MINITRACTOR
"XINGTAI"

*XT-DEER*T220\T224\T244

OPERATING MANUAL FOR AGRICULTURAL TRACTORS

TRACTOR PASSPORT

Tractor information	
Tractor brand	
Tractor model	
Tractor serial number	
Engine model	
Engine serial number	
The organization that sold the tractor	
Name of company	
Address, telephone	
Date of sale	"__ "_____ 20__
FULL NAME. responsible person	_____ signature M.P.
Salesman	
Seller's address	
Tractor owner	
FULL NAME. or name of the tractor owner	
Address, telephone	

1. General information

1.1. Introduction

Dear buyer!

Thank you for choosing and purchasing a tractor of the brand "*XT-DEER*"

Agricultural Tractors "*XT-DEER*» manufactured By modern technologies, ensuring their reliable operation over a long period of time, subject to compliance with safety precautions, operating and maintenance rules.

ATTENTION!
Before operating the tractor, carefully read this manual and strictly follow its requirements.

This manual contains all the information about the product necessary for its proper use, assembly, maintenance and adjustment: description of design features, brief technical data, recommendations for operation and maintenance, as well as necessary safety measures when working with the product.

ATTENTION!
Unauthorized modification of the design, re-equipment and modernization of the tractor is prohibited.

The manufacturer is not responsible for damage and possible damage caused as a result of unauthorized re-equipment and modernization of the tractor, improper handling of the product or its use for other purposes.

TM "*XT-DEER*» is constantly working to improve its products and, in this regard, reserves the right to make changes that do not affect the basic technical and operational characteristics, principles of operation and maintenance of the tractor, both in the appearance, design, configuration and equipment of the tractor, and into the contents of this manual without prior notice to consumers. All possible changes will be aimed only at improving and modernizing the tractor.

Keep this manual carefully and refer to it if you have any questions regarding operation, maintenance, repair, storage or transportation of the tractor. If the Owner of the tractor changes, this manual must be transferred to the new Owner.

1.2. Accepted abbreviations

battery - accumulator battery;
DB - differential lock;
TDC — top dead center of the diesel piston;
PTO - PTO;
State Tax Service — hydraulic suspension system;
timing belt - gas distribution mechanism;
Spare parts — spare parts, tools and accessories;
ZVM - rear driving axle;
IR - combined indicator;
KP - Transmission;
MTA — machine-tractor unit;
THAT - Maintenance;
TSU — towing device.

1.3. Purpose

Agricultural, universal row-crop tractors with a classic layout**T220 / T224 / T244** are designed to perform a wide range of agricultural work, including operations for preparing and cultivating soil, sowing and planting crops, cultivating crops, harvesting, and transporting goods. For this purpose, tractors can be combined with agricultural mounted, semi-mounted and trailed machines.

ATTENTION!
Prohibited usage tractors Not By purpose And execution Not agricultural work!

1.4. Placement of unit serial numbers

When registering a tractor, individual chassis and engine serial numbers are used. These numbers are indicated in the accompanying documentation for the tractor, as well as on plates. The chassis number plate is located on the left rear or dashboard, the engine number plate is located on the left side of the engine or on the valve cover.

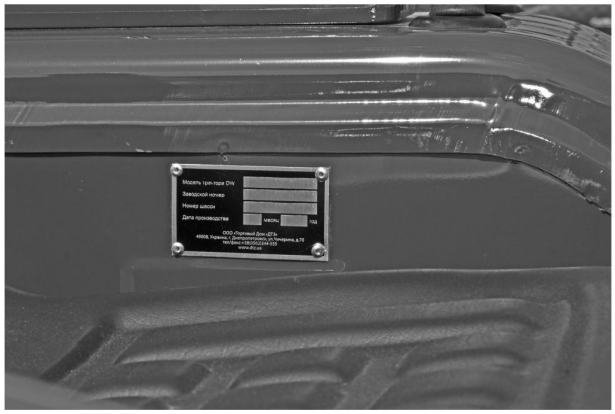

Figure 1.1. Chassis number placement

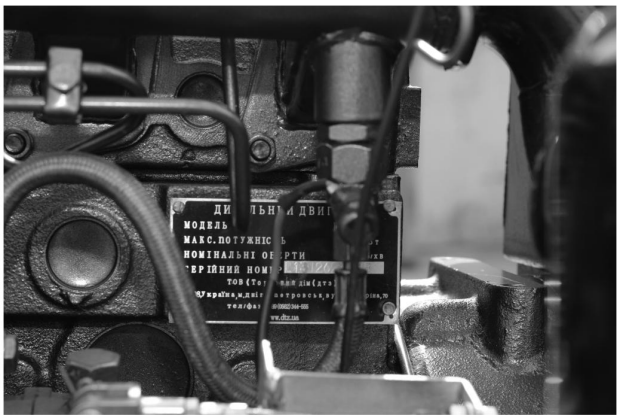

Figure 1.2. Engine number placement

1.5. Specifications

Options	**T220**	**T224**	**T244**
power, kWt	16.18	16.18	17.6
Engine model	LL380BT	LL380BT	KM385BT
Engine displacement	1356	1356	1532
Number of cylinders	3	3	3
Cooling system	liquid, forced		
Starting the engine	electric starter		
Wheel formula	4x2	4x4	4x4
checkpoint	(3+1)*2	(3+1)*2	(4+1)*2
Lock differential	+	+	+
power steering	-	- \+	+
PTO	rear 540 rpm, 6 splines, Ø35		
Rear linkage system	universal 3-point with hydraulic lift		
Transmission type	mechanical gear		
Front wheel size	5.00x14	6.00x14	6.00x16
Rear wheel size	7.5x20	9.5x20	9.5x24

1.6. Contents of delivery.

The tractors are supplied with:

1. Tractor assembled.
2. Spare parts kit.
3. Operation and Maintenance Manual.

1.7. Acceptance.

All tractors of the brand "*XT-DEER*» undergo strict control and testing during the assembly process, as well as pre-sale preparation, and are supplied to retail sales fully filled with working fluids and fuels and lubricants (except for fuel). Acceptance of the tractor by the Owner or his authorized representative is carried out directly at the point of purchase, in the presence and with the participation of the Seller or his representative, and includes:

1. visual inspection of the tractor;
2. checking for completeness;
3. checking the operation of electrical equipment: side lights, headlights (low and high beam), rear lights, brake lights, direction indicators, sound signal, instrument panel;
4. engine start;
5. checking the operation of tractor systems and assemblies while parked and in motion;
6. checking the completeness and correctness of filling out the accompanying documentation.

After the acceptance procedure, mutual settlements and completion of the accompanying documentation, claims for incompleteness and malfunctions that could be identified during the acceptance process will not be accepted.

The tractor is run in by the Owner independently in accordance with the requirements and recommendations given in this manual.

2. Safety rules and precautions

Before operating the tractor, carefully read this manual and strictly follow its requirements.

Strict adherence to safety rules, precautions, accurate and timely implementation of the requirements and recommendations of this operation and maintenance manual are the main conditions for the safe, efficient and long-term operation of tractors of the "*XT-DEER*"

2.1. General provisions and safety rules

Only those tractors that are duly registered with the state vehicle registration authorities are allowed for operation.

It is only permitted to operate technically serviceable tractor. Independent Re-equipping the tractor or changing standard settings may adversely affect the safety of its operation. It is not allowed to dismantle from the tractor the protective covers or guards provided by the design, as well as other parts and assembly units that affect the safety of its operation.

A tractor can be driven by persons who have a standard driver's license, have passed a medical examination, and are familiar with the structure of the tractor, the rules of its operation and safety requirements.

ATTENTION!
IT IS STRICTLY PROHIBITED to operate or perform maintenance on the tractor or devices attached to it while under the influence of alcohol or drugs, or under the inhibitory effect of medications!

The tractor driver is obliged to comply with the operating rules established by the manufacturer; comply with all requirements of the Traffic Rules, fire safety rules, safety and personal hygiene rules when carrying out maintenance operations; be able to provide first aid to victims of injuries and accidents.

It is prohibited to start the engine and operate the tractor in a closed room without providing the necessary ventilation. Exhaust gases are poisonous and can cause poisoning or death!

If safety requirements are violated, the driver is liable in accordance with the current legislation of Ukraine.

To maintain performance and ensure driver safety in field conditions, it is necessary to have on the tractor a sufficient supply of drinking water, a first aid kit equipped with bandages, iodine tincture, ammonia, hydrogen peroxide, boric petroleum jelly, soda, validol, analgin. If continuous work on a tractor lasts more than 2.5 hours during a work shift, it is advisable to use personal protective equipment against noise (earplugs, antiphons, etc.).

2.2. Safety requirements before driving

You can start driving only after a visual inspection of the tractor and checking the serviceability of the main components and control systems. Particular attention must be paid to the serviceability and adjustment of the brakes and steering.

The tractor must be refueled in advance, observing the safety rules established at the refueling points. To pump fuel, use only special devices.

Trailed agricultural machines and transport trailers must have rigid couplings that prevent them from swinging and colliding with the tractor during transportation.

When transporting cargo on a trailer, it is necessary to distribute it as evenly as possible on the loading platform and securely secure it. The center of gravity of the load should be as close to the center of the platform as possible. Incorrect load distribution affects trailer stability and tractor controllability.

The transported cargo should not protrude beyond the dimensions of the trailer more than allowed by the Road Traffic Regulations, and the weight of the cargo should not exceed the permissible load capacity.

ATTENTION!
It is prohibited to transport passengers on a tractor or on agricultural machinery mounted with it.

Before starting the engine, the parking brake must be applied, the gearshift lever must be set to the “neutral” position, and the PTO engagement lever must be set to the “off” position. The driver must make sure that at the time of starting there are no people under the tractor, in front and behind it, between the tractor and the equipment attached to it, as well as under the trailer.

It is prohibited to start the engine and operate the tractor without batteries. Starting the engine from a tug is permissible only in an extreme emergency, in order to avoid intense wear of transmission parts.

Before starting to move, you need to make sure that there are no foreign objects under the wheels and on the open rotating parts of the tractor and attachments, that there are no obstacles to movement, in accordance with the safety requirements of road conditions, the size of passages and turns, slopes and differences in the road surface or field, if necessary, apply sound signal to warn others and those working on trailed machines.

2.3. Safety requirements while driving

When driving the tractor, the driver must comply with the Traffic Rules; be attentive and not distracted from your duties; ensure environmental safety; control the operation of units and systems of the tractor and equipment aggregated with it; if necessary, use personal protective equipment: dust goggles, respirator, gloves, etc. If the tractor is equipped with a seat belt, use it when operating.

When driving on public roads or in a convoy of vehicles, you must maintain a safe distance from the vehicle moving ahead. When driving in places where people or animals are crowded, as well as in areas where they may suddenly appear, you must reduce your speed and, if necessary, sound a sound signal.

To avoid rollover, always operate at a safe speed appropriate to the road conditions, especially when driving over rough terrain, on slopes, over ditches, over obstacles, and when making sharp turns. The driving speed on turns is allowed no more than 5 km/h, on slippery roads - 3 km/h. Descend from the mountain in 1st or 2nd gear. The speed on access roads and driveways should be no more than 10 km/h. It is recommended to avoid sudden braking, especially on wet roads and ice.

If signs of a malfunction of the engine or chassis system or mounted equipment appear, the movement must be stopped and measures must be taken to eliminate the malfunction. It is recommended to always carry a set of spare parts and a compact fire extinguisher in the tool box.

You must not leave a tractor with the engine running without supervision, even for a short time, and even more so during stops. Before leaving the tractor, you need to make sure that it does not interfere with the movement of other vehicles in the same or oncoming directions. Before exiting the tractor, you must turn off the PTO, stop the engine, engage the parking brake, and remove the key from the ignition. It is prohibited to turn off the electrical system with the ignition key until the engine is stopped.

2.4. Safety requirements when working with attachments

It is permissible to aggregate and operate the tractor only with serviceable agricultural mounted and trailed equipment of the appropriate size, weight and power.

When using machines and units that require the participation of other assistant operators, the driver must coordinate all his actions with the assistants and begin driving only after receiving a signal from them that they are ready to work. When coupling to a tractor and attaching agricultural machinery and implements to it, the trailer must be at a safe distance until it comes to a complete stop. Hitching should begin only after the driver’s signal.

Trailed agricultural machines and trailers must have serviceable rigid couplings that prevent them from swinging and running over the tractor or unintentional disengagement during work or transportation, as well as a safety cable or chain. When moving with implements raised to the transport position, it is necessary to use the rear linkage locking mechanism.

It is necessary to constantly keep in mind that when a tractor is coupled with mounted and trailed equipment, its dimensions, dynamic characteristics and controllability change dramatically. Use caution and extra care when working with large or heavy attachments.

Before raising and lowering attachments, as well as when turning the tractor, you must make sure that there is no danger of hitting anyone or catching on any obstacle. Lower the implement into the working position only after the implement has been turned and raise it before turning.

Impaired weight balance of the tractor can lead to deterioration or complete loss of controllability. If the front part of the tractor lifts off the ground when attaching heavy machines and implements to the hitch mechanism, it is necessary to install additional front weights. In this case, it is necessary to ensure that the total mass of implements and cargo does not exceed the permissible value.

It is prohibited to operate a trailer without autonomous brakes if the weight of the loaded trailer exceeds half of the total actual weight of the tractor. Transporting people in trailers is prohibited.

When working with equipment driven by the PTO, before getting out of the tractor after stopping the engine and disconnecting the equipment, you must make sure that the PTO shaft has completely stopped. Do not clean, adjust or service PTO-driven equipment while the engine is running. When the PTO is not used, the PTO end cap must be installed in place.

When working with stationary units driven by the PTO, it is necessary to engage the parking brake and block the rear wheels in front and behind with stops, make sure that the tractor and the connected unit are securely fixed.

2.5. Safety requirements for maintenance

When carrying out all types of maintenance of the tractor and the equipment attached to it, including control inspection, refueling with fuel and oil, lubrication, etc., it is necessary to comply with the general and fire safety requirements adopted for working with flammable substances and materials.

It is prohibited to add gasoline, ether or other flammable substances to diesel fuel (for example, to dilute it or to facilitate engine starting at low temperatures), as this can lead to the formation of an explosive mixture, damage or failure of the engine.

It is recommended not to fill the fuel tank completely, but to leave a small amount for the fuel to expand as it heats up. To avoid fuel splashing out when refueling the tractor using a mechanized method (pump, refueling nozzle, etc.), it is necessary to remove the strainer from the neck of the fuel tank. The strainer is intended only for use when refueling the tractor manually in the field.

All maintenance operations related to cleaning the chassis, engine and transmission can only be performed with the engine stopped and the tractor securely braked. Mounted machines and implements must be lowered.

Tools and devices for carrying out maintenance must be in good working order, suitable for their intended purpose and ensure safe performance of work.

The engine cooling system operates under pressure, which is regulated by a valve installed in the filler cap. It is dangerous to remove the cover on a hot engine. To avoid burns to the face and hands, the radiator filler cap on a hot engine must be opened carefully, after covering the cap with a thick cloth and wearing a mitten.

The engine and other components may become very hot during operation. To avoid burns, be careful when draining coolant or water from the cooling system or hot oil from the engine, hydraulic system, and transmission.

When servicing the battery, special care must be taken, since the electrolyte corrodes clothing and, if it gets on the skin, causes acid burns. When charging, the battery releases hydrogen, which is an explosive gas. To avoid a hydrogen explosion, do not allow open flame sources near the battery.

To avoid damage to the electronic equipment of the tractor, it is prohibited to disconnect and connect electrical wires, including battery terminals, until the engine is turned off and completely stopped and the electrical equipment is turned off with the ignition key. When servicing the electrical system, care must be taken not to cause a short circuit due to incorrect or accidental connection of wires: in addition to damaging electrical equipment, a spark can cause fuel or oil to ignite. Connect the battery to the electrical system only after making sure that its voltage and terminal polarity are correct.

2.6. Fire safety requirements.

It is prohibited to refuel the tractor while the engine is running. During the refueling process, it is prohibited to use open fire, smoke, welding, forging and other fire-hazardous types of work in the immediate vicinity (closer than 5 meters) from the tractor and fuel containers.

The tractor must be equipped with fire-fighting equipment - a shovel and a fire extinguisher. It is prohibited to operate the tractor without fire extinguishing equipment. Parking areas for tractors and storage of fuel and lubricants must be provided with fire extinguishing means. When washing parts and assembly units with kerosene or gasoline, it is necessary to take measures to prevent ignition of the vapors of the washing liquid.

To avoid fire, do not contaminate the exhaust manifold and muffler with dust, fuel, straw, etc., or wrap straw on the rotating parts of machines connected to the tractor. It is not allowed to operate the tractor in fire hazardous areas with the hood and other protective devices removed from the heated parts of the engine. While the engine is running, there should be no flammable materials near the manifold and muffler. When harvesting hay or straw, or working in places with a high fire hazard, it is necessary to use spark arresters in the exhaust system, complete with a muffler or separately from it.

When a flame appears, it is necessary to fill it with sand and cover it with a tarpaulin, burlap or other dense, preferably wet, cloth. To extinguish burning fuel, use a carbon dioxide or powder fire extinguisher; do not pour water on the burning fuel.

3. Tractor design

3.1. Appearance and general structure

Wheeled tractors T220 / T224 / T244 belong to the traction class of 0.6 kN. They have a classic layout: front engine, front steering wheels, rear wheels, disconnectable front drive axle on tractors with all-wheel drive. The tractors are equipped with a universal three-point hydraulic lifting system and have a hydraulic connector for connecting the hydraulic equipment of mounted agricultural units.

3.2. Driver's workplace

Driver's workplace for tractors of the brand "*XT-DEER*» designed in accordance with modern safety, ergonomics and occupational health requirements. The location and configuration of the controls provides easy access to them and eliminates accidental switching of modes, even with strong vibration and shaking during operation. The driver's workplace is reliably protected from dirt and foreign objects: in front and behind - by guards, on the left and right - by casings of the rear and front wheels, from below - by a solid floor and a protective casing.

Location And appointment organs management tractors shown in Figures 3.3.

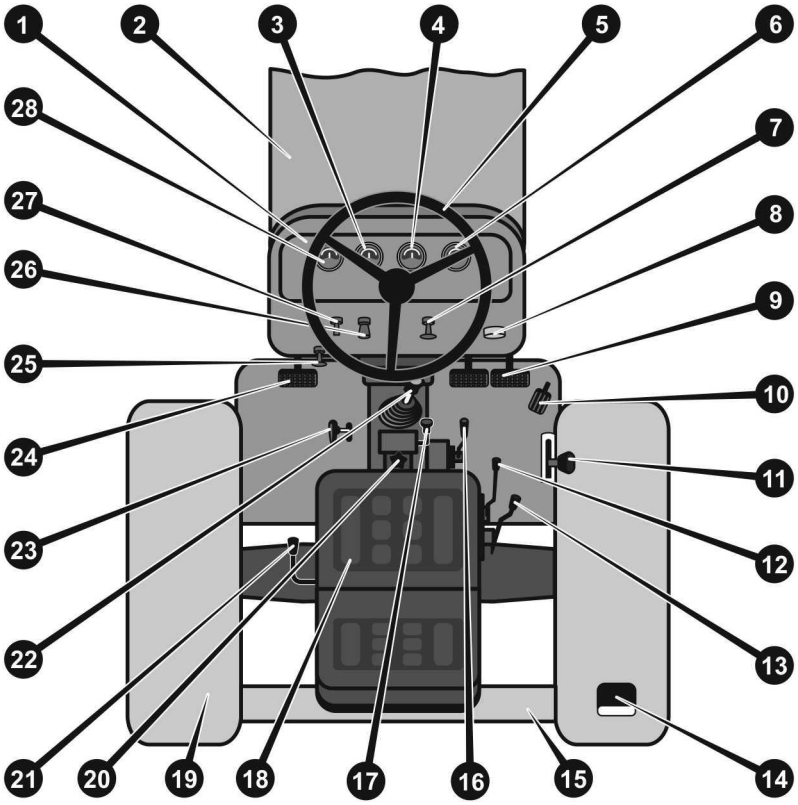

Figure 3.3. Control layout

1. Instrument panel.
2. Engine hood.
3. Oil pressure indicator in the engine lubrication system.
4. Coolant temperature gauge.
5. Steering wheel.
6. Ammeter.
7. Handle for switching side lights, headlights and taillights.
8. Ignition switch.
9. Double brake pedals for the rear wheels.
10. Fuel control pedal (“gas pedal”).
11. Fuel supply control lever (“manual gas”).
12. Control lever for the differential lock of the rear wheel drive.
13. GNS hydraulic drive control lever.
14. Rear additional headlight.
15. Rear guardrail of the driver's workplace.
16. PTO control lever.
17. Control lever for 2-band transmission.
18. Driver's seat.
19. Rear left wheel fender.
20. Valve for switching hydraulic system operating modes.
21. Lever for switching PTO speed.
22. Gearbox control lever.
23. FDA disengagement lever.
24. Clutch pedal.
25. Handle for engine shutdown mechanism.
26. Sound button.
27. Direction indicator switch.
28. Air pressure indicator in the pneumatic system.

