EN

CAT Lift Trucks

Operation & Maintenance Manual

NSR12K
NSR16K
NSR20K

MCFE
Hefbrugweg 77,
1332 AM Almere,
The Netherlands

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5. Driving instructions

Daily checks before operation

Carry out the daily maintenance check before using the truck. Neglecting daily maintenance may decrease the safety and reliability of the truck. Notify the site supervisor immediately if you notice an error or deficiency during the check.

- Check the truck externally to see that there are no oil leaks.
- Check all wheels for damage or wear.
- Check the battery fluid in each battery cell. Top up with battery water if needed. The fluid surface should be about 15 mm above the plates (this does not apply to maintenance-free batteries).
- Check the gearbox for leaks. Also check the hydraulic pipes, hoses and connectors. No leaks or damage should be found.
- Turn on the power and test the operation of the lifting hydraulics by raising and lowering the forks.
- Check the operation of the accelerator and steering by driving slowly forward and backward.
- Also check the operation of the other electrical functions.
- Check that the batteries are charged and locked in place.
- Check the operation of the horn.
- Check that the safety pedal works.
- Check that the emergency stop operates properly.

Before you start:

- Make sure that the daily maintenance has been carried out.
- Turn on the power.
- Grip the steering wheel knob with your left hand and use the valve levers or buttons and the accelerator with your right hand.
- Take a position where only one foot is on the safety pedal and lean against the backrest.

Driving

- Press the safety pedal down to move the truck.
- Turn the accelerator lightly in the driving direction.
- To brake, turn the accelerator in the opposite direction to the driving direction.
- Steer the truck smoothly because abrupt movements may cause a dangerous situation, especially when driving at high speed.

Electronic steering system

The truck is equipped with a fully electronic steering system. The steering wheel movement is transmitted without a mechanical connection to the steering motor that controls the drive wheel.

The system consists of three main components:

1. Tachometer located in the steering wheel
2. Control unit located in the motor compartment
3. Steering motor, which is also in the motor compartment

The control unit processes the signal coming from the tachometer and directs the steering motor to turn the drive wheel in the desired direction. In addition, the control unit constantly monitors the status of the system and reacts immediately if there are any problems.

Notice that when the drive wheel reaches its maximum position (+80°/-100°), the steering wheel can still turn without a mechanical stop.

10. Troubleshooting

Troubleshooting

Symptom	Fault	Action
Truck does not move	Battery connector is loose	Plug in the battery connector.
	Battery is empty	Recharge the battery.
	Emergency stop button is activated	Release the emergency stop button.
	Key switch is faulty	Replace the switch.
	Drive motor fuse has blown	Check the connections and cables and replace the fuse.
	Control circuit fuse has blown	Check the connections and cables and replace the fuse.
	Microswitch for safety pedal is broken	Replace the microswitch.
	Drive motor carbon brushes are worn out	Replace the carbon brushes.
	Accelerator is faulty	**Contact maintenance personnel.**
	Drive motor controller is faulty	**Contact maintenance personnel.**
Lift pump does not run	Pump or control circuit fuse has blown	Check the connections and cables and replace the fuse.
	Pump motor's carbon brushes are worn out	Replace the carbon brushes.
	Pump motor controller is faulty	**Contact maintenance personnel.**
Lifting functions improperly	Overload	Decrease the load.
	Battery is empty	Recharge the battery.
	Not enough oil in tank	Add oil.
	Oil leak	Check the joints and seals.
	Pump is faulty	Replace the pump.
	Dirt or wear and tear in valves	Clean the valves, replace if necessary.
Battery does not charge	Charger is incorrectly connected	Check the connection.
	Charger fuse has blown or main voltage is missing	Check the connections and cables and replace the fuse.
	Battery cell's water level or specific gravity is low	Check the cell's water level and specific gravity. Add water and/or acid when necessary. See *Section Recharging the battery in Chapter 7 Batteries*.
Steering does not work properly	Steering motor fuse has blown	Check the connections and cables and replace the fuse.

