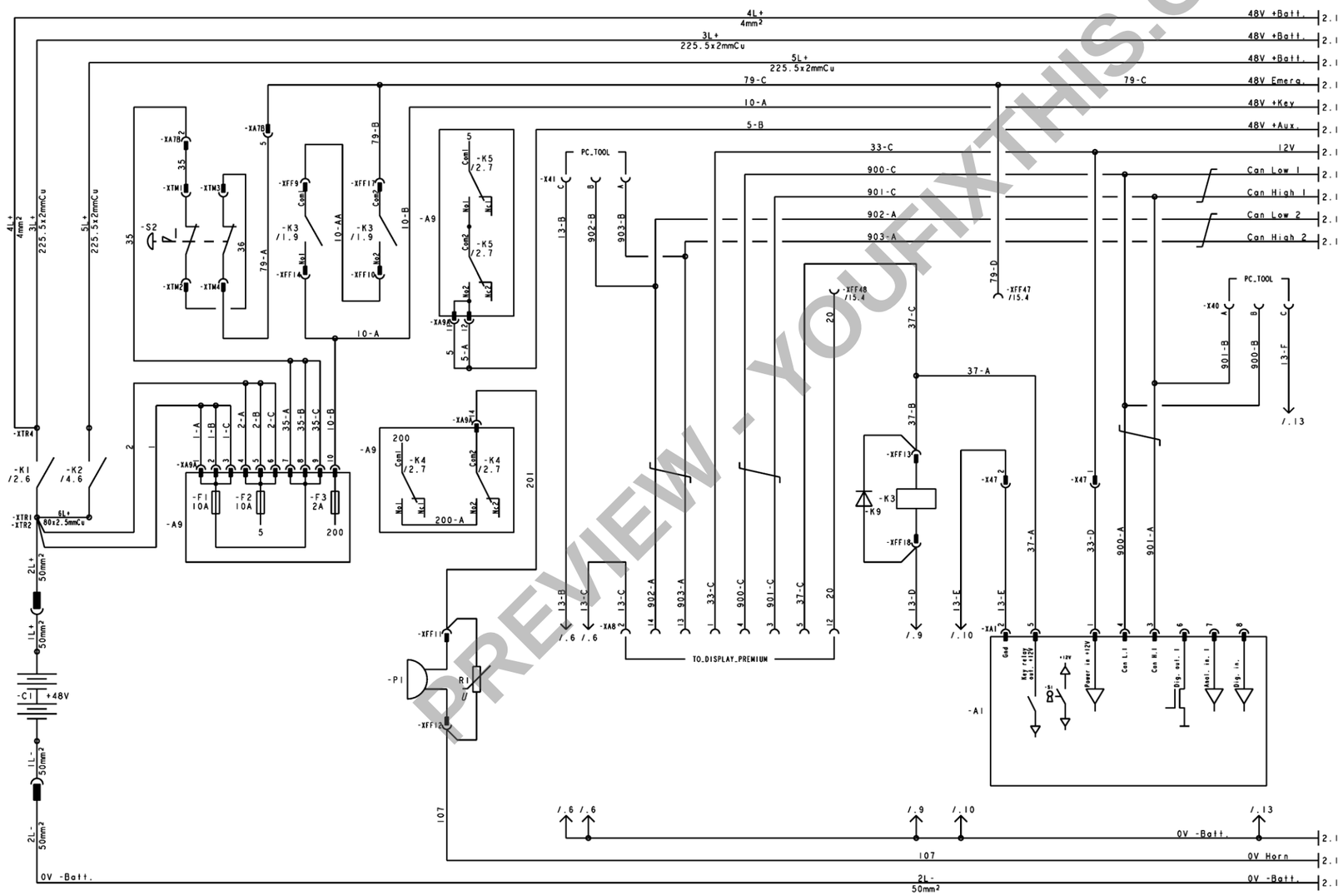
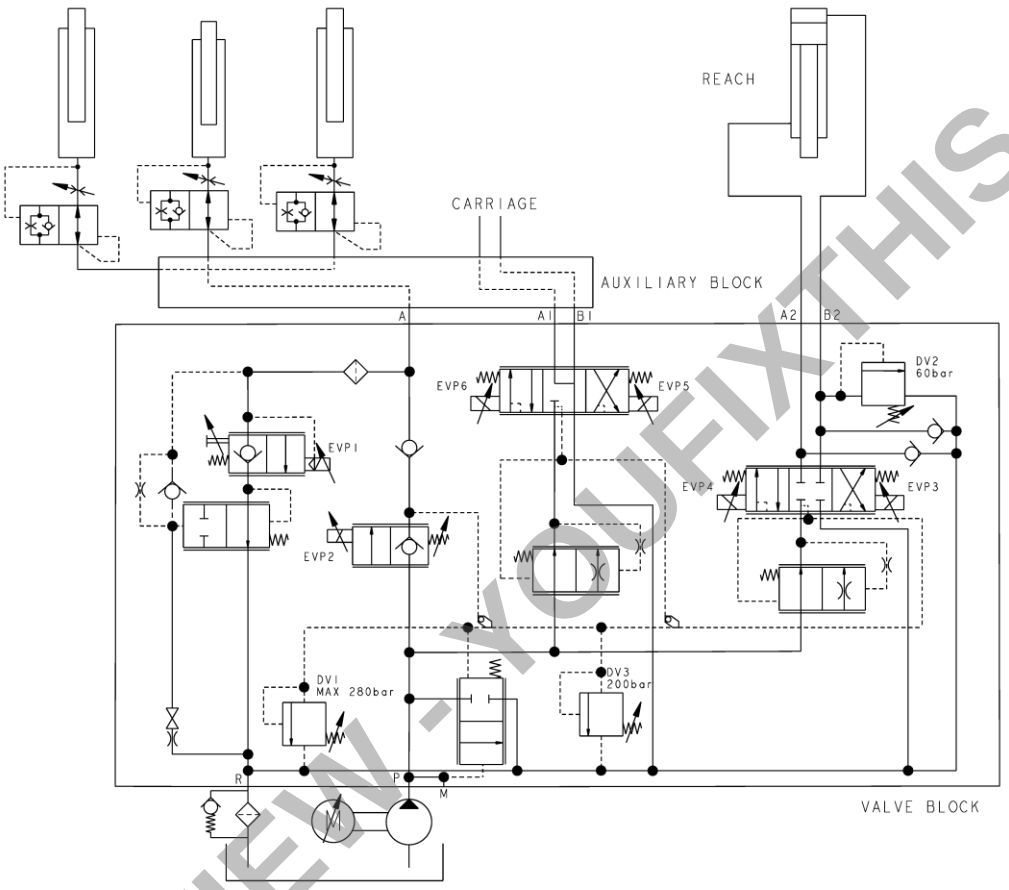
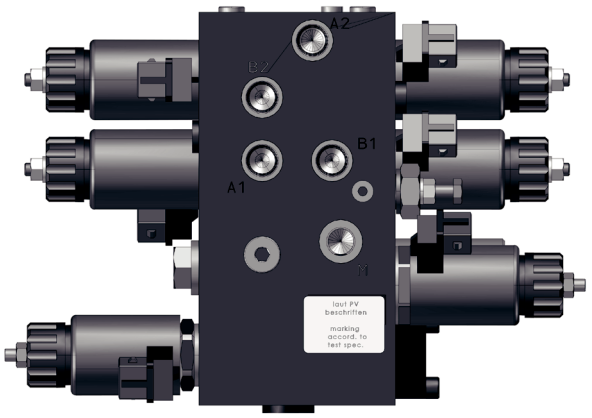