3.3. Engine

The tractors are equipped with reliable 4-stroke diesel engines without turbocharging, with direct fuel injection, in-line vertical cylinder arrangement, and a liquid cooling system (hereinafter referred to as the engine). The tractors are equipped with 3-cylinder engines, the technical characteristics of the engines are indicated in the section technical characteristics of the tractor

Since the engine crankcase is the main load-bearing element, the tractors of these models do not have a semi-frame. The rear part of the engine crankcase is rigidly attached to the gearbox housing. Front FDA mounting beams are attached to the engine crankcase, on which the engine cooling system radiator, battery and additional counterweights are also placed.

The main structural elements of the engine and its systems are shown in Figure 3.4. and 3.5.

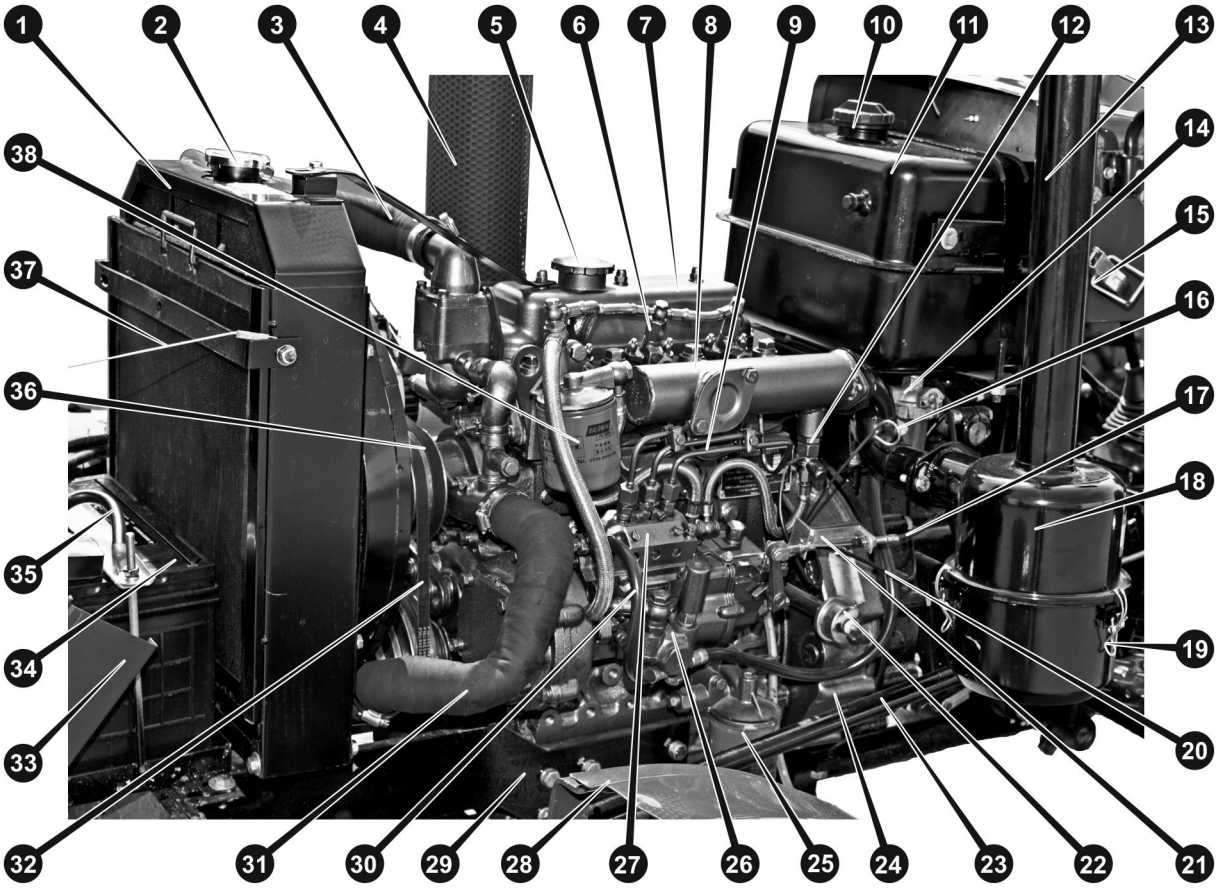

Figure 3.4. Engine LL380BT and*KM385BM*, left view

1. Cooling system radiator.
2. Filler neck of the radiator of the cooling system.
3. Upper radiator pipe of the cooling system.
4. Muffler with protective mesh.
5. Neck plug for filling oil into the engine crankcase.
6. Nozzle.
7. Valve cover.
8. Air intake manifold.
9. High pressure fuel line.
10. Filler plug for filling fuel into the fuel tank.
11. Fuel tank.
12. Air heater.
13. Air filter intake pipe.
14. Coarse fuel filter.
15. Lock for fixing the hood in the closed position.
16. Dipstick for monitoring the oil level in the engine crankcase.
17. Fuel control system cable.
18. Air filter.
19. Air filter latch.
20. Engine stop cable.
21. Fuel supply adjustment mechanism.
22. Oil pressure sensor.
23. Left steering rod.
24. Flywheel housing.
25. Lubrication system oil filter.
26. Fuel pump.
27. High pressure fuel pump (HFP).
28. Front left wheel fender.
29. FDA mounting beam.
30. Low pressure fuel line.
31. Lower radiator pipe of the cooling system.
32. Water pump belt.
33. Engine hood.
34. Rechargeable battery (AB).
35. Terminal for securing the battery "-" terminal.
36. Water pump pulley.
37. Hood lock in the raised position.
38. Fine fuel filter.

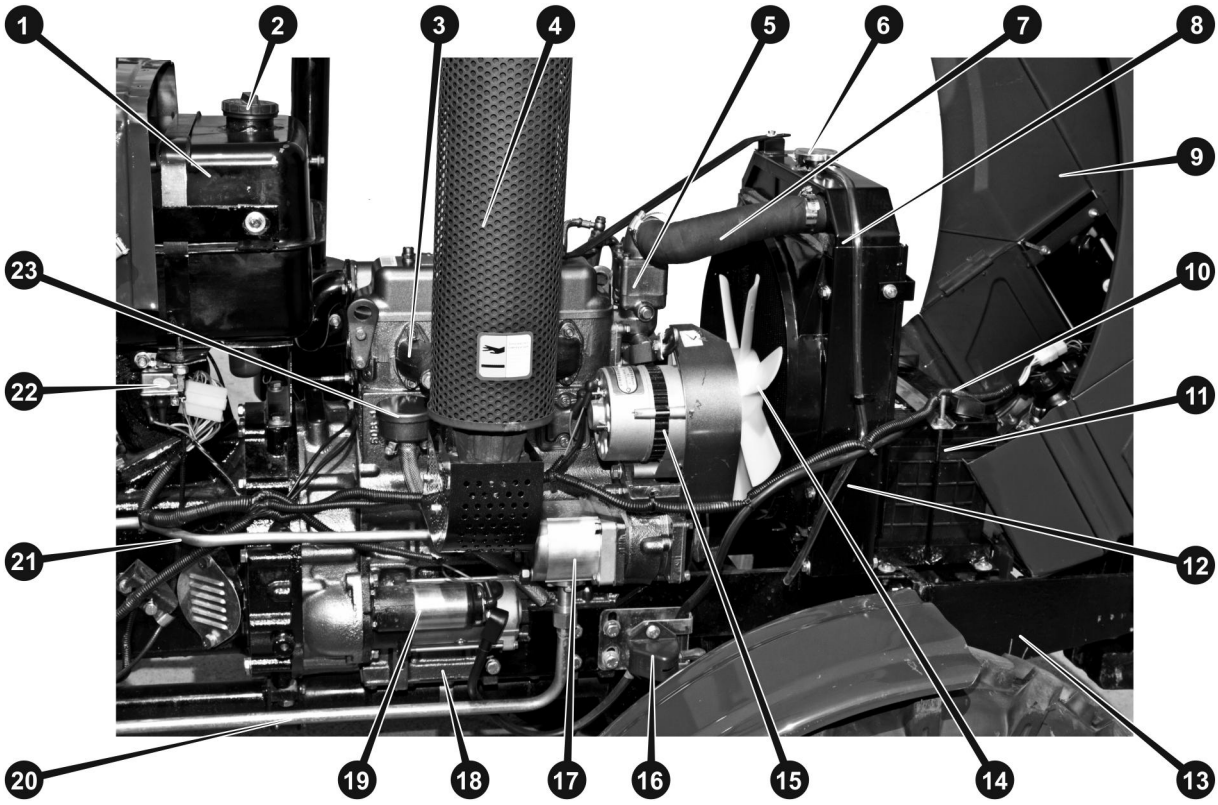

Figure 3.5. Engine LL380BT and*KM385BM*, right view

1. Fuel tank.
2. Filler plug for filling fuel into the fuel tank.
3. Exhaust manifold.
4. Muffler with protective mesh.
5. Engine water cooling pump.
6. Filler neck of the radiator of the cooling system.
7. Upper radiator pipe of the cooling system.
8. Pipeline for releasing excess coolant pressure through the radiator valve.
9. Engine hood.
10. Electrical equipment cable.
11. Rechargeable battery (AB).
12. Cooling system radiator.
13. FDA mounting beam.
14. Cooling fan.
15. Electric generator.
16. Ground switch.
17. Gear pump of the GNS system.
18. Engine crankcase.
19. Electric starter.
20. High pressure oil line.
21. Return pipeline of the GNS system.
22. Relay.
23. Engine breather.

3.4. Engine power system

The engine power supply system includes an air cleaner, fuel tank, fuel filters, low and high pressure fuel lines, injection pump, fuel control system, injectors, and engine stop system.

Tractors are equipped with an air cleaner with oil inertial contact air cleaning. The air cleaner is installed on the left side of the engine in the direction of travel of the tractor (see Fig. 3.1., 3.2. and 3.4.). To facilitate starting the engine in the cold season, a spiral electric spark plug is installed on the engine air manifold pipe (see Fig. 3.4.), controlled from the central switch (“ignition switch”) (see Fig. 3.9.).

To purify the fuel, several stages of filtration are provided. A mesh filter is installed in the filler neck of the fuel tank, protecting the system from debris when refueling from an open container in the field. When refueling with a refueling nozzle or a special pump through a hose, the strainer must be removed to avoid fuel splashing from the pressure jet (see paragraph 4.1.2.).

Fuel from the fuel tank flows through low-pressure pipelines into the settling filter, then into the fuel boost pump, into the fine filter, into the injection pump and then through high-pressure pipelines to the injectors.

The injection pump is driven from the engine crankshaft through a gear located in the engine crankcase. Direct fuel injection nozzles are installed on the cylinder head (see Fig. 3.4.). Fuel from the injection pump is supplied to them through high-pressure pipelines. The amount of fuel supplied to the cylinders is controlled either by pressing the foot pedal ("gas pedal") located on the right side of the driver's seat floor, or by setting the fuel supply adjustment lever ("hand gas"), located to the right of the driver's seat, to the desired position (see Fig. 3.3 and 3.4).

The design features, frequency and procedure for servicing the devices that make up the engine power system are specified in paragraph 5 of this manual.

3.5. Engine cooling system

The T220 / T224 / T244 tractors use a closed liquid cooling system with forced circulation of liquid, with temperature control by a thermostat. As a coolant, either ready-made mixtures OZh-40, OZh-65 and the like are used, or (in the warm season) clean water. The volume of the cooling system is indicated in section 1.5. this manual. Coolant cooling occurs in a tubular radiator located in the front part of the engine compartment (see Fig. 3.4., 3.5.). The air flow through the radiator is created by a fan mounted on the shaft of the water pump. The coolant temperature is regulated by a thermostat and under normal operating conditions should be in the range of 75...85 °C. The driver controls the temperature using a dial indicator on the instrument panel (see Fig. 3.8.). Maintenance of the cooling system is given in paragraph 5.5. this manual.

3.6. Engine lubrication system

The engine uses a combined lubrication system generally accepted for medium-power diesel engines: forced lubrication under pressure created by the oil pump, combined with splash lubrication and oil mist formed in the engine crankcase during crankshaft rotation. The types of oils used are indicated in clause 1.5. and clause 5.5. of this manual and must correspond in temperature range to the current time of year. The volume of the lubrication system is indicated in section 1.5. this manual.

The lubrication system has a replaceable oil filter (see Fig. 3.4.), which cleans the oil from wear products of moving engine parts and dust that has entered the crankcase from outside. A control valve is installed on the filter, which allows you to change the operating oil pressure in the lubrication system.

The frequency and sequence of operations for changing the oil in the engine crankcase and the oil filter are indicated in paragraph 5 of this manual.

3.7. Transmission

Torque from the engine crankshaft is transmitted through the clutch to the gearbox and to the 2-range mode switching box (high/low), then, using the transfer case, FDA disconnect mechanism, shafts and gears, it is distributed between the front and rear drive axles. Part of the engine power is transferred to the PTO through a separate kinematic chain, as well as to a hydraulic power drive, which provides control of the hydraulic attachment system and hydraulic equipment of devices mounted on the tractor.

The clutch is controlled using the clutch pedal (see Fig. 3.3.). Any switching of power transmission units must be performed only with the clutch fully depressed.

The design provides for the presence of one common crankcase volume for all units included in the power transmission. Season-appropriate or all-season oil is poured into the power transmission crankcase. Filling oil into the transmission crankcase and monitoring its level is done through the neck located next to the gearbox shift lever (see Fig. 4.1.).

3.8. Chassis. Tires

The chassis of the tractors includes a switchable front drive axle (FDA) with steered wheels (for 4*4 tractors), as well as a driven rear axle (DRA) with separate brakes on each wheel. The FDA is mounted on beams fixed in the front part of the engine crankcase.

The VVM is structurally integral with the rest of the transmission units. Damping of uneven road surfaces or soil and dampening of vibrations when the tractor moves is due to low-pressure pneumatic tube tires.

The design does not provide brakes on the front wheels. The rear wheel brakes are drum type. The brake drums are placed in separate housings and connected to the axle shafts of the rear wheels through special gears. The brakes are driven mechanically by pedals, separate for the left and right wheels. (see Fig. 5.2.).

Tractors do not have a parking brake as an independent mechanism; instead, the brake pedals of the rear wheels are locked in a clamped position using a special locking lever.

Tractors use tubed pneumatic tires with a special off-road herringbone tread.

3.9. PTO drive

The tractors are equipped with a semi-independent PTO, with an outer diameter of 35 mm (see Fig. 3.6.), with a standard splined connection. The torque to the PTO is transferred from the gearbox input shaft. The direction of PTO rotation is clockwise (when viewed from the end of the shaft). PTO rotation speed - 540 rpm) at rated engine speed. The PTO is engaged using a separate lever from the driver's seat (see Fig. 3.3. and 3.4.). If the PTO is not in use, it must be covered with a special protective cap.

3.10. Hydraulic system

The hydraulic system of tractors is designed to ensure the functioning of the hydraulic pump and actuating hydraulic units of trailed and mounted agricultural equipment. The hydraulic system includes a separate hydraulic pump (see Fig. 3.4. and 3.5.), an oil filter, a hydraulic lifting mechanism of the mounted system, a hydraulic distributor, pipelines, and quick-release couplings.

The volume of oil required for the operation of the hydraulic system is located in the cavity of the hydraulic lifting mechanism housing.

The hydraulic lifting mechanism of the mounted system is controlled using a lever located to the right of the driver’s seat (see Fig. 3.3.). The same lever controls the hydraulic equipment of machines connected to the tractor, connected through a quick-release coupling. Switching the oil flow from the HLS to the quick-release couplings and back is carried out by a valve located under the driver's seat on the front side of the HLS hydraulic lift housing (see Fig. 3.3. and 3.4.).

3.11. Hitch mechanism

The tractors are equipped with a universal three-point linkage mechanism for aggregating the tractor with a wide range of mounted and semi-mounted agricultural equipment, which, due to its weight, size and power characteristics, can be used with tractors of the 0.6 kN traction class. The rules and methods for aggregating mounted, semi-mounted and trailed devices are set out in clause 4.9. this manual.

3.12. Electrical equipment

Tractors use DC electrical equipment with a supply voltage of 12 V. The sources of electricity are the battery (see Fig. 3.4. and 3.7) when the engine is not running and the generator (see Fig. 3.5.) when the engine is running. Consumers of electricity are the electric starter, lighting and signaling devices (headlights, taillights, front and rear direction indicators), sound signal, sensors for monitoring the condition of tractor components, and the instrument panel. Electrical equipment also includes a set of switching and control devices, electrical wiring, and fuses.

ATTENTION!
It is not recommended to install additional electrical equipment on the tractor with a total power of more than 100 W in order to avoid overload and failure of the power supply system.