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B13	PMC	Positive of the main contactor.
B14	KEY OUT	Output of the Key switch signal.
B15	NOT USED	Free.
B16	PEB	Positive of the electromechanical brake.
B17	PEVP	Positive of the proportional electrovalve.
B18	PEV2	Positive of the electrovalve 2.
B19	PEV1	Positive of the electrovalve 1.
B20	PEV4	Positive of the electrovalve 4.
B21	PEV3	Positive of the electrovalve 3.
B22	PEV5	Positive of the electrovalve 5.

Note:
Proportional valve can be programmed by console as proportional or ON/OFF: if proportional the valve has an acceleration and deceleration ramp and its current is controlled by the lifting potentiometer.
If ON/OFF the valve is completely opened/closed without ramps.
The positive supply to the main contactor is provided from the key (pin 12) trough a diode against polarity inversion. The positive supply for the electrobrake is available in the pin 16 only if the tiller switch is closed.
The positive for the brake and all the other ON/OFF valves comes from the main contactor, so these loads do not affect the key input but only the auxiliary fuse.

3.3.3 Connector "C" description

The "C" connector manages the serial link of the tiller card.

C1	-BATT	Negative free for the customer.
C2	BELLY	Quick inversion microswitch input. This signal is directly connected with the Combi for safety reason.
C3	SNAIL + T	Snail microswitch input. It is necessary that the tiller microswitch is cabled in the serial tiller card; in this case it is possible to run the truck also with the handle released at a slow speed.
C4	TILLER	Tiller microswitch input. In this case the tiller is directly connected with the Combi.
C5	DRFT	Data from the serial tiller
C6	-BATT	Negative for the serial tiller card.
C7	KEY OUT	Positive for the serial tiller card (is a key switch signal).
C8	KEY OUT	Positive for the tiller microswitch (is a key switch signal).

Note:
The tiller microswitch can be cabled in the serial tiller (see ‘serial tiller’ drawing) or directly in the controller (PIN 4 and 8 for the key in the serial tiller).

7) VFIELD NOT OK 3

This test is made in standby with the Main Contactor open. In this condition the voltage on both the connections of field must be around ½ VBatt. This alarm is generated if the field voltage is different from this value. Possible causes:

a) Frame fault on the motor to chassis.

b) Incorrect connection of the field winding to the chopper.

c) Failure of the chopper in the section relative to the field.

8) PUMP VACC NOT OK 4

This alarm is generated if the lifting potentiometer output voltage from the serial tiller is higher than 1V. Possible causes to be checked on the serial tiller:

a) the track of the potentiometer has become open.

b) the potentiometer is not wired correctly.

c) the potentiometer itself is defective.

d) the values set during the acquisition procedure are wrong.

9) I = 0 EVER 49

This check is made while driving. If the current is not higher than a preset minimum value, this alarm is generated and the machine disabled. Possible causes: see "STBY I HIGH" alarm.

10) HIGH FIELD CURRENT 57

Problem detected with the field current sensor. Possible causes:

a) Failure of the field current sensor.

b) Failure of the field power unit.

11) NO FIELD CURRENT 58

Problem detected with the field winding current. Possible causes:

a) Failure of the field current sensor.

b) Field cables not connected or incorrectly connected.

c) Failure of the field power unit.

12) DRIVER SHORTED 74

The test is carried out with Main Contactor open. The logic unit verifies that the coil of the Main Contactor is not shorted. Possible causes:

a) Driver shorted.

b) Problems in the feed back circuit of the Main Contactor coil.

c) Wiring error.

d) Fault in the protection circuit.