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ace2 PumP anD traction moDuLe Diagnosis sYstem

ace2 PumP and traction module alarms

programmer message	message sicos	description	effect	state of the truck
WatcHDog	CALL sERVICE	The watchdog signal is not in the correct state◊	MC open, EB activated, traction/pump station-ary◊	• start up • stand-by • During traction
	Re-start procedure: Re-start up of the key◊			
eeProm Ko	CALL sERVICE	Error detected in EEPROM or in EEPROM management◊	The control device works using the default parameters◊	• Continuous
	Re-start procedure: None◊			
Logic Failure #3	CALL sERVICE	Hardware protection cir- cuit failure due to high current◊	MC not closed, EB ac-tivated, traction/pump stationary◊	• start up
	Re-start procedure: Make a traction or hydraulic request◊			
Logic Failure #2	CALL sERVICE	Motor phase voltage feed-back circuit failure◊	MC open, EB activated, traction/pump station-ary◊	• switch-on (im-mediately after the MC closes)
	Re-start procedure: Make a traction or hydraulic request◊			
Logic Failure #1	CALL sERVICE	A condition of undervolt-age/overvoltage has been	MC not closed, EB ac-tivated, traction/pump stationary◊	• start up • stand-by • During traction
	Re-start procedure: Make a traction or hydraulic request◊			
Vmn Low	CALL sERVICE	Motor output voltage low-er than expected◊	MC open, EB activated, traction/pump station-ary◊	• start up • During traction
	Re-start procedure: Make a traction or hydraulic request◊			
Vmn High	CALL sERVICE	Motor output voltage high-er than expected◊	MC not closed, EB ac-tivated, traction/pump stationary◊	• start up • stand-by
	Re-start procedure: Make a traction or hydraulic request◊			
contactor closed	CALL sERVICE	The LC contact is locked	MC not closed (the control has not been activated), EB activat- ed, traction/pump sta-	• start up
	Re-start procedure: Make a traction or hydraulic request◊			

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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
M6	17.2	20.9
M10	50.5	60.3
M14	101.2	120.8
M18	176.6	203.5
M22	278.8	321.2
M27	422.3	486.5

				Pre-load N	TORQUE SETTING Nm					
					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 oFF the TRUCK and Fitting the Mast to the TRUCK Base

equipment and tools

fork lift truck load capacity 2500 kg	crane truck or bridge crane load capacity 2500 kg	open ended spanner 19 mm	torque wrench	lifting sling load capacity 2500 kg	ladder

Procedure

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

Phase 1

TRUCK BATTERY - FORK LIFT TRUCK LOAD CAPACITY 2500kg

Connect the battery to the truck base, switch on the forklift and transfer it to a place equipped with a crane truck or bridge crane Using the lift truck, fork the pallet on which the mast assembly is secured, raise it and carry it to the same place as the truck base

Phase 2

BRIDGE CRANE - LIFT BELT

Remove the packing of the mast assembly

Slip the lifting belt beneath the upper crossbars of the mast assembly by making a noose and hook the other end to the bridge crane hook **(fig.1)**

Start lifting slowly with the bridge crane and raise the mast assembly, separating it from the pallet Take the mast assembly into the vertical position

