GENERAL NOTES

THIS WIRING DIAGRAM SHOWS ALL THE OPTIONS. YOUR MODEL MIGHT NOT HAVE ALL THE OPTIONS INDICATED

REFER TO THE INSTRUCTIONS TO IDENTIFY THE CORRECT CONNECTION OF ALL THE OPTIONS

REFER TO THE WIRING DIAGRAM OF EACH CONFIGURATION TO DETERMINE THE EXACT CONTENT

ALL COMPONENTS ARE SHOWN IN THEIR NORMAL POSITION. ALL SWITCHES ARE SHOWN IN THEIR STATIC POSITION

REVERSE AND DIRECTIONAL DRIVE WITH FORKS

ALL TERMINALS NOT USED MUST BE FIXED TO A MAIN WIRE HARNESS

YOUR MODEL DOES NOT HAVE ALL THE OPTIONS SHOWN IN THIS WIRING DIAGRAM. REFER TO THE WIRING DIAGRAM FOR EACH CONFIGURATION TO DETERMINE THE EXACT CONTENT.

CIRCUIT IDENTIFICATION COLOURS

RED RED CIRCUIT BATTERY LEVEL

GRN GREEN - GREEN GROUND SIGNAL AND CAN BUS COMMiniCATION CIRCUIT

BLK BLACK - HIGH CURRENT (HIGHER THAN THE AMPERAGE OF THE LINE FUSES

YEL YELLOW - CAN/BuS HI CIRCUIT COMMUNICATION

ORN ORANGE - 5 VOLT CIRCUITS

PNK PINK - 12 VOLT CIRCUITS

WHT WHITE - ALL THE OTHER CIRCUITS

ALL THE WIRES HAVE A CIRCUIT MARKED ON THE SURFACE ID

ALL THE WIRES ARE WHITE UNLESS OTHERWISE SPECIFIED

ALL THE WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED

APPROX. 900 DEDICATED FOR CAN-LO BUSS - GREEN WIRE

APPROX. 901 DEDICATED FOR CAN-HU BUSS, YELLOW WIRE

WIRES 900 AND 901 MUST BE TWISTED

CIRCUITS 101-104 ARE LOW CURRENT GROUND

CIRCUITS WITH THE FOLLOWING IDENTIFICATION NUMBERS ARE USED ON CIRCUITS WITH BATTERY LEVEL VOLTAGE

- CIRCUITS 10, 35, 79 AND 239

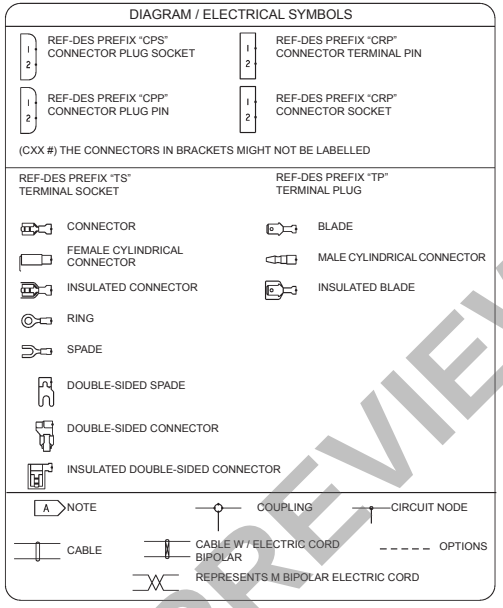
CIRCUITS 33 CIRCUITS AT 12 VOLTS 1S A

CIRCUITS 250 CIRCUITS AT 5 VOLTS 1S A

THE FOLLOWING CIRCUIT IDENTIFICATION NUMBERS ARE USED FOR THE GROUND SIGNALS

-101 TO 104

DIAGRAM / ELECTRICAL SYMBOLS



GENERAL ABBREVIATIONS

ALTERNATING CURRENT - AC
AMPERES - A
BATTERY - BATT
BDI - BATTERY
DISPLAY INDICATOR
CIRCUIT - CKT
CONNECTOR - CONN
CONTACTOR - K
CONTROLLER - CNTLR
DIAGNOSTICS - DGS
DIODE - D
DIRECT CURRENT - DC
DISCONNECT - DISC
DISPLAY - DISP
DRIVE - DR
EXAMPLE - EX
FUSE - FU
GROUND - GND
WIRE HARNESS - HRN
HEATER - HTR
HYDRAULIC - HYD
LEFT HAND - LH
LIGHT - LGT
MOTOR - MTR
NEGATIVE - NEG
OUTPUT- OUP
PRESSURE - PRESS
PROXIMITY - PROX
RIGHT HAND - RH
SENSOR - SEN
SIGNAL - SIG
STEERING - STEER
SWITCH - SW
TEMPERATURE - TEMP
TRACTION - TRAC
TRANSDUCER - XDCR
VOLTS - V

WIRE COLOR ABBREVIATIONS

COLORS	
BLK - BLACK	GRY - GRAY
WHT - WHITE	BRN - BROWN
RED - RED	BLU - BLUE
GRN - GREEN	PUR - PURPLE
