PETERBURGSKY TRAKTORNY ZAVOD

47, Stachek Ave, letter AB, room 615,
St. Petersburg, Russia, 198097
www.kirovets-ptz.com

KIROVETS TRACTORS K-7M TYPE

Operation and Maintenance Manual

7M-00.00.010

2021

In connection with permanent work to improve tractors, increasing their reliability and operating conditions, minor changes not reflected in this manual revision, may be made to the design.

ABBREVIATIONS

Battery – Storage Battery
QRC – Quick Release Coupling
PTO – Power Take-Off
POL – Petroleum, Oil and Lubricants
ICE – Internal Combustion Engine
DMT – Daily Maintenance
SPTA – Spare Parts, Tools and Accessories
RH – Rear Hitch
SC – Short Circuit
GB – Gearbox
Efficiency – Efficiency
PTOM – Power Take-Off Mechanism
CAC – Charge Air Cooler
AOI – Air-Oil Intensifier
HPH – High Pressure Hose
MAINT – Maintenance
MAINT-1 – First Maintenance
MAINT-2 – Second Maintenance
MAINT-3 – Third Maintenance
MAINT-SS – Spring-Summer Maintenance
MAINT-AW – Autumn-Winter Maintenance
Vehicle – Vehicle
Drawbar – Drawbar
CFF – Coarse Fuel Filter
ECU – Electronic Control Unit
ECS – Electronic Control System
GPP – Glow-Plug Preheater
EHR – Rear Hitch Position Control System
EHS – Electronic Changeover Valve Section Control System

Revision September 2021

CONTENT

DEAR CONSUMER!

Warranty, maintenance and repair of your tractor shall be carried out only by representatives of the Service Centers of Peterburgsky Traktorny ZavodJSC*.

During the post-warranty period, we also recommend to contact the Service Centers of Peterburgsky Traktorny ZavodJSC.

*The addresses of the Service Centers are specified in the tractor service books and on the website of Peterburgsky Traktorny ZavodJSC

Buying a K-7M type Kirovets tractor, you acquire a modern and high-performance multi-purpose tractor.

Before starting operation of the tractor, it is necessary to familiarize yourself with the materials of this Operating and Maintenance Manual (hereinafter referred to as Manual), which contain information about the tractor design and its technical data, basic rules of operation and maintenance.

Information on the engines YaMZ (Autodiesel PJSC), TMZ (TMZ PJSC), OM460LA (Mercedes) is given in Operating manuals, which are enclosed to the tractors and are an integral part of this Manual.

The contents of the Manual can be found on the website of Peterburgsky Traktorny Zavod JSC (https://kirovets-ptz.com/catalog/kirovets-k7m/#documentation).

If you do not understand any of the information in this Manual, or if you need additional information or support, please contact your dealer.

IT IS NECESSARY TO STORE THE MANUAL IN THE TRACTOR CAB IN THE PLACE PROVIDED FOR STORAGE OF THE MANUAL (POCKET ON THE BACK OF THE DRIVER'S SEAT).

ONLY TRAINED AND CERTIFIED PERSONNEL HAVE THE RIGHT TO OPERATE THE KIROVETS TRACTOR.

Long-term and reliable operation of the Kirovets tractors is ensured under the condition of correct operation and timely maintenance.

Kirovets tractors of K-7M type are manufactured in the following configurations:

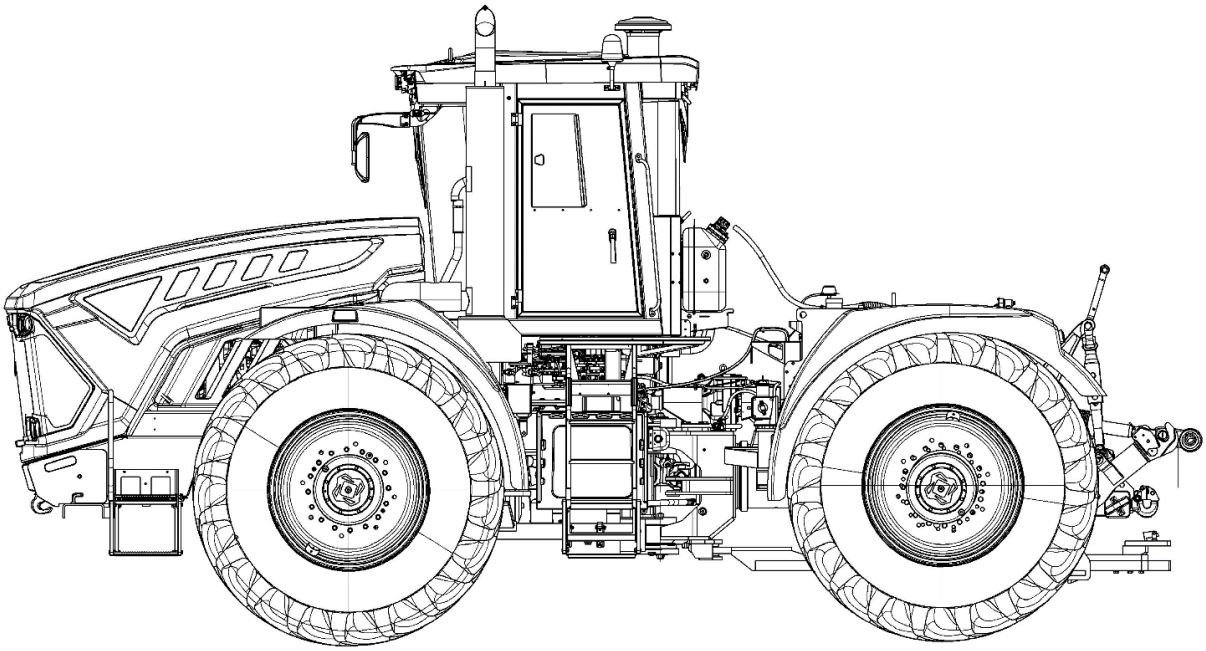
– with YaMZ engines – K-730M St; K-735M St; K-739M St; K-742M St;

– with TMZ engines – K-730M St 1; K-735M St 1; K-739M St1; K-742M St1;

– with OM460LA engines – K-735M Pr; K-740M Pr; K-742M Pr.

1 GENERAL DESCRIPTION AND TECHNICAL CHARACTERISTICS OF THE TRACTOR

1.1 TRACTOR PURPOSE AND SCOPE OF APPLICATION



The general purpose tractors are used for various agricultural operations with mounted, semi-mounted and trailed machines and implements, in the unit with which you can perform plowing, cultivation, harrowing, seeding, shallow plowing, disk tillage, deep plowing, subsoil tillage, snow retention and other types of work.

In addition, tractors can be effectively used in transport operations on field and dirt roads, as well as on paved roads.

Tractors are designed for widespread use in most soil and climatic zones.

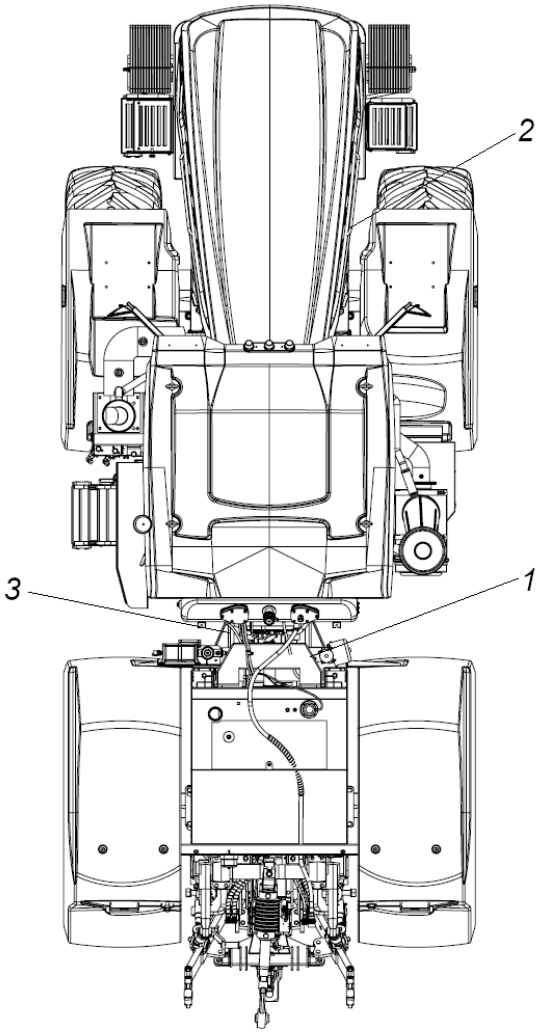
In the text of this Manual, the right and left sides of the tractor refer to the position relative to the operator, sitting in the tractor cab, facing forward, in the engine direction.

The Kirovets tractor is classified as a vehicle with a hinged frame with four drive wheels.

The tractor consists of front and rear semi-frames. The semi-frames can rotate relative to each other around a horizontal and hinges *1*.

An engine, a front axle, a GB and a cab are located on front semi-frame of the tractor *2*. Steering and working equipment pumps are located on the GB.

The rear semi-frame of the tractor *3* is fitted with a rear axle, a fuel tank, a hitch mechanism.



1.2 SERIAL NUMBERS OF TRACTOR PARTS

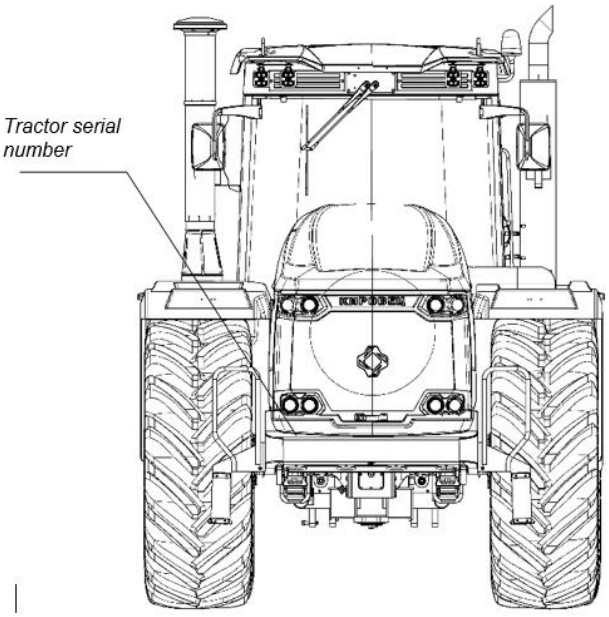
Tractor nameplate indicating the brand and the tractor model, the manufacturer's name, the country of manufacture, the manufacturer's trademark, the serial number and the year of manufacture, is located on the front panel of the tractor cab central part.

The tractor serial number is stamped on the front horizontal surface of the bumper in the right (in the tractor's travel direction) corner. The number includes:

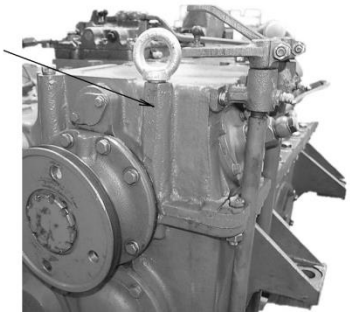
– the first three digits – designation of the year of manufacture of the tractor, starting with “0”;

– the next symbol is the letter designation of the year of tractor manufacture;

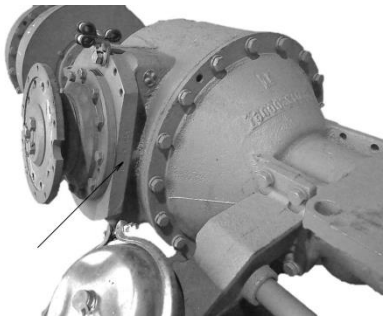
– the next 4 digits are the order number of the tractor manufacture of this year.



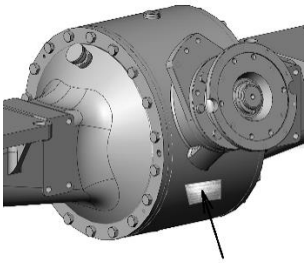
The serial number of the gearbox is stamped on the upper half of the gearbox, in the area of the compressor drive pulley, vertically under the eye nut.



The axle serial number is stamped on the drive gear housing in the area of the inlet flange on the left side (**axles made by PZM LLC**).



The serial number of the axle is stamped on the nameplate fixed to the drive gear housing (**T400 series axles**).



1.3 WARNING STICKERS AND LABELS

Warning stickers and labels are located on the tractor in places of possible danger. All inscriptions and symbols indicated on them shall be legible.

Damaged or missing warning stickers and labels shall be ordered from the dealer and installed at the specified locations.

It shall be installed on the left rear fender near the control buttons of the rear hitch (EHR).

When controlling the rear hitch (EHR), stay out of the area of its movement.

Designation of GB oil-filling neck.

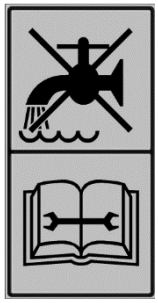
It shall be installed in the area of the hood gas springs.

It shall be installed inside the tractor cab on the front cab post, to the left in the tractor's travel direction.

Before starting work on the tractor, it is necessary to study the section “SAFETY REQUIREMENTS” of this Manual.

Fasten your seat belt while driving.

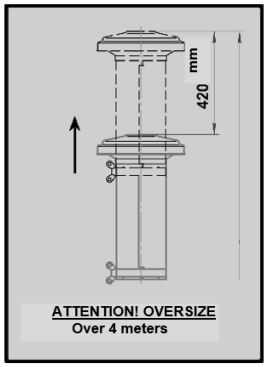
Study the rules for using the parking brake.



It shall be installed at the filler neck of the expansion tank of the engine cooling system.

DO NOT FILL THE ENGINE COOLING SYSTEM WITH WATER.

Itshall be installed on the air intake pipe. It is possible to increase the size of the air intake pipe.



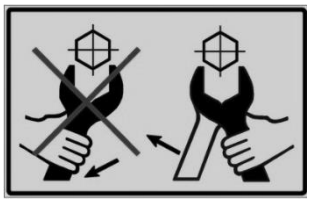
It shall be installed on the planes of the rear fenders.

Do not step on. Slippery.

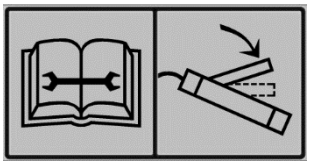
It shall be installed on the plane of the left front fender.

Do not step on the protective casing of the exhaust pipe with your feet.

To prevent turning of HPH and pipes, tighten HPH and valves using two keys.

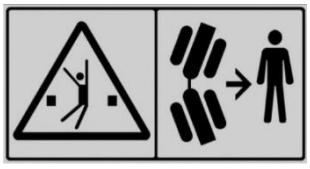


It shall be installed in places of greasing the vertical and horizontal hinges of the frame.

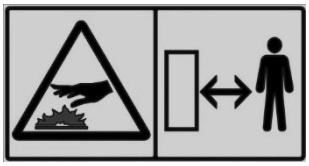


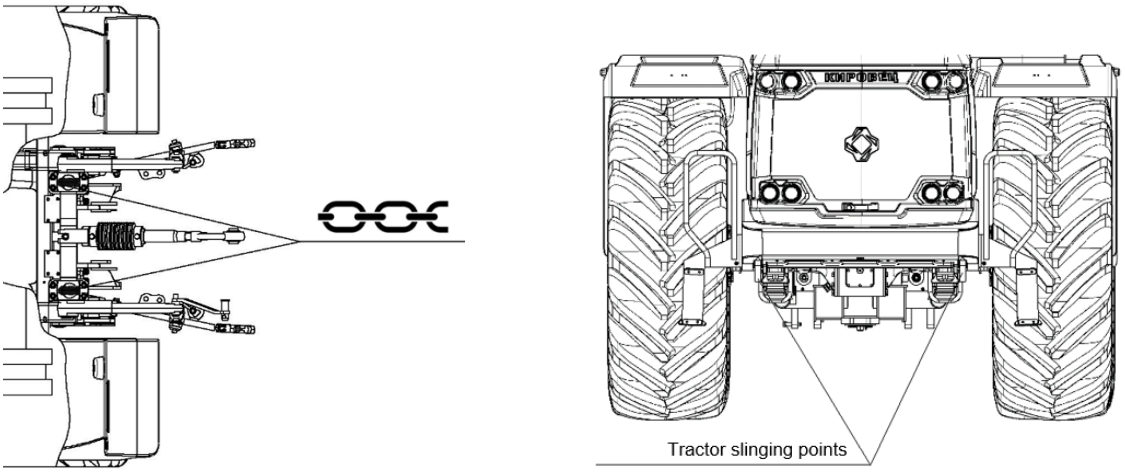
It shall be installed in the area of the frame swiveling device.

IT IS FORBIDDEN TO STAY IN FRONT, BEHIND, UNDER THE TRACTOR, OR IN THE AREA OF THE FRAME SWIVELING DEVICE, WHILE THE ENGINE IS RUNNING.



Burn hazard.



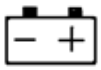


Designation of tractor slinging points

1.4 SYMBOLS

The symbols used on the tractor (instrument panels, fuses, handles for turning on lighting and signaling devices) are shown below.

fuel	parking brake
engine oil pressure	pneumatic system pressure
engine oil temperature	marker lights
emergency engine coolant temperature	front head lighting
emergency engine oil temperature	rear head lighting
engine oil filter	low beam
engine error (for the OM460 engine)	high beam
gearbox oil pressure	N — neutral
gearbox oil filter	R — reverse motion
engine start permit indicator	thermo-start (GPP)


storage battery


heater fan


front washer


front wiper


rear wiper/washer


left turn activation


right turn activation


Alarm


“Road train” sign


sound signal


air filter


emergency hydraulic system oil temperature


braking the trailer


lowering the hitch


floating position of the hitch


PTO is ON


PTO is OFF


deceleration


acceleration


slower


faster


pump capacity adjustment


battery disconnect switch

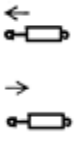
emergency air pressure in the 1st circuit

emergency air pressure in the 2nd circuit


blinking beacon light


lifting the hitch


floating position of hydraulic lines for connecting hydraulic implements


working operations of hydraulic implements

1.5 TRACTOR BASIC TECHNICAL DATA

The basic technical parameters and characteristics of the tractors are given in Table 1.

Table 1

Parameter		Option				
		K-730M St K-730M St 1	K-735M St K-735M St 1 K-735M Pr	K-739M St K-739M St 1	K-740M Pr	K-742M St K-742M St 1 K-742M Pr
Wheel configuration		4WD				
Tractor capacity for hitching in % of the tractor operating weight as per GOST 19677-87, as minimum[3)]		20				
Overall dimensions, mm:	length (with hitch lifted)	7,400±100				
	width (at wheel level)	3,050±100				
	height	3,950±100				
Tractor base, mm		3,750±50				
Tractor track, mm		2,940				
Road clearance under the drive gear of the drive axle (at static radius of tires 887 ± 22), as minimum:		520				
Smallest diameter of rotation circle, mm, as maximum		13,821				
Overall diameter of rotation circle, mm		14,196				
Maximum fordable depth, m, as maximum		1.0				
Tractor weight, kg, as maximum[2)]:	structural (in basic configuration)	12,940 12,735	14,040 14,170 13,710	15,420 15,550	15,085	15,420 15,550 15,085
	operational (in basic configuration)	14,250 14,950	14,600 14,650 14,550	16,250 16,050	16,100	16,500 16,650 16,100
	maximum permissible operational	18,830				
Mass distribution by axles in basic configuration, kg:	front axle	8,200 8,900	8,350 8,400 8,300	9,350 9,150	9,200	9,600 9,750 9,200
	rear axle	6,050	6,250	6,900		

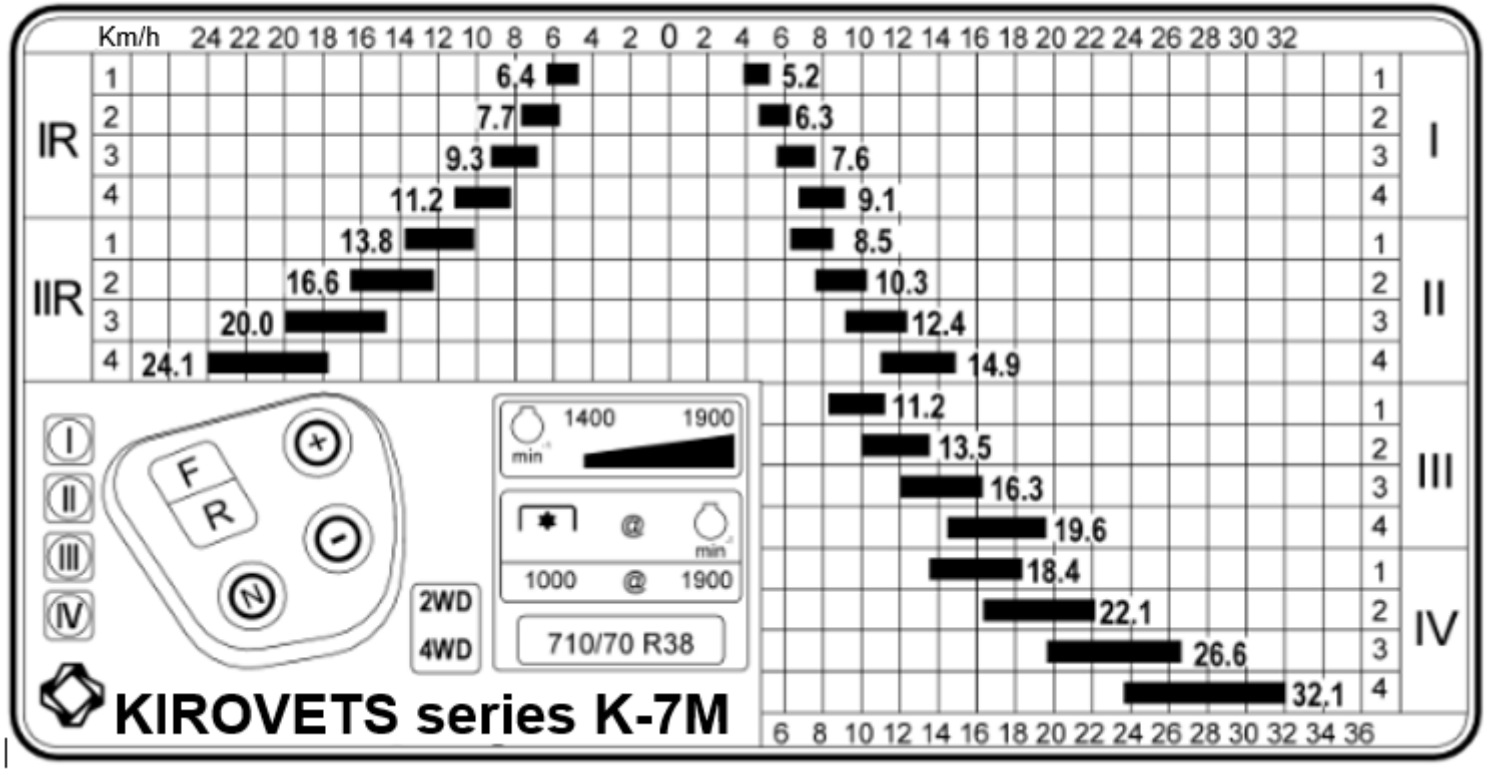
Parameter		Option				
		K-730M St K-730M St 1	K-735M St K-735M St 1 K-735M Pr	K-739M St K-739M St 1	K-740M Pr	K-742M St K-742M St 1 K-742M Pr
ENGINE						
Grade		YaMZ-65854 TMZ-8481.10-11	YaMZ-65855 TMZ-8481.10 OM460LA E3A/5	YaMZ-65857 TMZ-8481.10-02	OM460LA E3A/4	YaMZ-6585-04 TMZ-8481.10-04 OM460LA E3A/3
Engine power, kW (h.p.):	rated[1)]	220.6 (300) 220 (300)	256.7 (350) 257 (350) 260 (354)	286 (390) 287 (390)	295 (401)	309 (420) 309 (420) 315 (428)
	operational, as minimum	205 (279) 198 (270)	235 (320) 235 (320) 250 (340)	265 (360) 265 (360)	284 (386)	287 (390) 287 (390) 298 (405)
Maximum power on PTO at rated engine crankshaft speed, kW (h.p.), as minimum		189 (257) 182 (250)	182 (250) 216 (294) 235 (319)	182 (250) 243 (331)	267 (363)	182 (250) 262 (363) 279 (380)
Engine crankshaft speed at rated power, min^{-1} [1)]		1900^{+50}_{-20} 1900^{+50}_{-20}	1900^{+50}_{-20} 1900^{+50}_{-20} 1800^{+50}_{-20}	1900^{+50}_{-20} 1900^{+50}_{-20}	1800^{+50}_{-20}	1900^{+50}_{-20} 1900^{+50}_{-20} 1800^{+50}_{-20}
Specific fuel consumption, g/(kW·h) (g/(h.p.·h)):	at rated power, as maximum[1)]	240 (177) 219 (161)	240 (177) 212 (156) 210 (154)	240 (177) 212 (156)	210 (154)	240 (177) 212 (156) 210 (154)
	at operating capacity, as maximum	213.1 (156.7) 225 (165.5)	260 (192) 225 (165.5) 217 (200)	260 (192) 230 (170)	217 (200)	260 (192) 230 (170) 217 (200)
	at maximum power on PTO, as maximum	282 (208) 250 (185)	282 (208) 250 (185) 230 (170)	282 (208) 250 (185)	230 (170)	282 (208) 250 (185) 230 (170)

Parameter		Option				
		K-730M St K-730M St 1	K-735M St K-735M St 1 K-735M Pr	K-739M St K-739M St 1	K-740M Pr	K-742M St K-742M St 1 K-742M Pr
Relative oil consumption by the engine as a percentage of fuel consumption[1]:	burning	0.1 0.3	0.1 0.3 0.5	0.1 0.3	0.5	0.1 0.3 0.5
	general, during operation, taking into account the lubricant replacement	0.6 0.7	0.6 0.7 0.5	0.6 0.7	0.5	0.6 0.7 0.5
Slip at maximum traction efficiency, percent, maximum		15	15	15	15	15
Transmission efficiency from the engine output shaft to the shank at maximum power on PTO, as minimum		0.92				
TRANSMISSION						
Gearbox		Hydromechanical with automated control of 16 forward speeds (four gears with shift without loss of torque inside each of the four ranges) and eight reverse speeds, connection and disconnection of the rear axle				
Number of gears:	forward motion	16				
	reverse motion	8				
Power take-off mechanism		Single-speed as per GOST 3480-76, independent, with circulation lubrication system of the gearbox. Speed of the gear shaft shank rotation at engine crankshaft rated speed of 1,000 min^{-1}. Shank type – Dout = 55, 45 mm, number of splines – 20				
FRAME, UNDERCARRIAGE						
Frame		Hinged				
Suspension	front axle	Suspended on the frame using two longitudinal semi-elliptic springs with hydraulic shock absorbers				
	rear axle	Rigidly connected to the frame				
Undercarriage type		Wheeled, with four drive wheels				
Type of driving mechanisms		Pneumatic tires, low pressure, with cross-country tread				
Tire designation		710/70R38 for doubling – tires similar to the basic ones				
Design and designation of rims		DW23Bx38 – unassembled				
Highest of the average rated pressures of driving mechanisms, kPa, as maximum		In accordance with GOST 26955-86 depending on soil moisture				
EQUIPMENT FOR MODULARIZATION						
Three-point hitch (GOST ISO 730-2019)						
Type		Category 4				

Parameter		Option				
		K-730M St K-730M St 1	K-735M St K-735M St 1 K-735M Pr	K-739M St K-739M St 1	K-740M Pr	K-742M St K-742M St 1 K-742M Pr
Carrying capacity of the hitch (at a distance of 610 mm from the suspension axis), , as minimum		5,500				
Hydraulic control system of hydraulic cylinders of the hitch drive and actuating hydraulic units of agricultural machines modularized with the tractor		Separate-unit				
Number of pairs of leads for separate control of hydraulic drive of modularized implement		Four pairs of leads				
Dimensions of connection triangle, mm:						
dimensions of central link hinge		see Table 2				
dimensions of lower links hinge						
Attachment of	hinged agricultural machinery	At three points				
	semi-hinged agricultural machinery	At two points				
Drawbar TSU-1-Zh (GOST 3481-79)						
Function		For modularization with trailed agricultural machinery				
Maximum load in vertical direction, N		4,000				
Distance from the mouth of the drawbar fork to the ground, mm		525				
Drawbar TSU-3-K (GOST 3481-79)						
Function		Modularization with tractor and automobile trailers having coupling loops and their arrangement as per GOST 2349-75				
Hook mouth diameter, mm		$48^{+1.9}$				
Distance in transport position from the hook axis to ground surface, mm, as minimum		700				

Parameter		Option				
		K-730M St K-730M St 1	K-735M St K-735M St 1 K-735M Pr	K-739M St K-739M St 1	K-740M Pr	K-742M St K-742M St 1 K-742M Pr
Fluid pressure in the hydraulic control system of the hitch and of the agricultural machinery hydraulic mechanisms, MPa:	maximum (valve opening termination)	21 (210)				
	at the hydraulic system outlet, as minimum	19,5(195)				
Duration of continuous operation without refueling at engine loading – 70 % of rated operating power, motor hours, as minimum		13	12 12 14	12 12	13	12 12 13
Braking distance of the tractor at a speed of 8.3 m/s (30 km/h), m, as maximum		13				
Angle of lateral static stability, deg., as minimum		35				
Ascent and descent angle, degrees, as maximum		20				
Angle of the tractor hold with parking brake, %, as minimum		18				
Angle of the tractor semi-frame rotation, as minimum	around the horizontal hinge	±16°				
	around the vertical hinge	±32°				
First overhaul period at ϒ= 80, motor hours, as minimum:	tractor	8,000				
	engine	according to the Engine Manual				
	transmission	8,000				
	carrying system	full service life of the tractor				
Tractor service life		10 years				

Tractor speed shall be selected in accordance with recommended operating speed ranges for the basic field operations, taking into account the optimal load of the tractor engine and the speed mode of the unit



2 SAFETY REQUIREMENTS

2.1 GENERAL PROVISIONS

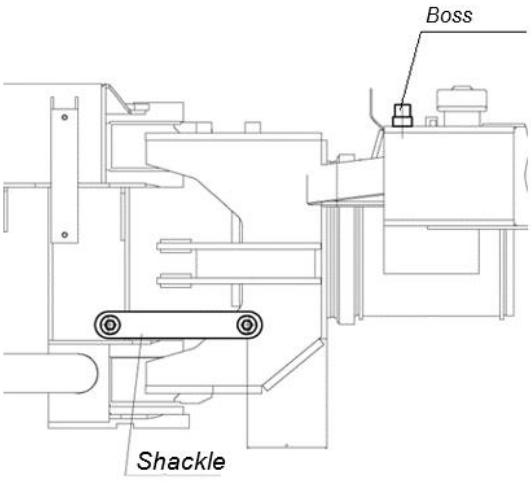
WARNING:

• BEFORE STARTING TO WORK ON THE TRACTOR, IT IS NECESSARY TO CAREFULLY READ THESE INSTRUCTIONS AND THE OPERATION MANUAL OF THE ENGINE INSTALLED ON THE TRACTOR.

• IT IS NECESSARY TO STRICTLY FOLLOW ALL OPERATION AND MAINTENANCE INSTRUCTIONS, PAYING SPECIAL ATTENTION TO THE "SAFETY REQUIREMENTS" SECTION.

• YOUR SAFETY AND THE SAFETY OF PEOPLE AROUND YOU DEPEND ON THE TRACTOR MAINTENANCE AND OPERATION.

ATTENTION! TO PREVENT FRAME DESTRUCTION BEFORE DRIVING THE TRACTOR, IT IS NECESSARY TO REMOVE THE SHACKLE LOCKING THE TRACTOR SEMI-FRAMES DURING TRANSPORTATION.



Install the removed shackle with fasteners on the front connection bosses of the rear semi-frame and attach them using bolts.

ALWAYS give a sound signal before starting the tractor.

IT IS STRICTLY FORBIDDENTO:

• OPERATE THE TRACTOR WITH FAULTY STEERING, BRAKE SYSTEM, ELECTRIC LIGHTING AND SIGNALING;

• OPERATE THE TRACTOR WITH LEAKING FUEL SYSTEM PIPELINES.

IT IS FORBIDDENTO:

• DRIVE THE TRACTOR, IF THERE ARE MORE THAN TWO PEOPLE, INCLUDING THE DRIVER, INSIDE THE TRACTOR CAB;

- ***OPERATE THE TRACTOR WITHOUT FIRE FIGHTING EQUIPMENT. THE TRACTOR SHALL BE EQUIPPED WITH FIRE-FIGHTING EQUIPMENT: A FIRE EXTINGUISHER AND A SHOVEL;***
- ***OPERATE THE TRACTOR WITH FAULTY EQUIPMENT;***
- ***TOW THE TRACTOR BY THE HITCH MECHANISM;***
- ***STAY UNDER THE TRACTOR WHEN THE ENGINE IS RUNNING;***
- ***USE FUSES THAT DO NOT MATCH THE RATING OF THE ELECTRICAL DIAGRAM;***
- ***FILL THE ENGINE COOLING SYSTEM AND HEATING SYSTEM WITH WATER. THIS CAN LEAD TO THE ENGINE FAILURE;***
- ***USE THE PARKING BRAKE WHEN DRIVING, AND TO USE THE MANUAL FUEL FEED LEVER DURING TRANSPORT WORKS;***
- ***CARRY OUT A SHARP TURN HIGHER THAN IN FIRST GEAR OF THE FOURTH MODE. AT TURNS SELECT A SPEED TO ENSURE THE TRAFFIC SAFETY.***
- ***IT IS FORBIDDEN TO USE FREE RUNNING WHEN DRIVING DOWNHILL.***

When working on slopes, be careful when driving the tractor and observe the following conditions:

– do not stop the engine, and do not shift the gears or modes when moving along steep climbs and slopes;

– when overcoming a climb requiring activation of both drive axles, switch on the rear axle in advance;

– across a slope (the size of a slope shall not exceed 5°) it is allowed to operate only at the modes I-II, to avoid sharp turns and overcoming the obstacles.

Drive with mounted machines over ditches, bumps and other obstacles at a right angle, at low speed, avoiding sharp jerks and rolls of the tractor more than 5°.

To avoid burning, **DO NOT OPEN** the expansion tank filler cap, when the coolant temperature is above 40 °C.

When using the tractor for transport operations on snowy, waterlogged and other roads with a low coefficient of adhesion, as well as on slopes, turns, hillsides, on ice crust, etc., drive at reduced speeds, and avoid sudden braking and turning.

When crossing dams, log-roads and bridges, first make sure that you can drive. The speed shall not exceed 8 km/h (not higher than the 1st gear of mode II).

Movement of the tractor train with a maximum speed (up to 30 km/h) is allowed only on roads with a dry hard surface.

The speed of a tractor with mounted implements in the transport position shall not exceed 10 km/h.

When the tractor is operating under load, it is possible to exceed the correction vibration acceleration for general vibration over 0.1 m/s^2, for local vibration – over 0.5 m/s^2.

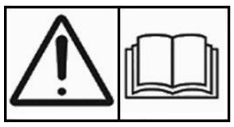
The tractor meets the requirements of sanitary standards of permissible noise level in the cab (80 dBA).

Design of the tractor ensures the safety of working on it.

The tractor shall be serviceable.

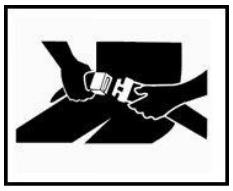
It is necessary to keep the tractor cab clean, and the tractor seat in good working condition. Do not leave items on the tractor floor. In case of sharp braking, they can damage the windshield of the cab.

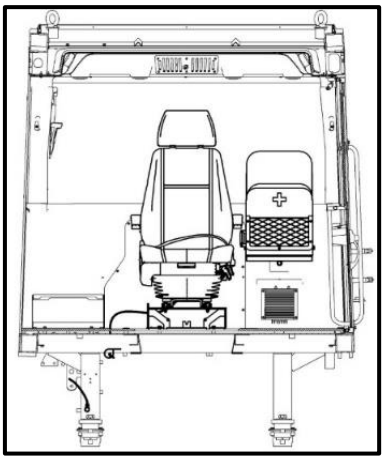
In order to avoid accidents, it is necessary to strictly observe the traffic rules and safety measures outlined in this section.



Failure to follow the safety instructions can lead to an accident or injury.

Prior to start the tractor, the driver and passenger shall use their seat belts.





A first aid kit shall be provided and fixed in the tractor cab, complete in accordance with the current regulatory documents.

A location for the first aid kit is provided on the folding part of the passenger seat.

If it is necessary to use the cab windows as an emergency exit, break the glass with a hammer in the cab.

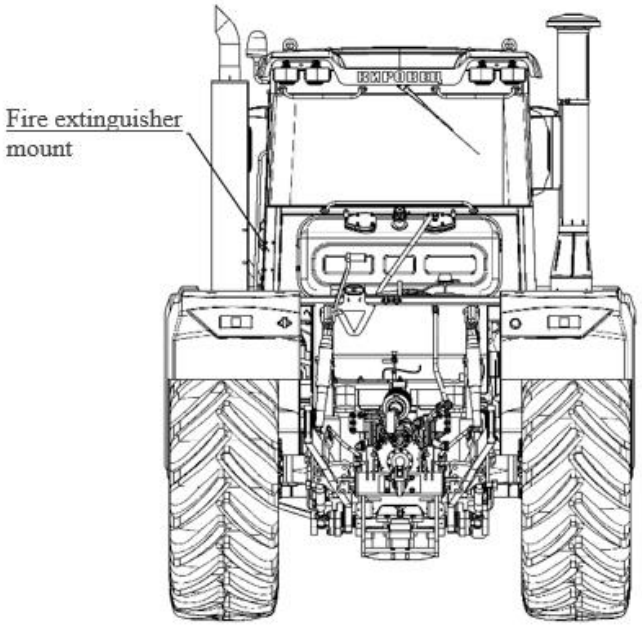
In case of malfunction, the tractor shall be stopped immediately to eliminate it.

2.2 FIRE SAFETY REQUIREMENTS

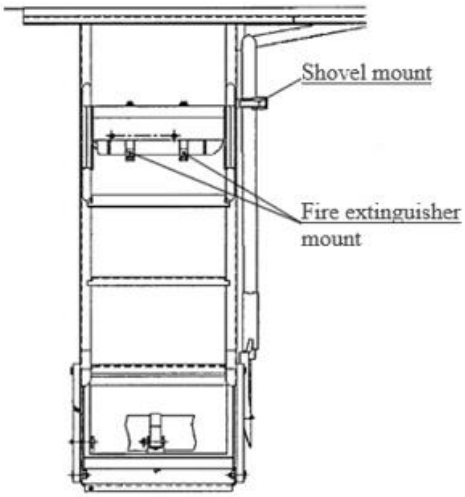
ATTENTION! EACH DRIVER SHALL BE CERTIFIED FOR KNOWLEDGE OF FIRE SAFETY RULES, METHODS OF EXTINGUISHING A FIRE AND OBSERVE MEASURES TO PREVENT THE OCCURRENCE OF FIRES.

The tractor shall be equipped with fire fighting equipment: fire extinguishers (OP-4 or OVP-4) and a shovel.

Fire extinguishers attachment brackets are installed in the left rear part of cab wall and on the left cab ladder.



Shovel attachment bracket is located on the right side of the cab ladder.



The parking areas of the tractor, storage of fuels and lubricants shall be plowed with a strip at least 3 m wide and provided with fire fighting equipment.

IT IS PROHIBITED TO SMOKE, MAKE FIRES, CARRY OUT WELDING WORKS, AS WELL AS WORKS RELATED TO THE USE OF OPEN FIRE NEAR THE STORAGE OF TRACTORS.

Perform filling of POL using a mechanized method. When refueling and checking oil and fuel levels, do not use open flames and do not smoke.

ATTENTION!

- ***IF IT IS NECESSARY TO PERFORM FIELD REPAIRS USING ELECTRIC GAS WELDING, REMOVE FUEL AND LUBRICANTS FROM THE SURFACE OF PARTS AND ASSEMBLIES TO BE WELDED, DETACH THE CONNECTORS OF ALL ECU AND ELECTRONIC DEVICES (ICE, GB, EHR, INSTRUMENT AND SENSOR PANEL, ETC.)IN ORDER TO PREVENT THEIR FAILURE.***
- ***PREPARE FIRE FIGHTING EQUIPMENT.***

When flushing parts and assembly units with kerosene or gasoline, take measures to prevent ignition of flushing fluid vapors.

Do not allow straw products to build up on the engine.

Ensure the serviceability and timely refilling of the fire extinguisher.

Upon completion of works on the tractor, turn off the battery disconnect switch.

DO NOT USE OPEN FIRE TO WARM UP PIPELINES, OIL IN THE ENGINE TRAY AND WHEN FILLING THE TRACTOR WITH FUEL OR OIL.

If a fire bed occurs, it is necessary to perform as follows:

– stop the engine;

– turn off the battery disconnect switch (de-energize the system);

– extinguish the fire with a fire extinguisher or other available means at hand (canvas sheet, sand, etc.).

Do not extinguish hot fuel and oil with water.

When working on the tractor, do not wear oiled, fuel-soaked work clothing.

Do not allow fuel and oil to leak at the pipe connections. Wipe off spilled fuel and oil with a cloth.

Do not allow sparks from the exhaust pipe, which can cause a fire, and indicate a malfunction of the engine fuel equipment.

2.3 SAFETY MEASURES FOR DE-PRESERVATION, INSTALLATION, TESTING AND RUNNING IN

During depreservation of the tractor, installation of additional equipment, assembly, testing and running-in, follow the instructions of the corresponding sections.

Depreservation and preservation of the tractor shall be carried out in a specially equipped room in compliance with all safety rules and fire safety regulations.

Prepare the tractor for operation only with the engine off and the parking brake on; mounted implements shall be lowered.

IT IS FORBIDDEN TO STAY UNDER THE TRACTOR WHILE THE ENGINE IS RUNNING, IN THE PATH OF ITS POSSIBLE MOVEMENT, AS WELL AS IN THE AREA OF THE FRAME SWIVELING DEVICE.

2.4 SAFETY PRECAUTIONS WHEN USING THE TRACTOR

Before starting the engine, the controls shall be in their initial condition:

– joystick in the “N” (neutral) position, “N” symbol shall light on the instrument panel and display of indication module;

- parking brake on.

Before starting off, make sure that the path is clear and that there are no people between the tractor and agricultural implements, as well as in the area of the frame swiveling device. Warn about the beginning of movement with a sound signal.

To avoid overheating of the hydraulic system, do not leave the tractor in the position of full (up to “stop”) rotation of the semi-frames to the right or left.

IT IS FORBIDDEN TO STAY IN THE RADIUS AREA OF CABLES WHEN WORKING WITH CABLES ON THE TOWING HOOKS.

During tractor operation with the drawbar, the lower links of the hitch mechanism shall be lifted to the extreme upper position.

When working on a tractor, it is necessary to monitor the readings of control instruments and their serviceability.

In case of an accident or excessive increase in engine speed, stop the engine immediately:

– by pressing the pneumatic stop button located to the right of the driver's seat and holding it until the engine stops completely (tractors with TMZ engine without ECU);

– by pressing “START-STOP” button (tractors with YaMZ and OM460LA engines);

– by pressing “START-STOP” button or engine emergency stop key on the control unit or the armrest (tractors with TMZ engine with ECU).

The brake system of the tractor shall be in good condition. When braking the tractor with a foot brake, the braking path on dry and hard ground at a speed of 8.33 m/s (30 km/h) shall be 13 m as maximum, and at a speed of 5.6 m/s (20.2 km/h) – 6.5 m as maximum. The fully depressed brake pedal shall not rest on the cab floor.

Air pressure in the pneumatic system of the brakes during operation shall be within the limits 0.71 to 0.85 MPa.

Storage batteries shall be securely fastened, closed with a lid and shall not have electrolyte leaks.

ATTENTION!

- ***CONNECTING AND DISCONNECTING STORAGE BATTERIES SHALL BE MADE WITH DISCONNECTED CONSUMERS. FIRST CONNECT THE POSITIVE TERMINAL COUPLED TO THE TRACTOR ONBOARD NETWORK, AND THEN THE NEGATIVE TERMINAL COUPLED TO ITS GROUND. DISCONNECT SHALL BE MADE IN REVERSE ORDER.***
- ***SHORT CIRCUIT OF THE BATTERY TERMINALS IS NOT ALLOWED.***
- ***OPERATION OF BATTERY WITH UNRELIABLE CONTACTS BETWEEN THE BATTERY TERMINALS AND THE WIRE TERMINALS IS NOT ALLOWED.***

It is necessary to monitor the condition of electrical equipment. Spark formation in the places of electric wiring contacts, breakage of wires and terminals, especially near heated parts and in places where oil and fuel may get on them, are unacceptable.

Allowable speed of the tractor on access roads is 10 km/h as maximum.

Wade over the water crossing only after careful preparation and checking of the route. It is allowed to overcome a ford with a depth of 1.0 m as maximum.

ATTENTION! ONLY PERSONS CERTIFIED FOR THE RULES FOR WORKING WITH TRAILERS, SEMI-TRAILERS AND OTHER VEHICLES, ARE ALLOWED TO OPERATE THEM.

Attachment to a tractor and hitching of agricultural machines and implements to a tractor shall be carried out by persons servicing these machines. A trailer hitching up the machine shall stand to one side until the tractor comes to a complete stop, and start attachment (hitching) only after a signal from the driver.

When operating a tractor with agricultural machines and implements, observe the safety rules set forth in the Operation Manual for this machine or implement.

Drive up the tractor to agricultural machines, implements or trailers at the minimum speed with the pedal of the drain spool actuator not fully depressed. When the tractor moves in reverse, an audio signal is automatically actuated.

After connecting to trailed implements and pumping the hydraulic system, check the oil level in the hydraulic tank and top up if necessary.

When working with hydraulic agricultural machines and implements, it shall be remembered that the maximum operating pressure at the outlet of quick-release breaking devices is at least (19.0–19.5) MPa.

When stopping the tractor for a long time, do not leave the mounted agricultural implement in the lifted position.

IT IS STRICTLY FORBIDDEN TO STAY UNDER THE LIFTED IMPLEMENT.

Drive with mounted machines over ditches, bumps and other obstacles at a right angle, at low speed, avoiding sharp jerks and high rolls of the tractor.

IT IS FORBIDDEN TO TRANSPORT PEOPLE ON TRAILED IMPLEMENTS NOT EQUIPPED FOR THIS, MOUNTED MACHINES AND OUTSIDE THE TRACTOR CAB.

Trailed implements and trailers shall have rigid couplings that do not allow them to run over the tractor.

When disconnecting the tractor from trailed implements or trailers, first disconnect the pneumatic system and electrical equipment.

When using the tractor for transportation works, the following precautions shall be taken:

– carry out works with the “Road train” sign switched on;

– check the reliability of the pneumatic system;

– pay special attention to the selection of speed, taking into account road conditions, turning radii, visibility, features and condition of vehicles and transported cargo;

– on snowy, waterlogged and other roads with a low coefficient of adhesion, as well as on slopes, turns, hillsides, on ice crust, etc., drive at reduced speeds, avoid sudden braking and turning;

– if there is a traffic hazard, take measures to reduce the speed and stop the transport train;

– in case of an unforeseen stop of the tractor on the carriageway, switch on the alarm. Start by pressing the key located on the steering column control panel. At the same time, both direction indicator lamps on the instrument panel begin to flash;

– trailer brakes shall be adjusted in accordance with the requirements of the trailer Operation Manual;

– movement of the tractor train with a maximum speed 30 km/h is allowed only on roads with a dry hard surface;

– at the parking lot of the tractor train, when loading (unloading) trailers, set the handle of the manual brake valve to the "pull" position. Before starting the movement, set the handle of the brake valve to the "push" position.

When driving the tractor with a vehicle:

IT IS FORBIDDENTO:

- ***USE THE MANUAL FUEL FEED LEVER. SET THE FUEL FEED LEVER TO THE MINIMUM FUEL FEED POSITION;***
- ***TRANSPORT PEOPLE ON TRAILERS.***

When operating the tractor, it is necessary to:

– follow the indications of devices and signaling devices. Instrument readings and signaling of control lamps shall comply with the instructions in the "CONTROLS" section;

– do not run the engine at full load when the coolant temperature is below 70 °C.

IT IS STRICTLY FORBIDDEN TO CONNECT UNCLEANED PIPELINES AND HYDRAULIC FITTINGS OF AGRICULTURAL MACHINES AND IMPLEMENTS TO THE TRACTOR HYDRAULIC SYSTEM.

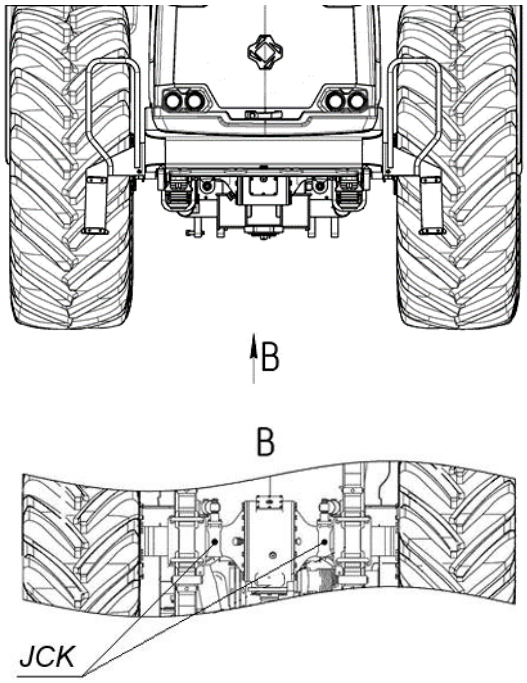
Upon completion of work on the tractor, before leaving the tractor, set the control joystick of the GB to the "N" position, engage the parking brake, turn off the ignition with the "START-STOP" button, turn off the battery disconnect switch on the instrument panel.

2.5 SAFETY PRECAUTIONS FOR MAINTENANCE, TROUBLESHOOTING AND STORAGE

Before carrying out maintenance and troubleshooting, clean the tractor from dust, dirt and oil products.

Carry out maintenance, troubleshooting and dirt removal operations only when the engine is off, the parking brake is on. The mounted implements shall be lowered.

When jacking up the tractor, use only reliable jacks with a lifting capacity of at least 120,000 N.Jacking up shall be done according to the jacking scheme, according to the “JCK” marks on the tractor, in accordance with instructions of the “TRACTOR JACKING” section.



ATTENTION! IN ORDER TO AVOID FOLDING OF THE TRACTOR SEMI-FRAMES WHEN JACKING IT UP AND CARRYING OUT MAINTENANCE, IT IS NECESSARY TO BLOCK THEM USING A SHACKLE FIXED TO THE REAR SEMI-FRAME.

When using lifting and transporting devices, it is necessary to strictly observe the safety requirements specified in the documentation for the use of these devices.

The tools and devices shall be in good working order, correspond to their purpose and ensure the safety of work.

When washing the tractor, applying and removing protective lubricants, workers shall be provided with aprons, gloves and goggles.

During mounting and dismantling of wheels strictly observe the rules specified in the "MOUNTING AND DISMANTLING OF WHEELS WITH TIRES" subsection.

ATTENTION!

- ***CARRY OUT ALL REPAIR WORKS RELATED TO THE USE OF ELECTRIC WELDING DIRECTLY ON THE TRACTOR, WITH THE BATTERY DISCONNECT SWITCH OFF.***
- ***DURING WELDING WORKS ON TRACTORS, IT IS NECESSARY TO DISCONNECT THE "+" AND "-" POWER WIRES FROM THE UPPER AND LOWER BATTERY. CONNECT THE WIRE TERMINALS TO EACH OTHER USING M10 BOLT WITH A NUT. FAILURE TO COMPLY WITH THIS REQUIREMENT MAY RESULT IN FAILURE OF THE ELECTRONIC ENGINE CONTROL SYSTEM. BEFORE CONNECTING THE BATTERY TO THE TRACTOR ELECTRICAL CIRCUIT, DISCONNECT THE ICE CONNECTORS, THEN CONNECT "+", THEN "-".***
- ***DURING WELDING WORKS ON TRACTOR, IN ORDER TO PREVENT FAILURE OF ELECTRONIC DEVICES, IT IS NECESSARY TO DETACH THE CONNECTORS OF ALL ECU AND ELECTRONIC DEVICES (ICE, GB, EHR, INSTRUMENT AND SENSOR PANELS, ETC.).***

2.6 SAFETY PRECAUTIONS FOR MAINTENANCE OF STORAGE BATTERIES

During maintenance of the battery, remove the folding ladder.

Do not allow electrolyte to come into contact with your hands.

When cleaning the battery, put on gloves and use a cleaning material soaked in an ammonia solution (ammonia).

IT IS FORBIDDENTO:

- ***CHECK THE STATE OF CHARGE OF THE BATTERIES BY SHORT-CIRCUITING THE TERMINALS.***
- ***USE OPEN FIRE WHEN CHECKING ELECTROLYTE LEVEL.***

Use distilled water in case of independent preparing of the electrolyte. Do not pour water into acid in order to avoid splashing it out.

Upon completion of works related to maintenance of the battery, install the folding ladder on the tractor and fix it.

2.7 SAFETY PRECAUTIONS WHEN STORING THE TRACTOR

When putting the tractor to storage, in the course of inspection and maintenance during the storage period, when removing it from storage, it shall be ensured that the corresponding instructions in the “TRACTOR STORAGE RULES” section are followed.

During the tractor storage, measures shall be taken to prevent it from overturning and unintentional displacement.

The tractor shall be installed on rigid, specially prepared stands or trestles.

3 INFORMATION ON THE TRACTOR COMPONENTS

The K-730M, K-735M, K-739M, K-740M, K-742M tractors differ in the design of power units, radiator assemblies, and availability of ballast weights.

3.1 ENGINE

The following engines are installed on tractors:

– four-stroke eight-cylinder V-shaped engine manufactured by Autodiesel PJSC (YaMZ-6585) or TMZ PJSC (TMZ-8481.10) – for tractors in “Standard” and “Standard 1” configurations, respectively;

– six-cylinder in-line Mercedes (OM460LA) engine – for tractors in “Premium” configuration.

The YaMZ or TMZ engine is installed on the front semi-frame of the tractor using three brackets (one front and two rear). The front part of the engine is pivotally fixed on a transverse beam, which by its ends rests on the front semi-frame of the tractor through shock absorbers. Rear part of engine by means of brackets fixed on flywheel casing also rests on the front semi-frame of the tractor through shock absorbers.

The OM460LA engine is mounted on the front semi-frame of the tractor and rests on the front semi-frame of the tractor through shock absorbers by means of four brackets, fixed on the engine crankcase and flywheel casing.

The engine is started by an electric starter.

The selection of oil and coolant is carried out in accordance with the engine Operation Manual and recommendations of these Instructions (see Table 26, Appendix A).

ATTENTION! USE THE RECOMMENDED FUEL GRADES SPECIFIED IN THE ENGINE OPERATION MANUAL TO ENSURE LONG AND RELIABLE OPERATION OF ENGINES.

3.1.1 AIR CLEANING SYSTEM

Air cleaning system is dry, two-stage, combined, with forced dust suction into the exhaust pipe. The air cleaners manufactured by Remiz LLCare used on tractors.

3.1.2 COOLING SYSTEM

The cooling system is closed, with a compensation circuit, with forced circulation of the coolant. To maintain optimal thermal conditions, the motors are equipped with an automatic fan control system.

3.1.3 FUEL SYSTEM

On tractors in “Standard” configuration with YaMZ engine, the fuel system consists of a fuel tank, fuel pipelines, CFF with a built-in fuel feed pump and fuel heater (located on the rear beam of the cab, to the left), a high-pressure fuel pump, a fuel fine filter, an electronic control unit, a HPFP dosing unit, high and low pressure fuel pipelines, a high pressure battery, and nozzles. The CFF fuel heater operates in automatic mode.

On tractors in "Standard 1" configuration with the TMZ engine, the fuel system consists of a fuel tank, fuel pipelines, CFF with a built-in fuel feed pump and fuel heater (located on the rear beam of the cab, to the left), a low-pressure fuel pump, fuel fine filters, a high-pressure fuel pump, an automatic timing device (for fuel injection), high and low-pressure fuel pipelines, and nozzles. The CFF fuel heater operates in automatic mode.

On tractors in "Premium" configuration with the OM460LA engine, the fuel system consists of a fuel tank, fuel pipelines, a coarse fuel filter with a built-in fuel feed pump and fuel heater (located on the rear beam of the cab, to the left), a fuel cooler, a low-pressure fuel pump, a fine filter, high pressure pumps (per each nozzle its own high pressure pump), and nozzles. The CFF fuel heater operates in autonomous mode.

3.1.4 EXHAUST SYSTEM

The exhaust system has one muffler equipped with ejection system and connecting pipes.

3.2 TRANSMISSION

The transmission of the tractor includes a gearbox, a semi-rigid coupling, a cardan drive, an intermediate support and drive axles. Kinematic diagram of transmission is given in Appendix B.

3.2.1 GEARBOX

Gearbox is hydromechanical, multistage, four-mode, with constant mesh gears, with a mechanical drive for switching modes and hydraulic gear shifting without interrupting the power flow within any of the modes. It allows for changing the speed of the tractor, move in reverse, disengage the rear drive axle, transmit torque to the PTOM. Hydraulic pumps of steering and mounted equipment are located on the GB.

For mounting and dismantling of the GB, four eye nuts are installed on its housing top cover.

3.2.2 SEMI-RIGID COUPLING

Semi-rigid coupling serves to transfer torque from the engine flywheel to the gearbox through the cardan shaft.

3.2.3 CARDAN DRIVE

The cardan drive consists of the cardan shaft “ICE – GB”, cardan shaft “GB – front axle”, cardan shaft “GB – intermediate support”,cardan shaft “intermediate support – rear axle”.

3.2.4 INTERMEDIATE SUPPORT

The intermediate support connects the cardan shafts that transmit torque from the GB camshaft to the rear axle.

3.2.5 DRIVE AXLES OF THE TRACTOR

Tractors can be equipped with T400 series axles or axles manufactured by PZM LLC.

The tractor axles are driving and serve to transfer the torque supplied to them from the GB to the wheels.

The front drive axle of the tractor, with a permanent drive, is suspended from the frame on two semi-elliptical springs with telescopic hydraulic shock absorbers.

The rear drive axle of the tractor is rigidly attached to the frame.

3.3 TRACTOR UNDERCARRIAGE AND PNEUMATIC BRAKING SYSTEM

3.3.1 PNEUMATIC TIRES

Both drive axles of the tractor are fitted with wheels with low pressure (tubeless 710/70R38) tires.

ATTENTION! TIRE SERVICE LIFE, EFFICIENCY AND TRACTION OF THE TRACTOR DEPEND ON THE CORRECTLY SELECTED (RECOMMENDED) TIRE INFLATION PRESSURE.

Selection of the optimal inflation pressure of wheeled tractors and the degree of its influence on the traction and coupling properties depend on the type of soil and the load acting on the tractor axle. The inflation pressure affects the contact patch of the wheel with the soil and, depending on the soil conditions, affects its traction and coupling qualities and the tractor's performance in operation.

3.3.2 TRACTOR FRAME

The tractor frame consists of two semi-frames: the front (engine) and the rear (load) frames, connected by a hinge device.

The semi-frames rotate relative to each other around horizontal and vertical hinges.

3.3.3 TRACTOR PNEUMATIC SYSTEM

The pneumatic system is designed to provide air supply to the tractor brake system, control the GB, pump the operator seat, pump the tires, blow the filter elements and tractor mechanisms with air.

The pneumatic system includes:

– compressor. Inflates air into the pneumatic system;

– pressure controller with air dryer. A pressure controller with the Wabco 432 410 007 0 adsorber is designed to dry and clean the compressed air supplied by the compressor to the tractor pneumatic system, maintain pressure in the system within the range 0.71 to 0.85 MPa, as well as to protect the system from overload. Equipped with electric heating;

– three-circuit protective valve. It distributes air to independent circuits and prevents air leakage in case of break of one of them;

– circuit receivers – special cylinders for accumulation of compressed air stock;

– pressure gauge – a device on the instrument panel of the steering column with pressure readings in the system;

– test and emergency annunciators – indicator lamps on the instrument panel.

3.3.4 TRACTOR BRAKING SYSTEM

The braking system of the tractor is pneumo-hydraulic, consists of pneumatic and hydraulic circuits.

3.3.4.1 PNEUMATIC CIRCUIT OF THE BRAKING SYSTEM

Pneumatic circuit of the braking system consists of:

– two-section brake valve *4* (Figure 1) or *8* (Figure 2) designed to control the service braking system;

– manual brake valve *6* (Figure 1) or *15* (Figure 2) providing control of the parking braking system;

– parking brake power accumulator acting as an actuator for the time of the tractor parking.

In the pneumatic brake drive system, there are three independent circuits, that is, if one is damaged, the rest shall continue to function.