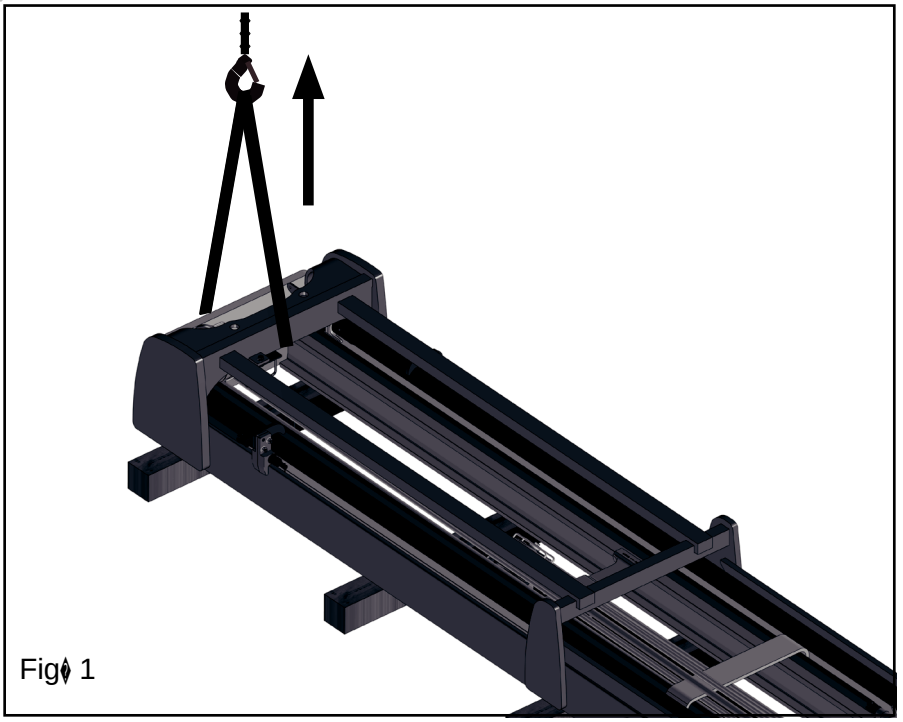


Fig 1

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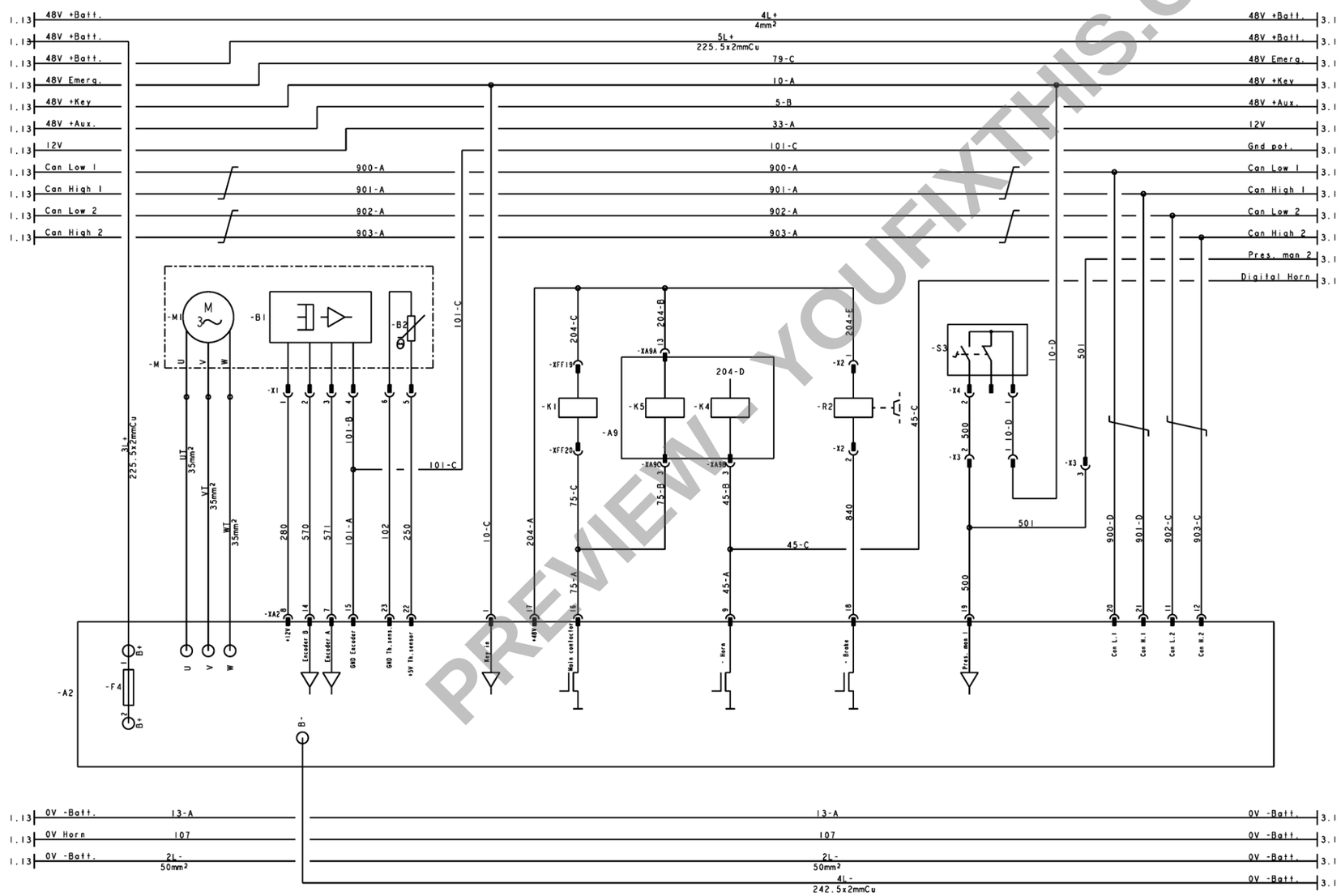
ScHeDuLeD maintenance

■ = checks and maintenance to be performed by the operator or the person assigned to truck maintenance (refer to the instructions given in the MAINTENANCE section of the operator's manual)
● = checks and maintenance operations that should only be performed by a technician authorised by the truck manufacturer (refer to the instructions given under the following headings in this section)
x = replacement of parts that should only be performed by a skilled technician authorised by the truck manufacturer (refer to the instructions given in the sections of this manual)