ORN - ORANGE	VIO - VIOLET
YEL - YELLOW	DK - DARK
PNK - PINK	LT - LIGHT
TAN - TAN	

WIRE COLOR CALLOUT
COLOR-SHADE EX. BLU-DK
STRIPED WIRE CALLOUT
PRIMARY/STRIPE EX. BLU/WHT

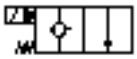
CO ORIGINATED BY: PRATHAMESH NIMKAR | DRW FIRST USED: - | RELEASED | A0 | PROJ 2-D

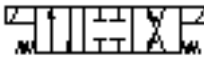
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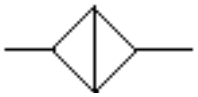
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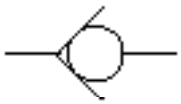
HYDRAULIC PLANS

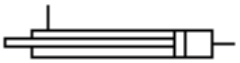
SYMBOLS


TWO POSITION SOLENOID VALVE


THREE POSITION SOLENOID VALVE


FILTER

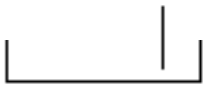

ONE-DIRECTIONAL VALVE


DOUBLE ACTING CYLINDER

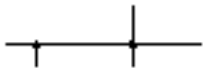

PROPORTIONAL VALVE


SINGLE ACTING CYLINDER


PUMP


TANK

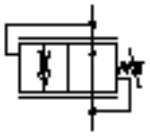

HYDRAULIC MOTOR

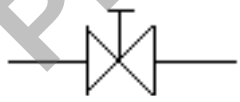

LINE CONNECTION

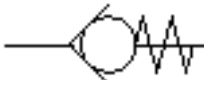


ELECTRIC MOTOR


PRESSURE RELIEF VALVE


FLOW VALVE


MANUAL COCK


BY-PASS VALVE

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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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DTC CODE

The status codes inform the operator of any malfunctioning and incorrect use of the truck.
The status codes are numeric codes that indicate failure or malfunctioning. If, during operation, the truck is used incorrectly or there is a fault, the key symbol will flash and the status code number will appear on the LCD screen. If the numeric status code appears, the truck must be checked and repaired by an authorized engineer.
The causes of each status code are detailed in this manual. This manual also provides detailed trouble-shooting procedures for the following systems or nodes:
NODE 30: TRACTION CONTROLLER
NODE 60: TILLER CARD
NODE 12: BATTERY CHARGER
The error codes are composed of 5 digits: the first two digits indicate the affected node, the last three indicate the number of the alarm.
Examples:
30001 – Lift Coil = Alarm Coil3 Open/Short on Combi controller
60058 – Snail = Snail redundant fault alarm on tiller board
12044 – Charger = Charger Fault alarm on optional battery charger

LED BLINKS

The module is equipped with a two-colour status LED (red and 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.