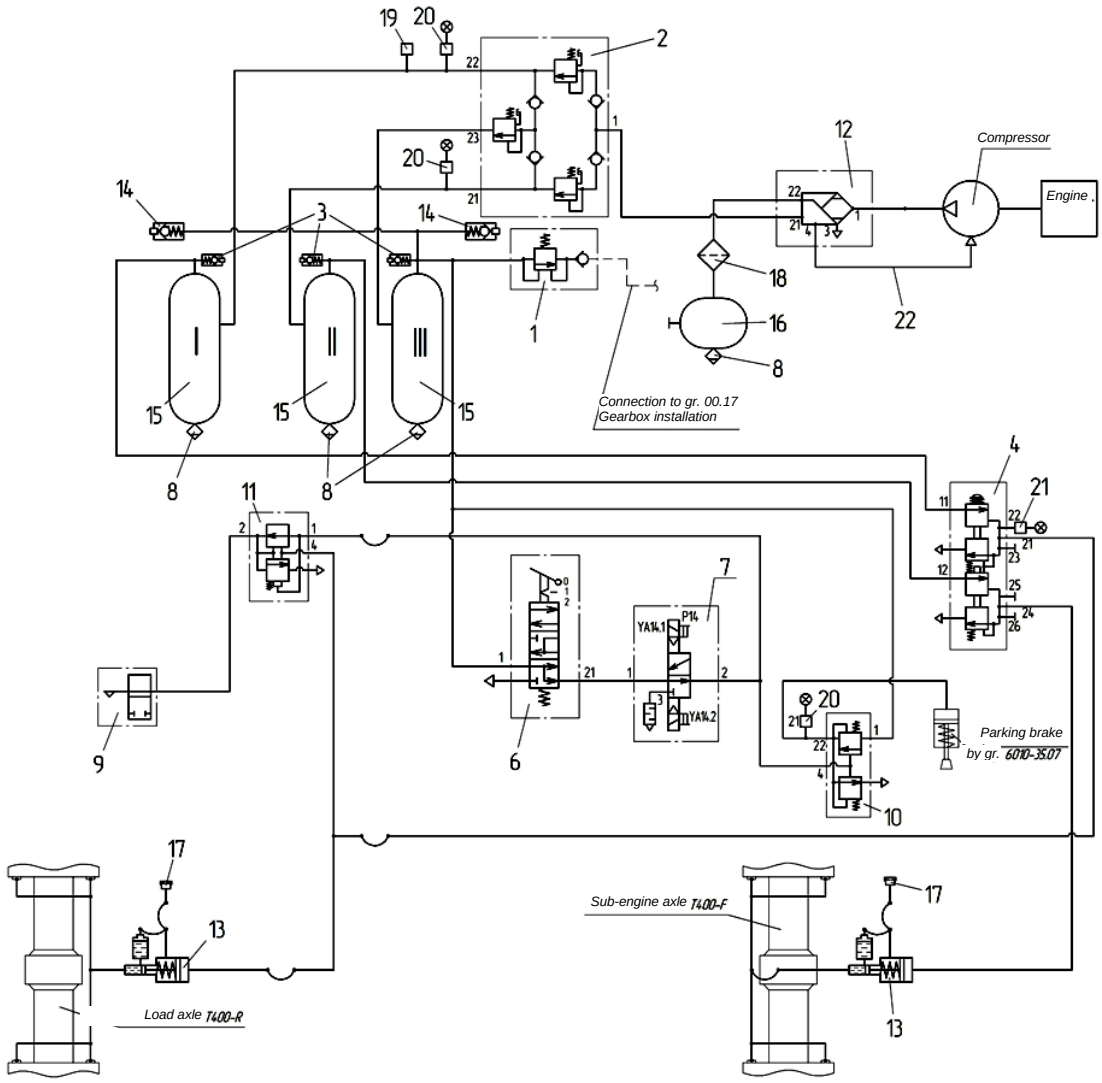
Circuit independence is ensured by installation of triple protective valve *2* (Figures *1, 2*) downstream the air dryer with pressure controller *12* (Figure 1) or *10* (Figure 2), which provides “cut-off” of failed circuit from serviceable ones. At the same time, serviceable circuits continue to function, providing braking of the tractor.

Two main circuits are designed for control of front and rear axle brakes.

The first main circuit, which performs the function of braking the rear wheels, consists of a receiver *15 (I)* (Figure 1) or *12 (I)* (Figure 2), connected to a two-section brake valve *4* (Figure 1) or *8*(Figure 2), feeding air to the air-oil intensifier *13* (Figure 1) or *11* (Figure 2) of the hydraulic circuit of the brake system. The connection is made by plastic tubes, sleeves and fittings.

The second main circuit, ensuring the function of braking the front wheels, consists of a receiver *15 (II)* (Figure 1) or *12 (II)* (Figure 2), connected to a two-section brake valve *4* (Figure 1) or *8* (Figure 2), feeding air to the air-oil intensifier *13* (Figure 1) or *11* (Figure 2) of the hydraulic circuit of the brake system and the front axle.

The third circuit is used to control the parking brake power accumulator and control the trailer brakes through a single-wire control system, supplies power the control system of the GB, pumps the operator seat and stops the engine. It consists of the receiver *15 (III)* (Figure 1) or *12 (III)* (Figure 2), manual brake valve *6* (Figure 1) or *15* (Figure 2), automatic valve *7* (Figure 1) or*9*(Figure 2) of the control system of the GB, acceleration valve *10* (Figure 1) or *5* (Figure 2), parking brake, trailer brake control valve, connecting heads.



1 – single protective valve;
2 – triple protective valve;
3 – test outlet valve;
4 – two-section brake valve with a pedal;
6 – manual brake valve;
7 – parking brake valve;
8 – condensate drain valve;
9 – connection head type “A”;
10 – acceleration valve;
11 – trailer brake control valve with a single-wire drive;
12 – air dryer with pressure controllers;
13 – air-oil intensifier;
14 – connecting plug;
15 – receiver;
16 – regeneration receiver;
17 – breather;
18 – trunk filter;
19, 20 – pressure sensor;
21 – pneumatic brake signal switch;
22 – feedback LS signal line (except for YaMZ engine).

Figure 1 – Pneumatic-Hydraulic Circuit Diagram of the Braking System with Compressed Air Drying (Single-Wire Trailer Brake Control Drive)

Single-wire and combined brake control systems of the trailer are designed to reduce the speed of the trailer as part of the road train, and to automatically brake it in case of a break in the coupling with the tractor.

3.3.4.2 HYDRAULIC CIRCUIT OF THE BRAKING SYSTEM

The hydraulic drive is represented by 2 circuits driving the brake mechanisms of the front and rear axles due to the transfer of force to the brake shoes with brake fluid under pressure, created in the air-oil intensifiers.

Single-wire trailer brake drive

The single-wire trailer brake drive (Figure 1) includes a single-wire trailer brake control valve*11*, a coupling head *9*type *A*.

The trailer brake control valve with the single-wire drive *11* operates upon availability of a single connecting line, which is used both as a feed one, and to control the braking intensity of the trailer. Besides, the valve operates to reduce pressure in the control line, up to atmospheric. As the pressure decreases, the braking intensity of the trailer increases.

Combined trailer brake drive

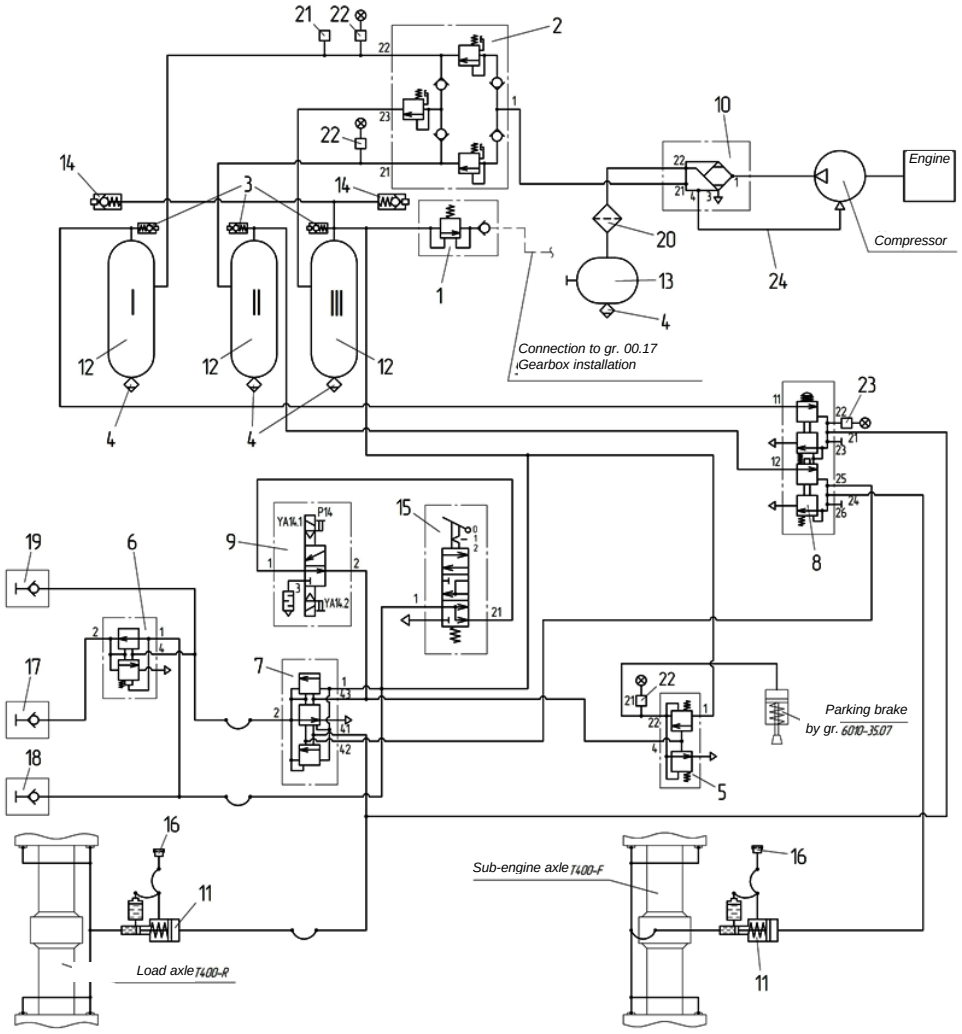
The combined brake drive of the trailer combines a single-wire and a two-wire brake drives of the trailer (Figure 2).

The single-wire drive is described above.

The two-wire drive of the trailer brakes includes the trailer brakes control valve with a two-wire drive *7*, connecting heads *18* and *19* – feeding one (red) and controlling one (yellow).

In the two-wire drive, a tractor and a trailer are connected using two lines. Compressed air enters the trailer receivers via one of them (feeding or emergency). The second (control or braking) line in the released state is connected through the brake valve and air distributor to the atmosphere.

Upon braking, the tractor brake valve communicates the tractor receivers with the tractor brake chambers. At the same time, compressed air flows through the control pneumatic line to the trailer air distributor, acting on the valve connecting the trailer receiver with the trailer brake chambers. The trailer is braked. In the course of braking, air from the tractor receiver continues to enter the trailer receiver. The trailer is also braked when disconnected from the tractor, since the air distributor also operates when pressure in the feeding line drops.



1 – single protective valve;
2 – triple protective valve;
3 – test outlet valve;
4 – condensate drain valve;
5 – acceleration valve;
6 – trailer brake control valve with a single-wire drive;
7 – trailer brake control valve with two-wire drive;
8 – two-section brake valve with a pedal;
9 – parking brake valve;
10 – air dryer with pressure controllers;
11 – air-oil intensifier;
12 – receiver;
13 – regeneration receiver;
14 – connecting plug;
15 – manual brake valve;
16 – breather;
17 – connection head type “A”;
18 – red connection (feeding) head;
19 – yellow connection (controlling) head;
20 – trunk filter;
21,22 – pressure sensor;
23 – pneumatic brake signal switch;
24 – feedback LS signal line (except for YaMZ engine).

Figure 2 – Pneumatic-Hydraulic Circuit Diagram of the Braking System with Compressed Air Drying (Combined Trailer Brake Control Drive)

3.4 TRACTOR HYDRAULIC SYSTEMS

The tractor is equipped with a steering hydraulic system and a high-performance hydraulic system for working equipment.

3.4.1 STEERING HYDRAULIC SYSTEM

Steering hydraulic system has a power drive. Rotation of the tractor is carried out due to rotation of the tractor semi-frames relative to each other around the vertical hinge using two hydraulic cylinders.

The speed and angle of rotation of the semi-frames are set by the operator according to the speed and angle of rotation of the steering wheel.

On tractors, the total play in the connections “hydraulic cylinder – eyes of semi-frames” (along the axis of hydraulic cylinders) can be 0.9 mm as maximum. The permissible total play during operation shall not exceed 1.8 mm.

3.4.2 HYDRAULIC SYSTEM OF WORKING EQUIPMENT

Hydraulic system of working equipment is modular, with two acting hydraulic cylinders, with adjustable axial-piston pump. There is no forsed of the a lowering in the EHR system.

To reduce losses in the hydraulic system and eliminate its overheating when working with implements, equipped with a hydraulic motor, there is a kit in the tractor SPTA set to ensure “free” (bypassing the SCV) drain to the hydraulic tank, and a set of hydraulic motor drainage.

Diagram of the steering and working equipment hydraulic system is given in Appendix C.

3.5 ELECTRICAL EQUIPMENT SYSTEM

The tractor electrical equipment system is single-wire, negative terminals are connected to the tractor ground. Network voltage is 24 V.

The power sources are two storage batteries and an alternator with a built-in integrated voltage controller.

Electrical circuits of electricity consumers are protected from short circuits by fuse boxes.

3.6 TRACTOR CAB

Tractor cab is of category 2, with built-in safety cage,double-seat, sealed, noise-insulated, with an extended field of view, with an installed salon rear-view mirror.

ATTENTION! THE CAB PROVIDES PROTECTION FROM DUST, BUT NOT FROM HAZARDOUS CHEMICALS AND FUMES.

THE TRACTOR CAB IS NOT DESIGNED FOR THE SAFE OPERATION OF THE OPERATOR IN PRESENCE OF SPRAYED CHEMICALS.

Excessive pressure in the tractor cab, according to STB EN 15695-1-2011, shall be at least 50 mm of w.c.

The cab is equipped with heating, air conditioning and audio systems. The cab is equipped with one entrance door on the left side.

The cab door and the right side glass are almost completely transparent and equipped with convenient quarter lights for ventilation.

For protection from the sun, a sun blind is installed on the front window of the cab.

3.6.1 OPERATOR SEAT

Operator seat is fitted with pneumatic suspension. The seat is adjustable in height, backrest angle, longitudinal direction and depending on the driver's weight. It is equipped with folding armrests. The seat is equipped with a two-point static seat belt and complies with the requirements of UNECE Regulations Nos. 14-07 and 17-08.

Before driving, adjust the driver's seat to your preference using the appropriate handles (levers). Recommendations for seat adjustment are given in the operating documents of the seat enclosed to the tractor.

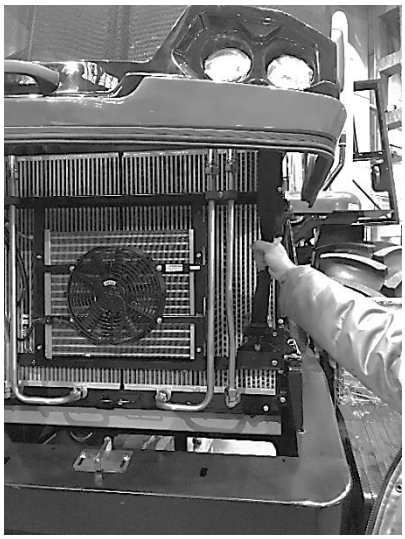
3.6.2 HOOD OPENING AND CLOSING MECHANISM

3.6.2.1 HOOD OPENING

Press the hood handle lock button. The lock shall be unlocked and the hood shall begin to open under the action of the gas springs.

In the process of opening, hold the hood by the belt to prevent jerks in case of gusts of wind.

The inertial mechanism of the belt design allows the hood to be locked in the open position at any angle. It is enough to give the belt upward acceleration during the opening process, and it shall lock, keeping the hood at the required height. To release the lock, slightly pull the belt down, and the hood shall continue to open.

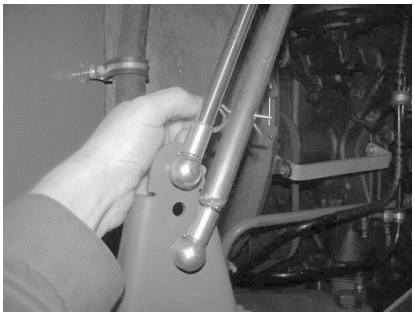


3.6.2.2 HOOD CLOSING

Smoothly, without jerking, pull the hood down by the belt. At the initial moment of movement, additional resistance may arise due to the design of the gas shock absorber (built-in damper). When lowering, the belt shall automatically rewind until it closes. **In this case, it is necessary to prevent the belt from skewing in the mechanism.**

Lowering the hood to chest level, grab the handle and close the hood until the lock is activated.

3.6.2.3 SECURITY MEASURES

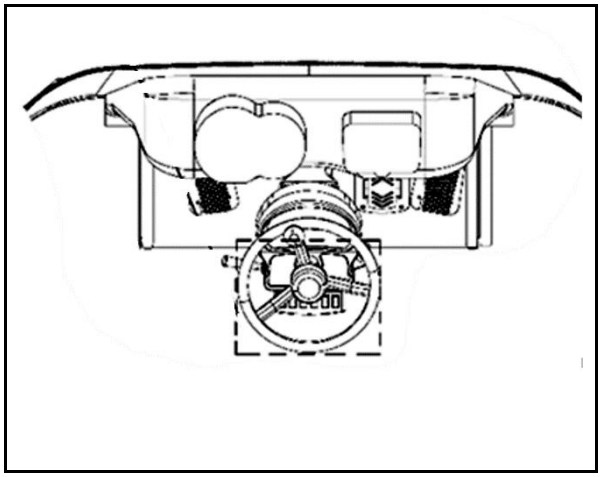


In order to comply with safety measures in terms of preventing spontaneous closing of the hood, the hood structure contains stops located parallel to the gas springs.

To bring the stop to a fixed position, open the hood, remove the spring cotter pin from the lower part of the stop, and install the cotter pin into a special hole in the upper part of the stop. To remove the lock, follow the reverse order.

IT IS FORBIDDEN TO USE GAS SPRINGS AS HANDRAIL WHEN LIFTING ONTO THE TRACTOR, IN ORDER TO AVOID GAS SPRINGS BREAKING OR FAILURE.

3.6.3 HATCH FOR MAINTENANCE OF UNITS ON THE UPPER HALF OF THE GB CRANKCASE



The tractor cab is fitted with a hatch for maintenance of units on the upper half of the GB crankcase, which is located between the seat and the steering column.

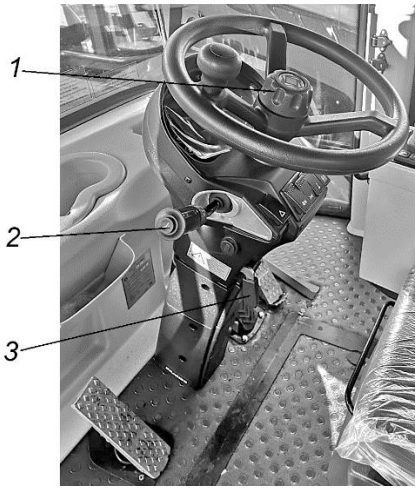
4 TRACTOR CAB CONTROLS

4.1 STEERING COLUMN

The steering column with an integrated instrument panel can be tilted to a nominal angle of 23° to the horizon.

The column is adjustable by 2° when tilted in “push” position and 21° when tilted in “pull” position relative to the nominal angle.

To change the height of the steering wheel, remove the wing nut *1* clockwise, adjust the height of the steering wheel and lock it by turning the wing nut counterclockwise.



1 – wing nut for steering wheel height adjustment; *2* – steering column switch; *3* – handle for fixing the tilt angle of the steering column

4.2 STEERING COLUMN CONTROL PANEL

***1* – alarm activation key**

Designed to simultaneously turn on the left and right turn signals in the blinking mode in case of an unexpected stop of the tractor on the roadway.

***2* – cab heater activation key**

The upper position of the key is “Heater off”.

The middle position of the key is “The 1st speed of the heater fan is on”.

The lower position of the key is “The 2nd speed of the heater fan is on”.

***3* – Key for marker lights, headlights**

The upper position of the key is “Off”.

The middle position of the key is “Marker lights are on”.

The lower position of the key is “Low/high beam is on”.

***4* – Key for switching on the tractor ground**

***5* – GPP actuation key for tractors with TMZ engine**

The upper position of the key is “GPP is off”.

The lower position of the key is “GPP is on” (non-fixed position).

To check GPP operability it is necessary to:

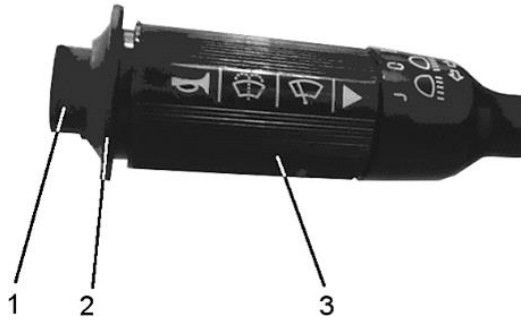
– switch on the ground of the tractor;

– start ignition by short-term pressing (less than 1.5 s) on the “START-STOP” button, press the GPP key and hold it until the indicator  on the instrument panel lights up;

– start the tractor by holding the key in the unlocked position.

***6* – Key for switching on the pre-start heater “Pramotronic” for tractors with YaMZ engine.**

4.3 STEERING COLUMN SWITCH



1 – turn on the sound signal

2 – switching on the front windscreen washer of the tractor. It is carried out by pressing the ring towards the steering column

3 – front wiper control switch

Positions:

“0” – off;

“I” – the 1st speed of the wiper motor is on;

“II” – the 2nd speed of the wiper motor is on;

“J” – intermittent wiper-washer control mode is on.

Turning on the direction indicators is done by moving the handle clockwise and counterclockwise.

The fixed high beam is switched on by moving the switch away from the steering wheel.

If necessary, it is possible to briefly turn on the high beam (“winking”) by moving the switch to the steering wheel.

4.4 STARTER AND INSTRUMENT SWITCH

The starter and the instruments are switched on by the "START-STOP" button located to the right on the steering column.

The "START-STOP" button provides actuation of the instrument panel, terminal 15 by a single short pressing (less than 1.5 s). Pressing the button for a longer time shall not turn on the instrument panel.

The button has a light indication, directly on the button, showing the state of electronic ignition operation, as well as an audio alarm warning about non-fulfillment of starter actuation conditions.

Upon switching on the instrument panel, the engine starts by repeated pressing of the "START-STOP" button more than 1.5 s.

Stop the engine by short-term pressing of the "START-STOP" button.

4.5 INSTRUMENT PANEL

1 – menu button

2 – "return" button

3 – indicator of the sound signal deactivation in case of a malfunction

4, 5 – menu selection buttons. Buttons *4* and *5* in the main window perform the following functions:

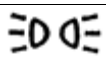
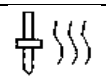
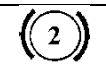
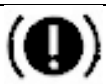
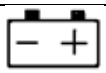
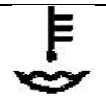
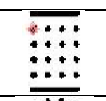
– arrow "up" (button *5*) – turn on the backlight of the keys (main page), pressing button *5* – go through the menu tabs;

– arrow "down" (button *4*) – turning off the buzzer (main page), pressing button *4* – moving through the menu tabs

6 – indicator of instrument panel illumination switching on.

4.5.1 INSTRUMENT PANEL SYMBOLS

Left turn indicator	High beam control lamp	Low beam control lamp	Control lamp for parking brake signaling. ***When driving with the parking brake on, the lamp starts flashing, while the instrument panel emits an intermittent sound signal***.	Right turn indicator

	Control lamp for turning on the marker lights	
	Control lamp of autonomous engine heater	It is used on tractors with YaMZ engine
	GPP control lamp	It lights up after holding the GPP button until the thermoelement is heated. It is used on tractors with TMZ engine
	ICE oil emergency pressure indicator	It lights up when the ICE oil emergency pressure sensor actuates
	Control lamp for signaling clogged engine oil filter	
	Control lamp for signaling emergency air pressure in the pneumatic system 1st circuit	The lamp lights up when the air pressure drops 0,45 to 0,55 MPa
	Control lamp for signaling emergency air pressure in the pneumatic system 2nd circuit	The lamp lights up when the air pressure drops 0,45 to 0,55 MPa
	Engine error control lamp	It is used on tractors with OM460LA engine
	Engine start permission	Flashes at attempt to start without the parking brake on and at absence of “Neutral” (N) signal from GB control system.
	Brake system emergency condition indicator	Brake fluid emergency level
	Steering filter clogging indicator	
	Control lamp for signaling storage battery discharge	The lamp lights up when there is no charging current from the generator
	Control lamp of the emergency temperature indicator of oil in the hydraulic system	The lamp lights up when the oil temperature of the hydraulic system reaches the emergency value 85 °C to 87 °C
	Neutral	
	Control lamp for signaling emergency coolant temperature.	For TMZ engine – 90 °C (short-term temperature increase up to 95 °C is allowed within 10 min). ***When the coolant temperature reaches 95 °C, the lamp shall start flashing and the instrument panel shall give an intermittent sound signal.*** For YaMZ engines – 100 °C.***When the coolant temperature reaches 100 °C, the lamp shall start flashing and the instrument panel shall give an intermittent sound signal.*** For OM460LA engine – 95 °C.***When the coolant temperature reaches 95 °C, the lamp shall start flashing and the instrument panel shall give an intermittent sound signal.***
	Control lamp for signaling clogged air filter	
	Control lamp for signaling clogged GB filter	

	Maintenance	The light comes on after every 250 hours of operation. To turn off the maintenance indication, press the "Return" button on the instrument panel and hold it for 2-3 s
	Engine oil emergency pressure gauge	**Oil pressure in the line of the heated YaMZ engine block** shall be within the range 0.4 to 0.7 MPa at the rated speed. Short-term illumination of the symbol of the control lamp of the engine emergency oil pressure is allowed at minimum speed with a warm engine. **Oil pressure in the line of the heated TMZ engine block** shall be within the range 0.38 to 0.5 MPa at the rated speed. **Oil pressure in the line of the heated OM460LA engine block** shall be within the range 0.25 to 0.5 MPa, at the rated speed. At engine oil pressure: YaMZ below 0.05 MPa; TMZ below 0.06 MPa; OM460LA below 0.05 MPa the emergency oil pressure sensor activates. ***When the emergency oil pressure sensor is activated within 5 s, the lamp starts flashing and the instrument panel emits an intermittent sound signal***
	Engine coolant temperature indicator	Maximum operating temperature of the coolant for: YaMZ engine – 100 °C. TMZ engine – 90 °C. OM460LA engine – 95 °C. It is not allowed to operate the engines under load at a coolant temperature below 70 °C.
	Fuel level indicator	It lights up when fuel level reaches less than 9 % ((72 ± 6) liters)
	Pneumatic system air pressure indicator	Air pressure in the pneumatic system during operation shall be 0.71 to 0.85 MPa.
	GB oil pressure indicator	Oil pressure in GB hydraulic system at gears at engine crankshaft speed 900 to 1,800 min^{-1} and oil temperature (70 ± 3) °C shall be 1.1 to 1.3 MPa. The build-up of oil pressure in each gear shall be fast. Neutral pressure and upon engagement of the synchronizing brakes shall not be lower than that on the gears. ***If the pressure in the GB falls below 1 MPa for 30 s, the indicator shall start blinking and the instrument panel shall give an intermittent sound signal on low pressure in the GB. If the buzzer sounds during the works execution, stop the work and make sure that pressure in the GB matches its operating pressure using a mechanical pressure gauge***

4.5.2 INSTRUMENT PANEL MENU

When pressing the button *1* to call the menu, an information window opens, consisting of the following sections:

– car condition;

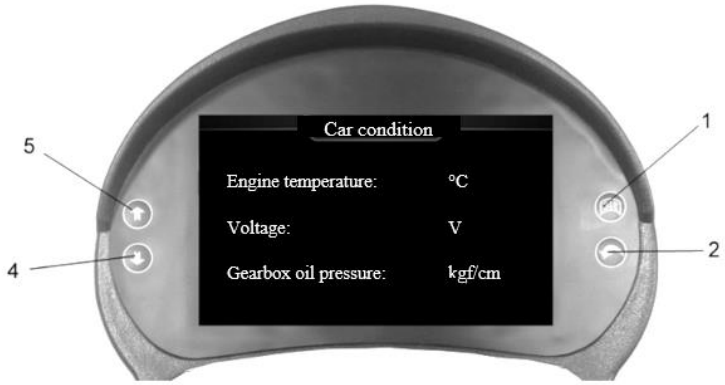
– time adjustment;

– advanced customization;

– device information.

“Car condition” section

The main indicators of the sensors are displayed in digital form.



“Time setting” section

The real time and date are set.

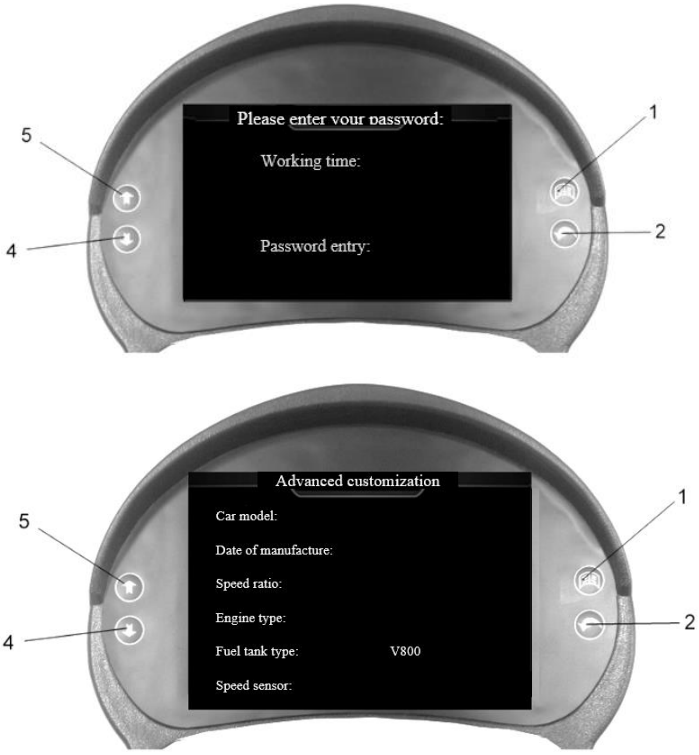
The setting is made using buttons *4*, *5* and *1*.

After that, to save the settings, you need to reboot the display.

“Advanced customization” section

To enter this section, enter the password using the controls (buttons *4*, *5* and *1*).

The password is “**8888”.** Then press the button *1* to call the menu. The additional menu page opens.



“Car model – K7M----” – indicator by default, with the ability to add characters 30, 35, 39, 40, 42.

“Date of manufacture” – 2021. - -. --(year.month.date)” – date of shipment.

“Speed ratio” – 03.67 – setting of tractor tachometer (03.67 – value by default, used on tractors with OM460LA and YaMZ engines, for TMZ engines enter the indicator **– 2.9)**

“Engine type” – there are two types of settings:

– “**0 (YaMZ-TMZ)” –** for YaMZ and TMZ engines;

– “**1 (OM460LA OML engine – 460)”** for OM460LA engines.

“Fuel tank type” – V800 – the tank volume 780 l entered. **THE VALUE IS NOT MODIFIED.**

“Language” – selection of language – Russian, English, Czech.

Entering the password “**2222**” opens the diagnostic menu of the engine control system malfunctions for TMZ and YaMZ tractors in the form of SPN and FMI codes. If there are problems, the “Check Engine” symbol appears on the main page of the display. List and definition of ICE fault codes are given in Appendixes D, E.

“Device information” section

The following information lines are displayed:

“Car model” – the indicator is configured in additional settings.

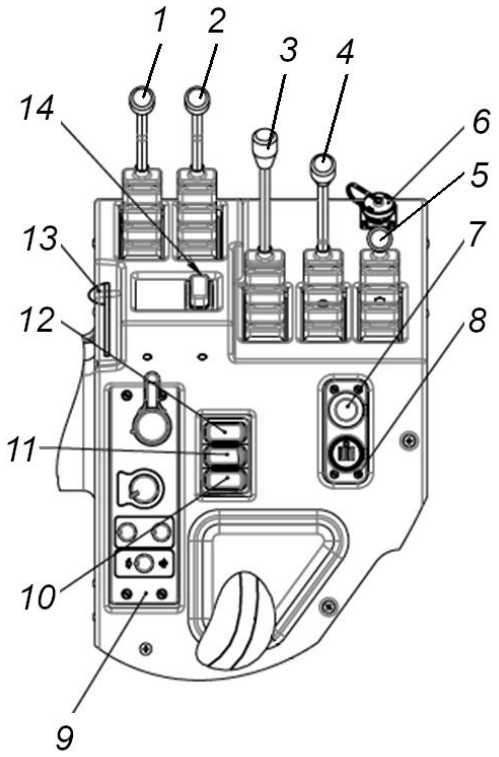
“Car number” – assigned according to the tractor number before shipment.

“Car manufacturer” – PTZ JSC – by default.

“Electric control version” – download file (firmware).

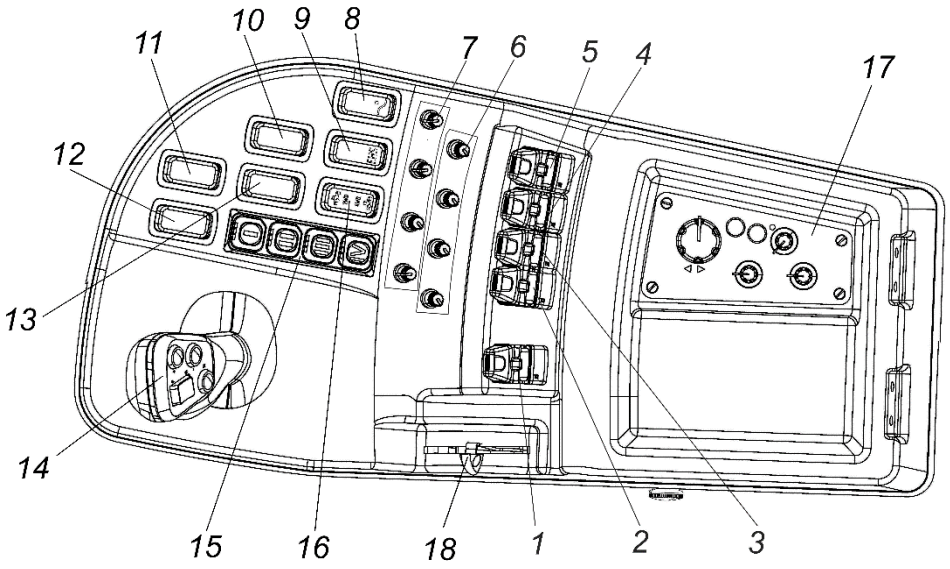
4.6 HYDRAULIC CONTROL

4.6.1 TRACTOR CONTROL UNIT WITH CABLE MECHANICAL CONTROL OF CHANGEOVER VALVE



1 – control lever of the tractor hitch hydraulic system; *2, 3, 4, 5* – external hydraulic line control levers; *6* – connector for monitoring of tractor system parameters (Glonass); *7* – 24 V socket;
8 – USB connector; *9* – EHR control panel; *10* – PTOM actuation key (**option**); *11* – engine fault diagnostics key; *12* – engine emergency shutdown key (for tractors with YaMZ and TMZ engines); *13* – ICE manual rpm controller; *14* – key for interlock of the hitch hydraulic cylinders (for tractors with EHR)

4.6.2 TRACTOR CONTROL PANEL WITH ELECTRIC CONTROL OF CHANGEOVER VALVE



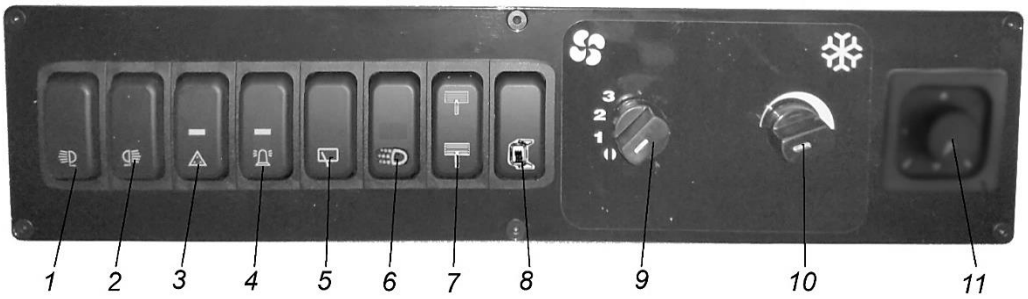
1 – joystick for control of the tractor hitch hydraulic system; *2, 3, 4, 5* – joysticks for control of changeover valve sections; *6* – timing devices; *7* – flow controllers; *8* – implement hydraulic motor activation key; *9* – EHS activation key; *10* – plug; *11* – plug or PTOM actuation key (**option**); *12* – plug or ICE emergency stop key (for tractors with YaMZ and TMZ engines); *13* – manual fuel feed mode activation key (for tractors with OM460LA engine) or ICE fault diagnostics key (for tractors with YaMZ and TMZ engines);

14 – control joystick of GB; *15* – button for selection of GB movement mode;

16 – key for actuation/deactivation of rear axle drive; 17 – EHR control panel;

18 – ICE manual rpm controller

4.7 SWITCHES AND ACCESSORIES ON THE CAB CEILING PANEL



1 – key for switching on the front working lights;

2 – key for switching on the rear working lights;

3 – key for switching on the "Road train" sign;

4 – key for switching on the blinking beacon;

5 – key for switching on the rear wiper/washer;

6 – key for switching on the optional lighting headlamps;

7 – sunblind control key (**OPTION**);

8 – key for switching on heating of the mirrors (**OPTION**);

9 – air conditioner fan speed controller;

10 – air conditioner temperature controller;

11 – joystick of rear view mirrors control (**OPTION)**, for tractors in "Premium" configuration

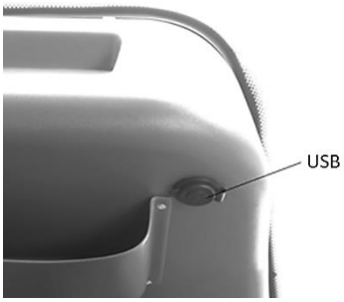
Car audio

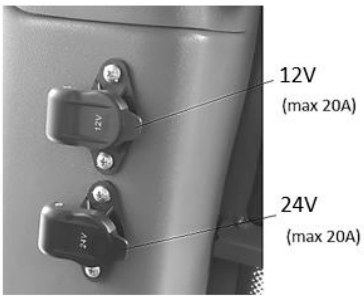
Air recirculation blinds

ATTENTION! IT IS NOT RECOMMENDED TO COOL THE AIR IN THE CAB BY MORE THAN 11 °C RELATIVE TO THE AMBIENT TEMPERATURE, AS THIS CAN CAUSE COLDS.

4.8 SOCKETS FOR CONNECTING ADDITIONAL EQUIPMENT

On tractors, it is possible to connect additional equipment to power with a voltage of 12 V, 24 V and a USB socket.





Sockets for connection of additional equipment are located on the right front post inside the cab, on the base of the cab on the left side under the hydraulic tank, on the right rear fender and the fender support post.

To connect trailers electrical equipment, the following sockets are installed on the tractor rear fenders and the fender support post: 24 V – on the left fender, 12 V – on the right fender.

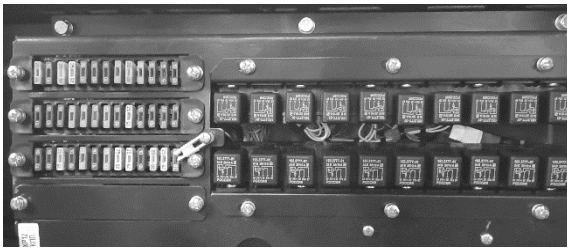
To connect the power supply of agricultural implements, two 12 V sockets are installed on the fender support post, each of them is designed for a current strength of 25 A.

To connect the portable light behind the cab from the right below the hydraulic tank, a 12 V socket (maximum current 6 A) is installed.

ATTENTION! TOTAL CURRENT OF DEVICES CONNECTED TO 12 V SOCKETS SHALL NOT EXCEED 50 A FOR STANDARD TRACTOR DESIGN. WHEN THE TRACTOR IS EQUIPPED WITH 90 A VOLTAGE CONVERTER, THE TOTAL CURRENT OF CONSUMERS INCREASES TO 90 A.

4.9 SWITCHING AND PROTECTION UNIT

The switching and protection unit (fuse and relay box) is located on the rear wall of the cab, behind the plastic cover, which is fitted with a plate indicating the rating and designation of fuses and relays.



4.10 GLOBAL POSITIONING SYSTEM (GPS)

To connect GPS for monitoring the parameters of tractor systems, a 14-pin socket connector 206043-1 is provided.

On tractors with mechanical cable control of changeover valve, the connector is located on hydraulic control unit.

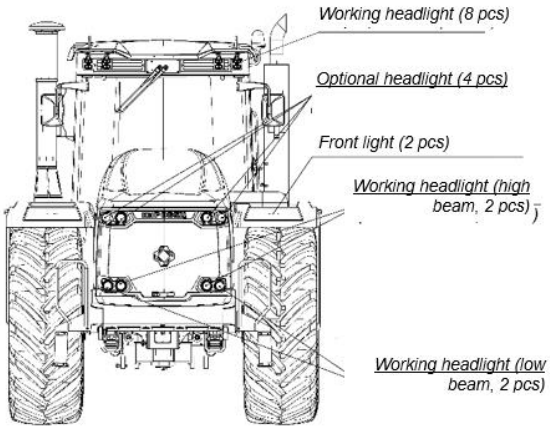
On tractors with electric control of changeover valve, the connector is located on the switching and protection unit.

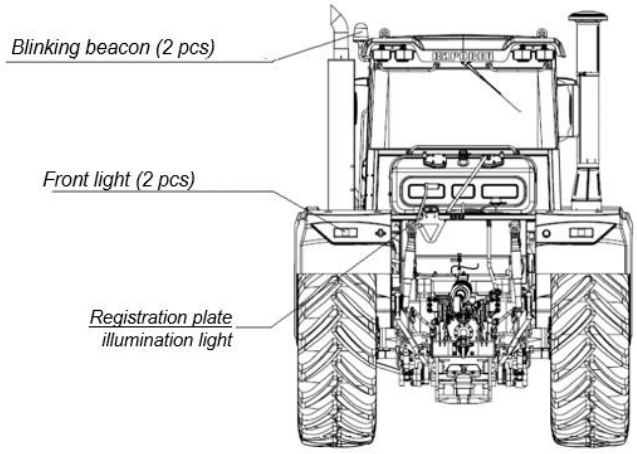
Pin shoe 206044-1

XS11

Contact No.	Wire number on the wiring	Controlled parameter
1	-	
2	-	
3	CAN_H	CAN bus (for K-744 Premium)
4	CAN_L	
5	32	Clogged gearbox filter
6	134	Clogged air filter
7	131	Gearbox oil pressure
8	46	Fuel level
9	D+	Generator D+terminal signal
10	15.6	+24 V After ignition lock
11	130	Speed sensor
12	108	Emerg. oil temperature in HS
13	30.4	+24V
14	31	GND

4.11 LIGHTING AND SIGNALING





To illuminate the roadway, the tractor is equipped with four headlights (2 high beam headlights and 2 low beam headlights).

To illuminate the working area, the following is installed:

– four optional lighting headlamps mounted at the top of the hood;

– eight headlamps of working lighting:

– four swivel working lights in front of the cab;

– four swivel working lights on the rear of the cab.

In accordance with the traffic safety requirements, the tractor is equipped with the following light signaling devices:

– front lights having two sections: one – with a colorless diffuser to indicate the dimensions of the tractor, the other – with an orange diffuser to signal the tractor turning;

– rear lights, which have three sections: the outermost – direction indicator (orange) and then – brake light (ruby), marker light (red);

– the “Road train” sign, mounted on the roof of the cab and consisting of three lights with orange diffusers;

– a registration plate illumination light mounted on the registration plate bracket on the rear fender support beam;

– blinking beacons (2 pcs).

To illuminate the cab, a single LED light with a switch is installed on the cab ceiling.

When driving on highways, only the front headlights are used, which have low and high beam modes. When the high beam headlamps are switched on, the low beam headlamps remain on.

IN ORDER TO AVOID DAZZLING ONCOMING TRAFFIC, AS WELL AS TRAFFIC COMING FROM BEHIND, SWITCHING ON OF FRONT AND REAR WORKING LIGHTS DURING TRANSPORT WORK IS FORBIDDEN.

When modularizing a tractor with a trailer (semi-trailer), it is obligatory to switch on the “Road train” sign.

Lists of the electric equipment elements are given in Appendixes F, G, I.

4.12 GEARBOX CONTROL SYSTEM DISPLAY

To obtain information about the GB state during the tractor operation, the GB control system display is located on the front right post of the cab.

5 TRACTOR FURTHER ASSEMBLY, ADJUSTMENT, RUNNING IN

5.1 FURTHER ASSEMBLY AND ADJUSTMENT OF THE TRACTOR

When dispatched from the manufacturer facility, some parts and assemblies are not installed on the tractor for ease of transportation and safety, and are put separately. The list of parts and assembly units not installed on the tractor is specified in the packing list for the SPTA box and the inventory of the tractor.

Preparation of the tractor for operation consists in de-preservation, installation of the attached units and parts, performance of maintenance work, start-up of the engine and running-in of the tractor.

Before starting to operate a new tractor, the following work shall be done:

– install headlights, central link hinge, mirrors, muffler, attachment and air intake pipe; thermal insulation in winter (**OPTION**);

– connect the plus bus to the battery disconnect switch terminal;

– remove the shims from under the spring attachment;

– fill the tractor with fuel;

– check the level of working fluids of the engine, GB, hydraulic tank;

– connect the rear axle to agricultural implements when the tractor is operating or under severe road conditions;

– check the correct adjustment of headlights, if necessary, adjust them in accordance with the instructions of the “ADJUSTING THE HEADLIGHTS” section.

5.1.1 AIR INTAKE PIPE INSTALLATION

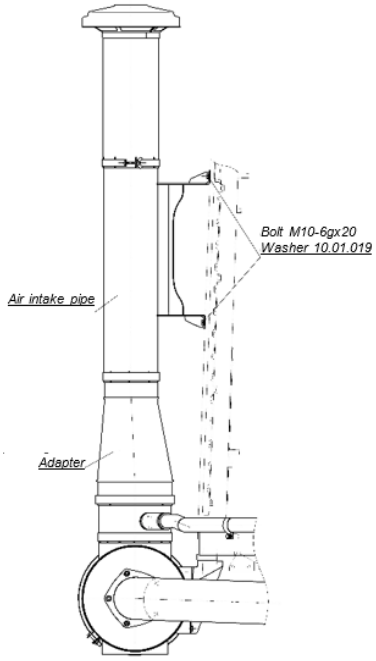
Install the air intake pipe in the following sequence:

– remove the process plug from the adapter;

– install an air intake pipe on the tractor and attach it with bolts fixed to the pipe during the tractor shipment.

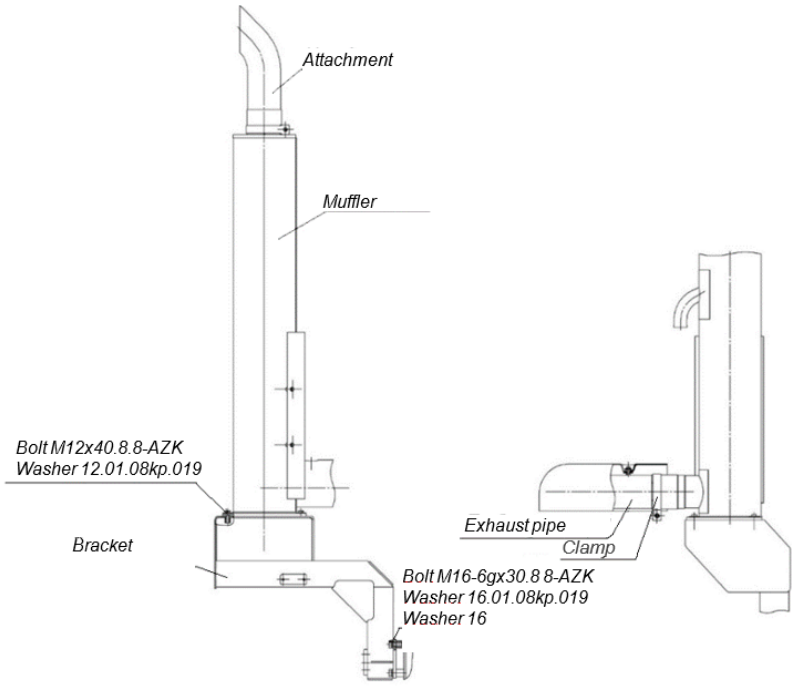
Tightening torque of the bolts is 25 to 30 N·m.

NOTE THAT THE PLASTIC ADAPTER IS NOT SKEWED PRIOR TO CLAMPING.



5.1.2 INSTALLATION OF THE MUFFLER

To ensure the tightness of the "exhaust pipe – muffler" joint, when connecting the muffler and the pipe, it is necessary to apply a layer of sealant (in the tractor SPTA box) on the exhaust pipe around the circumference, in a continuous roller with a thickness 5 to 7 mm, at a distance 5 to 10 mm from the pipe end.



NO GAS BREAK IS ALLOWED IN THE JOINT OF THE EXHAUST PIPE AND THE MUFFLER DURING THE ENGINE START-UP AND OPERATION.

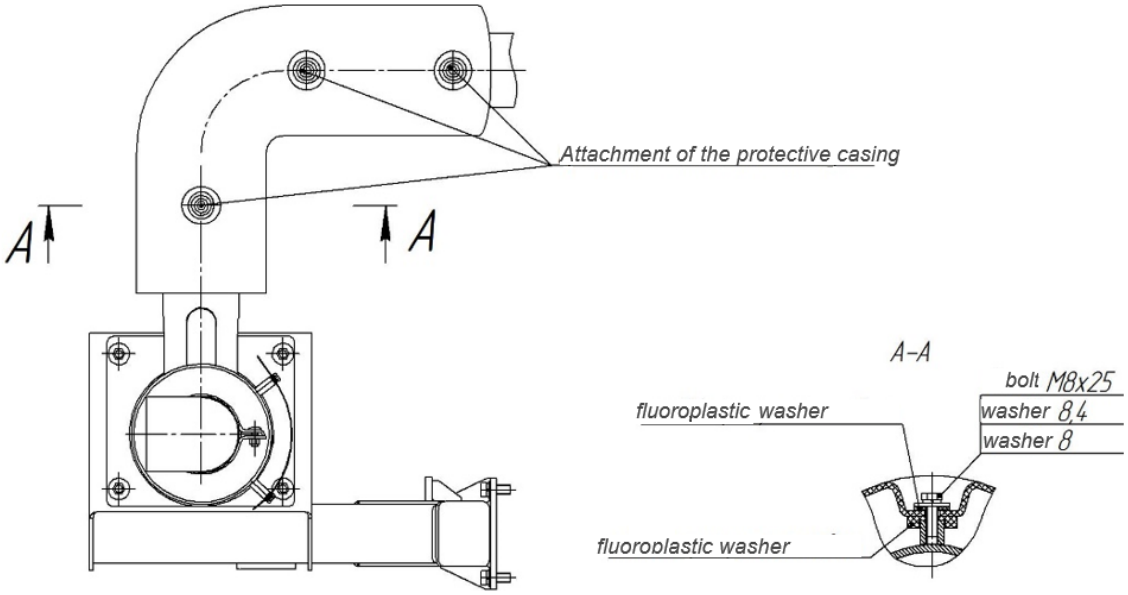
Tightening torque of the bolts:

– M12x40.8.8-A3K – 80 to 85 N·m;

– M16-6gx30.8.8-A3K – 185 to 200 N·m.

5.1.3 INSTALLATION OF THE EXHAUST PIPE PROTECTIVE CASING

Install the protective casing above the exhaust pipe and attach it to the bosses on the pipe. The casing is located in the cab, the fasteners are installed on the bosses.



ATTENTION! THERMAL PROTECTION WASHERS SHALL BE INSTALLED BETWEEN THE EXHAUST PIPE AND THE PROTECTIVE CASING TO PREVENT THERMAL IMPACT ON THE CASING MATERIAL.

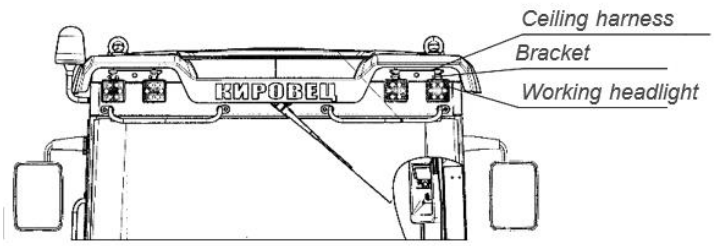
Tightening torque of the bolts is 8 to 15 N·m.

5.1.4 LIGHT-SIGNALING EQUIPMENT INSTALLATION

ATTENTION! DURING FURTHER ASSEMBLY OF THE TRACTOR IN TERMS OF INSTALLATION OF LIGHT-SIGNALING EQUIPMENT, IT IS REQUIRED TO ENSURE THAT ELECTRICAL HARNESSES AND WIRES DO NOT TOUCH SHARP EDGES, MOVING PARTS OF THE TRACTOR, AND ALSO ARE NOT PINCHED BETWEEN THE PARTS OF THE TRACTOR DURING INSTALLATION.

Installation of light-signaling equipment shall be carried out with the ground off.

Rear (front) working lights shall be installed on the mounting brackets in the upper part of the cab, front and rear, respectively.



Connect the front and rear working lights, front and rear lights, side repeaters and “Road train” signs according to the wiring diagram.

5.1.5 ADJUSTING THE HEADLIGHTS

Headlights (external – low beam, internal – high beam) are built into the hood.

The initial directivity of the light flux is adjusted at the manufacturer’s facility.

However, during operation, when replacing lamps, the direction of the light flux may change, which shall require the need for additional adjustment of the headlights.

To adjust the headlights, place the tractor on a flat horizontal platform at a distance of 5 m from the screen (wall).

Adjust the headlights in sufficiently darkened conditions.

Mark the screen to adjust the position of the light spots of the headlights according to the marking scheme.

Center the position of the vertical axis O of the screen (shall be in the longitudinal axis of symmetry of the tractor).

Select the value B = 125 mm for a distance to the screen of 5 m.

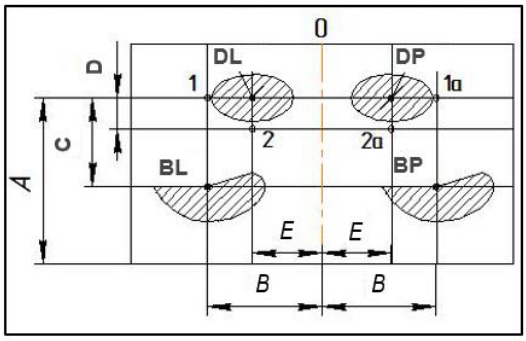
O – vertical axis of symmetry;

1, 1a, 2, 2a – projections of the geometric centers of the headlights on the screen;

BL, BP – points of alignment of the centers of light spots of the left and right low beam headlights;

DL, DP – points of alignment of the centers of light spots of the left and right high beam headlights;

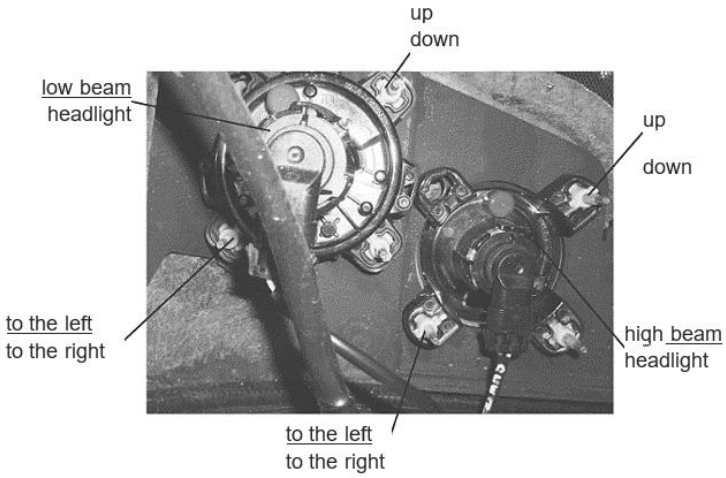
(A = 1,320 mm; B = 570 mm; C = 125 mm; D = 50; E = 450)



To adjust the headlights, a TORX E5 key head with internal torx socket.

Position of the adjustment screws on the left headlights is shown in the figure (view from inside the hood).

On the right headlamps, position the screws is in mirror image.



To adjust the direction of the headlights, lift the hood, put the TORX E5 head on the adjusting screw and turn in the desired direction.

For left headlights, turning clockwise or counterclockwise of the upper adjustment screw of the headlight results in turning the light beam up or down, respectively; and turning clockwise or counterclockwise of the lower adjustment screw of the headlight results in turning the light beam to the left or right, respectively. By lowering the hood, compare the result with the desired one. Adjust several times until a picture similar to the screen layout is reached.

Adjustment is carried out for each headlight separately, while excluding illumination from other lights by installing opaque screens or by disconnecting the connectors from the corresponding headlights.

It is possible to adjust the headlights without opening the hood. To do this, remove the protective casing of the radiator and carry out adjustment in accordance with the instructions above.

5.1.6 INSTALLATION OF BLINKING BEACONS

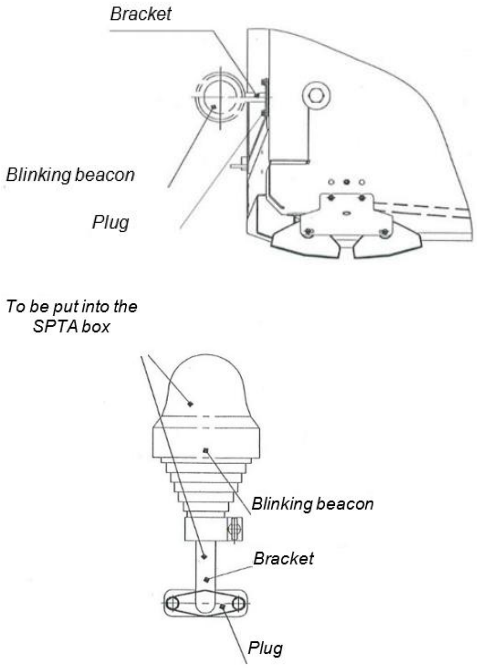
Installation of blinking beacons (2 pcs packed in the SPTA box) shall be carried out in the rear part of the cab, on the left and on the right in the direction of the tractor travel. For this, proceed as follows:

– remove the plug;

– remove the power supply wire;

– connect a blinking beacon;

– attach the beacon on the bracket (2 pcs are put in the SPTA box).



5.1.7 CHECKING THE CAB WINDOW WASHERS

The tank of front and rear glass washers of the cab is installed on the bracket at the rear of the tractor cab on the left side in the tractor's travel direction.

To check the operation of washers, fill the tank with glass washer fluid in the amount of 6 liters and turn on the battery disconnect switch. Switch on the washer of the front and rear windows in sequence. The tractor's front windscreen washer is switched on by pressing the steering column switch ring towards the steering column. The rear window washer is switched on by turning the key to the lower position on the cab ceiling panel.

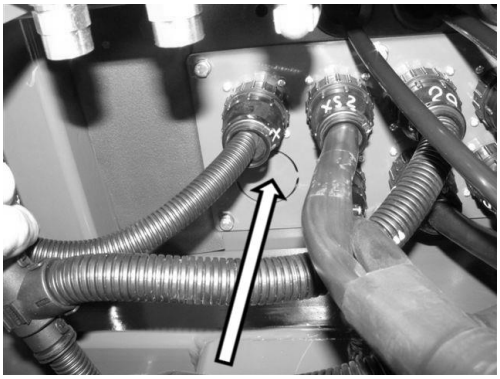
If necessary, adjust the direction of the water jet from the jet nozzles located on the pantograph device of the wiper.

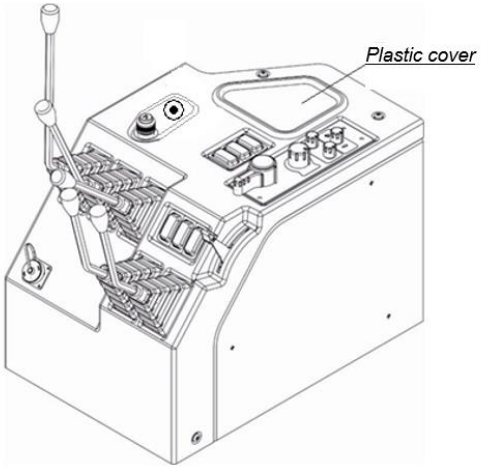
5.1.8 ENTRY OF WORKING EQUIPMENT CABLE INTO TRACTOR CAB

In the rear right part of the cab, inside the floor heater casing of the cab, a hole with a diameter of 60 mm is provided for laying a harness of working equipment cables into the tractor cab.

To lay the cable of the seeding complex or other trailed equipment, it is necessary to remove the sound insulation material covering the hole, remove the metal plug, bring the harness of the working equipment cables into it.

On tractors with cable mechanical control on the control unit, remove the plastic cover and pull the harness inside the cab.





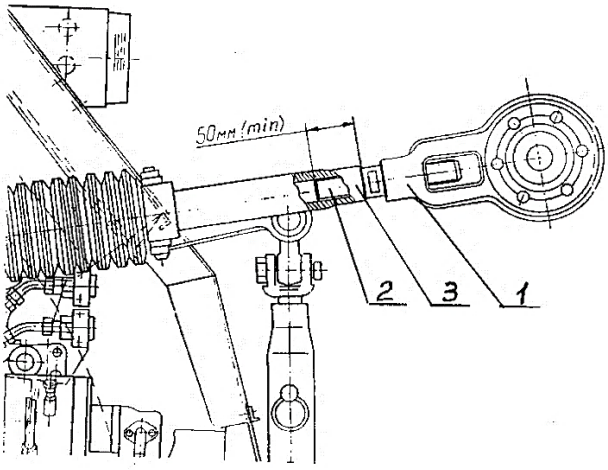
Seal the hole formed in the cab floor with bitumen-based material (vibro-plast, etc.).

5.1.9 INSTALLATION OF HINGED EQUIPMENT

5.1.9.1 INSTALLATION OF HINGE OF THE HITCH CENTRAL LINK

1 – hinge; *2* – tightening screw;

3 – central link pipe

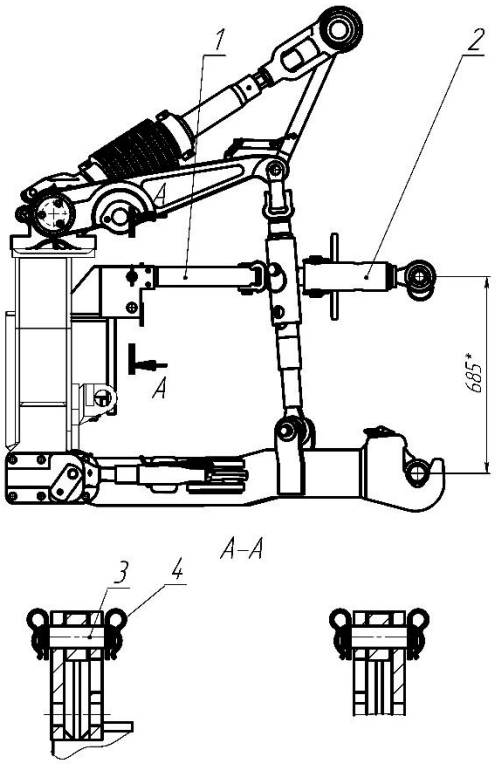


5.1.9.2 INSTALLATION OF CATEGORY 3 CENTRAL LINK AS PER GOST ISO 730-2019 (OPTION)

Install the eye *1* in the bracket of the rear semi-frame, attach it with pins *3* and retainers *4*.