operation description	maintenance intervals			
	every 8 hours	every 1000 hours	every 3000 hours	every 5000 hours
Check the screws and bolts		●		
Check the integrity of the cab and frame fixing supports		●		
Check the conditions of the guides for sliding the retractable carriage		●		
Clean the guides for sliding the retractable carriage		●		
Check the height of the outriggers off the ground(1)		●		
Visually check the main welds				●
Check the functionality of the levers for emergency exit (cab for application in cold room)	■			
Check the adjustment of the door closing device and lubrication (Cab for application in cold room) (6)				
Check the conditions of the door hinge bearings (cab for application in cold room) (6) (2)				
Replacement of heater filter (cab for application in cold room) (6)				
Dynamic braking action check	■	●		
Reverse braking action check	■	●		
Normal braking action check	■	●		
Emergency braking action check	■	●		
Electromagnetic parking brake and coil efficiency check		●		
Electromagnetic parking brake liner wear check(2)			●	
Load wheels brake liner wear check(2)		●		
Oil leak check	■	●		
Valve operation check	■			
Tank oil level check		●		
Check the condition and tension of the hoses(3)		●		
Tank oil change			x	
Renew oil filter cartridge			x	
Renew plug with air cleaner			x	
Motor insulation check		●		
Cable connection check		●		
Fixing nut condition check		●		
Bearing noise check		●		
General cleaning		●		
Oil leak check	■	●		
Check oil level		●		
Change oil in reduction unit(4)				
General cleaning		●		
Check reduction unit outer gear teeth wear (steering crown wheel and pinion)		●		

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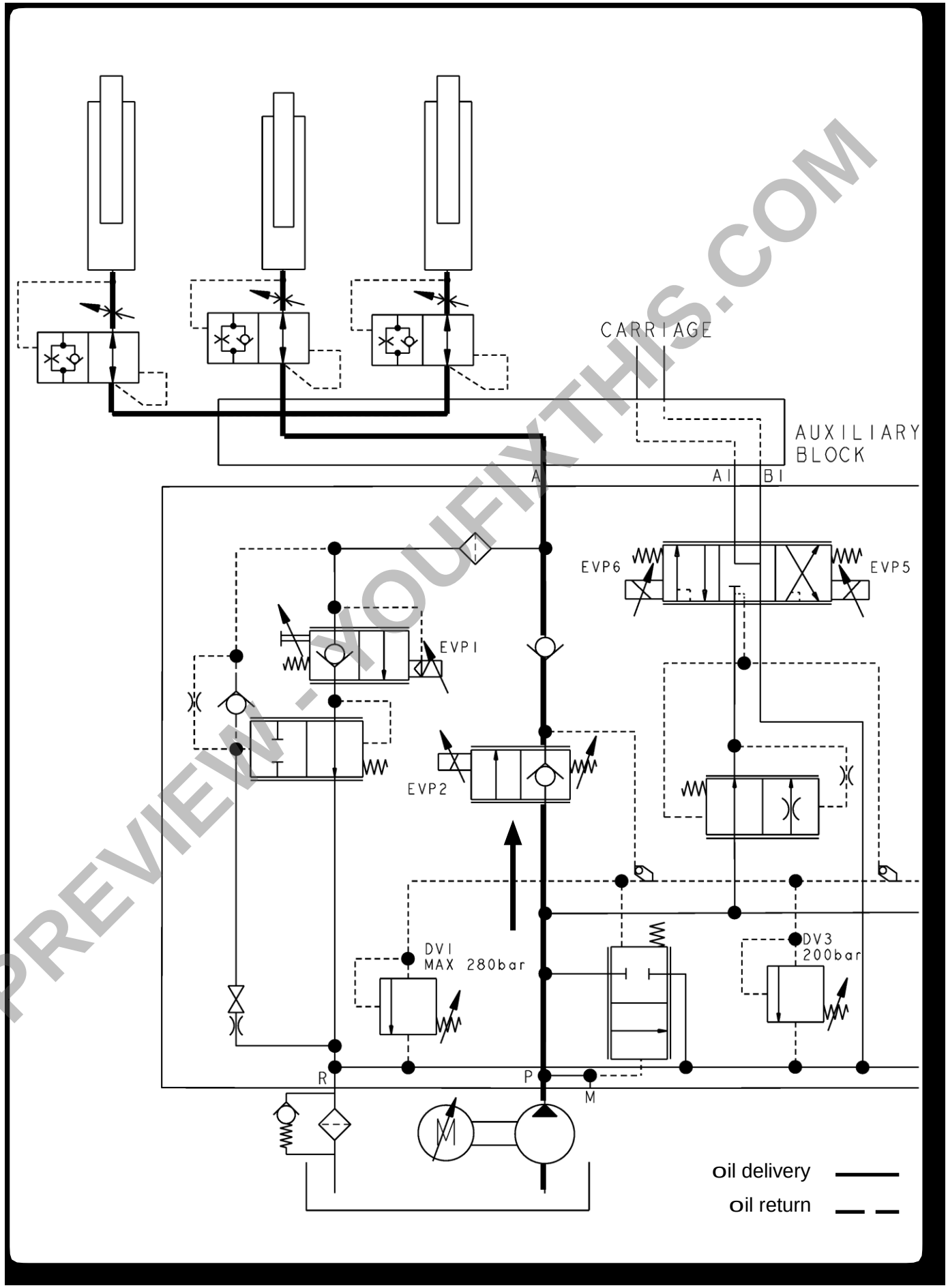
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programmer message	message sicos	description	effect	state of the truck
contactor oPen	CALL sERVICE	The MC coil has been activated, but the MC fails to close◊	MC open, EB activated, traction/pump stationary◊	• switch-on (immediately after the MC closes) • stand-by • During traction
	Re-start procedure: Make a traction or hydraulic request◊			
stBY i HigH	CALL sERVICE	In stand-by conditions (no current applied to the motor), current feedback is outside the permissible stand-by	MC not closed, EB activated, traction/pump stationary◊	• start up
	Re-start procedure: Make a traction or hydraulic request◊			
caPacitor cHarge	CALL sERVICE	The voltage of the power capacitors fails to increase◊	MC not closed, EB activated, traction/pump stationary◊	• start up
	Re-start procedure: Make a traction or hydraulic request◊			
tH◊ Protection	CALL sERVICE	The control device has reached the thermal re- duction temperature of 85°C when the current is	The traction control device reduces the maximum current linearly from I_{MAX} (85°C) to 0A	• Continuous
	Re-start procedure: None◊			
motor temPerat◊	CALL sERVICE	The motor temperature sensor is open (if dig- ital) or has exceeded the 150°C threshold (if	The maximum current is halved and the speed is reduced◊	• Continuous
	Re-start procedure: None◊			
BatteryY LoW	CALL sERVICE	The battery is <= 10% when the BATTERY CHECK parameter is	The maximum current is halved and the speed is reduced (if CHECK	• start up • stand-by • During traction
	Re-start procedure: Recharge the battery◊ Re-start up of the key◊			
DriVer sHorteD	CALL sERVICE	The MC driver has shorted and therefore is not capable of opening the contactor◊	MC open (the control has been released), EB activated, traction/	• start up • stand-by • During traction
	Re-start procedure: Make a traction or hydraulic request◊			