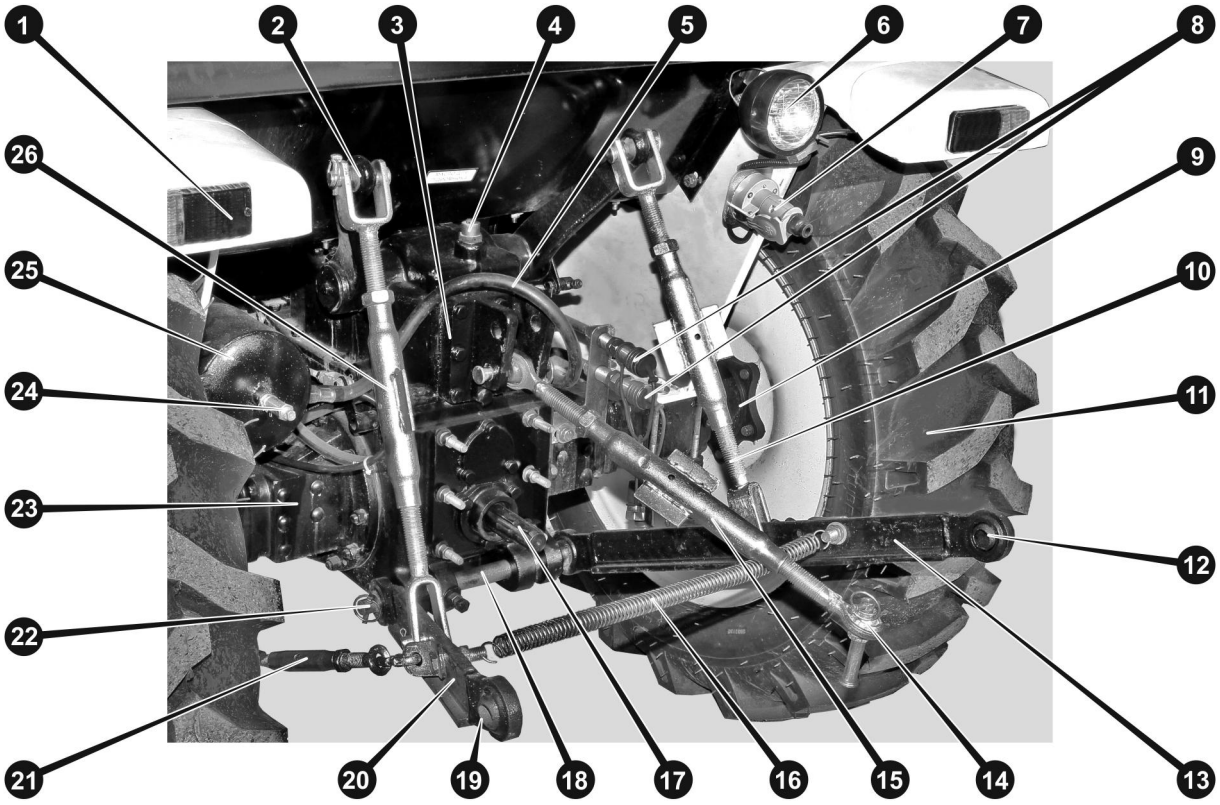

Figure 3.6. Three-point hydraulic linkage and power take-off shaft

1. Turn signal and stop.
2. The hinge of the lever of the hydraulic lifting mechanism of the mounted system (HNS).
3. Housing of the hydraulic lifting mechanism.
4. Dipstick plug for filling oil into the hydraulic lifting mechanism.
5. Pneumatic system hose.
6. Additional rear light.
7. Trailer electrical connection socket.
8. Quick release hydraulic couplings.
9. Rear wheel hub.
10. Right adjustment brace.
11. Rear right wheel.
12. Spherical joint of the right lower link.
13. Lower right row.
14. Spherical joint of the upper link with a pin and a lock.
15. Upper pull.
16. Compression spring.
17. Power take-off shaft.
18. Lower link mounting axis.
19. Spherical joint of the left lower link.
20. Lower left row.
21. Stretching the left lower row.
22. Lower link fastening axis clamp.
23. Sleeve ZVM left.
24. Receiver pressure reducing valve.
25. Receiver cylinder of the pneumatic system.
26. Left adjustment brace.

Figure 3.7. Front lighting and alarm devices

1. Sound signal.
2. Hood lock.
3. Front left headlight.
4. Left turn indicator.
5. Cooling system radiator.
6. Front right headlight.
7. Right direction indicator.
8. Hood.

3.13. Controls

The movement of the tractor and the operation of its individual systems and units are controlled using controls, a set of mechanical, hydraulic and electrical switches. The location and purpose of controls is shown in Fig. 3.3. Operational control over the operation of the tractor is carried out by the driver using pointers and indicators located on the tractor dashboard (see Fig. 3.8.).

3.13.1. Instrument panel

On the instrument panel, located behind the steering wheel, there is an instrument panel, a button for turning on the sound signal and a switch for operating modes of electrical lighting devices.

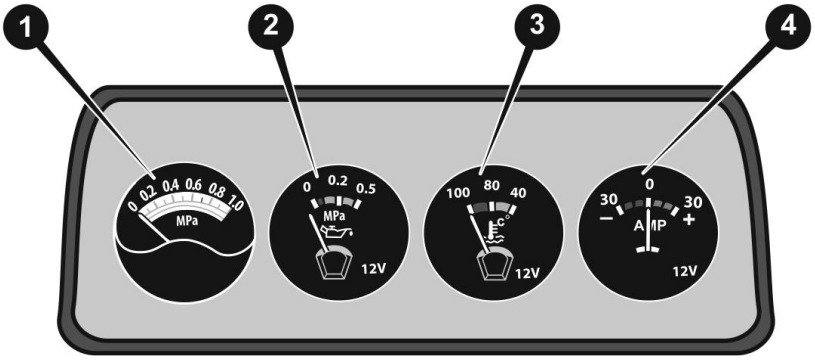

Figure 3.8. Dashboard

1. Air pressure indicator in the pneumatic system.
2. Oil pressure indicator in the oil system.
3. Coolant temperature indicator.
4. Ammeter.

The instrument panel turns on when the ignition key is turned to the “ON” position.

- The air pressure indicator in the pneumatic system begins to operate immediately after starting the engine. The air pressure in the tractor pneumatic system should be in the range from 0.15 MPa to 0.60 MPa.

- Oil pressure and temperature indicators begin to operate immediately after starting the engine. The oil pressure in the tractor lubrication system must be within the range of 150 kPa (1.5 kgf/cm$_2$) up to 600 kPa (6 kgf/cm$_2$) . The
- temperature gauge shows the coolant temperature in the cylinder block. The normal operating temperature of a warm engine is 80 °C. If it overheats, you must stop the tractor and let the engine cool at idle speed. If the temperature does not decrease for a long time, it is necessary to turn off the engine, find and repair the malfunction of the cooling system.
- The ammeter indicator shows the strength and direction of the current; it is connected between the generator and the battery. The ammeter has bi-directional scales with the needle at the "+" end when the alternator is charging the battery; The arrow is at the "-" end when the battery releases its charge to the electrical equipment.

3.13.2. Electric switches

The on-board power supply is turned on using the central switch combined with the ignition switch (see Fig. 3.3., 3.9.):

OFF– all sources and consumers are disabled; the position is fixed, the key can be removed from the lock. all
H– sources and consumers are turned on and ready to work; the position is fixed, the key cannot be removed from the lock; heating the air with a glow plug, the glow plug turns on 2 seconds after setting the key to this position; the position is not fixed - you must hold the key, the key cannot be removed from the lock.
ST– starting the engine with an electric starter; the position is not fixed - it is necessary to hold the key, overcoming the resistance of the spring, the key cannot be removed from the lock; After starting the engine, you must immediately release the key so that it returns to the “H” position on its own.

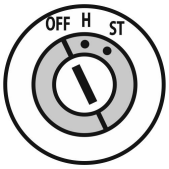

Figure 3.9. Egnition lock

Below the instrument panel there are electrical switches: switch for headlights and side lights, switch for direction indicators, and a sound signal.

– the horn switch has two positions: top – the horn is off; lower – the sound signal is on.

– the direction indicator switch has three positions: central – the direction indicators are off; top – right turn indicators are on; lower – left turn indicators are on. The lever returns to the central neutral position not automatically, but forcibly after completing the turning maneuver.

– the switch for side lights and front and rear headlights has four positions: I – the front and rear headlights are off; II - side light is on; III - the low beam of the headlights is on, IV - the high beam of the headlights and the rear light are on.

3.13.3. Controlling the direction and speed of movement

The tractor's trajectory is changed by turning the steering wheel.

The forward-backward direction of movement of the tractor is controlled by selecting one of the forward or reverse gears in the gearbox (see Fig. 3.3. and 3.10.).

The tractor speed is controlled by switching the gearbox and modes (see Fig. 3.10.), as well as by changing the engine crankshaft speed. Changing the engine crankshaft speed is carried out by adjusting the amount of fuel entering the tractor cylinders using the appropriate pedal (gas pedal) or the minimum speed preset lever (manual gas) located to the right of the steering column (see Fig. 3.3. and 3.11.). The pedal and preset lever operate in parallel.

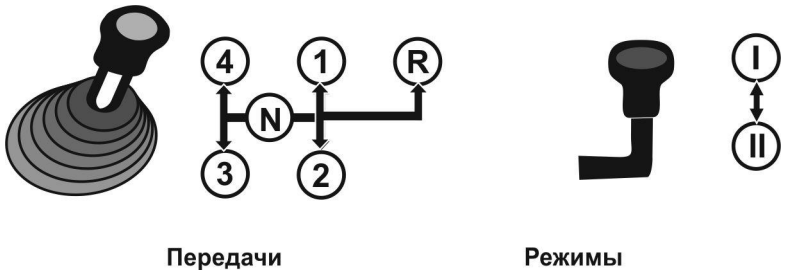

Figure 3.10. Switching gears and modes for the T244 tractor

Table 3.1. Design speed

Mode	Gearbox transmission				
	1	2	3	4	R
I	2.17	3.25	5.21	7.04	2.77
II	10.00	14.28	21.28	24.00	12.50

Figure 3.11. Fuel control lever ("manual gas")

Slowing down and stopping the tractor is done using the brake pedals of the rear wheels (see Fig. 3.3.), acting simultaneously or independently, depending on the driver's choice.

3.13.4. PTO drive control

The PTO drive is controlled using a lever located to the right of the driver's seat (see Fig. 3.3.). The lever has two positions: front – "PTO on", rear – "PTO off" (see Fig. 3.12.). Engaging and disengaging the PTO should only be done with the clutch pedal depressed.

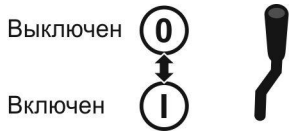

Figure 3.12. PTO control diagram

3.13.5. Attachment control

The process of raising and lowering attached equipment is controlled using the hydraulic distributor lever located to the right of the driver's seat (see Fig. 3.3.). The lever has two positions: "raise", "lower" (see Fig. 3.14.).

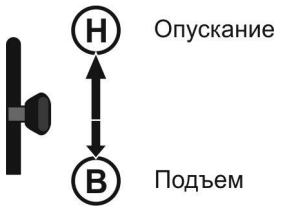

Figure 3.14. Control diagram of the hinged mechanism.

When the lever is moved to the "Lift" position, the hydraulic distributor provides oil supply under a pressure of 16.0 MPa (160 kgf/cm2) into the working cylinder of the hydraulic lifting mechanism, while the levers of the hinged system rise upward. Lowering of the elements of the mounted system occurs under the influence of its own weight when the control lever is moved to the "Lowering" position.

To switch control from the hydraulic pump to the hydraulic equipment of the mounted machine, it is necessary to close (tighten clockwise until it stops) the valve located in front of the driver's seat (see Fig. 3.3.). In this case, the hydraulic distributor lever will regulate the flow of oil directed through the quick-release fluid coupling into the hydraulic system of the mounted machine: in the "Lifting" position, operating pressure is applied, in the "Lowering" position, the oil is drained into the crankcase.

3.13.6. Control of differential locking device ZVM

The differential lock of the CVM is carried out using a lever located at the bottom right in front of the driver's seat (see Fig. 3.3.). The OBD mechanism is activated by pressing the locking lever from top to bottom with your hand (with the clutch depressed). The design of the DB mechanism ensures that it automatically turns off when the forces on the wheels are equalized, therefore, to ensure constant operation of the DB, it is necessary to keep the lever in the on (lower) position.

ATTENTION!
The BD mechanism can only be engaged when the tractor is moving in a straight line at a reduced speed on loose or slippery surfaces that allow partial wheel slip. It is prohibited to make turns with the OBD mechanism engaged.

3.13.7. Connection of FDA

The FDA on tractors is switchable. Connecting and disconnecting the FDA is carried out using a lever located at the bottom left in front of the driver's seat (see Fig. 3.3. and 3.15.). Activation of the FDA is allowed only when the tractor is completely stopped and the clutch is fully depressed.

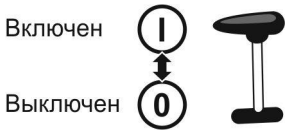

Figure 3.15. FDA connection diagram

4. Tractor operation

ATTENTION!
Only a fully equipped, serviceable tractor in a unit with a serviceable, securely fastened, correctly adjusted and correctly connected mounted (trailed) agricultural equipment, which, due to its weight, size and power characteristics, can be used with tractors of this traction class is allowed for operation.

Before starting to operate the tractor:

1. Depreserve and wash the tractor.
2. Check the battery and, if necessary, bring it into working condition.
3. Remove protective plastic covers and protective films.
4. Check the correct installation and secure fastening of the air cleaner and muffler.
5. Check the quality and level of oil in the engine crankcase, air cleaner sump, power transmission housing, FDA housing, add or replace oil if necessary.
6. Lubricate the mechanisms and components of the tractor in accordance with the lubrication table.
7. Fill the fuel tank with summer or winter (depending on the time of year) diesel fuel.
8. Fill the cooling system with coolant to a level 50-60 mm below the upper end of the radiator filler neck.
9. Check the tire pressure.

4.1. Preparing to start the engine

4.1.1. Inspection before starting the engine

To ensure safety, it is very important to take a little time and walk around the tractor before starting to drive, checking its condition. If you find any malfunction, be sure to fix it yourself or contact the place of sale to have it repaired.

ATTENTION!
Improper maintenance of the tractor or a malfunction left unattended before the trip can cause an accident, which may cause significant material damage, as well as injury to people of varying severity, including death.

Before each trip or work, you must check:

1. Engine oil level - add engine oil if necessary. Make sure there are no leaks.
2. Fuel level - add fuel to the fuel tank if necessary. Make sure there are no leaks.
3. Brakes - check that the brake system is working properly.
4. Tires - check condition and pressure.
5. Lights and Horn - Make sure the headlights, taillight, brake light, turn signals and horn are working properly.
6. When using the tractor for transport work, increase the track of the rear wheels of the tractor to the maximum possible.

4.1.2. Refueling

Depending on the season, the tractor's fuel tank is filled with the appropriate (winter or summer) diesel fuel. The quality of engine and fuel equipment operation depends on the presence of impurities of mechanical particles and water in the fuel. Before refueling, it must sit for at least 48 hours; containers and equipment used must be closed and clean. When unsettled and unfiltered diesel fuel is used, fuel tanks become contaminated, a rapid loss of throughput of filter elements occurs, as well as failure of plunger pairs and injector nozzles. To avoid the entry of mechanical particles and water into the engine power system, it is necessary to prevent complete emptying of fuel storage containers, i.e., taking it from the bottom of these containers. It is also not recommended to completely drain the fuel tank, since water, dirt and debris accumulated at the bottom can damage the engine fuel system.

ATTENTION!
It is not allowed to mix diesel fuel with other types of petroleum products and flammable materials. The presence of water in the fuel being refilled is not allowed.

It is advisable to always keep the tractor fuel tank fully filled. This prevents condensation of water vapor in the air space of the tank, and thereby reduces corrosion of its internal surfaces. When pouring fuel into the tank, do not allow the level to exceed the "Full Tank" mark on the fuel level indicator on the tractor dashboard. When the tractor is operating with an overfilled tank, it pours out through the holes in the filler cap, and this, in turn, causes the hole to become clogged with dust and dirt, which can lead to interruptions in engine operation.

Fueling a tractor can be done either mechanically - using a filling dispenser or a special fuel pump, or manually, from cans or other specialized containers with fuel. When refueling in bulk from cans or it is recommended to use a special funnel to avoid fuel spills on the engine.

To access the fuel tank filler neck, you must open the tank cap. There is a strainer in the neck of the tank, which should be removed from there before refueling the tractor using a refueling nozzle or hose to avoid fuel splashing from the pressurized jet. When refueling from an open container, especially in the field, there is no need to remove the strainer from the tank neck.

ATTENTION!
It is not recommended to refuel directly at gas stations, since they store unsettled fuel, which means there is a high probability of water and mechanical impurities getting into the tractor tank.

If you have to refuel the tractor during precipitation, the filler hole of the tank must be carefully covered from above with a tarpaulin in order to prevent moisture from entering the tank through it. Refueling the tractor at night is allowed only under artificial lighting. In this case, it is prohibited to use open flame sources.

4.1.3. Oil filling

The presence of a sufficient amount of oil in the engine crankcase, in the combined crankcase of the gearbox and rear axle, is one of the necessary conditions for the operation of the tractor.

Filling and topping up of engine oil into the engine crankcase is done through the filler neck located on the engine valve box cover (see Fig. 3.4.).

Oil is poured into the combined gearbox and rear axle housing through the filler neck located next to the gearbox shift lever (see Fig. 4.1.).

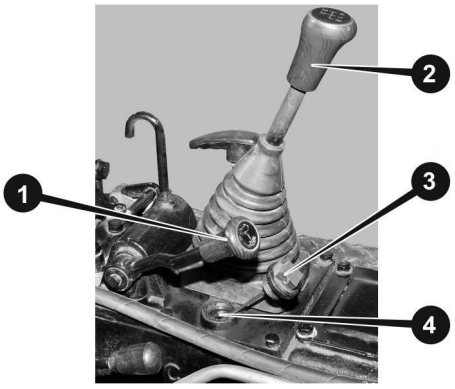

Figure 4.1. Transmission housing oil neck

1. Control lever for 2-mode (additional) box.
2. Control lever of the main gearbox.
3. Dipstick plug for the oil neck of the transmission housing.
4. Transmission housing oil filler neck.

Oil is poured into the FDA crankcase through the filler neck on the right side of the FDA (see Fig. 4.2.).

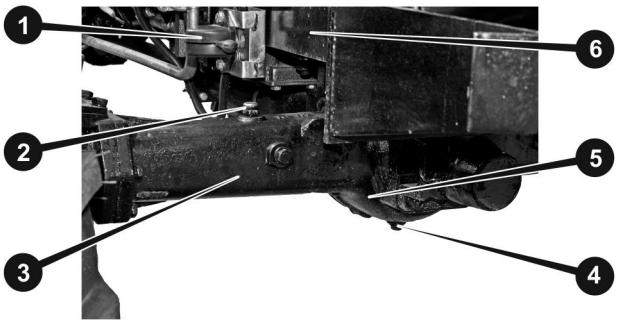

Figure 4.2. Oil neck of the FDA crankcase

1. Ground switch.
2. FDA crankcase plug.
3. Front drive axle (FDA).
4. FDA mounting beam.
5. FDA housing.
6. Oil drain plug from the FDA crankcase.

Oil is poured into the hydraulic lifting mechanism through the filler neck (see Fig. 3.6.), located at the rear of the tractor.

Oil level control is checked by marks on special dipsticks. The characteristics of the oils to be filled must correspond to the current time of year and be free of moisture, foreign impurities and debris. Detailed operations for replacing and adding oils, as well as the types of oils used, are indicated in Section 5 of this manual.

4.2. Starting the engine

ATTENTION!
Never start the engine when the cooling system is not filled.

ATTENTION!
Start the engine only while in the driver's seat.

Starting the engine under normal conditions:

1. Set the gear shift lever to neutral.
2. Set the PTO engagement lever to the “off” position.
3. Set the fuel supply lever (“manual gas”) to the middle position.
4. Depress the clutch pedal.
5. Turn the ignition key to the “ON” position, and by the reaction of the indicators on the instrument panel, make sure that the on-board electrical network is turned on normally.
6. Turn the ignition key to the “ST” position and hold it until the engine starts, but no more than 15 s. If the engine does not start, restart it no earlier than after 30...40 s.
7. Release the clutch pedal. Run the engine at 1000 rpm until the oil pressure stabilizes in the operating range.

After starting the engine, it is necessary to check the operation of all indicators and instrument readings (coolant temperature, engine oil pressure, battery charge).

Features of starting the engine at low temperatures (+4°C and below):

At established low temperatures, it is necessary to use winter diesel fuel, and winter grades of oils in the engine crankcase, gearbox and hydraulic system in accordance with the recommendations of this manual. The battery must be in good working order and fully charged. It is recommended to drain the sediment from the coarse fuel filter daily.

The engines of Stavropolets tractors are equipped with an air preheating system. When it is turned on, the electric coils installed in the air filter pipe become hot and heat the air sucked into the engine cylinders.

Procedure for starting the engine at low temperatures:

1. Follow steps 1-5 of the procedure for starting the engine.
2. Turn the ignition key to the “H” position and pause for more than 2 seconds.
3. Follow steps 6 - 7 of the procedure for starting the engine.

ATTENTION!
To avoid damage to the engine and power transmission, starting the engine from a tug in the winter is strictly prohibited, and in the summer it should be used only in cases of extreme emergency.