Install the link with hinge *2* on eye *1*, attach it using the axle with retainer from the link set.

The central link set is available in tractor SPTA set.



5.1.9.3 INSTALLATION OF LOWER LINKS AND BRACES OF THE HITCH MECHANISM

Before assembly, lubricatethe rubbing surfaces with Litol-24 lubricant, GOST 21150-87.

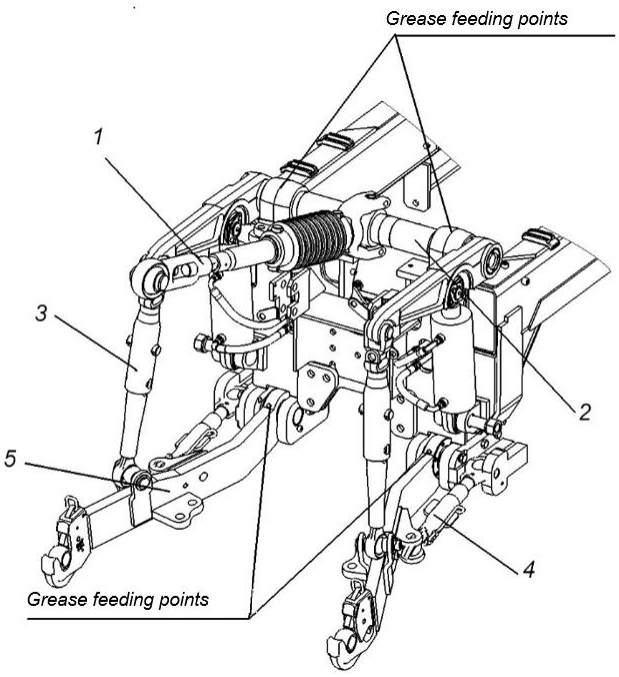
Connect vertical braces *3* to the left and right main levers of the lever shaft *2*.

Connect the lower links *5* to the lower eyes of vertical braces *3.*

Connect the lower links to the brackets on the rear semi-frame of the tractor.

Connect the corresponding ends of horizontal braces *4* to the eyes on lower links and to eyes of brackets attachment to rear semi-frame.

When preparing the tractor for operation, it is necessary to gun-grease the places of lubrication with Litol-24 lubricant, until it appears from the gaps.



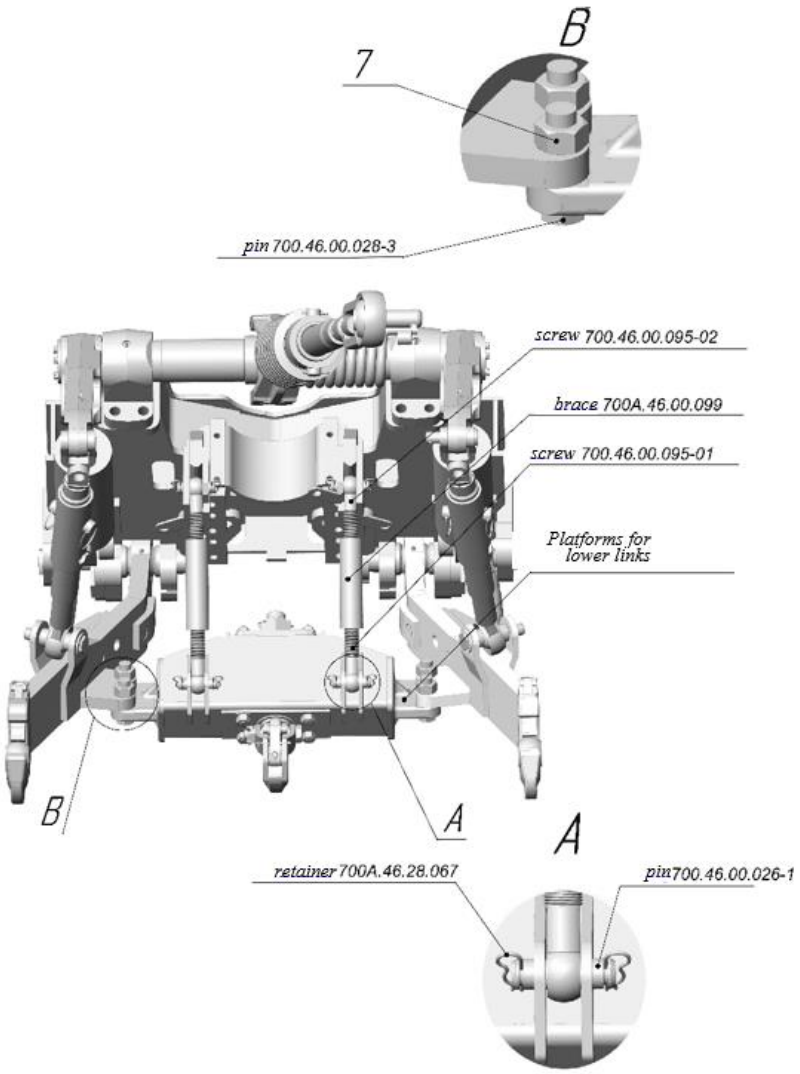
5.1.9.4 INSTALLATION OF TSU-3-K (HYDRAULIC HOOK)

The hydraulic hook is intended for modularization with tractor and automobile trailers having coupling loops and their arrangement as per GOST 2349-75.

Install the hydraulic hook as follows:

– bring the hydraulic hook under the lower link areas. Hydraulic hook platforms shall be located below the lower link platforms. Attach the hydraulic hook using nuts M30 *7* and pins 700.46.00.028-3.

Tightening torque of nut M30 *7* and pin 700.46.00.028-3 for attaching the hydraulic hook to lower links 500 to 600 N·m.



5.2 TRACTOR RUNNING-IN

ATTENTION! THE NEW TRACTOR NEEDS TO BE RUN-IN, DURING WHICH THE RUBBING PARTS, WORKING WITH LOW LOADS, ARE WELL RUN-IN TO EACH OTHER.

TRACTOR RUN-IN SHALL BE CARRIED OUT IN ACCORDANCE WITH THE REQUIREMENTS OF THIS OPERATION MANUAL, AS WELL AS THE ENGINE OPERATION MANUAL.

OPERATION AT HIGH SPEEDS AND AT FULL LOAD IS NOT ALLOWED DURING RUNNING-IN.

IF KNOCKING, ABNORMAL NOISES APPEAR, THE RUNNING-IN SHALL BE STOPPED IMMEDIATELY AND MEASURES SHALL BE TAKEN TO FIND OUT THE CAUSE AND ELIMINATE THE MALFUNCTION.

CORRECT RUNNING-IN IS A PREREQUISITE FOR THE LONG-TERM OPERATION OF THE TRACTOR. RUNNING-IN SHALL BE ALSO CARRIED OUT AFTER OVERHAUL OF THE TRACTOR.

Run-in during the first fifty motor hours or 15 days of tractor operation (depending on what comes first).

Carry out the tractor run-in by modularizing with a trailer or with agricultural machines and implements in modes that prevent the possibility of engine overloads. Changing the run-in mode is achieved by choosing the type of implement, limiting the working width, tillage depth and machine speed.

While the tractor is operating with mounted agricultural machines and implements, check the hydraulic system of the attachment, for this, make several lifting and lowering movements of the implement at an average and maximum engine crankshaft speed.

During running-in, watch the engine work, do not overload it. To prevent the engine from smoking, do not allow a drop in the crankshaft rotation speed, observe the operation of transmission units, hydraulic systems and electrical equipment. Moreover, check for leaks from under the seals and pipelines, as well as air leaks in the suction line.

The list and content of maintenance works at the end of the operational run-in are set out in the corresponding subsection of this Manual.

6 TRACTOR OPERATION AND ADJUSTMENT RULES

6.1 PROCEDURE FOR PREPARING THE TRACTOR FOR OPERATION

Prepare the tractor for operation with the engine off (except for special check operations), with the parking brake on. Hinged agricultural implements shall be lowered.

Check the condition of the tractor by visual inspection, paying attention to the absence of leaks of fuel, oil, coolant, electrolyte, and, if necessary, eliminate the leaks.

Check the level and, if necessary, add oil to the engine lubrication system, GB, and the hydraulic system, coolant to the expansion tank to a level between the MIN and MAX marks.

Check the engine condition by visual inspection.

Check the tire pressure.

Fill the tractor with fuel. Before refueling, it is necessary to clean the filler neck of the fuel tanks from dust and dirt. During fueling it is necessary to prevent suction of mechanical impurities and water from the tank. Grades of working liquids are given in Appendix A. Contamination or presence of water in the transparent container of CFF indicates the need to drain fuel sludge from the fuel tank.

Check operation of the tractor controls, operation of the braking system, lighting and signaling, steering and hitch hydraulic system. For this:

– pedals, handles and levers shall work without jamming, pedals shall freely return to their original position under the influence of springs, levers shall be securely fixed against spontaneous switching on and off;

– turn on the battery disconnect switch of the tractor, holding the power key pressed for 2 s as maximum. Before turning on the battery disconnect switch after a long parking of the tractor (more than one day), especially in summer, open the cover of the storage battery container for at least 5 minutes, to remove an explosive hydrogen-air mixture. Storage batteries shall be securely fastened, closed with a lid;

– after switching on the battery disconnect switch, start ignition by short-term pressing (less than 1.5 s) on the “START-STOP” button. The counter of tractor operating hours on the instrument panel shall show a digital value;

– turn on illumination of instrument panel buttons, internal lighting of the cab, exterior light. Check serviceability of all switched-on lamps;

– press the sound signal button on the steering column switch – a sound signal shall be heard;

– turn on the handles of the turn signal “right” – “left”, while the indication on the instrument panel and light lamps of turn repeaters shall flash;

– press the brake pedal, while the lamps of the rear lights shall light up a bright red light. The check is carried out at an air pressure in the pneumatic system not lower than 0.45 MPa;

– engage the parking brake, the warning light (P) shall glow on the instrument panel;

– give two short sound signals and start the engine by pressing the “START-STOP” button for more than 1.5 s.

After starting the engine, the battery charging indicator on the instrument panel shall go out.

Let the engine idle for a few minutes. In this case, the engine lubrication shall fill the system, reach the turbocharger bearings and rubbing engine parts before the engine runs at rated speed.

The tractor status menu displays the current voltage value in the battery circuit, it shall be (28.4 ± 0.4) V.

Check the engine operation by ear and by readings of control instruments. The heated engine shall operate stably, evenly, without extraneous knocks or noise.

Adjust the driver’s seat depending on the weight and height (see the seat’s certificate).

Make sure that the brakes are engaged reliably when the tractor is moving. The operating brakes shall ensure a complete stop of the tractor on a dry hard surface providing good traction of the wheels with the road.

On concrete or asphalt ground, make 2-3 complete turns of the tractor in place. The turn shall be smooth, without jerks, vibrations, oscillations.

Perform 1-2 hitch lifting and lowering operations, at that the changeover valve handle (with mechanical cable control) shall be fixed in “Lifting” and “Forced lowering” positions. From all operating positions the handle shall return to “neutral” position after manual removal from locking. Carry out the check at the rated speed of the engine crankshaft. On tractors, in the hydraulic system of which there is a changeover valve with electrohydraulic control, the handles (joysticks) in the “Lifting” and “Lowering” positions are not fixed.

Set the required tire air pressure in accordance with the recommendations of the “TIRE OPERATING RULES AND SELECTION OF OPTIMAL TIRE PRESSURE” section.

The operating conditions of the tire shall correspond to the values of Tables 8, 9, 10.

6.2 OPERATING RULES AND CONTROL OF THE TRACTOR DURING OPERATION

When working on a tractor, it is necessary to strictly observe the instructions of the “SAFETY REQUIREMENTS” section, to follow the indications of devices and signaling devices. Instrument readings and signaling of control lamps shall comply with the instructions in the “CONTROLS” section.

IT IS FORBIDDEN TO WORK WITH THE INSTRUMENT PANEL EMERGENCY LAMPS LIT.

All tractor control levers shall be locked in their respective positions.

In case of an accident or excessive increase in engine speed, immediately stop the fuel supply by pressing the “START-STOP” button.

If temperature of the engine oil and coolant rises above the permissible values, stop the tractor and set the minimum engine crankshaft speed. After reaching normal values, continue driving.

To prevent overheating of the coolant, it is necessary to ensure that the radiator assembly is not clogged. To do this, it is necessary, when working in dusty conditions, to blow the radiator every shift with compressed air at a pressure 5 to 7 kg/cm^2, or (if dirt is not blown out) wash the radiator core with water at a pressure 5 to 7 kg/cm^2 in accordance with instructions of the “MAINTENANCE OF THE COOLING SYSTEM” section.

The tractor is not allowed to drive under structures with a passage height below 4 meters.

Make sure there are no leaks of coolant, oil, fuel or electrolyte. If detected, eliminate the leak.

It is necessary to regularly clean the tractor from dust and dirt, check the completeness of the tractor, the reliability of all external fasteners.

When carrying out transport works, set the manual fuel feed lever to the minimum fuel feed position.

IT IS PROHIBITED, FOR SAFETY PURPOSES, TO USE MANUAL FUEL SUPPLY DURING TRANSPORTATION WORKS.

Operation of pneumatic tires is in accordance with the “TIRE OPERATING RULES AND SELECTION OF OPTIMAL TIRE PRESSURE” section.

ATTENTION! IN ORDER TO PREVENT PREMATURE FAILURE OF THE REAR AXLE CARDAN DRIVE AND REDUCE TIRE WEAR, IT IS NECESSARY TO ENGAGE THE REAR AXLE ONLY WHEN THE TRACTOR OPERATES WITH AGRICULTURAL IMPLEMENTS AND WHEN DRIVING UNDER SEVERE ROAD CONDITIONS.

THE REAR AXLE SHALL BE DISENGAGED WHEN DRIVING UNDER GOOD ROAD CONDITIONS (ON SOLID OR PAVED ROADS).

6.3 ENGINE STARTING

Before starting the engine make sure that the levers of changeover valve of the hitch hydraulic system are in neutral position, parking brake is engaged.

Start the engine in the following order:

– fill, if necessary, the engine supply system with fuel. To do this, pump the system for 2 to 3 minutes with a manual fuel feed pump located on the CFF;

– switch on the battery disconnect switch of the tractor ;

– set the manual fuel feed lever to the position corresponding to the minimum engine crankshaft speed;

– set GB to “modes neutral” by pressing the “N” button on the GB control joystick handle. At that, “N” symbol is displayed on the instrument panel and on the display of indication module. The process is described in details in the Operating Manual of the control system of Pneuma-3P GB enclosed to the tractor.

– start ignition by short-term pressing (less than 1.5 s) on the “START-STOP” button. Then the engine starts by prolonged pressing of the “START-STOP” button (more than 1.5 s).

At that, the moment of button release is not important, starter shutdown shall occur when the engine reaches 600 min^{-1}.

If during starter operation over 15 s the engine does not start, the starter is automatically switched off. The system provides delay of starter re-actuation in proportion to starter operation time 1:1.

The “START-STOP” button locks the starter actuation at operating engine.

It is allowed to start the tractor when the indicators are displayed:

– engine start permit indicator;

– emergency pressure in the 1st circuit of the pneumatic system;

– emergency pressure in the 2nd circuit of the pneumatic system;

– control lamp for signaling storage battery discharge;

– engine oil emergency pressure indicator.

In all other cases, it is necessary to eliminate the malfunction according to the alarm parameters indication.

After starting, warm up the engine to a coolant temperature 40 °C to 45 °C first at the minimum, and then at the average crankshaft speed.

Oil pressure in the heated engine shall be within the range 0.45 to 0.6 MPa at the rated speed, and as minimum 0.1 MPa at minimum speed.

In this case, the control lamps 

, , , shall go out.

If, after starting the OM460LA engine, the emergency lamp  remains on, switch off the engine and contact a service station.

ATTENTION! IN CASE OF CONTINUOUS INDICATION OF ONE OF THE EMERGENCY PARAMETER CONTROL LAMPS, CHECK:

- ***ENGINE OIL PRESSURE;***
- ***PRESSURE IN AIR CYLINDERS OF BOTH CIRCUITS;***
- ***COOLANT TEMPERATURE;***
- ***ENGAGEMENT OF PARKING BRAKE.***

After starting the engine, make sure that the tractor systems are functioning, there are no faults, check operation of light and sound signaling, braking system, hydraulic control systems and hitch, check readings of the control instruments.

Oil pressure in GB hydraulic system at gears at engine crankshaft speed 900 to 1,800 min^{-1} shall be 1.1 to 1.3 MPa (11 to 13 kg/cm^2).

The build-up of oil pressure in each gear shall be fast. The pressure on the “neutral” shall be no lower than on the gears.

6.4 STARTING THE ENGINE FROM AN EXTERNAL CURRENT SOURCE

If it is impossible to start the engine from storage batteries due to their strong discharge, it is allowed to start the engine from an external power source (from storage batteries of another vehicle: tractor or car with onboard network voltage of 24 V).

When starting the engine from the battery of another vehicle, the following procedure shall be strictly observed:

– switch off the tractor battery switch;

– remove the battery container cover;

– engine of the vehicle that is the source of the external start shall be stopped;

– connect the external battery to the tractor. To connect, use power wires 2 to 2.5 m long with a cross section of at least 25 mm^2, equipped with crocodile lugs designed for a current of at least 200 A. Connect the "+" (+24 V) terminal from the external source (another Kirovets tractor, two batteries (12 V) connected in series, starter charger 24 V, etc.) to the "+" (+24 V) terminal of the tractor battery. Connect the "-" terminal of the external battery to the tractor "ground", for example, a grounding boss;

– turn on the tractor battery switch and start the engine at idle speed. After 1-2 minutes of the engine operation, increase the engine speed to medium values (1,000 to 1,200 min^{-1}) and let the engine run for 5 to 10 minutes;

– stop the tractor engine. Turn off the battery switch. Disconnect the wires from the external battery in reverse order;

– turn on the battery switch and start the tractor engine from its own batteries. In case of successful start-up, let the engine operate in order to charge the discharged batteries.

ATTENTION! FAILURE TO COMPLY WITH THESE RULES CAN LEAD TO AN INCREASED DISCHARGE OF THE VEHICLE BATTERY, FROM WHICH THE LAUNCH IS MADE, OR THE FAILURE OF ITS GENERATOR.

6.5 START OF MOTION AND PNEUMATIC SHIFT OF GEARS

The order of actions of the driver at the beginning of movement on the tractor, selection of driving modes, switching gears in motion shall be carried out in accordance with the instructions of the Operating Manual of the control system of Pneuma-3P GB enclosed to each tractor.

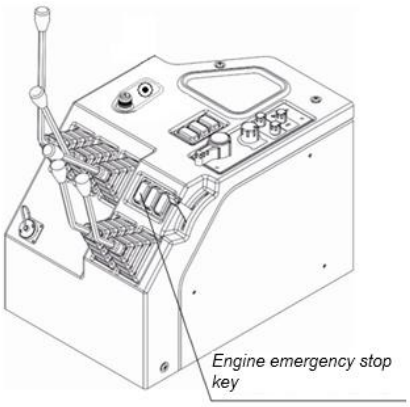
6.6 STOPPING THE ENGINE

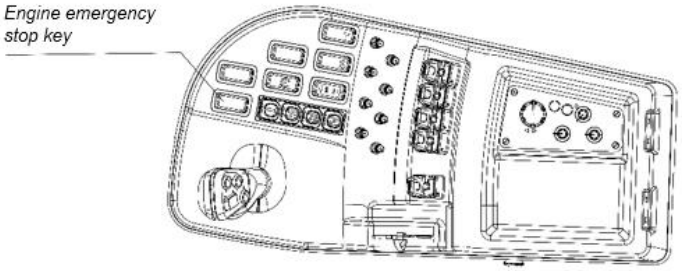
Stop the engine:

– **on tractors with TMZ engine without ECU** by pressing the pneumatic stop button located to the right of the driver's seat and holding it until the engine stops completely;

– **on tractors with YaMZ and OM460LA engines**by pressing the “START-STOP” button.

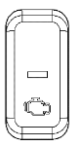
– **on tractors with TMZ engine with ECU** by pressing the “START-STOP” button or engine emergency stop key on the unit or control panel.

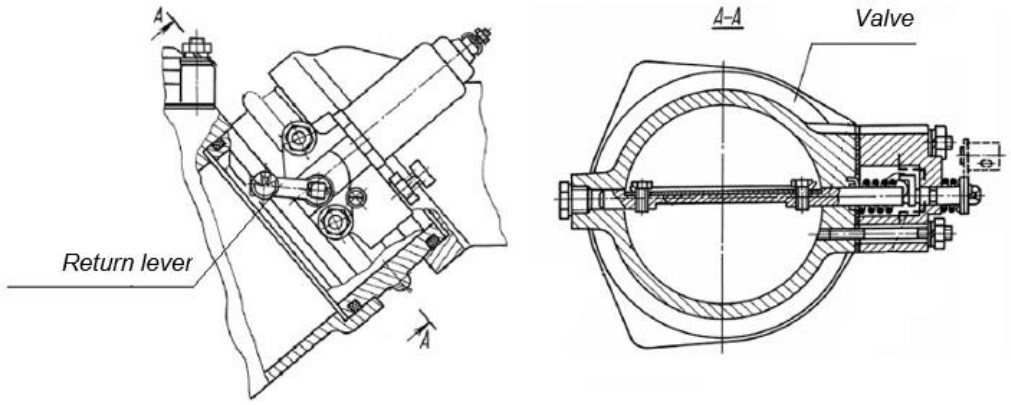




To ensure emergency shutdown of the engine, the tractors are fitted with a key that duplicates control of the air valve of the engine ECS. When the ECS valve is closed, the red indicator on the emergency shutdown key shall light up.

In case of faults, the orange indicator on the fault diagnostics key (for tractors with YaMZ and TMZ engines) lights up.





After actuation of the air valve, it can be opened only manually using the return lever. The valve is set to initial (open) position, including after its actuation, by turning the return lever by 90-95° clockwise, with force 80 to 100 N on the arm of 28 mm.

6.7 FEATURES OF TRACTOR WINTER OPERATION

It is recommended to combine the tractor preparation for winter operation and carrying out MAINT-AW with the next MAINT-2 or MAINT-3.

To ensure uninterrupted operation of the tractor in winter conditions, timely replace summer grades of oils (in the absence of all-season grades) and fuel with winter ones in accordance with Table 26 and Appendix A. Firstly, drain sludge from the fuel tank.

To facilitate the engine start-up at low temperatures, tractors with TMZ and OM460LA engines are equipped with GPP.

Tractors with YaMZ engine shall be equipped with pre-start heating system “Pramotronic 30ZhD24” or “OZhD 30”.

6.7.1 STARTING THE ENGINE AT NEGATIVE TEMPERATURES

When starting the engine under conditions of low ambient temperatures, observe the following conditions:

– the storage batteries shall be fully charged;

– fuel shall comply with winter operating conditions, the fuel tank shall be clean, with no contaminants or water;

– viscosity of the engine oil shall correspond to the ambient temperature range;

– hydraulic and gear oils shall comply with seasonal operating conditions of the tractor;

– the cooling system shall contain (if coolant concentrates are used) a solution of at least 50 % ethylene glycol for adequate protection;

– fill the fuel tank to the top level at the end of each working day, to prevent condensation in the fuel tank and, consequently, water ingress into the fuel system;

– periodically monitor and remove water from the fuel tank so that water does not ingress to the engine fuel system.

6.7.1.1 USE OF GPP DURING START-UP OF TMZ ENGINES

The tractor GPP provides engine start-up at ambient air temperature up to minus 20 °C.

Start the engine at ambient temperatures up to minus 20 °C in the following order:

– before starting the engine make sure that the levers of changeover valve of the hitch hydraulic system are in neutral position, the parking brake is engaged, the batteries are fully charged.

– the GB control joystick in the “N” position (neutral, “N” symbol shall light on the instrument panel and display of indication module). Set the manual fuel feed lever to the position corresponding to the minimum engine crankshaft speed;

– switch on the battery disconnect switch by the key  on the steering column control panel;

– start ignition (terminal 15) by short-term pressing of the “START-STOP” button, set the sound signal and press (hold) the GPP actuation key  on the steering column control panel. After 1-2 minutes the control lamp  on the instrument panel shall light up;

– start the engine by pressing and holding the “START-STOP” button, at this, do not release the GPP actuation key;

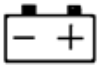
– after the engine starting release the “START-STOP” button and the GPP actuation key, the control lamp  on the instrument panel shall go off.

6.7.1.2 USE OF GPP DURING START-UP OF OM460LA ENGINES

For tractors with the OM460LA enginethe GPP is switched on automatically by short-term pressing the “START-STOP” button.

After starting, warm up the engine to a coolant temperature 40 °C to 45 °C first at the minimum, and then at the average crankshaft speed.

Oil pressure in the heated engine unit line shall be within the range 0.45 to 0.6 MPa at the rated speed, and as minimum 0.1 MPa at minimum speed.

After starting the engine, the control lamps  ,  and the control lamp of the engine oil pressure  shall go off, while the control lamps  and  can blink.

After generation of operating pressure in the 1st and the 2nd circuits of the tractor pneumatic system, the control  ,  shall go OFF.

6.7.1.3 USE OF PRESTART HEATER DURING YaMZ ENGINE START-UP

To start the engine at an air temperature below minus 5 °C, the tractor is equipped with a pre-start heating system “Pramotronic 30ZhD24” or “OZhD 30”.

The heater is designed for pre-start heating of the engine with a liquid cooling system, as well as for automatic maintenance of the optimal thermal mode of the engine.

The heater is equipped with its own fuel tank with volume of 8 l, which provides operation of the heater for from 6 to 8 hours. Fuel tank filler neck is located to the left behind the engine front support.

Start the pre-start engine heater by pressing the key on the steering column control panel. 

Switched on heater automatically maintains the engine coolant temperature in the range 65 °C to 75 C.

Turn off the heater by pressing the key again.

The heater shall be operated in accordance with the heater Operating Manual (included in the tractor operating documentation) at ambient temperature not lower than minus 40 °C.

7 RULES FOR TRANSPORTATION, TOWING AND JACK-UP OF THE TRACTOR

7.1 TRACTOR TRANSPORTATION

Tractors are transported mainly by rail. In addition to railway transport, water (river or sea) transport, as well as special trailers, can be used to transport tractors.

A tractor loaded onto an open rolling stock (platform), taking into account packaging and fastening, is placed in the outline of the main loading gauge.

Install the tractor on a 4-axle universal platform with continuous wooden or wood-metal flooring, after having cleaned the platform floor of garbage, dirt (snow, ice), and checked condition of the flooring. Sprinkle a thin layer of clean dry sand on the places where the wheels, thrust beams, SPTA boxes can be supported.

Before installing the tractor on the platform, proceed as follows:

– lift the hitch as high as possible;

– bring the inflation pressure to 0.2 MPa;

– set control levers to neutral positions;

– drain fuel from the fuel tank and condensate from air cylinders;

– switch off the battery disconnect switch;

– disconnect the minus bus from terminals of the battery disconnect switch and secure it with standard bolt on the frame;

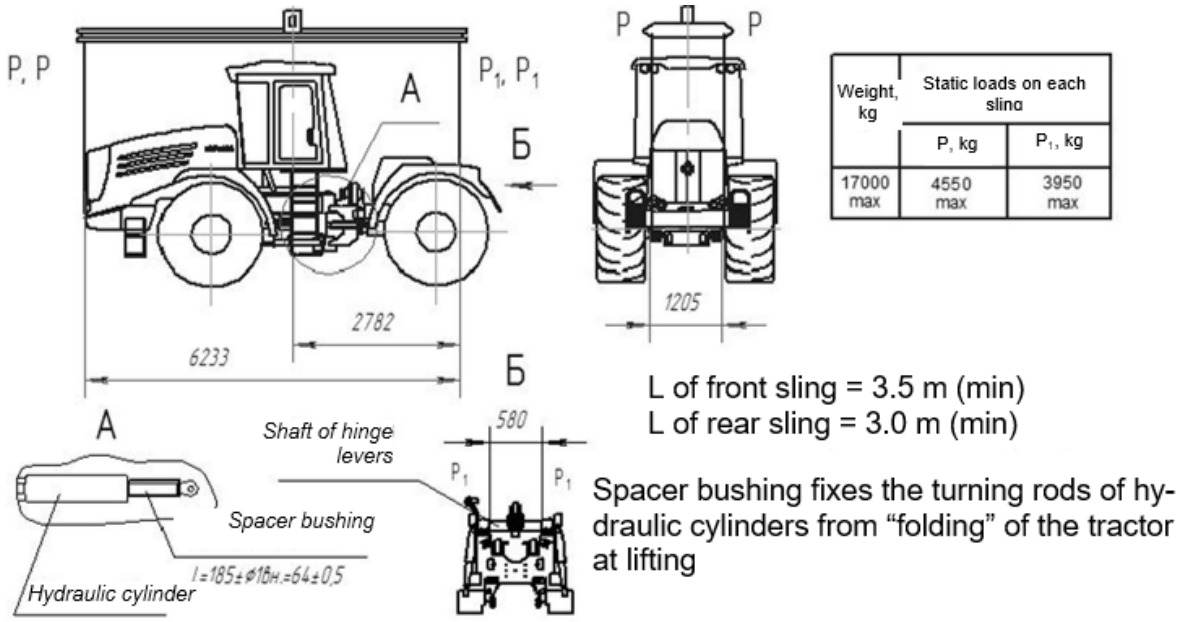
– remove the air intake pipe and the exhaust pipe, protect the holes on the removed parts and on the tractor from dust and moisture ingress. Secure the muffler to the platform. Put the air intake pipe into the tractor cab;

– when transporting the tractor on a railway platform, in order to avoid folding of the tractor semi-frames, it is necessary to connect them (block) using a shackle fixed to the rear semi-frame.

– after the tractor is installed on the platform, engage the parking brake.

When loading and unloading the tractor, it is necessary to observe the relevant instructions in the “SAFETY REQUIREMENTS” section. Place, fasten and seal the tractor on the railway platform in accordance with the “Technical conditions for placement and fastening of goods in wagons and containers”.

Load and unload the tractor with a crane with a lifting capacity of at least 200,000 N according to the slinging diagram.



Maximum static loads on each line: P = 4,550 kg; P_1 = 3,950 kg

WHEN SLINGING THE TRACTOR, IT IS FORBIDDEN TO STAY UNDER THE TRACTOR, OR TO USE FAULTY TOOLS AND ROPES.

7.2 TRACTOR TOWING

Tow the tractor only on a rigid hitch in accordance with the requirements of the Road Traffic Rules. At the same time, the towing speed shall not exceed 15 km/h.

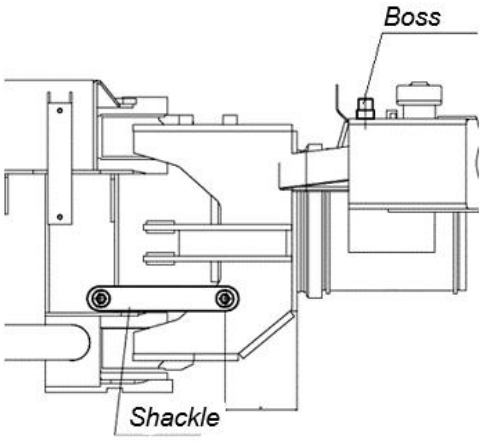
If it is impossible to switch the operating elements of the GB control system in the standard way using the control interface, preparation of the tractor for towing is performed manually. The procedure for preparing the tractor for towing is given in the Operating Manual of the control system of Pneuma-3P GB (Section 6 “Tractor preparation for the towing state”) enclosed to each tractor.

ATTENTION! ALL OPERATIONS CAN BE PERFORMED ONLY WHEN THE ENGINE IS OFF AND THE GB CONTROL SYSTEM IS DE-ENERGIZED.

7.3 TRACTOR JACKING

When jacking, install the tractor on a flat horizontal platform. Stop the engine, engage the parking brake, set the GB control joystick to the "N" position, set the levers of changeover valve of the hinged equipment hydraulic system to the "neutral" position. Install pads under the tractor wheels.

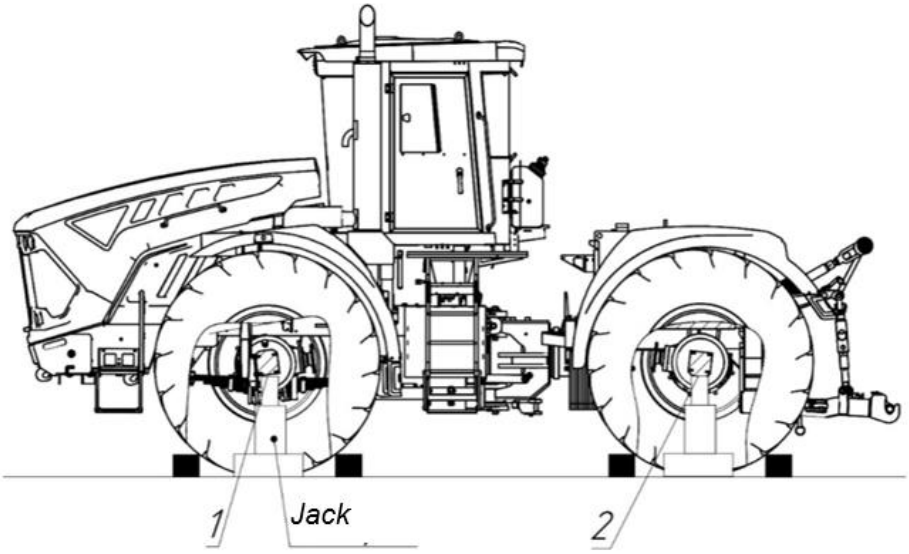
To avoid folding the semi-frames of the tractor during jacking, install a locking shackle on the frame.



For jacking of the tractor, use only a serviceable jack with a lifting capacity of at least 120,000 N.

IT IS FORBIDDEN TO STAY UNDER THE JACKED TRACTOR.

The tractor shall be jacked in accordance with the jacking diagram, as per the "JCK" marks on the tractor.



1 – under the casing of the front axle semi-axis; *2* – under the casing of the rear axle semi-axis

8 TRACTOR MODULARIZATION

The tractor in the unit with mounted, semi-mounted and trailed machines and implements is used in various agricultural works (plowing, harrowing, cultivation, seeding, shallow plowing, transport works).

ATTENTION!

- ***AGRICULTURAL MACHINES AND IMPLEMENTS INTENDED FOR MODULARIZATION WITH TRACTORS SHALL BE AGREED UPON WITH PETERBURGSKY TRAKTORNY ZAVOD JSC. DESCRIPTION OF THE DESIGN, INSTALLATION AND THE OPERATION RULES OF THE SPECIFIED EQUIPMENT IS SET OUT IN THE MANUAL ENCLOSED TO EACH TYPE OF EQUIPMENT. LIST OF AGRICULTURAL MACHINES AND IMPLEMENTS MODULARIZED WITH TRACTORS IS GIVEN ON THE WEBSITE OF PETERBURGSKY TRAKTORNY ZAVOD JSC (HTTPS://KIROVETS-PTZ.COM/AGREGATS/).***
- ***CLAIMS FOR TRACTOR FAILURES IN CASE OF ITS MODULARIZATION WITH AGRICULTURAL MACHINES AND IMPLEMENTS NOT AGREED UPON WITH PETERBURGSKY TRAKTORNY ZAVOD JSC SHALL NOT BE ACCEPTED FOR CONSIDERATION. THE TRACTOR SHALL BE RELEASED FROM WARRANTY.***

To connect the tractor to agricultural machines, implements and vehicles, the following is provided:

– three-point hitch category 4 according to GOST ISO 730-2019;

– drawbar TSU-3-K (hydraulic hook) as per GOST 3481-79;

– drawbar TSU-1-Zh (drawbar) as per GOST 3481-79.

8.1 ATTACHMENT OF AGRICULTURAL MACHINERY OR IMPLEMENTS TO A TRACTOR

8.1.1 ATTACHMENT BY A HITCH

The hitch provides a connection:

– with mounted agricultural machines and implements with three connecting elements, with attachment to a central link and lower links with Walterscheid connection;

– with semi-mounted agricultural machines and implements, which have two connecting elements, with attachment to the lower link with Walterscheid connection.

The hitch is adapted to be modularized with implements with a hitch of the following categories:

– NU-4 (category 4 GOST ISO 730-2019) – main;

– NU-3 (category 3 GOST ISO 730-2019) – optional;

– Kirovets – optional.

Dimensions of the connecting elements of the hitch on the tractor are given in Tables 2 and 3.

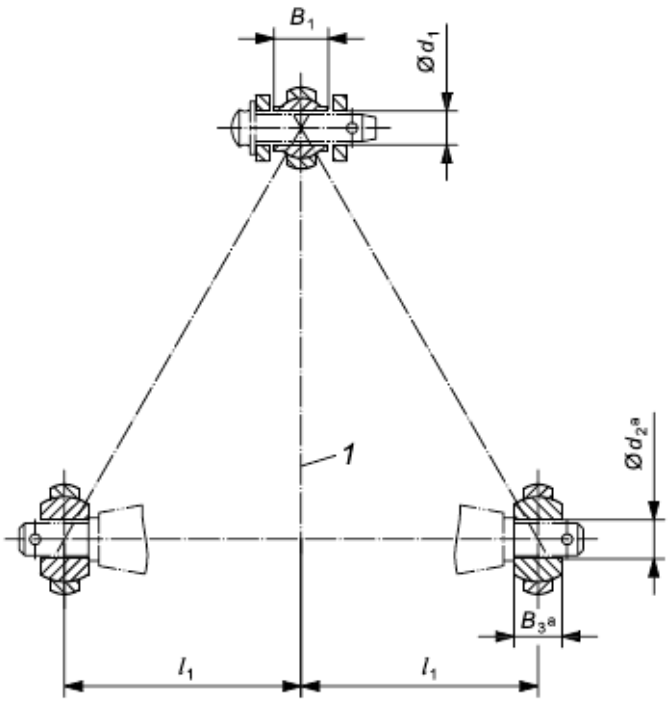
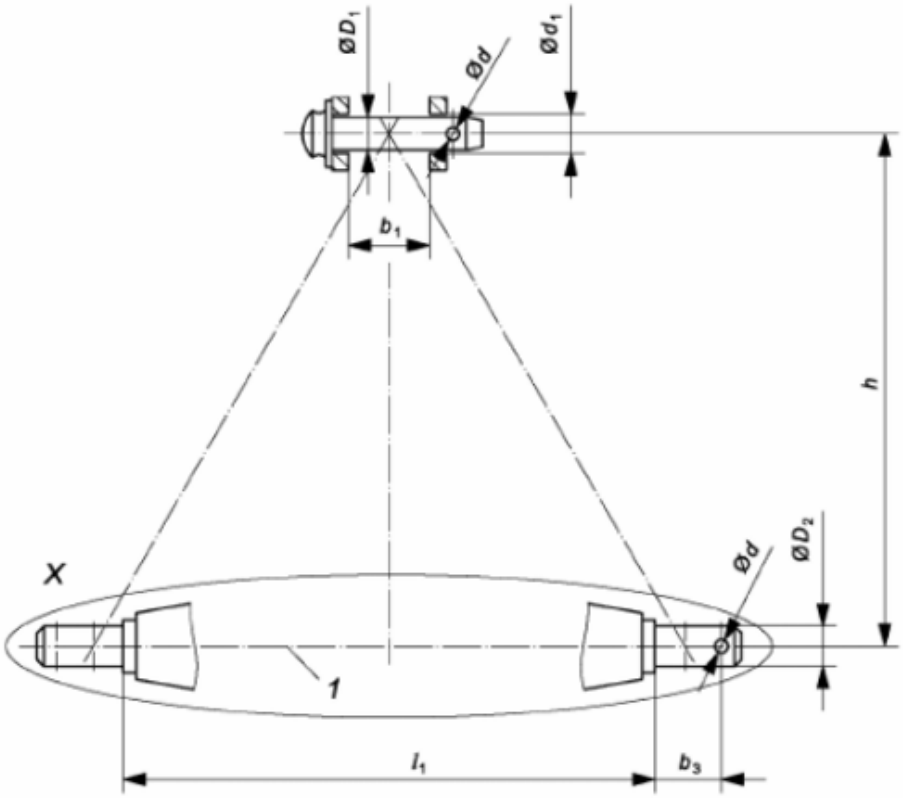
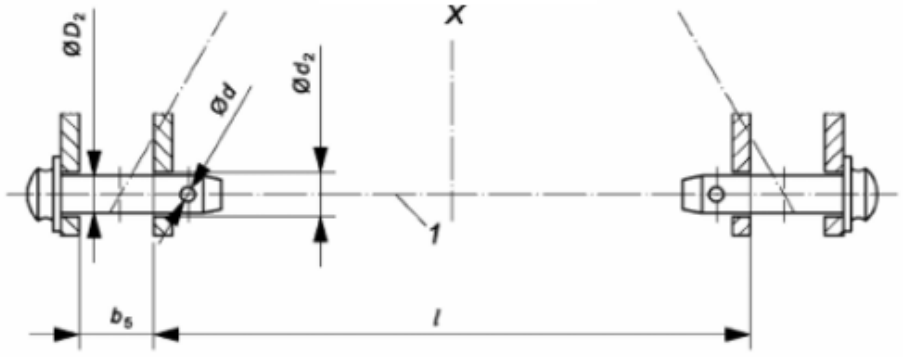


Table 2 – Dimensions of the connecting elements of the tractor hitch

Designation of the hitch parameters			
Parameter by figure	Kirovets	ISO	
		ISO 730/1	ISO 730/3
		category 3	category 4
Top hinge point			
d_1 Diameter of pin hole, mm	$40^{+0.62}$	$32^{+0.25}$	$45.2^{+0.3}$
B_1 Hinge width, mm	$98_{-0.97}$	$51_{-0.5}$	$64_{-0.5}$
Bottom hinge point			
d_2 Diameter of pin hole, mm	$60^{+0.46}$	$37.4^{+0.35}$	$51^{+0.5}$
B_3 Hinge width, mm	$80_{-0.74}$	$45_{-0.5}$	$57.5_{-0.5}$



a) type "pin"

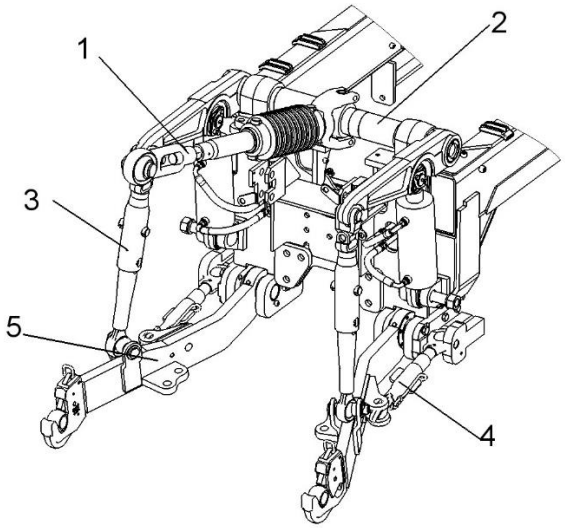


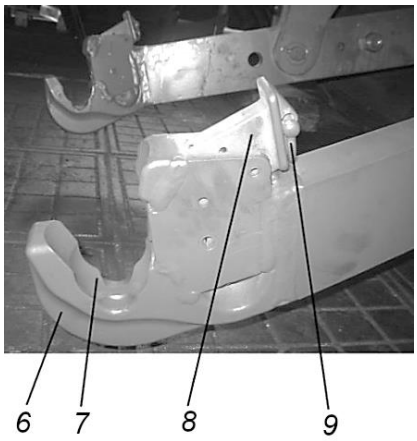
b) type"bracket"

Table 3 – Dimensions of the connecting elements of the tractor modularized machine

Designation of the hitch parameters			
Parameter by figure	Kirovets	ISO	
		ISO 730/1	ISO 730/3
		category 3	category 4
Top hinge point			
D_1 Pin diameter, mm	$39.5_{-0.8}$	$31.75_{-0.2}$	$45_{-0.8}$
b1 Width between the fork inner surfaces, mm	99 min	52 min	65 min
Bottom hinge point			
D_2 Pin diameter, mm		$36.6_{-0.2}$	$50.8_{-1.1}$
l Distance between the lower connection points, mm	1,120	965±1.5	1,166.5±1.5
Other dimensions			
h Post height, mm	1,100	685±1.5	1,100±1.5

Attach the trailed agricultural machines or implements as follows:





– install ball joints on the axle of trailed agricultural machines or implements;

– set the agricultural machine or implement in the working position on a level surface and drive up smoothly in reverse so that the tips of the lower links *6* come to the pins on the frame of agricultural machine or implement;

– align the ball joints with the hook mouths of the lower links until the latch is activated;

– attach the central link *1* to the post on the frame of the agricultural machine or implement, and secure it with the pins;

– having connected a mounted agricultural machine or implement to the tractor at three points, or semi-mounted one at two points, pre-install its frame in a horizontal position. Install by changing the length of the vertical braces and the central link;

– when connecting the mounted and semi-mounted agricultural machines or implements to the tractor, to ensure maximum transport clearance, the length of the vertical brace *3* shall be minimal.

N o t e – Connect the lower links and the central link of the tractor to coupling elements of agricultural machine or implement with the tractor parking brake engaged.

When disconnecting the agricultural machine or implement from the tractor's hitch mechanisms, disconnect the central link and fix it, and then disconnect the lower links of the hitch mechanism.

8.1.2 CONNECTION USING TSU-3-K (HYDRAULIC HOOK)

To modularize a tractor with trailed implements, it is necessary to:

– drive at low speed to the drawbar of the transported vehicle with an open latch on the hook. In this case, it is necessary to visually align the symmetry planes of the “hook-loop” coupling devices. When the distance between their connecting elements is 0.6 to 1.0 m, get out of the cab and check that the hook and loop are aligned in the vertical plane; if necessary, rotate the steering wheel to ensure this alignment. Continue approaching the tractor until the hook stops in the loop, then, controlling the changeover valve lever by lifting the hitch, insert the hook mouth into the loop and lift the hook to the transport position to a height of 700 mm;

– close the latch and install the braces;

– connect the hydraulic system of the vehicle to the hydraulic system of the tractor;

– close the connecting heads of the pneumatic system. Before connecting the pneumatic system of the tractor, press the valve of the connecting head of the tractor and, opening the isolation valve, blow the system until condensate is removed. At negative temperatures, repeat this operation after the end of work;

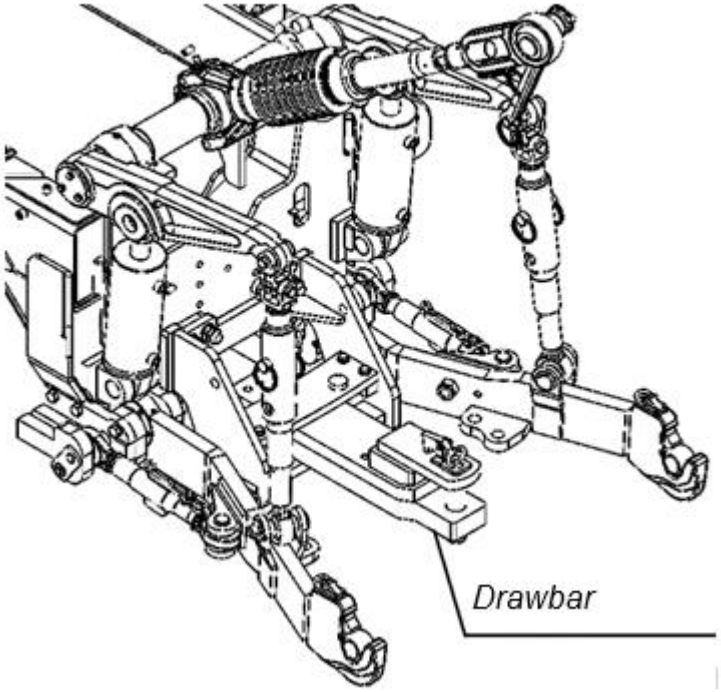
– connect the electrical equipment;

– if a transport train is composed (of a semi-trailer and a trailer), then switch the marker lights to the trailer.

ATTENTION! THE LATCH AND THE HOOK PAWL SHALL BE LOCATED IN THE LONGITUDINAL-VERTICAL PLANE ABOVE THE HOOK MOUTH AND SECURED WITH A COTTER PIN.

8.1.3 CONNECTION USING TSU-1-ZH (DRAWBAR)

The drawbar is designed for modularization of tractors with trailed and semi-trailed agricultural machines and implements.



Technical characteristics of the drawbar are given in Table 4.

Table 4

Parameter	Value
Maximum static vertical load applied to the fork along the pin axis, as maximum, kN	40
Shackle connecting pin diameter, mm	50.8

ATTENTION! TO WORK WITH TRAILED IMPLEMENTS CREATING VERTICAL LOAD ON THE COUPLING 20 TO 40 kN, DOUBLE WHEELS SHALL BE INSTALLED ON THE TRACTOR, AND REAR BALLAST WEIGHTS SHALL BE REMOVED.

9 PROCEDURE FOR TRACTOR OPERATION WITH AGRICULTURAL MACHINES (IMPLEMENTS) AND VEHICLES

9.1 GENERAL RULES OF THE TRACTOR OPERATION WITH MOUNTED AND SEMI-MOUNTED AGRICULTURAL MACHINES (IMPLEMENTS)

When modularizing a tractor with mounted and semi-mounted agricultural machines or implements, it is necessary to comply with the following rules:

– lower and lift agricultural machines or implements only when the tractor is moving in a straight line;

– do not allow the tractor to turn with agricultural machines or implements, the working bodies of which are inside the soil.

CAUTION: TURNING THE MACHINE WITH RECESSED IMPLEMENTS CAN LEAD TO ACCIDENTS.

IT IS FORBIDDEN TO SET THE CHANGEOVER VALVE HANDLES TO THE "FORCED LOWERING" POSITION FOR THE WORKING POSITION OF THE AGRICULTURAL MACHINE OR IMPLEMENT, WHEN THE TRACTOR UNIT IS OPERATING.

– When transporting an agricultural machine or an implement, their working bodies shall be in the transport position, and the changeover valve levers shall be in the "Neutral" position.

CAUTION: WHEN MODULARIZING THE TRACTOR WITH MOUNTED AND SEMI-MOUNTED AGRICULTURAL MACHINES ATTACHED TO THREE OR TWO POINTS OF THE HITCH, HORIZONTAL BRACES (STABILIZERS) SHALL BE ADJUSTED SO, THAT THE REAR HINGES OF THE HITCH LOWER LINKS MOVE FREELY IN THE TRANSVERSE PLANE BY 150–200 MM.

IN TRANSPORT POSITION, THE HORIZONTAL BRACES SHALL BE ADJUSTED TO A POSITION PREVENTING FREE MOVEMENT OF REAR HINGES OF LOWER LINKS (HITCH AXIS) IN TRANSVERSE PLANE.

N o t e - The procedure for regulating the working bodies of agricultural machines or implements, the mode of their operation, as well as their transfer to the transport position are indicated in the Operation Manuals for these machines and implements.

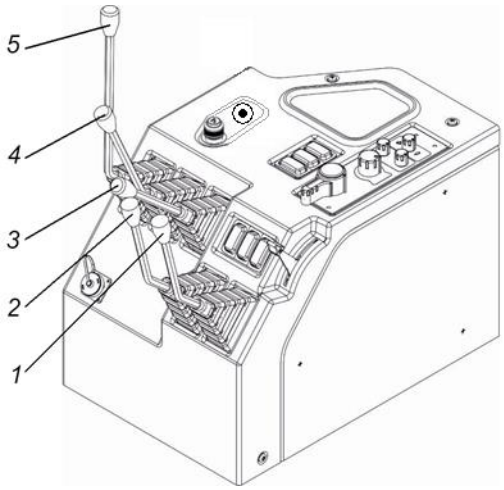
When modularizing a tractor with implements equipped with hydraulic motors (for example, a fan drive), their hydraulic lines shall be connected to the second and the third pairs of tractor hydraulic system couplings. Hydraulic motor pressure line shall be connected to the "Lowering" position. Stop the hydraulic motor by setting the changeover valve handle to the "Floating" position.

Drain from the hydraulic motor shall be connected through a hose with an internal diameter of 20 mm, with a length of 3,200 mm (available in the SPTA set), directly to the cover of the hydraulic tank filter on the right side of the tractor, bypassing the changeover valve.

9.2 CONNECTING THE HYDRAULIC SYSTEM OF AGRICULTURAL MACHINES, IMPLEMENTS AND VEHICLES TO THE HYDRAULIC SYSTEM OF THE TRACTOR

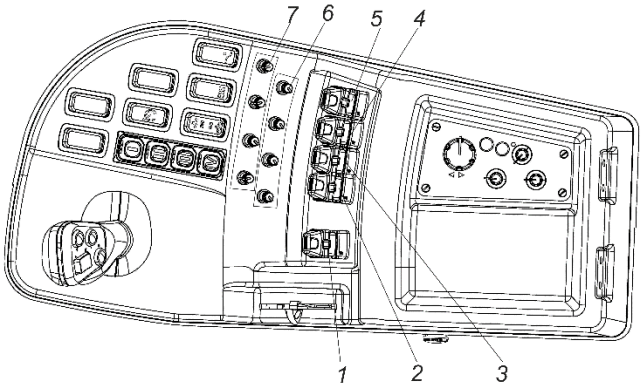
A 5-section changeover valve with mechanical cable control or electric control (on the fuel tank) is installed in the hydraulic system of working equipment on the tractors.

Four sections of the SCV are designed for connection to external hydraulic lines with the possibility of flow control from the pump within the range 10 to 90 l/min with Directional Control Velve BOSCH or 10 to 120 l/min with Directional Control Velve Bucher. SCV sections have flow controllers. Handles of four flow controllers (SCV with mechanical cable control) are brought into the cab through holes in the floor behind the driver's seat. When the handle rotates clockwise, flow through the section decreases, counterclockwise – it increases.



1 – control lever of hydraulic system of the tractor hitch; *2, 3, 4, 5* – external hydraulic line control levers

Control unit with mechanical cable control



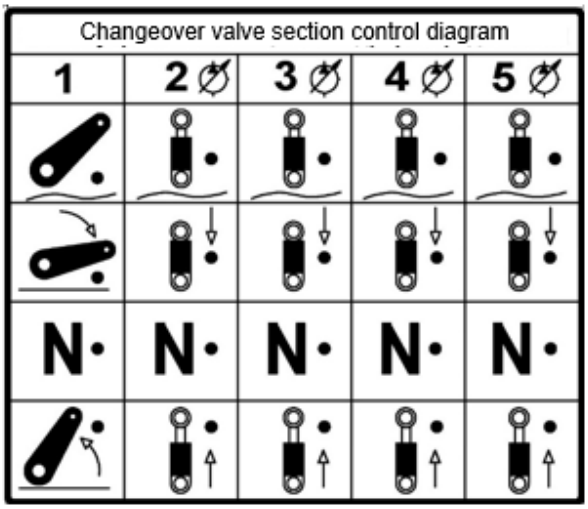
1 – joystick for control of the tractor hitch hydraulic system; *2, 3, 4, 5* – joysticks for control of changeover valve sections; 6 – flow controllers;

7 – timing devices

Control panel with electric control

To expand the functionality of the tractor hydraulic system, all spools of the SCV designed to feed working fluid to external hydraulic lines, are unified and have no auto return.

Setting of handles *2, 3, 4, 5* from positions “Lifting”, “Lowering” and “Floating” to “Neutral”shall be carried out manually.



On tractors with electric control of changeover valve, spools are controlled from joysticks 6 and 7 located on the control panel to the right of the driver. Each of the four spools controlled by the hydraulic system of the modularized implement has the possibility of adjusting the operation time (timer) and adjusting the oil flow through the section.

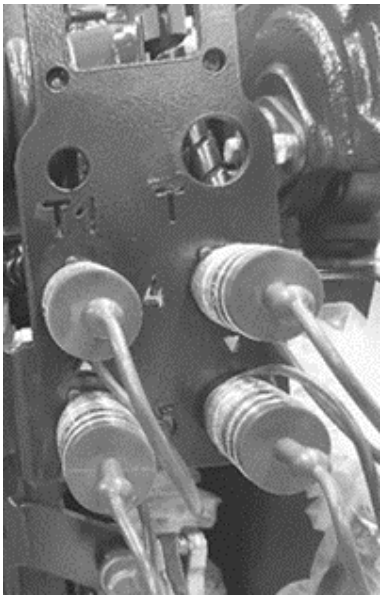
Operation actuation time increases when the regulator turns clockwise and decreases upon turning counterclockwise. In the extreme position, when turning clockwise, the oil flow through the section shall be without limiting the response time. This is necessary to provide hydraulic motors that require constant operation, for example, a fan drive, a generator, etc., seeding complexes.

Change in oil flow rate is required to ensure that the required speed of the hydraulic implement drives is set.

To connect to the working hydraulic lines of the tractor, the corresponding hydraulic lines of the hydraulic system of an agricultural machine or implement, to prevent oil leakage from the high-pressure hydraulic hoses when they are disconnected or emergency rupture, four pairs of quick-release devices are designed.

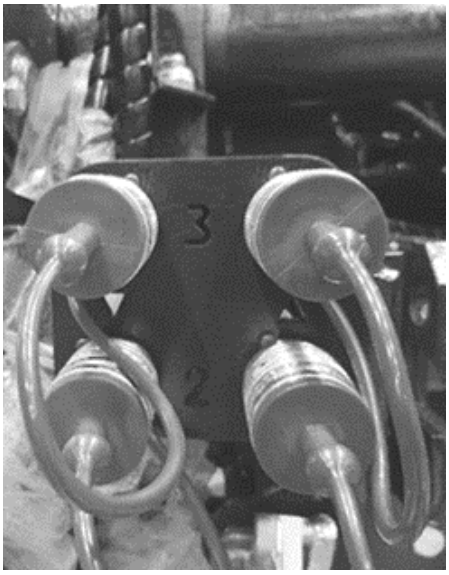
Quick-release devices are located on the tractor's rear frame and are connected to four working sections of the changeover valve.

A consumer may be connected to each pair of terminals of the quick-release couplings, requiring constant power during operation, for example, a fan hydraulic motor or a “clamp” of the cultivator sections. Numbers of the sections to which the QRC pair is connected, are indicated on the brackets by numbers. Flow “lifting” and “lowering” directions are indicated on brackets by numbers.



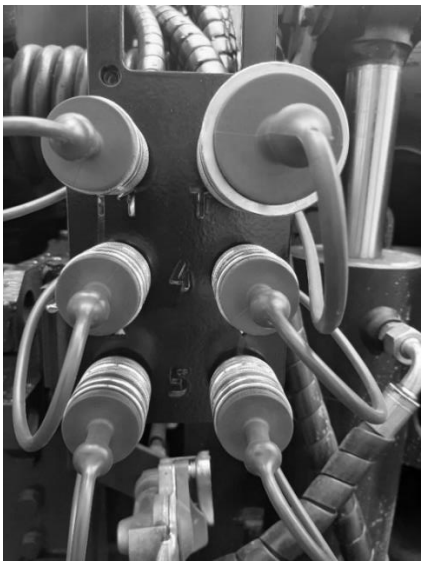
Tractor QRC with cable mechanical control

They are controlled by handles *4* and *5* of the control unit.



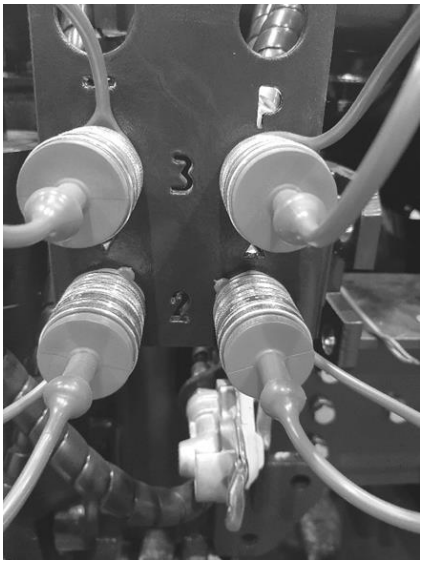
Tractor QRC with cable mechanical control

They are controlled by handles *2* and *3* of the control unit.



Tractor QRC with electric control

They are controlled by joysticks *4* and *5* of the control panel. From above – free drain clutches (right clutch) and drain clutches (left clutch).



Tractor QRC with electric control

Controlled by control panel joysticks *2* and *3*

Direction of oil flow and belonging of pairs of quick-release devices to spools of change-over valve are indicated on brackets for attachment of quick-release devices.

A consumer may be connected to each pair of terminals of the quick-release devices, requiring constant power during operation, for example, a fan hydraulic motor or a “clamp” of the cultivator sections.

ATTENTION! CONNECT THE HYDRAULIC SYSTEM ONLY WHEN THERE IS NO PRESSURE IN THE HOSES.