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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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Phase 3

OPEN ENDED SPANNER 19 mm

Using the open ended spanner, unscrew and remove the screws securing both side blocks of the mast assembly **(ref.A fig.2)**. Remove the blocks **(ref.B fig.2)**.
Using the bridge crane, slowly lift the mast assembly and rest it vertically on the truck base in the special housings **(ref.C fig.2)**. Keeping the belt taut, position both side blocks and, using a torque wrench, tighten the fixing screws **(ref.A fig.2)** to a torque of 88 **to** 97 Nm.

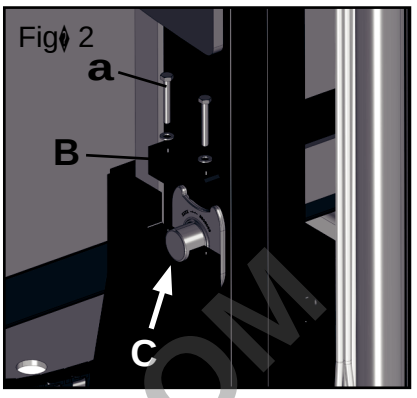
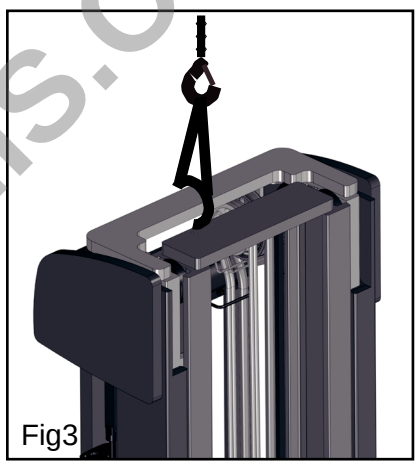


Fig. 2

Phase 4

BRIDGE CRANE - LADDER - LIFT BELT

Set the ladder next to the mast assembly and climb up.
Insert the lift belt beneath the upper crossbar of the middle section of the mast assembly by making a noose and hook the ends to the bridge crane hook **(fig.3)**. Climb down the ladder, raise the bridge crane to
reveal the seats of the screws securing the mast assembly to the truck base **(fig.4)**.


Fig3

Phase 5

TORQUE WRENCH - BRIDGE CRANE - LIFT BELT

Using the torque wrench, tighten the bolts securing the mast assembly to the truck base **(ref.D fig.4)** to a torque of 300 **to** 330 Nm.
Using the bridge crane, lower the mast assembly to the ground.
Climb up the ladder and remove the belt from the mast assembly.

Phase 6

Remove the cover to access the hydraulic control valve **(fig.5)**.
Connect the hydraulic pipes from the control valve on the truck base to the one on the mast assembly **(fig.6)**.

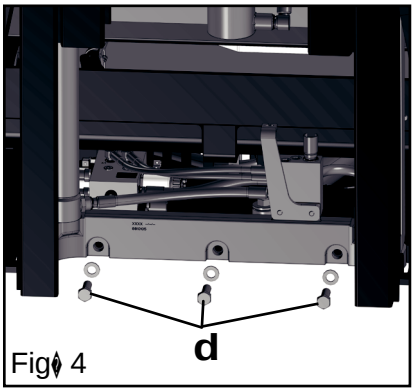
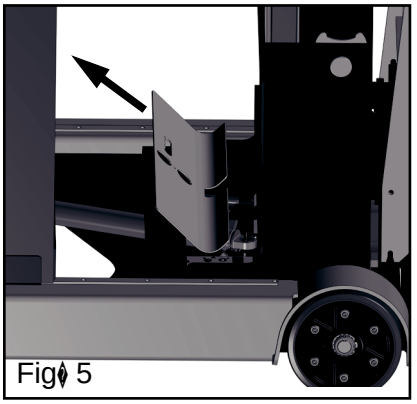
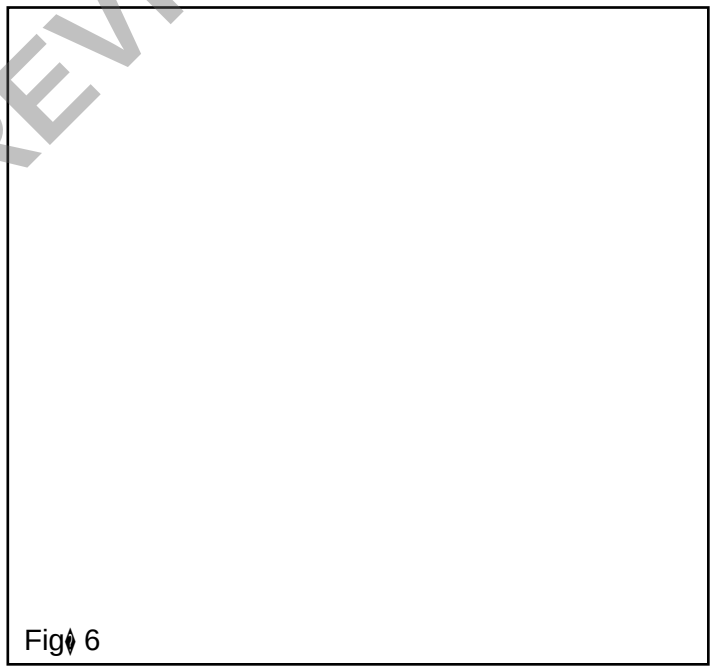