ATTENTION!
Engine exhaust gases are toxic. It is prohibited to start the engine and operate the tractor in enclosed spaces with insufficient ventilation.

4.3. Start of movement

In order to start moving the tractor, it is necessary to start the engine and, if necessary, warm it up. Then decide on the driving mode, squeeze the clutch, set the fuel control lever (“manual gas”), gearshift lever, mode switching to the desired position (see Fig. 3.3 and diagrams in Fig. 3.10.). Then slightly increase the fuel supply with the pedal, smoothly release the clutch pedal and move in the desired direction, at the desired speed. If during operation it is necessary to use the PTO, it must also be engaged only with the clutch depressed.

When performing most agricultural work, the tractor moves at a stable speed and frequent switching of gearbox modes and gears is not required. In this case, the mode switch lever is set to position “I”. When performing transport and towing work on well-established dirt roads and paved roads, the mode shift lever is set to position “II”, and the gearbox is switched from low to high or vice versa - depending on the requirements of the current situation.

ATTENTION!
Without exception, all changes in the operating modes of the tractor, carried out by switching manual transmissions, must be carried out only with the clutch pedal fully depressed.

4.4. Stopping the tractor and engine

To stop the tractor, do the following:

1. Reduce engine speed.
2. Depress the clutch pedal.
3. Stop the tractor by pressing the brake pedals.
4. Set the gearshift lever to the neutral position.
5. Set the tractor to the parking brake.

ATTENTION!
It is not allowed to completely stop the tractor using the brakes without first disengaging the clutch.

To stop the engine, do the following:

1. After removing the load from the engine, let it run at low crankshaft speed for 3-5 minutes to reduce the temperature; It is not recommended to stop the engine at high coolant temperatures.

2. Use the fuel supply control knob to set the minimum idle speed.
3. Use the engine stop handle (see Fig. 3.3.) to stop the engine by pulling it towards you until it stops.

4.5. Parking

The site chosen for stopping or parking the tractor must be as level and solid as possible, ensuring the safety and security of the tractor, attachments, trailer and cargo. After parking the tractor, you must lock the parking brake and turn off the engine. If there is a need to stop on a slope, you need to orient the tractor across the rise in order to reduce the risk that the tractor will spontaneously move, put stops under the wheels of the tractor and trailer. If the tractor is parked with attached equipment, the hydraulic linkage system must be lowered to the lower position before stopping the engine.

ATTENTION!
You should not leave the tractor on liquid soil or liquid mud in the fall during the period of cold weather and frosts, as the tires may freeze to the supporting surface or freeze into the soil, which will lead to their damage when starting to move!

4.6. Run-in

A new tractor must be run in for at least 30 hours. Running in a tractor is a mandatory operation before putting it into operation. During the running-in process, the tractor parts are broken in, which contributes to their further long-term operation. Insufficient and poor-quality running-in leads to a significant reduction in the service life of the tractor.

ATTENTION!
Starting a new, untested tractor from a tow is strictly prohibited in order to avoid intense wear of engine and transmission parts.

First, it is necessary to run the engine at idle speed for 15-30 minutes and 10-20 minutes with a gradual increase in rotation speed to the nominal speed, after which you can increase the speed to maximum, but for a short time of 3-5 minutes.

During break-in, carefully check the engine for fluid leaks, extraneous noises and other abnormal phenomena; Monitor the engine oil pressure, it should be constant and within normal limits. If any malfunction is detected, you should immediately stop the engine, fix the problem, and only then continue running in.

After running in the engine, you should run in the PTO and hydraulic attachment system.

To break in the PTO, you need to set the minimum stable engine speed, turn on the PTO and let it idle for 5-10 minutes, then increase the engine speed to medium and let it run for another 10 minutes.

To run-in the hydraulic attachment system, it is necessary to set the engine speed to medium and lift and lower the attachment system without load at least 20 times. In the future, it is recommended to carry out a similar operation with a medium-heavy mounted unit attached to the system.

Running in the transmission and chassis of the tractor should also be done gradually, in all modes. When running in the transmission and chassis, it is not recommended to increase engine speed above average and load it at more than 50% power. Run-in should be started with the FDA drive turned off. There is no need to move in one gear for a long time; on the contrary, you should regularly switch the gearbox and modes from low gears to high gears, turn the OBD mechanism on and off (only on a straight path and on open ground). After 5-6 hours of running the tractor without load, you can use it for light work, gradually increasing the load from light to medium.

During running-in of the tractor, you should pay attention to the stability of the engine, power transmission (clutch, gearbox, reduction gearbox, BD, FDA, brakes), electrical equipment, and the correctness of the readings of the relevant instruments.

After finishing running in the tractor under load, you should perform maintenance in accordance with the requirements of Section 5. Having made sure that the tractor is in good condition, you can begin its full operation.

4.7. Operating the tractor in various conditions

Because the tractor intended For operation V quality traction unit For agricultural mounted and trailed devices, machines and units, the conditions of its movement can also vary from complete off-road conditions and loose soils to highways with asphalt pavement. Therefore, the design of the tractor provides many operating modes so that the driver can choose the optimal combination for each specific case.

First of all, it is necessary to select the correct speed and provide the required torque on the drive wheels. Correctly selected driving speed allows you to avoid unnecessary braking, achieve optimal performance, obtain the best economic results, and increase the life of the tractor. The tractor must not be overloaded frequently; the diesel engine must have some power reserve, that is, the operating speed must be chosen such that the engine load is about 80% of its rated power. If the engine sound becomes low, intermittent, movement slows and black smoke appears, you must shift to a lower gear to avoid overload. If the load is light and the operating speed should not be too high, it is better to select a higher gear and reduce the engine speed to save fuel.

If the movement of the tractor stops due to the fact that one rear wheel is slipping (most often this occurs due to a difference in the coefficients of adhesion of the wheels to the ground or different loads on the wheels), then you can use the differential locking mechanism (DL). To do this you need:

- Depress the clutch pedal.
- Select a low gear.
- Set the engine crankshaft speed above average using the “manual throttle” lever. Press the control lever for the BD
- mechanism (see Fig. 3.3.), which is located on the right under the driver’s seat.

- Smoothly release the clutch pedal.

From this moment, the tractor's drive wheels will rotate synchronously, and the tractor will be able to drive out of a slippery or loose section of the road. After the tractor leaves the difficult area, you must immediately release the control lever for the BD mechanism.

ATTENTION!
It is prohibited to carry out a turning maneuver when the DB mechanism is engaged, engage the DB without using the clutch, use the DB in high gears, or use the DB on paved roads to avoid damage to tractor units.

When operating a four-wheel drive tractor on wet and soft ground with a heavy load, you can use a front driving axle to improve cross-country ability and increase traction. To do this, you need to depress the clutch pedal and set the FDA control lever, located in front of the driver’s seat on the left (see Fig. 3.3 and 3.15.) to the “on” position. In this case, the torque will be transmitted to the FDA. After the tractor leaves a difficult area, you must immediately disable the FDA.

ATTENTION!
It is not permitted to use FDA at high speed in transport mode.

When driving the tractor on uphill and downhill slopes, especially if the traction of the wheels with the ground or road surface is insufficient, it is recommended to switch to the desired gear in advance and not change gears while on a slope.

ATTENTION!
Coasting on slopes is strictly prohibited.

When driving over very rough terrain, over bumps, or when driving over puddles, ditches or other obstacles, be sure to reduce your speed and shift to a lower gear in advance. It is not allowed to reduce the speed of the tractor by partially disengaging the clutch and to move over obstacles (“jump”) by abruptly engaging the clutch, as this can lead to rapid failure of the transmission and chassis.

4.8. Towing a trailer, transporting goods

Since tractors do not have specially equipped places for transporting goods, trailers are used for these purposes. A trailer is a vehicle towed by a tractor and designed to transport goods. Trailers also include trailers in which part of the vertical load is transferred to the towing tractor (semi-trailers).

Trailers are divided into universal (transport platforms of various configurations, tipper and non-tipper) and special (tanks, manure spreaders, etc.), without brakes, and with autonomous brakes (inertia type, mechanical, pneumatic, hydraulic). Agricultural tractors T220 / T224 / T244 belong to the traction class of 0.6 kN, therefore the maximum weight of a towed trailer with a load (on paved and dirt roads of average quality) for them is 2500 - 3000 kg. But in any case, it is prohibited to work with a trailer for non-agricultural purposes and without autonomous brakes if its loaded weight exceeds half of the total actual weight of the tractor.

Before carrying out transport work in a unit with a trailer or semi-trailer, it is recommended to increase the tractor track to the maximum possible; lock the brake pedals of the rear wheels and, if necessary, adjust the brakes to operate simultaneously; check the operation of the parking brake, light and sound alarms. Do not drive at high speed while towing.

Agricultural trailers must have serviceable rigid couplings and be additionally connected to the towing tractor with a safety chain or cable. When a standard towing device is installed on the tractor, it is prohibited to attach trailers and semi-trailers with non-standard drawbars to it.

When towing a trailer, the driver must remember that when moving downhill, the trailer is pushed by the tractor with a large inertial force, so it is forbidden to turn sharply and sharply press the brake pedal so that the trailer does not overturn the tractor. Before turning, be sure to reduce your speed.

When transporting cargo, it is necessary to distribute it as evenly as possible over the area of the trailer's cargo platform and securely secure it. The center of gravity of the load should be as close to the center of the platform as possible. Incorrect load distribution negatively affects the stability and controllability of the trailer. The transported cargo should not protrude beyond the dimensions of the trailer platform more than permitted by the Road Traffic Regulations, and the weight of the cargo should not exceed the permissible load capacity.

4.9. Connecting a tractor with various machines

Tractors of the brand "*XT-DEER*» are aggregated with agricultural mounted, semi-mounted and trailed machines, implements and units for universal and special purposes, providing the ability to perform a wide range of agricultural work, including operations for preparing and cultivating soil, sowing and planting crops, cultivating crops, and harvesting , for cargo transportation. It is possible to use tractors to drive various stationary agricultural machines.

The driver operating the tractor (tractor operator) bears personal responsibility for compliance with the Road Traffic and Safety Rules, as well as safety measures, for the correct use of the tractor in accordance with this manual. Before performing work on the unit with the equipment, he must also carefully read the technical documentation for the operation of the agricultural machine attached to the tractor. To connect, you need to drive up to the machine being aggregated in reverse at low speed and without jerking; There should be no people between the tractor and the machine. Hitching can only be done when the tractor is stopped.

A tractor in combination with a machine aggregated with it is usually called a machine-tractor unit (MTA).

4.9.1. Classification of aggregated equipment

Equipment mounted with a tractor is classified according to a number of characteristics:

- By type of technological process performed - arable, sowing, planting, tillage and sowing, harvesting.

- According to the method of carrying out work - mobile, stationary-mobile, stationary. According to
- the type of drive of the working parts of the machine - traction, traction-drive, drive.
- According to the number of machines in the MTA - single- and multi-machine (a machine that performs several work operations, the technological modules of which are not intended to be used as a separate technical means, is considered one machine).
- According to the location of the working bodies relative to the longitudinal axis of the tractor - symmetrical and asymmetrical.
- By location relative to the rear wheels and the longitudinal plane of the tractor - rear, side left and right (in the space between the front and rear wheels), front and mixed.
- By the number of technological operations performed - single-operation, multi-operation, combined, universal, etc.

According to the method of aggregation with a tractor, machines are divided into the following types:

- Mounted - the machine is attached at three points to the hinges of the upper and lower links of the HNS. In this case, the entire weight of the machine in the transport position is completely absorbed by the tractor; the structural elements of the machine in the transport position do not have contact with the supporting surface (ground).
- Semi-mounted - the machine is attached either at three points to the hinges of the upper and lower links of the GNS, or only at two points to the hinges of the lower links of the GNS; the weight of the machine in the transport position is partially taken up by the tractor and mostly by its own running wheels (usually one or two). Semi-trailer - the
- machine is attached at one point to the coupling loop (fork, axle) of the trailer hitch. The option of a two-point articulated connection with the HNS is possible (without using the top link). The weight of the machine in the transport position is partially absorbed by the tractor and mostly by its own running wheels (usually at least two). When transferring the machine from the working position to the transport position, the connection point between the agricultural machine and the tractor does not change its position. Semi-trailers also include general and special-purpose semi-trailers (including tanks, dump trucks, means of mechanizing technological processes in agriculture).

- Trailed - the machine is attached at one point to the coupling loop (fork, axle) of the trailer hitch. The option of a two-point articulated connection with the HNS is possible (without using the top link). The weight of the machine in the transport position is completely absorbed by its chassis system; the tractor's coupling device bears only the load from the weight of the machine's connecting device. When transferring the machine from the working position to the transport position, the connection point between the machine and the tractor does not change its position. Trailed vehicles also include general and special purpose trailers.

NOTE.
When aggregating mounted, trailed, semi-mounted and semi-trailered machines, it is allowed to attach their individual elements (SAK consoles, markers, limit ties, connecting fittings, brackets, etc.) to the structural elements of the tractor, provided that all instructions and requirements of the operating manuals are observed.

4.9.2. Recommendations for the selection of agricultural machines for aggregation

The selection and purchase of agricultural machines for the tractor is carried out by the consumer independently, based on his needs, taking into account the characteristics of the machine and tractor, as well as local conditions (requirements of agricultural technologies, soil conditions, personal experience, recommendations of relevant regional advisory centers and agricultural production organizations).

It must be borne in mind that agricultural machines of the same purpose, but from different manufacturers, may differ in the features of aggregation, have different technical characteristics and adjustments. The procedure for assembling tractor-based units and the operating features of the machine are usually given in the operating manuals for the aggregated technical equipment. In any case, the manufacturer (seller) of the machine is obliged, at your request, to provide information on the basic minimum characteristics of the tractor, which should ensure the possibility of aggregating the machine.

ATTENTION!
To avoid breakdowns, it is not recommended to combine the tractor with machines for which their technical characteristics are unknown.

To create an MTA based on a tractor means to determine how many and with what characteristics agricultural machines need to be attached to the tractor, what hitch to use, if necessary, what additional working equipment to use, what adjustments and settings to make, and in what modes to work. In all cases, it is necessary to check the compliance of the machine with the tractor in terms of connecting elements, the carrying capacity of attachments and tires, and the permissible load on the trailer hitch and axles of the tractor.

The initial data for choosing machines aggregated with tractors are: traction
- properties and power of the tractor;
- traction resistance and energy needs of working machines, their operating weight, method of aggregation, vertical load on the connecting device;
- agrotechnical requirements for the work performed (working speed, agrotechnical clearance, track, tire width, direction of travel);
- type and characteristics of the cultivated soil;
- sizes and relief of fields.

When choosing machines, it is necessary to pay special attention to the variable characteristics of the operating conditions of agricultural machinery in the field. For example, a tractor of traction class 0.6 under normal conditions must work with a single-furrow plow, but on light soils, in areas of fields without slopes, it can operate with a double-furrow plow.

The possibility of aggregating a machine with a tractor can be determined based on the recommendations of the machine manufacturer, as well as independently - experimentally or by calculation, or on the basis of tests previously carried out by relevant organizations.

Calculation method of aggregation. In the calculation method, based on initial data from reference technical literature, calculations are made using the appropriate formulas, the characteristics of the tractor and the machine are compared, and on this basis a conclusion is made regarding the possibility of aggregation. Since average values are usually used in calculations, an MTA compiled in this way may sometimes turn out to be ineffective and will require additional "finishing" during work in the field. This method can be recommended for approximate calculations in cases where there is no experimental data or when you immediately need to know the approximate composition of MTA.

Experienced aggregation method. In the experimental method, the selection of machines and further assembly of MTAs is carried out by practical testing of compatibility on the basis of available operational documentation, regulatory and reference data, as well as taking into account the accumulated experience in assembling units directly in a given farm or enterprise.

Determining the possibility of aggregating a tractor with agricultural machines is best done in the following sequence.

1. Carefully study this manual, understand the main technical and geometric characteristics of the tractor, including: traction class, rated traction force, engine power, permissible power of mechanical and hydraulic take-off, connecting dimensions of the hydraulic pump; PTO shank, hydraulic outlet, relative position of the end of the PTO shank in relation to the center of the suspension axis of the hydraulic pump, range of speeds and tracks, availability of the necessary working equipment, maximum permissible weight of the tractor, permissible loads on the axles and tires of the wheels, total weight of the towed trailer.

2. Study the operating manual of the machine, find out its main technical characteristics: traction resistance, power of mechanical, electrical and hydraulic take-off, dimensions of the connecting triangle, PTO shaft, hydraulic outlet, electric plug; the relative position of the end of the PTO shaft relative to the center of the suspension axis of the connecting triangle or drawbar loop; the ability to change the configuration and direction of rotation of the PTO shaft, the range of operating speeds, the total operating weight with technological load, the presence of brakes, the presence of a cardan shaft (type, length, presence and type of protective coupling). If necessary, ask the seller for the missing data on the car.

3. Assess the possibility of constructively linking the mating elements of the tractor with the corresponding elements of the machine, including compliance of the track and standard size of the wheels with the requirements of the technology of the work being performed, the location of the PTO and the cardan shaft of the machine.
4. After checking the availability and (if necessary) additional installation of the required working equipment on the tractor, complete and prepare the MTA, taking into account the recommendations of the operational documentation for the mounted technical equipment.
5. Determine by calculation or experiment the total weight of the MTA, the load on the axles and tires, the mass of the required ballast and process load (the weight of the MTA on the tractor axles must not exceed the permitted values).
6. Check the interaction of the aggregated tractor and the machine as part of the MTA: make sure that the hydraulic lifting station of the attached machine with its full operating weight can be raised and lowered; find out the values of the rotation angles and the maximum lifting height of the hydraulic pump until the machine elements rest against the tractor elements, the sufficiency of the length and free space zones of the cardan shaft when turning and transferring the machine to the working and transport positions; assess the degree of correspondence between the energy capabilities of the tractor and the needs of the machine.
7. Check the ground clearance and controllability of the tractor as part of the MTA, the overall roadworthiness, the effectiveness of the brakes, static stability on slopes, the ability of the tractor to overcome ups and downs with the machine and with technological material, the ability to move on slopes, and the fit of the MTA into the row spacing of the cultivated crops.

ATTENTION!
Under no circumstances should the front wheels of the tractor leave the road or soil surface while driving. In any case of its use, the front axle of the tractor must bear at least 20% of the load (controllability criterion Ku ≥ 0.2 ***) of its own operating weight.***

8. Carry out test runs to perform technological operations in accordance with the purpose of the machine (with mandatory compliance with safety requirements), find out the optimal speed modes of operation, hourly (specific) fuel consumption, evaluate productivity for 1 hour of operating time.

4.9.3. Checking the correct composition of the machine-tractor unit

It is impossible to allow the MTA to operate both with overload and underload. In the first case, there will be increased wear of tractor parts, excessive fuel consumption and a decrease in unit performance; in the second case, there will be a decrease in economic indicators (primarily productivity) and an increase in fuel consumption.

When determining the optimal operating modes of an agricultural tractor, it is first necessary to select the optimal speed. During the operation of the MTA, there are two main speed modes - operating speed and speed on turns and crossings with the working parts turned off.

The main of these modes is the operating speed, the change of which affects the quality of the technological process in accordance with agrotechnical requirements. The machine operating manuals for each individual machine model indicate the permissible operating speed ranges. Any change in the operating speed of the tractor with the attached machine, including operational maneuvering during the working stroke, is permissible only within the limits determined by agrotechnical requirements. Typically, the initial operating speed varies within acceptable limits depending on the working width of the machine.

The speed limit of the MTA on short-haul transport is limited mainly by safety requirements. Due to the relatively short duration of turns and the need to follow instructions on limiting transport speed when moving from one field to another, the corresponding idling speed of the tractor is often close to the operating speed.

Thus, if the machine for aggregation is selected, then all that remains is to determine the required operating speed and the corresponding gear.