Connect the hydraulic system of the tractor and agricultural implement in the following order:

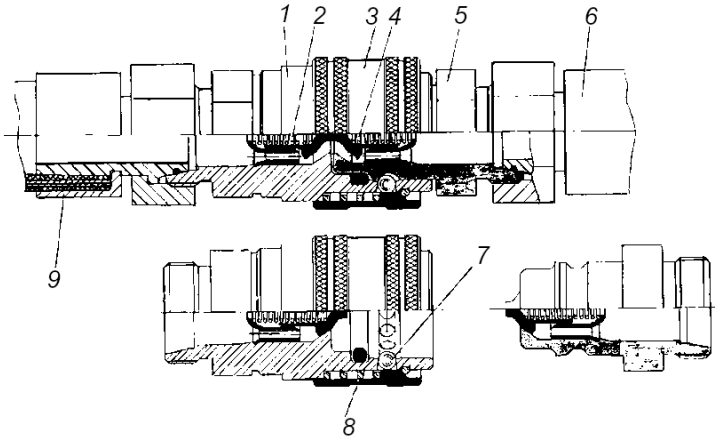
– before connection set the levers (joysticks) of SCV to the "Floating" position;

– move shutoff bushing 3 as far as it go;

– install the valve *5* into the coupling *1* up to the stop;

– release the shutoff bushing *9*, the coupling *1* shall return to its original position under the action of the spring *8*;

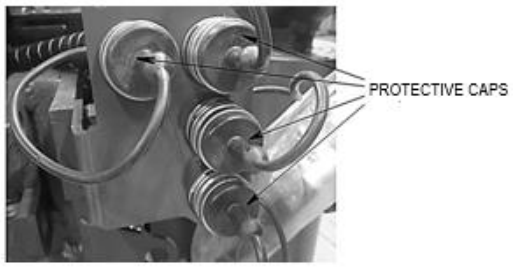
– make sure that the valve *5* is securely fixed in the body *1*.



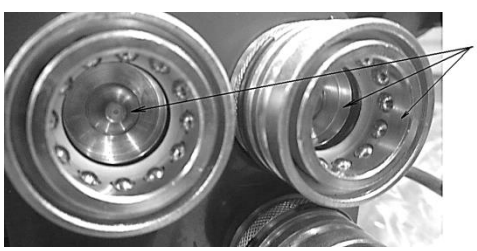
1 –housing; *2*, *4*, *8* – springs; *3* – shutoff bushing; *5* – valve; *6*, *9* – hoses; *7* – balls

ATTENTION! MOST FAILURES OF HYDRAULIC ASSEMBLIES OCCUR DUE TO INGRESS OF FOREIGN PARTICLES IN THEM. ONE OF THE SOURCES OF SUCH CONTAMINATION IS DIRT IN THE TRACTOR QUICK-RELEASE COUPLING – IMPLEMENT HYDRAULIC VALVE. THEREFORE, IT IS NECESSARY TO CONSTANTLY MONITOR THE CLEANLINESS OF ELEMENTS CONNECTING HYDRAULIC SYSTEMS OF THE TRACTOR AND THE IMPLEMENT.

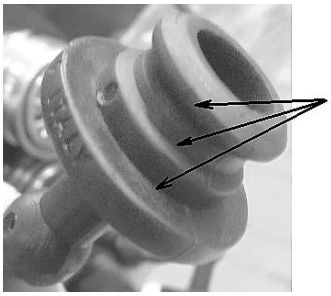
When not using the tractor couplings, they shall be covered with protective caps.



After disconnecting the implement hydraulic system from the tractor hydraulic system, thoroughly clean the inner surfaces of the coupling with a lint-free cloth.

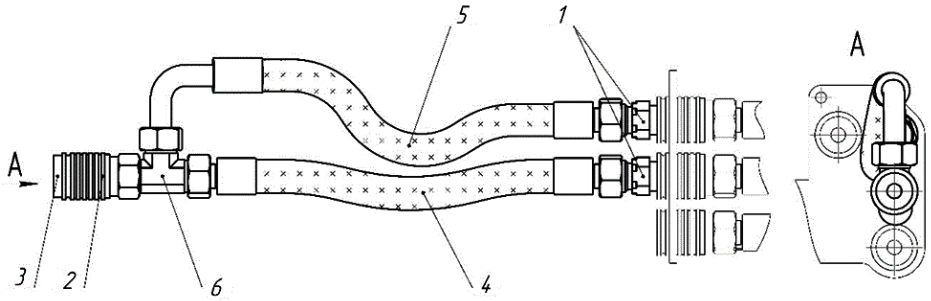


The mating surfaces of the coupling shall also be cleaned before installing the protective caps.



It is also necessary to keep clean, clean and protect the mating surfaces of the hydraulic system valves of the agricultural implement.

To ensure oil consumption of 130 l/min from two sections of the changeover valve through one pair of quick-release couplings on tractors, the tractor is optionally manufactured with a set of combining sections of the changeover valve.



Components of the set are given in Table 5.

Table 5

Position in Figure	Designation	Description	Quantity
1	CNV082/2615M	Valve	2
2	CPV082/2615F	Coupling	1
3	TM 12 L/G	Dust protection cap	1
4		2SN16/410 DKOL-DKOL (90) in plastic protection	1
5		2SN16/360 DKOL-DKOL in plastic protection	1
6	XELAD22Lz3	Tee	1

Tightening torque of the hose nuts is $105^{+10.5}$ N·m.

9.3 FREE DRAINAGE AND DRAINAGE ROUTES INSTALLATION

On tractors with SCV with mechanical cable control, to reduce losses in the hydraulic system and eliminate its overheating when working with implements, equipped with a hydraulic motor, there is a kit in the tractor SPTA set to ensure “free” drain, bypassing the changeover valve, to the hydraulic tank, and a set of hydraulic motor drainage (Figure 3).

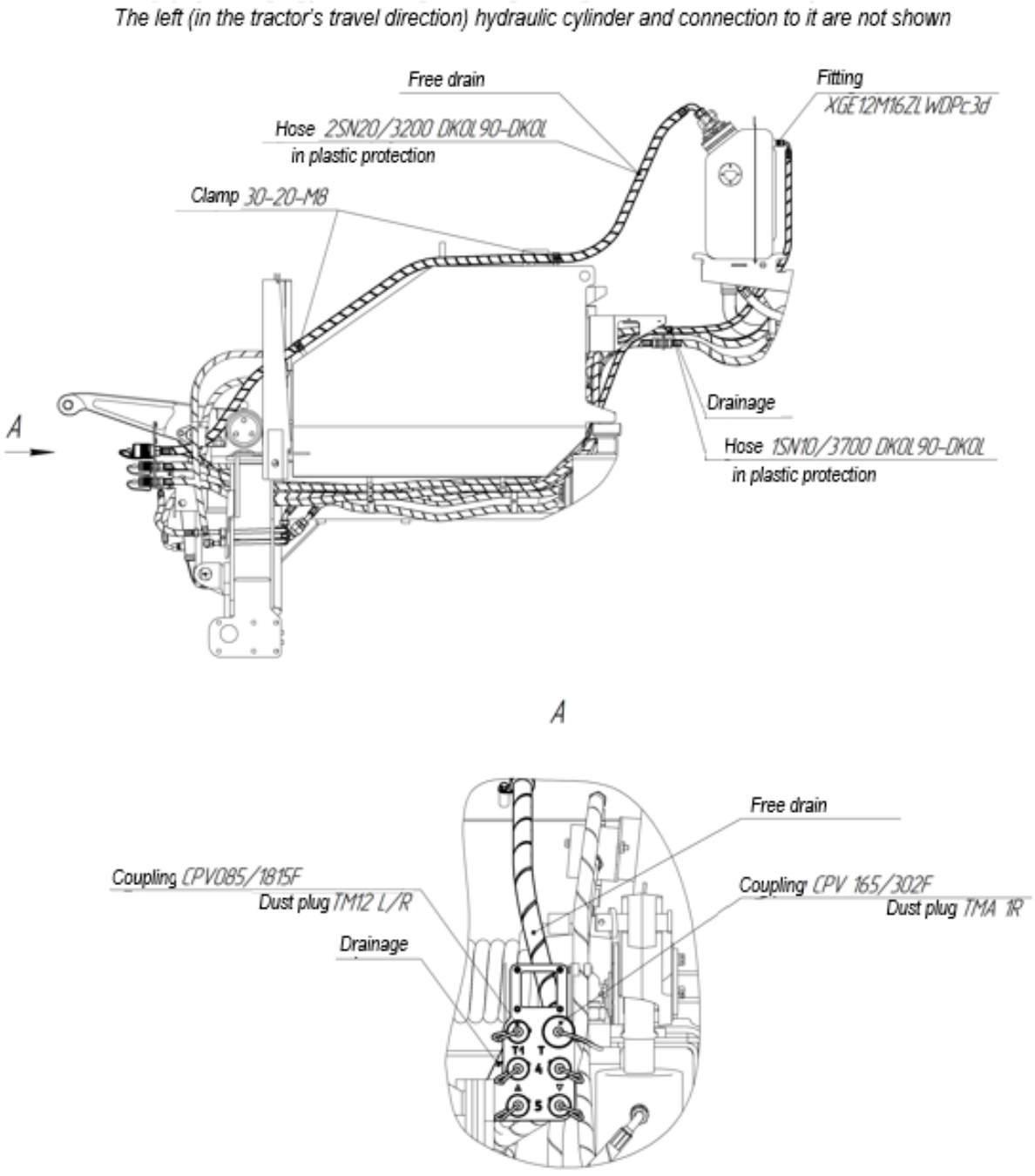


Figure 3 – Free drainage and drainage routes installation diagram

9.3.1 INSTALLATION OF FREE DRAINAGE SET

The free drainage set consists of hose 1SN 20 DKOL90-DKOL, L = 3,200, quick coupling CPV165/302F (size 1″) and two clamps 30-20-M8.

Install the free drainage set as follows:

– remove the plug from the connector of hydraulic tank filter cover (right in the tractor's travel direction);

– install the hose 1SN 20 DKOL90-DKOL, L = 3,200, connect the fitting with valves 90° to the connector of the hydraulic tank filter cover;

– to fix a sleeve on bosses of the fuel tank with the use of collars 30-20-M8, fix collars to bosses using standard bolts; provide “sagging” of the hose (about 1,000 to 1,200 mm from the connector of the hydraulic tank cover to the fuel tank unit), to prevent damage to the hose when folding the tractor around the vertical hinge axis;

– install the quick release coupling on the bracket by the threaded part, tighten the coupling nut up to stop;

– connect the sleeve fitting to the quick coupling CPV165/302F (dimension 1″).

9.3.2 INSTALLATION OF DRAINAGE SET

Drainage set consists of connector XGE12M16ZLWDPz3, hose 2SN 10 DKOL90-DKOL, L = 3,700 and coupling CPV085/1815F (1/2″).

Install the drainage set as follows:

– remove the plug M16 on a hydraulic tank wall from the cab side;

– install connector XGE12M16ZLWDPc3d into the tank boss;

– attach the hose 2SN10 DKOL90-DKOL, L = 3,700 to the connector and lay it under the fuel tank, fixing it with plastic clamps to the hoses;

– install the quick release coupling on the bracket by the threaded part, tighten the coupling nut up to stop;

– connect the coupling to the free end of the hose. Connect the valve of the drain route (leaks from the hydraulic motor housing) of the agricultural implement to the coupling.

ATTENTION! ONLY HYDRAULIC MOTOR DRAIN LINE (IF ANY) SHALL BE CONNECTED TO THIS ROUTE. DO NOT CONNECT DRAINAGE LINES TO IT.

9.4 TRACTOR OPERATION WITH POWER TAKE-OFF MECHANISM (OPTION)

The power take-off mechanism is designed to supply engine power to the working bodies of machines modularized with a tractor. Power transfer takes place in a chain: engine flywheel, elastic clutch, cardan shaft, gearbox drive shaft, cardan shaft, coupling clutch friction, cardan shaft, single-speed reducer with interchangeable power take-off shafts.

PTOM is independent. The PTO speed depends on the engine speed of the tractor ($n_{\text{PTO}} = n_{\text{ICE}} \cdot 0.53$), but does not depend on the tractor speed (selected gearbox mode).

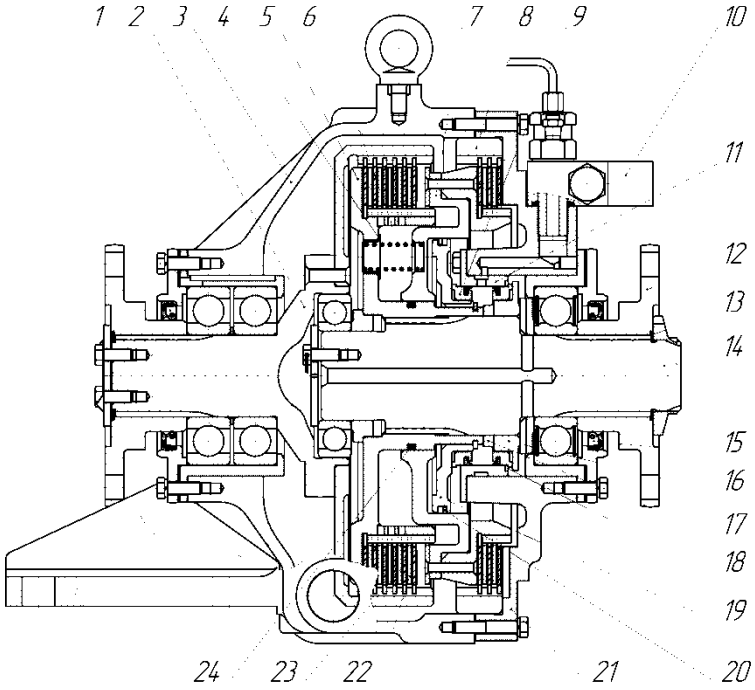
Technical data of PTOM are given in Table 6.

Table 6

Description	Value
Power take-off mechanism	Independent
Speed at rated engine rpm, rpm	1,000
Maximum power on the power takeoff shaft (for PTO 530-42.03.036 – ∅ 55 mm, z = 20, m = 2.5), kW (h.p.)	
- tractor K-730M St, K-730M St 1	203 (276)
- tractor K-735M St, K-735M St 1, K-735M Pr	236 (322)
- tractor K-739M St, K-739M St 1	264 (359)
- tractor K-740M Pr	271 (367)
- tractor K-742M St, K-742M St1	284 (386)
- tractor K-742M Pr	290 (394)
Control pressure, MPa (kg/cm^2)	1.1–1.3 (11–13)
Lubrication pressure (minimum), MPa (kg/cm^2)	0.03 (0.3)
Weight, kg	≈ 313

PTOM consists of a coupling, a single-speed reducer, cardan shafts, connecting pipelines, a smooth valve, an electro-hydraulic actuation mechanism.

The coupling (Figure 4) provides starting of PTOM regardless of tractor movement or parking.



1 – lip seal (input); *2* – drive shaft; *3* – coupling housing; *4* – sleeve; *5* – middle drum; *6* – spring; *7* – pressure disk; *8* – crown; *9* – sealing ring; *10* – grease distributor; *11* – sleeve; *12* – flange; *13* – gasket; *14* – driven shaft; *15* – lip seal (output); *16* – ring; *17* – ring; *18* – lip seal; *19* – middle disk; *20* – sealing ring; *21* – cover; *22* – master disk; *23* – driven disk; *24* – sealing ring

Figure 4 – Coupling

Coupling is a friction-type coupling with friction disks and hydraulic pressure device for coupling actuation. Torque transmission of the coupling is provided by feeding oil under pressure disk *7* at a pressure 1.1 to 1.3 MPa (11 to 13 kg/cm^2) from GB hydraulic system.

Lubrication of coupling bearings is circulating, it is provided by oil feed from the GB lubrication system.

Single-speed reduction gear with oil pump represents single-stage cylindrical gear assembled in housing and consisting of drive shaft-gear and driven gear with internal splines for installation of PTO.

Circulation lubrication of the single-speed reduction gear is carried out from the GB hydraulic system.

The oil gear pump installed on the reduction gear has a drive from the input gear shaft of the reduction gear, operates only when the coupling is turned on and serves to pump oil from the reduction gear cavity into the gearbox housing.

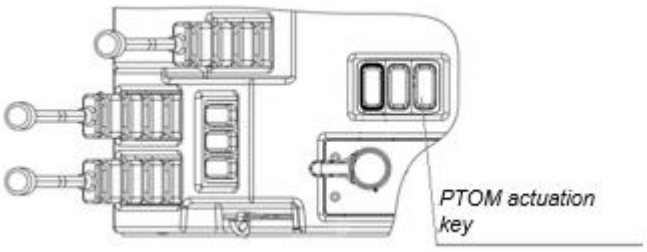
Technical characteristics of PTO are given in Table 7.

Table 7

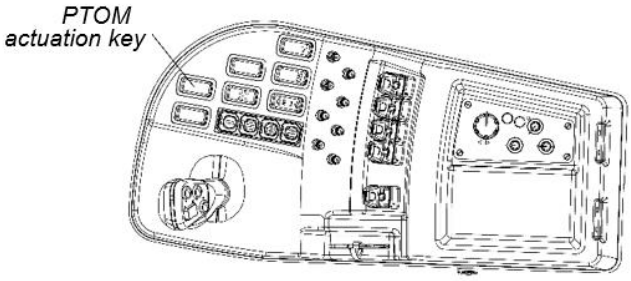
PTO shank parameters	Maximum power transmitted by shank, kW (h.p.)
530-42.03.036 (Ø 55mm, z = 20, m = 2.5), type 4*	290 (394)**
530-42.03.037 (Ø 45mm, z = 20, m = 2.117), type 3*	290 (394)**
530-42.03.038 (Ø 35mm, z = 21, m = 1.5875), type 2*	115 (156)***
530-42.03.045 (Ø 38mm, z = 8, S = 6), type 1c*	115 (156)***
* Type of shank as per GOST 33032-2014 ** For tractors K-742MPr *** As per to GOST 33032-2014	

PTOM is switched on and off:

- for tractors with a key for mechanical cable control, located on the control unit in the tractor cab;



- for tractors with a key for electrical control of changeover valve, located on the control panel (armrest).



The key has an orange indication signaling that PTOM is on. Start the PTOM at minimum engine speed. Before completion of works on the tractor, turn off the PTOM key, then stop the engine.

Observe the following requirements during operation:

– ***IT IS NOT ALLOWED TO*** rotate the rear cardan shaft when the PTOM is OFF;

– actuate the coupling for load at pressure in the GB hydraulic system within the range 1.1 to 1.3 MPa.

FOR TRACTORS EQUIPPED WITH PTOM, IT IS FORBIDDEN TO:

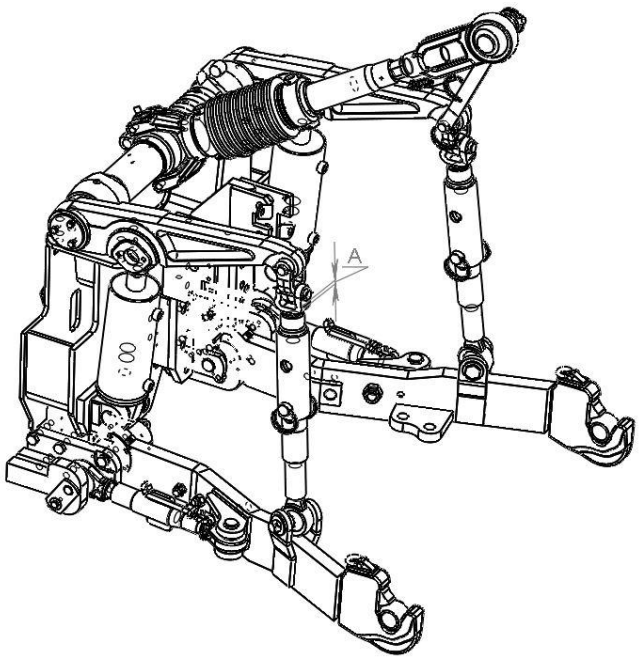
- ***PERFORM ALL OPERATIONS FOR INSTALLATION OF PTOM UNITS WHEN THE ENGINE IS NOT OPERATING AND THE PARKING BRAKE IS ON.***
- ***WORK WITH PTOM WITHOUT INSTALLED PROTECTIVE CASINGS.***
- ***TURN THE TRACTOR AT MAXIMUM FOLDING ANGLE OF SEMI-FRAMES WITH PTOM ON.***
- ***TURN THE TRACTOR AT MAXIMUM FOLDING ANGLE OF SEMI-FRAMES AT ENGINE RPM HIGHER THAN 1,300 MIN^{-1}REGARDLESS OF PTOM ACTUATION OR DEACTIVATION.***
- ***IN CASE OF SHORT-TERM SHUTDOWNS TO INSPECT THE UNIT THAT OPERATING WITH PTOM, IT IS NECESSARY TO STOP THE TRACTOR ENGINE.***

Installation, adjustment and running-in of the power take-off mechanism shall be carried out in compliance with the recommendations of the Manual for installation, starting, adjusting and running-in PTOM, enclosed to the tractor, when equipped with a power take-off mechanism.

For installation and removal of the PTOM coupling, the coupling housing is fitted with an eye-bolt.

9.5 TRACTOR OPERATION WITH PLOUGHS

When modularizing the tractor with a mounted plough, to ensure a floating mode, the pins of the vertical braces of the hitch shall be installed so that they pass through the lower holes of the outer and longitudinal slots of the inner pipes of the vertical braces (open brace). In this case, dimension A at the top and bottom shall be as maximum than 60 mm.



The plowing depth under the front and rear plough bodies is set only by the screws of the front and rear mechanisms of the plough support wheels.

When preparing the tractor with a plough for long-term transportation, the length of the central link is reduced in such a way that the extreme point of the plough in the lifted state does not exceed the height of the tractor.

9.6 GENERAL RULES FOR OPERATION OF TRACTOR WITH VEHICLES

ATTENTION! TRANSPORT TRAIN IN SEQUENCE AND COMPOSITION OF TRACTOR, SEMI-TRAILER (1PTS-9B OR OZPT-8573) AND TRAILER (ZPTS-12B OR OZPT-8572) IS INTENDED FOR TRANSPORTATION OF CARGOES ON ALL TYPES OF ROADS SUBJECT TO TRAFFIC RULES. UNDER UNFAVORABLE ROAD CONDITIONS, THE TRACTOR IS MODULARIZED WITH ONLY ONE SEMI-TRAILER OR TRAILER.

When using the tractor with other vehicles, comply with the following additional requirements:

– the load on the tractor wheels shall not exceed the data indicated in Table 8;

– all machines used for the transportation of goods shall be equipped with pneumatic or pneumo-hydraulic brakes to ensure traffic safety;

– the braking system of a trailed vehicle shall ensure its own deceleration of trailers with a load during emergency braking of at least 5.5 m/s^2.

– the total mass of the transported cargo with a trailer shall not exceed 36 t.

9.7 TIRE OPERATING RULES AND SELECTION OF OPTIMAL TIRE PRESSURE

ATTENTION!

- ***IF IT IS NECESSARY TO REMOVE THE TIRE, THE WHEEL SHALL BE DISASSEMBLED BY A QUALIFIED MECHANIC USING SPECIAL EQUIPMENT.***
- ***IN CASE OF DIFFICULTIES OR LACK OF PROPER QUALIFICATION, THE MECHANIC SHALL SEND THE TIRE AND THE RIM TO A TIRE REPAIR SHOP, WHERE THERE IS SPECIALLY TRAINED PERSONNEL EQUIPPED WITH SPECIAL SAFE TOOLS.***
- ***IN CASE OF UNEVEN ARRANGEMENT OF A TIRE ON WHEEL OR ITS OVERINFLATION, THE TIRE SIDE CAN SLIDE OFF THE WHEEL SIDE WITH ABRUPT AIR RELEASE, WHICH LEADS TO WHEEL THROWING OFF WITH SIGNIFICANT FORCE. TO AVOID INJURY, INFLATE THE TIRES IN THE PROTECTIVE CAGE (ZONE).***
- ***MONITOR THE TIRE PRESSURE AT LEAST ONCE EVERY TWO WEEKS USING A PRESSURE GAUGE WITH 10 KPA SCALE DIVISION, AT THAT TIRES SHALL BE "COLD".***
- ***AT THE TIRE PRESSURE OF 80 KPA, THE PRESSURE CHECK SHALL BE CARRIED OUT MORE OFTEN AS THE RISK OF AIR LEAKAGE INCREASES AT LOW PRESSURE.***
- ***USE AND STORE TIRES IN ACCORDANCE WITH THE RULES FOR TIRE USE AND STORAGE FOR TRACTORS AND AGRICULTURAL MACHINES.***
- ***WHEN OPERATING WITH HIGH TRACTION FORCES, THE TIRE TURN RELATIVE TO SIDES CAN BE OBSERVED. THIS PHENOMENON CAN BE ELIMINATED BY INCREASING TIRE PRESSURE BUT REDUCING THE TRACTION.***

To avoid premature tire failure, observe the following rules:

– do not allow the tractor to operate with significant wheel slip;

– do not allow the tractor to operate or park on damaged and flat tires;

– in order to avoid increased tire wear, operate the tractor on hard-surface roads as maximum than 30 % of the total operating time;

– prevent ingress of ICE coolant, oil, fuel and other petroleum products to the tires;

– do not allow the tractor to operate with internal inflation pressure that does not correspond to the normal for a specific case of its use;

– correct the inflation pressure when changing the operating conditions of the tractor, because changes in pressure affect their performance and tractor performance.

The magnitude of internal established pressure depends on the speed of movement and weight loads on the axles of the tractor, created by the mass of the modularized machines and implements, taking into account the own operating weight of the tractor, ballast installed, and also operating conditions.

The internal inflation pressure in the tires for each specific case of modularization of the tractor is different. Therefore, when the operating conditions of the tractor change, it is necessary to check and, if necessary, correct the inflation pressure. Failure to comply with the pressure standards significantly reduces the life of the tires.

In order to correctly determine the required internal pressure in the tires, as well as the need to install ballast, it is necessary to determine the amount of load on each axis of the tractor. The exact value of the load in a particular case of using the tractor, falling on the front or rear wheels of the tractor, can only be determined by practical weighing of the tractor with the modularized machine and the implement.

Determination of the optimal inflation pressure is achieved by weighing the tractor according to the following method:

– install the front axle of the tractor on the vehicle scale;

– determine the weight on the front axle with the working equipment lowered;

– install the rear axle of the tractor on the vehicle scale;

– determine the weight on the rear axle with the working equipment lifted.

ATTENTION! THE TIRE PRESSURE SHALL BE SET TAKING INTO ACCOUNT LOADS AND SPEEDS APPLICABLE FOR THE TYPE OF WORK TO BE CARRIED OUT!

Changes in operating conditions may require adjustments to inflation pressure and ballasting.

When performing agricultural works with mounted and semi-mounted tools with a speed of 10 km/h as maximum, and carrying out transport works with a speed of 30 km/h as maximum, it is necessary to follow the data given in Table 8.

Table 8

Tire pressure, MPa	Maximum axle load, N			
	Cultor 710/70R38 RD-03 166D	Mitas 710/70R38 AC-65 166D	Mitas 710/70R38 SFT 166D	Machxbib 710/70R38 171D TL
0.2	-	-	-	131,600
0.18	-	-	-	126,800
0.16	121,900	121,900	121,900	121,900
0.14	111,000	111,000	115,700	110,900
0.12	100,000	100,000	108,500	99,900
0.1	91,400	91,400	99,000	88,900
0.08	82,200	82,200	88,900	77,800
0.06	-	72,400	78,100	66,800

Table 8 (continuation)

Tire pressure, MPa	Maximum axle load, N		
	710/70R38 VOLTYRE-AGRO DR-109 169A8/166D	710/70R38 Bel-179 166D	710/70R38 NORTEC TA-01 166D/169A8
0.2	124,000	-	-
0.18	119,800	-	-
0.16	113,400	121,900	97,400
0.14	104,300	112,200	89,800
0.12	93,600	102,400	81,800
0.1	82,900	92,700	78,000
0.08	71,700	-	-

N o t e – The load capacity and tire pressure data given in the tables are for reference purposes only. It is necessary to know the exact values of load capacity and pressure in tires from the tire manufacturer.

When carrying out agricultural works, follow the data given in Tables 9 and 10.

Table 9 – Recommendations for selection of ballast, WDS and speed for the K-735M, K-739M, K-740M, K-742M tractors at the main agricultural operations

Tractor model	Recommended operating weight, kg	Required traction on hook, t, at speed, km/h			Need for ballast	Need for WDS
		seeding 14 km/h	harrowing 11 km/h	plowing 9 km/h		
K-735M St 1 (257 kW)	15,250	4.2	5.5	6.5	no	no
K-735M Pr (260 kW)	14,790					
K-739 St 1 (287 kW)	17,930	4.8	6.5	7.2	500 kg	yes
K-740M Pr (295 kW)	17,465					
K-742 St 1 (309 kW)	18,130	5.0	6.7	8.0	700 kg 900 kg	yes
K-742M Pr (315 kW)	17,865					

Table 10 – Recommendations for setting up the tractor for specific works

Type of work	Tractor model	
	K-739M, K-740M, K-742M	
	WDS	ballast
Plowing, chiseling, 7–11 km/h	+	front
Disc tillage, harrowing, seeding, 9–17 km/h	-	full
Cultivation, 10–15 km/h	-	full
Transportation, 20–30 km/h	-	+

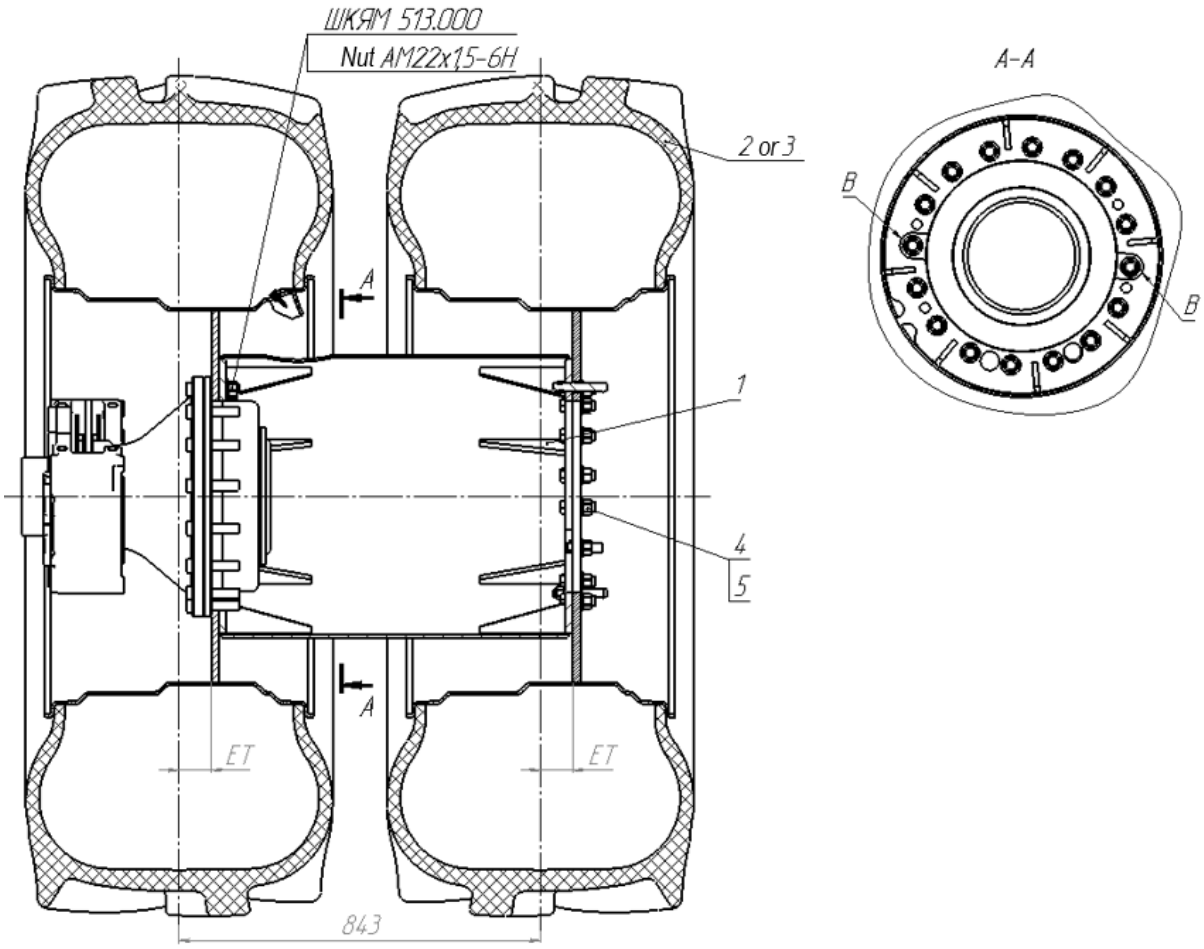
9.7.1 WHEEL DOUBLING SET (OPTION)

To ensure the operation of tractors on soils with high humidity (early spring and other works), in order to reduce the specific pressure on the soil and increase the cross-country capability, it is planned to install additional wheels on the tractor with parts for their installation.

ATTENTION!

- ***WHEELS USED AS MAIN AND AS ADDITIONAL WHEELS SHALL HAVE THE SAME WHEEL OFFSET.***
- ***DURING REMOVAL AND INSTALLATION OF WHEELS, PROCESS STUDS LOCATED ON THE CARRIER OF DRIVE AXLE SHALL BE INSTALLED IN VERTICAL PLANE. BEFORE REMOVAL OF DOUBLED WHEELS (OR ONE OF THEM) FROM THE HUB, BLEED AIR FROM BOTH WHEELS.***

DO NOT OPERATE THE TRACTOR WITH THE WHEEL DOUBLING SET INSTALLED IN TRANSPORT RANGE GEARS.



1 – spacer; *2* – right wheel; *3* – left wheel; *4* – nut; *5* – bolt

Before installation of spacers 1 it is necessary to screw off fourteen nuts (ШКЯМ 513.000 Nut AM22x1.5-6H) on each carrier of both axles. At the same time the remained two nuts B shall be located absolutely opposite to each other, as shown in A-A section.

Install the set in the following sequence:

– place the main wheel of the tractor above the ground (see Section

– install spacer *1* on the main wheel of the tractor, providing matching of the chamber valve with hole B in the spacer. The moment for tightening the nuts securing the spacer to the main wheel (ШКЯМ 513.000 Nut AM22x1.5-6H) is 350 to 450 N·m; the tightening shall be made crosswise;

– install additional wheel *2* on spacer *1* ensuring alignment of direction of the additional wheel tread pattern with the main one;

– lock the wheel, install bolts *5* and tighten nuts *4* fastening the additional wheel to the spacer. The moment for tightening the nuts 4 is 500 to 600 N·m; the tightening shall be made crosswise.

9.7.1.1 RUNNING-IN AND MAINTENANCE OF WHEEL DOUBLING SET

Set the inflation pressure:

– main wheels – (0.1±0.01) MPa;

– additional wheels – (0.078±0.01) MPa.

Check tightening of nuts of the main and additional wheels after two hours of operation on the tractor with installed set for wheels doubling, and further check reliability of attachment.

In case of daily maintenance (as maximum after 10 motor hours of tractor operation) check tightening torque of nuts attaching the main and additional wheels. Tighten the main wheels fasteners of the tractor during MAINT-1.

Detailed information on WDS is given in the Manuals for installation, operation and maintenance of the wheel doubling set enclosed to the tractor during WDS configuration.

9.8 REAR HITCH CONTROL EHR (OPTION)

The EHR system is designed to control the working bodies of mobile machines, including the tractor hitch.

RH control is carried out from the PU-03 panel located on the control unit (cable mechanical control of changeover valve) or from the PU-04 panel located on the control panel-armrest (electrical control of changeover valve).

A specific feature of the system for tractors with the changeover valve electric control is the fact, that the mounted device is lowered only in the “Floating” mode, the “Forced lowering” function is absent. EHR system provides operation of tractor with mounted implements in the following modes:

– lift height limitation;

– lowering speed limit;

– manual control from external buttons;

– positional adjustment;

– power and mixed control;

– “Floating”;

– transportation;

– transportation with vibration damping.

9.8.1 CONTROL PANEL PU-03

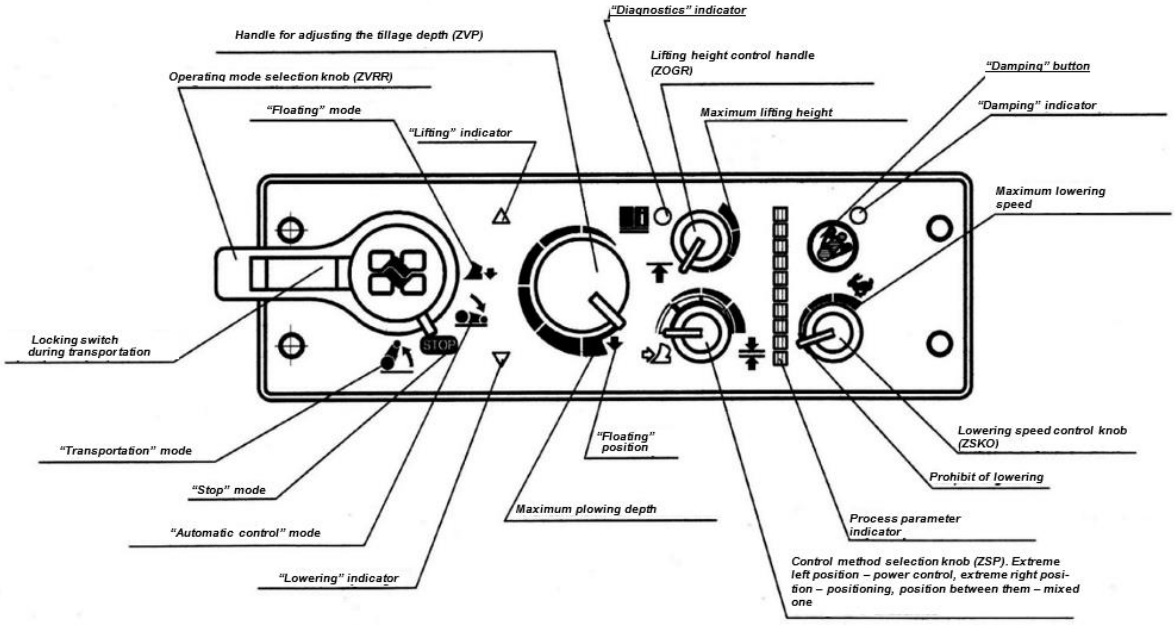


Figure 5 – Control panel PU-03

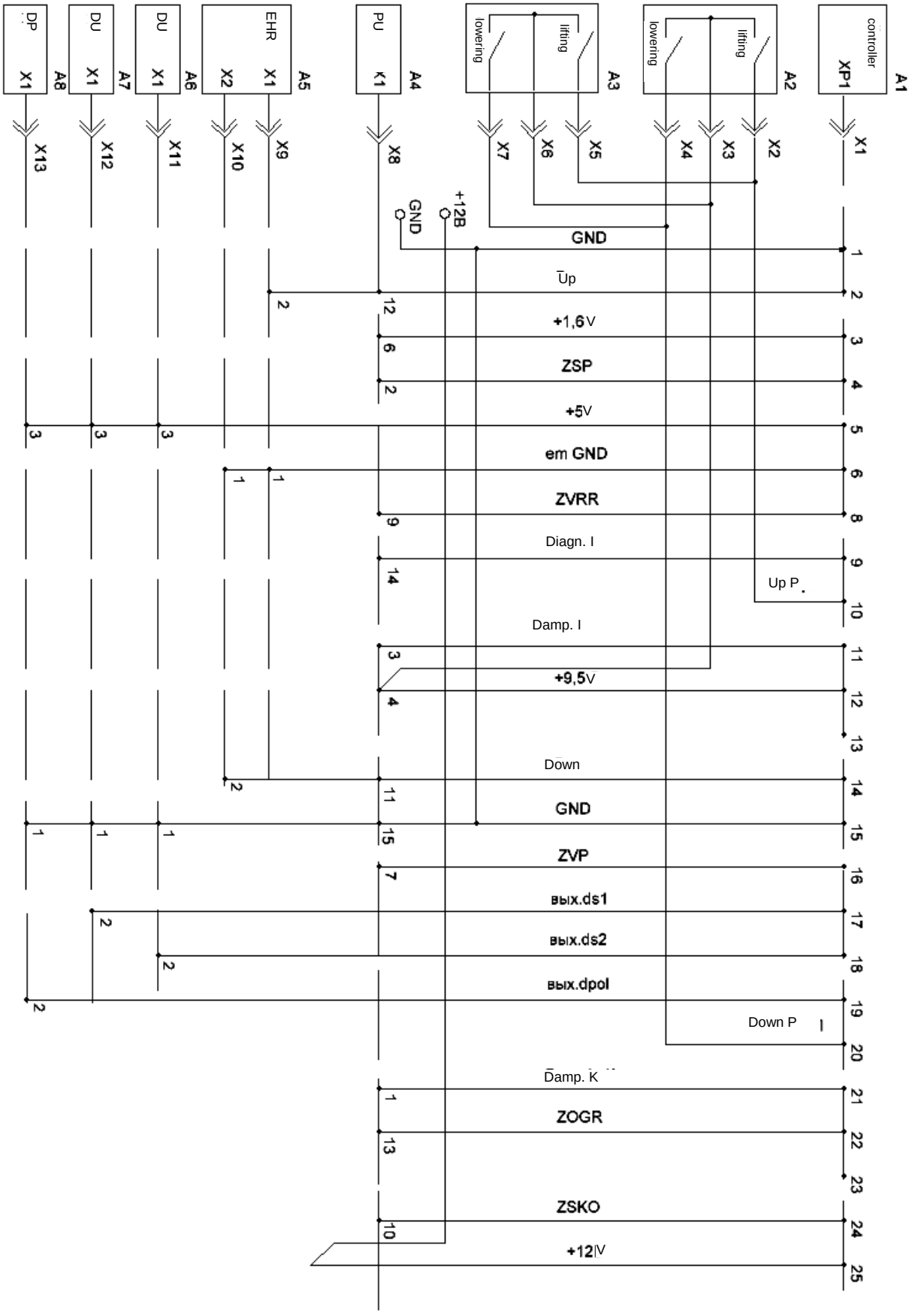
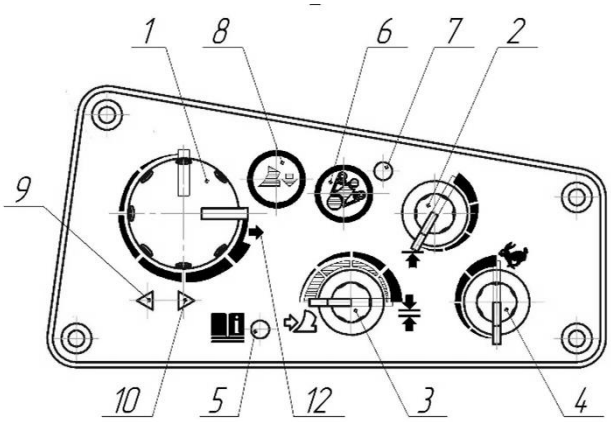


Figure6 – System components connection diagram with the PU-03 control panel

9.8.2 CONTROL PANEL PU-04



1 – handle for adjusting the tillage depth; *2* – handle for limiting the lifting height; *3* – knob for selecting a control method: extreme left position – power control mode, extreme right position – positional control mode, between them – mixed control mode; *4* – knob for lowering speed control; *5* – "Diagnostics" indicator (red color);

6 – "Damping" button; *7* – "Damping" indicator (green color);

8 – button of the "Floating" mode (without fixation); *9* – "Lifting" indicator (red color);

10 – "Lowering" indicator (green color)

Figure 7 – Control panel PU-04

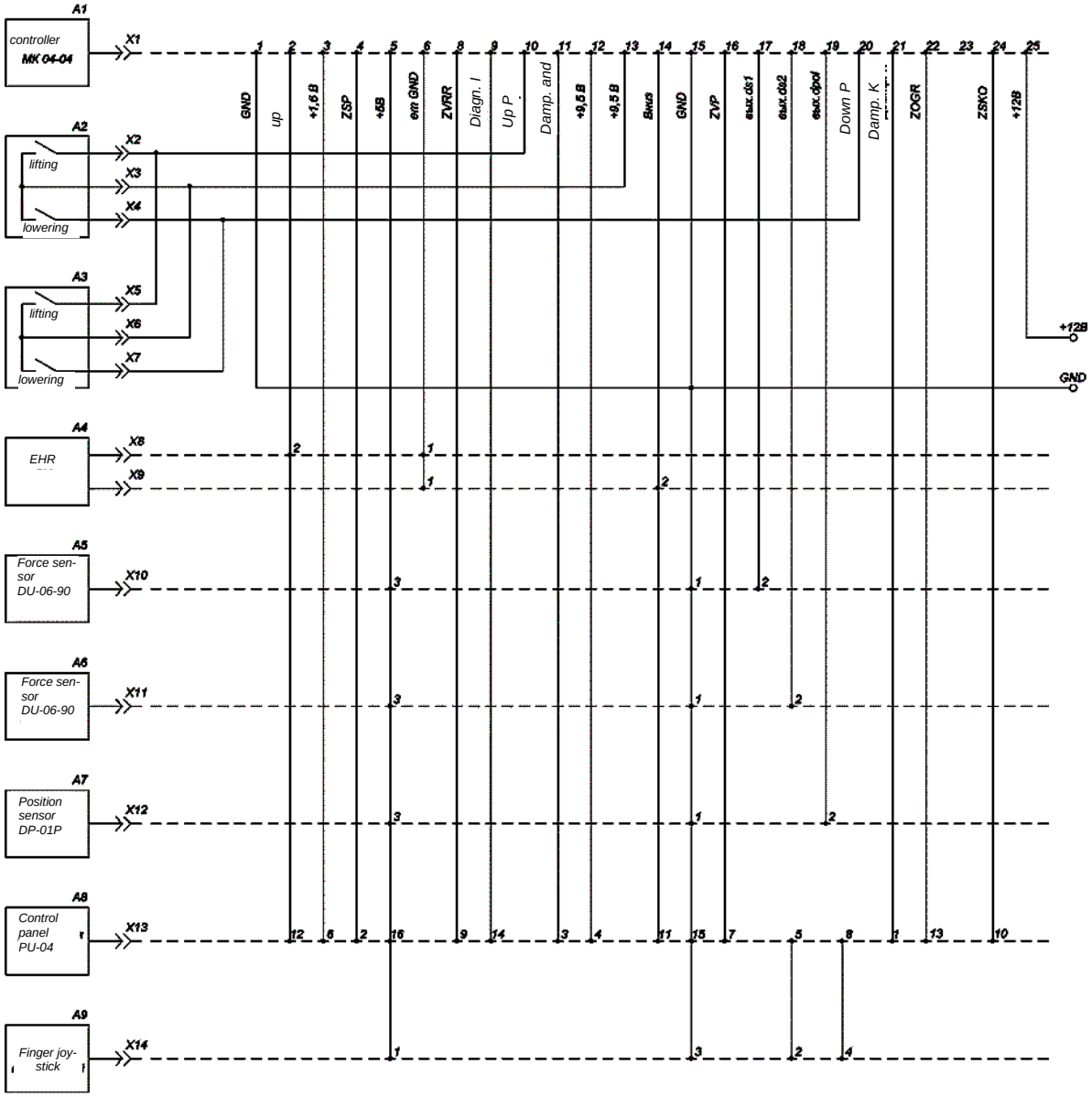


Figure 8 – System components connection diagram with the PU-04 control panel

9.8.3 DESIGN AND OPERATION

A schematic diagram of a tractor plowing unit with automated control of hitches is shown in Figure 8.

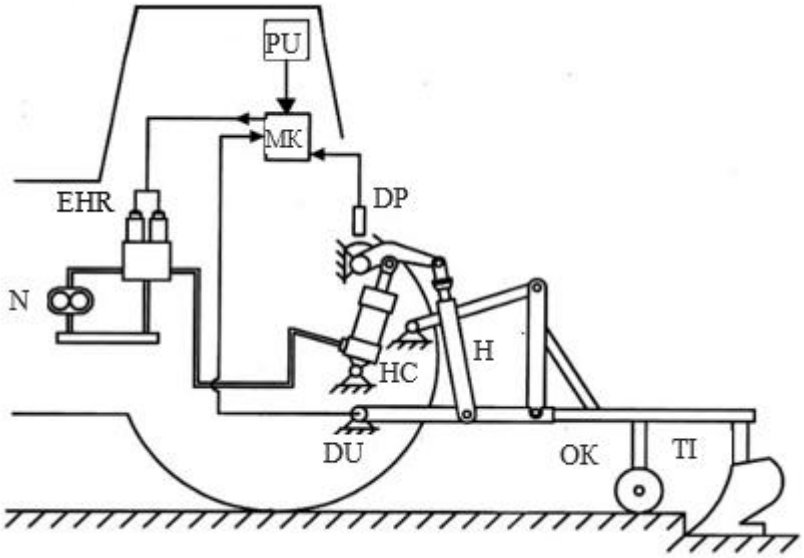


Figure 9 – Conventional diagram of a tractor plowing unit

The tractor plowing unit contains the tillage implement (TI), which is kinematically connected with the hitch (H) and the hydraulic power cylinders (HC).

The plowing unit also includes:

– two remote control force sensors (DU);

– a non-contact position sensor (DP);

– an electro-hydraulic distributor (EHR) (for tractors with electric control of changeover valve);

– a hydraulic fluid supply pump (N) for control of hydraulic cylinders (HC) by means of electro-hydraulic distributor (EHR);

– a microprocessor controller (MK) that implements a control and regulation algorithm;

– a control panel (PU) for setting control modes in the process of work.

In the automatic control mode, depending on the type of regulation selected by the operator, the system allows you to maintain a given position of the tillage implement (TI) relative to the tractor, stabilize the traction resistance force in the longitudinal rods of the hitch mechanism.

Electrical signals from the position sensor (DP) (with positional control) or the total signal of the position sensor (DP) and two remote control force sensors (DU) (with mixed control) are sent to the controller MK, where they are compared with the signal set by the operator on the control panel (PU). In case of a mismatch of these signals, the controller MK generates a control action for the solenoids of the electro-changeover valve EHR, which, through the hydraulic power cylinders HC, performs a corrective movement of the tillage implement TI up or down, and thus stabilizes the given parameter (position, force).

9.8.4 SYSTEM OPERATION MODES

The system operation modes are given in Table 11.

Table 11

Operation mode	Position of controls and mode indication
"Stop"	Set the mode selection knob for the **PU-03** control panel to "Stop" position. The system does not respond to external impact, the system is blocked. EHR control is possible only from remote buttons. **When the system is equipped with the PU-04 control panel, operation mode selection functions are provided with a finger joystick (installed outside the PU-04 panel) and the "Floating" button (located on the PU-04 panel).** The "Stop" mode is set at the middle position of joystick.
"Transportation" (lifting the hitch)	Set the mode selection knob for the **PU-03** control panel to the "Transportation" position.Adjust the lifting height of the hitch with the lifting height limiting knob. If the system is equipped with the **PU-04** panel, the "Transportation" mode is set at the upper position of joystick. When lifting the hitch, the "Lift" indicator lights up on the control panel. If necessary (during transportation) by the selector switch located on the mode selection knob, lock the mode switching during transportation **(only for the PU-03 panel).** To activate the mode of damping mechanical oscillations during transportation, press the "Damping" button.
"Floating" (lowering the hitch)	Adjust the lowering speed of the hitch with the lowering speed control knob.Set the mode selection knob to the "Floating" position. Hold the knob in the specified position with a hand. On the **PU-04** control panel, set the "Floating" position with the button *8* (Figure 7). On the control panel, when lowering the hitch, the "Lowering" indicator lights up. The extreme left position of the lowering speed control knob is the prohibit of lowering.

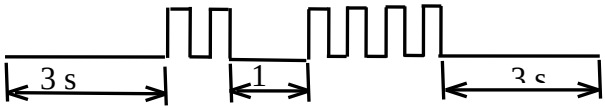
Operation mode	Position of controls and mode indication
"Automatic control"	Set the mode selection knob to the "Automatic control" position. For the **PU-04** panel set the finger joystick to the lower position. Using the knob for selecting the control method, set the control method – positional, power or mixed. Use the knob for adjusting the tillage depth to set the required tillage depth. During operation, the "Lifting" and "Lowering" indicators light up and go out alternately. The extinction of both "Lifting" and "Lowering" indicators means, that the system has reached the minimum mismatch between the set and measured parameters, and it is in the dead zone.

9.8.5 SYSTEM DIAGNOSTICS AND TROUBLESHOOTING

The system controller provides diagnostics of the operability of the system components and, in case of a malfunction, blocks the operation of the system in automatic mode from the main control panel with the issuance of a malfunction code.

In the "Stop" mode (system operation is blocked), the system diagnostics is not performed.

The fault code is displayed on "Diagnostics" indicator as per diagram. Malfunction code "24" is given as an example.



Malfunction codes are given in Table 12.

Table 12

Code	Brief description of the malfunction	Troubleshooting method
11	Break of the upper solenoid circuit.	Check the wires connected to the solenoid. If they are operating properly, check the solenoid. Replace, if defective.
12	Break of the lower solenoid circuit.	Check the wires connected to the solenoid. If they are operating properly, check the solenoid. Replace, if defective.
13	Short circuit in solenoid circuits.	Check the solenoid circuits of the system for a short circuit.
14	Short circuit of the “Lifting” button of the remote control.	Check the button for short circuit.
15	Short circuit of the “Lowering” button of the remote control.	Check the button for short circuit.
16	The voltage at the power supply +9.5 V (for the MK-03-03 and MK-04-04 controllers) is below 9.25 V or above 9.75 V. The voltage at the power supply +5 V (for the MK-04-04 controller) is below 4.7 V or above 5.2 V.	Ring the power circuit for a short circuit to the on-board network, ground. If a short circuit is detected, eliminate it.
19	System power supply is below 10.7 V or above 16 V.	Check the electrical equipment of the tractor (battery, regulating relay). Check the battery voltage. Recharge or replace it, if necessary. It is also possible to operate the malfunction code during long-term operation of the starter (under-voltage during the time interval, over 6 seconds). In this case, after a successful engine start, switch the operating mode selection potentiometer to the position “Transportation”, “Automatic control”, “Stop” several times until the malfunction code goes out.
22	Position sensor malfunction.	Check the presence of supply voltage (5 V) on the contacts of the sensor connector. If it is present, and there is no visible damage to the cable, adjust the sensor’s position in accordance with the method of its installation. If there is no effect, replace the sensor.
23	Malfunction of the potentiometer for adjusting the tilling depth.	Replace the control panel.
24	Height limiting potentiometer malfunction.	Replace the control panel.
28	Operation mode selection potentiometer malfunction.	Replace the control panel.
31, 32	Malfunction, respectively, of the force sensor 1 (code 31), force sensor 31 (code 32).	Check the presence of supply voltage (5 V) on the contacts of the sensor connector. If it is present, and there is no visible damage to the cable, replace the sensor.

Code	Brief description of the malfunction	Troubleshooting method
34	Lowering speed control potentiometer malfunction.	Replace the control panel.
36	Malfunction of the potentiometer for selecting the control method.	Replace the control panel.
97	There is no solenoid current through the "Lowering" channel in the absence of a solenoid break and a short circuit between the controller contacts 14, 6 (solenoid ground).	Check the contacts 14, 1 for short circuit. If there is a short circuit, (resistance less than 1.5 Ω), eliminate it, in other cases replace the controller
98	There is no solenoid current through the "Lifting" channel in the absence of a solenoid break and a short circuit between the controller contacts 2, 6 (solenoid ground).	Check the contacts 2, 1 for short circuit. If there is a short circuit, (resistance less than 1.5 Ω), eliminate it, in other cases replace the controller
99	Leakage of current through one or two channels "Lifting", "Lowering".	Replace the controller.
-	There is no lifting and lowering of the hitch when controlled from the main control panel. There is no malfunction indication.	Check the EHR. If it works, replace the controller.

After the system enters the "Diagnostics" mode, the system is returned to the operating state according to the following method:

– **option a)** de-energize and after 3-4 s switch on the power supply.

When 12 V power supply is fed to the system, the "Diagnostics" and "Damping" indicators on the control panel shall light up, then the "Damping" indicator shall go out;

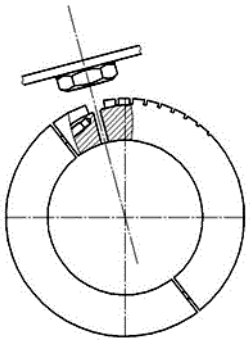
– **option b)** switch the mode selection knob to the "Stop" mode, and then to the required mode.

9.8.6 PROCEDURE FOR INSTALLING THE CAM AND POSITION SENSOR

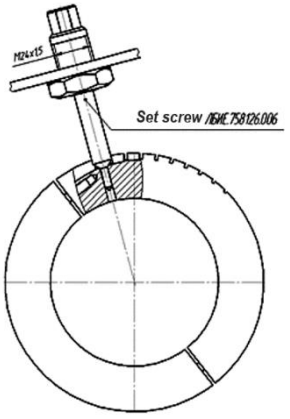
To install the cam and position sensor correctly, follow these steps:

1 On the tractor with running engine, lift the hitch to the maximum height using the remote buttons (at the maximum lifting point, the pump is not allowed to operate on the safety pressure reducing valves).

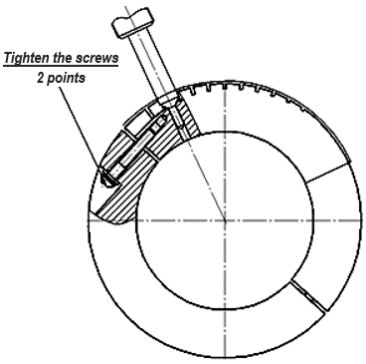
2 Approximately install the cam on the pivot shaft with an incomplete tightening of the cam mounting screws so that the hole in the threaded part of the bracket is aligned with the hole for the cam set screw (in SPTA box).

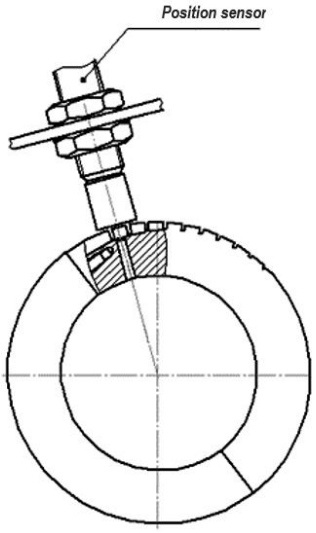


3 Turning the cam, screw in the set screw so that it enters the cam hole.



4 Tighten the cam screws.





5 Unscrew the set screw. Instead screw the position sensor all the way into the cam, then unscrew the position sensor 1.5 turns back to provide a gap between the sensor and the cam.

6 Secure the position sensor with a lock nut.

7. Calibrate the position sensor.

7.1. Disconnect the electrical connector from the position sensor.

7.2 Press and hold the “Damping” button for about 5 s until the “Damping” LED flashes with high frequency. After release of the button, the “Diagnostics” LED shall light on continuously.

7.3 Attach the electrical connector to the position sensor.

7.4 Lift the RH levers to the upper extreme position using the “Lifting” remote button.

7.5 Press and hold the “Damping” button until the “Diagnostics” LED goes off (the control unit has memorized the upper limit).

7.6 Lower the RH levers to the lower extreme position using the “Lowering” remote button.

7.7 Press and hold the “Damping” button until the “Diagnostics” LED goes off (the control unit has stored the lower limit).

7.8 After setting of the upper and lower points, press both remote buttons for a short time to exit the calibration mode, and save the parameters.

N o t e s :

1 After correct installation of the sensor, its output signal in the uppermost position of the hitch shall be equal to about 4.5 V.

2 If during operation of the system and a working position sensor appears the malfunction code “22”, this may mean that the output signal of the sensor in the extreme positions goes beyond the threshold limits set in the system. If this occurs in the lower position of the hitch (the output signal of the sensor goes beyond the lower threshold – 0.5 V), then it is necessary to unscrew the position sensor a little, and if the malfunction code “22” appears in the extreme upper position (the output signal of the sensor goes beyond the upper limit threshold – 4.5 V), then the position sensor shall be screwed in a little.

3 The indicated adjustments of the position sensor are based on the fact that its output signal depends on the size of the gap between its end and the working surface of the KR-01 cam. The closer the working surface of the cam is to the end of the sensor, the lower the output signal of the sensor, and vice versa.

4 Position sensor of DP-01 type measures lifting height of the mounted device by non-contact method, interacting with working surface of the cam. Rotation of the cam of KR-01 type 0 to 87° corresponds to the movement of cam working surface relative to the sensitive end surface of position sensor in the range 1.8 to 7.5 mm. Change of position sensor output signal is 0.5 to 4.5 V for the DP-01P sensor, 2.3 to 7.1 V for the DP-01 sensor.

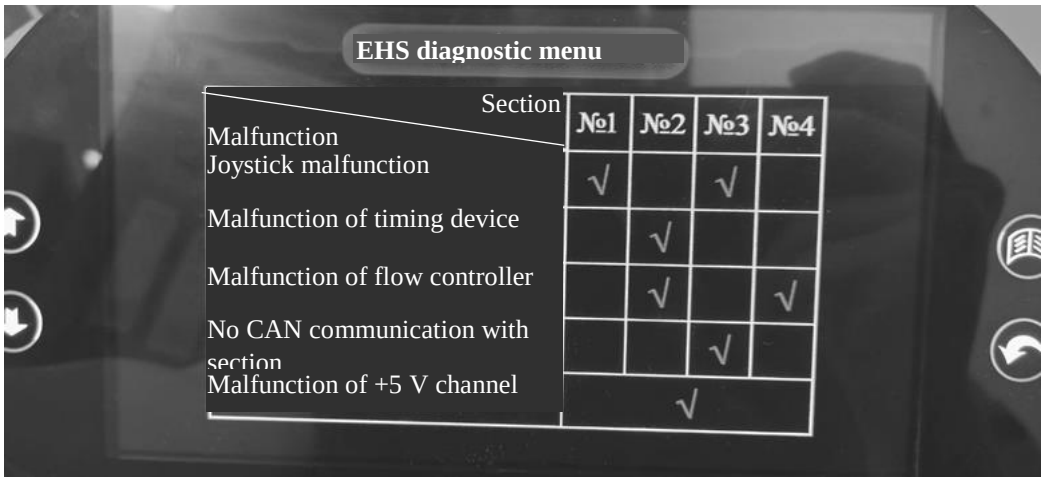
The criterion for the correct installation of the position sensor is the maximum use of the entire range of movement of the hitch from the lowest position to the highest upper position without overloading the hydraulic pump at the end of the lift and without leaving the hitch in the safety stop. In this case, the corrections for lifting and lowering the hitch shall be finite in time.

5 If the DP-01 type position sensor is inoperative or if it is incorrectly installed (error code “22” appears), the lifting and lowering of the hitch can be controlled from the remote buttons. When you press the remote button, the movement of the hitch shall not be continuous, unlike when the position sensor channel is configured correctly, but discrete with a duration of about 3 s.