Fig. 4


Fig. 5

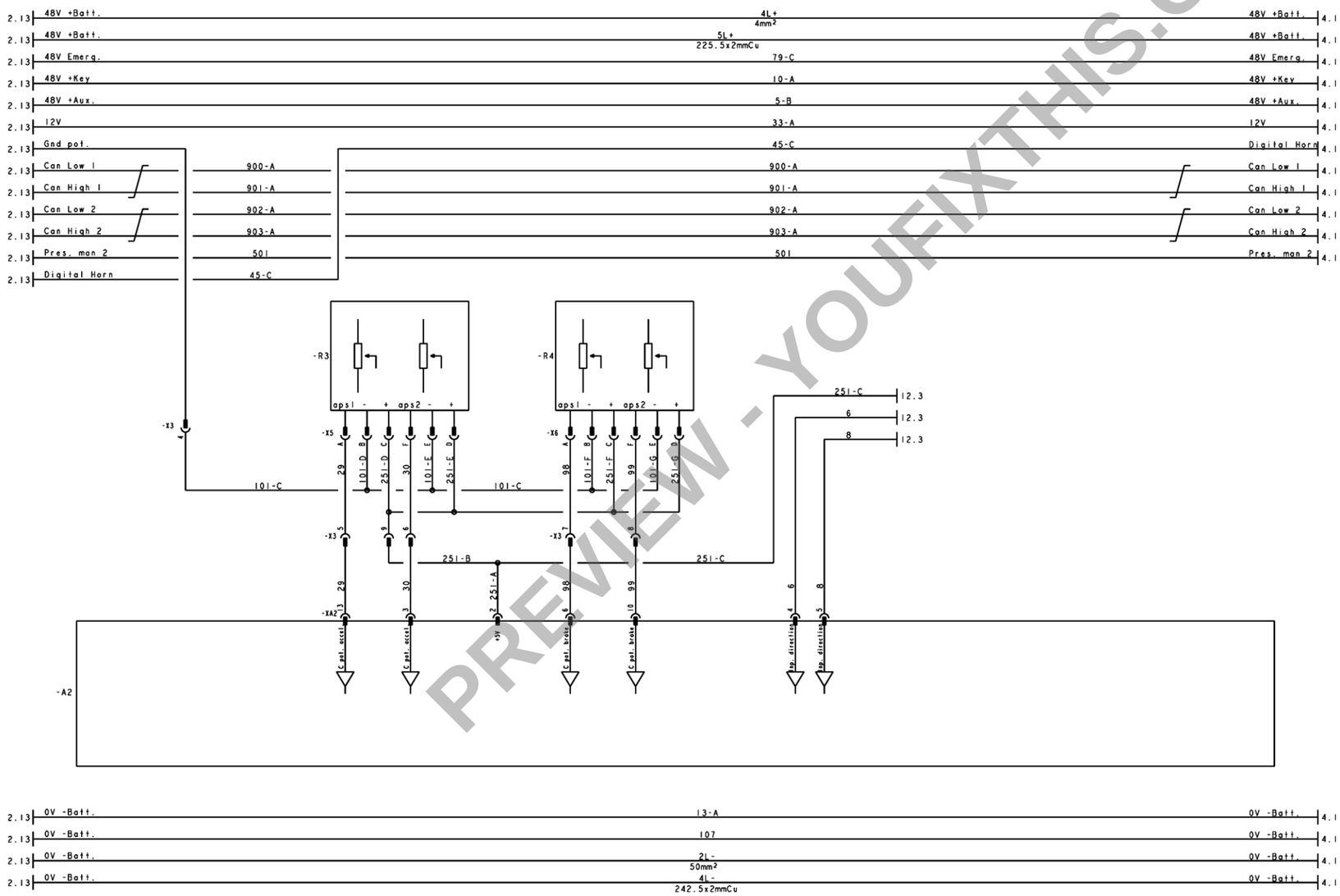

Fig. 6

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operation description		maintenance intervals			
		every 8 hours 1 day	every 1000 hours 1 year	every 3000 hours 2 years	every 5000 hours 3 years
	Adjust retractable carriage side rollers		●		
	Check the screws and bolts		●		
	Check chain tensioner conditions(2)		●		
	Check lifting chain link and pin wear(2)		●		
	Check lift chains stretch		●		
	Check conditions of chain pulleys, tubes and cables		●		
	Clean mast bearings sliding guides		●		
	Check conditions of mast bearings sliding guides		●		
	Check fork condition	■	●		
	Check conditions of bearings of retractable carriage and mast(2)		●		
	Check the fork support device screws		●		
	Check play of side shift outrigger sliding blocks		●		
	Check side shift and tilt cylinder rods and check steering bushes(2)			●	
	Check wear of side shift upper and lower sliding blocks(2)			●	
	Check conditions of fork support device bearings(2)		●		
	Check the screws securing the hooks and the tilt cylinders		●		
	Tilt cylinders integrity check		●		
	Check wear on slide blocks (2)		●		
	Check conditions of fork support device bearings (2)		●		
	Grease reduction unit outer gear (steering crown wheel and pinion)		●		
	Grease battery tray sliding blocks		●		
	Grease retractable carriage cylinder joint bearings		●		
	Grease retractable carriage bearings sliding guides		●		
	Grease mast bearings sliding guides		●		
	Lubricate lifting chains		●		
	Grease side shift		●		
	Check the seat conditions and operation	■	●		
	Check seat belt conditions and operation	■	●		
	Check machine functions with actuating controls and instrumentation	■	●		
	Battery plug/socket integrity check	■	●		
	Check conditions of electrical power connections		●		
	Check conditions of electronic controllers auxiliary connections				●
	Electrical wiring check		●		
	Sensor operation check		●		
	General cleaning of electrical panel		●		