4.10. Load and speed control

In practice, the operating speed and loading of the MTA are selected and controlled based on tachometer readings. Knowing the range of agrotechnically permissible speeds for a given agricultural machine, the tachometer determines the tractor gear (travel speed) at which the tractor should enter this range.

A normal MTA load should be considered one in which the crankshaft speed readings on the tachometer are equal to or lower (but not more than 5-6%) to the nominal speed specified in the manual. A drop in speed of more than 6% indicates that the engine is overloaded. An increase in frequency above the nominal indicates an underload of the engine.

The choice of speed mode is carried out within the limits of permissible slipping, since increased slipping of tractor wheels leads to the destruction of structural soil particles with the subsequent development of wind and water erosion processes. The maximum permissible slip rate is 16% for wheeled tractors with two drive axles, and up to 18% for wheeled tractors with one drive axle.

4.11. Using GNS

The design of the GNS is shown in paragraph 3.11. this manual. It provides aggregation of the following types of machines and implements:

- mounted with a three-point hitch (upper and lower links are used); semi-
- mounted (lower links);
- semi-trailer with the help of a cross member on the suspension axis (lower links).

To protect the connected machines from swinging, length-adjustable external limit ties are used.

To ensure the required position of the machine, adjustments of the hydraulic pump are provided in the vertical and horizontal planes using the top link, braces and limit ties.

Changing the length of the top link leads to a change in the longitudinal angle of inclination of the mounted machine. For example, if the frame of a mounted plow is tilted forward in the direction of travel of the tractor and the front plow body plows deeper than the rear one, it is necessary to lengthen the top link, and if the frame is tilted back and the front body plows with a shallower depth than the rear one, then to equalize the working depth, the top link must be shortened .

By changing the length of one of the braces (right or left), the transverse angle of inclination of the machine being aggregated is adjusted, on which the uniformity of the depth of processing by the working parts of this machine across the working width depends. Ideally, the lengths of the braces should be the same. In practice, the machine being aggregated is leveled by increasing the length of the brace on the side of the machine that is raised higher than necessary and which must be lowered.

Changing the length of both braces at once by the same amount leads to a change in the ground clearance of the aggregated machine in the transport position, as well as to a change in the distance between the elements of the tractor and the machine in the uppermost position of the HV. Rough adjustment of the length of the brace is made by moving the lower link into one of the holes of the brace fork; fine adjustment is done using a threaded adjusting sleeve.

Changing the length of the side links leads to a change in the angle between the longitudinal axis of the tractor and the lower links. When transporting an agricultural machine, the couplers must be shortened as much as possible within their adjustment range to limit the rocking of the aggregated machine during movement in order to avoid possible emergency situations and damage to elements of the tractor and machine. When working with most agricultural machines, it is necessary to provide partial blocking, limiting the amplitude of swing of the lower links in the horizontal plane (no more than 20 mm at the rear end of the link). When working with mounted and semi-mounted tillage machines that have passive working elements for continuous tillage, it is necessary to ensure free movement in the horizontal plane (swinging) of the rear ends of the lower links by 125 mm in each direction from the longitudinal axis of the tractor by completely unlocking the restrictive couplers.

ATTENTION!
Failure to follow the above recommendations for adjusting the hanging system may lead to breakage of ties, support brackets or other damage.

4.12. Using the towbar

In the basic configuration, tractors are equipped with a removable towing rod, but if necessary, towing hitches (TCU) of various types (pendulum, fork, ball, saddle, automatic and semi-automatic, etc.) can be used, providing aggregation of trailed and semi-trailer agricultural machines, connecting the devices of which correspond to these types of trailer hitch. In any case, it is necessary to ensure that the traction and vertical components of the load from the machine being coupled to the trailer hitch do not exceed the permissible values for the given trailer hitch.

Trailed and semi-trailer units must be securely fixed in the trailer hitch assembly, and in addition, the hitch must be additionally secured with a safety chain or cable to hold the trailer in the event of a trailer hitch failure.

4.13. Using a PTO

To drive traction-drive and driven aggregated machines, the tractor design provides an independent type PTO with a rotation speed of 540 rpm at the rated engine crankshaft speed. The PTO has a standard splined shank, which allows mechanical connection of the machine through standard (included with the machine) or separately purchased torque transmission mechanisms, such as cardan shafts, couplings of various types, belt and chain drives, etc.

The main requirement when connecting a PTO to aggregated agricultural machines is to ensure the reliability and safety of the connection in all operating modes of the MTA. Mechanical transmissions must be covered with casings or a protective fence of another type, eliminating the possibility of accidental exposure of parts of clothing and limbs of the operator, winding of straw, branches, etc.

Before connecting the cardan drive of the machine to the PTO shaft, you need to lubricate the telescopic joint of the cardan joints with grease and make sure that the forks are in the same plane. This improves the dynamic balance of the transmission and reduces the transmitted loads. If the planes of the forks do not coincide, then you need to disconnect the splined bushing and, by turning it several splines, ensure that the planes of the forks coincide at both ends of the shaft. Then attach the driveshaft protective cover to the PTO flange. After installing the cardan transmission, check the telescopic connection for the absence of stops and disconnections in the extreme positions of the machine relative to the tractor. The overlap of the telescopic elements of the propeller shaft must be at least 110...120 mm (see Fig. 4.2.) to avoid opening and jamming of the connection.

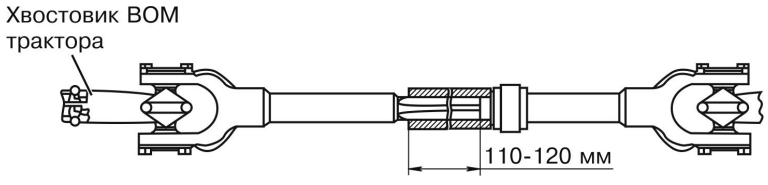

Figure 4.2. Cardan shaft spline

The required torque on the cardan shaft or other type of transmission must not exceed the permissible torque on the PTO. To protect the PTO drive from overloads, it is advisable to install a safety clutch on the machine, and when aggregating with inertial machines, it is necessary to use transmissions with an overrunning clutch on the machine side.

The PTO must be turned on and off smoothly, without jerking, at low engine speeds. Before starting the machine, check its idle operation at low and maximum diesel speed. Before lifting a mounted machine into the transport position for turning on the headland, as well as before turning a trailed machine, the PTO must be turned off. After uncoupling the machine from the tractor, you must not leave the universal joint on the PTO shaft.

When working with rotary tillage machines, it is necessary to especially carefully monitor the serviceability and normal operation of safety devices, do not engage the PTO when the working tool is lowered to the ground, lower the machine with rotating working bodies smoothly while the tractor is moving, do not engage the PTO when the angle of refraction is in one from the universal joints more than 35 degrees.

4.14. Chassis adjustment

Depending on the type of work performed and the type of machines being coupled, the required track of the front and rear wheels is set on the tractor, the air pressure in the tires is adjusted, and additional weights are installed.

4.14.1. Adjusting the toe of the front wheels

Adjusting the toe-in of the front driving axle wheels significantly affects the wear rate of the tire tread. Checking the toe-in value of the front axle wheels is carried out in the following order:

1. Check that there are no backlashes in the FDA connections; if necessary, eliminate the backlashes.
2. Place the tractor with clean wheels on a flat horizontal platform with the possibility of moving forward 3 m.
3. In the middle of the tire treads at the height of the wheel rotation centers behind the FDA, make longitudinal marks using a marker (you can use a ballpoint pen or paint).
4. Using a tape measure, measure the distance “B” between the applied marks with an accuracy of 1 mm as shown in Fig. 4.3.
5. With the FDA drive turned off, move the tractor forward by half a turn of the front wheels.
6. Using a tape measure, repeat measurement “A” between the marks on the treads.
7. Subtract the measurement value “A” from the measurement value “B”. If the result is in the range from 4 to 12 mm, the amount of convergence is within normal limits. If not, then it is necessary to make an adjustment by changing the length of the steering rods. Make sure that the lengths of both tie rods are the same.

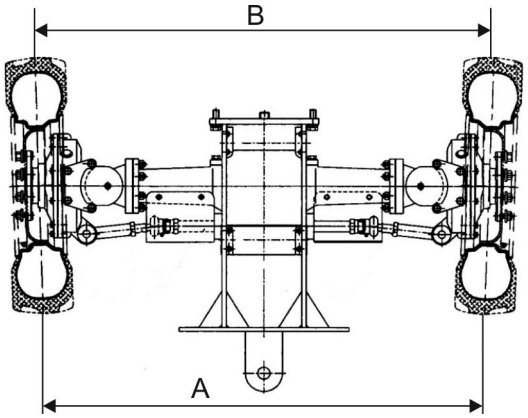

Figure 4.3. Adjusting the toe of the front wheels

The track is adjusted by interchanging the wheel rims from the right side to the left and from the left to the right. It must be remembered that the herringbone tread pattern on the tires is unidirectional, therefore, when reinstalling the wheels, it is necessary to re-align the tires so that the direction of rotation of the wheels coincides with the direction of the arrow on the sidewall of the tire.

4.14.2. Rear wheel track adjustment

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Changing the track width is done by choosing the position of the wheel rim on the hub - convex inward or outward; choosing the option of mounting the rim on the disk - from the inside of the disk or from the outside; choosing the rim location option - with the lugs inward or outward. Tread adjustment diagrams are shown in Fig. 4.4.

To adjust the track, the rear wheels of the tractor must be lifted one by one using a jack, which is installed under the rear axle sleeve. Then a stable stand is installed next to the jack, on which the tractor is placed.

ATTENTION!
It is prohibited to carry out work without a stand!
Before jacking up the tractor, it is necessary to exclude the possibility of its arbitrary movement: turn on the FDA, pair the left and right brake pedals, press them to the limit and lock the pedals with the parking brake handle. Place blocks or stops under all wheels standing on the ground.

If you have the appropriate technical equipment (stands, jacks, stops), it is possible to simultaneously remove both rear wheels.

When rearranging the rims of the rear wheels, it is also necessary to ensure that the direction of rotation of the wheel coincides with the direction of the arrow on the sidewall of the tire.

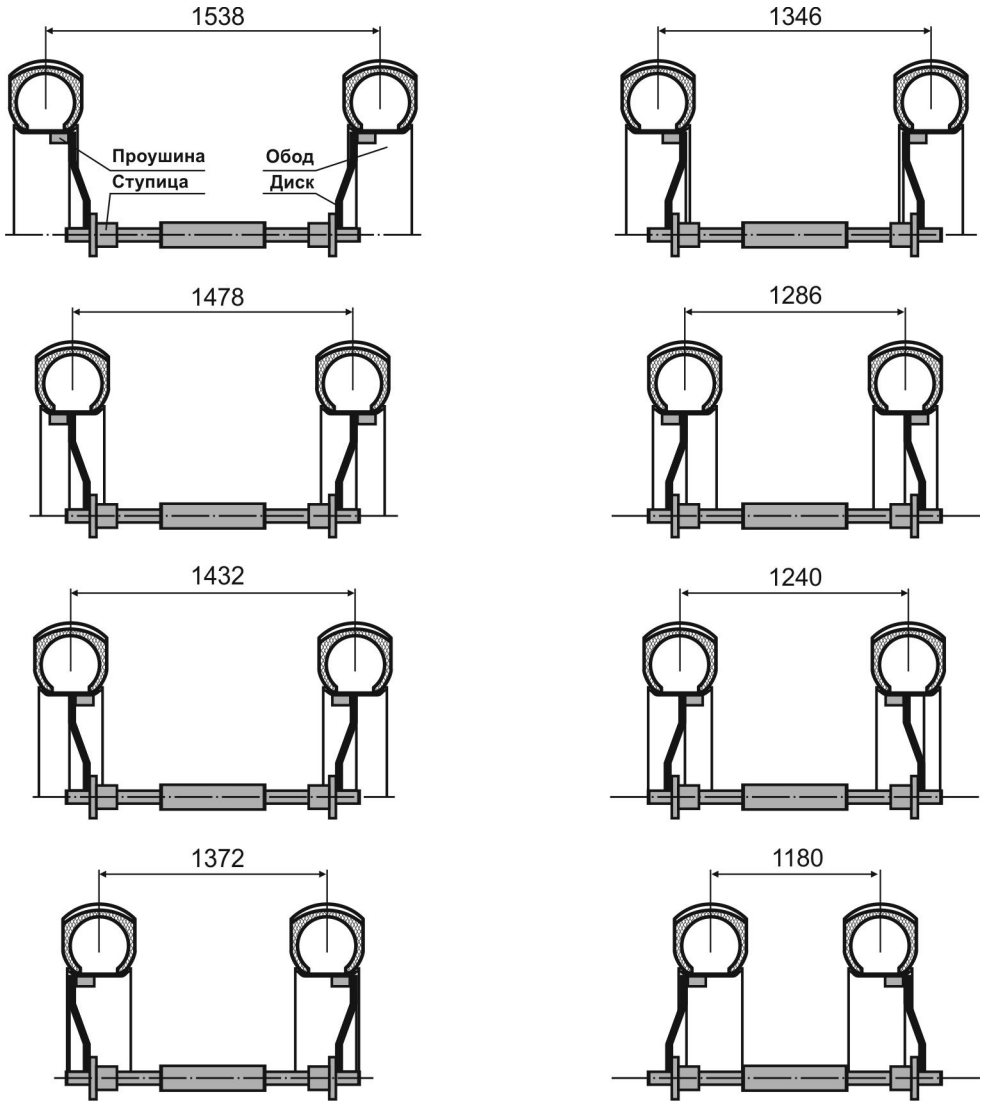


Figure 4.4. Rear wheel track adjustment diagrams

4.14.3. Improving traction properties

Traction force is the part of the gravity force of a tractor prepared for work (filled with fuel, oil and water, with a tractor driver in the cab), pressing its drive wheels to the soil. If the tractor is stationary, it is subject to the force of gravity and the normal reaction of the soil. The force of gravity is applied to the center of gravity of the tractor, in a horizontal section of the field it is directed perpendicular to the soil and is equal to the product of the mass of the prepared tractor and the acceleration of free fall (G=mg). In agricultural tractors of the universal row-crop type with a 4x4 wheel arrangement, the front drive wheels account for 33%, and the rear drive wheels account for 67% of the traction force. When a tractor moves with a load, the adhesion force due to the redistribution of forces acting on the tractor, as a rule, increases on the rear wheels and decreases on the front wheels.

When the tractor moves with a load, under the action of the lugs of the driving wheels, the soil is crushed and moves slightly. In this case, the wheels slip, which leads to a decrease in the forward speed of the tractor and an increase in energy consumption for rolling the tractor. This phenomenon of slipping of the drive wheels when the tractor moves is called slipping.

One of the main ways to reduce slipping and increase the traction force of a tractor is to hang cast iron ballast weights on the rear wheel rims. Moreover, if the tractor works with harrows, seeders and similar machines and implements, then the loads are attached to the right and left wheels. In the case when the tractor is plowing, due to the fact that its right wheel runs along the bottom of the furrow, and it itself is tilted to the right, the distance from the projection of the tractor's center of gravity to the right wheel is smaller, and to the left wheel is greater. As a result, the traction force of the right wheel is greater than the traction force of the left wheel. If we take into account the fact that the left wheel runs on looser soil, where the coefficient of adhesion is lower, and the right wheel runs on the dense bottom of the furrow, where the coefficient of adhesion is greater, then in order to increase the adhesion force on the left wheel, it is necessary to install ballast discs on the left wheel.

To equalize the load balance on the front and front driving wheels and maintain tractor controllability when working as part of an MTA with heavy attachments, front ballast weights are used, which are included in the delivery set of tractors. The quantity of these loads is chosen so that the front axle accounts for at least 20% of the total weight of the MTA.

As the height of the lugs of the driving wheel tires wears out, slipping increases, and when the lugs are worn by 80%, it becomes so great that it leads to a sharp decrease in the productivity of the tractor unit and an increase in fuel consumption. Further use of these tires becomes impractical and they should be replaced with new ones.

Tire air pressure is one of the important factors affecting the slipping of drive wheels. As the pressure decreases, tire deformation increases, and therefore the area of contact between the wheels and the soil increases, which improves their grip. On wet and loose soils, it is advisable to work with reduced tire pressure. However, this method must be used very carefully and reduce the pressure only to the limits limited by the tire manufacturer. When switching the tractor to work on hard ground, the air pressure in the tires should be increased to normal.

Nominal tire pressure when towing a trailer on public roads: in the front - 0.16...0.25 MPa (1.6...2.5 kg/cm$_2$), in the rear - 0.15...0.20 MPa (1.5...2.0 kg/cm2).

Recommended tire pressure for plowing and other work on the soil, MPa (kg/cm$_2$): in the front - 0.14...0.18 MPa (1.4...1.8 kg/cm$_2$), in the rear - 0.10...0.15 MPa (1.0...1.5 kg/cm$_2$).

4.15. Transporting the tractor and towing it

Transportation of tractors is permitted by all types of transport with sufficient carrying capacity to ensure its safety, including railway transport, on cars and on trailers in accordance with the general rules of transportation, as well as towing. During transportation and loading and unloading operations, the tractor should not be subjected to sudden shocks and impacts, and should be protected from external damage. When transporting the tractor over a long distance, it is recommended to drain the fuel from the fuel tank and disconnect the battery.

The placement and fastening of the tractor in the body or on the loading platform of the vehicle must ensure a stable position and the inability to move the tractor during transportation. The platform must be cleared of debris, snow and ice. In winter, sand should be poured under the wheels of the tractor on the platform in a layer of 1...2 mm. When transporting tractors, it is necessary to set the gearbox lever to first gear, engage the parking brake, and securely secure the tractor to the platform with wire with a diameter of 3-5 mm, chains, or guy wires.

The tractor can be loaded and unloaded onto the vehicle platform either under its own power or with the help of a lifting device. When loading and unloading tractors, it is necessary to use serviceable, certified lifting equipment with a lifting capacity of at least 3 tons. Do not use the towbar to lift the tractor. Do not use holes in wheel rims for slinging.

When towing a serviceable tractor as a tractor, it is advisable to use a tractor of equal traction class. When towing a tractor with faulty brakes, the tractor must weigh twice as much as the weight of the tractor being towed. In this case, a rigid hitch should be used. Towing a tractor with an inoperative HPS is permitted only by partial loading. To connect the towing rope, a towing device is installed on the front beam of the tractor.

ATTENTION!
Towing a tractor with faulty steering is prohibited.

The driver of a towing tractor must drive his car smoothly, without sudden braking or turning, without exceeding the set speed, and observe through the rear-view mirror the behavior of the towed machine. It must be remembered that sharp braking can lead to a collision between the towed tractor and the towing one. The driver of the towed tractor must carefully monitor the actions of the driver of the towing tractor, as well as the tension of the cable, preventing it from weakening. Otherwise, the tractor must immediately slow down slightly.

5. Maintenance

5.1. General provisions

Maintenance (TO) is a set of mandatory operations (cleaning, fastening, adjusting components, refueling, checking technical condition, etc.) that ensure good technical condition and economical operation of the tractor for a given resource and prevent the occurrence of malfunctions.

ATTENTION!
Improper tractor maintenance or an unattended malfunction can cause an accident that could result in serious injury or even death.

When starting any maintenance or repair work on the tractor, carefully study the relevant section of this manual, make sure that you have the necessary tools and that you have the appropriate skills.

Before starting work, allow the engine and exhaust system to cool down, as contact with hot parts may cause burns. If you need to start the engine during work, this should be done outdoors or with good ventilation, since carbon monoxide contained in exhaust gases is highly toxic. Do not start the engine unless instructed to do so for the operation being performed, as running the engine increases the risk of injury from moving parts.

Use caution when handling fuel and battery to avoid the risk of fire or explosion. To clean tractor parts, use only non-flammable solvents and detergents and do not use gasoline. Do not approach fuel system components or the battery with a lit cigarette or open flame.