DTC CODE	MDI TXT	DTC TXT	LED BLINKS
30001	LiftCoil	Coil3 Open/short	33
30003	Lwr Coil	Coil4 Open/short	34
30033	MainCoil	Coil 1 open/short Main open/short	31
30035	Brake	Coil2 open/short Embrake Open/short embrake failed to set	32 32 92
30037	AlrmCoil	Coil7 Open/short	27
30039	AlrmCoil	PD Open/short Coil6 Open/Short	35 26
30052	Thumb Sw Start Up	Throttle Wiper high Analog HPD fault	41 67
30060	Mtr Curr	Controller overcurrent	12
30061	Mtr Open	motor open	37
30062	Encoder	Encoder fault Encoder LOS	36 93
30067	MainCont	Main contactor welded	38
30068	MainCont	Main contactor DNC	39
30069	PreCharg	Precharge failed	14
30080	OverHeat MtTmpSns	Motor temp hot cutback Motor temp sensor do not display	28 29
30082	OverHeat	overtemp cutback	22
30083	OverHeat	Severe overtemp	16

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TRUCK UNLOADING

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)**.

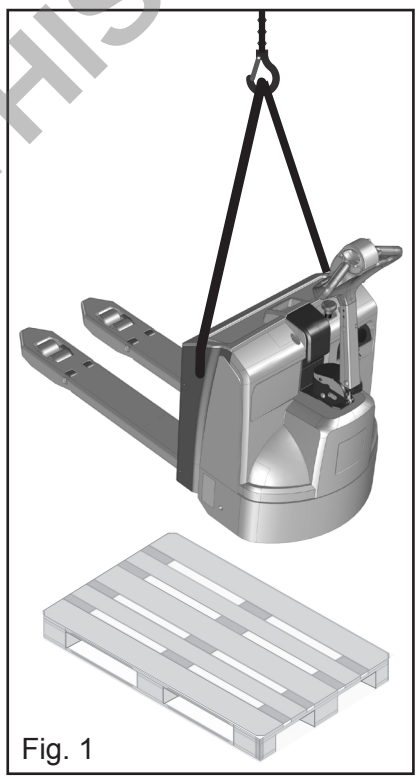


Fig. 1

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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COMBI CONTROLLER ALARMS - Node 30

ALARM		troubleshooting
DTC CODE	**MDI TXT**	• Carry out a visual inspection of all the connectors paired with the error code. Restart the truck and check whether the error code is still present.
30001	**LiftCoil**	CAUSE A • Disconnect the connectors TS11 and TS12 from the contactor coil and switch on the truck. • Measure the voltage between the connector TS11 and B(-). If the voltage is not 24 ± 2.5 V DC, check wire 239. • Disconnect the connector CPS01 from the Combi controller and measure the resistance between pin 4 and connector TS11. If the resistance is > 1 ohm, check wire W028. • Measure the voltage between the connector TS12 and B(+) holding down the fork lifting button. If the voltage is not 24 ± 2.5 V DC proceed with cause C. CAUSE B • Measure the resistance between the two contacts of the contactor coil; if the resistance is not equal to 55 ± 5.25 ohms, replace the pump contactor. CAUSE C • If no trouble is found, replace the controller.
Description: The Combi controller has detected a problem on the pump contactor coil.		
Possible causes: A. Short circuit or open circuit in the coil wire harness B. Short circuit or open circuit in the coil windings C. Combi controller faulty		

ALARM		troubleshooting
DTC CODE	**MDI TXT**	• Carry out a visual inspection of all the connectors paired with the error code. Restart the truck and check whether the error code is still present.
30003	**LwrCoil**	CAUSE A • Disconnect the connector CRS05 from the down valve coil located on the hydraulic pump and switch on the truck. • Measure the voltage between connector CRS05 pin 1 and B(-), if the voltage is not equal to 24 ± 2.5 V DC, check wire W239-D. • Disconnect the connector CPS01 from the Combi controller and measure the continuity between CRS05 pin 2 and CPS01 pin 3; if the resistance is > 1 ohm, check wire W801. • Measure the voltage between the connector CRS05 pin 2 and B(+) holding down the fork lifting button. If the voltage is not 24 ± 2.5 V DC proceed with cause C. CAUSE B • Measure the resistance between the two contacts of the valve coil; if the resistance is not equal to 19 ± 2.0 ohms, replace the down valve coil. CAUSE C • If no trouble is found, replace the controller.
Description: The Combi controller has detected a problem on the fork down valve.		
Possible causes: A. Short circuit or open circuit in the coil wire harness B. Short circuit or open circuit in the coil windings C. Combi controller faulty		