9.9 ELECTRONIC CONTROL SYSTEM OF ELECTRIC CHANGEOVER VALVE SECTIONS (EHS)

9.9.1 GENERAL INFORMATION

The EHS system, installed on tractors with electric control of the changeover valve, serves to control the sections of the STB LCV 5-FACH changeover valve manufactured by Bucher, or SB23LS EHS EHR manufactured by Bosch, installed on the tractor fuel tank. When power is supplied to the control unit, the electronic system performs self-diagnostics of the control elements; if there are faults of the electronic control system EHS, the indicator on the system activation switch lights up. A detailed description of the error can be found in the diagnostic menu of the steering column display “Additional parameters” under the password: 3333.



If faults occur, the red indicator on the indication key lights up. To decrypt errors, go to the display menu of the steering column “Additional parameters” under the password: 3333 (for Bucher distributor only).

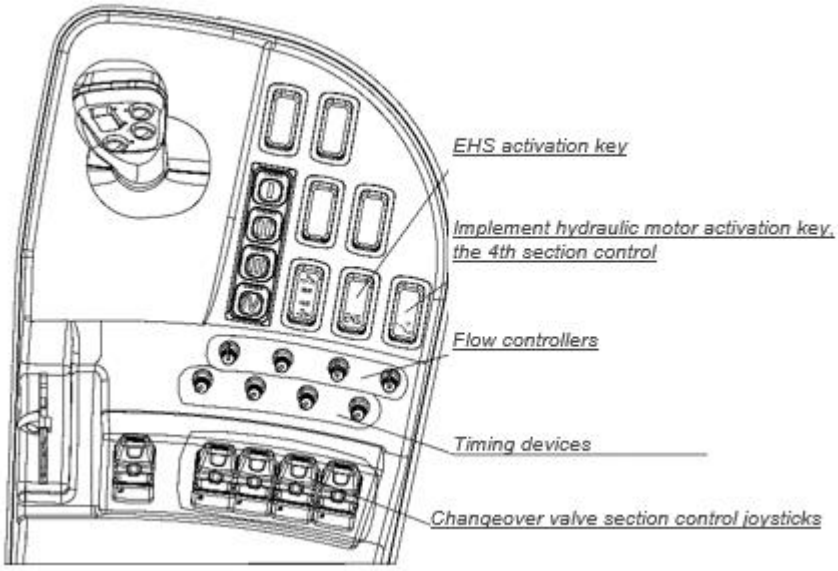
If “Bosch” EHS electronic control system fails, fault codes are indicated on the activation switch indicator. The rules for reading diagnostic light codes (Table 14) are similar to the rules for reading diagnostic light codes from the changeover valve sections (Table 13).

Diagnostic codes from the switch and from the changeover valve sections do not duplicate each other and display various malfunctions, even if the codes are the same.

For example:

- malfunction code “21” on the switch – resistance of the oil supply limiting regulator for the valve of section No. 2 is out of range, or open circuit;
- malfunction code “21” on the distributor section – a low supply voltage level (8 to 11 V) on the distributor section is not permissible.

9.9.2 EHS CHANGEOVER VALVE SECTION CONTROL



EHS changeover valve section control includes the following elements:

– electronic control unit of EHS MUG-01 system (SRC4-5);

– EHS system activation switch with switch on alarm and fault diagnostics;

– 4 flow controllers of each of the sections (I, II, III, IV) of the changeover valve;

– 4 regulators for controlling the operation response time when the hydraulic valve section (I, II, III, IV) is turned on;

– 4 control handles for sections I, II, III, IV of the changeover valve;

– switch for selection of control mode of the fourth section (set only with “Bucher” distributor).

Section control handles have 5 switching positions:

1 The central position is neutral.

2 Non-fixed position forward (towards the engine) – lowering the implement.

3 Non-fixed reverse position (towards the load semi-frame) – lifting the implement.

4 Fixed forward position (towards the engine) – actuation of the “Floating” mode of section.

5 Fixed reverse position (towards the load semi-frame) – actuation of constant oil flow through the section. In this position of the handle, you can set the required oil flow using the flow controller, as well as set the operation response time using the timing device.

Operating range of flow controller in fixed positions of section control handles is 270°. It ensures change of oil flow rate, 0 to 120 l/min for “Bucher” SCV, and 0 to 90 l/min for “Bosch” changeover valve:

– when the knob of the controller is turned clockwise, the flow increases;

– when turning the controller knob counterclockwise – the flow decreases.

Range of timing device operation in fixed positions of handles is 270°. Turning the handle by an angle 0 to 250° changes the operation time 2 to 60 s, turning by an angle 250 to 270° provides the flow of oil without limiting the time:

– when the timing device handle turns clockwise, the operation time increases;

– when the timing device handle turns counterclockwise, the operation time decreases;

– constant flow of oil without time limitation is provided in extreme position clockwise of timing device handle.

When the fourth section control key is turned on, the fourth section control algorithm changes:

1 The central position is neutral.

2 Non-fixed forward position (towards the engine) – the “Floating” mode.

3 Non-fixed reverse position (towards the load semi-frame) – the “Floating” mode.

4 Fixed forward position (towards the engine) – actuation of constant flow for lowering the implement.

5 Fixed reverse position (towards the load semi-frame) – actuation of constant flow for lifting the implement.

Table 13 – Error codes of SB23LS EHS EHR distributor manufactured by “Bosch”, and electronic changeover valve section control system via diagnostics light code of code indicator on the EHS changeover valve section

Code malfunctions	Possible cause and malfunction nature
11 12 13 14 15	There is no CAN bus control signal. The central spool of the distribution section spontaneously returns to the “Neutral” position. CAN protocol does not match the required one
16	A memory error was detected when turning on the changeover valve section. The central spool of the distribution section remains in the “Neutral” position
17	When the system starts up, the control signal does not correspond to the “Neutral” position
23	Clogging of a fine filter or a sintered filter of a coarse filter is extreme, or there is no voltage on the switching solenoid of the reducing valve, or clogging of the reducing valve of the signal preparation section of the changeover valve. In this case, the spool of the distributor section, when controlled from the handles, does not move or moves slowly and not at full stroke. Code indication occurs on all sections to which the control signal is supplied. In the absence or interruption of the control signal, the code indication stops
24	Movement of the distributor spool beyond the specified limits or the spool does not return to the “Neutral” position by spring force
25	The “floating” position does not turn on for a certain period of time due to mechanical wedging of the central spool or a malfunction of the control valve, low control pressure For code “25” on all distribution sections, see code “23”. The central spool of the distributor spontaneously returns to the “Neutral” position. The work of the distribution section from the joysticks to the “lowering”, “floating” position is blocked. The code indication is carried out only on the faulty section, both in the presence of a control signal, and after its removal until the control signal to “lifting” appears
26	Activation of the section spool in the “lowering” or “floating” position was due to the control valve wedging, respectively, in the “lowering” or “floating” position. If the control valve wedges in the position of the corresponding oil supply to move the spool to the “lifting” position, then after starting the tractor, the section spool shall move to the “lifting” position
31	Inadmissibly low level of supply voltage (below 8V)
32	Inadmissibly high level of supply voltage (above 18V)
41	The supply voltage is above the threshold level (over 45 V). In this case, the central spool of the distributor section spontaneously returns to the “Neutral” position. Handle control is impossible. The malfunction code is indicated on all sections regardless of the presence (absence) of the control signal

Code malfunctions	Possible cause and malfunction nature
42	Control valve current is out of allowable or expected range. In this case, the section spool is constantly in the “Neutral” position. Handle control is impossible. The code is displayed on faulty sections in the presence of a control signal
43	Malfunction of the inductive spool position sensor. The malfunction code is indicated only on the faulty section of the distributor immediately after energizing
44	When the system starts up, the control valve is open. In this case, the central spool moves to the position of the open channel
81	The distributor spool does not move back to Neutral. In this case, control from the handles is impossible. Center spool wedged in “lifting”, “lowering” or “floating” position In case of the above malfunctions, the code “24” is displayed once, then the code “81” is constantly displayed
82	The center spool of the distributor section is not initially in the “Neutral” position, or a false signal is received from the position sensor. In this case, control from the joysticks is impossible. The malfunction code is indicated only on the faulty distribution section immediately after energizing. The code is displayed only if the spool is initially in the “lifting” or “lowering” position
83	Logical error in section memory

Table 14 – Error codes of SB23LS EHS EHR distributor manufactured by “Bosch”, electronic EHS changeover valve section control system via diagnostics light code of code indicator located on the “EHS activation” switch

Code malfunctions	Possible cause and malfunction nature
11	Resistance of the oil supply limiting regulator for the valve of section No. 1 is out of range, or open circuit
12	Inconsistency or absence of a signal from the handle to the controller in section No. 1
14	There is no connection with section No. 1. The following light codes may appear on the section malfunction code indicator: 26, 31, 32, 41, 42,81,82
21	Resistance of the oil supply limiting regulator for the valve of section No. 2 is out of range, or open circuit
22	Inconsistency or absence of a signal from the handle to the controller in section No. 2
24	There is no connection with section No. 2. The following light codes may appear on the section malfunction code indicator: 26, 31, 32, 41, 42, 81, 82
31	Resistance of the oil supply limiting regulator for the valve of section No. 3 is out of range, or open circuit
32	Inconsistency or absence of a signal from the handle to the controller in section No. 3
34	There is no connection with section No. 3. The following light codes may appear on the section malfunction code indicator: 26, 31, 32, 41, 42, 81, 82

Code malfunctions	Possible cause and malfunction nature
41	Resistance of the oil supply limiting regulator for the valve of section No. 4 is out of range, or open circuit
42	Inconsistency or absence of a signal from the joystick to the controller in section No. 4
44	There is no connection with section No. 4. The following light codes may appear on the section malfunction code indicator: 26, 31, 32, 41, 42, 81, 82
72	The supply voltage is out of range (7≤Ur≥18) V. The system is blocked
77	The temperature of the oil passing through the section of the integral block is above 100 °C

9.10 TRACTOR PARAMETERS REMOTE MONITORING SYSTEM "KIROVETS-AGROMONITOR"

For remote control of tractor operation parameters, it is possible to use a remote control system of parameters on the GLONASS-monitoring cloud platform "KIROVETS-AGROMONITOR" using reports included in it.

The "KIROVETS-AGROMONITOR" monitoring service (hereinafter referred to as the service) allows for monitoring operation of the tractors and machine operators using the reports included in its composition.

Note:

1 For warranty equipment, the period of information storage in the service is 24 months. In the post-warranty period – upon agreement with the Customer.

2 The "KIROVETS-AGROMONITOR" service is open, i.e. it is possible to add other user equipment to this program (under a separate contract).

To access the service, it is enough to have a personal computer connected to the Internet. The use of mobile devices (phone, tablet, iPad) is provided. When using a mobile phone on the iOS or Android platform, it is necessary to install an application with the same name, available in the iTunes and Play Market, respectively. Browsers recommended for work in the service: Google Chrome, Mozilla, Firefox, Yandex.Browser.

9.10.1 ACCESS TO SERVICE MONITORING "KIROVETS-AGROMONITOR"

To access the program, enter the following address in the browser address bar: http://agromonitor.kirovets-ptz.com. After that, in the opened authorization form (Figure 10), type the login (arrow 1) and the password (arrow 2) in the corresponding windows, press the "Enter" button (arrow 3).

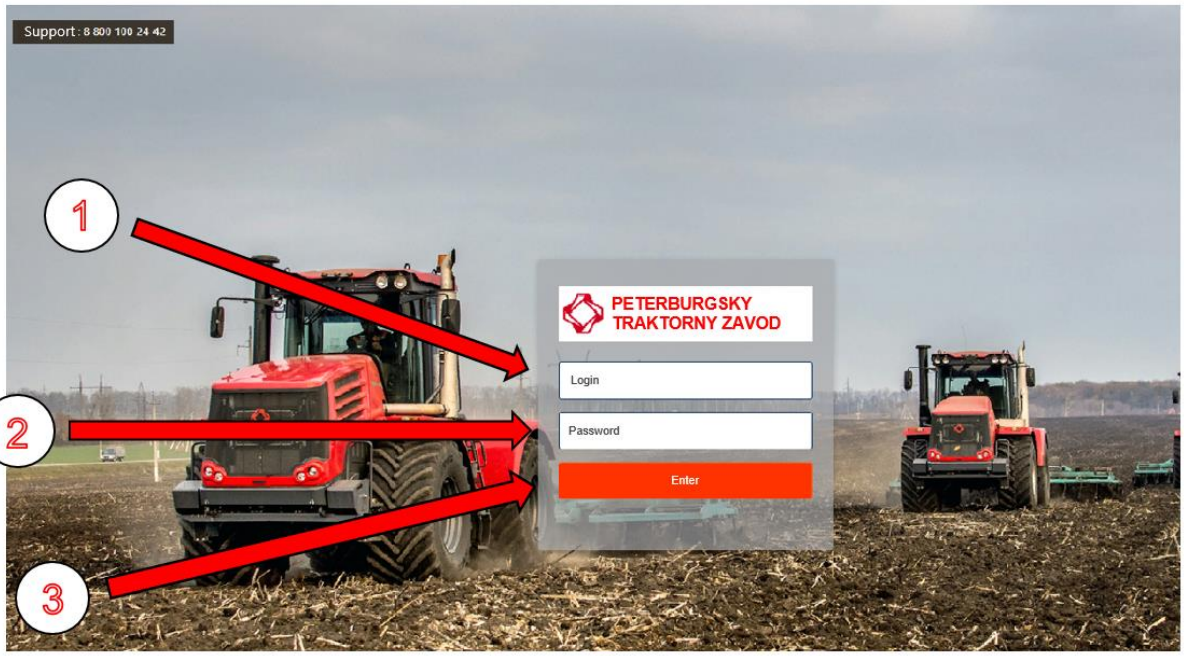


Figure 10

All user categories (plant/dealer/customer) have an appropriate program access level. Each customer receives a login/password from the dealer of Peterburgsky Traktorny Zavod JSC at the place of purchase of the tractor. The dealer receives a login/password in the service department of Peterburgsky Traktorny Zavod JSC.

If the login and password are entered correctly, a page shall open to work with your tractor in the “KIROVETS-AGROMONITOR” cloud service.

9.10.2 OVERVIEW OF WORKING WITH REPORTS

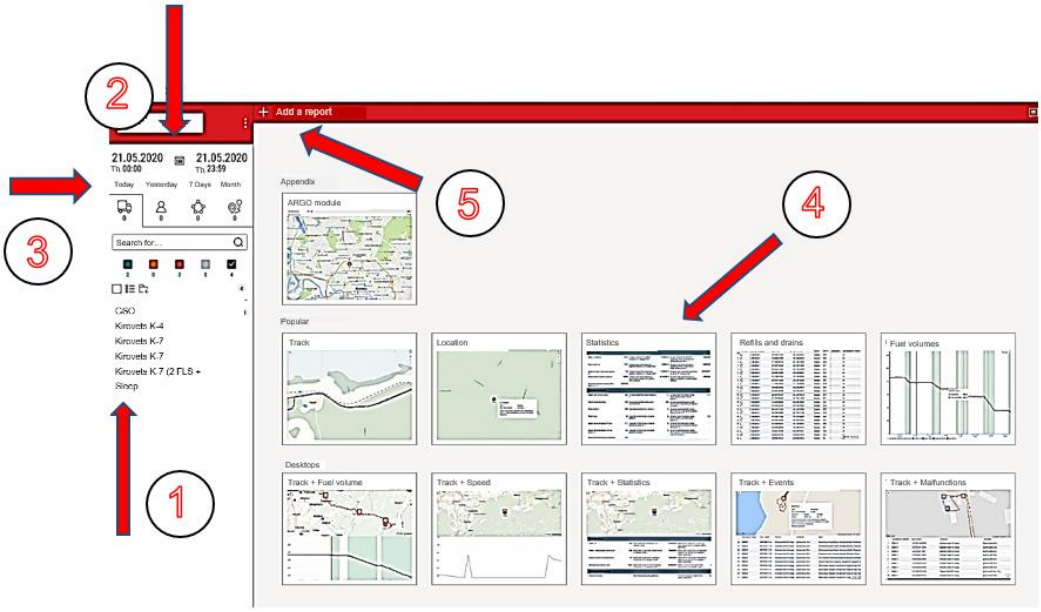


Figure 11

On the left side (Figure 11) of the opened window, there is a list of your equipment (arrow 1), a link for selecting the report building period (arrow 2), as well as quick links for selecting the report building period (today, yesterday, 7 days, month) (arrow 3).

In the central part of the window, there is a desktop for building and using various reports (arrow 4). To add a report, click the left mouse button "+ Add a report") (arrow 5).

All information in the program is divided into 4 large groups (Figure 12):

– "Reports" (arrow 1);

– "Map" (arrow 2);

– "Charts" (arrow 3);

– "Desktops" (arrow 4).

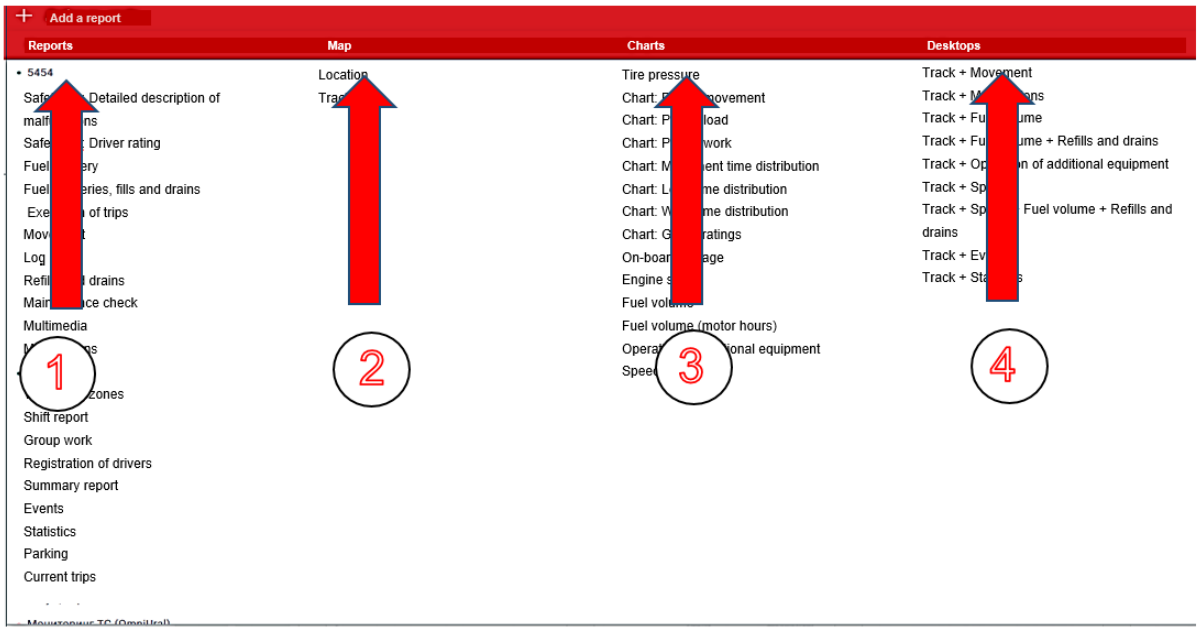


Figure 12

9.10.3 TRACK REPORT CONSTRUCTION EXAMPLE

1 In the left part of the main window of the program, tick the vehicle needed (click the left mouse button on the multi-colored square to the left of the vehicle name) – arrow 1 in Figure 13.

Figure 13

2 Select the desired report period. To do this, click the icon with “calendar” display (Figure 14, arrow 2) and in the opened calendar (Figure 15) select the date when the report was built (in the left calendar window (arrow 3)) and the date when the report was built (in the right calendar window (arrow 4)).

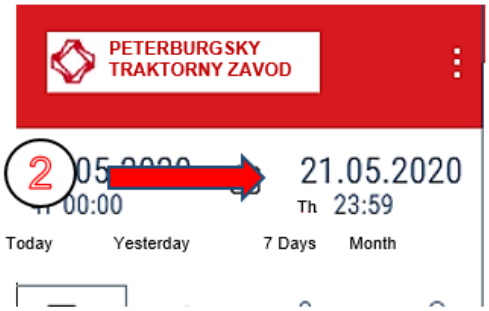


Figure 14

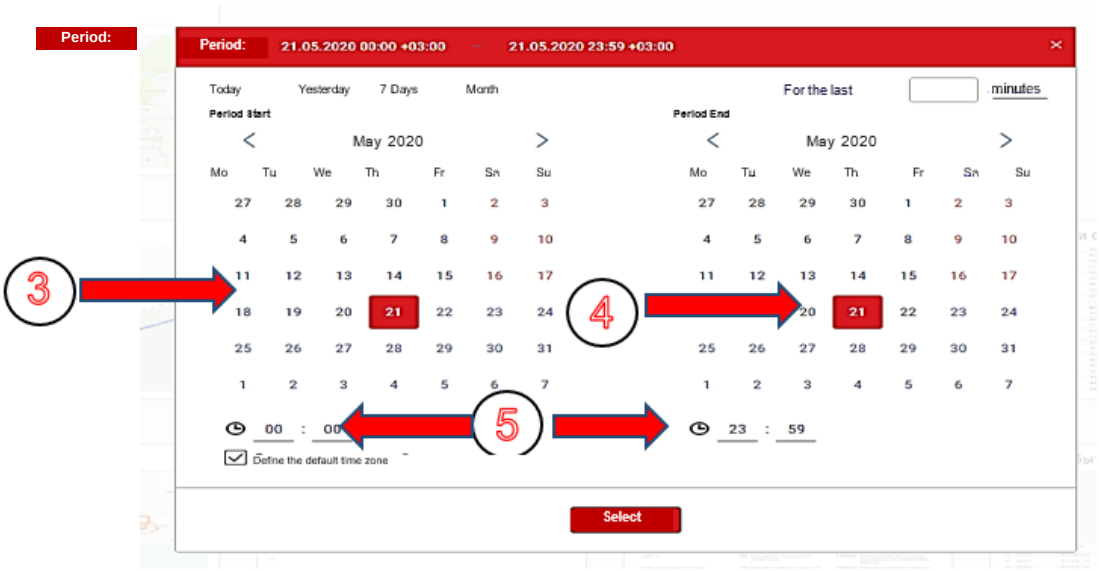


Figure 15

If necessary, it is possible to select a specific time for the start and end of the report period within the day (00:00–23:59) by clicking on the corresponding images under the calendar dates (default is the start and end of the day, respectively (arrows 5)).

Period selection is also possible using shortcuts: today, yesterday, 7 days, month (Figure 16 (arrow 6)).

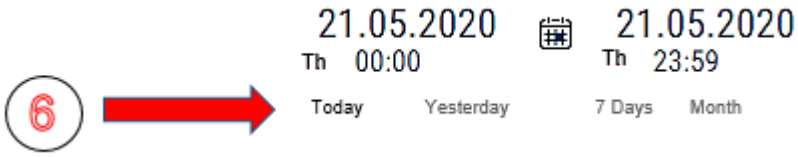


Figure 16

3 After selecting the report period, select the report needed (in this case, “TRACK”). A report can be selected using two methods:

Method 1. Click the quick link on the desktop of the main window of the program (not available for all reports, (Figure 17, arrow 7)).

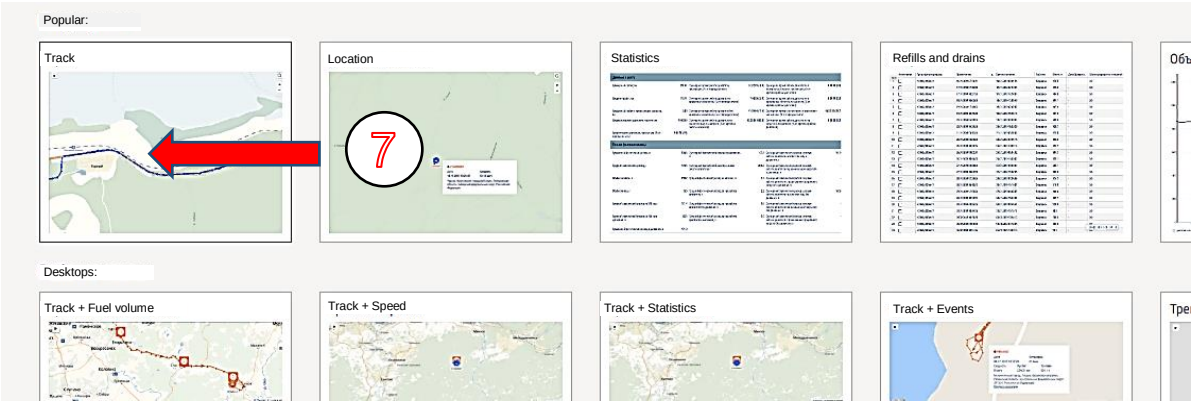


Figure 17

Method 2. Select the report from the list of reports in the upper left corner of the desktop by clicking on the “+Add a report” button on the red background (Figure 18, arrow 1) and selecting the report from the drop-down lists (Figure 19, arrow 2).

Figure 18

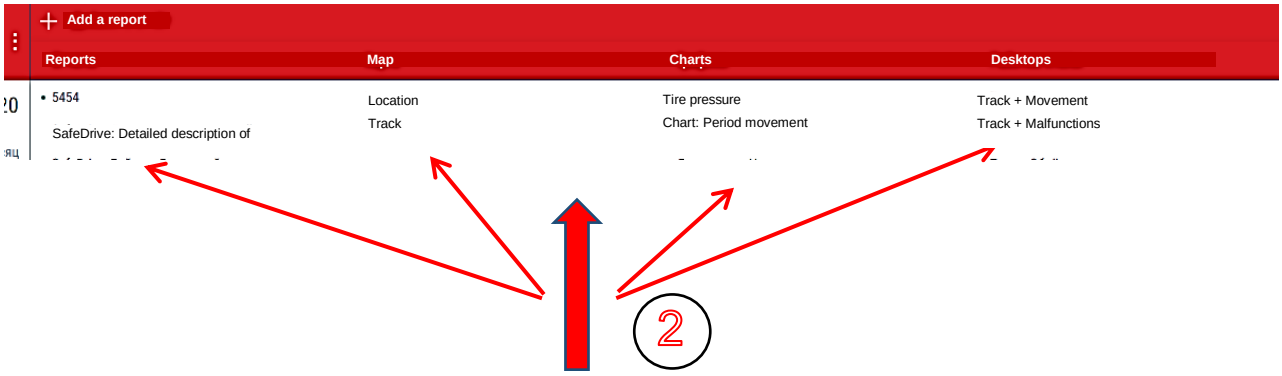


Figure 19

In the main window, the selected report is generated on the desktop (Figure 20).

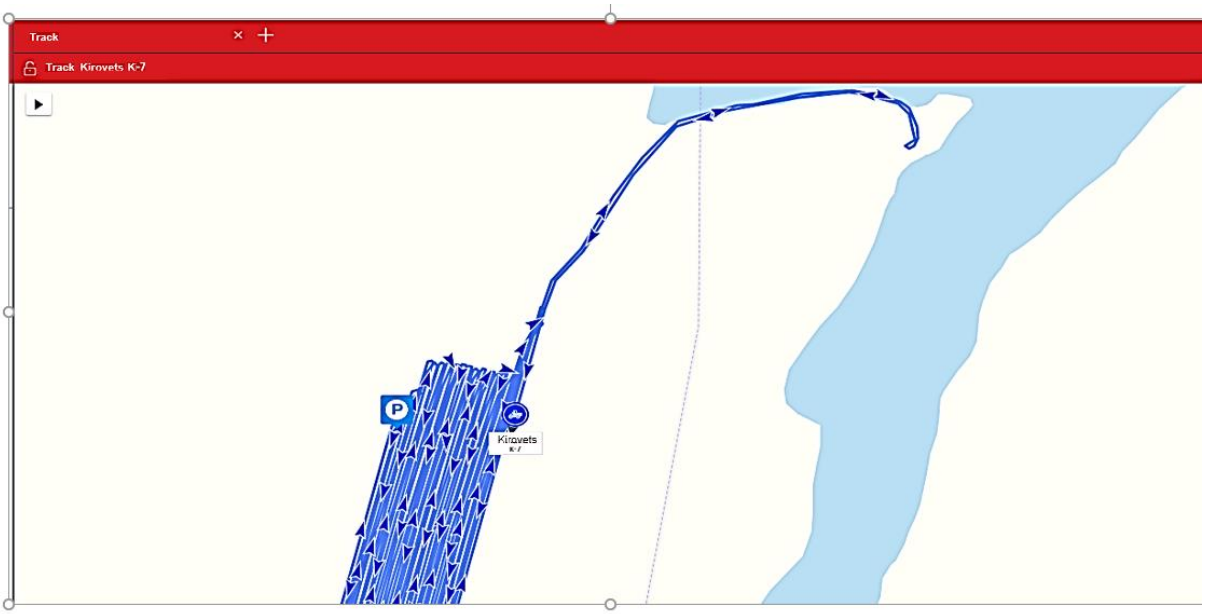


Figure 20

For mapping reports, there is a feature to select different types of maps (Google maps, Yandex maps, Google satellite, etc.).

To change the type of map, click the corresponding link in the upper right corner of the map report (Figure 21, arrow 3).

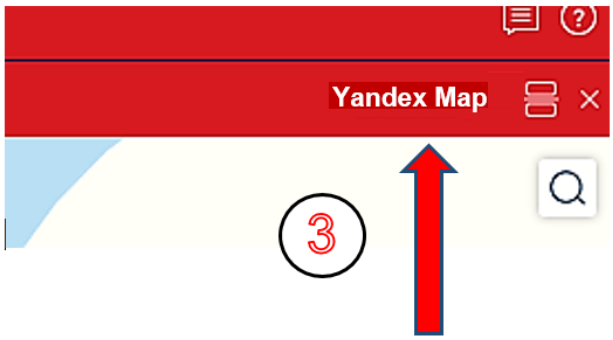


Figure 21

Similarly, all reports available in the program are generated (a complete list of reports is given in Table 15).

The display of information in reports can be configured as desired by the user.

Depending on the type of report, it can be generated as a table, graph, or map.

It is possible to save generated tabular reports in Excel format.

Table 15 – Full list of reports available in Omnicomm Online

Report name	Note
“Reports” group	
SafeDrive: Detailed description of malfunctions	When setting the “Safe Drive” option
SafeDrive: Driver rating	When setting the “Safe Drive” option
Fuel delivery	Only for fuel servicing trucks
Fuel deliveries, fills and drains	Only for fuel servicing trucks
Execution of trips	
Movement	
Log book	
Refills and drains	
Maintenance check	When setting up the “Maintenance check” service
Multimedia	When using the Omnicomm video monitoring solution
Malfunctions	Vehicle profile adjustment required
Visit to geozones	Preliminary creation of geozones required
Shift report	
Group work	
Registration of drivers	
Summary report	
Events	
Statistics	
Current status	
Current trips	
“Map” group	

Report name	Note
Location	
Track	
“Charts” group	
Tire pressure	When installing tire pressure sensors
Chart: Period movement	
Chart: Period load	
Chart: Period work	
Chart: Movement time distribution	
Chart: Load time distribution	
Chart: Work time distribution	
Chart: Group ratings	
On-board voltage	
Engine speed	
Fuel volume	
Fuel volume (motor hours)	
Operation of additional equipment	
Speed	
“Desktops” group	
Track + Movement	When setting the “Safe Drive” option
Track + Malfunctions	When setting the “Safe Drive” option
Track + Fuel volume	
Track + Fuel volume + Refills and drains	
Track + Operation of additional equipment	
Track + Speed	
Track + Speed + Fuel volume + Refills and drains	
Track + Events	
Track + Statistics	

The program allows for automatic monitoring of changes in the operating parameters of the machinery in real time, notifying the user of certain parameters exceeding the permissible limits by issuing various notifications to the user (pop-up window of the main interface of the program and sending a message to the e-mail specified by the user), when an event occurs, automatically report equipment malfunctions.

The program displays information from the CAN bus of the vehicle. The list of CAN bus parameters is given in Table 16.

Table 16 – List of parameters read on CAN-bus of the Kirovets K-7M tractors

Parameter description
Engine oil pressure, kPa
Engine emergency pressure, kPa
ICE oil filter clogging detector
Coolant temperature, °C
Critical coolant temperature, °C
ICE air filter clogging detector
Engine speed, rpm
Gearbox oil pressure, kPa
Gearbox emergency oil pressure, kPa
Gearbox temperature, °C
Oil filter clogging detector
“Brakes” actuation annunciator
Filter clogging detector of hinged equipment
Filter clogging detector of working equipment
Drain filter clogging detector
Critical level of hydraulic tank oil, l
Critical temperature of hydraulic tank oil, °C
Tractor pneumatic system pressure, kPa
Emergency air pressure switch in the 1st circuit
Emergency air pressure switch in the 2nd circuit
Brake system malfunction
Parking brake engagement annunciator
Tractor speed, km/h
Tractor slipping
Tank fuel level, l
Instantaneous engine fuel consumption, l
K15 power on

For viewing (downloading) the full version of the “KIROVETS-AGROMONITOR” Service Operation Manual.

9.10.4 BRIEF DESCRIPTION OF SERVICES AVAILABLE TO “KIROVETS-AGROMONITOR”

Additional capabilities allow for expanding the functionality of the cloud platform by using some additional services.

The main ones are:

– vehicle maintenance control;

– displaying information from fuel cards;

– identification of drivers (requires additional equipment);

– uploading monitoring data to 1C.

"Maintenance check" allows for monitoring maintenance of the vehicle by setting service intervals in the form of vehicle mileage or maintenance time, with automatic notification of the user about the approach of the next maintenance of the vehicle.

"Displaying information from fuel cards" allows for displaying information on filled fuel volumes as per filling station data, with indication of filling station address and filled fuel volume. The system compares the volume of the filled fuel according to the fuel level sensor with information from the gas station, which makes it possible to detect one of the types of fuel theft.

When using the "Driver identification" service, the system recognizes the driver who started work on this vehicle by reading data from the unique key attached by the driver, and displays this information in the KIROVETS-AGROMONITOR monitoring system, indicating the start and end of the driver change on this vehicle.

Integration with 1C allows for uploading various information necessary for further processing in 1C application, from the monitoring program to 1C.

9.10.5 SUMMARY OF OPTIONAL SERVICES

Depending on the tasks (client needs) to be solved, the machinery can be additionally equipped with the following options:

– "Multimedia" option. Video surveillance includes a specialized terminal, with four video cameras that provide the ability to record video information and upload it to the cloud service (the maximum information recording period is 17 days with the use of two SD cards (one SD card is included in the scope of supply of video recorder));

– "Tire pressure control" option. Allows for controlling overload of the vehicle. It works in case of installing tire pressure sensors.

9.10.6 NOTIFICATION OF CONSEQUENCES IN CASE OF DAMAGE TO FACTORY SEALS

ATTENTION!

- ***ONBOARD EQUIPMENT OF THE "KIROVETS-AGROMONITOR" MONITORING SYSTEM INSTALLED ON THE VEHICLE, SHALL BE SERVICED ONLY BY QUALIFIED SPECIALISTS HAVING APPROPRIATE CERTIFICATES.***
- ***TO AVOID UNAUTHORIZED ACCESS, COMPONENTS OF ONBOARD EQUIPMENT OF THE MONITORING SYSTEM HAVE SEALED UNITS:***

– ATTACHMENT OF FUEL METER TO THE FUEL TANK (PLASTIC SEAL-PLUG);

– ELECTRICAL CONNECTOR OF THE FUEL METER (PLASTIC SEAL);

– COVER OF THE TERMINAL HOUSING (ELECTRONIC SEAL – OPENING SENSOR).

- ***DAMAGE TO FACTORY SEALS IS UNACCEPTABLE AND AUTOMATICALLY LEADS TO RELEASE THE MANUFACTURER OF WARRANTY OBLIGATIONS FOR INSTALLED EQUIPMENT. FURTHER CORRECTION OF CONSEQUENCES OF UNAUTHORIZED INTERFERENCE IS CARRIED OUT AT THE EXPENSE OF THE PARTY THAT COMMITTED THE SAID VIOLATION.***

9.10.7 OPERATING PROCEDURE FOR INFORMATION RETRANSMISSION TO THE CLIENT MONITORING SYSTEM SERVER*

Onboard equipment of the monitoring systems is configured to transmit information to the servers of the "KIROVETS-AGROMONITOR" cloud service. To retransmit data to a third-party monitoring system, proceed as follows:

1 The client (his monitoring representative) requests such a retransmission from the dealer of Peterburgsky Traktorny Zavod JSC with the following information:

– list of vehicles in the "KIROVETS-AGROMONITOR" monitoring system, for which retransmission setting is required;

– IP address of the server, port and data protocol of the client monitoring system.

2 The dealer of Peterburgsky Traktorny Zavod JSC sends the request (by e-mail) to the service manager of "KIROVETS-AGROMONITOR".

* The volume of retransmission data can be limited by the data transfer protocol.

3 The service manager of “KIROVETS-AGROMONITOR” carries out necessary procedures to configure the retransmission of information to a third-party system. Upon completion of the retransmission adjustment procedure, the dealer of Peterburgsky Traktorny Zavod JSC shall be notified of the completion of the process.

10 TYPES AND FREQUENCY OF MAINTENANCE

ATTENTION!

- ***ENGINE MAINTENANCE SHALL BE PERFORMED IN ACCORDANCE WITH THE ENGINE OPERATION MANUAL.***
- ***AIR CONDITIONER MAINTENANCE SHALL BE PERFORMED IN ACCORDANCE WITH THE AIR CONDITIONER OPERATION MANUAL.***

IT IS STRICTLY FORBIDDEN TO USE THE TRACTOR WITHOUT REGULAR MAINTENANCE. DEVIATION OF THE ACTUAL FREQUENCY (LEADING OR LAGGING) OF MAINT–1, MAINT–2 UP TO 10 % AND MAINT–3 UP TO 5 % OF THE ESTABLISHED ONE IS ALLOWED.

Types and frequency of the tractor maintenance are given in Table 17.

Seasonal maintenance of tractors shall be carried out twice a year:

– MAINT-SS (spring – summer) – at a steady ambient temperature not lower than plus 5 °C;

– MAINT-AW (autumn – winter) – below plus 5 °C.

It is desirable to combine seasonal maintenance of tractors with regular maintenance.

Table 17

Maintenance type	Frequency of tractor operation, motor hour
Maintenance upon completion of tractor operating run-in	50
Maintenance upon completion of engine operating run-in	According to the engine Operation Manual
Daily maintenance	every 10 hours or every shift of tractor operation
First maintenance	250
Second maintenance	500
Third maintenance	1,000
Seasonal maintenance (MAINT-SS), (MAINT-AW)	Upon transfer to spring-summer or autumn-winter operating conditions
Maintenance under special operating conditions (sandy, rocky and boggy soils, desert, low temperatures and high mountains)	To be carried out under conditions that significantly differ from those typical
Maintenance during long-term storage	It is carried out during indoor storage at least once per 2 months, and during storage under a shed and in open areas – once per month

An operating company or an enterprise shall have a schedule for carrying out MAINT-1, MAINT-2 and MAINT-3 for each month, and in the corresponding months – MAINT-SS and MAINT-AW.

The Service Book of the tractor shall indicate the performance of all maintenance, except for DMT, indicating the date, type of maintenance, as well as the operating hours since the start of operation of new or overhauled tractors.

10.1 MAINTENANCE AT THE END OF OPERATIONAL RUN-IN

Table 18

Content of work	Note
The tractor shall be clean.	
Check condition of the tractor by visual inspection, paying attention to the absence of leaks of fuel, oil, coolant and electrolyte, to the absence of abnormal noise, knocking in the engine and transmission units, and, if necessary, eliminate these malfunctions	
DMT (see the list of works on DMT execution)	
Maintenance of the frame, hitch, hitch and steering hydraulic systems	
Lubricate:	
- pins of hydraulic cylinders of the hitch and steering hydraulic systems	See Table 26
- shaft supports of the main levers of the hitch	See Table 26
- axes of the frame vertical hinge	See Table 26
Check the level and top up, if necessary:	

Content of work	Note
- oil to the hydraulic tank	
Replace:	
- filtering elements with washing of hydraulic tank filter housings	
Check and tighten, if necessary:	
- wedge joints of vertical frame hinge axes	
- bolts fastening the rear cover of horizontal hinge pipe of frame	
Maintenance of drive axles	
Check and tighten, if necessary:	
- nuts for fastening the tractor wheels	See Appendix J
- nuts of the stepladders for fastening the drive axles	See Appendix J
- nuts of eyes and pads to the spring of the front drive axle	
- bolts attaching the casings to the drive gear housings of the drive axles	See Appendix J
- bolts fastening the T400 series axle caliper	See Appendix J
- bolts fastening the “carrier–hub” joint of drive axles by PZM LLC	See Appendix J
Wash and blow with compressed air:	
- breathers of the drive gear of the drive axles	
Lubricate:	
- eyes of the springs of the front drive axle	See Table 26
- operating brakes cam supports of the drive axles by PZM LLC	See Table 26
- operating brake levers by PZM LLC	See Table 26
Check and, if necessary, adjust:	
- rod stroke of brake chambers of the drive axles by PZM LLC	
Check the absence of play in bearings of the hub assembly; if there is a play, adjust tension in bearings for axles by PZM LLC	
Replace the oil in the housings of the drive gears and final drives of the drive axles	
Maintenance of GBs and drive shafts	
Check the engine start interlock with gear engaged	
Check and tighten, if necessary:	
- bolts fastening the flanges of the cardan shafts from the semi-rigid coupling to the GB, from the GB to the front drive axle, from the GB to the intermediate support and from the intermediate support to the rear drive axle	See Appendix J
- bolts fastening the intermediate support clamps	See Appendix J
Wash the housing of GB oil filter	
Replace the GB oil filter element	
Lubricate:	
- bearings of cardan shaft joint trunnions - splined joints of cardan shafts	See Table 26 Gun-grease if an oil pot is available. See Table 26

Content of work	Note
Maintenance of the engine power and cooling system	
Drain:	
- sludge from the coarse fuel filter	
- sludge from fuel tank	
Check condition of the filter elements of stages I and II of the air cleaner and, if necessary, service them	Carry out maintenance when the filter element clogging detector lamp lights up
Check tightness of the air supply lines to the engine and dust extraction from the air cleaner	
Check and, if necessary, adjust:	
- tension of generator belts	
- tension of the engine cooling system pump belt	
- tension of the pneumatic compressor belt	
- tension of the air conditioner compressor belt	
Check the level and top up, if necessary:	
- coolant to the expansion tank	
Brake system maintenance	
Check the level and top up, if necessary:	
- brake fluid in AOI tanks	For tractors with T400A axles
Blow or wash the AOI breathers	
Storage battery maintenance	
Check the electrolyte level. Add distilled water, if necessary	
Check the status of the terminals. If necessary, lubricate with grease and tighten the fasteners	
Check the status of the gas discharge channels. If necessary, clean them	
Lubricate the non-contact parts of the terminals and wire lugs	Loctite 7039 aerosol
When operating using the air conditioner and ventilation system	
Check and, if necessary, adjust:	
- tension of the air conditioner compressor drive belt	On tractors with OM460LA engine
Check the electrical contacts of the solenoid clutch connectors	
Check condition of the cab ventilation filter elements and, if necessary, service them	
List of operations to check the tractor technical condition after periodic maintenance	
Pump the engine fuel system using a fuel feed pump	
Check the condition of tires and the air pressure in them	
Start the engine and check the engine operation by ear	
Check operation of the wipers, lights and alarm	

Content of work	Note
Check operation of the engine and GB according to the readings of control devices after the engine warm up to operating temperature, and operating air pressure in the pneumatic system	
Check operation of the tractor controls, brakes, hitch and steering hydraulic systems	
Check operation of the brakes and steering mechanism while driving	
After stopping the engine, check by ear the operation of the turbocharger and the centrifugal oil filter of the engine	

10.2 DAILY MAINTENANCE (DMT)

Table 19

Content of work	Note
At the beginning of the shift	
Check condition of the tractor by visual inspection, paying attention to the absence of leaks of fuel, oil, coolant and electrolyte, to the absence of abnormal noise, knocking in the engine and transmission units, and, if necessary, eliminate these malfunctions	
Visually check general condition of the tires for mechanical damage to the side and working surfaces	
Measure the tire inflation pressure	
Check operation of the engine and GB by ear and according to the readings of control devices after the engine warm up to operating temperature, and operating air pressure in the pneumatic system	
Check operation of the tractor controls, brakes, hitch and steering hydraulic systems	
Check operation of the lights and alarm	
Maintenance of the frame, hitch, hitch and steering hydraulic systems	
Visually check the general condition and fastening of the hitch elements	
Lubricate:	
- pins of hydraulic cylinders of the hitch and steering hydraulic systems	See Table 26
- shaft supports of the main levers of the hitch	See Table 26
Check the level and top up, if necessary:	
- oil to the hydraulic tank	
Maintenance of drive axles and pneumatic system	
Drain condensate from air cylinders	In winter, drain the sludge daily, in summer – at least once a week
Check the level and top up, if necessary:	
- oil to the housings of the drive gears and final drives of the drive axles	
Check and tighten, if necessary:	
- nuts for fastening the tractor wheels	See Appendix J
- nuts of the stepladders for fastening the drive axles	See Appendix J
Check and, if necessary, adjust:	
- rod stroke of brake chambers of the drive axles	for axles by PZM LLC
Maintenance of GBs and cardan drives	

Content of work	Note
Check the level and top up, if necessary:	
- oil	
Check and, if necessary, adjust:	
- drain pedal drive	
Check the engine start interlock with gear engaged	
Check and tighten, if necessary:	
- bolts fastening the flanges of the cardan shafts from the semi-rigid coupling to the GB, from the GB to the front drive axle, from the GB to the intermediate support and from the intermediate support to the rear drive axle	See Appendix J
Maintenance of the engine power and cooling system	
Check visually:	
- condition of radiator assembly for clogging	
- condition of the air conditioner condenser for clogging	
- engine mount	
Drain:	
- sludge from the coarse fuel filter	If necessary
Check condition of the filter elements of stages I and II of the air cleaner and, if necessary, service them	Carry out maintenance when the filter element clogging detector lamp lights up
Check tightness of the air supply lines to the engine and dust extraction from the air cleaner	
Check and, if necessary, adjust:	
- tension of generator belts	
- tension of the engine cooling system pump belt	
- tension of the pneumatic compressor belt	
- tension of the air conditioner compressor belt	
Check the level and top up, if necessary:	
- oil to the engine lubrication system	
- coolant to the expansion tank	
Brake system maintenance	
Check the level and top up, if necessary:	
- brake fluid in AOI tanks	For tractors with T400A axles
Blow or wash the AOI breathers	
When operating using the air conditioner and ventilation system	
Check visually:	
- condition of the Freon lines for damage	
Check and, if necessary, adjust:	

Content of work	Note
- tension of the air conditioner compressor drive belt	On tractors with OM460LA engine
Check the electrical contacts of the solenoid clutch connectors	
Check condition of the cab ventilation filter elements and, if necessary, service them	
At the end of the shift	
After the engine stops, immediately check the operation of the turbocharger by ear	
Check by touch the degree of heating of the bearing units of the cardan shafts	
Under operating conditions at negative ambient air temperatures, as well as at significant fluctuations in daytime and night air temperatures:	
- fill the fuel tank completely with fuel to avoid formation of condensation in the fuel tank	
Wash with water and wipe dry with a soft cloth the hydraulic cylinder rods and the rod seal wiper in the cover without disassembling the cylinder	
When working in dusty conditions, blow the radiator every shift with compressed air at a pressure of 5 to 7 kg/cm^2 from both sides: from the front of the radiator and from the side of the fan casing.	

10.3 FIRST MAINTENANCE (MAINT-1), SECOND MAINTENANCE (MAINT-2), THIRD MAINTENANCE (MAINT-3)

Table 20

Content of work	MAINT-1 (250 m·h)	MAINT-2 (500 m·h)	MAINT-3 (1,000 m·h)	Note
The tractor shall be clean	■	■	■	
Check condition of the tractor by visual inspection, paying attention to the absence of leaks of fuel, oil, coolant and electrolyte, to the absence of abnormal noise, knocking in the engine and transmission units, and, if necessary, eliminate these malfunctions	■	■	■	
DMT (see the list of works on DMT execution)	■	■	■	
Maintenance of the frame, hitch, hitch and steering hydraulic systems				
Lubricate:				
- pins of hydraulic cylinders of the hitch and steering hydraulic systems	■	■	■	See Table 26

Content of work	MAINT-1 (250 m·h)	MAINT-2 (500 m·h)	MAINT-3 (1,000 m·h)	Note
- shaft supports of the main levers of the hitch	■	■	■	See Table 26
- axes of the frame vertical hinge		■	■	See Table 26
- horizontal frame hinge			■	See Table 26
Check the level and top up, if necessary:				
- oil to the hydraulic tank		■		
Replace:				
- filtering elements with washing of hydraulic tank filter housings	■	■	■	
Flush the hydraulic tank filler strainer			■	
Check and tighten, if necessary:				
- wedge joints of vertical frame hinge axes		■	■	
- bolts fastening the rear cover of horizontal hinge pipe of frame		■	■	
Maintenance of drive axles and pneumatic system				
Drain condensate from air cylinders	■	■	■	
Check the level and top up, if necessary:				
- oil to the housings of the drive gears and final drives of the drive axles	■	■		
Replace the oil in the housings of the drive gears and final drives of the drive axles		■ PZM LLC	■	
Check and tighten, if necessary:				
- nuts for fastening the tractor wheels	■	■	■	See Appendix J
- nuts of the stepladders for fastening the drive axles	■	■	■	See Appendix J
- nuts of eyes and pads to the spring of the front drive axle		■	■	
- bolts fastening the “carrier–hub” joint of drive axles by PZM LLC		■	■	See Appendix J
- bolts attaching the casings to the drive gear housings of the drive axles		■	■	See Appendix J
- bolts fastening the T400 series axle caliper	■	■	■	See Appendix J
Check the absence of play in bearings of the hub assembly; if there is a play, adjust tension in bearings		■	■	
Check and, if necessary, adjust:				

Content of work	MAINT-1 (250 m·h)	MAINT-2 (500 m·h)	MAINT-3 (1,000 m·h)	Note
- rod stroke of brake chambers of the drive axles by PZM LLC	■	■	■	
Lubricate:				
- operating brakes cam supports of the drive axles by PZM LLC	■	■	■	See Table 26
- eyes of the springs of the front drive axle		■	■	See Table 26
Check the wear of the brake pads of T400 series axles using the visual wear indicator	■	■		In accordance with the "T400 series axles" subsection
Wash and blow with compressed air:				
- breathers of the drive gear of the drive axles		■	■	
Maintenance of GBs and cardan drives				
Check the level and top up, if necessary:				
- oil	■			
Replace:				
- oil			■	
Check and, if necessary, adjust the drain pedal drive	■	■	■	
Check the engine start interlock with gear engaged	■	■	■	
Check and tighten, if necessary:				
- bolts fastening the flanges of the cardan shafts from the semi-rigid coupling to the GB, from the GB to the front drive axle, from the GB to the intermediate support and from the intermediate support to the rear drive axle	■	■	■	See Appendix J
- bolts fastening the intermediate support clamps		■	■	See Appendix J
Wash:				
- gearbox oil filter housing		■	■	
Lubricate:				
- bearings of cardan shaft joint trunnions	■	■	■	See Table 26
- splined joints of cardan shafts	■	■	■	See Table 26
- support of vertical rollers for switching GB modes		■	■	See Table 26

Content of work	MAINT-1 (250 m h)	MAINT-2 (500 m h)	MAINT-3 (1,000 m h)	Note
Maintenance of the engine power and cooling system				
Drain:				
- sludge from fuel filters		■	■	
- sludge from fuel tank	■	■	■	
- condensate from the engine CAC	■	■	■	For tractors with OM460LA and YaMZ engines
Check condition of the filter elements of stages I and II of the air cleaner and, if necessary, service them	■	■	■	Carry out maintenance when the filter element clogging detector lamp lights up
Check tightness of the air supply lines to the engine and dust extraction from the air cleaner	■	■	■	
Check and, if necessary, adjust:				
- tension of generator belts	■	■	■	
- tension of the engine cooling system pump belt	■	■	■	
- tension of the pneumatic compressor belt	■	■	■	For tractors with YaMZ engines
- tension of the air conditioner compressor belt	■	■	■	
Check and, if necessary, tighten threaded connections of generator attachment and electrical contacts			■	
Check the level and if necessary add coolant to the expansion tank	■			
Replace the coarse fuel filter element with washing the filter housing		■	■	
Brake system maintenance				
Check the level and top up, if necessary:				
- brake fluid in AOI tanks	■	■	■	For tractors with T400A series axles
Blow or wash the AOI breathers	■	■	■	

Content of work	MAINT-1 (250 m h)	MAINT-2 (500 m h)	MAINT-3 (1,000 m h)	Note
Storage battery maintenance				
Check the electrolyte level. Add distilled water, if necessary	■	■	■	
Check condition of the terminals, tighten the fasteners, if necessary	■	■	■	
Check condition of the flue gas ducts and clean, if necessary	■	■	■	
Lubricate the non-contact parts of the terminals and wire lugs	■	■	■	Loctite 7039 aerosol
Check the electrolyte density and state of charge of the storage batteries and, if necessary, recharge them or replace them with charged ones		■	■	
When operating using the air conditioner and ventilation				
Check and, if necessary, adjust:				
- tension of the air conditioner compressor drive belt	according to the air conditioner Operation Manual or Certificate			
Check the electrical contacts of the solenoid clutch connectors	according to the air conditioner Operation Manual or Certificate			
Refill the air conditioning system with Freon with the addition of oil	according to the air conditioner Operation Manual or Certificate			
Check condition of the cab ventilation filter elements and, if necessary, service them	■	■	■	
List of operations to check the tractor technical condition after periodic maintenance				
Pump the engine fuel system using a fuel feed pump	■	■	■	
Check the condition of tires and the air pressure in them	■	■	■	
Start the engine and check the engine operation by ear	■	■	■	
Check operation of the wipers, lights and alarm	■	■	■	
Check operation of the engine and GB according to the readings of control devices after the engine warm up to operating temperature, and operating air pressure in the pneumatic system	■	■	■	
Check operation of the tractor controls, brakes, hitch and steering hydraulic systems	■	■	■	

Content of work	MAINT-1 (250 m h)	MAINT-2 (500 m h)	MAINT-3 (1,000 m h)	Note
Check operation of the brakes and steering mechanism while driving	■	■	■	
After the engine stops, check the operation of the turbocharger by ear	■	■	■	
Lubricate the friction parts of the operator seat compression mechanism		■	■	

10.3.1 ADDITIONAL PROCESS OPERATIONS TO THE LIST OF MAINT-3 (1,000 MOTOR HOURS)

Table 21

Content of work	Note
With operating time of 2,000, 4,000, 6,000, 8,000...(further similarly) motor hours	
Maintenance of drive axles	
Replace the oil in the drive gears and final drives of the drive axles	
Maintenance of the hitch and steering hydraulic systems	
Replace the oil in the hitch and steering hydraulic system	
With operating time of 3,000, 6,000, 9,000...(further similarly) motor hours	
Maintenance of the engine power system	
Carry out maintenance of:	
- turbocharger	According to the engine Operation Manual
- starter	According to the engine Operation Manual
With operating time of 4,000, 8,000...(further similarly) motor hours	
Maintenance of the engine power system	
Carry out generator maintenance	According to the engine Operation Manual

ATTENTION! DURING TRACTOR OPERATION IN CLIMATIC CONDITIONS THAT DO NOT REQUIRE SEASONAL MAINTENANCE (MAINT-SS, MAINT-AW), REPLACE OIL IN GEARBOX HYDRAULIC SYSTEM EVERY 1,000 M/H.

10.4 SPRING-SUMMER (MAINT-SS) AND AUTUMN-WINTER (MAINT-AW) SEASONAL MAINTENANCE

MAINT-SS and MAINT-AW are combined with the next periodic maintenance of the tractor.

Table 22

Content of work	MAINT-SS	MAINT-AW	Note
Maintenance of the frame, hitch, hitch and steering hydraulic systems			
Replace summer oil grades to winter oil in the hydraulic systems of the hitch and steering control*		■	
Replace filtering elements with washing of hydraulic tank filter housings*		■	
Maintenance of drive axles and pneumatic system, hitch			
Replace summer oil grades with winter oil grades in drive gear and final drive of the drive axles*		■	
Replace winter oil grades with summer oil grades in drive gear and final drive of the drive axles*	■		
Flush the breathers of the drive gear of the drive axles and blow with compressed air*	■	■	
Lubricate:			
- eyes of the springs of the front drive axle	■	■	See Table 26
- levers of operating brakes by PZM LLC		■	See Table 26
- operating brakes cam supports by PZM LLC		■	See Table 26
GB Maintenance			
Wash the gearbox oil filter housing	■	■	
Replace summer oil grades with winter oil grades in gearbox hydraulic system *	■		See Table 26
Replace winter oil grades with summer oil grades in gearbox hydraulic system *		■	See Table 26
Maintenance of the engine power system			
Replace the oil filter	According to the engine Operation Manual		
Check the coolant density		■	If necessary, bring to a density appropriate for your climate zone
Prepare for operation and check the engine pre-start heating system		■	In the presence of a preheating system
Air conditioning system shall be serviced in accordance with the air conditioner operation manual			
* Operations are not carried out when using all-season oils.			

10.5 TYPES AND LISTS OF MAINTENANCE WORKS DURING LONG-TERM STORAGE OF TRACTOR

10.5.1 MAINTENANCE DURING PREPARATION FOR LONG-TERM STORAGE (STORAGE MORE THAN TWO MONTHS)

Table 23

Content of work	Note
The tractor shall be clean.	
DMT (see the list of works on DMT execution)	
Putting the tractor to the storage place	
Maintenance of the hitch, hitch and steering hydraulic systems	
Carry out preservation:	
- protruding parts of the hitch and steering hydraulic cylinder rods	
- threaded, spherical connections of the central link, vertical and lower links of the hitch	
- hydraulic tank filler caps	
Maintenance of drive axles	
Unload the tires of the front and rear drive axles by placing the tractor on stands with unloading of the springs of the front drive axle	
Flush, blow with compressed air and preserve the breathers of the drive gears of the drive axles	
Check and, if necessary, adjust the tire air pressure	In accordance with the instructions of the “PREPARING THE TRACTOR FOR SHORT-TERM AND LONG-TERM STORAGE” subsection
Maintenance of the engine power and cooling system	
Drain the sludge from the coarse fuel filter	
Carry out preservation:	
- fuel tank filler cap of pre-start heater	For the K-730M tractors with YaMZ engines
- fastening parts and connecting terminals of the lights	
- fastening parts and connecting terminals of the generator	
- fastening parts and connecting terminals of the starter	
Blow air cleaner filter elements with compressed air	
Perform sealing:	
- upper part of the air intake pipe	

Content of work	Note
- upper part of the muffler	
Relieve tension:	
- generator belts	
- engine cooling system pump belt	
- pneumatic compressor belt	
- air conditioner compressor drive belt	
Other operations	
Remove the battery for warehouse storage	
Drain:	
- condensate from air cylinders	
- fluid from the washer reservoir	
Preserve air cylinder bleed valves	

10.5.2 TRACTOR MAINTENANCE DURING LONG-TERM STORAGE

ATTENTION! CARRY OUT MAINTENANCE AT LEAST ONCE A MONTH. AFTER STRONG WINDS, RAINS AND SNOW DRIFTS, CARRY OUT MAINTENANCE IMMEDIATELY.

Table 24

Content of work	Note
Check the correct position of the tractor on the stands	
Check:	
- inflation pressure	
- state of storage batteries charging and, if necessary, perform maintenance of the battery	
- tightness of connections of the tractor hydraulic parts	
- integrity of preservation, integrity of the paint and absence of corrosion on the surfaces	

10.5.3 TRACTOR MAINTENANCE WHEN REMOVING FROM LONG-TERM STORAGE

Table 25

Content of work	Note
Maintenance of the hitch, hitch and steering hydraulic systems	
Carry out depreservation:	
- protruding parts of the hitch and steering hydraulic cylinder rods	
- threaded, spherical connections of the central link, vertical and lower links of the hitch	
- hydraulic tank filler caps	
Maintenance of drive axles and pneumatic system	
Check the level and, if necessary, add oil to the drive gears and final drives of the drive axles	
Carry out depreservation:	
- breathers of the drive gear of the drive axles	
- bleed valves of air cylinders	
Check and set operating pressure in wheel tires	
Remove the tractor from the stand	
GB Maintenance	
Check the level and top up to the GB, if necessary	
Maintenance of the engine power and cooling system	
Drain:	
- sludge from the coarse fuel filter	
- sludge from fuel tank	
Carry out depreservation:	
- fuel tank filler cap of pre-start heater	For the K-730M tractors with YaMZ engines
Depressurize:	
- upper part of the air intake pipe	
- upper part of the muffler	
Adjust the tension:	
- generator belts	
- engine cooling system pump belt	
- pneumatic compressor belt	
- air conditioner compressor drive belt	
Storage battery maintenance	
Place and connect charged storage batteries on the tractor	

10.6 TRACTOR LUBRICATION CHART

Perform lubrication of the tractor, refer to lubrication chart and Table 26. List of oils and lubricants used is given in Appendix A.