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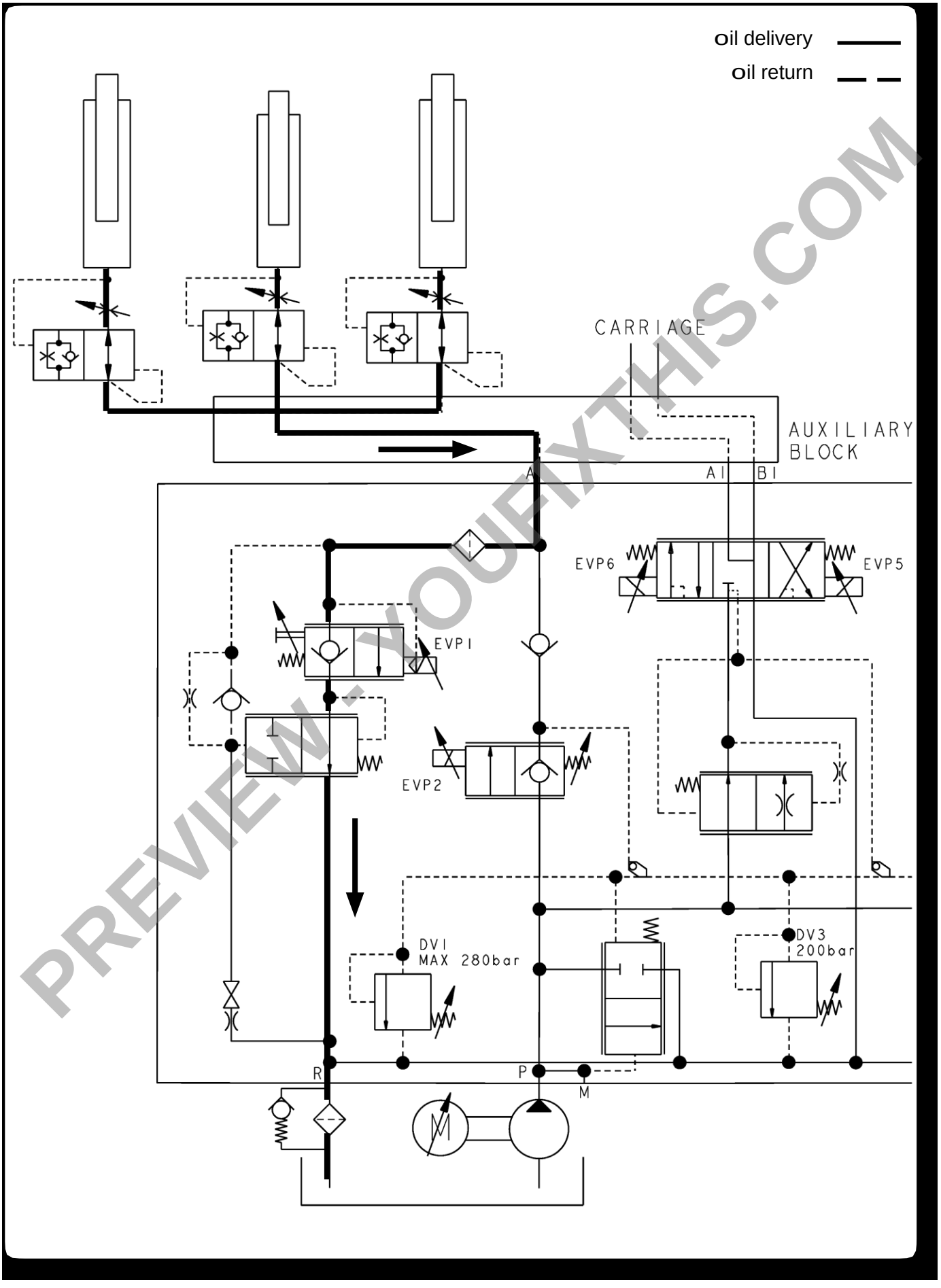
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programmer message	message sicos	description	effect	state of the truck
contactor DriVer	CALL sERVICE	The MC coil driver is damaged (it can't close)♦	MC open (the control has been released), EB activated, traction/	• stand-by • During traction
	Re-start procedure: Make a traction or hydraulic request♦			
Vacc not oK	CALL sERVICE	The value of the accelerator/lifting potentiometer is greater than the minimum recorded value and the direction/activation	The traction/pump mo- tor is stationary♦	• start up • stand-by • During traction
	Re-start procedure: Make a traction or hydraulic request♦			
incorrect start tract	CALL sERVICE	Incorrect starting sequences♦	The traction/pump mo- tor is stationary♦	• start up • stand-by
	Re-start procedure: Make a traction or hydraulic request♦			
ForW + BacK	CALL sERVICE	Drive requests active in both directions at the same time♦	Traction is stationary♦	• start up • stand-by • During traction
	Re-start procedure: Make a traction request♦			
encoDer error	CALL sERVICE	Problem in reading the encoder♦	MC open, EB activated, traction/pump stationary♦	• During traction
	Re-start procedure: Make a traction or hydraulic request♦			
VDc oFF sHorteD	CALL sERVICE	when switching on, the VDC-off logic signal is low♦	MC open, EB activated, traction/pump stationary♦	• start up
	Re-start procedure: Re-start up of the key♦			
Wrong sLaVe Ver ♦	CALL sERVICE	The software versions for the slave and Master are not the same♦	MC open, EB activated, traction/pump stationary♦	• start up
	Re-start procedure: Re-start up of the key♦			
VDc LinK oVerV♦	CALL sERVICE	A condition of overvoltage has been detected♦	MC open, EB activated, traction/pump stationary♦	• stand-by • During traction
	Re-start procedure: Make a valve or traction or hydraulic request♦			

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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.



Fig. 1

equipment and tools

funnel	oil resistant gloves	T handle hex key 5 mm


Fig. 2

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. turn the keyswitch to OFF and disconnect the battery.