ALARM		troubleshooting
DTC CODE	**MDI TXT**	• Carry out a visual inspection of all the connectors paired with the error code. Restart the truck and check whether the error code is still present.
30033	**MainCoil**	CAUSE A • With the key in the ON position, disconnect the connector TS07 from the contactor coil and measure the voltage between the connector TS07 and B(-); if the voltage is not equal to 24 ± 2.5 V DC, check wire W239-B. • With the key in the OFF position, disconnect the connector CPS01 from the Combi controller and connector TS08 (negative) of the contactor coil. Measure the resistance between the connector TS08 and the connector CPS01 pin 6; if the resistance is > 1 ohm, check wire 075. CAUSE B • With the key OFF, measure the resistance between the contacts of the main contactor coil; if the resistance is not equal to 30 ± 3 ohms, replace the main contactor. CAUSE C • If no trouble is found, replace the Combi controller.
Description: The Combi controller has detected a problem in the main contactor coil.		
Possible causes: A. Short circuit or open circuit in the coil wire harness B. Short circuit or open circuit in the coil windings C. Combi controller faulty		

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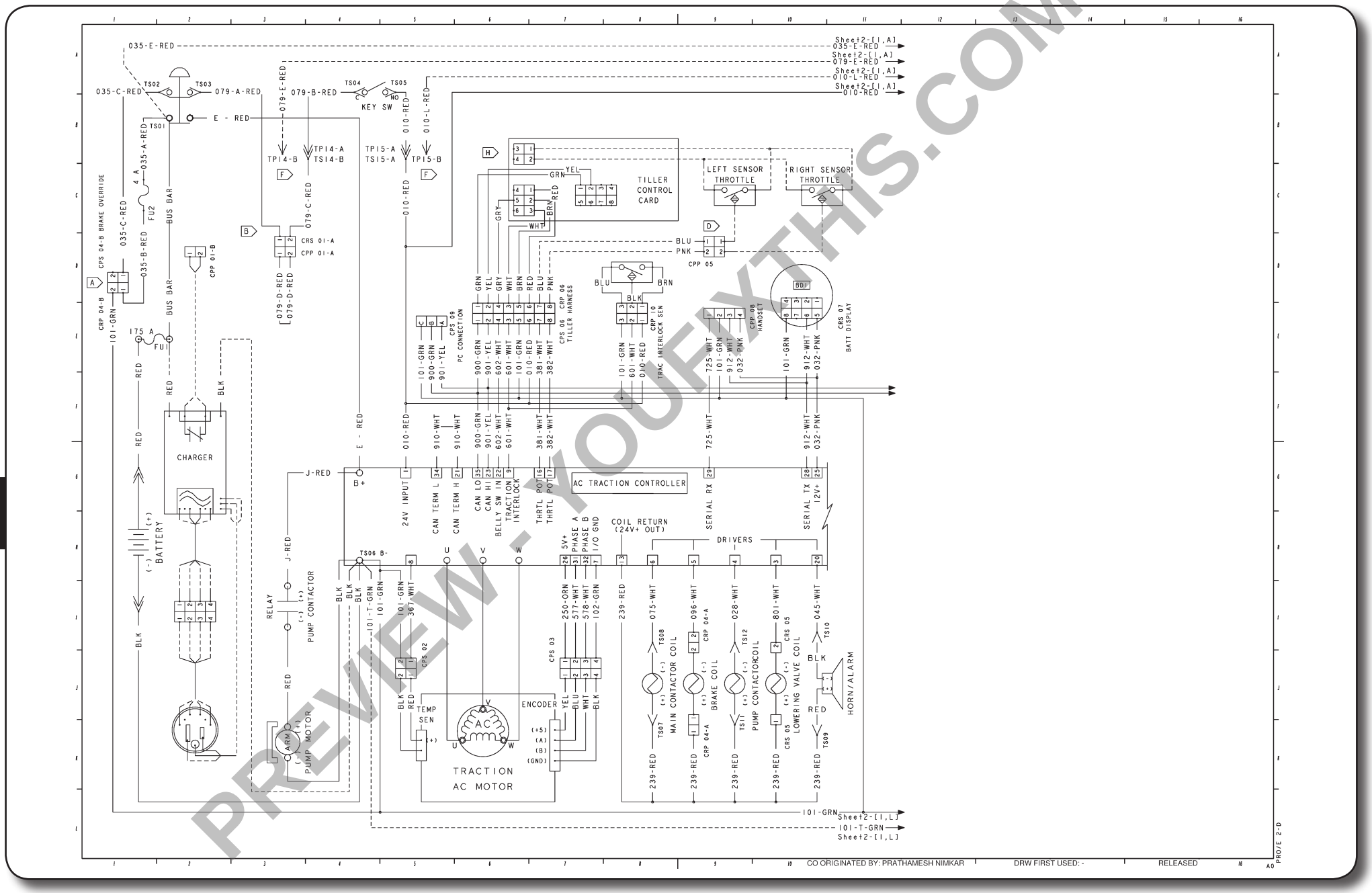
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SCHEDULED MAINTENANCE

