laden/unladen (driving on ground) | km/h | 4 / 4 | | |
| | 5.1 | traverse speed, laden/unladen (driving on machine) | km/h | 8.5 / 12 | | |
| | 5.2 | lift speed laden/unladen | m/s | 0.03 / 0.03 | | |
| | 5.3 | lowering speed with/without load | m/s | 0.04 / 0.03 | | |
| | 5.7 | grade ability with/without load | % | 10 / 20 (3) | | |
| | 5.8 | maximum gradeability laden/unladen | % | 10 / 20 (3) | | |
| | 5.10 | electromagnetic service | | brake | | |
| MOTOR UNITS | 6.1 | traction motor, power S2 60 minutes | kW | 4 | | |
| | 6.2 | lifting motor, power S3 16% | kW | 1.4 | | |
| | 6.3 | battery in compliance with DIN 43531/35/36 A,B,C, no | | DIN B<br>DIN B<br>no (BS) | no (BS) | no (BS) |
| | 6.4 | battery rated voltage/capacity at 5 hours | V/Ah | 24/210<br>24/250<br>24/300 | 24/400 | 24/500 |
| | 6.5 | battery weight (+/- 5%) | kg | 212<br>212<br>233 | 303 | 364 |
| | 6.6 | consumption per VDI cycle | kWh/h | 0.47 | | |
| | 8.1 | type of drive control | | AC ~ Mosfet | | |
| | 8.4 | noise level detectable by the operator | dB (A) | <70 | | |
| | | vibration | $m/sec^2$ | <2.5 | | |

(1) The values refer to trucks with 400Ah battery with forks b5=560 L=1183

(2) refer to the manufacturer for other configurations

(3) values determined by the wheel friction, if you frequently climb onto the ramps (within 1h), see your sales rep

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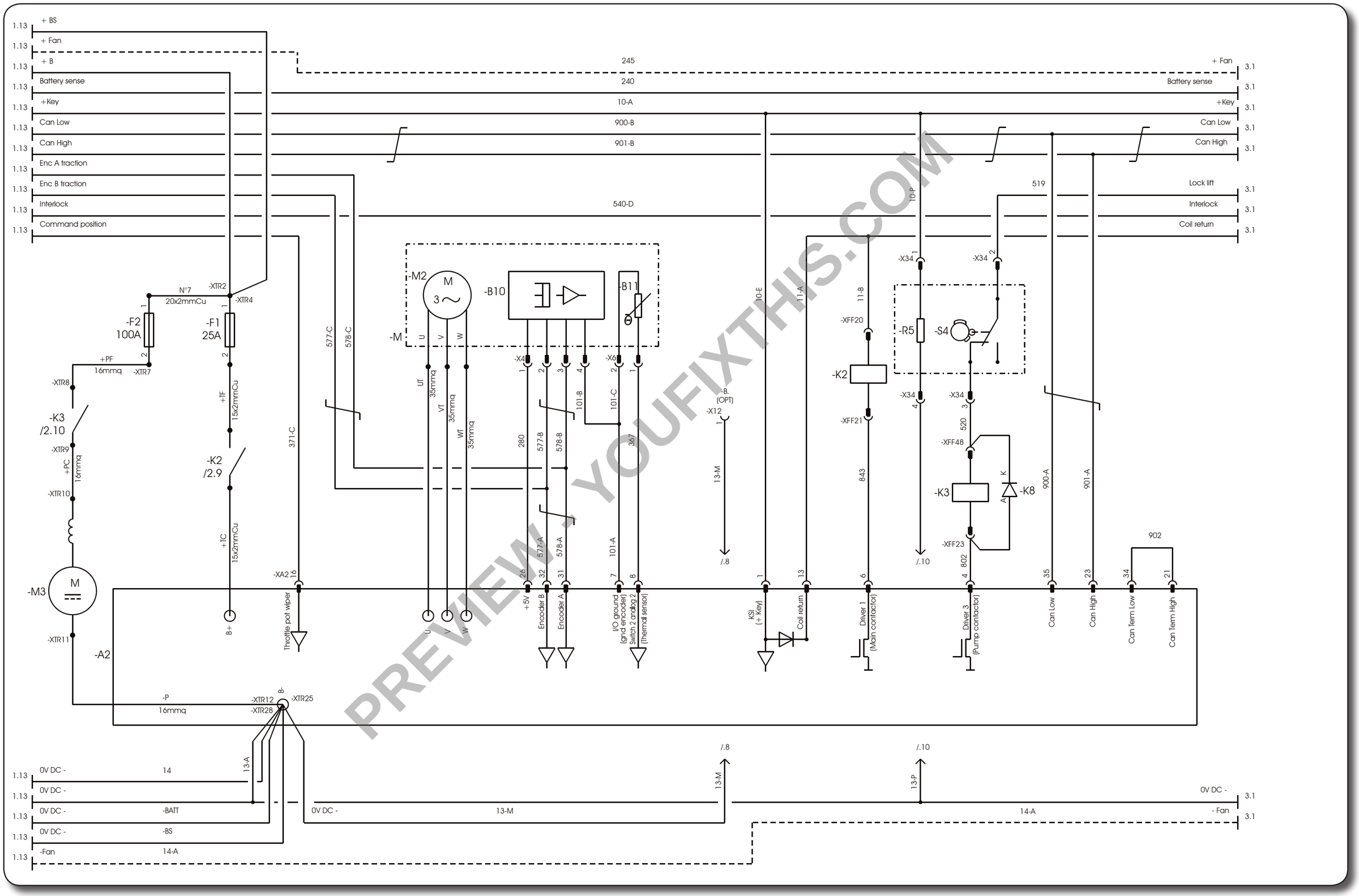
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## SCHEDULED MAINTENANCE