Phase 1

T-HANDLE HEX KEY 5 mm

Use the T-handle hex key to unscrew and remove the motor cover screw **(ref.A fig.1).**
Completely open the cover **(fig.2).**

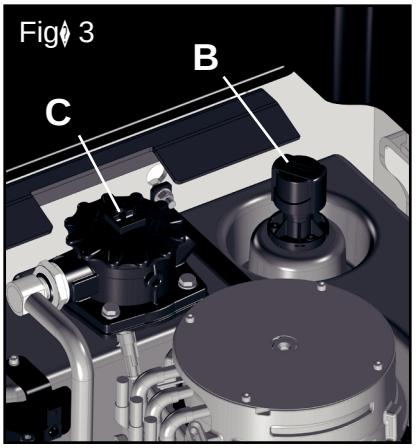


Fig. 3

Phase 3

To facilitate the filling of the tank unscrew the breather valve **(ref.B fig.3)**, so that the air can come out when topping up.

Phase 3

FUNNEL

Unscrew the reservoir cap **(ref.C fig.3)**, place the funnel in the filler hole and top up the oil level.
Be sure not to fill the reservoir too much by checking the level via the marks on the reservoir **(fig.4).**

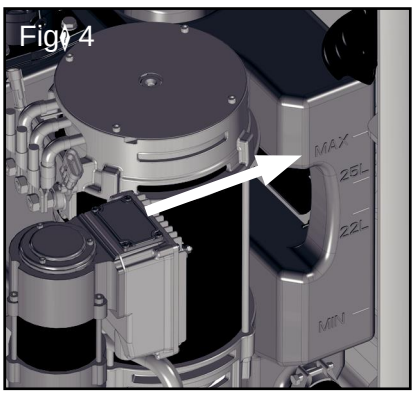


Fig. 4

Screw the breather valve and the reservoir cap back on.

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	operation description	maintenance intervals			
		every 8 hours 1 day	every 1000 hours 1 year	every 3000 hours 2 years	every 5000 hours 3 years
	Check safety labels and decals	■	●		
	Clean safety labels and decals	■	●		
	Check condition and wear of drive wheel(2)	■	●		
	Check drive wheel fixing nuts		●		
	Check condition and wear of load wheels(2)	■	●		
	Check load wheel fixing nuts		●		
	Check conditions of load wheel bearings(2)		●		
	Check condition and wear of steering side rollers(2)		●		
	Check steering side rollers fixing nuts		●		
	Check condition of steering side rollers bearings(2)		●		●
	Battery charge check	■	●		
	Cable connection check		●		
	Liquid leaks check	■	●		
	Electrolyte density check		●		
	Electrolyte level check(5)		●		
	Battery insulation check		●		
	General cleaning		●		

(1) check also when replacing the drive wheel

(2) replace if necessary

(3) replace in the following situations:

- a shift of the connection on the pipe;
- the presence of damage, cuts or abrasions on the superficial layer;
- hardening or stiffness of the pipe, the presence of burns or cracks due to heat exposure;
- the presence of cracks, damages or strong corrosion on the connection;
- the presence of leaks along the pipe or at the coupling joint;
- the presence of permanent creases, compression, flattening or twists in the pipe;
- the presence of blisters, softening, wear of the external coat.

(4) change recommended after 7500 hours or 5 years

(5) fill up whenever the electrolyte levels falls to 5-10 mm (0.19-0.39 in) from the splash guard

(6) every 500 hours

Trucks working in cold stores must be lubricated every 500 hours, or even more frequently in the case of particularly intensive use◊

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GENERAL SAFETY RULES

PERSONAL SAFETY

- Always wear the personal protective equipment in situations requiring it.
- Pay particular attention to the risk of getting crushed due to moving parts, oscillations, material not properly secured when performing lifting operations or moving loads.
- Do not wear any rings, watches, jewellery, loose or hanging items of clothing such as scarves, unbuttoned jackets or tops with open zippers that can get caught up in moving parts.
- Never do any cleaning, lubrication or maintenance work with the battery connected.
- Using compressed air to clean the parts, protect yourself with goggles that have side protection. The maximum air pressure must not exceed 1 bar.

SAFETY AT THE WORKPLACE

- Make sure that all the work tools are perfectly efficient and ready for use. Keep the work surfaces clean and clear of debris that can come into contact with parts of the machine and cause damage.
- Make sure you keep sparks, naked lights and cigarettes away from fuels or flammable materials such as the gas of the batteries and fuels.
- Make sure that the work area is ventilated, well illuminated, dry and clean. Remove any puddles of water or oil stains.
- Make sure that the equipment, devices or lifting machinery used is able to sustain the load in a stable manner.
- Never use gasoline, diesel fuel or other flammable liquids such as detergents: instead use non-flammable and non-toxic trade solvents.
- When working outside the garage, move the machine preferably onto the level and block it. If working on a slope is inevitable, block the machine beforehand and move it onto a level area as soon as possible with a certain margin of safety.
- Disconnect the batteries and label all the controls to signal that work is in progress. Block the machine and every attachment that has to be raised.
- Never perform any servicing on the machine with persons at the controls, unless they are accredited operators and help with the operation to be performed.
- When towing use solely the prescribed coupling points and check that the pins and/or bolts are firmly secured before pulling. Lift and handle all the heavy parts with lifting equipment of adequate capacity. Use the lifting eyebolts intended for this purpose. Make sure no one is near the load to be lifted.
- Avoid twisting chains or metal ropes.
- Do not trust bent or damaged chains or ropes: do not use them for lifting or pulling. Always wear the safety gloves to handle them.
- Do not accumulate rags soaked in grease or oil: they are a great fire hazard. Always put them away into a closed metal container.
- Used oil must be specially collected. It must not be disposed of into normal drainage system pipes. Special companies can be employed to dispose of or recycle industrial oils according to the laws in force in individual countries.
- When welding is necessary, you must use appropriate safety protection: dark goggles, hard hat, overalls, gloves, safety footwear. Dark goggles must be worn also by those who are not doing the work if they remain nearby during the welding.

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