	● = check and maintenance ■ = operator check x = replacement	Maintenance intervals		
	Operation description	every 8 hours 1 day	every 1000 hours 12 months	every 3000 hours 36 months
FRAME	Check the tightening of the nuts and bolts		●	
	Check welded joints			●
	General cleaning			●
BRAKING SYSTEM	Check release braking	■	●	
	Check reverse braking	■	●	
	Check emergency braking	■	●	
	Check parking mode braking	■	●	
	Check brake lining wear (1)		●	
	General cleaning		●	
HYDRAULIC SYSTEM	Check for oil leaks	■	●	
	Check hydraulic functions	■	●	
	Check oil level in tank		●	
	General cleaning		●	
	Check flexible hoses (2)			●
	Tank oil change			x
	Change oil filter			x
REDUCTION UNIT	Visual oil leak check	■	●	
	Check reduction unit noise		●	
	Change oil in reduction unit (4)		●	
	General cleaning		●	
FORKS				
	Check state of forks	■		
	General cleaning			●
WHEELS & TYRES	Check traction wheel wear (1)	■	●	
	Check load wheels wear (1)	■	●	
	Check wear of castor wheels (1)	■	●	
	Check the tightening of traction wheel fastening nuts		●	
	Check tightening of pivoting wheel fastening nuts		●	
	Check load and castor wheels bearings (1)		●	
	Check castor wheels support bearings	■	●	
TIE-RODS				
	Check state of linkage		●	
TILLER	Check the condition and operation of the tiller	■		
	Check gas spring efficiency		●	
GREASING POINTS				
	MDU gear greasing		●	
	Grease pins, tie rods			