| | ● = check and maintenance<br>■ = operator check<br>x = replacement | Maintenance intervals | | | |
|---|---|---|---|---|---|
| | Operation description | every 8 hours 1 day | 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 | | | ● | |
| | Check shock absorber assembly | | | | ● |
| | Check efficiency of platform gas springs | ■ | | | |
| | Check platform suspension springs | | ● | | |
| | Lubrication of platform suspension springs | | ■ | | |
| | Check efficient open/close action of side barriers | ■ | | | |
| | Check clutch plate pad wear (1) | | ● | | |
| | 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 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 | | ● | | |
| | Check sensor efficiency | | ● | | |
| | General cleaning of electrical panel, remote-control switches and contacts using dry air at low pressure | | ● | | |

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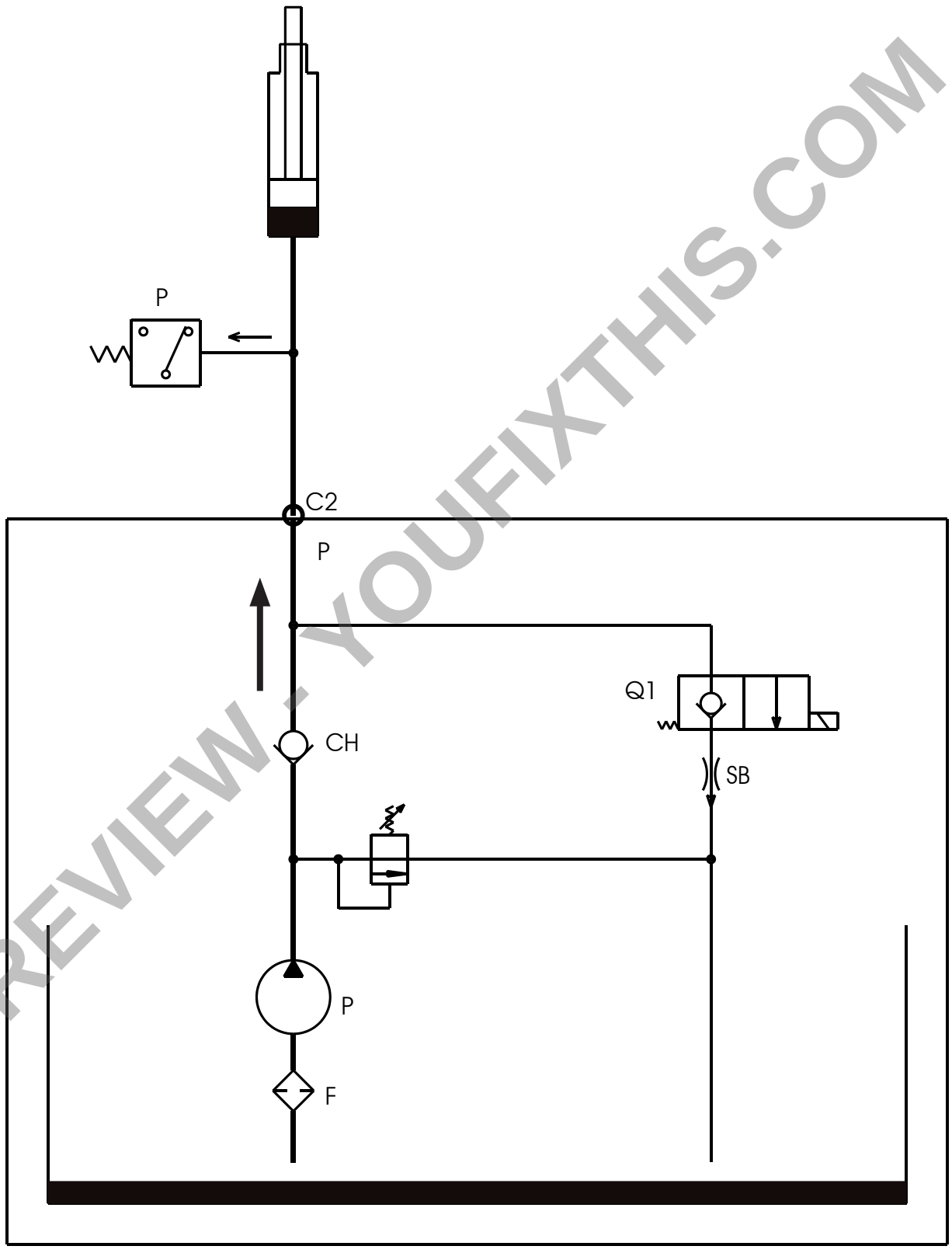