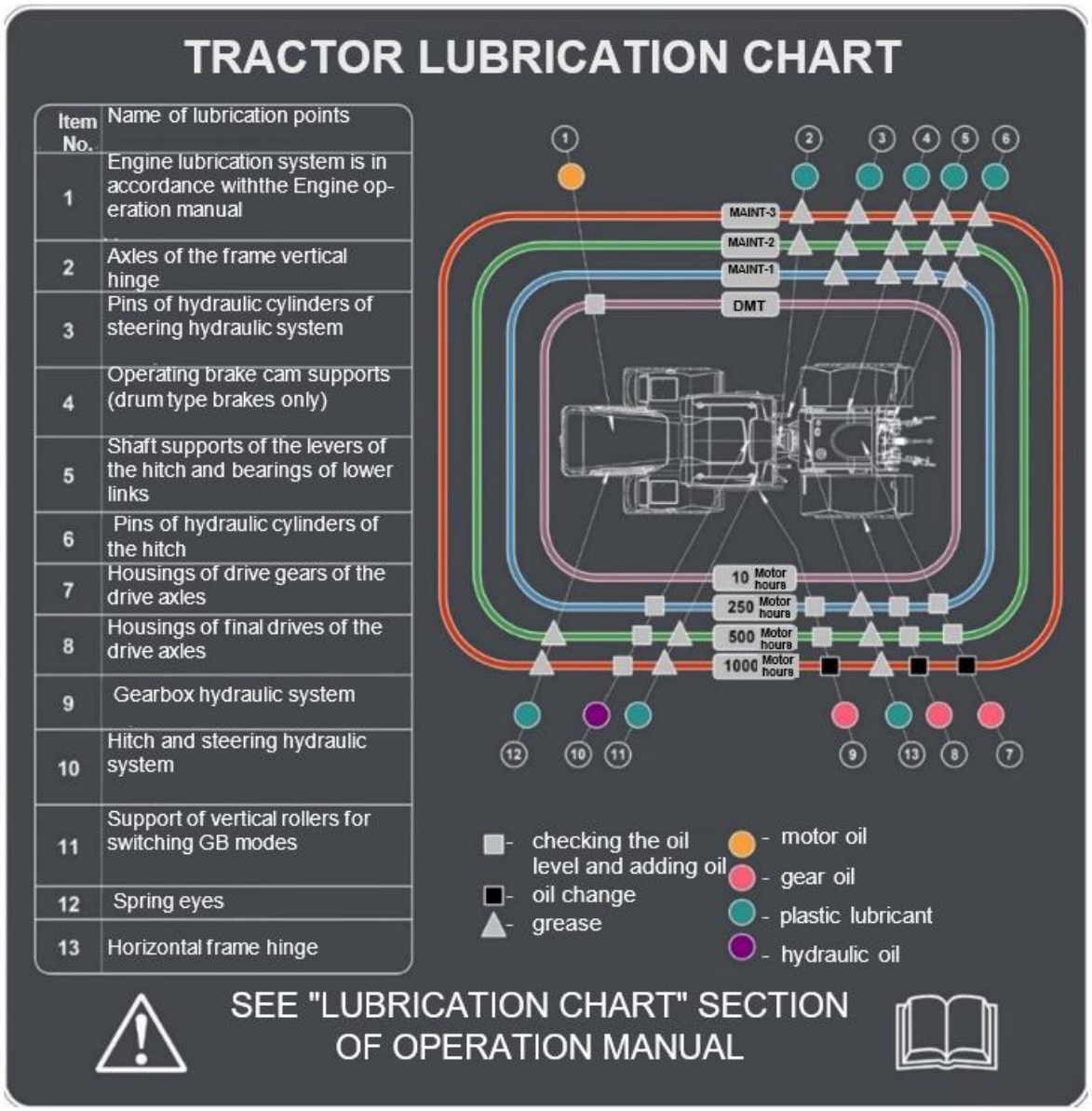


Table 26 – Lubrication chart

Position number on the lubrication chart	Description of lubrication points	Name, grade and standard designation for lubricants and liquids			Number of lubrication points and their volume	Frequency of lubricant change (motor hours, MAINT type)	Note
		lubrication and filling during operation at temperature		lubrication during storage			
		minus 40 °C to plus 5 °C	plus 5 °C to plus 40 °C				
1	Engine lubrication system	**According to the engine Operation Manual**					
2	Axles of the frame vertical hinge	VNII NP-232 paste GOST 14068-79		Main lubricant used	2 x 0.3 l	500	
3	Pins of hydraulic cylinders of steering hydraulic system	Litol-24 grease GOST 21150-2017		Main lubricant used	4 x 0.05 l	250	
4	Operating brake cam supports (drum type brakes only)	Litol-24 grease GOST 21150-2017		Main lubricant used	8 x 0.05 l	250	Axles manufactured by PZM LLC
5	Shaft supports of the main levers of the hitch and bearings of lower links	Litol-24 grease GOST 21150-2017		Main lubricant used	4 x 0.05 l	250	
6	Pins of hydraulic cylinders of the hitch	Litol-24 grease GOST 21150-2017		Main lubricant used	4 x 0.05 l	250	
7	Housings of drive gears of the drive axles	Gear oil Kirovets Reducer Lux API GL-5, SAE 80W-90		Main oil used	2 x 24 l for T400 series axles 2 x 10 l for axles by PZM LLC	1,000	Use at ambient air temperatures minus 26 °C to plus 35 C

Position number on the lubrication chart	Description of lubrication points	Name, grade and standard designation for lubricants and liquids			Number of lubrication points and their volume	Frequency of lubricant change (motor hours, MAINT type)	Note
		lubrication and filling during operation at temperature		lubrication during storage			
		minus 40 °C to plus 5 °C	plus 5 °C to plus 40 °C				
8	Housings of final drives of the drive axles	Gear oil Kirovets Reducer Lux API GL-5, SAE 80W-90		Main oil used	4 x 11 l for T400 series axles; 4 x 5 l for 750 axles by PZM LLC; 4 x 6 l for 751/755 axles by PZM LLC	1,000	Use at ambient air temperatures minus 26 °C to plus 35 C
9	Gearbox hydraulic system	Kirovets Gearbox UTTO SAE 10W-30		Main oil used	1 x 38 l with PTOM; 1 x 37 l w/o PTOM	1,000	Oil change after running-in is not required. Use at ambient air temperatures minus 25 °C to plus 35 C
10	Hitch and steering hydraulic system	All-weather Kirovets Hydraulics Lux 32		Main oil used	1 x 165 l	2,000	
11	Support of vertical rollers for switching GB modes	Litol-24 grease GOST 21150-2017		Main lubricant used	2 x 0.05 l	500	
12	Spring eyes	Litol-24 grease GOST 21150-2017		Main lubricant used	2	500	
13	Horizontal frame hinge	Litol-24 grease GOST 21150-2017		Main lubricant used	1 x 2.8 l	during MAINT-1, MAINT-2, MAINT-3	

Position number on the lubrication chart	Description of lubrication points	Name, grade and standard designation for lubricants and liquids			Number of lubrication points and their volume	Frequency of lubricant change (motor hours, MAINT type)	Note
		lubrication and filling during operation at temperature		lubrication during storage			
		minus 40 °C to plus 5 °C	plus 5 °C to plus 40 °C				
	Brake lever	Litol-24 grease GOST 21150-2017		Main lubricant used	8 x 0.05 l	1,000	Axles manufactured by PZM LLC
	Bearings of cardan shaft joint trunnions	Lubricant No. 158M TU 38.301-40-25-94		Lubricant used	8 x 0.1 l	50	Greasing after run-in is required. Gun-grease until the lubricant begins to escape through the seals
	Splined joints of cardan shafts	Litol-24 grease GOST 21150-2017		Lubricant used		250	Greasing after run-in is required. Gun-grease if an oil pot is available. Gun-grease until the lubricant begins to escape through the seals. If an oil pot is unavailable, grease is not required (Rilsan self-lubricating polymer coating is used)

Notes:

1 The volume of collection of used oils during their replacement is 80 % of the filling tanks.

2 When using Litol-24 lubricant, it is not allowed to mix it with calcium (solidols), sodium and aluminum lubricants.

3 At ambient temperature plus 5 °C and higher, use summer oils all year round.

10.7 CONTENT AND PROCEDURE FOR CARRYING OUT MAINTENANCE OPERATIONS

10.7.1 CHANGING THE ENGINE OIL

Place the tractor on a horizontal platform. Warm up the engine for best results.

To drain the oil, remove the oil filler neck after cleaning it from dust and dirt, place a container of the required volume under the tractor, and unscrew the drain plug on the engine oil tray.

After complete oil drain, tighten the tray plug, before that replace the plug gasket with a new one.

Before filling the engine with oil, clean the oil filler neck of dust and dirt. Check the tightness of the oil tray drain plug.

Check the oil level using the dipstick.

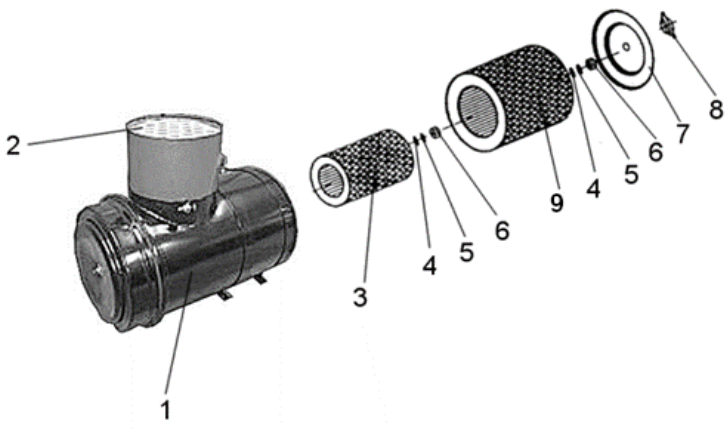
To fill the engine lubrication system with oil, start the engine for 2–3 minutes and after stopping, after 10–15 minutes, add oil to the required level.

10.7.2 AIR CLEANER MAINTENANCE

Service the filter elements of the air cleaner when the clogging detector is triggered.

To service or replace the main filter element *9*, unscrew the nut *8*, remove the cover *7* and unscrew the nut *6* from the air cleaner housing.

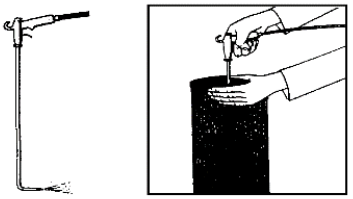
Inspect and maintain safety filter element *3* in the course of MAINT-1. Replace in case if breaks of filtering material are detected.



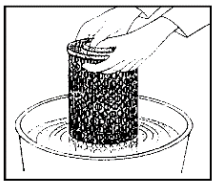
1 – air cleaner housing; *2* – cyclone device;
3 – safety filter element;
4 – sealing gasket; *5* – washer; *6* – nut;
7 – cover; *8* – nut; *9* – main filter element

ATTENTION! ALWAYS CLOSE CHANNELS OF THE ENGINE AIR CLEANING SYSTEM AFTER REMOVAL OF FILTER ELEMENTS WITH CLEAN LINT-FREE RAGS TO PREVENT INGRESS OF DUST INTO THE CLEANING SYSTEM. BLOW THE FILTER ELEMENTS OF THE AIR CLEANER AWAY FROM THE TRACTOR.

Filter elements are cleaned by blowing them with compressed air or washing them in washing solution with further drying.



Washing the filter element



Blowing the filter element

Assemble the air cleaner in the order given above.

ATTENTION! FILTER ELEMENTS SHALL BE INSTALLED WITHOUT SKEW AND STRICTLY PERPENDICULAR TO INSTALLATION PLANE OF THE AIR CLEANER HOUSING. TIGHTENING TORQUE OF THE NUT (6) 5 TO 10 N·M.

10.7.2.1 BLOWDOWN OF THE AIR CLEANER FILTER ELEMENTS

Blow the filter element as follows:

– connect the hose to a compressed air source;

– turn on the air supply;

– direct a stream of dry air at the rear end of the filter element (from the side of the safety filter element), blow the filter element until dust is completely removed. Adjust the blowing intensity by changing the air supply. Be careful when blowing to avoid tearing the filter media. If there are breaks or other through damage, replace the filter element. 5-6 cleaning of the main filter element is allowed before its complete replacement.

In order to prevent dust from entering the cylinder-piston group of the engine, special attention shall be paid to the following:

– when cleaning (blowing out) the filter element, do not allow dust to enter its inner cavity and the suction line of the engine;

– do not allow the filter elements to be installed with damaged seals at the ends, including those with non-glued seals, as well as with damaged filter paper;

– make sure that the filter elements are correctly installed and that the end rubber seals of the cartridges are tightly attached to the air cleaner housing;

– regularly check reliability of the tightening and, if necessary, tighten the clamps securing the corrugated pipe connecting the air cleaner to the intake pipe of the engine turbocharger. When servicing the air cleaner, check the suction path behind the air cleaner for traces of dust. If dust is found, eliminate the cause immediately.

10.7.2.2 CHECKING THE TIGHTNESS OF THE CLEANED AIR SUPPLY ROUTE TO THE ENGINE AND THE DUST SUCTION FROM THE AIR CLEANER

After each removal and installation of the air cleaner on the tractor or disconnecting it from the engine, it is necessary to check the tightness of the connectors of the cleaned air supply route to the engine, as well as the dust extraction route from the air cleaner.

Check with the KI-4870-GOSNITI device, or with a U-shaped water pressure gauge.

Tighten all track hose clamps before checking. Check with the engine idling with a crankshaft speed of 1,800 min^{-1}. Press the tip of the device against the connector or suspected leak. A change in the water level in the tube indicates a leak.

After eliminating the malfunction, the tightness is checked again.

IT IS FORBIDDEN TO OPERATE THE ENGINE WITH LEAKING AIR SUPPLY LINES FROM THE AIR CLEANER TO THE ENGINE.

During the operation of the tractor, it is necessary to check the tightness of the cleaned air supply route to the engine at MAINT-1.

IT IS STRICTLY FORBIDDEN TO: WORK WITH A CLOGGED OR ICY MESH OF THE AIR INTAKE PIPE COVER, AND WITHOUT A FREE OUTLET OF GAS FROM THE EXHAUST PIPE.

10.7.3 COOLING SYSTEM MAINTENANCE

10.7.3.1 FILLING AND CHECKING THE COOLANT

Fill the tractor cooling system through the filler neck of the expansion tank to a level between the MIN and MAX marks on the tank. When working, do not allow the level to drop above the permissible level.

Do not allow leaks of coolant.

To prevent premature contamination of the cooling system, fill the coolant into a clean container, avoiding the ingress of oil products.

A drain plug is provided for draining the coolant. The plug is located in lower part of the pipe supplying cooling liquid from the radiator assembly to the engine pump.

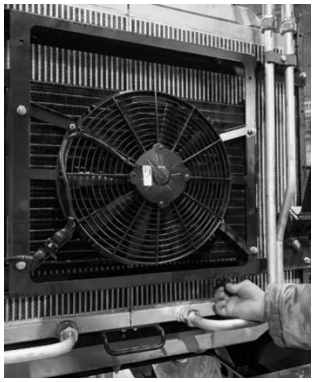
Fill and refuel the cooling system only with motor coolants specified in the Engine Operating Manual.

ATTENTION!

- ***TO AVOID OVERHEATING OF THE ENGINE, IT IS NECESSARY TO ENSURE THAT THE FINS OF THE WATER RADIATOR ARE NOT CLOGGED. TO DO THIS, IT IS NECESSARY, WHEN WORKING IN DUSTY CONDITIONS, TO BLOW THE RADIATOR EVERY SHIFT WITH COMPRESSED AIR AT A PRESSURE OF 5TO 7 KG/CM^2 FROM BOTH SIDES: FROM THE FRONT OF THE RADIATOR AND FROM THE SIDE OF THE FAN CASING.***
- ***IN CASE OF REPEATED ENGINE OVERHEATING, THE CONDITION OF THE RADIATOR CORE SHALL BE CAREFULLY CHECKED. NAMELY, CHECK THE ABSENCE OF CLOGGING BETWEEN THE RADIATOR FINS IN THE LIGHT USING STANDARD PORTABLE LAMP. IF NECESSARY, BLOW OR (IF DIRT IS NOT REMOVED BY BLOWING) WASH THE RADIATOR CORE WITH WATER AT A PRESSURE 5 TO 7 KG/CM^2.***

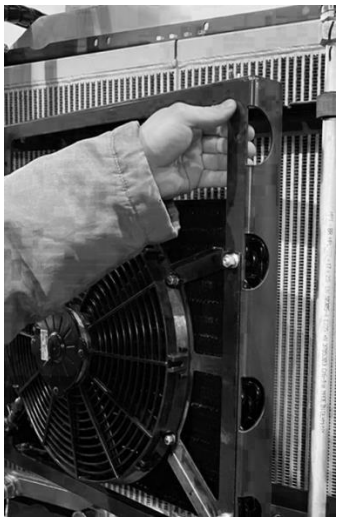
10.7.3.2 RADIATOR ASSEMBLY CLEANING ON TRACTORS WITH ENGINES BY TMZ PJSC

Air Conditioner Condenser Cleaning



Open the hood.

Loosen the upper and lower wing screws securing the conditioner condenser on the right side.



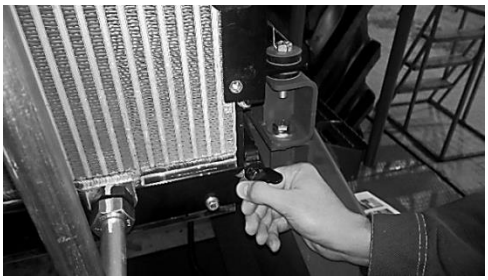
Pull the frame of the conditioner condenser to access its internals.

The air conditioner radiator is ready for cleaning. Blow out the air conditioner cells in the direction opposite to the air flow.

After cleaning the radiator of the air conditioner, install it in the reverse order. The whole process, excluding cleaning the radiator cells, takes 1.5–2 minutes.

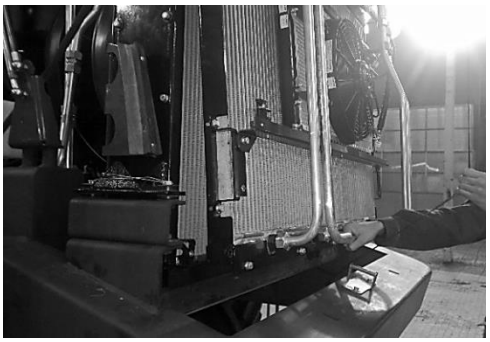
Cleaning the radiator assembly

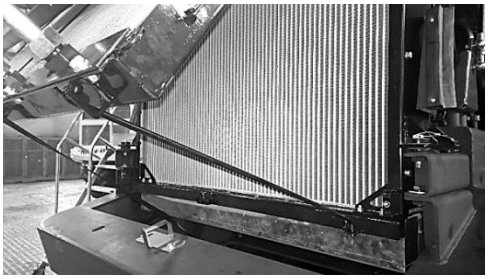
Radiator assembly manufactured by Avtomash-Radiator LLC



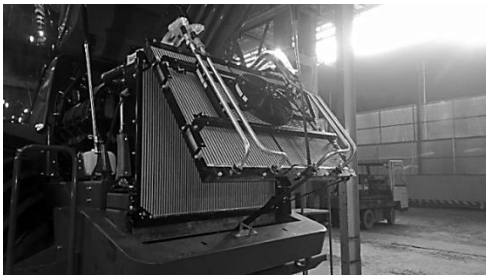
Open the hood.

In the lower part of the radiator assembly on the right and left, unscrew the wing screws.





Pull the hood belt, push the radiator forward by the handle and lock it using the stop.



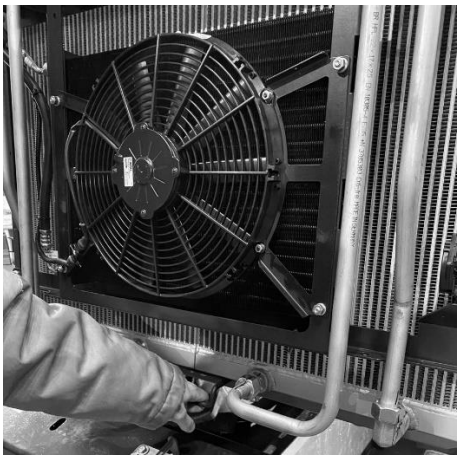
The radiator assembly is ready for cleaning.

Radiator assembly manufactured by Orenburgsky Radiator LLC

Loosen the nuts on both sides.

Open locks.

Pull the radiator assembly up by the handle.



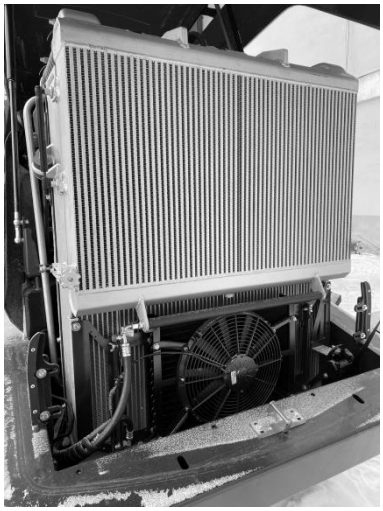
Lock the radiator assembly in open position with stop.

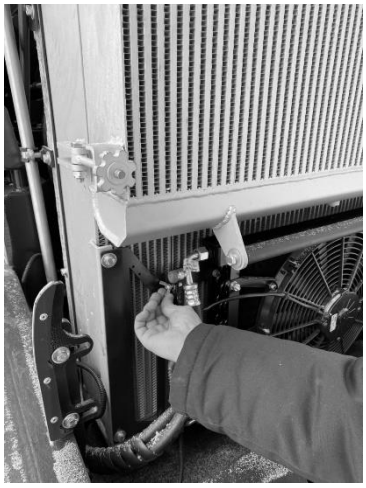
After cleaning, return the radiator assembly to its original position in the reverse order. The whole process, excluding cleaning the radiator assembly, takes 3 minutes.

10.7.3.3 RADIATOR ASSEMBLY CLEANING ON TRACTORS WITH ENGINES BY YAMZPJSC

Air Conditioner Condenser Cleaning

Open the hood.

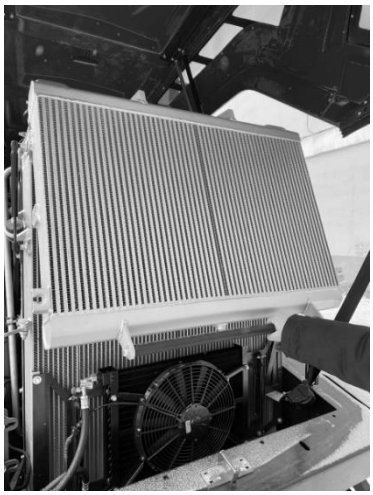




Loosen the wing screws fastening the conditioner condenser frame.

Tilt the condenser with the frame forward.

Loosen the screws fastening the charge air radiator on both sides.

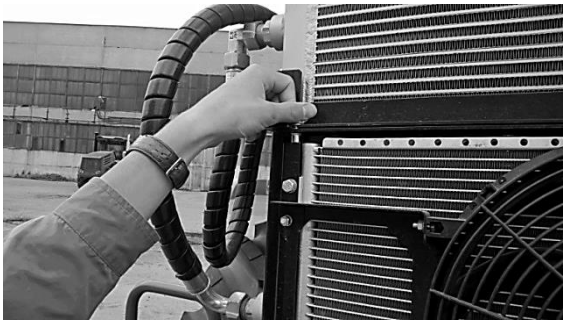


Pull the charge air cooling radiator. In the open position, it shall be held by gas springs located on both sides.

Assemble in reverse order.

10.7.3.4 RADIATOR ASSEMBLY CLEANING ON TRACTORS WITH OM460LA ENGINES

Air Conditioner Condenser Cleaning



Open the hood.

Loosen the upper and lower wing screws securing the conditioner condenser.

Open the conditioner condenser by pulling with your left hand, bring it to the hood belt.

With your right hand, wrap the hood belt around the conditioner condenser.

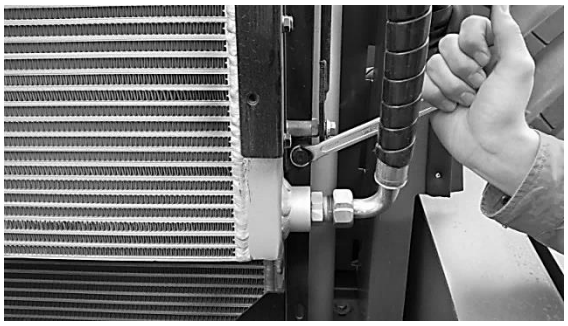
The conditioner condenser is ready for cleaning.

Blow out the air conditioner cells in the direction opposite to the air flow.

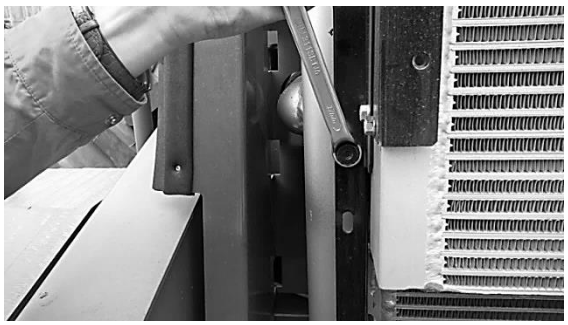
After cleaning the condenser of the conditioner, install it in the reverse order. The whole process, excluding cleaning the radiator cells, takes 1.5–2 minutes.

Cleaning the radiator assembly

Open the hood.



In the lower part of the radiator assembly on the right and left, unscrew the fastening nuts with a 17 mm wrench.



In the middle part of the radiator assembly on the right and left, unscrew the fastening nuts with a 13 mm wrench.

Unlock the radiator stop (to the right of the unit in the upper part) with 14 wrench.

Pulling the hood belt, pull the radiator assembly by the handle.

Lock the radiator assembly with a stop.

The radiator assembly is ready for cleaning.

After cleaning, return the radiator assembly to its original position in the reverse order. The whole process, excluding cleaning the radiator assembly, takes 3 minutes.

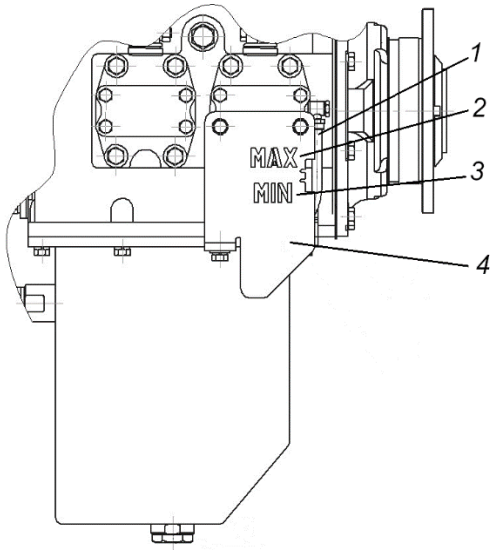
10.7.4 GEARBOX MAINTENANCE

10.7.4.1 LEVEL CHECK AND OIL FILLING

Place the tractor on a horizontal platform.

Check the oil level in GB visually by oil level gauge *1* 8–15 min after the engine shutdown. The oil level in the gauge shall be between the MAX *2* and MIN *3* marks on the protective bracket *4*. If necessary, add oil or drain it.

If the tractor has a PTOM, check the oil level in the GB after the engine is running with the PTOM coupling engaged.(see Appendix A List of oils lubricants used for tractors with PTOM)



1 – oil level gauge;

2 – MAX mark corresponding to the upper oil level;

3 – MIN mark corresponding to the lower oil level;

4 – protective bracket with marks for visual control of oil level in the oil level gauge

10.7.4.2 CHANGE OF OIL IN GEARBOX

Install appropriate oil drain tank under the GB tray. Remove the GB tray drain plug and drain the oil. For better removal of used oil and sediment, drain immediately after stopping the engine. Clean the plug magnet. Replace the O-ring before installing the plug. Reinstall the plug. Remove the plug of oil filler neck.

Pour pure oil into the GB.

Always monitor the volume of GB oil depending on installation or absence of PTOM on the tractor.

Screw the plug of oil filler neck.

10.7.4.3 REPLACING THE GEARBOX FILTER ELEMENT

ATTENTION! WASHING THE GEARBOX FILTER ELEMENT IS NOT ALLOWED.

The first GB filter element shall be replaced after running-in of the tractor for 50 motor hours, the subsequent replacement – when the indicator lamp of the GB filter clogging is lit, or after operation for 1,000 motor hours.

To replace the filter element, unscrew the plug *10* of the GB filter and drain the oil.

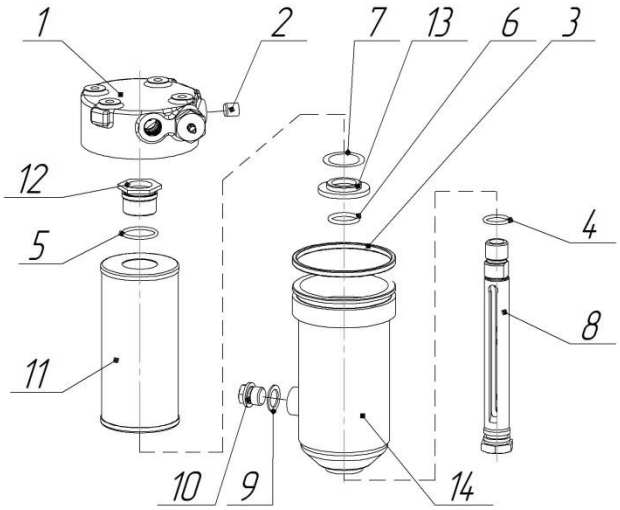
Unscrew the base *8* and separate the filter sleeve *14* assembly from the body *1*.

Unscrew the nut *12* securing the filter element and remove the filter element *11*. The filter element shall be disposed.

Wash the sleeve *14* and all filter parts in diesel fuel.

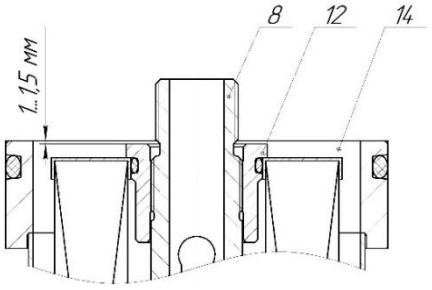
Install a new filter element *11*.

Assemble the filter.



1 – body; *2* – plug;
3, *4*, *5*, *6*, *7* – ring; *8* – base;
9 – gasket; *10* – plug; *11* – filter element;
12 – nut; *13* – washer;
14 – sleeve

ATTENTION! FILTER ELEMENT 11 SHALL BE TIGHTENED WITH THE NUT 12. AT THIS, CHECK CLEARANCE BETWEEN THE NUT 12 PLANE AND THE SLEEVE 14 END. IT IS NECESSARY TO GUARANTEE THAT THE OUTER END OF NUT 12 IS BELOW THE SLEEVE PLANE BY 1–1.5 MM.



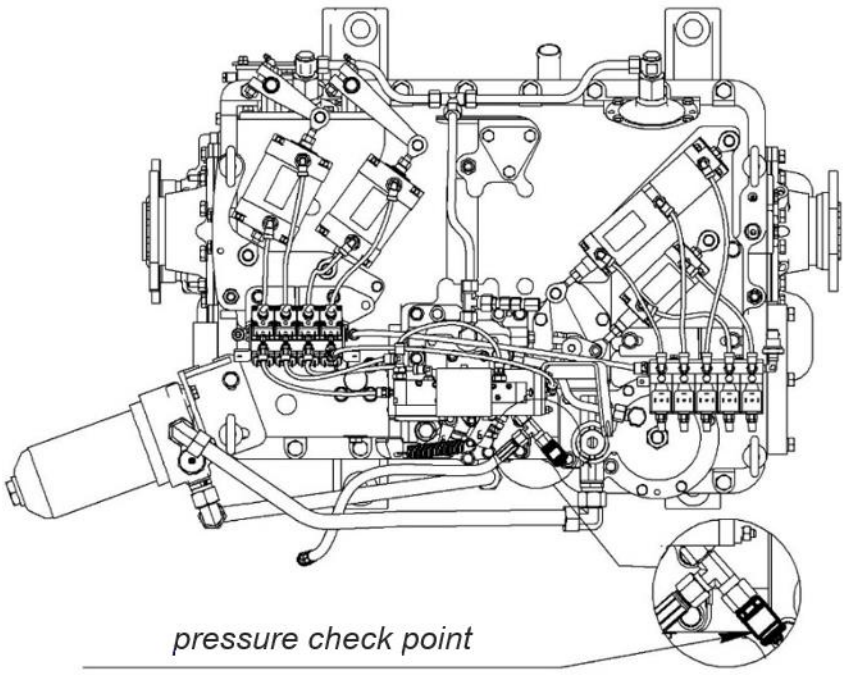
10.7.4.4 CONTROL AND ADJUSTMENT OF OIL PRESSURE IN GEARBOX

During the operation of the tractor, performance of the GB pump decreases.

To increase the GB overhaul time, it is necessary to periodically check and adjust the oil pressure in the GB.

Oil pressure control is carried out by a mechanical pressure gauge with an upper measurement limit of 1.6 MPa (16 kg/cm^2). Accuracy class is at least 1.5.

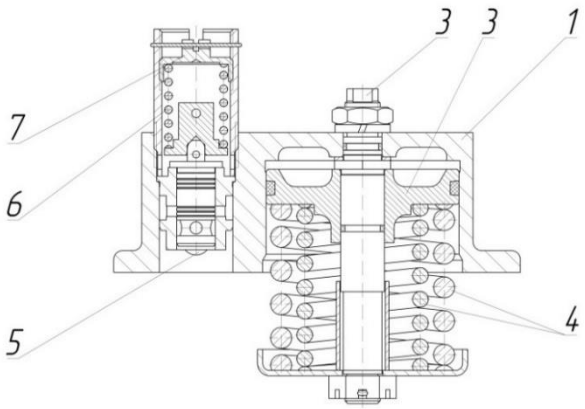
To check the oil pressure, remove the protective cover at the pressure control point and connect the pressure gauge. Thread for connection of the gauge is outside M16x2.



Oil pressure in the heated GB hydraulic system at gears at engine crankshaft speed 900 to 1,800 min^{-1} and oil temperature 67 °C to 73 °C shall be 1.1 to 1.3 MPa (11 to 13 kg/cm^2).

Neutral pressure and upon engagement of the synchronizing brakes shall not be lower than that on the gears.

Pressure is adjusted by screwing the plug *7*.



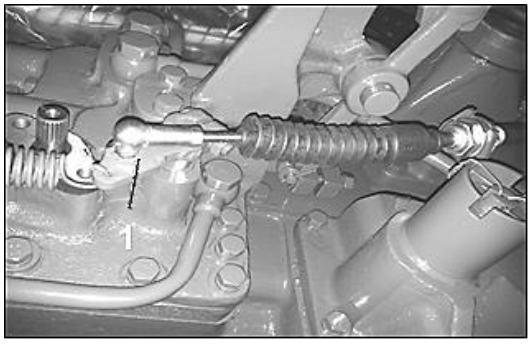
1 – body; *2* – rod; *3* – piston;
4 – hydraulic accumulator spring;
5 – pressure control valve;
6 – valve spring;
7 – adjusting plug

ATTENTION! THE HYDRAULIC ACCUMULATOR SPRINGS ARE CONSTANTLY COMPRESSED. DISASSEMBLY OF THE HYDRAULIC ACCUMULATOR SHALL BE CARRIED OUT BY A QUALIFIED SPECIALIST IN COMPLIANCE WITH SAFETY REGULATIONS AND WITH THE USE OF SPECIAL TOOLS.

10.7.5 ADJUSTING THE DRAIN PEDAL DRIVE

When carrying out MAINT-1, MAINT-2 and also each 500 motor hours of operating time, it is necessary to adjust the drive of the drain pedal.

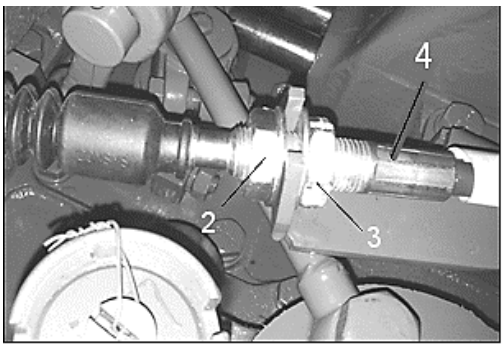
For this:



– with the nut *2* loosened, tighten the adjusting nut *3* until the lever *1* starts to turn under the influence of the cable *4*.

– loosen the adjusting nut *3* by one turn;

– lock adjusting nut *3* with the nut *2*. Tightening torque is 85 to 106 N·m;

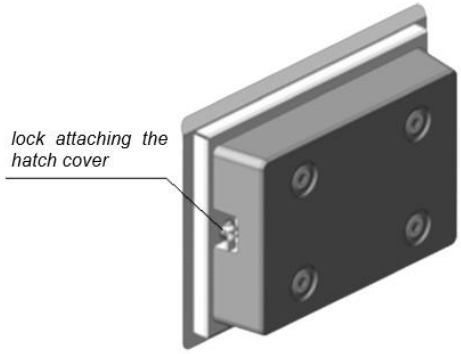


– check the function of the cable drive: with the drain pedal depressed, the shift from neutral to the first gear and vice versa shall occur without jamming. After depressing the pedal, the slow return of the pedal to its original position is **NOT ALLOWED**.

10.7.6 MAINTENANCE OF UNITS ON THE UPPER HALF OF THE GEARBOX CRANKCASE

To open the hatch it is necessary to:

– shift the operator seat to the extreme rear position;



– open the protective rubber caps of the hatch cover locks;

– using the wrench included in the keys of the tractor, open the locks fastening the hatch cover, rotating the wrench by ¼ turn clockwise;

– open the hatch by lifting the cover using two iron edges.

Upon completion of unit maintenance, install the hatch cover in reverse sequence.

10.7.7 MAINTENANCE OF DRIVE AXLES, OPERATING BRAKES

Maintenance of drive axles ensures their constant technical serviceability, maximum overhaul time, eliminates causes of premature wear, faults and breakdowns of units and parts.

Faults detected during operation shall be eliminated without waiting for the next maintenance.

Periodically check the drive gear housing and wheel shroud for overheating. In case of overheating, check the axle oil level.

ATTENTION! IT IS ALLOWED TO INCREASE THE SURFACE TEMPERATURE OF AXLES FROM 90 °C TO 95 °C DURING OPERATION AT AN AMBIENT TEMPERATURE ABOVE 40 °C.

10.7.7.1 AXLES MANUFACTURED BY PZM LLC

To check the oil level and to change the oil in the drive gear and final drive of the drive axle, it is necessary to install the tractor on a horizontal platform (car ramp, inspection pit).

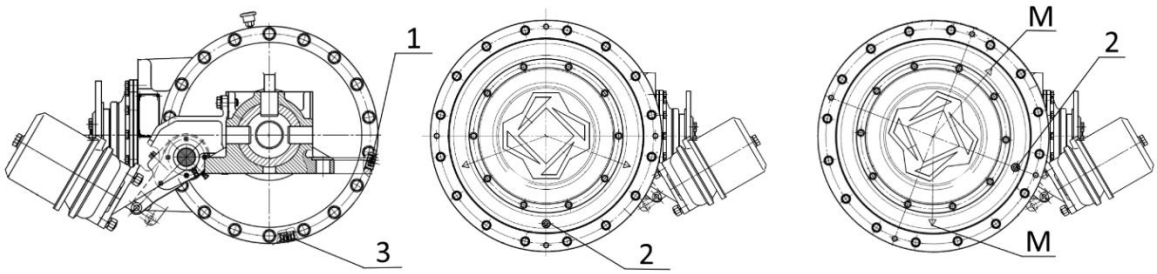
Checking the oil level

Check oil level in the drive gear and final drive of the drive axle 5–6 minutes after the engine shutdown.

To check the oil level in the drive gear, unscrew the plug *1* (Figure 22).

To check the oil level in the final gears, turn the wheel so that either of the two carrier marks “M” is directed downwards, and unscrew the plug *2* (Figure 22).

If there is no oil leakage from the control hole, add oil to the lower edge of the control hole through plugs *1* and *2* for the drive gear and final drive, respectively. The oils recommended for use are listed in Table 26 and Appendix A.



1 – plug of filler (control) hole of the drive gear; *2* – final gear plug;

3 – plug of the drive gear drain hole;

M – mark for oil level check in final gear

Figure 22 – Checking the level and changing the oil in the drive axle

Oil change

To replace the oil, it is necessary to turn the tractor wheels so that the drain plug *2*(Figure 22) of the final gear is at the bottom.

Unscrew the drain plugs *3* and *2* of the drive gear and final drive, respectively, drain the used oil.

ATTENTION!

- ***IT IS RECOMMENDED TO DRAIN THE USED OIL WHEN IT IS STILL WARM FROM THE HEATING DURING THE TRACTOR OPERATION.***
- ***IT IS NECESSARY TO PROTECT TIRES FROM INGRESS OF DRAINED OIL ON THEM.***

After draining the oil, reinstall the plug *3* and tighten it securely. Remove the control plug *1* ofthe drive gear.

To fill the oil to the final gears, turn the wheel so that either of the two carrier marks “M”is directed downwards.

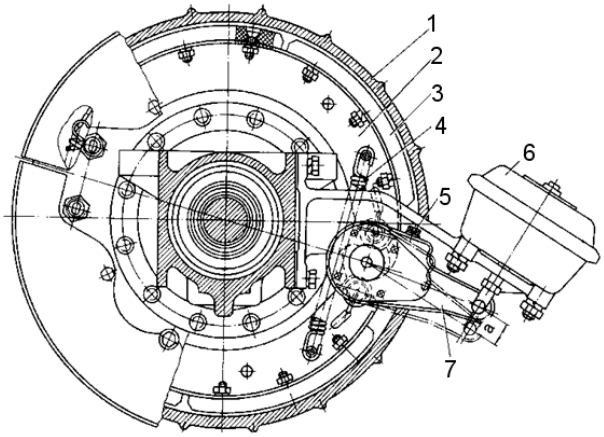
Pourclean gear oil into the drive gear and final drive through holes *1* and *2* to the level of the lower edge of the hole. The oils recommended for use and the filling volumes are given in Table 26 and Appendix K.

Replace the plugs *1*, *2* and tighten them securely.

Check and adjustment of brake chamber rods stroke of the operating brakes

Check air pressure in pneumatic system, fill the system to pressure 7.1 to 8.5 kg/cm^2, if necessary.

Depress the brake pedal and check the stroke of the brake chamber rods *6*. Rod travel shall be 42 mm as maximum, the difference between the right and the left rods shall be 7 mm as maximum.



1 – brake drum; *2* – brake shoe; *3* – lining; *4* – spring;
5 – worm axis;
6 – brake chamber; *7* – brake lever;
a – stroke of the brake chamber rod

If necessary, carry out the following adjustment:

– turn axle *5* to obtain stroke of the brake chamber rod *6* of 42 mm as maximum;

– turn the worm axis *5* every time by 1/6 turn (60°) to the next fixed position. Then check the tractor in motion.

Make sure of reliable and simultaneous action of brakes, absence of heating of brake drums *1* during tractor movement without using brakes.

10.7.7.2 T400 SERIES AXLES

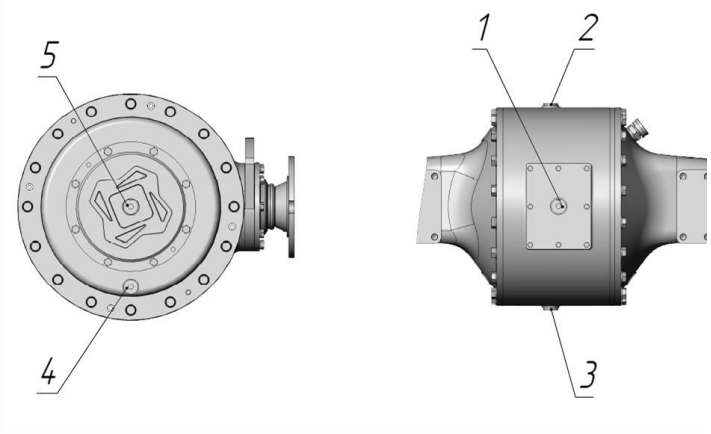
Checking the level, filling and oil change in drive gear and final drive

Place the tractor on a horizontal platform (car ramp, inspection pit) and check the oil level 5–6 minutes after stopping the engine.

To check the oil level in the drive gear, unscrew plug *1*, in final drives – plug *5*.

If there is no oil leakage from the control hole, add oil to the lower edge of the control hole through plugs *2* and *4* for the drive gear and final drive, respectively. The oils recommended for use are listed in Table 26 and Appendix A.

Tighten the plugs *2* and *4*, tightening torque of the plugs is 80 to 100 N·m.



1 – plug of the drive gear control hole;
2 – plug of the drive gear filler hole;
3 – plug of the drive gear drain hole;
4 – plug of drain (filler) hole of the final drive; *5* – plug of the control hole of the final drive

Oil for change in the drive gear and final drive shall be clean, settled, without impurities.

The tractor wheels shall be turned so that the drain plug *4* of the final drive is at the bottom.

Unscrew the drain plugs *3* and *4* of the drive gear and final drive, respectively, drain the used oil.

ATTENTION! IT IS RECOMMENDED TO DRAIN THE USED OIL WHEN IT IS STILL WARM FROM HEATING DURING OPERATION. PROTECT TIRES AND BRAKE DISCS FROM INGRESS OF DRAINED OIL.

Remove any dirt from the magnets of the drain plugs *3* and *4*.

After draining the oil, reinstall the plug *3* and *4* and tighten it securely. Tightening torque of the plugs is 80 to 100 N·m.

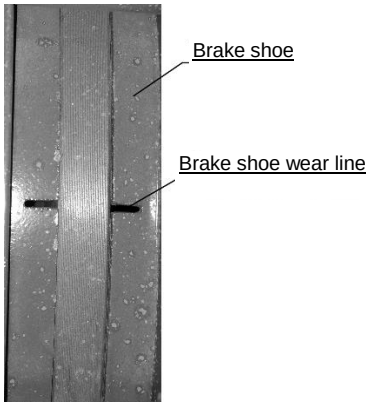
Unscrew the filler and inspection plugs *1*, *2* and *5* of the drive gear and final drive, respectively. Remove any dirt from the magnets of the plugs *1* and *5*.

Pour clean gear oil into the drive gear and final drive through holes *2* and *4* to the level of the lower edge of inspection holes *1* and *5*, respectively. Lubricants recommended for use and their volumes are given in Table 26.

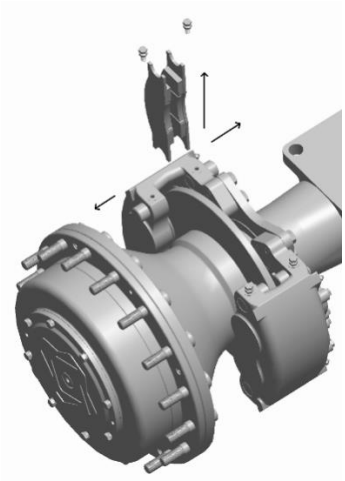
Replace the plugs *1*, *2* and *5*, and tighten them securely. Tightening torque of the plugs is 80 to 100 N·m.

Wheel brake service for T400 series drive axles

When servicing the wheel brakes of the drive axle, it is necessary to check the degree of wear of the brake discs and brake shoes. In the presence of cracks, warpage of the brake disc, as well as when the disc thickness is less than 14.5 mm, it shall be replaced.



Check the wear of brake pads by wear line. If the shoe is worn down to the wear line (there is no slot), the brake shoes shall be replaced.



For monitoring and replacement of brake pads, it is sufficient to:

– loosen the installation bolts and nuts;

– extend the pin by 15 mm as maximum;

– remove the brake pads.

Replace the pads and assemble in reverse sequence.

10.7.8 MAINTENANCE OF CARDAN SHAFTS

During operation it is necessary to observe the following rules of cardan shafts maintenance:

– at the end of each shift, check the degree of heating of the bearing units using a pyrometer. The heating temperature shall not exceed 60 °C. In case of overheating, remove the cardan shaft. Carry out troubleshooting at the service station or in the repair shop. When removing cardan shafts from the tractor or when installing them on the tractor, it is not allowed to use a mounting blade or other objects inserted into the hinge for cranking the cardan shaft. This entails damage to the seals, which can lead to premature failure of the cardan joints;

– regularly check the attachment of the cardan shaft flanges. All nuts shall be firmly tightened. Tightening torque and fastener type are specified in Appendix J.

ATTENTION! CARDAN SHAFTS ARE ATTACHED TO THE FLANGES OF THE GEARBOX AND DRIVE AXLES USING SELF-LOCKING NUTS AS PER DIN 980 (COMPLIES WITH GOST R ISO 10513-2009) "PREVAILING TORQUE TYPE, (ALL-METAL HEXAGON NUTS), STYLE 2, WITH METRIC FINE PITCH THREAD". REUSE OF NUTS AFTER REMOVAL IS PROHIBITED.

10.7.9 MAINTENANCE OF THE TRACTOR PNEUMATIC SYSTEM

10.7.9.1 DRAINING CONDENSATE FROM AIR CYLINDERS

To ensure normal operation of the tractor pneumatic actuators, upon completion of works, it is necessary to remove condensate from the air cylinders, since the accumulated condensate in them can enter the tubes and devices of the braking system, cause corrosion and failure of the components of the braking system.

To remove condensate, slide the plug rod at the bottom of the cylinder aside.

In winter, more carefully monitor the absence of condensate in the receivers to avoid its freezing in the drive pipes.

10.7.9.2 CHECKING THE TRACTOR PNEUMATIC SYSTEM OPERATION

On the stopped tractor, bleed air from the pneumatic system completely by depressing the brake pedal several times.

Start the engine and move the manual fuel feed lever to the maximum engine speed and start the stopwatch.

Fill the system with air to the maximum pressure, determined by the cessation of the movement of the arrow of the air pressure indicator, which is noticeable to the eye. In good condition and with a normally adjusted pressure controller, the compressor shall fill the system to a pressure 0.71 to 0.85 MPa in 180 s (3 min) as maximum.

Press the brake pedal, while the pressure shall drop sharply, and then there shall be no displacement of the arrow of pressure indicator while the pedal is depressed.

To check the tightness of the pneumatic system, it is necessary to measure the pressure value in the system under two conditions:

– at free position of the brake pedal the value of pressure drop in the system shall not exceed 0.05 MPa for a period of time (30 ± 2) min;

– when holding the brake pedal in the fully depressed position, the pressure drop in the system shall not exceed 0.05 MPa for a period of time (15 ± 1) min.

If the pressure drops above the specified values, it is necessary to find the place of air leakage and eliminate the malfunction. If the air pressure in the pneumatic system does not correspond to the specified value, i.e. it is not in the range 0.71 to 0.85 MPa, then the pressure controller shall be serviced.

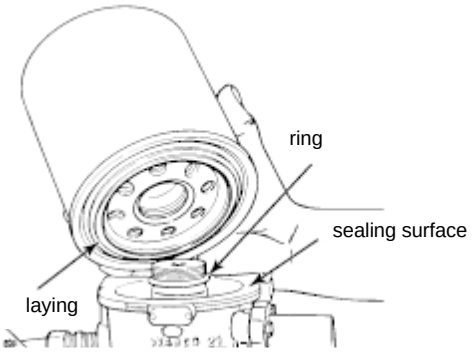
10.7.9.3 MAINTENANCE OF PNEUMATIC SYSTEM COMPONENTS

The gates and valves of the tractor pneumatic system do not need special maintenance and are not subject to repair. If in the process of work any defects are revealed, then the components shall be replaced with new ones.

Maintenance of the connection heads consists in periodic inspection, cleaning from dirt, moisture and dust. The connecting heads are covered with covers to protect them from dirt, snow, moisture.

10.7.9.4 MAINTENANCE OF THE PRESSURE CONTROLLER WITH ADSORBER

During operation of the tractor, it is necessary to replace the adsorber cartridge 432 410 0020 2 of the pressure controller at least once a year.



It is recommended to use cartridges 432 410 244 2 or 432 901 223 2, including oil collection in the pressurized air, in case of high engine operating time or presence of traces of oil from the pneumatic compressor.

If a malfunction of the pressure controller is detected, we recommend to contact the Service Center of Peterburgsky Traktorny Zavod JSC.

10.7.9.5 MAINTENANCE OF FILTER ELEMENT OF THE TRUNK FILTER

The trunk filter 12.3511310-01 is installed in order to prevent dirt ingress from the regeneration receiver into the pressure controller with a dryer into the brake system of the tractor.

Carry out maintenance of the filter element with frequency of 500 motor hours (MAINT-2).

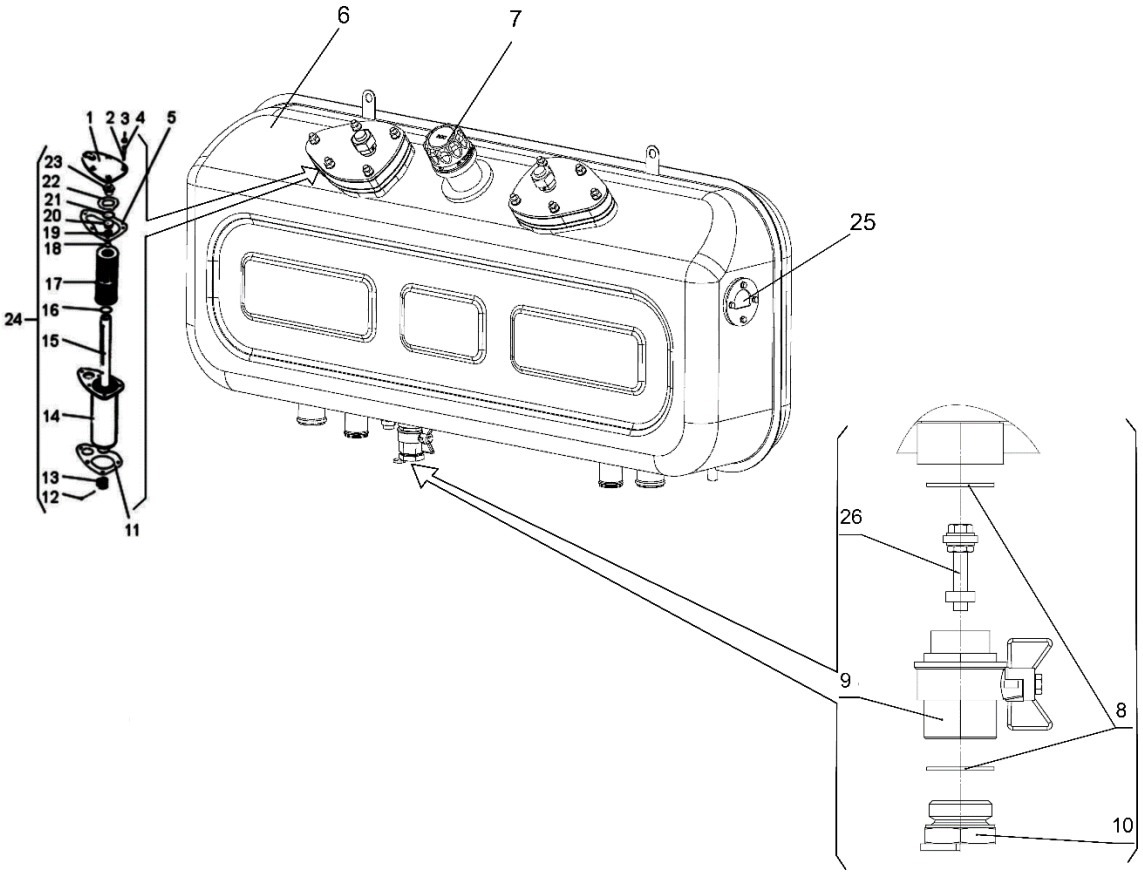
To remove contaminants, remove the locking ring holding the plastic cover, remove the filter element located inside and blow it with compressed air. Assemble in reverse order.

10.7.10 MAINTENANCE OF THE HITCH AND STEERING HYDRAULIC SYSTEMS

10.7.10.1 CHECKING THE LEVEL AND OIL CHANGE IN HYDRAULIC TANK

Place the tractor on a horizontal platform.

Check the oil level in the hydraulic tank (Figure 23) by the sight glass *25* of the hydraulic tank, the oil shall be visible in the sight glass. Pour clean oil through the filler screen *7*. When checking the oil level in the hydraulic tank, make sure there is no foaming.



1 – cover; *2* – stud; *3* – nut; *4* – washer; *5* – gasket; *6* – tank housing; *7* – oil filling neck;
8 – O-ring; *9* – ball valve; *10* – plug; *11* – gasket; *12* – cotter pin;
13 – spring; *14* – filter housing; *15* – pipe; *16* – ring; *17* – filterelement;
18 – washer; *19* – spring; *20* – valve; *21* – ring; *22* – washer; *23* – valve seat;
24 – filter assembly; *25* – sight glass; *26* – magnetic device

Figure 23 – Hydraulic tank

When changing oil, keep clean. The oil used serves not only as a working fluid, but at the same time lubricates the pump bearings, therefore, contamination of the working fluid with mechanical impurities or water causes the formation of scratches on the surface of the sliding bearings and disables the pumps.

Change the oil in the following order:

– immediately after stopping the engine, unscrew the plug *10*, open the ball valve *9* and drain the heated oil;

– replace the filter elements *17*, wash the filler neck mesh;

– wash in diesel fuel and blow out the filler neck *7*;

– fill oil to the hydraulic tank, start the engine and run 2–3 minutes at low speedof crankshaft without rotating the steering wheel. Changeover valve levers shall be in the "Neutral" position;

– increase the speed of the engine crankshaft and make several turns of the tractor to the right and left to the stop and several lifting and lowering movements of the hitch;

– stop the engine and check the oil level in the hydraulic tank and the tightness of connections, if necessary, add oil to the tank.

10.7.10.2 REPLACING THE FILTER ELEMENTS OF THE HYDRAULIC TANK

To replace filter elements it is necessary to:

– remove attachment nuts *3* and the cover *1* (Figure 23);

– remove the filter *24* with filter element and install it on the base of the housing *14* (by cotter pin *12* upwards);

– compress the spring *13*, remove the cotter pin *12* and remove the spring;

– remove the pipe *15* together with the filter element *17* from the housing *14*;

– remove the lower rubber ring *16* and the filter element *17*;

– wash the filter housing in diesel fuel;

– replace the paronite filter gaskets if they are damaged;

– replace the filter element and reassemble the filter in the reverse order.

Replace the second element similarly.

10.7.10.3 REMOVING LEAKS OF PIPELINES, HOSES AND SEALS OF HYDRAULIC UNITS OF STEERING AND HITCH HYDRAULIC SYSTEMS

If the seals on the low pressure hoses are leaking, do the following:

– dismantle the low pressure hose, first draining the working fluid from the hydraulic lines;

– check the quality ofthe hose inner surface. If damage is detected, replace;

– inspect the surface of the pipelines and the ridge on the pipe. If violations of the surface cleanliness are found, clean it with a file and grind the sealed surface;

– install the hose and retighten the clamps in the prescribed manner.

If the seals of connectors, elbows and cut-in rings of hydraulic assemblies and pipes are leaking, carry out the following operations:

– remove the connector or elbow;

– remove the rubber rings and carefully check the absence of cuts or tears on its working surface, if found, replace the ring;

– inspect the surfaces to be sealed, if any scratches or traces of processing are found, clean them with a scraper and grind;

– wash the sealing surfaces with diesel fuel;

– make the final installation of the elbow with a fixed nut.

To preventleakage in the hydraulic system during operation, keep in mind the following:

– tightening of pipe connections and high-pressure hoses with one wrench, without supporting the second connection element with a wrench, is **NOT ALLOWED** and may lead to destruction of the welded joints of pipelines as a result of deformation;

– when dismantling low pressure hoses, damage to the inner rubber layer shall be avoided;

– tightness of the seals of parts of hydraulic units with a rubber O-ring depends on the cleanliness of the sealed surfaces, the preservation of the integrity of the ring during installation and the depth of the mounting grooves;

– most leaks cannot be repaired by tightening only.