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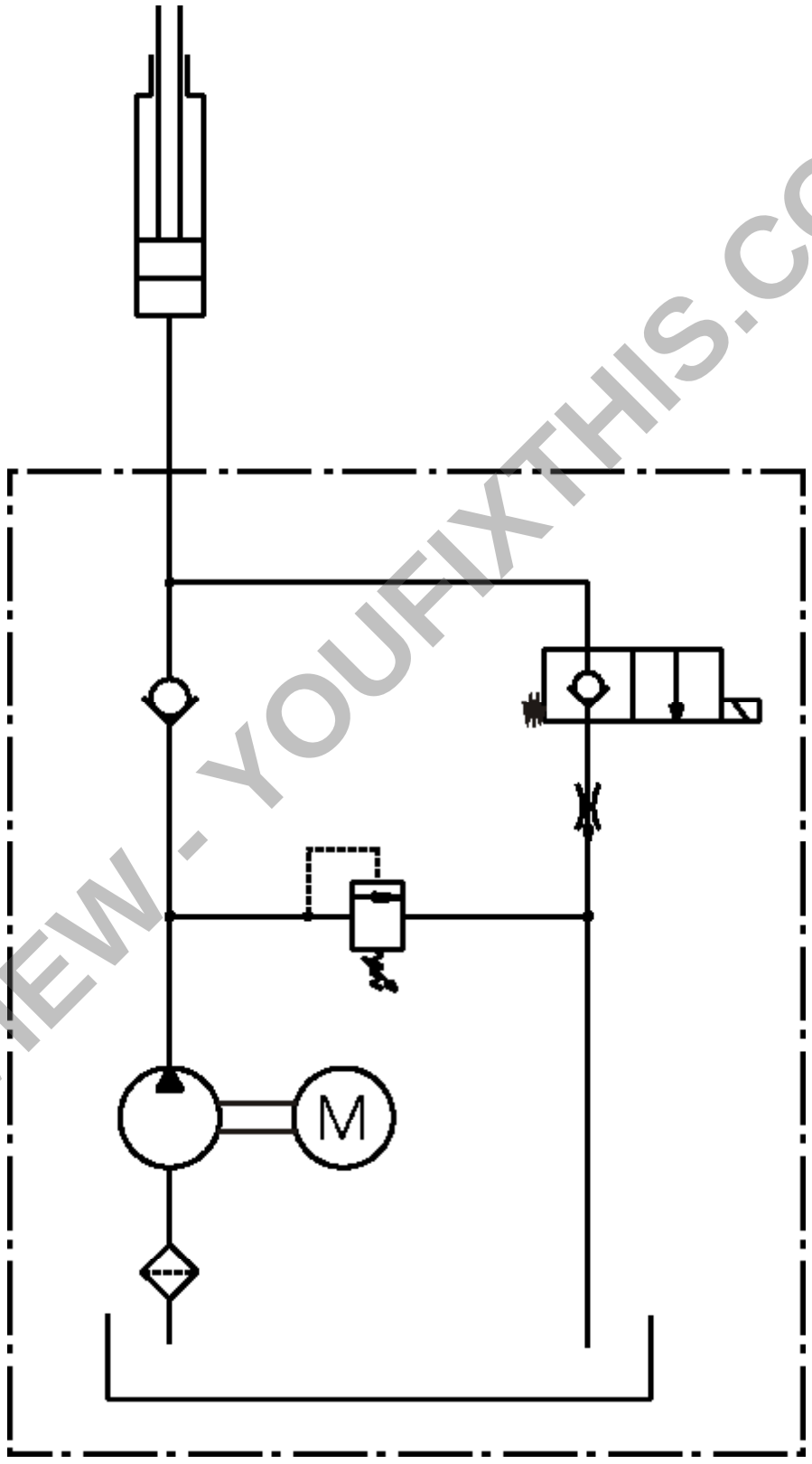
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MAIN HYDRAULIC DIAGRAM



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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

BSP REVOLVING FEMALE

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

ORFS REVOLVING FEMALE

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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DTC CODE	MDI TXT	DTC TXT	LED BLINKS
30086	Low Batt	Severe Undervoltage Undervoltage Cutback Severe Undervoltage Shutdown	17 23
30087	OverVolt	Overvoltage Overvoltage Cutback	18 24
30090	12&5Vout	external supply out of range 5v supply failure	 25
30099	CTRLLR	Current sensor fault OS general	13 71
30106	CAN Comm	CAN Startup failure PDO Timeout	51
30201	Startup	HPD Sequencing fault interlock fault EMR HPD	47 58 47
30227	Stalled	Stall detected	73
30231	Maintremnd	Maintenance reminder	
30232	Software	EEPROM Failure VCL runtime error	46 68
30247	Parametr	Parameter change fault motor characterization fault	49 87
30248	Low Temp	Severe undertemp	15
60050	EmerRev	EMR cutback shutdown Parity belly fault	 59
60058	Snail	Snail redundant fault	63
60099	CtrlCard	Rema tiller fault	53
60210	EmerRev	BB sequencing fault	61
60211	Start Up	KSI Interlock SRO	62
12044	Charger	Charger fault	54
12113	Charger	Charger CAN fault	55