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## HYDRAULIC DIAGRAM FOR LIFTING




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

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## TOPPING UP THE OIL RESERVOIR

Before topping up the oil in the hydraulic oil reservoir make sure that the forks are fully lowered.

### Equipment and tools



funnel



oil resistant gloves



T handle hex key 5 mm

### Procedure

**Before starting work, ensure that you are wearing suitable protective clothing.**
**Move the truck to a safe place, away from areas of transit of other vehicles and pedestrians. Turn the keyswitch to OFF and disconnect the battery.**



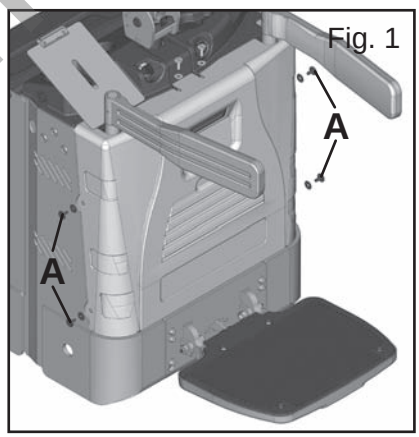


Fig. 1

**Phase 1**

LARGE FLAT HEAD SCREWDRIVER

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

**Phase 2**

OIL RESISTANT GLOVES - FUNNEL

Unscrew the oil reservoir cap **(ref.B fig.2)**, place the funnel in the filler hole and top up the oil level.
Do not overfill the reservoir.
After topping up the oil level, replace the screw on filler cap.

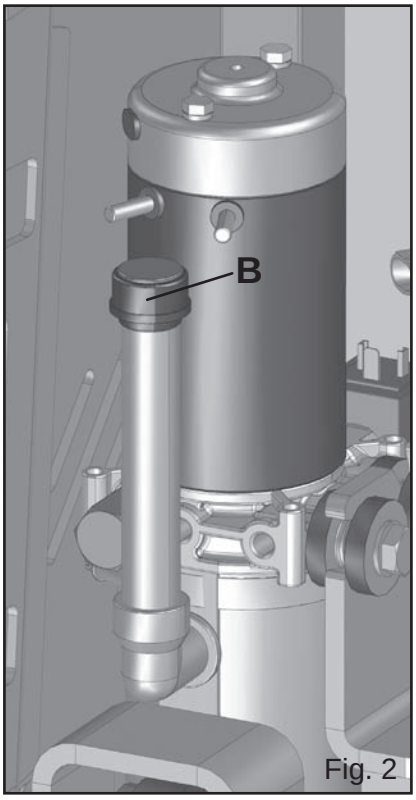


Fig. 2

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