To ensure the best quality and reliability when repairing and replacing components and parts, use only new original parts or their complete equivalents.

Maintenance work is divided into:
- performed when preparing a new tractor for operation, during and after the first 50 hours of operation of the new tractor;
- performed on demand; mandatory (scheduled)
- maintenance during operation.

Maintenance work on a new tractor is carried out once. Work performed as required is carried out depending on the readings of control devices, indicators and objective signs of technical condition. These works are usually carried out during shift maintenance. Scheduled maintenance work is carried out without first checking the tractor.

Seasonal maintenance during the transition to the spring-summer period of operation (TO-VL) is carried out at a steady ambient temperature above 5°C. When transitioning to the autumn-winter period of operation with a steady ambient temperature below 5°C, TO-OZ is carried out. Performing seasonal maintenance can be timed to coincide with one of the periodic maintenance. When operating a tractor in specific conditions (increased dust, rocky and swampy soils, low temperatures, high mountains), the maintenance is supplemented (specified) with the corresponding subsection.

ATTENTION!
It is not allowed to operate the tractor without performing maintenance in full and at specified intervals.

Depending on the operating conditions, deviations from the established frequency are allowed: TO-1 and TO-2 – up to 10%, TO-3 – up to 5%. Shift maintenance and scheduled maintenance-1 and maintenance-2 can be carried out at the place where the tractor is working with its departure to a site that ensures proper cleanliness and is fire-safe. TO-3, TO-VL and TO-OZ are performed indoors or in places that protect the tractor from precipitation and dust.

During seasonal maintenance, it is necessary to replace the oil in the systems and summer fuels with winter grades during TO-OZ, and winter grades with summer grades during TO-VL.

Maintenance work is carried out on a cleaned and washed tractor. At the end of washing, parts, components and assemblies must be blown with compressed air or wiped dry. The operations of washing, draining oil (fuel, antifreeze), and filling tractor systems with fuels and lubricants must be carried out carefully, without polluting the territory (site) where maintenance is carried out. When draining used oils from tractor systems and assembly units, containers (buckets, bathtubs, etc.) should be used to prevent oil from falling on the ground and to ensure that it is drained in full. After finishing work, used cleaning material must be collected and placed in a specially designated place. Drain the used oil into containers designed to collect used oil and then submit it for regeneration. Diesel fuel, kerosene, and gasoline used for washing parts should not be poured out, but rather, without mixing them, poured into specially designated containers for settling, after which they can be reused.

Operations to tighten fasteners with a given torque value must be carried out using torque wrenches.

To carry out maintenance, the tractor must first be cleaned and washed. When washing, do not direct the water stream at air purifiers, appliances, or electrical equipment. Cover the filling necks of the units, starter, and generator with plastic covers. At the end of washing, wipe dry the parts, components and assemblies that are subject to maintenance.

5.2. Maintenance when preparing the tractor for operation

Maintenance when preparing the tractor for the first trip:

- Check the completeness of the tractor and, if necessary, carry out additional assembly.
- Re-preserve external surfaces coated with protective lubricant, remove protective films and coatings. Check the level
- and, if necessary, add oil: into the engine crankcase, into the transmission crankcase; into the FDA housing; into the air filter pan.
- Fill (refuel): the tractor fuel tank with diesel fuel; cooling system - coolant (coolant).

- Install and connect the battery, prepared for operation, to the tractor electrical network.
- Check by external inspection the reliability of fastening of the tractor components, as well as the absence of leaks of fuel, oil, coolant and, if necessary, tighten the fastenings and eliminate leaks.

Maintenance when preparing the tractor for running in:

- Clean the tractor from dust and dirt, remove preservative grease (if present on the tractor). Check the oil level and, if
- necessary, top up the engine crankcase; into the transmission housing; into the FDA housing; into the air filter pan.

- Lubricate: axle bearings; rear linkage shaft bushings.
- Check the battery and, if necessary, clean the terminals from oxides and lubricate them with technical petroleum
- jelly. Check and, if necessary, adjust: the tension of the cooling system pump and generator belts; tractor control mechanisms; tire air pressure; front wheel alignment. Check and, if necessary, tighten external threaded
- connections.
- Fill coolant into the radiator of the cooling system.
- Listen to the engine and check the readings of the control devices for compliance with the standards.

Maintenance during the running-in process:

- Monitor the level and, if necessary, add: oil to the engine crankcase and transmission crankcase, coolant to the radiator;
- Monitor the performance of the engine, controls, brakes, lighting and alarm systems.

Maintenance at the end of the run-in (TO-1N after 50 hours of tractor operation):

- Inspect and clean the tractor.
- Listen to the components of the tractor in operation.
- Check and, if necessary, adjust the belt tension, free play of the clutch and brake pedals.

- Check the battery and, if necessary, clean the surface, terminals, wire tips, and ventilation holes in the plugs.

- Change the oil in the engine crankcase, transmission crankcase, FDA crankcase, and air cleaner sump. Replace the
- engine oil filter elements.
- Check and, if necessary, tighten the external fastenings of the tractor units and parts, including the engine cylinder head bolts; bolts of power transmission housings, rear wheel hubs; nuts securing front and rear wheels.

- Check the level and, if necessary, add coolant to the radiator. Drain the sediment
- from the fuel sediment filter and replace the fuel filter.
- Check and, if necessary, restore the tightness of the air cleaner and engine intake pipes.

- Check the performance of the engine, control systems, and lighting.

5.3. Maintenance under special operating conditions

In dusty conditionsspecial attention must be paid to tightness engine intake tract, clean the engine and transmission surfaces every shift. Once every three shifts, check the electrolyte level in the batteries and, if necessary, add distilled water.

When carrying out maintenance-1 (after 125 operating hours), additionally rinse the fuel tank cap, diesel breathers, hydraulic system breather, transmission and gearbox breather, drain the sediment from the fuel tank and the fuel separator filter.

After 125 operating hours, carry out maintenance of the engine lubrication system and service the engine air cleaner.

At low temperatures In case of long-term parking, remove the battery from the tractor and store it in a warm place. storage. At ambient temperatures below minus 30 °C, use arctic diesel fuel and special grades of oils and lubricants. At the end of each shift, drain the sediment from the fuel tank and fuel separator filter. Fill the cooling system with low-freezing liquid.

In the case of year-round operation of the tractor, it is necessary to carry out seasonal maintenance: winter (TO-z) - when a stable average daily temperature is less than +5 ºC, and summer (TO-l) when a stable average daily temperature is more than +5 ºC. Seasonal maintenance includes maintenance work 1 and, additionally, changing the filling fluids to those appropriate for the season (in the case of using all-season fluids, replacement is not necessary).

5.4. Periodic maintenance

5.4.1. Types of periodic maintenance

The full period of tractor maintenance is 6000 engine hours (see Table 5.1.). After every 6,000 hours of engine operation, the tractor should be overhauled.

Table 5.1.

<table>
<tr><th>View THAT</th><th colspan="48">Number of engine hours worked</th></tr>
<tr><td>TO-1</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td><td>125</td></tr>
<tr><td>TO-2</td><td colspan="4">500</td><td colspan="4">500</td><td colspan="4">500</td><td colspan="4">500</td><td colspan="4">500</td><td colspan="4">500</td><td colspan="4">500</td><td colspan="4">500</td><td colspan="4">500</td><td colspan="4">500</td><td colspan="4">500</td><td colspan="4">500</td></tr>
<tr><td>TO-3</td><td colspan="8">1000</td><td colspan="8">1000</td><td colspan="8">1000</td><td colspan="8">1000</td><td colspan="8">1000</td><td colspan="8">1000</td></tr>
<tr><td>TR</td><td colspan="16">2000</td><td colspan="16">2000</td><td colspan="16">2000</td></tr>
<tr><td>KR</td><td colspan="48">6000</td></tr>
</table>

TO-1 – maintenance No. 1. TO-2 – maintenance No. 2. TO-3 – maintenance No. 3.

TR – current repair. KR - major repairs.

Daily inspection (before starting work and after work)

1. Check for oil, coolant or fuel leaks, and if necessary, repair the leak.
2. Checking the oil levels in the engine, transmission, FDA, and coolant level. If the level of these fluids is insufficient, add them.
3. Refueling after completion of work (fill fuel to a level approximately 25 mm below the fuel tank filler cap).
4. Cleaning the tractor after work (in dusty places, clean the air filter element, remove dry grass, etc. from the radiator, clean the radiator and radiator screen).
5. Check the tightness of external threaded connections (all nuts and bolts must be tightly tightened, especially carefully check the mounting bolts of the front and rear wheels).
6. Check tire pressure and, if necessary, adjust pressure.
7. Check the free play of the brake and clutch pedals.
8. Checking the electrolyte level in the battery (if it is below the specified level, add distilled water).

TO-1 (every 125 operating hours)

1. Carrying out ETO work.
2. Cleaning (replacing) the air filter filter element, cleaning the filter housing from the inside.
3. Clutch adjustment.
4. Topping up coolant (in cold weather, check the specific gravity of the mixture of water and antifreeze).
5. Check the radiator and water pipes for damage and leaks.
6. Tightening the nuts and bolts of fastening systems and components of the tractor.
7. Checking the axial play of the front hub.
8. Cleaning the fuel filter.
9. Checking and filling electrolyte into the battery.

TO-2 (every 500 operating hours)*

1. Carrying out ETO and TO-1 work.
2. Changing the engine oil (the engine oil should be changed during maintenance-1N after the first 50 hours of operation, the second change should be carried out after the next 125 hours, and subsequently change the oil every 500 hours of operation).
3. Replacing the engine oil filter.
4. Checking the specific gravity of the battery electrolyte.
5. Cleaning the fuel filter.

TO-3 (every 1000 operating hours)

1. Carrying out ETO, TO-1 and TO-2 work.
2. Changing the oil in the transmission crankcase.
3. Changing the oil in the FDA crankcase.
4. Cleaning the filter of the HNS system.

TR (every 2000 operating hours)

1. Carrying out work on previous types of maintenance.
2. Replacing the coolant.
3. Replacing the fuel filter.
4. Cleaning the outer surface of the radiator.
5. Checking (with partial or complete disassembly) the condition and performance of the engine; lubrication, power supply systems (including valve clearances, injector condition and fuel injection pressure) and cooling systems; transmission units, chassis, hydraulic suspension system; electrical equipment. Restoration or replacement of damaged and worn parts and assemblies.

KR (every 6000 operating hours)

When overhauling a tractor, the components and assemblies of the tractor are tested using special equipment; complete disassembly, troubleshooting and replacement of parts and assembly units that are not suitable for further use; assembly in accordance with the technical processes of the manufacturer using factory technology. When the repair is carried out at the Supplier's service center, a guarantee is given for the units and components that have been repaired.

TO-1 and TO-2 are recommended to be carried out in stationary conditions, but they can be carried out in places where the tractor is parked using mobile maintenance units.

TO-1N, TO-3, seasonal maintenance, TR and KR of tractors must be carried out in stationary conditions at repair shops, stations or maintenance points.

During the warranty period, all types of periodic maintenance must be carried out only in service centers or (if it is impossible to deliver the tractor to the service center) - with the involvement of service center specialists, directly at the places where the tractor is used, if the required conditions exist there.

In order to record and control compliance with the frequency of maintenance, as well as to maintain the right to warranty service for a new or overhauled tractor, the tractor owner must maintain a tractor maintenance schedule (attached as part of this Operation Manual). Notes on scheduled maintenance are made by a representative of the service center and certified with a seal.

5.4.2. Table of frequency of a number of maintenance works

Table 5.2.

No.	Unit, material, operation	Interval (every X operating hours)				
		TO-1N X = 50	TO-1 X = 125	TO-2 X = 500	TO-3 X = 1000	TR X = 2000
1	Engine oil	**Z**	**P**	**Z**	**Z**	**Z**
2	Transmission housing oil	**Z**	**P**	**P**	**Z**	**Z**
3	Oil in the FDA crankcase	**Z**	**P**	**P**	**Z**	**Z**
4	Oil in the oil bath of the air filter	**P**	**Z**	**Z**	**Z**	**Z**
5	Engine lubrication filter	**Z**	**-**	**Z**	**Z**	**Z**
6	Fuel filters	**OZ**	ABOUT	**O(Z)**	**Z**	**Z**
7	Air filter element	ABOUT	ABOUT	ABOUT	**O(Z)**	**Z**
8	GNS filter	**-**	**P**	**P**	**Z**	**Z**
9	Coolant	**Z**	**P**	**P**	**P(Z)**	**Z**
10	Cooling system radiator	**OP**	**OP**	**OP**	**OP**	**OP**
eleven	Battery, specific gravity of electrolyte and charge amount	**OP**	**OP**	**OP**	**OP**	**OP**
12	Injectors, condition and injection pressure	**P**	**OP**	**OP**	**OP**	**OP(G)**
13	Valve clearances	**P**	**-**	**-**	**P**	**P**
14	Alternator and water pump drive belts	**P**	**P**	**P**	**P(Z)**	**Z**
15	Clutch – pedal free play, discs	**P**	**P**	**P**	**P**	**P(Z)**
16	Brakes – pedal free play, linings	**P**	**P**	**P**	**P(Z)**	**Z**
19	Wheels and tires	**P**	**P**	**P**	**P**	**P(Z)**
20	Tightening nuts and bolts of fastening systems and tractor units	**P**	**P**	**P**	**P**	**P**

Z- Replacement **ABOUT**– Cleaning **P**- Examination

The replacement, cleaning and inspection intervals given in the table refer to tractor operation under normal conditions and are the maximum possible. If operating conditions worsen, it is necessary to shorten these intervals and carry out maintenance depending on the operating conditions of the tractor in such a way as to guarantee its operability. When using high-quality all-season filling fluids, their replacement intervals can be increased in accordance with the recommendations of the manufacturers of these fluids/

5.5.1. Fuel system maintenance

The design of the engine power system is described in paragraph 3.4. this manual.

Fuel system maintenance operations include:
- checking the condition of low and high pressure fuel lines and their connections; checking
- the operation of the boost pump;
- checking the functioning and performance, adjusting the injection pump and injectors;
- draining sludge from the settling filter and cleaning the settling filter;
- flushing the fuel tank;
- replacement of the FE fine fuel filter;

Checking the condition of the fuel lineslow and high pressure and their connections is visual inspection of them in order to detect damage and fuel leaks. Low pressure fuel lines are made of special petrol-resistant rubber and are designed for a long service life. However, over time, cracks and mechanical damage may occur on them. If a leak is detected, it is necessary to immediately replace damaged elements and tighten leaking connections, since fuel entering a hot engine can lead to a fire in the tractor.

Checking the operation of the booster pumpdone by unlocking and removing low pressure fuel line from the inlet fitting of the fine fuel filter and pressing the plunger of the boost pump several times vigorously. In this case, fuel should begin to flow out of the fuel line. If this does not happen, you should remove, wash and repair the booster pump, then install it in place, check the operation and securely fix the fuel lines. If the pump cannot be repaired, it should be replaced. Operating the tractor without a booster pump or with a faulty pump is not permitted.

Checking the functioning and performance of the injection pump and injectors, as well as their repair and adjustment are complex technological operations, therefore, in the absence of the necessary knowledge, skills and equipment, they must be carried out in a service center or at a specialized service station.

ATTENTION!
Self-adjustment of fuel equipment by the driver (owner) of the tractor is grounds for voiding the manufacturer's warranty.

You can replace the injectors yourself using a universal tool. Various injector malfunctions, such as wear of the nozzle parts, the formation of carbon deposits on them, weakening of the spring, can cause engine smoking, interruptions, decreased power and excessive fuel consumption. Since the condition of the injectors is one of the main factors affecting engine performance, it is recommended to have a spare set of injectors, previously checked and adjusted, for quick installation on the engine.

Replacement of injectors is carried out in the following sequence:
1. Before disconnecting or loosening any parts of the fuel system, completely clean the surrounding working surfaces.
2. Relieve pressure in the fuel system.
3. Unscrew the union nuts and disconnect the high pressure fuel lines from the injectors and injection pump.
4. Remove the high pressure fuel lines.
5. Unscrew the injector mounting bolts and remove the injectors.
6. Install checked, cleaned and adjusted injectors by performing the above operations in reverse order.

7. Remove air from the fuel system.
8. Tighten all connections securely.

The copper gasket under the injector or under the banjo bolt should be lightly lubricated with grease before installation. The gasket can be used no more than two times, after which it must be replaced with a new or annealed one. The tightening torque of the union nut securing the nozzle is from 45 to 65 Nm (from 4.5 kgf-m to 6.5 kgf-m).

To remove air from the system:

1. Loosen the fine filter plug.
2. Check if there is fuel in the tank.
3. Quickly pump the system with a booster pump until clean fuel without air bubbles comes out from under the plug. Tighten the fuel pump plug.
4. If starting the engine is difficult, loosen the union nuts of the fuel lines of each injector and, turning the engine with the starter for 10...15 s, remove air from the lines, then tighten the union nuts.

5. Check the tightness of all fuel system connections.

Draining sludge from the settling filtercarried out by loosening or completely unscrewing drain plug at the bottom. It is recommended to regularly drain the sediment from the sediment filter, especially if there is reason to suspect the presence of water in the fuel. The sludge must be drained until clean fuel appears without water and dirt, only into a special container and disposed of correctly. The sediment filter should be cleaned by first draining the remaining fuel from the fuel tank. After removing the filter cap, its elements are thoroughly rinsed in kerosene or diesel fuel. After assembling and installing the sediment filter, it is necessary to remove air from the fuel system.

Flushing the fuel tanknecessary in cases where there is reason to believe that it a significant amount of water and dirt has accumulated, or low-quality or unrefined fuel was refueled. The tank is washed only after it is removed from the tractor. It is recommended to wash with kerosene or hot water with detergents and then thoroughly dry the tank by blowing with compressed air or heating. After installing the tank and securing the fuel lines, it is necessary to fill the tank with fuel and remove air from the fuel system.

Replacing the fine filteralso possible only when the fuel has been drained from the tank. After replacement FE, assembling the filter and securing the fuel lines, it is necessary to remove air from the fuel system.

5.5.2. Air filter maintenance

The T220 / T224 / T244 tractors are equipped with inertia-oil type air filters with wire packing (see Fig. 5.1.).

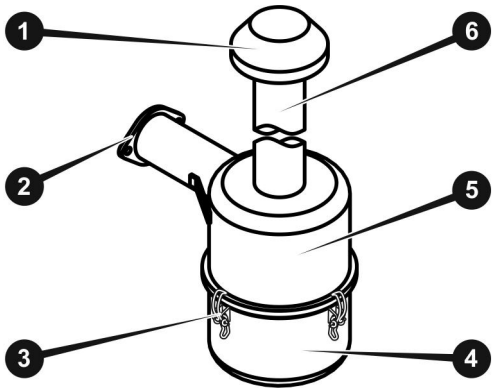


Figure 5.1. Air filter

1. Coarse air filter.
2. Connecting flange.
3. Latch.
4. Air cleaner tray.
5. Air cleaner housing.
6. Air intake pipe.

Filters of this design work well in conditions of heavy dust, but they require constant monitoring and fairly frequent cleaning. It is necessary to monitor the oil level in the filter pan and the degree of contamination every 10 operating hours, and if necessary, add oil or replace it.

ATTENTION!
Do not overfill the pan with oil above the mark, as this may lead to oil entering the engine combustion chambers and creating a false impression of increased oil consumption due to waste.

The filter is cleaned and checked monthly. To do this you need:

1. Unlock the three pallet fastening latches and carefully remove the pallet;
2. remove the wire FE;
3. wash the FE in kerosene or white spirit and dry thoroughly;
4. clean the inside of the filter housing from deposits using a rag soaked in kerosene or white spirit;

5. drain the contaminated oil from the filter pan, rinse the pan with kerosene or white spirit and dry thoroughly;
6. pour clean oil into the filter pan up to the mark (approximately 0.6 l);
7. Insert the cleaned PV into the filter housing, install the tray and secure the latches.