Tachometer circuit	.....	Disconnections and short circuits
	.....	are detected.
Electronic controller	.....	Motor output voltage above
	.....	commanded values detected.
Motor circuit	.....	Disconnections and short circuit are
	.....	detected.
Temperature protection	.....	Linear reduction of current limit
	.....	starting at $75^{o}C$.
	.....	
Short circuit protection	.....	- Motor output+ to motor output-
	.....	- Motor outputs to battery -
Power supply contactor	.....	At every start-up: checking that contactor is open
Emergency brake coil	.....	At every start-up: checking there is no voltage on the coil
Direction limit switches	.....	In direction limiting mode there is still possible to get max 20-40% of supply voltage on the motor output

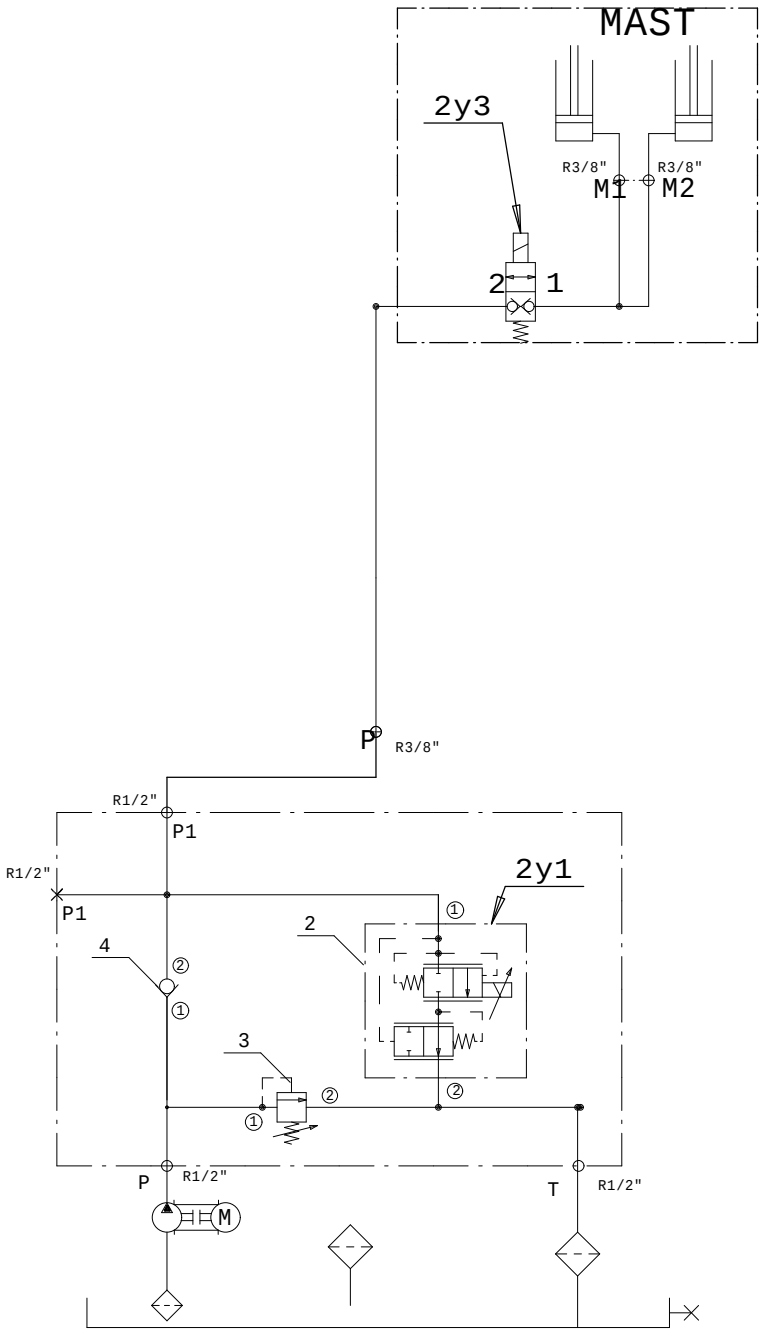
2.11 INDICATIONS

LED-indications

- Controller active
- Negative direction blocking active
- Positive direction blocking active
- Error in tacho sensor circuit
- Error in controller or motor circuit
- Error in controller
- Supply contactor closed or voltage on emergency brake coil

Outputs indications

- Controller active
- Error in sensor circuit
- Error in controller or motor circuit
- Error in controller
- Supply contactor closed or voltage on emergency brake coil



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HYDRAULIC DIAGRAM
TH73 0105
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