ATTENTION! TO INCREASE THE SERVICE LIFE OF THE PUMPS, REFUEL THE HYDRAULIC SYSTEM AFTER DRAINING THE WORKING FLUID AS FOLLOWS:

- ***ADD OIL TO THE HYDRAULIC TANK THROUGH THE OIL FILLER NECK, WHILE THE OIL LEVEL SHALL REACH THE MIDDLE OF THE SIGHT GLASS.***
- ***START THE ENGINE.***
- ***PUMP THE SYSTEM BY PERFORMING 3 TO 5 TURNS OF THE TRACTOR FROM STOP TO STOP AND 4 LIFTING AND LOWERING OPERATIONS OF THE HITCH.***
- ***ADD OIL TO THE HYDRAULIC TANK.***
- ***DURING REPLACEMENT OF AXIAL-PISTON PUMP IT IS NECESSARY TO ENSURE PRESENCE OF OIL IN THE HOUSING. FOR THIS, IT IS NECESSARY TO FILL 400 ML OF WORKING FLUID INTO THE HOUSING.***

10.7.10.4 INSTALLATION AND OPERATION OF HIGH PRESSURE HOSES

Observe the following rules when installing and operating the hoses:

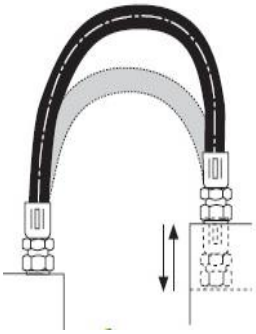
– when installing on a tractor, do not allow the hoses to touch sharp edges and moving parts of the tractor during operation;

– do not expose the hoses to mechanical stress, as this can lead to their destruction;

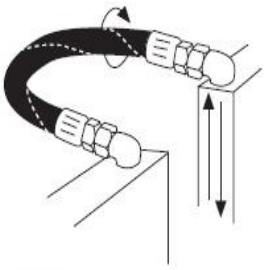
– do not allow fuel, coolant and lubricants to come into contact with the outer rubber layer of the hoses;when the hose is installed in a straight line, there shall be sufficient slack of the hose along its line to compensate for the change in length when pressure is applied;

CORRECT **INCORRECT**

– prevent twisting and deformation by bending the hose in the same plane as the movement of the sleeve to which the hose is connected;

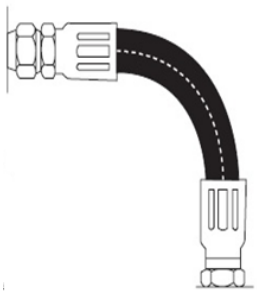


CORRECT

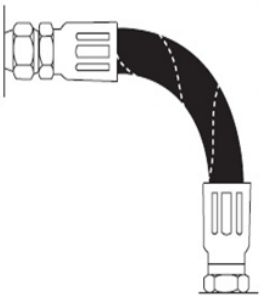


INCORRECT

– do not allow the hoses to twist during assembly and disassembly; check the correct installation of the hoses by the straightness of the marking strip. An increase in pressure in a twisted hose can lead to destruction of the hose or loosening of the connections;

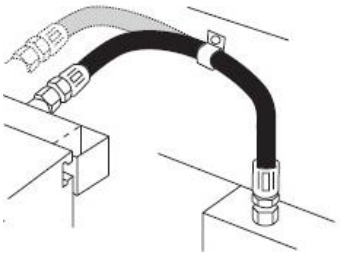


CORRECT

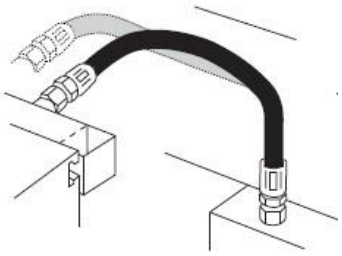


INCORRECT

– do not allow twisting of hose lines in two planes by securing the hose with a clamp at the point of plane change;

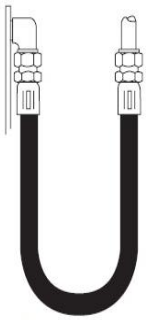


CORRECT

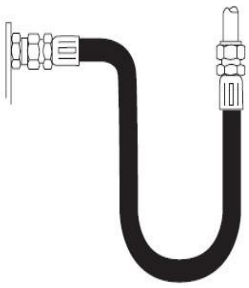


INCORRECT

– use proper angle adapters to avoid kinking or bending the hose at an acute angle;

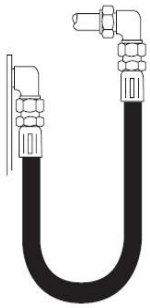


CORRECT

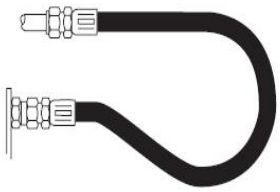


INCORRECT

– when the radius is less than the required minimum, use the angle adapter to avoidbends at an acute angle;

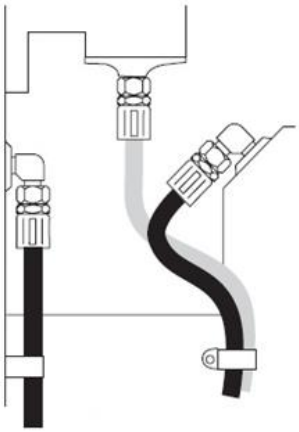


CORRECT

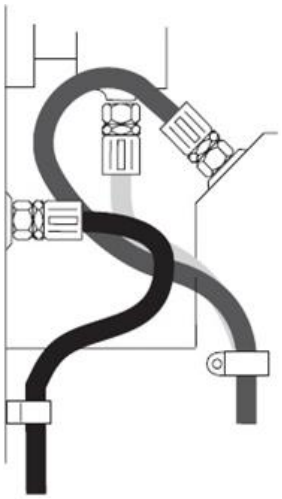


INCORRECT

– route hoses straight using adapters and fittings at 45° and/or 90°. For the best look, avoid excessive length of hoses;

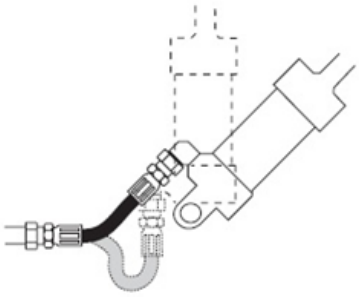


CORRECT

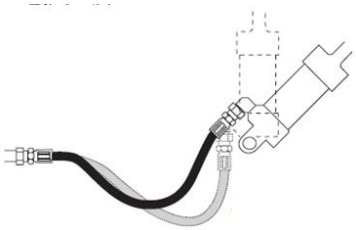


INCORRECT

– an appropriate hose length is necessary to distribute movement and prevent abrasion when using bending hoses;

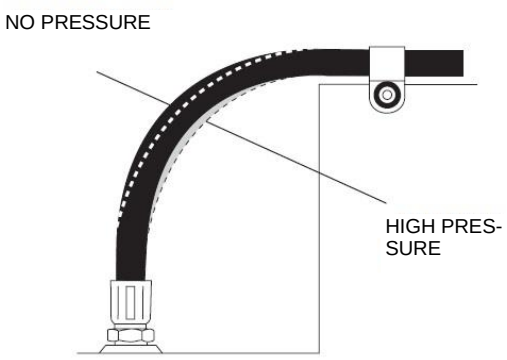


CORRECT

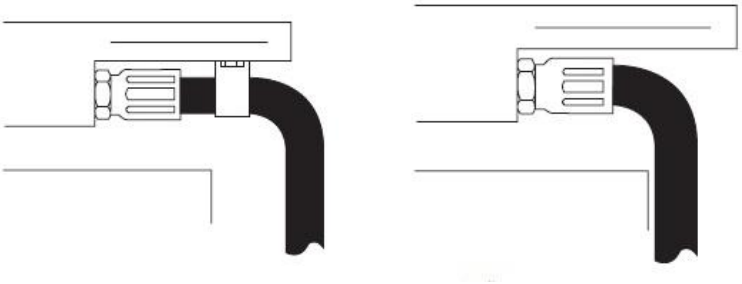


INCORRECT

– to compensate for changes in hose length under pressure, do not secure the hose to bends so that the bends can absorb pressure changes. Do not tie together hoses that are part of high and low pressure lines;

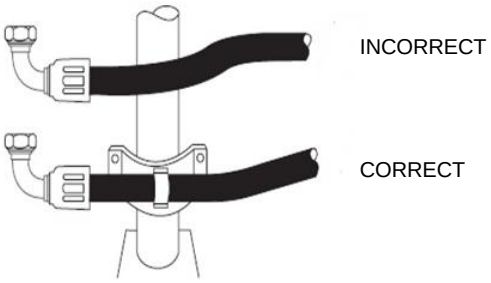


– route hoses to avoid chafing and abrasion. Clamps are often used to support long hoses or to keep them away from moving parts. Use clamps of the correct size. Over-sized clamps shall cause the hose to move in the clamp and cause abrasion;

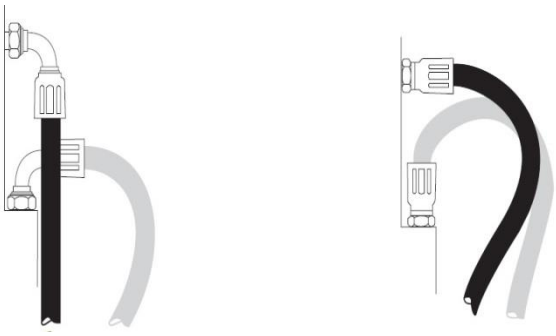


CORRECT **INCORRECT**

– high ambient temperatures shorten the service life of the hose. Make sure the hose is away from hot parts. Otherwise, insulate the hose;

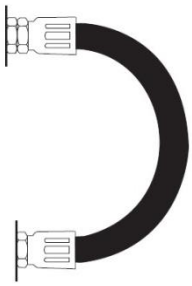


– to relieve stress on the assembled hydraulic hose, use appropriate elbows and adapters and precision fit to provide access for inspection and maintenance;



CORRECT **INCORRECT**

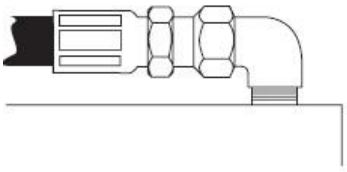
– to avoid pinching the hose and reduce the flow, the bending radius of the hose shall be as large as possible. Refer to hose specification tables for minimum bend radii;



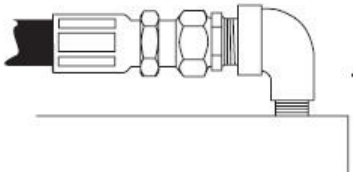
CORRECT

INCORRECT

– reduce the number of threaded butt connections by using appropriate hydraulic adapters instead of pipe fittings.



CORRECT



INCORRECT

10.7.11 MAINTENANCE OF THE AIR CONDITIONING SYSTEM

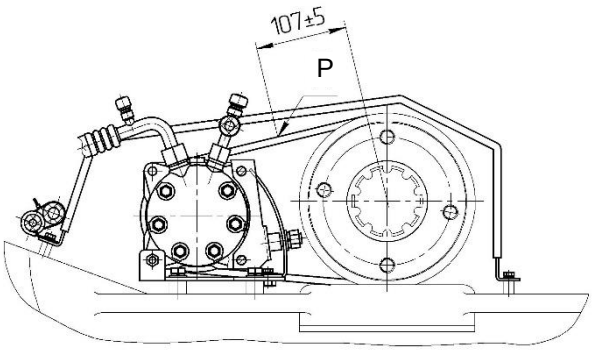
ATTENTION! MAINTENANCE OF THE AIR CONDITIONING SYSTEM SHALL BE CARRIED OUT IN ACCORDANCE WITH THE OPERATION MANUAL OR THE AIR CONDITIONER CERTIFICATE ENCLOSED TO THE TRACTOR.

When working with an air conditioner, it is required to:

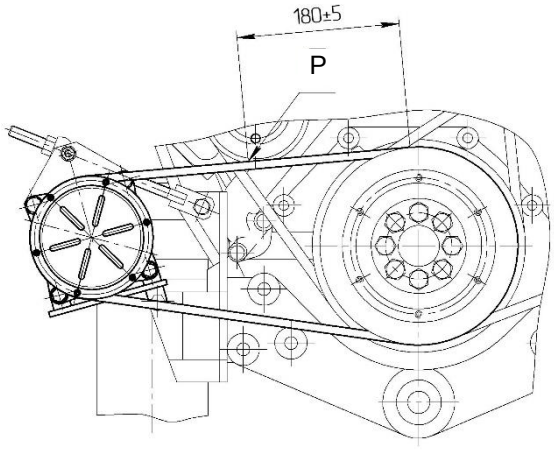
– inspect the condenser on a daily basis and remove chaff, plant particles, adhered dirt from the plates and inter-plate cavities, and blow the condenser with compressed air, and check the tension of the compressor wedge belt;

– at least once a week, check the amount of refrigerant in the system (by the sight glass in accordance with the air conditioner Operation Manual or Certificate), check the Freon lines for damage;

– when carrying out MAINT-1, MAINT-2, MAINT-3, check and, if necessary, regulate a compressor drive belt tension. Belt deflection at application of force (4 ± 0.2) kg at point “P” shall be within the range 9 to 14 mm;



Adjustment of compressor drive belt installed under the cab



Adjustment of compressor drive belt, installed on the engine

– during long-term storage of the tractor, the compressor drive belt shall be loosened;

– term for replacing the air filter is after 500 motor hours, but at least once a year;

– frequency of cleaning and blowing the air filter is at least 125 motor hours.

Carry out filling of air conditioning system with Freon R134a in volume according to Operation manual or Certificate of the air conditioner*.

To lubricate the compressor, use oil in accordance with the enclosed Operation Manual or Certificate of the air conditioner*.

IT IS STRICTLY NOT ALLOWED to mix the Freon R134a refrigerant with others or to use another refrigerant besides the permitted one.

In case of leakage when recharging the system, it is necessary to replace the air conditioner receiver.

* When filling the system with Freon during operation, to determine the required amount of oil in the compressor, consult with the specialists of the Peterburgsky Traktorny Zavod or the manufacturer of air conditioners.

ATTENTION!

• TO KEEP THE AIR CONDITIONING SYSTEM IN OPERATING CONDITION DURING PERIODS WHEN IT IS NOT USED, BUT THE TRACTOR IS IN OPERATION (AUTUMN-WINTER PERIOD), IT IS NECESSARY TO:

– TURN ON THE CONDITIONING SYSTEM FOR 5 MIN, ONCE EVERY TWO OR THREE WEEKS;

– IF THE TRACTOR IS STORED IN A WAREHOUSE, PERIODIC START OF THE COMPRESSOR IS NOT REQUIRED.

• TO AVOID COMPRESSOR JAMMING AFTER LONG SERVICE INTERVAL (MORE THAN 2–3 MONTHS) IT IS NECESSARY TO MANUALLY TURN THE COMPRESSOR SHAFT BY 10–15 RPM CLOCKWISE, PRIOR TO START THE ENGINE. FOR THIS PURPOSE, IT IS NECESSARY TO REMOVE THE PROTECTIVE COVER FROM THE COMPRESSOR BY UNSCREWING THREE SCREWS AND TURN THE COMPRESSOR WITH A SOCKET WRENCH BY THE NUT OF THE COMPRESSOR DRIVE SHAFT. IT IS ALLOWED TO USE SPECIAL TOOL TO TURN THE COMPRESSOR, THEN INSTALL THE COVER AND SECURE IT WITH SCREWS. THIS OPERATION IS REQUIRED TO MAKE THE ACCUMULATED COMPRESSOR OIL FROM THE CONDITIONER COMPRESSOR CRANKCASE ENTER THE OPERATING CYLINDERS AND LUBRICATE THEM EVENLY. FAILURE TO PERFORM THIS OPERATION AFTER A LONG TRACTOR OUTAGE CAN CAUSE THE COMPRESSOR FAILURE.

Cover attachment screws

Turn the compressor clockwise using the wrench with a socket 13 or 14 (depending on the compressor installed).

- ***FILLING THE SYSTEM WITH FREON AND REPLACING THE SYSTEM UNITS SHALL BE CARRIED OUT ONLY BY SPECIALISTS CERTIFIED IN THE MAINTENANCE AND REPAIR OF AIR CONDITIONERS.***

IT IS FORBIDDENTO:

- ***WORK WITH A FAULTY FAN OF THE EVAPORATOR BLOCK;***
- ***FILL THE ENGINE COOLING SYSTEM WITH WATER.***

10.7.12 MAINTENANCE OF THE TRACTOR WHEELS

10.7.12.1 CHECKING THE CONDITION OF THE WHEEL TIRES

Every day before driving the tractor, inspect tires and wheels, clean tires from foreign objects stuck in the tread. Parts of wheels with cracks and tires with damages reaching the cord or through are **NOT ALLOWED** for use.

It is necessary to protect the tires from ingress of tosol, ICE coolant, oil, fuel, other oil products, as well as foreign objects.

Tighten the wheel nuts evenly crosswise with a special wrench attached to the tractor in the SPTA set.

For a more even wear of the tire tread pattern, it is recommended to swap the front and rear wheels every 1,900–2,000 motor hours, observing the direction of rotation of the wheels in accordance with the arrow on the tire.

10.7.12.2 CHECKING AIR PRESSURE AND TIRE INFLATION

Measure the tire pressure at least once every five days before driving the tractor to work. Record the results in the Logbook (Appendix L).

To check the inflation pressure, use serviceable instruments with a graduation of 10 kPa as maximum. This shall ensure that the measurements are reliable.

It is necessary to control the inflation pressure in a cold state with a pressure gauge, which shall be periodically checked for accuracy of readings.

The sequence of operations is as follows:

– unscrew on the valve cap;

– measure the inflation pressure using a tire pressure gauge;

– remove the protective cap from the test outlet valve located on the air cylinder and connect the tire inflation hose to the tap (enclosed to the tractor SPTA set);

– attach a fitting to the tip of this hose;

– connect the fitting tip to the tire valve;

– start the engine;

– inflate the tire to the required pressure in accordance with Tables 8, 9, 10;

– screw on the valve cap.

10.7.12.3 INSTALLATION AND REMOVAL OF TIRES

IT IS STRICTLY FORBIDDEN TO MOUNT/DISMOUNT TIRES ON WHEELS DIRECTLY ON THE TRACTOR.

Only serviceable tires and wheels of the same size and type shall be installed.

For each type of wheel, it is required to fit only a tire of that size, which is determined by the technical characteristics of the given wheel.

IT IS FORBIDDEN TO MOUNT TIRES OF INAPPROPRIATE DIMENSIONS ON TRACTORS.

Tires shall be clean and dry. Mounting and dismantling of the tires is carried out by two workers using two mounting blades (available in the tractor SPTA).

The first tire iron is a lever, one end of which is made in the form of a fork and serves only for removing the tire beads from the rim seats, and the other end serves for mounting the tire.

The second tire iron has one end in the form of a curved profile, which provides a secure grip for the rim flange, as well as the removal of the tire beads from the rim seats paired with the forked end of the first tire iron, the other end is a socket wrench for the locking screw of the hydraulic jack.

When installing the tire, make sure that when installing the wheel on the tractor, the direction of rotation of the wheel coincides with the arrow on the tire.

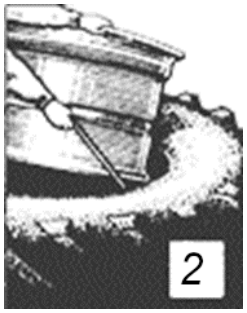
Mounting and dismantling, setting of the tire beads is possible only when the diametrically opposite part of the tire relative to the bead being refueled is recessed into the rim well.

The application of soap solution to the tire beads during assembly and disassembly work greatly facilitates assembly and disassembly, and increases the service life of tires.

Mount the tire on the rim in the following order:

– put the tire on a flat surface and place the rim down on it with the rim located closer to the well, so that part of the bead goes into the rim well;

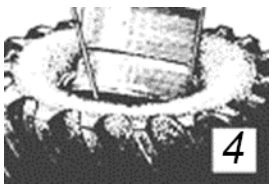
– insert the first tire iron between the top bead of the tire and the rim so that the curved end grips the bead securely and, acting as a lever, slide the bead to be mounted behind the bead of the rim. Repeat this operation several times until the installation of the mounted bead shall not cause difficulties;



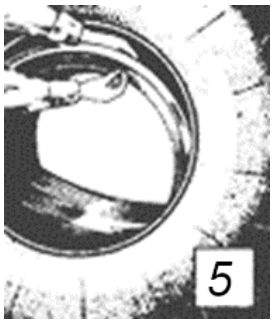
– use the second tire iron to facilitate further installation. Insert it between the tire bead and the rim and press the rim upwards, insert the other tire iron closer to the inserted bead of the tire and repeat the previous operation;

– continuously moving along the circumference, repeat this operation several times until the rim flange enters the tire cavity;

– enter the last section of the rim into the tire by smoothly pressing two blades at the same time;



– insert the valve into the valve hole and secure it with a nut, while making sure that the valve is in the correct position, do not allow it to be skewed:



– place the tire on the floor. On the opposite side of the valve, insert both tire irons at a distance of 250–300 mm from one another so that they securely grip the rim flange, and pushing the tire irons down, lead the tire bead behind the rim flange;

– holding one tire iron in this position, pull out the second tire iron and insert it at a distance 50 to 100 mm from the first so that it grips the rim, and, pressing the tire iron down, put the tire bead behind the rim flange. Installation is greatly facilitated if you simultaneously press on the tire with your foot. In order to facilitate the process of inserting the top bead of the tire, put down the part of the tire opposite to the bead to be filled into the rim well with your feet;

– installation ends at the valve with two tire irons.

Inflate the tire to normal pressure, then completelyrelease the air from the tire and inflate again to pressure 0.25 MPa, and for NORTEC tires – to pressure 0.2 MPa, withstanding at this pressure until the tire beads fit on the rim seats. Then release the air until the recommended tire pressure is established.

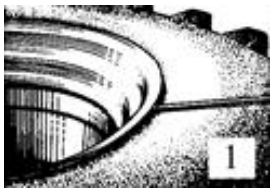
Dismantle the tire from the rim in the following order:

– completely release the air from the tire;

– remove the tire beads from both tapered flanges of the rim using the forked end of the first tire iron and the curved end of the second tire iron;

– first, remove the beads from the seat opposite the valve opening in the following order:

– insert the curved end of the second tire iron between the rim bead and the tire and press the tire bead down;



– insert the forked end of the first tire iron into the gap formed between the side flange of the rim and the tire so that the curved end of the second tire iron is in the groove of the forked tire iron;

– press the tire bead down with the first tire iron. Repeat the operations of items 1, 2, 3 along the entire circumference of the rim until the tire beads are completely removed from the landing seats;

– insert the tire irons on both sides of the valve hole at a distance of 100 mm and, pressing the opposite tire bead into the rim mounting groove with your feet, remove a part of the tire bead by the rim flange;

– step back from the removed part of the tire bead around the circumference to a distance where you can easily insert the second tire iron with the curved end between the rim flange and the tire bead, and again remove the tire bead by the rim flange;

– repeating the operation of item 5, remove the top tire bead;

– turn the wheel with the tire and remove the second tire bead from the rim, for which:

– lift the rim up so that you can insert both tire irons between the tire bead and the rim at a distance 200 to 250 mm between the vanes, press the rim up first with one and then with the other tire iron, release the second tire iron, leaving the rim in the depressed state;

– insert the curved end of the second tire iron into the gap between the flange and the tire bead at a distance of 150–200 mm from the first tire iron and, grasping the rim flange, remove the rim from the tire. Repeat this operation several times until the rim is completely out of the tire.

10.7.12.4 INFLATION OF TUBELESS TIRES UNDER FIELD CONDITIONS

Place the mounted tire on the platform (tray) to prevent foreign objects from getting between the beads of the tire.

Before inflating the tire, in order to create the necessary tightness between the tire beads and the rim flanges, the tire shall be compressed around the tread circumference using a ratchet tightening strap so that the tire beads are tightly pressed against the rim flanges.

Prepare the gas generator for operation and connect it to the compressor.

Using a compressor, pump air in the booster to operating pressure.

Unscrew the spool from the valve and connect the compressor air hose to the valve of the tubeless tire and apply air to the tire.

Apply a booster (such as BL-35 POLARUS) to explosively inflate tubeless tires.

Place the flat end of the booster outlet tube between the edge of the rim and tire and briskly open the outlet valve.

Inflate the tire with the compressor when the valve spool is turned out, to the pressure indicated on the tire sidewall by the "Horseshoe" sign to ensure that the beads fit on the rim. When releasing air from the tire, set the pressure according to the type of tractor operation. Screw in the spool and the valve cap.

10.7.12.5 TIRE PERFORMANCE RECORD

Keep the records of performance on each tire separately. For this, a Tire performance record card (Appendix M) is kept, which is the main document characterizing the operation of tires upon presentation of a claim, write-off, and also in other cases.

The inflation pressure in tires shall be registered in the "Logbook for recording measurements of the tire internal air pressure" (Appendix L).

10.7.13 MAINTENANCE OF ELECTRICAL EQUIPMENT

Carry out maintenance operations on storage batteries in accordance with their Operation Manual supplied with the tractor.

10.7.13.1 CHECKING THE DEGREE OF THE BATTERIES CHARGE

Check the degree of battery charging when the engine is off. For this:

– turn on the headlights for 2 min, turn them off, wait a minute and check the battery with a load diagnostic device, for example, H-2001. For this, the clamp "–" shall be connected to terminal "–" of the battery, then make contact with the probe on the "+" terminal of the battery **without pressing**. The digital indicator shall show the battery voltage. To accurately determine the state of charge of the battery, follow Table 27;

– when connected to the "+" terminal of the battery **with pressing**, a load of 200 A is connected.Hold the probe on the "+" terminal **with pressing** for 5 seconds. If the voltage on the display is at least 9 V, then the battery is in good order;

– if there is no diagnostic device, then monitor the voltage using a digital indicator on the instrument panel;

– with the headlights off, the voltage shall be at least 24.7 V. If the voltage is lower, then it is necessary to remove the batteries and charge them from a stationary charger;

– if the voltage is higher or equal to 24.7 V, then we start the engine. Give it to work at least 2 minutes at idle. Next, increase the speed to 1,500 min^{-1} and turn on the full load (working lights, headlights, interior heaters are on). If the voltmeter reading is between 28 V and 28.8 V, then the generator is operating normally.

Table 27

Voltage, V	Charge level,%
12.72	100
12.50	75
12.35	50
12.10	25

11 TRACTOR STORAGE RULES

11.1 GENERAL INFORMATION

Prepare, store and de-preserve the tractor in accordance with this section, the Operation Manual of the engine and storage batteries enclosed to the tractor.

Put the tractors to storage:

– inter-shift – a break in use up to 10 days;

– short-term – from 10 days to two months;

– long-term – more than two months.

Works related to the preparation of the tractor for storage are carried out by specialized teams or machine operators under the guidance of the person responsible for storage. The machine operators hand over, and the responsible persons take the prepared tractor for storage. Putting the tractor for long-term storage and removing it from long-term storage shall be formalized by acts.

Store tractors indoors or under a shed. Storage in open equipped areas is allowed with the obligatory performance of works on preservation, sealing of the tractor and removal of components that require warehouse storage.

Periodically, during the cold season and during long-term storage, carry out lubrication of the cylinder mechanism, which is located in the button of the door lock handle, by injection with agents HG 5503 (HG 5501, WD-40).

Tractors storage areas shall have all necessary equipment and tools in accordance with fire safety regulations.

With all storage methods, tractors are arranged so that inspections and maintenance can be carried out, each tractor can be freely entered and left.

Each tractor shall undergo the next maintenance before storage.

Check the condition of the tractor during storage in closed rooms at least once every two months, in open areas and under a shed – monthly.

After strong winds, rains and snow drifts, check and eliminate any deficiencies found immediately. Record the results of periodic inspections in the inspection log. Carry out maintenance during storage in accordance with the instructions of the “TYPES AND LISTS OF MAINTENANCE WORKS DURING LONG-TERM STORAGE” section.

11.2 PREPARATION OF TRACTOR FOR INTER-SHIFT STORAGE

The tractor is put into inter-shift storage immediately after the completion of work and DMT.

Preparing the tractor for inter-shift storage is as follows:

– carefully clean the tractor from dust, dirt, plant residues;

– drain sludge from fuel coarse and fine fuel filters, condensate from air cylinders. After draining the sludge from the air cylinders, wipe the valves dry, lubricate with grease;

– remove plugs of filler necks of hydraulic tank, expansion tank, wash and wipe them dry;

– wash and wipe dry the breathers of the PTOM reduction gearbox (if any), housings of drive gears of the drive axles;

– lubricate threaded connections of plugs with plastic grease and screw them in place. Wrap or close with polyethylene film and bind with twine;

– wrap the upper part of the exhaust and intake pipes with plastic film and tie it with twine;

– disconnect storage batteries, clean, remove traces of corrosion and electrolyte; clean the ventilation holes, grease the connection terminals with grease.

11.3 PREPARING THE TRACTOR FOR SHORT-TERM AND LONG-TERM STORAGE

The tractor is put into short-term and long-term storage immediately after completion of work and carrying out MAINT-1.

Preparing the tractor for short-term storage is as follows:

– clean the tractor after operation from dust, dirt, oil drips, plant and other residues. After cleaning and washing, blow the tractor with compressed air to remove moisture;

– check the level and, if necessary, add oil to the gearbox, housings of drive gears and final drive of the drive axles;

– after draining the sediment from the air cylinders, wipe the valves dry, lubricate with grease;

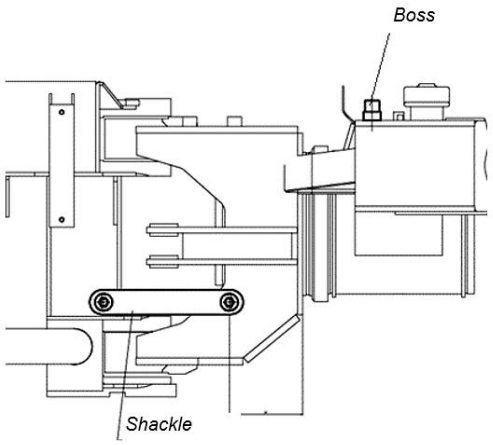
– unscrew the filler caps of the hydraulic tank, expansion tank, wash and wipe them dry; wash and wipe dry the PTOM reducer breather, housings of the drive gears of the drive axles; lubricate the threaded joints of the plugs with grease and screw into place; wrapor close with plastic film and tie with twine;

– blow out the filter element of the air cleaner and air conditioner with compressed air. Wrap the upper part of the exhaust and intake pipes with plastic film and tie it with twine;

– lubricate threaded connections of the central link, vertical braces, spherical surfaces of the central link and lower links of the hitch, the protruding parts of the hydraulic cylinders of the steering and hitch hydraulic systems with preservation oil or grease; pre-clean, remove traces of corrosion, wash, degrease and dry surfaces. After applying preservation oil or grease, wrap the above threaded connections, spherical surfaces and parts with polyethylene film or waxed paper, tie with twine;

– set the levers and pedals of the control mechanismsto a position that excludes arbitrary activation of the tractor and its units;

– to prevent folding of semi-frames, it is necessary to lock them using a shackle fixed on the rear semi-frame;



– set the tractor on stands or pads in a position that relieves the pneumatic wheels and springs. There shall be a gap of 80 to 100 mm between the tires and the supporting surface;

– cover the tire surfaces with a protective compound. Reduce the inflation pressure for indoor and outdoor storage to 0,011 MPa;

– disconnect storage batteries, clean, remove traces of corrosion and electrolyte; clean the ventilation holes, grease the connection terminals with grease. Set the electrolyte level and density in accordance with the Operation Manual of storage batteries;

– when preparing the tractor for long-term storage, disconnect the battery balancing device from the storage batteries;

– if the tractor is stored at low temperatures or for more than one month, remove the storage batteries and hand them over to the warehouse. Clean the headlights, generator, starter, blow with compressed air and grease their fastening parts and connecting terminals with plastic grease.

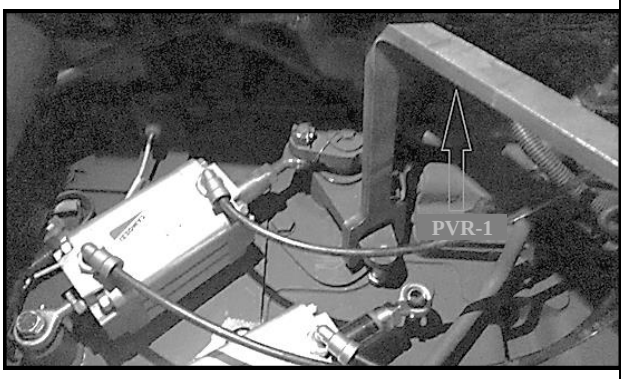
12 POSSIBLE MALFUNCTIONS AND TROUBLESHOOTING METHODS

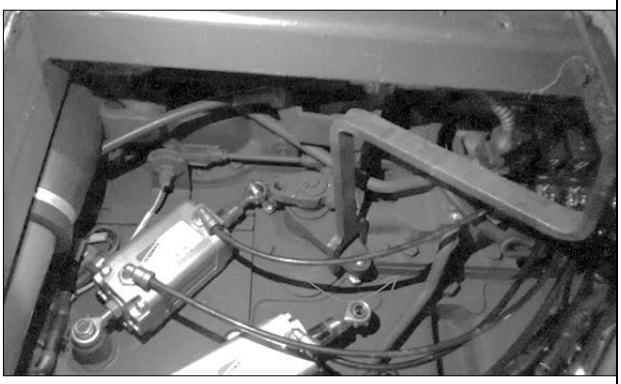
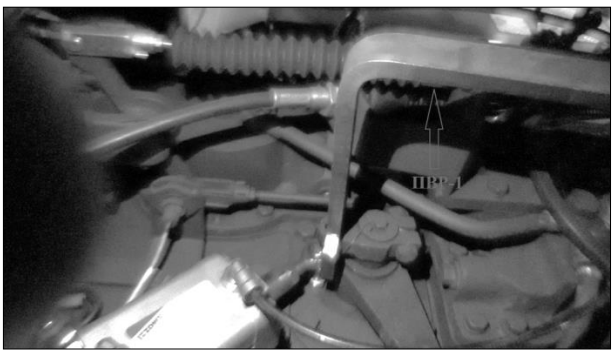
Possible malfunctions and troubleshooting methods are given in Table 28.

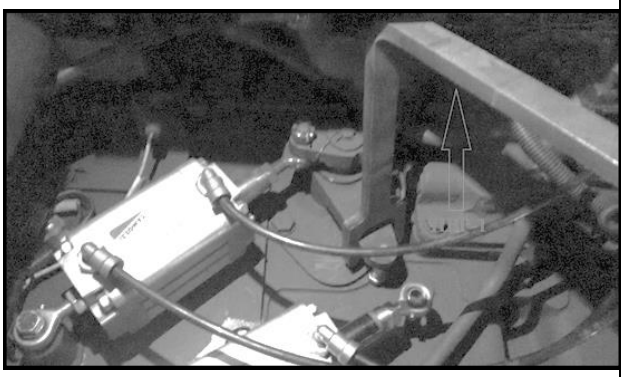
Table 28

Malfunction	Remedies
Transmission malfunctions	
No or insufficient oil pressure in the gearbox.	Check the oil pressure with a mechanical pressure gauge beforehand.
Oil leaks in the oil line connections.	Eliminate the leak.
Low oil level in the GB.	Add oil.
Defective oil pressure gauge or indicator.	Replace.
Hanging pressure valve of the hydraulic system.	Wash and adjust the pressure valve. Adjust the pressure valve at rated engine speed in any of the gears at a pressure of 1,1–1,3 MPa by screwing in the plug. Perform the control using a pressure gauge of a class notlower than 2.5 with a maximum measurement scale of 1,5–2,0 MPa. Oil pressure in GB hydraulic system at gears at engine crankshaft speed 900 to 1,800 min^{-1} and oil temperature (70 ± 3) °C shall be 1.1 to 1.3 MPa (11 to 13 kg/cm^2). The build-up of oil pressure in each gear shall be fast. Neutral pressure and upon engagement of the synchronizing brakes shall not be lower than that on the gears.
Loss of GB pump performance.	Check and adjust the pressure in accordance with the "CONTROL AND ADJUSTMENT OF OIL PRESSURE IN GEARBOX" section. Replace the pump if necessary.
Hanging pressure valve of the hydraulic system.	Wash and adjust the pressure valve. Adjust the pressure valve at rated engine speed in any of the gears at a pressure of 1,1–1,3 MPa by screwing in the plug. Perform the control using a pressure gauge of a class notlower than 2.5 with a maximum measurement scale of 1,5–2,0 MPa. Oil pressure in GB hydraulic system at gears at engine crankshaft speed 900 to 1,800 min^{-1} and oil temperature (70 ± 3) °C shall be 1.1 to 1.3 MPa (11 to 13 kg/cm^2).

Malfunction	Remedies
	The build-up of oil pressure in each gear shall be fast. Neutral pressure and upon engagement of the synchronizing brakes shall not be lower than that on the gears.
Increased noise in the area of the pressure valve when the gear shift lever is in "Neutral" position or when the drain pedal is depressed.	Check the oil level in the GB.
Constant increase in the oil level in the GB, oil ejection from the GB breather pipe, rapid overheating of the oil in the GB, loss of power (overflow of the GB with oil due to "leakage" from the hydraulic tank through the pumps seal).	Identify the pump with an "overflow", fix the malfunction by replacing or repairing.
Engine speed drop is lower than minimum upon gear shifting (the engine stalls).	
Warping discs.	Replace the discs.
External mechanical noise during mode switching.	
Wear of synchronizing brakes shoes.	Replace the synchronizing brakes shoes.
Misalignment of the drain spool control drive.	
Slow return of the drain pedal. An increase in the release force, jamming when switching N-1, 1-N when the drain pedal is depressed. Stuck drain pedal in the 1st gear.	Adjust the drain pedal drive. With a properly adjusted cable drive, the drain pedal in the pressed position shall rest against the bolt when the gear shift GS drain lever is turned fully counterclockwise. With the drain pedal released, the drain lever shall be turned clockwise up to the stop. Replace the remote control cable if necessary.
Oil leaks from drive axles.	
Increased oil level. Breather contamination.	Drain off excess oil. Wash and blow the breather.
Failure of seals.	Replace seals.
Jerks when starting off and knocking – loosening of the connecting flanges of the cardan shafts.	Replace fasteners. Tightening torque is specified in Appendix J.
Increased heating in the area of bearing assemblies of cardan shafts.	Replace the faulty cardan shaft.
Faults of GB control system	
Failure of GB control system on the stopped tractor at actuated forward mode.	Place the implement in transport position. Continue driving to the parking lot with the engaged forward mode.
Failure of GB control system on the stopped tractor at actuated reverse mode.	1 Stop the engine. 2 Remove the hatch:

Malfunction	Remedies
	- shift the operator seat to the extreme rear position; - open the protective rubber caps of the hatch cover locks; - using the wrench included in the keys of the tractor, open the locks fastening the hatch cover, rotating the wrench by ¼ turn clockwise; - open the hatch by lifting the cover using two iron edges. 3 Disconnect the rods of the three-position pneumatic cylinder and the pneumatic cylinder for engaging the forward and reverse gears from the corresponding levers B and A of the drive for controlling the couplings of the load shaft. 
	4 Switch off the reverse gear using the PVR-1 key (in the tool box) by turning the lever A counterclockwise to a fixed position.  5 Engage the parking brake. 6 To check the neutral of modes, start the engine and, engaging the first gear, make sure there is no movement.

Malfunction	Remedies
	7 Switch on the reduced mode using the PVR-1 key by turning the lever B counterclockwise to the fixed position.  8 Do not switch modes on the distribution shaft. 9 Close the hatch and start driving.
	If it is impossible to turn off the reverse gear when the engine is not running, the engine is started as follows: - engage the parking brake; - depress the drain pedal; - press 4 mode selection buttons at the same time; - start the engine. After starting the engine, turn off reverse with the PVR-1 key by turning lever A counterclockwise to a fixed position.  Then perform actions as per steps 6 to 9.
Failure of GB control system on the stopped tractor at the modes neutral.	1 Stop the engine. 2 Remove the hatch: - shift the operator seat to the extreme rear position; - open the protective rubber caps of the hatch cover locks;

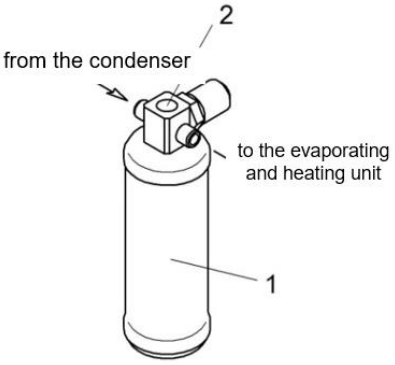
Malfunction	Remedies
	- using the wrench included in the keys of the tractor, open the locks fastening the hatch cover, rotating the wrench by ¼ turn clockwise; - open the hatch by lifting the cover using two iron edges. 3 Disconnect the rod of the pneumatic cylinder for engaging the forward gear from the lever B of the drive for controlling the couplings of the load shaft. 
	4 Engage the parking brake. 5 Start the engine. 6 Switch on the reduced mode using the PVR-1 key by turning the lever B counterclockwise to the fixed position.  7 Do not switch modes on the distribution shaft. 8 Close the hatch and start driving.
Steering hydraulic system malfunctions	
Noise during system operation, jerks during turning the tractor .	
Air suction in the hydraulic system.	Tighten the clamps in the pump suction route. Check the absence of air suction by absence of bubbles in the hydraulic tank sight glass. Pump the hydraulic system: - heat the oil to temperature 40 °C to 50 °C;

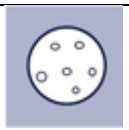
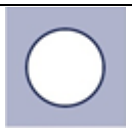
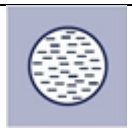
Malfunction	Remedies
	- make 8 to 10 turns of the tractor from one extreme position to another at engine crankshaft speed of 1,200 min^{-1}.
Increased force on the steering wheel when turning the tractor.	
Increased leaks in the pump.	Turn the tractor with the load axle drive off and on, if there is a difference in force on the steering wheel, replace the pump.
There is not enough oil in the hydraulic tank. Leakages by seal of the piston of one of rotation hydraulic cylinders.	Refuel the hydraulic system. The oil level shall be visible in the sight glass of the hydraulic tank. Replace the hydraulic cylinder piston seal.
Spontaneous rotation of the steering wheel, the tractor spontaneously turns.	
There is no gap between the shaft of the steering column and the end of the teeth of the dosing pump.	Remove the steering unit, measure projection of the column shaft above the flange. The projection shall be 6 to 7.5 mm. If the projection is greater than this value, replace the column.
Ingress of foreign particles under the gerotor of the hydraulic motor of the dosing pump.	Wash the gerotor, including disassembly and assembly of the dosing pump, according to the Danfoss Manual. Request the Manual from the service center or the warranty and service department of Peterburgsky Traktorny Zavod JSC. If the tractor is under warranty, the possibility of disassembly shall be agreed with the warranty and service department of Peterburgsky Traktorny Zavod JSC.
Heavy steering. Low pump performance.	Check the time of full rotation of the tractor from one extreme position to another at engine crankshaft speed of 1,300 and 1,900 min^{-1} and at the maximum possible steering wheel speed. If turn time is more than 5 s, replace the steering system pump.
Internal oil leaks through the hydraulic cylinder piston seals.	Replace the hydraulic cylinder piston seal.
The tractor does not turn, or the number of turns from one extreme position to another is more than 5 revolutions.	
Too low oil level in the hydraulic tank.	Add oil to the hydraulic tank until the level appears in the sight glass of the hydraulic tank.

Malfunction	Remedies
One of the flow amplifier spools is jammed.	Wash the flow amplifier spools, including disassembly and assembly, in accordance with the Danfoss Manual. Request the Manual from the service center or the warranty and service department of Peterburgsky Traktorny Zavod JSC. If the tractor is under warranty, the possibility of disassembly shall be agreed with the warranty and service department of Peterburgsky Traktorny Zavod JSC.
The tractor does not turn in place, the pressure at the reference point upstream the flow amplifier is below 210 bar at the stop in the extreme position	
Flow amplifier safety valve is jammed.	Replace the flow amplifier.
The steering pump is defective.	Replace the pump.
Oil in the hydraulic system is overheated.	
Too low oil level in the hydraulic tank.	Add oil, the oil level shall be visible in the sight glass.
The bypass valve is jammed.	Remove and wash the valve.
Increased (over 25°) free stroke of the steering wheel.	
Air in the hydraulic system.	Eliminate air suction and pump the hydraulic system as indicated above.
Malfunctions of working equipment control hydraulic system	
Noise during hydraulic system operation.	
Air in the hydraulic system.	Eliminate suction in the suction routes of the pumps and pump the hydraulic system: heat the oil 40 °C to 50 °C, carry out 8 to 10 cycles of lifting-lowering of the hinged device.
Changeover valve handle is not fixed in operating or floating position (changeover valve with mechanical cable control).	
Adjustment of changeover valve control cable drive is disturbed.	The cable drive shall be adjusted, the cable adjustment procedure shall be obtained in the Service Center or the Warranty and service department of Peterburgsky Traktorny Zavod JSC
Spontaneous return of changeover valve handle from operating position to neutral position (changeover valve with mechanical cable control).	
The control cable of the changeover valve is extended.	Replace the cable.

Malfunction	Remedies
The hitch is not lifted or lowered when the handle is turned on.	
The hitch hydraulic cylinder piston seal is broken.	Replace the hydraulic cylinder piston seal.
Ingress of foreign particles under one of working equipment pump valves.	Disassemble the valves without disturbing the adjustment, wash the valves, assemble and install to the normal place. Check pressure of LS valve and the pump discharge valve, adjust if necessary. The valve disassembling, assembling and procedure shall be obtained in the Service Center or the Warranty and service department of Peterburgsky Traktorny Zavod JSC.
Operation on the implement from the remote hydraulic line of the tractor does not work.	
Handle of flow controller of the changeover valve section is screwed up to stop.	Remove the controller handle counterclockwise with setting of the required flow rate of operating fluid from the pump.
Pneumatic system malfunctions	
Illuminated control lamp "Parking brake on" when the engine is running and the parking brake is off.	
Air leak in the parking brake circuit.	Eliminate air leakage.
There is no pressure in one or two air cylinders:	
The triple safety valve is defective (see Figures 1, 2).	Replace valve.
Depressurization of the system.	Check the system for tightness.
Pressure controller is often triggered when the pneumatic system is full.	
Air leaking from pneumatic connections.	Eliminate the leak by tightening the connections (locate the leak "by ear" or "by touch").
Air leakage through one of the pneumatic units.	Replace unit.
Ineffective braking or no braking when the brake pedal is fully depressed.	
Brake valve defective.	Connect the pressure gauges to the control outlet valves of the upper and lower sections of the brake valve. If, at full stroke of the brake valve lever, the pressure according to the pressure gauge readings is lower than on the instrument panel gauge, replace the brake valve.
Presence of air in the hydraulic circuit.	Check the brake fluid level. Pump the system.
Electric equipment	

Malfunction	Remedies
The electrolyte level decreases rapidly.	
Leakage of electrolyte from the storage battery cans.	Replace the battery.
The voltage controller maintains a high voltage level in the tractor electrical system.	Replace the voltage control relay or generator.
Turn signal lights do not work.	
Fuse blown out.	Repair the short circuit in the wiring, then replace the fuse.
Contact in terminal connections is broken, or wire breakage.	Restore the contact in the terminal connections, check the condition of the wiring.
The turn indicator relay is faulty.	Replace the indicator relay.
The lamps of the lights are burnt out.	Replace the lamps.
Rattling noise of sound signal.	
Fastening of the signal, cover or coil is loose.	Tighten the fasteners.
Cracks in the membrane.	Replace the signal.
The sound signal does not turn on.	
Fuse blown out.	Repair the short circuit in the wiring, then replace the fuse.
Contact in the signal button is broken.	Recover the contact.
Control equipment does not read or gives incorrect readings.	
Fuse blown out.	Repair the short circuit in the wiring, then replace the fuse.
Broken contact in the “pointer-sensor” circuit.	Check the reliability of connection of the wires to the indicators and sensors.
The pointer or sensor is faulty.	Replace the pointer or sensor.
The control lamp “Battery charging” (on the instrument panel) is on when the engine is running.	
The generator drive belt is loosely tensioned.	Tighten the belt.
Open circuit of the power supply of the excitation winding, oxidation of the transition terminals, loosening of the fastening of the terminals.	Restore continuity, clean and tighten the adapter terminals.
Hanging, wear of brushes, breakage of springs in brush holders.	Check condition of the brush assembly, replace brushes and springs if necessary.
Earth fault of the wires supplying the excitation winding of the generator.	Repair the short circuit in the power circuit of generator excitation winding.
The voltage controller lowered the level of the adjusted voltage in the tractor power network.	Replace the generator.
Air conditioning system malfunctions	

<table>
<tr><th>Malfunction</th><th colspan="4">Remedies</th></tr>
<tr><td>Inefficient air conditioner operation.</td><td colspan="4">Use compressed air to remove dust and dirt from the condenser, compressor with a coupling and air filters under the cab roof.
Turn on the air conditioner and check the refrigerant level in the receiver. If there is an insufficient level or excess of Freon, it is necessary to contact the service center.</td></tr>
<tr><td colspan="5">Checking the amount of refrigerant using the sight glass</td></tr>
<tr><td rowspan="3"> 

Air conditioning system receiver
1 – receiver;
2 – sight glass</td><td>Refrigerant status in sight glass 2</td><td>  </td><td>  </td><td>  </td></tr>
<tr><td>Description</td><td>Almost transparent fluid. Individual gas bubbles are possible.</td><td>Transparent liquid. There are no bubbles. Cold performance is insufficient.</td><td>Milky liquid. Large amount of gas bubbles.</td></tr>
<tr><td>State of the system</td><td>The system is correct.</td><td>The system may have been refilled.Contact the service center.</td><td>The amount of refrigerant is insufficient. Contact the service center.</td></tr>
<tr><td colspan="2">The air conditioner does not turn on.</td><td colspan="3"></td></tr>
<tr><td colspan="2">Damage to electrical wiring.</td><td colspan="3">Check the wiring harness contacts.</td></tr>
<tr><td colspan="2">Fuse defect.</td><td colspan="3">Replace the fuse.</td></tr>
<tr><td colspan="2">Low pressure in the system.</td><td colspan="3">Check pressure. If necessary, check the system for leaks and top up the system.</td></tr>
<tr><td colspan="2">Excessive pressure in the system.</td><td colspan="3">Check condition of the condenser, if it is clogged, blow it out with compressed air.</td></tr>
<tr><td colspan="2">The air conditioner turns on and switches to cyclical operation with an operation cycle 0.5 to 1.0 s.</td><td colspan="3">If the temperature in the cab is high, the fan performance may be low.
Check pressure in the system (it may be overcharged) and, if necessary, bleed off excess refrigerant.
Check air filters and replace if necessary.</td></tr>
<tr><td colspan="2">The air conditioner turns on and switches to cyclical operation with an operation cycle from 5 s.</td><td colspan="3">If the temperature in the cab is low, then the evaporator overcooling protection is triggered, which is not a malfunction.
Check the fan performance (replace if necessary).</td></tr>
<tr><td colspan="2">Loud compressor noises.</td><td colspan="3"></td></tr>
<tr><td colspan="2">Ball bearing defect.</td><td colspan="3">Replace compressor.</td></tr>
</table>

Malfunction	Remedies
Defect of the solenoid clutch.	**Replace the clutch.**
Wedge belt noises.	The belt is worn out, replace it.
N o t e – Troubleshooting works **in bold**shall be carried out by certified technicians only.	

13 PROCEDURE FOR SUBMISSION OF CLAIMS

1 If a failure or malfunction is detected and there are no violations set forth in item 2, the consumer is obliged to call a representative of the Service Center servicing the machinery in your region (send a copy of the failure message to the manufacturer) in order to determine the cause of the defect.

Manufacturer's address:

47, Stachek Ave, letter AB, room 615,

St. Petersburg, Russia, 198097

Peterburgsky Traktorny Zavod JSC

Tel./fax (812) 302-62-77

E-mail: garant-sptz@sptz.kzgroup.ru

The addresses of the Service Centers are specified in the tractor service book and on the website of Peterburgsky Traktorny ZavodJSC.

A call from a representative of the manufacturer and complaints about the quality of the tractor shall be sent through the enterprise (organization) that sold (supplied) the tractor and has a contract with the manufacturer.

2 Messages about failures, malfunctions and quality claims detected during the warranty period are not sent to the manufacturer in the following cases:

– in case of violation of the rules of operation, transportation and storage set out in the Operation Manual and GOSTs, if this was the reason for the failure;

– when a failure or malfunction is eliminated by replacing the tractor components from the individual set of spare parts attached to each tractor;

– when disassembling and repairing the tractor before the arrival of the manufacturer's representative within the specified time, if as a result of this it became impossible to establish the reason for the failure.

3 Messages about the engine failure or malfunction (except for tractors in Premium configuration) shall be sent in addition to the first address:

– **for engines produced by AutodieselPJSC:**

to the address of the regional service center of Autodiesel PJSC and to the address of AutodieselPJSC:

75, Oktyabrya Ave, Yaroslavl, 150040

AutodieselPJSC

Fax (4852) 58-81-28; E-mail: garantia@adzl.ru

– **for engines produced by Tutaev Motor PlantPJSC:**

to the address of Tutaev Motor PlantPJSC:

1, Stroiteley Str., Yaroslavl Region, Tutaev, 152300

Tutaev Motor PlantPJSC

Tel. (48533) 2-35-65; E-mail: OGO721@mail.ru

4 The failure or malfunction message shall include:

– serial number of the tractor and engine, and motor hours;

– the nature and external manifestation of the failure or malfunction;

– exact address of the consumer.

ATTENTION! THIS PROCEDURE FOR CLAIMING A MALFUNCTION AND CONSIDERING COMPLAINTS IS VALID ONLY IN THE TERRITORY OF THE RUSSIAN FEDERATION. COMPLIANCE WITH THIS PROCEDURE GUARANTEES THE CONSUMER PROMPT DECISION-MAKING TO IDENTIFY THE CAUSES AND ELIMINATE FAILURES AND COMMENTS ON THE TRACTOR

Appendix A

(recommended)

List of oils and lubricants used

During operation it is permitted to fill the tractor systems and lubricate the mechanisms with the following oils and lubricants given in the table below:

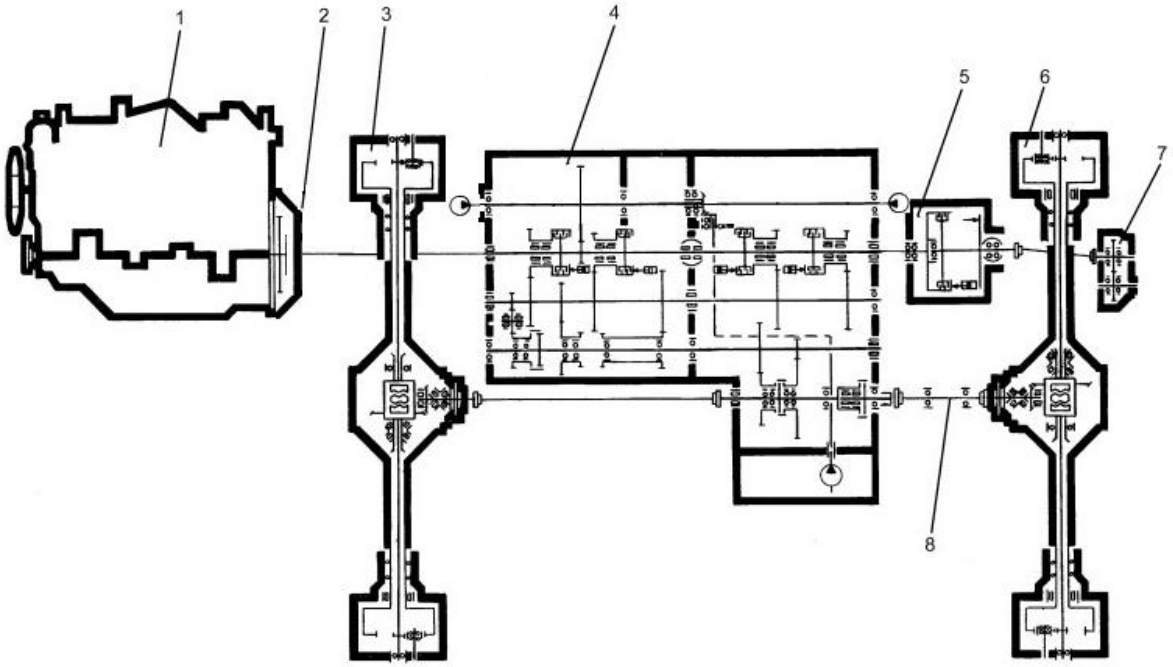
Name of lubrication points	Description, brand and designation of the standard for lubricants and fluids	Filling and lubrication volume	Note
ICE			
Engine lubrication system	According to the engine Operation Manual		
HYDRAULIC SYSTEM			
Hitch and steering hydraulic system	**HLP and HVLP liquids as per DIN 51524 Part of 2 and 3** Compliance specifications: ASTM D6158 Standard Requirements for Mineral Hydraulic Oils; ISO 1158 Hydraulic Fluids; ISO 1158 Hydraulic Fluids-Cont'd Viscosity classification (according to ISO) DIN 2909-2004 GOST 17479.3-85/ISO 3448 G-Special Power HVLP-32; Gazpromneft Hydraulic Nord-32; Rosneft Gidrotec LT 32; Shell Tellus S4VX 32; Total EQUIVIS ZS 32; Total AZOLLA ZS 32; RWX-Hydraulic S ForseHV-ZF 32	165 l – primary filling (155 ± 5) l – secondary filling of the hydraulic system during change	Filling of operating fluid is carried out using a filtering system (unit) with filtration degree of 10 μm. The working fluid shall have a purity class 20/18/15 as per ISO 4406 or class 13 as per GOST 17216-2001. Use the working fluid according to viscosity characteristics corresponding to the specified viscosity class.
Pins of hydraulic cylinders of the hitch and steering hydraulic system	**Plastic lubricants** ITMOL-150N grease TU BY 100029077.005-2006; Grease No. 158 TU 38.101320-77	0.05 l	Feed the lubricant until fresh lubricant appears from the gaps.

Name of lubrication points	Description, brand and designation of the standard for lubricants and fluids	Filling and lubrication volume	Note
TRANSMISSION			
Housings of drive gears of the drive axles	**Gear oils** Rosneft Kinetic Hypoid API GL-5, SAE 75W-90, 80W-90, 85W-90; Gazpromneft API GL-5, SAE 75W-90, 80W-90; G-Truck API GL-5, SAE 80W-90, 85W-90; Kirovets Reducer Lux API GL-5, SAE 80W-90	24 l for T400 series axles; 10 l for axles by PZM LLC	
Housings of final drives of the drive axles		11 l for T400 series axles; 5 l for 750 axles by PZM LLC; 6 l for 751/755 axles by PZM LLC	
Supports of operating brakes cams Brake lever	**Plastic lubricants** ITMOL-150N grease TU BY 100029077.005-2006; Grease No. 158 TU 38.101320-77	0.05 l	For drum type brakes
Note – The oils above: - use SAE 80W-90 viscosity class at ambient air temperatures minus 26 °C to plus 35 C; - use SAE 75W-90 viscosity class at ambient air temperatures minus 40 °C to plus 35 C; - use SAE 85W-90 viscosity class at ambient air temperatures minus 12 °C to plus 45 C.			
Gearbox hydraulic system	**Multi-purpose tractor gear oils:** G-Special UTTO SAE 10W-30; Rosneft Kinetic UTTO SAE 10W-30 **Gear and hydraulic oils TO-4:** G-Special TO-4 SAE 10W, 30, 50; Rosneft Kinetic Catran TO-4 SAE 10W, 30, 50	38 l with PTOM; 37 l without PTOM	Oil change after running-in is not required
Support of vertical rollers for switching GB modes	**Plastic lubricants:** ITMOL-150N grease TU BY 100029077.005-2006; Grease No. 158 TU 38.101320-77	0.025 l	Feed the lubricant until fresh lubricant appears from the gaps.
Note – The oils above: - use SAE 10W-30 viscosity class at ambient air temperatures minus 25 °C to plus 35 C; - use SAE 10W viscosity class at ambient air temperatures minus 40 °C to plus 10 C; - use SAE 30 viscosity class at ambient air temperatures minus 10 °C to plus 30 C; - use SAE 50 viscosity class at ambient air temperatures minus 5 °C to plus 50 C.			