5.5.3. Engine lubrication system maintenance

Maintenance operations for the engine lubrication system include:

- monitoring the oil level in the crankcase and pressure in the lubrication system;
- Change of oil;
- replacing the oil filter;
- flushing the system.

The oil level in the engine crankcase is monitored using a dipstick located on the left side of the engine in the lower part. The oil level mark should be between the “MIN” and “MAX” marks. In this case, the tractor must be installed on a horizontal, level area with the engine turned off and the parking brake on. The measurement can be performed at least 10 minutes after the engine has been turned off, so that the oil has time to drain through the lubrication channels down into the crankcase.

If the oil level is below the “MIN” mark, add oil to the required level. If the oil level is above the mark, it is necessary to reduce it by removing the excess using a syringe or draining it through the drain plug in the bottom of the crankcase. Filling and topping up oil can be done through the neck on the valve box cover (see Fig. 3.4. and 3.5.).

The characteristics of the oils used in the lubrication system must correspond to the operating conditions of the engine and the ambient temperature. For T220 / T224 / T244 tractors, the following types of motor oils are available.

Oils according to the classification of CIS countries: M-8G2, M-8D2 for the winter season and M-10G2, M-10D2 for the summer season. Oils according to SAE classification: SAE 10W, SAE 15W for the winter season, SAE 30, SAE 40 for the summer season, SAE 5W-30, SAE 10W-30, SAE 10W-40 as all-season.

Used oil is replaced in the following order:

ATTENTION!
When changing oil, be careful to avoid burns from hot oil. Drain the oil into a special waste oil container and dispose of it properly afterwards.

1. Warm up the engine to normal operating temperature (at least 70 °C).
2. Place the tractor on a level area, turn off the engine, leaving the handle of the silencing mechanism in the “off” position, and brake the tractor with the parking brake.
3. Place a container for used oil under the drain plug.
4. Remove the oil filler cap, unscrew the drain plug and drain the hot oil into the prepared container.
5. Using an electric starter, crank the engine for 2-3 seconds.
6. Allow the oil to drain completely from the crankcase.
7. Replace the drain plug and fill in fresh, clean engine oil with characteristics corresponding to the current season through the oil filler neck until the “MAX” mark on the dipstick is reached.
8. Replace the filler cap.
9. Start the engine and let it run for 1-2 minutes.
10. Turn off the engine, 10 minutes after stopping the engine, check the oil level with a dipstick.
11. If necessary, adjust the oil level in the engine crankcase in one direction or another by adding or removing it from the crankcase.
12. Check that the drain plug is securely tightened and that there is no oil leakage through it.

In case of significant contamination of the engine oil (and therefore the entire lubrication system) with wear products of moving engine parts, as well as when changing the type of oil being filled, it is necessary to flush the lubrication system.

Flushing the lubrication system is performed in the following order:

1. Perform steps 1-6 of the oil change operation.
2. Remove the oil filler cap and fill the crankcase with diesel fuel to approximately the “MIN” mark on the dipstick.
3. Start the engine and let it run for 2 - 3 minutes at medium speed, observing the pressure in the lubrication system, which should be at least 300 - 400 kPa (0.3 - 0.4 kg/cm$_2$).
4. Perform steps 7-12 of the oil change operation.

Simultaneously with the oil change, the FE oil filter of the lubrication system is replaced, which is located on the left side of the engine crankcase (see Fig. 3.7.). Replacing the FE is carried out after draining the used oil and flushing the system (if any), before adding fresh oil.

When installing the filter housing after changing the PV, the rubber sealing gasket must be lubricated with engine oil, after the gasket touches the housing, tighten the filter another half turn, install the filter on the housing only by hand.

A valve-regulator of oil pressure in the lubrication system is installed on the filter housing. After changing the oil, it is necessary to start the engine at medium speed and by rotating the head of the control valve set the operating pressure in the lubrication system in the range from 300 kPa to 400 kPa (0.3 - 0.4 kg/cm$_2$).

After changing the oil, you need to start the engine and let it idle for several minutes, then measure the oil level with a dipstick and, if necessary, add the missing oil.

5.5.4. Changing the oil in the transmission crankcase

All elements of the power transmission of the T220 / T224 / T244 tractors are structurally assembled into a single transmission unit with a common crankcase, from which oil is taken to lubricate them. In addition, oil from this volume is used as a working fluid for the hydraulic drive of the mounted system and the drive of the hydraulic equipment of aggregated machines, which places additional demands on it. At the same time, the service life of the oil in the transmission crankcase significantly exceeds the duration of one season. Therefore, for filling into the transmission crankcase, it is recommended to use all-season universal oils of the API-GL5 class with friction modifiers, intended for tractors and agricultural machinery, which make it possible not to have to replace them due to the change of season.

In accordance with the CIS interstate standard GOST 17479.3-85, mineral oils of group “B” with antioxidant, anti-corrosion and anti-wear additives, which also contain thickening and anti-foam additives, are recommended for the hydraulic system of tractors. Oils of group “B” correspond to group “HV”, and oils of group “B” with thickening additives added to their composition correspond to group “HM” according to the ISO 6743/4-82 classification system. Thus, it is recommended to use hydraulic oils: MG-15-V(s) - low-viscosity oil, trademark VMGZ (TU 38.101479-86), which has a mineral base, contains antioxidant, anti-wear and anti-foam additives, and is thickened with a polymethacrylate additive. The oil is intended for hydraulic drive systems of tractors operating outdoors at temperatures in the working volume of the oil from -40 °C to +50 °C depending on the type of hydraulic pump.

To change the oil, you need to start the tractor and drive 300-500 meters to warm up the oil. Immediately after stopping the tractor, until the oil has cooled down, it is necessary to unscrew the drain plug in the lower part of the transmission housing and drain the oil into a previously prepared container. After this, you need to replace the oil filter and fill in new oil. The drained oil must be disposed of.

After changing the oil, you need to start the engine and drive the tractor a few tens of meters, then measure the low level with a dipstick and, if necessary, add the missing oil or drain the excess oil.

5.5.5. Changing the oil in the FDA crankcase

The FDA crankcase must be filled with transmission oils that meet the parameters. The procedure for changing the oil in the FDA crankcase is in many ways similar to the procedure for changing the oil in the transmission: after warming up the oil in motion with the FDA drive engaged at a distance of 300-500 m, set the tractor on a horizontal surface, unscrew the FDA crankcase cover (see Fig. 3.8.), unscrew plug in the lower part of the FDA housing and drain the oil into a previously prepared container. After this, unscrew the oil drain plugs from the right and left cams of the front axle and drain the remaining oil from them.

Since oil filtration in the FDA is not provided, if necessary, you can wash the FDA cavities by filling in diesel fuel as a flushing fluid and driving with the FDA drive mechanism turned on for a distance of 500...1000 m, after which the flushing fluid must be completely drained before it cools down and poured into FDA crankcase fresh oil. The drained flushing fluid and oil must be disposed of.

5.5.6. Cooling System Maintenance

Indicators of the technical condition of the cooling system are: the presence,

- composition and level of coolant;
- tightness of components, pipelines and connections;
- radiator cooling capacity;
- fan belt tension; serviceability of the
- steam-air valve; Thermostat
- serviceability;
- serviceability of the pump (pump);
- condition of the sealing gasket and cylinder head; thickness of
- scale on heating surfaces.

When carrying out maintenance, first of all, it is necessary to clean the radiator from dust, dirt and plant debris (when operating the tractor on marshy soils, clean it every shift), check by external inspection the tightness of the system components and connections, and, if necessary, eliminate leaks and malfunctions. Then check the coolant level in the radiator and top up if necessary. During operation, the coolant level must not be allowed to drop more than 100 mm from the upper edge of the filler neck.

ATTENTION!
Only clean and soft water can be added to the cooling system through a funnel with a mesh. Before pouring, hard water should be softened by boiling or adding 10...12 g of soda ash (Na_2CO_3) per 10 liters of water.

When using water as a coolant during periods when the ambient temperature is below 0 °C, it is necessary to drain the water from the system into a clean container at the end of the shift so that it can later be poured back into the cooling system. Water should be changed as rarely as possible. When switching to operation in autumn-winter conditions, it is recommended to fill the cooling system with a liquid that does not freeze at low temperatures (antifreeze), for example OZh-40, OZh-65. The optimal coolant for a diesel engine is antifreeze: it does not contain any mineral additives or active substances that react with the cooling system and disable it.

ATTENTION!
Oil must not be allowed to enter the cooling system, since even in small quantities it forms a film on the walls of the engine water jacket, which impairs the transfer of heat from the cylinder walls to the coolant.

ATTENTION!
When using ethylene glycol-based coolants, remember that ethylene glycol is poisonous and can penetrate the body even through the skin. If ingested, the lethal dose for humans can be as little as 35 cm h. It must be kept out of the reach of children; spilled ethylene glycol poses a certain danger to animals.

Insufficient fan and water pump belt tension leads to engine overheating and increased belt wear. A belt that is too tight will cause the water pump bearings to wear out quickly. To check the tension, grab the belt with your hand on its largest branch and press with a force of about 40 N (approximately 4 kg). In this case, the belt deflection should be from 10 to 15 mm. If the belt tension is insufficient, the water pump will not work efficiently: coolant will not be pumped throughout the entire cooling system, which can lead to overheating. In case of delamination, significant elongation or breakage of the belt, it must be replaced immediately.

The water pump of the cooling system is equipped with bearings and a mechanical seal that do not require maintenance during the entire period of operation.

The coolant must be periodically changed and the cooling system flushed, as rust and dirt form in the system channels. The coolant is replaced on a cold engine. Avoid getting coolant on painted body surfaces and clothing.

Coolant replacement procedure:

1. Remove the plug from the radiator filler neck.

ATTENTION!
If you try to open the radiator cap immediately after stopping the engine, you may be burned by hot steam. In this case, you must use a protective glove.

2. Place a container under the radiator, open the drain valve and drain the coolant.
3. Place a container under the cylinder block, open the drain valve and drain the coolant from the cylinder block jacket through a special pipeline. In this case, to completely drain the coolant, you can start the engine for a short time (1-2 minutes).
4. If necessary, flush the cooling system. To do this: close the drain valves, fill in flushing fluid instead of coolant, start the engine and let it run for 20 to 60 minutes (the dirtier the drained coolant was, the longer it takes to flush the system), stop the engine, drain the flushing fluid, flush the system clean water.

5. Fill the radiator of the cooling system with fresh coolant through the neck.
6. Start the engine, add coolant to the radiator as it spreads through the system until a stable level is established.

5.5.7. Brake service

The rear wheel drum brakes are a reliable means of slowing down and stopping the MTA. With proper use, they can last a long time without repair or replacement.

Brake maintenance on tractors T220 / T224 / T244 includes adjusting the free travel of the pedals, synchronizing the operation of the brakes of the right and left rear wheels, and replacing the brake linings as they wear out.

While the tractor is moving, the brakes should not jam (when braking) or heat up (off). The effectiveness of the brakes is determined using control braking. When turned on, the brake must stop the MTA running at a speed of 20 km/h on a dry concrete (asphalt) road over a section up to 6 m long. The left and right brakes must brake equally effectively, and in a locked state - simultaneously, otherwise the tractor may skid when braking and it will capsize.

The free play of the pedals should be 20...30 mm. The pedal travel is adjusted by changing the length of the brake rod (see Fig. 5.2.). To do this, you need to unscrew and remove one of the brake rod mounting axles (front or rear), loosen the lock nut and change the length of the rod by screwing or unscrewing the eye along the threads on the rod rod, then tighten the lock nut, insert it into place and cotter the rod mounting axis.

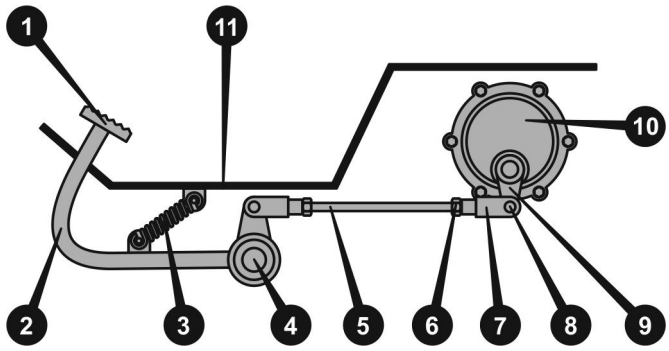


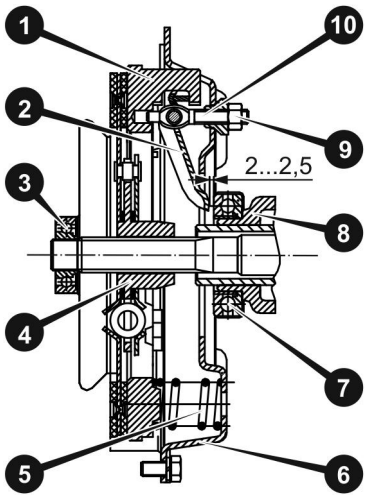
Figure 5.2. Brake drive adjustment diagram

1. Brake pedal.
2. Brake pedal lever.
3. Return spring.
4. Transverse brake shaft.
5. Brake rod of adjustable length.
6. Lock nut.
7. Brake rod eye.
8. Brake rod mounting axis.
9. Brake drum lever.
10. Brake drum housing
11. Tractor cabin floor.

To replace the brake linings, you must first remove the corresponding rear wheel and the wheel fender. Then unscrew and remove the adjustable rod, unscrew the bolts securing the brake drum housing cover, disconnect and remove the brake mechanism. Further actions to replace worn brake linings should be carried out by a qualified specialist at a service station or service center. Reassembling the brakes is carried out in the reverse order.

5.5.8. Clutch maintenance

The T220 / T224 / T244 tractors use a dry type, single-disc, permanently closed clutch. In order to ensure normal operation of the clutch, the gap between the working surface of the release lever and the end surface of the release bearing should be 2...2.5 mm (see Fig. 5.3.), and there should not be a difference in gaps for all lever heads more than 0.2 mm.



1. Drive disk.
2. Release lever.
3. Bearing.
4. Driven disk.
5. Spring.
6. Clutch housing.
7. Release bearing.
8. Distribution bearing strut.
9. Fixing nut.
10. Adjustment screw.

Figure 5.3. Single-plate clutch

During the operation of the tractor, due to the gradual wear of the clutch friction lining discs, the gaps gradually decrease and even disappear. Therefore, the clutch should be checked and adjusted regularly: first, after the first 50 operating hours of the tractor, and then every 125 operating hours.

Normal clutch operation is also ensured by the presence of free play in the clutch pedal, which is set within 23 to 26 mm. The need to adjust the clutch control drive arises only in cases of replacing the engine, clutch or parts of the clutch control drive.

It is recommended to carry out all work on adjustment and repair of the clutch mechanism in service centers, specialized service stations or with the help of a qualified specialist.

5.5.9. Tire service

The technical condition of tractor tires is characterized by the presence of damage on their surface, as well as the degree of wear of the tread (lugs). In case of through damage or when the wear limit of the lugs is reached, the tires must be replaced. The limiting wear of the tread lugs should be understood as wear at which the traction power of the tractor cannot be realized due to increased slip. When operating a tractor with tires whose wear exceeds the maximum limit, productivity decreases by 10-11%, and direct costs increase significantly. For a herringbone tread, the wear limit is 80% of the lug height of the new tire.

The air pressure in the tires must be systematically checked and, if necessary, adjusted to the required level. You need to measure the pressure on cold tires. When tires operate with increased internal air pressure, the cord threads experience high tension, so when hitting an obstacle, the carcass may rupture. Working with low internal pressure leads to significant deformation of the tire, from which, during movement, the cord threads experience either tension, compression and bending, which causes fatigue failure.

ATTENTION!
It is necessary to protect tires from getting fuel and lubricants on them, as they dissolve the rubber!

5.5.10. Electrical equipment maintenance

Maintenance of tractor electrical equipment or its repair in some cases involves removing the corresponding devices from the tractor or partially disconnecting them from the wiring. In this case, it is necessary to stop the engine and de-energize the tractor.

With proper operation and the absence of overloads, maintenance of electrical equipment on tractors comes down to a few simple operations: timely cleaning of electrical appliances and batteries, monitoring the charge and condition of the batteries (when using serviced batteries), timely replacement of burnt-out light bulbs in lighting and signaling devices, replacement of generator carbon brushes as required. their wear, monitoring the performance of electrical devices and sensors, monitoring the integrity of electrical wiring and the reliability of connections of terminals and detachable contacts.

ATTENTION!
It is not allowed to: change the polarity when connecting the battery; wash the generator, starter, battery with diesel fuel, gasoline, or a jet of water under pressure; even short-term short-circuit the generator outputs to ground.

The generator and electric starter do not require adjustments or lubrication during operation. Starter maintenance involves maintaining general cleanliness, checking the reliability of fastening and the condition of the terminals. To ensure normal operation of the generator, it is necessary to keep it clean, periodically check the tension of the drive belt, the fastening of the generator and connecting wires, the condition of the terminals, cleaning them from oxides as necessary (after disconnecting the battery). To check the voltage level of the generator, it is necessary to connect a voltmeter (not lower than the second accuracy class) between the “+” terminal of the generator and the “ground” of the tractor, start the engine and set the crankshaft speed close to the nominal one. When operating a generator with a battery, the voltage should be within 13.0...14.0 V. Connect and disconnect the voltmeter only with the engine stopped. If the generator, electric starter, voltage regulator and other electrical appliances fail, they should be repaired in workshops with special equipment.

Battery maintenance is performed in accordance with the manual for this battery. It is necessary to regularly clean the battery case, oxidized terminals and wire tips and lubricate them with a thin layer of technical petroleum jelly. The battery on the tractor should be in a state close to fully charged; a discharge of more than 50% in summer and 25% in winter is not allowed.

6. Tractor storage

During breaks between field work, as well as while waiting for repairs or in any other cases, the tractor is put into storage: inter-shift - duration up to 10 days, short-term - from 10 days to 2 months, long-term - more than 2 months. In this case, it is necessary to create such conditions so that its parts are not exposed to moisture, sun, low or high ambient temperatures and do not collapse prematurely. The greatest damage is caused by moisture (rain, snow), which settles on the surface of metal parts and causes them to corrode, so the tractor must be stored indoors or under a canopy. It is allowed to store the tractor in an open equipped area, subject to mandatory conservation, sealing and removal of components that require storage; the tractor storage location must be protected from snow drifts. The more thoroughly a tractor is prepared for storage, the longer and more reliably it operates and the fewer spare parts are required for repairs.

The tractor is placed for inter-shift and short-term storage immediately after completion of work, and for long-term storage - no later than 10 days from the date of completion of work. The condition of the tractor during storage should be checked indoors at least once every 2 months, in open areas and under a canopy - monthly. During the storage period, check: the tightness of the closure of the caps on the filler necks of the tractor units; condition of anti-corrosion coatings (presence of protective lubricant, integrity of paint, absence of corrosion); air pressure in tires, integrity and reliability of fastening of protective covers. Elimination of detected deficiencies should be carried out immediately.

Preparing the tractor for inter-shift storage consists of carrying out the next maintenance, installing the tractor at the storage location and disconnecting the battery (the more thoroughly the tractor is prepared for storage, the longer and more reliably it works and the fewer spare parts are required for repairs). All filler necks of tractor units must be tightly closed with lids. Inter-shift storage of tractors is allowed directly at the work site.