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TOPPING UP THE OIL RESERVOIR

If required top up the oil in the hydraulic oil reservoir. Before proceeding, make sure that the forks are fully lowered.

Equipment and tools



funnel



oil resistant gloves



socket wrench
13 mm

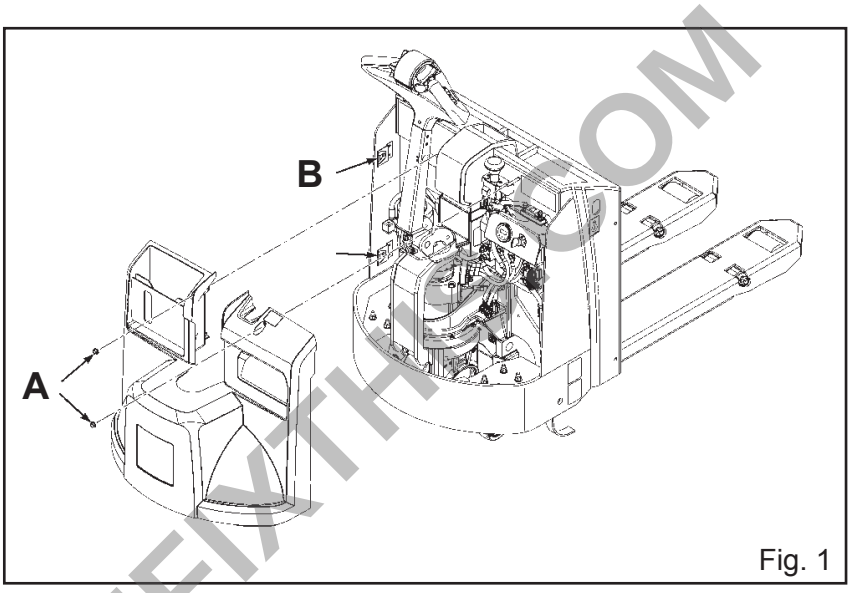


Fig. 1

Procedure

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



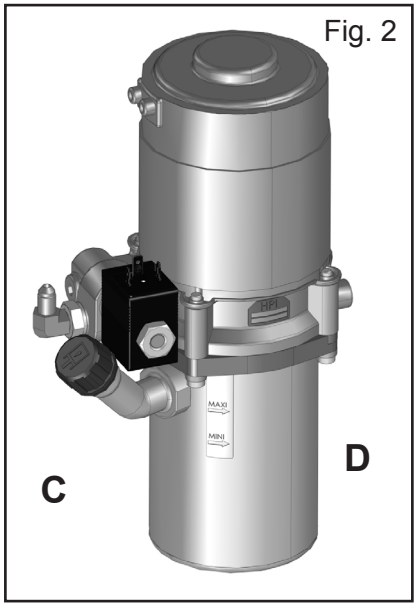


Fig. 2

Phase 1

SOCKET WRENCH SIZE 13 mm

Use the socket wrench to unscrew and remove the motor cover fixing nuts **(ref.A fig.1)**.
Remove the motor cover by pressing your hands first on the left and then on the right-hand side to trip the locking clips **(ref.B fig.1)**.

Phase 2

OIL PROTECTING GLOVES - FUNNEL

Unscrew the reservoir cap **(ref.C fig.2)**, place the funnel in the filler hole and top up the oil level.
Take the oil level in the tank to between the MIN and MAX values **(ref.D fig.2)**.
At the end of the operation screw the tank cap back on.

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