Preparing the tractor for short-term storage:

- clean and wash the tractor (do not direct a stream of water at air cleaners, instruments and elements of electrical equipment, filling necks of units, starter, generator, cover with plastic covers before washing), after cleaning and washing, blow off the tractor with compressed air to remove moisture; carry out regular maintenance operations;
-
- disconnect the batteries; batteries are stored in accordance with their operating instructions;

- clean areas of metal corrosion, restore damaged paint on the tractor; preserve the threaded surfaces of the filler
- necks and the outer surfaces to be preserved by applying PVK lubricant, heated from plus 60 to plus 80 ° C, with a layer thickness of 0.5 to 1.5 mm; you can also use the wax composition ZVV-13 and other materials;

- lubricate tools and accessories with protective lubricant;
- starter, engine breather, transmission and hydraulic system filler necks, generator, wrap in waxed paper in two layers and tie with twine; when storing the tractor in conditions of high humidity, additionally wrap with plastic film and cover with adhesive tape;
- set the levers and pedals of the control mechanisms to a position that prevents arbitrary movement of the tractor.

Preparing the tractor for long-term storage indoors and under a canopy: bring all

- components and assemblies of the tractor into technically sound condition; perform operations
- to prepare for short-term storage;
- Raise the tractor and place it on stands so that the clearance between the tires and the surface of the platform is 80...100 mm.
- fill all filling containers, except the cooling system, to the upper level (it is recommended to use working fluids with anti-corrosion additives);
- drain the coolant from the engine cooling system and fill the system with antifreeze or preservative solution;

- loosen the tension on the fan and generator drive belts, wash the belts with warm soapy water, dry them and powder them with talcum powder.

Long-term storage in open areas requires the following additional work:

- thoroughly clean and rinse the air purifier, pour working conservation oil into the pan; carefully seal all openings in
- the components and assemblies of the tractor - muffler, air cleaner, breathers, fluid couplings, etc.

- remove, prepare for storage and put away the generator, starter, fan and generator drive belts, spare parts, and, if possible, rubber and plastic structural elements; coat the working surfaces of the fan and generator drive pulleys
- and other external unpainted surfaces of engine parts with protective lubricant;

- wrap undismounted flexible pipelines with wax paper;

When storing the tractor without stands, the tire pressure should be increased by 15...20%, and when stored on stands (stepladders, trestles) it should be reduced by 20...30% of the normal value. The surfaces of tractor tires must be coated with wax or a protective compound, for example a mixture of aluminum powder and white spirit in a ratio of 1:5.

When removing the tractor from storage:

- re-preserve external surfaces coated with a protective lubricant by wiping the surfaces with a rag moistened with white spirit or another suitable solvent and wiping dry;
- remove waxed paper or film protection from mechanisms and other places wrapped during conservation;

- install the removed components on the tractor;
- charge and install the battery;
- fill the tractor mechanisms and systems with fuel, oil and coolant; check the operation and
- regulation of the tractor mechanisms.

7. Possible malfunctions and ways to eliminate them

ATTENTION!
Failure to timely detect and eliminate even minor damage and malfunctions can lead to serious breakdowns and failure of units during operation of the tractor. Operation of the tractor in a faulty condition is grounds for termination of the warranty.

7.1. Engine

Table 7.1.

Signs malfunctions	Possible reason malfunctions	Remedy malfunctions
The engine is not starts	Filter elements are clogged fuel filters	Clean the fuel filters. Replace if necessary filter elements
	Fuel lines are clogged (in winter, ice jams may form)	By sequentially disconnecting the fuel pipelines, determine the location of the blockage, rinse and blow out the pipeline, and if ice plugs form, warm the pipeline.
	Air got into the power system fuel	Upgrade system fuel pump manual Pedits.
	The engine oil has become very thick.	Drain part of the oil, warm it up and fill the V system. Start the engine.
	Loose connections, cracks in air ducts in the power system air	Determine the location by inspection or hearing defect and eliminate it.
	The electric starter does not provide the required speed crankshaft	Check the condition of the battery and, if necessary, restart charging.
	Injection pump faulty	Check the fuel injection pump for operability: disconnect the high pressure fuel lines, set the maximum fuel supply and crank the engine crankshaft with the starter. If there is no fuel supply from the pump, contact a service center to repair or replace the injection pump.
The engine develops insufficient power	Poor fuel quality	Replace fuel with recommended one
	Control rods not adjusted Injection pump or fuel injection pump itself	Check and adjust the injection pump control rods or the injection pump itself
	Filter elements are clogged fuel filters	Wash the fuel filters, if necessary, replace the fuel filters elements.
	Filter element clogged air filter	Clean the air filter
	Injector faulty	Remove and check the injectors one by one, Replace faulty injectors.
	Faulty fuel injection pump (plunger stuck, spring broken plunger)	Check the fuel injection pump for operability: disconnect the high pressure fuel lines, set the maximum fuel supply and crank the engine crankshaft with the starter. If fuel supply will not come out of the pump - contact a service center for repair or replacement injection pump
The engine develops insufficient power, smokes black smoke.	Air has entered the fuel system	Remove air from the fuel system
	Filter element clogged air filter	Clean the air filter
	Faulty injector (needle stuck, fuel leaking through spray)	Remove and check the injectors one by one, Replace faulty injectors.
The engine develops insufficient power, white smoke smoke.	Engine not good enough warmed up after starting.	Reduce load and warm up engine
	To the fuel system water got in	Remove water from the fuel system or change fuel

Table 7.1. (continuation)

Signs malfunctions	Possible reason malfunctions	Remedy malfunctions
The engine develops insufficient power, smokes blue smoke	Excess oil in the engine crankcase	Drain off excess oil by installing level at the top mark of the oil dipstick
	High oil consumption due to increased piston wear rings and oil ingress into the combustion chamber.	The engine needs to be repaired.
The engine is going crazy (unauthorized frequency increases crankshaft revolutions).	The regulator is faulty or The fuel injection pump rack is jammed.	Stop the engine immediately and stop fuel supply, load the engine as much as possible, and engage gear. Replace Injection pump.
Oil pressure in lubrication system warm engine low or absent.	Insufficient amount of oil in lubrication system	Add oil to the engine crankcase until required level.
	Oil filter clogged	Replace the oil filter.
	Bypass valve clogged oil pump	Wash the bypass valve without dislodging its adjustment.
	Faulty pressure gauge or sensor oil pressure	Replace pressure gauge or pressure sensor oils
	Limit wear of journal joints crankshaft - bearings"	Contact the service center for engine repair
After starting the engine oil pressure rose and immediately fell	Insufficient oil supply to the oil pump (cold oil)	Drain some of the oil, warm it up and fill into the system. Start the engine.
Pressure gauge needle oil fluctuates	Air leaks in connections oil line.	Eliminate system leaks lubricants
Increase in consumption oils, smoke and pushing gases through prompter	Increased wear of the piston rings and, as a result, oil entering the combustion chamber.	The engine needs to be repaired.
Decrease or absence oil consumption	Fuel getting into the oil through leaks in the connections on the cones of the high-pressure pipes on the side heads	Tighten the high pressure pipe fittings pressure
	Cracks in the nozzle or injector slot filter	Check injectors, faulty replace
	Leakage of the combined fuel drain pipeline from the injectors under the head covers	Check the system for tightness. Eliminate leaks.
Heat Coolant at the outlet from the engine	Insufficient amount of coolant in cooling system	Add appropriate coolant into the cooling system, after cooling the engine
	Dirty radiator	Clean and flush the radiator
	Engine overloaded	Reduce the load, why switch to lower gear and increase frequency rotation of the crankshaft. If the temperature does not decrease, find out the reason.
	Faulty sensor or indicator coolant temperature	Replace sensor or indicator coolant temperature
	A large amount of scale in the system cooling	Remove scale (see point 5) from the system cooling. Fill the cooling system with appropriate coolant (water with a three-component additive or antifreeze).
	Drive is damaged or weakened water pump belt	Replace the drive belt or adjust the belt tension.
	Faulty water pump	Check water circulation. Repair faulty pump or replace.
Coolant leakage into inspection hole water pump	Mechanical seal failure water pump	Replace the water pump.

Table 7.1. (continuation)

Signs malfunctions	Possible reason malfunctions	Remedy malfunctions
Smoky exhaust and the release of drops fuel	Engine waxing due to long-term operation at low coolant temperature	Operate at the maximum permissible engine load at a coolant and oil temperature of at least 75 °C. In the future, do not allow continuous operation of the engine without load for more than 4 hours at coolant and oil temperatures below 75 °C.

7.2. Transmission

Table 7.2.

Signs malfunctions	Possible reason malfunctions	Remedy malfunctions
Clutch slips	Oil from the engine, gearbox or due to excessive lubrication of the thrust bearing gets on the friction linings. release bearing	Replace the driven disc or friction linings. If the oiling is slight, wash the linings in gasoline and clean the working surfaces with fine sandpaper
	Driven disc linings are worn	Replace the driven disk assembly
Incomplete shutdown clutch (clutch "leads")	Increased pedal free play	Adjust pedal free play
	Driven disk deformation	Replace the driven disk.
Noise in the release clutch bearing	Lack of lubrication in the release bearing	Lubricate or replace the release valve bearing.
Increased noise and knocking when the gearbox is running	Wear of gear teeth	Contact a service center to replace worn gears teeth
Won't turn on or turn on with difficulty transmissions in the gearbox, mode switching box	Incomplete clutch disengagement clutch, clutch "drives"	Adjust pedal free play
	The drive adjustment is incorrect or the control drive control couplings are loosened checkpoint	Adjust the control drive gearboxes
Self-shutdown gears in the gearbox, in the mode switch	Worn or chipped teeth gears	Contact the service center for gear replacement
	Gear shift fork bent	Contact the service center for plug replacement
	Damaged axle lock spring gear shift forks	Contact the service center for plug replacement
	Bearing wear	Contact the service center for bearing replacement
Self-shutdown front axle	Bearing wear	Contact the service center for bearing replacement
Increased heating gearbox parts and transmissions	Insufficient or excessive amount of oil in the crankcase transmissions	Bring the oil level to normal.
	Damaged gears or bearings	Contact a service center to replace gears or bearings
Oil leakage from transmission and drive front axle	Seals are damaged or worn, seals, gaskets	Replace oil seals, seals
	Caps are loose bearings	Tighten fastenings
Drive shaft vibration front axle	Deformation of pipes, loosening of tightening fastening bolts	Check for correct assembly and fastening, damaged parts replace
Oil leakage from drive axle hubs	Seals are damaged or worn, seals, gaskets	Replace oil seals, seals, gaskets

7.3. FDA and steering

Table 7.3.

Signs malfunctions	Possible reason malfunctions	Remedy malfunctions
Rapid wear front tires	Discs are severely deformed front wheels.	Roll a deformed disc or replace with a new one.
	The toe angle is broken front wheels.	Adjust front toe-in wheels
	Insufficient for these conditions tire pressure	Raise the pressure in the front tires to recommended according to operating conditions
	Constantly switched on FDA drive	Disable FDA drive
Front wheels swing	Excessive wear worn out bearing front wheel hubs.	Replace the front wheel bearing wheels.
	Sick wear on the steering knuckle support sleeve bearing.	Replace the support sleeve bearing steering knuckle lever.
	Discs are severely deformed front wheels.	Roll a deformed disc or replace with a new one.
Appeared extraneous noise	Loss of clearance or excessive wear of gears or bearings FDA drive	Adjust gaps, replace damaged or worn bearings and gears
Tractor "does not hold the road"	Play in steering rod connections due to loose fastenings swivel joints	Tighten the hinge joints or replaced worn ones connections

7.4. Brake system

Table 7.4.

Signs malfunctions	Possible reason malfunctions	Remedy malfunctions
The tractor doesn't pull well brake drums heat up when fully pedal released	There is no free play of the pedal or a small gap between the brake block and drum.	Adjust the drive mechanism brakes
When you press the brake pedals tractor does not happen.	Severe wear or oiling of the brake friction linings pads	Check the tightness of the seals and the absence of damage on them, if necessary, replace them carefully wash the pads, dry their surface and clean with emery cloth paper.
Ineffective and incomplete braking and the tractor “pulling” to the side when fully pressed on the brake pedal.	The control drives of the left and right brakes of the rear wheels are unevenly adjusted.	Adjust the left and right brakes to synchronous braking.
	Oiling of friction brake pad linings due to oil leakage from under drum seals.	Check the tightness of the seals and the absence of damage on them, if necessary You can replace them, rinse the pads thoroughly, dry their surface and clean with sandpaper.
	Large gap between pads and brake drum.	Conduct adjustment mechanism braking .

7.5. Hydraulic suspension system

Table 7.5.

Signs malfunctions	Possible reason malfunctions	Remedy malfunctions
Hitch mechanism doesn't even rise under light loads.	Very low oil level transmission housing.	Add oil to normal level
	Dirty oil filter hydraulic system.	Replace oil filter hydraulic system.
	Clogged oil line.	Disconnect the oil line and clean it it with compressed air. After installing the oil line, check for leaks at its connection points.

Table 7.5. (continuation)

Signs malfunctions	Possible reason malfunctions	Remedy malfunctions
Hitch mechanism doesn't even rise under light loads.	Faulty gear oil pump	Repair or replace gear oil pump.
	Control valve stuck in hydraulic valve	Disassemble the hydraulic distributor, clean the valves, blow with compressed air.
Hinged mechanism rises only without load or with light load, and with load does not rise, or rises slowly	The oil intake is dirty, inlet or outlet oil lines	Check the oil intake and oil lines. If necessary, disassemble, clean from dirt and blow out compressed air.
	Pressure reducing valve hydraulic system adjusted to very low pressure.	Adjust the pressure relief valve to set pressure.
	Severe gear wear oil pump, low pressure oil in the system.	Repair or replace the gear oil pump.
When rising agricultural the machine, the attachment mechanism rises jerkily or rises very slowly.	Oil filter dirty hydraulic system.	Replace oil filter hydraulic system.
	Faulty gear oil pump.	Repair or replace gear oil pump.
	Very low oil level transmission housing.	Add oil to normal level
After lifting mechanism Doesn't hold weight agricultural machine in a given position, but gradually lowers.	Jamming or damage control valve in hydraulic valve	Repair or replace valve in the hydraulic distributor
	Pressure relief valve damaged	Repair or replace pressure reducing valve
	The seal in the hydraulic drive cylinder of the mounted system is broken	Restore the seal in the hydraulic drive hanging system
	The tightness at the joints is broken oil lines	Check oil lines for missing leaks. If necessary, tighten the fastenings at the oil pipe connection points.
When finding the lever control in position lift, in distributor there is a sharp noise	Lift valve stuck in lift position or open pressure reducing valve.	Disassemble the distributor, rinse and clean it from dirt, blow with a compressed air the oil passages, adjust the relief pressure to pressure reducing valve.
For additional hydraulic outlet no oil supply.	Oil supply channel is closed to additional hydraulic outlet.	Translate flow switch tap oil to the oil supply position additional hydraulic connector
	Jamming or damage control valve in the hydraulic distributor	Repair or replace valve in the hydraulic distributor

7.6. PTO

Table 7.6.

Signs malfunctions	Possible reason malfunctions	Remedy malfunctions
The power take-off shaft is not turns on or not turns off.	Broken fork on/off PTO drive.	Replace the on/off plug PTO drive to a new one.
	Broken fork shaft on/off PTO drive.	Replace the fork shaft turning on/off the PTO drive on new.
During PTO operation, a foreign substance appears in the PTO drive. noise.	Gears or bearings in the PTO drive have failed.	Repair gears or bearings in the PTO drive.

7.7. Electrical equipment

Table 7.7.

Signs malfunctions	Possible reason malfunctions	Remedy malfunctions
When you turn the key ignition electrical system tractor does not turn on	Absent , faulty or fully battery is discharged	Check Availability And charging Battery At necessity – will replace b battery.
	Fuse blown power supply networks	Replace the fuse, having first identified and eliminated its cause. actuation
	No online contact power supply	Check the presence of contact and the reliability of the wire connection power supply
	Oxidized clamps or lugs battery wires	Clean the clamps and tips , pull up their.
The starter does not crank the engine or cranks at low speed	Oxidized clamps or lugs battery wires	Clear clamps and tips , pull up their.
	Defective or completely battery is discharged	Check the condition and charging of the battery. If necessary, charge or replace Battery
	The starter power supply circuit is broken or starter relay	Check and restore the power circuit starter or starter relay
	Low electrolyte level in battery	Bring the electrolyte level in the battery to norms
	Increased voltage drop in starter power circuit	Clean battery clamps, tighten fastening the starter wires.
No lock starter. The starter is not turns off when running engine or turns on automatically when the engine is running (a characteristic grinding)	Central damaged switch (“ignition switch”)	Check the central switch (ignition switch), if necessary – replace it
	There is no voltage in the circuit between the contacts of the starter connectors and retractor relay.	Restore contacts in the starter circuit and in the exhaust electromagnet circuit.
The starter turns off before it starts engine	The relay regulator is faulty	Replace the relay regulator
When the engine is running, the "discharge" indicator lights up. battery"	Drive belt slipping generator	Check Adjust the tension of the belt - Lebanon And it is missing.
	Stuck generator brushes.	Clean the brush holder from dirt and brush dust.
	Faulty generator .	Replace the generator.
	Faulty relay-regulator	Replace the relay regulator
Ammeter constantly shows very big charging current	The relay-regulator is faulty (the adjustment of the regulator is broken voltage)	Replace the relay regulator
	Faulty or discharged battery	Replace or charge battery.
Fast boiling electrolyte in the battery	Increased voltage in the on-board network due to regulation failure voltage in the relay regulator.	Replace the relay regulator
Accelerated battery self-discharge	Contaminated surface battery	Delete dirt With surfaces battery
Some do not light up electric lamps	Burnouts threads incandescent	Replace lamps
	Loose or oxidized contact in lamp socket	Bend the spring contacts, clean the oxidized contact points
	Violation contacts in connections uh electrical networks	Restore broken contacts
	Switch faults or switches.	Replace the switch or switch.
No lamp light "STOP" signal in the rear lanterns during tractor braking.	Broken contacts in the connection of wires with the signal switch "STOP"	Restore contacts to electrical wiring
	Signal switch faulty "STOP"	Replace the STOP light switch.
Lamps are constantly on "STOP" in the rear lights	Switch contact closure "STOP" signal.	Replace the STOP light switch.

Table 7.7. (continuation)

Signs malfunctions	Possible reason malfunctions	Remedy malfunctions
Pointers don't work turns	Fuse blown V result- short circuit V networks.	Fix the problem in electrical networks, replace the fuse b on new.
	Faulty indicator breaker turn signal (turn relay).	Replace turn signal relay
The buzzer does not sound and does not consume large amounts of current	Contact sintering or breakage insulating (textolite) plates.	Replace the sound signal with a working one
	Relay fuse blown signal	Determine the cause (possibly a short circuit) that caused the fuse to burn out and eliminate it fault and insert a new one fuse.
	Broken signal power wires or poor contact in places their connections	Check electrical wiring restore contact
	The adjustment of the signal breaker contacts is broken (no contact)	Adjust breaker contacts
The beep sounds but the sound is hoarse	Contact adjustment is broken signal interrupter	Adjust breaker contacts
The hour meter does not work when the tractor is running.	Engine hour sensor burnt out	Find out the cause, eliminate the malfunction or replace the sensor.
	Broken sensor connection wires or poor contact in places their connections	Check wiring, repair contact
Pressure gauge needle at running engine and proper lubrication system shows "0".	The connection between the wires, pressure gauge terminals and pressure sensor.	Check the condition of the electrical wiring and reliability of contacts
	There is no power supply to the sensor or pressure gauge terminals	Check the condition of the electrical wiring and reliability of contacts
Pointer arrow coolant temperature at different temperatures engine is deflected to the left all the way or vice versa goes beyond the value of 120 °C (“off scale”)	The connection between the wires, sensor terminals or temperature indicator	Check the condition of the electrical wiring and reliability of contacts
	Temperature sensor faulty	Replace temperature sensor
	Temperature indicator is faulty	Replace temperature indicator