Name of lubrication points	Description, brand and designation of the standard for lubricants and fluids	Filling and lubrication volume	Note
Splined joints of cardan shafts	**Plastic lubricants:** ITMOL-150N grease TU BY 100029077.005-2006; Grease No. 158 TU 38.101320-77	0.1 l	Greasing after run-in is required. Gun-grease if an oil pot is available. Gun-grease until the lubricant begins to escape through the seals. If an oil pot is unavailable, grease is not required (Rilsan self-lubricating polymer coating is used).
HITCH AND RUNNING STRUCTURES			
Axles of the frame vertical hinge	**Impregnating lubricants:** Loctite 8103 grease	0.3 l	
Horizontal frame hinge	**Plastic lubricants:** ITMOL-150N grease TU BY 100029077.005-2006; Grease No. 158 TU 38.101320-77	2.8 l	
Spring eyes	**Plastic lubricants:** ITMOL-150N grease TU BY 100029077.005-2006; Grease No. 158 TU 38.101320-77	0.06 l	
DRAWBAR AND HINGED DEVICES			
Shaft supports of the main levers of the hitch	**Plastic lubricants:** ITMOL-150N grease TU BY 100029077.005-2006; Grease No. 158 TU 38.101320-77	0.05 l	

Appendix B
(recommended)

Transmission kinematic diagram

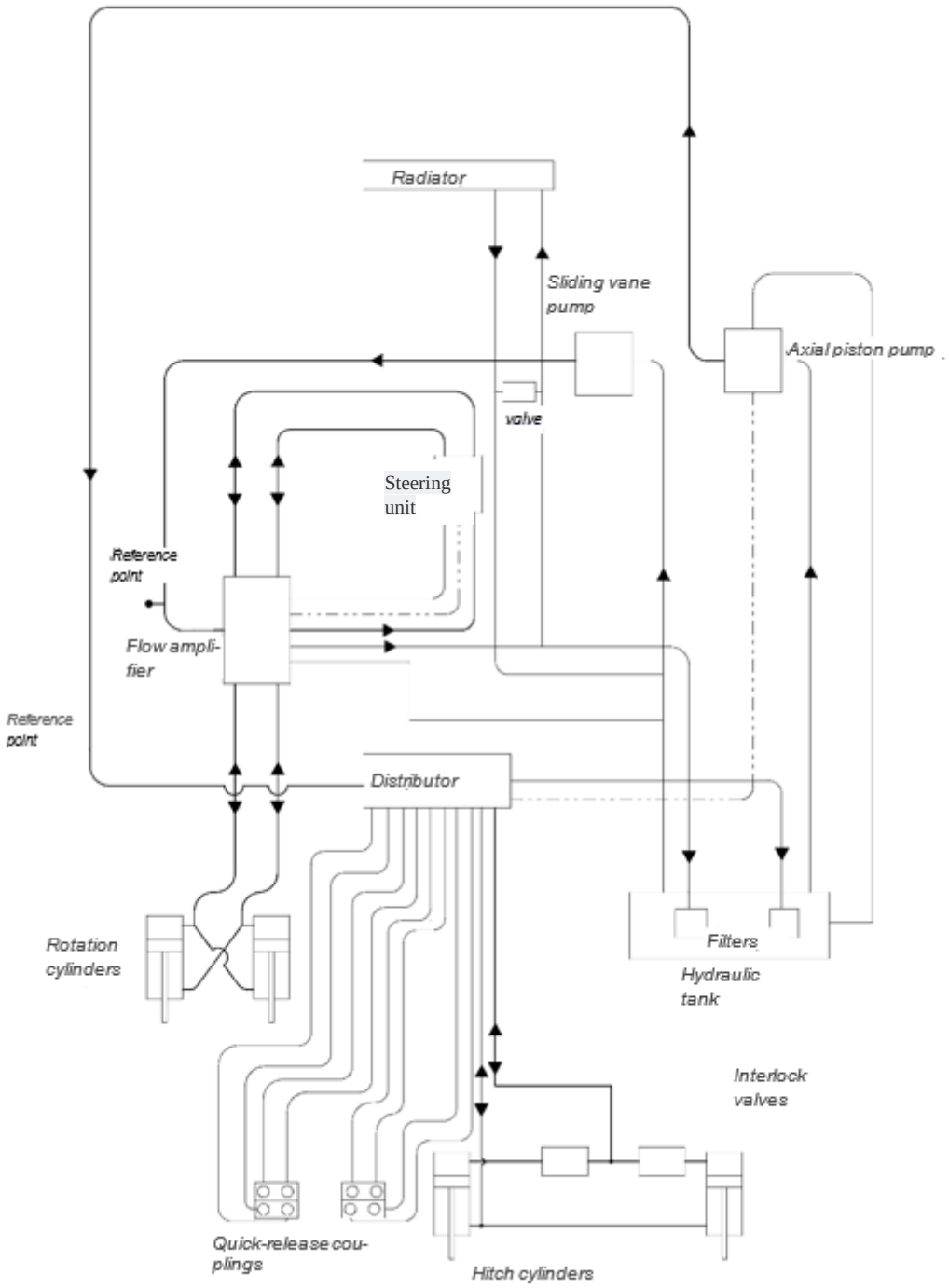


1 – ICE; *2* – semi-rigid coupling; *3* – front drive axle; *4* – gearbox;
5 – PTOM coupling; *6* – rear drive axle; *7* – PTOM gearbox;
8 – intermediate support

Appendix C

(recommended)

Hydraulic diagram of steering and working equipment control systems



Appendix D

(recommended)

List of M230 fault codes

N	KWP	FS	BC	Name	S	Conditions of occurrence	Status	SPN	FMI	FF
3	P0107	FS2.2	12	Boost pressure sensor – ground fault	L	Sensor ADC < C158	YELLOW	106	4	+
4	P0108	FS2.2	12	Boost pressure sensor – short circuit on the vehicle network	H	Sensor ADC > C159	YELLOW	106	3	+
7	P0122	FS1.5	27	HPFP position sensor – ground fault	L	Sensor ADC < C152	YELLOW	51	4	+
8	P0123	FS1.5	27	HPFP position sensor – short circuit on the vehicle network	H	Sensor ADC > C153	YELLOW	51	3	+
9	P0112	FS1.3	31	Air temperature sensor – ground fault	L	Sensor ADC < C143	YELLOW	105	4	-
10	P0113	FS1.3	31	Air temperature sensor – short circuit on the vehicle network	H	Sensor ADC > C144	YELLOW	105	3	-
11*	P0606	FS2.7	29	Control unit error	U	ADC is not ready	YELLOW	0	-	+
17	P0117	FS1.4	36	Water temperature sensor – ground fault	L	Sensor ADC < C140	YELLOW	110	4	-
18	P0118	FS1.4	36	Water temperature sensor – short circuit on the vehicle network	H	Sensor ADC > C141	YELLOW	110	3	-
19	P0603	FS2.6	29	Control unit non-volatile memory error	U	EEPROM read error	YELLOW	0	-	-
22	P0336	FS1.0	15	Crankshaft timing sensor break	NS	N1 = 0 rpm, N2 > 100 rpm	YELLOW	190	2	+
30	P0219	FS7.6	42	Exceeding of allowable engine rpm	U	N > _C4_	YELLOW	74	11	+
31	P0217	FS7.7	-	Engine overheating	U	Tw > _C6_ and no sensor fault	YELLOW	110	11	+
33	P1230	FS4.7	19	Primary circuit of main relay – no signal	NS	Relay driver diagnostics	YELLOW	0	-	-
34	P1230	FS4.7	19	Primary circuit of main relay – ground fault	L		YELLOW	0	-	-
35	P1230	FS4.7	19	Primary circuit of the main relay – short circuit on the vehicle network	H		YELLOW	0	-	-
40	P0650	FS4.1	-	Diagnostic lamp – ground fault	L	Driver diagnostics	YELLOW	0	-	-
41	P0650	FS4.1	-	Diagnostic lamp – short circuit on the vehicle network	H	Driver diagnostics	YELLOW	0	-	-
46	P0563	FS2.0	54	High power voltage	H	U > C102	YELLOW	158	3	
47	P0562	FS2.0	-	Low power voltage	L	U < C101	YELLOW	158	4	
67	P0605	FS2.6	29	Control unit ROM error	U	Checksum error	YELLOW	0	-	-
72	P0006	FS4.4	-	Fuel cut-off valve – ground fault	L	Driver diagnostics	YELLOW	0	-	-
73	P0007	FS4.4	-	Fuel cut-off valve – short circuit on the vehicle network	H	Driver diagnostics	YELLOW	0	-	-
74	P0480	FS4.2	-	Primary circuit of fan relay – no signal	NS	Driver diagnostics	YELLOW	977	2	-
75	P0480	FS4.2	-	Primary circuit of fan relay – ground fault	L	Driver diagnostics	YELLOW	977	4	-

N	KWP	FS	BC	Name	S	Conditions of occurrence	Status	SPN	FMI	FF
76	P0480	FS4.2	-	Primary circuit of fan relay – short circuit on the vehicle network	H	Driver diagnostics	YELLOW	977	3	-
92*	P0615	FS7.2	-	Starter interlock relay – no signal	NS	Driver diagnostics	YELLOW	0	-	-
93*	P0616	FS7.2	-	Starter interlock relay – ground fault	L	Driver diagnostics	YELLOW	0	-	-
102	P0115	FS1.4	37	Water temperature sensor – incorrect readings	U	There are revolutions, C182! = 0, running time > C182 a Tw < C183	YELLOW	110	11	
107	P0182	FS9.0	38	Fuel temperature sensor – ground fault	L	Sensor ADC < C146	YELLOW	174	4	-
108	P0183	FS9.0	38	Fuel temperature sensor – short circuit on the vehicle network	H	Sensor ADC > C147	YELLOW	174	3	-
140	P0227	FS9.7	11	Pedal 1 position sensor – ground fault	L	Sensor ADC < C156	YELLOW	91	4	+
141	P0228	FS9.7	11	Pedal 1 position sensor – short circuit on the vehicle network	H	Sensor ADC > C157	YELLOW	91	3	+
159	P0222	FS11.2	27	HPFP 2 position sensor – ground fault	L	Sensor ADC < C154	YELLOW	51	4	-
160	P0223	FS11.2	27	HPFP 2 position sensor – short circuit on the vehicle network	H	Sensor ADC > C155	YELLOW	51	3	-
161	P2122	FS11.3	11	Pedal 2 position sensor – ground fault	L	Sensor ADC < C162	YELLOW	91	4	
162	P2123	FS11.3	11	Pedal 2 position sensor – short circuit on the vehicle network	H	Sensor ADC > C163	YELLOW	92	3	
163	P0106	FS11.4	13	Boost pressure sensor – incorrect readings on the stopped engine	L	N=0, Pk < C235	YELLOW	106	4	+
164	P0109	FS11.4	13	Boost pressure sensor – short circuit on the vehicle network	H	If XX and N < Nxx + 50, at this time Pk>C236	YELLOW	106	3	+
168	P0298	FS11.7	-	High oil temperature	H	Toil >= C27	YELLOW	175	3	+
170	P0520	FS12.0	-	Low oil pressure	L	N > 0 within 10 s after start-up, at this time Poil < T175 (N)	YELLOW	100	4	+
171	P0197	FS12.2	-	Oil temperature sensor – ground fault	L	Sensor ADC < C149	YELLOW	175	4	-
172	P0198	FS12.2	-	Oil temperature sensor – short circuit on the vehicle network	H	Sensor ADC < C150	YELLOW	175	3	-
177	P0236	FS12.4	34	Boost pressure above normal value	H	No XX, C13 < N < C14, at this time Pk > S60* S62 + S61, upon expiration of time C24_1	YELLOW	102	3	-
178	P0523	FS12.5	-	Oil pressure sensor – short circuit on the vehicle network	H	Sensor ADC < C160	YELLOW	100	3	-
179	P0522	FS12.5	-	Oil pressure sensor – ground fault	L	Sensor ADC > C161	YELLOW	100	4	-
180	P0115	FS1.4	37	Water temperature sensor – break	NS	C141 > sensor ADC > C142	YELLOW	110	2	-
181	P0110	FS1.3	32	Air temperature sensor – break	NS	C144 > sensor ADC > C145	YELLOW	172	2	-
182	P0180	FS9.0	39	Fuel temperature sensor – break	NS	C147 > sensor ADC > C148	YELLOW	174	2	-

N	KWP	FS	BC	Name	S	Conditions of occurrence	Status	SPN	FMI	FF
183	P0195	FS12.2	-	Oil temperature sensor – break	NS	C150 > Sensor ADC > C151	YELLOW	0	-	-
184	P2100	FS12.6	21	Break in the HPFP drive circuit	NS	If there is no position sensor malfunction and the position error exceeds 1 % within 4 seconds at Ihpfp < C253	YELLOW	1083	2	+
185	P2102	FS12.6	21	Malfunction in the HPFP drive circuit	L	Ihpfp > _C252_ or Phpfp > C72	YELLOW	1083	4	-
186	P2103	FS12.6	21	Malfunction in the HPFP drive circuit	H	Driver diagnostics	YELLOW	1083	3	-
187	P0338	FS1.0		Timing sensor 1 break	H	Login status = 1	YELLOW	190	3	-
188	P0343	FS1.1		Timing sensor 2 break	H	Login status = 1	YELLOW	190	3	-
189	P0560	FS12.7	-	No power voltage from the main relay	L	With the main relay on, no power voltage	YELLOW	-	-	
193	P0236	FS12.4	34	Boost pressure below normal value	L	No XX, C13 < N < C14, at this time Pk < S60* S62 – S61, upon expiration of time C24_1	YELLOW	102	4	-
194	P0572	FS13.0	28	Brake pedal sensor – ground fault	L	4 times the speed was reset at unchanged signal from the brake sensor	YELLOW	521	4	-
195	P0573	FS13.0	28	Brake pedal sensor – short circuit on the vehicle network	H	4 times the speed was reset at unchanged signal from the brake sensor	YELLOW	521	3	-
198	P2101	FS12.4	-	Short circuit in the HPFP drive circuit	NS	Within 2 s the error of HPFP drive installation exceeds 2 %	YELLOW	1083	2	
199	P1221	FS13.2	-	Exceeding of difference in position of pedal 1 and 2 tracks	U	If there are two pedal sensor potentiometers, readings mismatch > C282	YELLOW	91	11	
200	P0405	FS5.7	-	Recirculation valve position sensor – ground fault	L	Sensor ADC < C248	YELLOW	-	-	-
201	P0406	FS5.7	-	Recirculation valve position sensor – short circuit on the vehicle network	H	Sensor ADC > C249	YELLOW	-	-	-
202	P2104	FS12.6	-	HPFP drive – calibration error	U	Drive is not set to the specified limits	YELLOW	1083	11	-
214	P0026	FS14.1	-	Emergency air valve is actuated	U	Overspeed, closing of EAV	YELLOW	2813	11	-
214	P2264	FS14.2	-	Water concentration in fuel is above the limit	U	Sensor ADC above threshold	YELLOW	97	11	

KWP		KWP fault name	FMI	FMI fault name

codes			codes	
U	0	unknown error	11	The main cause is unknown
H	1	high level	3	Voltage is higher than normal or short-circuited to plus
L	2	low level	4	Voltage is lower than normal or short-circuited to ground
SR	3	timing failure	8	Incorrect frequency or pulse width, or period
NS	4	no signal, break	2	Non-consistent, intermittent or incorrect data
HT	5	Overheating	0	The data is reliable, but it is above the normal range – the most dangerous level

Appendix E

(recommended)

Full list of M240 fault and blink codes

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
+1	P008A		-	94	1	Low pressure in fuel low pressure circuit	Sensor malfunction. Coarse fuel filter is clogged. Air suction in the system.
+2	P008B		-	94	0	High pressure in fuel low pressure circuit	Sensor malfunction. Fine fuel filter is clogged.
+3	P0107	231	1	106	4	Low level signal from boost air pressure sensor	Sensor fault, ground fault in the sensor connection circuit.
+4	P0108		1	106	3	High level signal from boost air pressure sensor	Sensor fault, short circuit to power in sensor connection circuit.
5	P0102			132	4	Low level signal from mass air flow sensor	Sensor fault, ground fault in sensor connection circuit.
6	P0103			132	3	High level signal from mass air flow sensor	Sensor fault, short circuit to power in sensor connection circuit.
+7	P0337	112		190	4	Low level signal of crankshaft position sensor CPS	Sensor fault, ground fault in sensor connection circuit.
+8	P0342	113		723	4	Low level signal of camshaft position sensor CSPS	Sensor fault, ground fault in the sensor connection circuit.
+9	P0112	234	1	105	4	Low level signal from boost air temperature sensor	Sensor fault, ground fault in sensor connection circuit.
+10	P0113		1	105	3	High level signal from boost air temperature sensor	Sensor fault, short circuit to power in sensor connection circuit.
11	P0606		-	629	12	Control unit error	Test procedure for the control unit internal components failed

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
+12	P1011		2	523613	7	Rail pressure control error	Fault in power stage circuit for control of pressure controller in the rail. High pressure pump malfunction. Faults in fuel lines.
+13	P2228	232		108	4	Low level signal from atmospheric pressure sensor	Sensor fault, ground fault in sensor connection circuit.
+14	P2229			108	3	High level signal from atmospheric pressure sensor	Sensor fault, short circuit to power in sensor connection circuit.
15	P1110		2	523470	11	Pressure relief valve error in the rail	Fault in power stage circuit for control of pressure relief valve in the rail.
16	P0168	215	3	174	16	Fuel overheating	
+17	P0117	241	1	110	4	Low level signal from coolant temperature sensor	Sensor fault, ground fault in sensor connection circuit.
+18	P0118		1	110	3	High level signal from coolant temperature sensor	Sensor fault, short circuit to power in sensor connection circuit.
19	P0603		-	520224	12	Control unit EEPROM error	EEPROM integrity test procedure failed.
20	P0610		-	520223	11	Control unit reset error	Break of the control unit power circuit or ground during the engine operation.
21	P0420		4	3050	1	Low efficiency of exhaust gas converter	Exhaust gas converter efficiency test fails.
+22	P0336	112	1	190	8	Crankshaft position sensor synchronization error	Malfunction of crankshaft position sensor, its connection circuit, magnetization or mechanical damage of timing master disk.
+23	P0335		1	190	5	Break of crankshaft position sensor	Sensor fault, break in connection circuit.
+24	P0341	113	1	723	8	Camshaft position sensor range error	
25	P0501	324	1	84	11	Vehicle speed sensor malfunction	Malfunction of speed sensor, its connection circuit.

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause

+26	P0351	114	1	723	2	Camshaft position sensor position error	Malfunction of the camshaft position sensor, its connection circuit, mechanical damage of the master disk, rotation of the master disk relative to the normal position.
+27	P0340	113	1	723	5	Signal break of camshaft position sensor	Malfunction of camshaft position sensor, its connection circuit.
+28	P0217	242	3	110	0	Engine temperature is above the emergency limit	Faults in the engine cooling system.
+29	P0127	234	3	105	0	Exceeding of emergency booster air temperature	Malfunction of air intercooler. Malfunction of booster air temperature sensor.
+30	P0219	226	3	74	0	Engine speed is above the maximum limit	Malfunctions in the engine fuel system leading to uncontrolled fuel supply to the cylinders. Incorrect gear selection in manual gearbox.
+31	P0217	242	3	110	18	Engine temperature is above the maximum limit	Faults in the engine cooling system.
+32	U0113			639	19	No communication with SCR system via CAN	J1939 network faults, SCR system faults.
33	P1230			2634	5	Break in the main relay primary circuit	Fault in main power relay control power stage circuit
34				2634	4	Ground fault of the main relay primary circuit	
35				2634	3	Short circuit to power of the main relay primary circuit	
36	P0645			1351	5	Break of the air conditioner relay primary circuit	Fault in conditioner relay control power stage circuit.
37	P0646			1351	4	Ground fault of the air conditioner relay primary circuit	
38	P0647			1351	3	Short circuit to power of the air conditioner relay primary circuit	
39	P0650			1213	5	Break in the circuit of the YEL fault indication lamp	Fault in power stage circuit for control of fault indication lamp.
40				1213	4	Ground fault in the circuit of the YEL fault indication lamp	
41				1213	3	Short circuit to power of the circuit of the YEL fault indication lamp	

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
+42	P2541		1	94	4	Low level signal from fuel pressure sensor in low pressure circuit	Sensor fault, ground fault in sensor connection circuit.
+43	P2542		1	94	3	High level signal from fuel pressure sensor in low pressure circuit	Sensor fault, short circuit to power in sensor connection circuit.
+44	P0121	221	1	91	13	Incorrect signal from the pedal position sensor (track 1)	Sensor fault, operator's error during calibration of the throttle pedal position sensor.
+45	P0221	221	1	29	13	Incorrect signal from the pedal position sensor (track 2)	Sensor fault, operator's error during calibration of the throttle pedal position sensor
46	P0562		1	158	1	Low onboard voltage	Malfunction in the vehicle network power circuits, discharged battery.
47	P0563		1	158	0	High onboard voltage	Malfunction in the vehicle network power circuits.
+48	P0201	141	2	651	5	Break of the cylinder nozzle 1	Malfunction of the solenoid valve of the first cylinder fuel fuel nozzle, malfunction in the power stage circuit of nozzle control
+49	P0261		2	651	4	Ground fault of the cylinder nozzle 1	
+50	P0262		2	651	3	Short circuit to power of the cylinder nozzle 1	
+51	P0202	142	2	652	5	Break of the cylinder nozzle *2*	Malfunction of the solenoid valve of the second cylinder fuel nozzle, malfunction in the power stage circuit of nozzle control
+52	P0264		2	652	4	Ground fault of the cylinder nozzle 2	
+53	P0265		2	652	3	Short circuit to power of the cylinder nozzle 2	
+54	P0203	143	2	653	5	Break of the cylinder nozzle 3	Malfunction of the solenoid valve of the third cylinder fuel nozzle, malfunction in the power stage circuit of nozzle control
+55	P0267		2	653	4	Ground fault of the cylinder nozzle 3	
+56	P0268		2	653	3	Short circuit to power of the cylinder nozzle 3	
+57	P0204	144	2	654	5	Break of the cylinder nozzle 4	Malfunction of the solenoid valve of the fourth cylinder fuel nozzle, malfunction in the power stage circuit of nozzle control
+58	P0270		2	654	4	Ground fault of the cylinder nozzle 4	
+59	P0271		2	654	3	Short circuit to power of the cylinder nozzle 4	
60	P0403		4	2791	5	EGR valve circuit break	Fault in power stage circuit

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
61	P0489		4	2791	4	Ground fault of the EGR valve circuit	for control of exhaust gas recirculation valve.
62	P0490		4	2791	3	Short circuit to power of EGR valve circuit	
63	P1251		2	523470	5	Break in pressure relief valve circuit	Fault in power stage circuit for control of pressure relief valve in the rail.
64	P1253		2	523470	4	Ground fault of pressure relief valve circuit	
65	P1254		2	523470	3	Short circuit to power of pressure relief valve circuit	
66	P0604		-	630	12	Control unit RAM error	Control unit RAM integrity test procedure failed.
67	P0605		-	628	12	Control unit ROM error	Control unit ROM integrity test procedure failed.
68	P0045		2	1188	5	Break in booster pressure controller valve circuit	Fault in power stage circuitfor control of booster pressure controller valve. If an external booster controller is used – it may be a break in the CAN network, or the controller may be faulty.
69	P0047		2	1188	4	Ground fault of booster pressure controller valve circuit	
70	P0048		2	1188	3	Short circuit to power of booster pressure controller valve circuit	
+71	P0090		2	523613	5	Break in pressure controller valve circuit in the rail	Fault in power stage circuit for control of pressure controller in the rail.
+72	P0091		2	523613	4	Ground fault of pressure controller valve circuit in the rail	
+73	P0092		2	523613	3	Short circuit to power of pressure controller valve circuit in the rail	
+74	P0480		-	1071	5	Break in the cooling fan relay primary circuit	Fault in cooling fan relay control power stage circuit. In case of external fan control unit – it may be a break in the CAN network, or the controller may be faulty.
+75	P0691		-	1071	4	Ground fault of the cooling fan relay primary circuit	
+76	P0692		-	1071	3	Short circuit to power of the cooling fan relay primary circuit	
77	P0654			645	5	Tachometer signal circuit break	Malfunction in tachometer control circuit.
78				645	4	Ground fault of tachometer signal circuit	
79				645	3	Short circuit to power of tachometer signal circuit	

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
80	P2280			107	16	Engine air filter clogging	
81	P1197			98	4	Low level signal in oil level sensor circuit	
82	P1198			98	3	High level signal in oil level sensor circuit	
83	P1524			100	0	High engine oil pressure	Oil pressure sensor readings are higher than the limit values. Malfunction in engine lubrication system. Malfunction of oil pressure sensor.
84	P0046			1188	7	Booster pressure controller error	Malfunction of turbine, actuator of booster pressure controller, leak in air manifold.
85	P1021		2	523470	16	Opening of emergency valve in the rail	Malfunction of MEU pressure controller, malfunction of emergency valve in the rail.
86	P1022		2	523470	0	Limits of emergency valve opening counters are exceeded.	Limits of operating time counters or number of emergency valve opening in the rail are exceeded.
87	P0863			639	19	No communication with A/T controller	Break in CAN-H or CAN-L line with transmission controller. Malfunction of transmission controller.
+88	P2135	221		91	2	Mismatch between two pedal sensor tracks	Position of the throttle pedal calculated by two tracks is significantly different. Malfunction in one of pedal position sensor tracks.
89	P1607			1136	12	Malfunction of controller temperature sensor	
90	P0532		1	523601	4	Low level signal from refrigerant pressure sensor	Sensor fault, ground fault in sensor connection circuit.
91	P0533		1	523601	3	High level signal from refrigerant pressure sensor	Sensor fault, short circuit to power in sensor connection circuit.
92	P0615			1321	5	Break in the starter interlock relay primary circuit	Fault in starter relay control power stage circuit.
93	P0616			1321	4	Ground fault of starter interlock relay primary circuit	

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause

94	P0617			1321	3	Short circuit to power of starter interlock relay primary circuit	
+95	P1561	131		3509	31	Malfunction of 5V power supply of sensors 1	Faults in the sensor power supply, short circuits in the sensor connection circuits.
+96	P1562			3510	31	Malfunction of 5V power supply of sensors 2	
+97	P1563			3511	31	Malfunction of 5V power supply of sensors 3	
+93	P1564			3512	31	Malfunction of 5V power supply of sensors 4	
+99	P1565			3513	31	Malfunction of 5V power supply of sensors 5	
+100	P1567			3514	31	Malfunction of 12V power supply of sensors	
101	P0105		1	106	2	Incorrect charge air pressure sensor signal	
+102	P0116		1	110	2	Incorrect signal from coolant temperature sensor	Coolant temperature sensor readings differ significantly from the design model of the engine temperature.
103			3	173	0	Exhaust gas temperature is above the emergency limit	
104			3	175	0	Oil temperature is above the emergency limit	
105			3	174	0	Fuel temperature is above the emergency limit	
106	P0717			103	5	Turbine speed sensor break	Malfunction of sensor, turbine speed sensor connection circuit.
107	P0182	215	1	174	4	Low level signal from fuel temperature sensor	Sensor fault, ground fault in sensor connection circuit.
108	P0183		1	174	3	High level signal from fuel temperature sensor	Sensor fault, short circuit to power in sensor connection circuit.
109	P0580		-	596	4	Low level signal from the CC control handle	
110	P0581		-	596	3	High level signal from the CC control handle	
+111	P0205	145	2	655	5	Break of the cylinder nozzle 5	Malfunction of the solenoid valve of the fifth cylinder fuel injector, malfunction in the power stage circuit of nozzle control.
+112	P0273		2	655	4	Ground fault of the cylinder nozzle 5	
+113	P0274		2	655	3	Short circuit to power of the cylinder nozzle 5	

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
+114	P0206	146	2	656	5	Break of the cylinder nozzle 6	Malfunction of the solenoid valve of the sixth cylinder fuel nozzle, malfunction in the power stage circuit of nozzle control.
+115	P0276		2	656	4	Ground fault of the cylinder nozzle 6	
+116	P0277		2	656	3	Short circuit to power of the cylinder nozzle 6	
+117	P0207	147	2	657	5	Break of the cylinder nozzle 7	Malfunction of the solenoid valve of the seventh cylinder fuel nozzle, malfunction in the power stage circuit of nozzle control.
+118	P0279		2	657	4	Ground fault of the cylinder nozzle 7	
+119	P0280		2	657	3	Short circuit to power of the cylinder nozzle 7	
+120	P0208	148	2	658	5	Break of the cylinder nozzle 8	Malfunction of the solenoid valve of the eighth cylinder fuel injector, malfunction in the power stage circuit of nozzle control.
+121	P0282		2	658	4	Ground fault of the cylinder nozzle 8	
+122	P0283		2	658	3	Short circuit to power of the cylinder nozzle 8	
123	P0627		-	1347	5	Break in the fuel pump relay primary circuit	Fault in fuel pump relay control power stage circuit
124	P0628		-	1347	4	Ground fault of fuel pump relay primary circuit	
125	P0629		-	1347	3	Short circuit to power of fuel pump relay primary circuit	
126	P2269	211		97	11	Water concentration in fuel is above the limit	Water detected in the fuel. Drain water from the coarse fuel filter
127	P2266			97	4	Low level signal of water-in-fuel sensor	Malfunction in sensor connection circuit, sensor fault.
128	P2267			97	3	High level signal of water-in-fuel sensor	
+129	P1421		4	520296	11	Exhaust gas converter efficiency below toxicity threshold	
+130	P1422		4	520297	11	Exhaust gas converter efficiency below moment limit threshold	
131	P0380			729	5	Break in the air heating relay primary circuit	Fault in air heating relay control power stage circuit.
132				729	4	Ground fault of air heating relay primary circuit	
133				729	3	Short circuit to power of air heating relay primary circuit	

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
134	P1680			1188	5	Break in the primary circuit of the exhaust gas bleed valve No. 1	Fault in the control power stage circuit of exhaust gas bleed valve No. 1.
135				1188	4	Ground fault of the primary circuit of the exhaust gas bleed valve No. 1	
136				1188	3	Short circuit to power of the primary circuit of the exhaust gas bleed valve No. 1	
137	P1681			1189	5	Break in the primary circuit of the exhaust gas bleed valve No. 2	Fault in the control power stage circuit of exhaust gas bleed valve No. 2.
138				1189	4	Ground fault of the primary circuit of the exhaust gas bleed valve No. 2	
139				1189	3	Short circuit to power of the primary circuit of the exhaust gas bleed valve No. 2	
+140	P0122	221	1	91	4	Low level signal from pedal 1 position sensor	Sensor fault, ground fault in sensor connection circuit.
+141	P0123	221	1	91	3	High level signal from pedal 1 position sensor	Sensor fault, short circuit to power in sensor connection circuit.
142	P2428			1137	15	Overheating via EGT channel No. 1	Exceeding by the readings of the EG temperature sensor No. 1 of limit values. Fault in fuel equipment, cooling system fault. Malfunction of EG temperature sensor No. 1.
143	P2429			1138	15	Overheating via EGT channel No. 2	Exceeding by the readings of the EG temperature sensor No. 2 of limit values. Fault in fuel equipment, cooling system fault. Malfunction of EG temperature sensor No. 2.
+144	P1336			190	12	CPS resistance out of allowable range	Sensor fault or malfunction in sensor connection circuit
+145	P1341			723	12	CSPS resistance out of allowable range	Sensor fault or malfunction in sensor connection circuit
146	P0545		1	1137	4	Low level signal of EGT sensor No. 1	Sensor fault, ground fault in sensor connection circuit.

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
147	P0546		1	1137	3	High level signal of EGT sensor No. 1	Sensor fault, short circuit to power in sensor connection circuit.
148	P0548		1	1138	4	Low level signal of EGT sensor No. 2	Sensor fault, ground fault in sensor connection circuit.
149	P0549		1	1138	3	High level signal of EGT sensor No. 2	Sensor fault, short circuit to power in sensor connection circuit.
+150	U0119			1119	19	No communication with NOx sensor via CAN	Break in the J1939 network. NOx sensor malfunction.
155	P0520			100	19	Oil pressure sensor – no signal via CAN	Break in the J1939 network. Missing the required message in the network. Sensor malfunction.
156	P0070			171	19	Ambient temperature sensor – no signal via CAN	Break in the J1939 network. Missing the required message in the network. Sensor malfunction.
157	P2226			108	19	Atmospheric pressure sensor – no signal via CAN	Break in the J1939 network. Missing the required message in the network. Sensor malfunction.
158	U0300		-	520225	11	Mismatch error of software version and calibration data version	
159	P0072			171	4	Low level signal from ambient temperature sensor	
160	P0073			171	3	High level signal from ambient temperature sensor	
+161	P0222	221	1	29	4	Low level signal from pedal 2 position sensor	Sensor fault, ground fault in sensor connection circuit.
+162	P0223		1	29	3	High level signal from pedal 2 position sensor	Sensor fault, short circuit to power in sensor connection circuit.

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
+163	P0069			106	13	Mismatch between the header pressure sensor and the atmospheric pressure sensor	Air pressure sensor readings in the manifold differ significantly from atmospheric pressure sensor readings Malfunction in one of the air pressure sensors.
164	P2080			1137	13	Mismatch between readings of the exhaust gas temperature sensor and the EG temperature design value	Exhaust gas temperature sensor readings differ significantly from the design value. Fault of EGT sensor is probable.
165	P012G	221	1	29	5	Pedal 1 position sensor malfunction	Break in the sensor circuit, break in the j1939 network (if an external sensor is used), sensor fault
166	P0220	221	1	91	5	Pedal 2 position sensor malfunction	Break in the sensor circuit, break in the j1939 network (if an external sensor is used), sensor fault
167	P1690		3	1318	14	Large difference between the EGT sensors No. 1 and No. 2	Exceeding the limit difference in readings of EG temperature sensors of the engine half-units. Fault in fuel equipment, cooling system fault. Malfunction in one of EG temperature sensors No.
163	P0298	245	3	175	16	Engine oil overheating	Oil temperature sensor readings are higher than the limit values. Malfunction of the engine lubrication system, malfunction of cooling system. Malfunction of oil temperature sensor.
169	P1573			571	3	High level signal of the engine brake pedal	
170	P0524	243	3	100	1	Low engine oil pressure	Oil pressure sensor readings below limit values. Malfunction in engine lubrication system. Malfunction of oil pressure sensor.
171	P0197	244	1	175	4	Low level signal from oil temperature sensor	Sensor fault, ground fault in the sensor connection circuit.
172	P0198		1	175	3	High level signal from oil temperature sensor	Sensor fault, short circuit to power in sensor connection circuit.

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
173	P0215			1072	5	Break in the engine brake primary circuit	Fault in power stage circuit of engine brake valve control.
174				1072	4	Ground fault of the engine brake primary circuit	
175				1072	3	Short circuit to power of the engine brake primary circuit	
176	P0297		3	84	0	Exceeding the permissible speed of the vehicle	
+177	P0234	231	3	102	0	Exceeding the permissible booster pressure	
178	P0522	243	1	100	4	Low level signal from oil pressure sensor	Sensor fault, ground fault in the sensor connection circuit.
179	P0523		1	100	3	High level signal from oil pressure sensor	Sensor fault, short circuit to power in sensor connection circuit.
+180	P0115	241	1	110	5	Break in coolant temperature sensor	Sensor fault, break in sensor connection circuit.
+181	P0110	234	1	105	5	Break in booster air temperature sensor	Sensor fault, break in sensor connection circuit.
182	P0180	215	1	174	5	Break in fuel temperature sensor	Sensor fault, break in sensor connection circuit.
183	P0195	244	1	175	5	Break in oil temperature sensor	Sensor fault, break in sensor connection circuit.
184	P2556			111	5	Break in coolant level sensor signal	Sensor fault, break in sensor connection circuit.
185	P2558			111	4	Low level signal of coolant level sensor	Sensor fault, ground fault in sensor connection circuit.
186	P2559			111	3	High level signal of coolant level sensor	Sensor fault, short circuit to power in sensor connection circuit.
+187	P0338	112		190	3	High level signal of crankshaft position sensor	Sensor fault, short circuit to power in the sensor connection circuit
+188	P0343	113		723	3	High level signal of camshaft position sensor	Sensor fault, short circuit to power in the sensor connection circuit

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause

+189	P0560			168	1	Power supply malfunction	
190	P0500	324	1	84	5	Break in the vehicle speed sensor circuit	Sensor malfunction. Break, ground fault or short circuit to power in sensor connection circuit.
191	P0502		1	84	4	Low level signal of the vehicle speed sensor	
192	P0503		1	84	3	High level signal of the vehicle speed sensor	
+193	P0299	231	3	102	1	Booster pressure is significantly lower than permissible	
194	P0192	133	2	157	4	Low level signal from fuel pressure sensor in the rail	Sensor fault, ground fault in sensor connection circuit.
195	P0193		2	157	3	High level signal from fuel pressure sensor in the rail	Sensor fault, short circuit to power in sensor connection circuit.
196	P0087	253	2	157	1	Low fuel pressure in the rail	Malfunction of fuel pressure controller valve in the rail. Fuel pump malfunction
197	P0088		2	157	0	High fuel pressure in the rail	
198	P1196		2	98	1	Low oil level	Engine oil leak. Sensor malfunction. It is necessary to check the oil level visually.
+199	P0263			651	31	Malfunction of power circuit of the 1st cylinder nozzle	Test procedure for the unit internal components in the nozzle control circuits failed. Malfunction (short circuit) in fuel nozzles connection circuits.
+200	P0266			652	31	Malfunction of power circuit of the 2nd cylinder nozzle	
+201	P0269			653	31	Malfunction of power circuit of the 3rd cylinder nozzle	
+202	P0272			654	31	Malfunction of power circuit of the 4th cylinder nozzle	
+203	P0275			655	31	Malfunction of power circuit of the 5th cylinder nozzle	
+204	P0278			656	31	Malfunction of power circuit of the 6th cylinder nozzle	
+205	P0281			657	31	Malfunction of power circuit of the 7th cylinder nozzle	
+206	P0284			658	31	Malfunction of power circuit of the 8th cylinder nozzle	
207	P1691			520194	5	Break in the CC lamp circuit	Fault in power stage circuit for control of cruise control indication lamp.
208				520194	4	Ground fault of the CC lamp circuit	
209				520194	3	Short circuit to power of the CC lamp circuit	
210	P1692			1081	5	Break in cold start lamp circuit	Fault in power stage circuit.

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause

211				1081	4	Ground fault of cold start lamp circuit	Short circuit to power of the circuit of the RED fault indication lamp.
212				1081	3	Short circuit to power of cold start lamp circuit	
213	P1693			520195	5	Break in the circuit of the RED fault indication lamp	Fault in power stage circuit for control of fault indication lamp.
214				520195	4	Ground fault in the circuit of the RED fault indication lamp	
215				520195	3	Short circuit to power of the circuit of the RED fault indication lamp	
216	P1694			520196	5	EAV circuit break	Fault in EAV control power stage circuit.
217				520196	4	Ground fault of EAV circuit	
218				520196	3	Short circuit to power of EAV circuit	
219	P1695			520207	5	Break in fuel heater circuit	Fault in fuel heater control power stage circuit.
220				520207	4	Ground fault of fuel heater circuit	
221				520207	3	Short circuit to power of fuel heater circuit	
222	P1696			520199	12	Malfunction of actuator driver power supply	
223	P0251			523612	5	Break in pressure controller valve power circuit	
224	P0253			523612	4	Ground fault of pressure controller valve power circuit	
225	P0254			523612	3	Short circuit to power of pressure controller valve power circuit	
226	P1698			520208	5	Break in the devices switched power circuit	
227				520208	4	Ground fault of the devices switched power circuit	
228				520208	3	Short circuit to power of the devices switched power circuit	
229	P1571			520222	31	Incorrect sequence of nozzle channels actuation	
230	P0405		1	27	4	Low level signal from EGR valve position sensor	

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
231	P0406		1	27	3	High level signal from EGR valve position sensor	
232	P1699			677	5	Starter relay power circuit break	
233				677	4	Ground fault of starter relay power circuit	
234				677	3	Short circuit to power of starter relay power circuit	
235	P1700			624	5	Break in diagnostic lamp power circuit	
236				624	4	Ground fault of diagnostic lamp power circuit	
237				624	3	Short circuit to power of diagnostic lamp power circuit	
238	P00AA	233	1	2629	5	Break in compressor air temperature sensor circuit	
239	P00AC		1	2629	4	Low level signal from compressor air temperature sensor	
240	P00AD		1	2629	3	High level signal from compressor air temperature sensor	
241	P0572		1	521	4	Low level signal from brake pedal tip	
242	P0573		1	521	3	High level signal from brake pedal tip	
243	P0831		1	598	4	Low level signal from clutch pedal tip	
244	P0832		1	598	3	High level signal from clutch pedal tip	
245	P0404		4	27	13	EGR valve position sensor calibration error	
246	P1705		1	109	4	Low level signal from coolant pressure sensor	
247	P1706		1	109	3	High level signal from coolant pressure sensor	
+248	P0127	234	3	105	15	Exceeding of limit booster air temperature	
249	P1707		3	109	15	Exceeding the coolant limit pressure	
250	P2454		1	3251	4	Low level signal of particulate trap pressure sensor	Sensor fault, ground fault in sensor connection circuit.
251	P2455		1	3251	3	High level signal of particulate trap pressure sensor	Sensor fault, short circuit to power in sensor connection circuit.

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
252	P244A		4	3936	1	Low pressure of particulate trap	Sensor malfunction, no particulate trap.
253	P244B		4	3936	0	High pressure of particulate trap	Sensor malfunction, filled particulate trap.
254	U0434		1	523618	2	SPN received from list 1	Received DM1 message from specified source with SPN specified in list 1.
255	U0435		1	523619	2	SPN received from list 2	Received DM1 message from specified source with SPN specified in list 2.
256	U0436		1	523620	2	SPN received from list 3	Received DM1 message from specified source with SPN specified in list 3.
257	U0437		1	523621	2	SPN received from list 4	Received DM1 message from specified source with SPN specified in list 4.
258	U0438		1	523622	2	SPN received from list 5	Received DM1 message from specified source with SPN specified in list 5.
+259	P0494		-	1639	1	Low fan speed	Faulty fan coupling. Fan speed sensor fault.
+260	P0495		-	1639	0	High fan speed	Fan speed sensor fault. Interference in the fan speed sensor circuit.
+261	P0528		-	1639	5	Break in the fan speed sensor	Break in the fan speed sensor circuit. Fan speed sensor fault.
262	P0095		-	1636	5	Break in air mixture temperature sensor	
263	P0097		-	1636	4	Low level signal from air mixture temperature sensor	
264	P0098		-	1636	3	High level signal from air mixture temperature sensor	
265	P1127		-	1636	0	Air overheating by air mixture temperature sensor	

Number	DTC	Blink code	FF	SPN	FMI	Fault description	Probable cause
266	P0401		-	2791	1	Very low EGR system efficiency	The temperature of the air mixture is below the expected minimum corresponding to the normal operation of the EGR system.
267	P0402		-	2791	0	Very high EGR system efficiency	The temperature of the air mixture is above the expected maximum corresponding to the normal operation of the EGR system.
268	P0488		-	2791	7	Error of EGR valve gate position regulator	Deviation of valve position relative to preset position is out of permissible range.
269	P0488		-	2791	13	EGR valve gate jamming	The range of the valve displacement is too small.
270	P1009		-	1653	13	Engine performance limitation mode is active	
271	P1801			520198	5	Break in the circuit of the GRN fault indication lamp	Fault in power stage circuit for control of fault indication lamp.
272				520198	4	Ground fault in the circuit of the GRN fault indication lamp	
273				520198	3	Short circuit to power of the circuit of the GRN fault indication lamp	
				520207			
-	P01240		5	641	9	No communication with turbocharger actuator	
-	P01241		5	641	16	Overheating of turbocharger actuator	
-	P01242		5	641	7	Error of turbocharger actuator position	
-	P01243		5	641	12	Malfunction of the turbocharger actuator logic unit	
-	P01244		5	641	2	Update rate in CAN network of turbocharger actuator is not normal	
-	P01245		5	641	19	Absence of turbocharger actuator command	
-	P01247		5	641	18	Low supply voltage of turbocharger actuator	
-	P01248		5	641	17	High supply voltage of turbocharger actuator	
-	P012A		5	641	8	Internal test of turbocharger actuator	

Bl. code	Faulty element in the system
112	Crankshaft position sensor malfunction
113	Camshaft position sensor malfunction
114	Camshaft sensor position error
131	Power supply malfunction of sensors
133	Malfunction of fuel pressure sensor in the rail
141	Malfunction in the cylinder nozzle 1 circuit
142	Malfunction in the cylinder nozzle 2 circuit
143	Malfunction in the cylinder nozzle 3 circuit
144	Malfunction in the cylinder nozzle 4 circuit
145	Malfunction in the cylinder nozzle 5 circuit
146	Malfunction in the cylinder nozzle 6 circuit
147	Malfunction in the cylinder nozzle 7 circuit
148	Malfunction in the cylinder nozzle 8 circuit
149	Malfunction in the cylinder nozzle 9 circuit
151	Malfunction in the cylinder nozzle 10 circuit
152	Malfunction in the cylinder nozzle 11 circuit
153	Malfunction in the cylinder nozzle 12 circuit
211	Malfunction of water-in-fuel sensor
215	Malfunction of fuel temperature sensor
221	Pedal position sensor malfunction
226	Engine speed is above the maximum limit
231	Malfunction of manifold air pressure sensor

232	Malfunction of atmospheric pressure sensor
233	Malfunction of booster air temperature sensor
234	Malfunction of manifold air temperature sensor
241	Malfunction of coolant temperature sensor
242	Engine temperature is above the maximum limit
243	Malfunction of engine oil pressure sensor
244	Malfunction of oil temperature sensor
245	Engine oil temperature is above the maximum limit
253	Incorrect fuel pressure in the rail
324	Vehicle speed sensor malfunction

Freeze Frames

ID (hex)	Parameter	Times	Definition	FF1	FF2	FF3	FF4
08	Engine mode (1-8)	1	1/1	*	*	*	*
09	Booster pressure, kPa	1	2 kPa/bit + 0	*	*	*	*
0A	Engine speed, rpm	2	1/8 rpm/bit + 0	*	*	*	*
10	Load, %	1	1%/bit + 0	*	*	*	*
11	Coolant temperature, °C	1	1°/bit – 40°	*	*	*	*
12	Vehicle speed, km/h	2	1/256 kmh/bit + 0	*	*	*	*
16	Pressure in the rail, MPa	2	1/256 MPa/bit + 0	*	*		
17	Pedal position,%	1	0.4 %/bit + 0	*	*		
18	Oil pressure, kPa	1	4 kPa/bit + 0	*			
19	Oil temperature, °C	2	1/32°/bit – 273°	*			
1A	Fuel pressure in the filter, kPa	1	4 kPa/bit + 0		*		
1B	Battery voltage, V	2	0.05 V/bit + 0		*		

Possible fault states – FMI field

FMI No.	Fault state	Standard parameter name
0	The data is reliable, but it is above the normal range – the most dangerous level	DATA VALID BUT ABOVE NORMAL OPERATIONAL RANGE
1	The data is reliable, but it is below the normal range – the most dangerous level	DATA VALID BUT BELOW NORMAL OPERATIONAL RANGE
2	Non-consistent, intermittent or incorrect data	DATA ERRATIC, INTERMITTENT OR INCORRECT
3	Voltage is higher than normal or short-circuited to plus	VOLTAGE ABOVE NORMAL, OR SHORTED TO HIGH SOURCE
4	Voltage is lower than normal or short-circuited to ground	VOLTAGE BELOW NORMAL, OR SHORTED TO LOW SOURCE
5	Current below normal level or circuit break	CURRENT BELOW NORMAL OR OPEN CIRCUIT
6	Current above normal level or short circuit	CURRENT ABOVE NORMAL OR GROUNDED CIRCUIT
7	Mechanical system does not respond or is not adjustable	MECHANICAL SYSTEM NOT RESPONDING OR OUT OF ADJUSTMENT
8	Incorrect frequency or pulse width, or period	ABNORMAL FREQUENCY OR PULSE WIDTH OR PERIOD
9	Incorrect update rate – usually occurs after a data timeout	ABNORMAL UPDATE RATE
10	Incorrect change rate	ABNORMAL RATE OF CHANGE
11	The main cause is unknown	FAILURE CODE NOT IDENTIFIABLE
12	Defective smart device or component	BAD INTELLIGENT DEVICE OR COMPONENT
13	Out of calibration	OUT OF CALIBRATION
14	Special instructions	SPECIAL INSTRUCTIONS
15	Reliable data, above normal operating range – lowest hazardous level	
16	Reliable data, above normal operating range – moderate hazardous level	
17	The data is reliable, but it is below the normal range – the lowest dangerous level	
18	The data is reliable, but it is below the normal range – moderate dangerous level	
19	Data received via network contains an error	
20–30	Reserved	
31	Not available	

Appendix F

(mandatory)

List of electrical equipment components to the tractor electric diagram

“Premium” configuration

Ref. designation	Description	Quantity	Note
A1	Steering column BP-TLJ-U2-06 or KR101-003.2	1	
A2	Electronic unit MR A541 150 0600	1	ICE set
A3	Electronic unit FLA A000 446 1207	1	ICE set
A4	Electronic unit CPC4 A003 446 1902	1	ICE set
A5	Pedal A9413000104	1	ICE set
A6	Conditioning system	1	
A8	Car audio JVC KD-X-163	1	
A9	Antenna	1	
A12	Protection device UZP-35P	1	
A13	Mirror SAKD.458201.100	1	Right
A14	Mirror SAKD.458201.100-01	1	Left
BA1, BA2	Loudspeaker PS422	2	
BP1	Pressure transmitter Trafag	1	Transmission oil
BP2	Pressure sensor 3902.3829010 GOST 1701-75	1	Air in PS
BV1	Pulse sensor PD8093-8 TU BY 300125187.211-2006	1	
EK1	Plug	1	Thermo-start
EK3	Pressure controller heating element with adsorber	1	Pneumatic system
EK4	Fuel filter heating element	1	Fuel filter
EL19, EL20	Headlight 1BL 247 042-017 (Hella)	2	D90 mm, H1, 24 V, low beam
EL1, EL2	Headlight 1KO 247 042-037 (Hella)	2	D90 mm, H1, 24 V, high beam
	Working headlights FR 01-18/7		
EL3, EL4		2	Right front
EL5, EL6		2	Left front
EL7, EL8		2	Right rear
EL9, EL10		2	Left rear
EL11	Under-hood light ALO-L4-E13T	1	Replacement with 18W Flood-S headlight is allowed
EL12	Cab light	1	
EL14	Registration plate illumination light ONZ 00-02	1	
EL15-EL18	Fog light, H7, 24 V, 505 598-24	4	Eurolight
FU1, FU2	Fuse box 41.3722 TU 37.469.013-95	2	
	Fuses TU 37.469.013-95:		
FU2.13	35.3722 (5 A)	1	
	352.3722 (10 A)	14	
FU1.1–FU1.3			
FU1.5–FU1.7			
FU1.9, FU2.2			
FU2.3, FU2.8			
FU2.10, FU2.11			
FU2.3, FU2.8			
	353.3722 (15 A)	6	

Ref. designation	Description	Quantity	Note
FU1.8, FU2.4			
FU2.5, FU2.7			
FU3.5, FU3.7			
FU1.4	354.3722 (20 A)	1	
FU2.9, FU3.3	355.3722 (25 A)	4	
FU3.8, FU3.9			
	356.3722 (30 A)	3	
FU2.1, FU2.6			
FU2.12			
FU5	Sealed fuse (7.5 A)	1	
FU22	Fuse 542.3722 (60 A) TU 37.469.056-2002	1	
FU29	Sealed fuse (20 A)	1	
G	Generator	1	ICE set
GB1, GB2	Battery 6ST-190L TU 3481-043-51760155-2016 or Battery 6ST-190L TU 3481-001-57586209-2010	2	
	Hornless sound signals TU 37.003.688-75:		
HA1	C313	1	
HA2	C314	1	
	Front light 37.23.3712-01 TU RB 0588255010-95:		
HL1		1	Right
HL2		1	Left
	Side turn indicator repeater 641.3726-01 TU 37.001.2164-2006:		
HL3		1	Right turn
HL4		1	Left turn
HL5–HL7	Turn indicator repeater UP C-24V	3	“Road train” sign
HL21,HL22	Rear light 7313.3716-01 TU RB 600124825026-2002	2	
KM	Switch 1212.3737-07 TU RB 07513211.006-97	1	
	Relay 193.3777-01:	19	
KV1		1	GPP lamp switching on
KV2		1	Air conditioner fan
KV3		1	Air conditioning compressor
KV4		1	Stop light
KV5		1	Low beam
KV6		1	High beam
KV7		1	EHR activation (D+)
KV8		1	EHR activation (term. 15)
KV9		1	Sound signal
KV10		1	Battery breaker interlock
KV11		1	Shut-off valve relay
KV12		1	Term. 15
KV13		1	Term. 15
KV14		1	Stop light 12 V
KV15		1	Right marker light 12 V
KV16		1	Left marker light 12 V
KV17		1	Right turn 12 V
KV18		1	Left turn 12 V
KV19		1	Inversion relay N+
KV20		1	Inversion relay 48+
KV21		1	Starter relay
K22	Relay 58.3777-03	1	Wiper relay

Ref. designation	Description	Quantity	Note
M1	Starter	1	ICE set
M2	Air conditioner fan	1	Air conditioner set
M3, M4	Windscreen washer pump	2	Front/Rear
M5	Wiper motor reducer	1	Front
M6	Wiper motor reducer	1	Rear
M7	Heater fan	1	
R1	Resistor S2-33N-5-220 Om	1	
	Force sensor DU-06-90:	2	
RF1		1	
RF2		1	
SA1	Switch F5.3709.011-344	1	Switching on the front working lights
SA2	Switch F5.3709.011-343	1	Switching on the rear working lights
SA3	Switch F5.3709.011-04	1	Switching on the “Road train” sign
SA4	Switch F5.3709.011-177	1	Switching on the blinking beacon
SA5	Switch F5.3709.011-342	1	Switching on the rear wiper
SA6	Switch F5.3709.011-632	1	Switching on the hood working lights
SA7	Switch F5.3709.011-562	1	Sunblind control
SA8	Switch F5.3709.011-531	1	Switching on the mirrors heating
SA9	Switch F5.3709.011-613	1	Switching on the shut-off valve
SA10	Switch F5.3709.011-504	1	Switching on the cab heaters
SA11	Switch F5.3709.011-195	1	Activation of manual fuel feed control
SA12	Switch F5.3709.011-633	1	PTOM control
SB1	Push-button switch RDTACT-3017-D	1	
SB2	Push-button switch RDTACT-3017-U	1	
SL1	Fuel level sensor	1	
SK3	Alarm sensor of the h/s oil unacceptable temperature	1	
SK4	Sensor KSD302-110-16-FBVL-P-M-B	1	
	Emergency air pressure sensor 6072.3829:	3	
SP1		1	Parking brake
SP9		1	Circuit 1 receiver
SP10		1	Circuit 2 receiver
SP2	Switch 2802.3829010 TU 37.453.092-93	1	Stop light
SP5	Pressure sensor DSDM-10MS	1	Brakes
SP6	Sensor of the gearbox filter clogging detector	1	
SP7	Coolant pressure sensor	1	Air conditioner receiver
SP8	Air filter clogging detector 131.3829	1	
SP11	Pressure filter clogging detector of hinged equipment	1	Pressure filter
SP12	Clogging detector of steering pressure filter	1	Pressure filter
SQ3	Limit switch PS-110 (AU-29)	1	
UZ	Voltage converter PN24/12.5	1	
UZ1	Battery balancing device UBAB-02	1	
VD1	Diode KD243B	1	
	Pin shoes CPC:		Cylindrical power connectors (AMR)
XP1	Pin shoe 213905-1	1	3-pin

Ref. designation	Description	Quantity	Note
	Pin shoe 206044-1:	2	14-pin
XP17		1	
XP18		1	
	Pin shoe 206838-3:	3	24-pin
XP3		1	
XP6		1	
XP8		1	
	Pin shoe 206151-3:	4	37-pin
XP2		1	
XP4		1	
XP5		1	
XP7		1	
	Pin shoe 182651-1:	3	4-pin
XP26.1		1	
XP27		1	
XP28		1	
	Pin shoes Supersiel 1.5		
	282105-1	3	3-pin
XP13		1	
XP89		1	
XP90		1	
	282108-1:	3	6-pin
XP99		1	
XP114		1	
XP115		1	
	Pin shoes OST 37.003.032-78:		
XP133	502601	1	
XP76	Pin shoe A 026 545 9728	1	ICE set
	Socket shoes CPC:		Cylindrical power connectors (AMR)
XS1	Socket shoe 213889-2	1	3-pin
	Socket shoe 182921-1:	4	4-pin
XS9		1	
XS26.1		1	
XS27		1	
XS28		1	
	Socket shoe 206043-1:	3	14-pin
XS11		1	
XS17		1	
XS18		1	
	Socket shoe 206837-1:	4	24-pin
XS3		1	
XS6		1	
XS8		1	
XS16		1	
	Socket shoe 206150-1:	5	37-pin
XS2		1	
XS4		1	
XS5		1	
XS7		1	
XS15		1	
	Socket shoes Supersiel 1.5		
XS33	282079-2	1	1-pin
	282087-1	3	3-pin
XS13		1	
XS89		1	

Ref. designation	Description	Quantity	Note
XS90		1	
XS32	282088-1	1	4-pin
	282090-1	5	6-pin
XS23		1	
XS70		1	
XS99		1	
XS114		1	
XS115		1	
XS91	Socket shoe DT06-2S	1	
	Socket shoe 601202	14	2-pin
XS26		1	
XS29		1	
XS38		1	
XS39		1	
XS43		1	
XS52		1	
XS53		1	
XS54		1	
XS55		1	
XS56		1	
XS63		1	
XS64		1	
XS96		1	
XS102		1	
	Socket shoe KDPA.732313.001:	10	For key switches
XS6.1		1	
XS6.2		1	
XS6.3		1	
XS6.4		1	
XS6.5		1	
XS6.6		1	
XS6.7		1	
XS6.8		1	
XS6.9		1	
XS6.10		1	
X1-18	A018 545 6726	1	
X2-18	A013 545 6426	21	
XS70			
X3-21	A013 545 6526	1	
X4-18	A013 545 6826	1	
XS67	A202 540 5981	1	
XS9.1	A001 545 5626	1	
XS50	A015 545 6726	1	
XS51	A000 153 0022	1	
	Socket shoes ISO 10487:		
XS79	962189-1	1	Type A
XS80	962191-1	1	Type B
	Socket shoes OST 37.003.032-78		
	602601	2	
XS36		1	
XS133		1	
	602602	6	
XS14		1	
XS21-12V		1	
XS22-24V		1	
XS65		1	

Ref. designation	Description	Quantity	Note
XS97		1	
XS98		1	
	602604	2	
XS19		1	
XS58		1	
	602606	3	
XS(KV19)		1	
XS34		1	
XS37		1	
	617605	21	
XS(KV1)		1	
XS(KV2)		1	
XS(KV3)		1	
XS(KV4)		1	
XS(KV5)		1	
XS(KV6)		1	
XS(KV7)		1	
XS(KV8)		1	
XS(KV9)		1	
XS(KV10)		1	
XS(KV12)		1	
XS(KV13)		1	
XS(KV14)		1	
XS(KV15)		1	
XS(KV16)		1	
XS(KV17)		1	
XS(KV18)		1	
XS(KV19)		1	
XS(KV20)		1	
XS(KV21)		1	
XS(KV22)		1	
XS88, XS89	Socket with electronics DIN 43650 type A	2	
	617605	21	
XS(KV1)		1	
XS(KV2)		1	
XS(KV3)		1	
XS(KV4)		1	
XS(KV5)		1	
XS(KV6)		1	
XS(KV7)		1	
XS(KV8)		1	
XS(KV9)		1	
XS(KV10)		1	
XS(KV11)		1	
XS(KV13)		1	
XS(KV14)		1	
XS(KV15)		1	
XS(KV16)		1	
XS(KV17)		1	
XS(KV18)		1	
XS(KV19)		1	
XS(KV20)		1	
XS(KV21)		1	
XS(KV22)		1	
XS10	Portable lamp socket PS400-24.3723	1	Remote 12 V
XS12 (12V)	Socket PS-300A3-2381	1	Right fender

Ref. designation	Description	Quantity	Note
XS24 (24V)	Socket PS325-2470	1	Left fender
XS88, XS89	Socket with electronics DIN43650 type A	2	
	Socket shoe 8-968970-2:	2	MRS 2.8
XS116		1	
XS117		1	
	USB charging connector RDU-2013:	2	
XS65.1		1	
XS119		1	
XS65, XS118	Cigarette lighter socket RDU-S	2	
XS120	Socket shoe F57.830.037	1	
XS121	Socket connector RD155-24S	1	
XS122	Socket connector RD155-12S	1	
YA1	Solenoid valve (lift)	1	
YA2	Solenoid valve (lowering)	1	
YA3	PTOM solenoid valve	1	
YA4, YA5	Changeover valve solenoid VDEC-P2-16C-D24-V1-3/4 or VDEC-P2-16C-D24-M1-3/4	2	
YC1	GPP solenoid valve	1	ICE set
YC2	Compressor solenoid valve	1	Air conditioner set
	EHR system (Meter) – option (not included to the basic configuration)		Figure 1 in the wiring diagram
A10	Controller MK 04-06 LBIE426469.046	1	EHR set
A11	Control panel PU-03 LBIE422411.003-01	1	EHR set
SQ2	Position sensor DP-01P	1	EHR set
	EHR system (Bosch) – option (not included to the basic configuration)		Figure 2 in the wiring diagram
A10	Control unit SRC4-5 R917P10522	1	EHR set
A11	Control panel CAN/BUS R917000349	1	EHR set
R2, R3	Resistor S2-23-0.5-120 Om	2	
SQ2	Position sensor R917008163	1	EHR set

Appendix G
(mandatory)

List of electrical equipment components to the tractor electric diagram in Standard 1 configuration

Ref. designation	Description	Quantity	Note
A1	Steering column BP-TLJ-U2-06 or KR101-003.2	1	
A6	Air conditioner control panel	1	
A7	Air conditioner “August”	1	
A8	Car audio JVC KD-X-163	1	
A9	Antenna	1	
A12	Protection device UZP-35P	1	
A13	Mirror SAKD.458201.100	1	Right
A14	Mirror SAKD.458201.100-01	1	Left
BA1, BA2	Loudspeaker PS422	2	
BK1	Temperature sensor TM100 TU 37.003.271-76	1	Coolant temperature
BP1	Pressure transmitter Trafag 8252-60 bar	1	Transmission oil
BP2	Pressure sensor 3902.3829010 GOST 1701-75	1	Air in PS
BP3	Pressure transmitter Trafag 8252-16 bar	1	Engine oil pressure
BV1	Pulse sensor PD8093-8 TU BY 300125187.211-2006	1	
EK1	Plug	1	ICE set
EK2	Plug	1	ICE set
EK3	Pressure controller heating element with adsorber	1	Pneumatic system
EK4	Fuel filter heating element	1	Fuel filter
KK2	Thermal switch 1202.3741	1	
EL19, EL20	Headlight 1BL 247 042-017 (Hella)	2	D90 mm, H1, 24 V, low beam
EL1, EL2	Headlight 1KO 247 042-037 (Hella)	2	D90 mm, H1, 24 V, high beam
	Working headlights FR 01-18/7		
EL3, EL4		2	Right front
EL5, EL6		2	Left front
EL7, EL8		2	Right rear
EL9, EL10		2	Left rear
EL11	Under-hood light ALO-L4-E13T	1	Replacement with 18W Flood-S headlight is allowed
EL12	Plafond with EC06-022 switch	1	
EL14	Registration plate illumination light ONZ 00-02	1	
EL15-EL18	Fog light, H7, 24 V, 505 598-24	4	Eurolight
FU1, FU2	Fuse box 41.3722 TU 37.469.013-95	2	
	Fuses TU 37.469.013-95:		
	352.3722 (10 A)	19	Used with the fuse box 41.3722
FU1.3- FU1.4			

Ref. designation	Description	Quantity	Note
FU1.6–FU1.7			
FU1.9–FU1.13			
FU2.1–FU2.4			
FU2.6–FU2.9			
FU2.12, FU2.13			
FU2.5	353.3722 (15 A)	1	
FU2.11	354.3722 (20 A)	1	
FU1.5, FU2.10	355.3722 (25 A)	4	
FU3.1, FU3.2			
FU1.1, FU1.2	356.3722 (30 A)	3	
FU1.8			
FU22	Fuse 542.3722 (60 A) TU 37.469.056-2002	1	
FU23	Sealed fuse (10 A)	1	
FU24	Sealed fuse (7.5 A)	1	
G	Generator 4512.3771-20	1	ICE set
GB1, GB2	Battery 6ST-190L TU 3481-043-51760155-2016 or Battery 6ST-190L TU 3481-001-57586209-2010	2	
	Hornless sound signals TU 37.003.688-75:		
HA1	C313	1	
HA2	C314	1	
	Front light 37.23.3712-01 TU RB 0588255010-95:		
HL1		1	Right
HL2		1	Left
	Side turn indicator repeater 641.3726-01 TU 37.001.2164-2006:		
HL3		1	Right turn
HL4		1	Left turn
HL5–HL7	Turn indicator repeater UP C-24V	3	“Road train” sign
HL21,HL22	Rear light 7313.3716-01 TU RB 600124825026-2002	2	
KM	Switch 1212.3737-07 TU RB 07513211.006-97	1	
	Relay 751.3777 TU 37.003.1418-94:	19	
KV1		1	Thermo-start
KV2		1	Air conditioner fan
KV3		1	Air conditioning com-pressor
KV4		1	Stop light
KV5		1	Low beam
KV6		1	High beam
KV7		1	EHR activation (D+)
KV8		1	EHR activation (term. 15)
KV9		1	Sound signal
KV10		1	Generator interlock
KV11			Battery breaker inter-lock
KV13		1	Shut-off valve relay
KV14		1	Term. 15

Ref. designation	Description	Quantity	Note
KV15		1	Term. 15
KV16		1	Stop light 12 V
KV17		1	Right marker light 12 V
KV18		1	Left marker light 12 V
KV19		1	Right turn 12 V
KV20		1	Left turn 12 V
KV21		1	Inversion relay N+
KV22		1	Inversion relay 48+
KV12	Relay 738.3747-20 TU 37.003.1418-94	1	ICE start
K22	Relay 46.3747010	1	Wiper relay
M1	Starter	1	ICE set
M2	Air conditioner fan	1	Air conditioner set
M3, M4	Windscreen washer pump	2	Front/Rear
M5	Wiper motor reducer	1	Front
M6	Wiper motor reducer	1	Rear
M7	Heater fan OS-7	1	
M8	Sunblind electric drive	1	
R1	Resistor S2-33N-5-220 Om	1	
	Force sensor DU-06-90:	2	
RF1		1	
RF2		1	
SA1	Switch F5.3709.011-344	1	Switching on the front working lights
SA2	Switch F5.3709.011-343	1	Switching on the rear working lights
SA3	Switch F5.3709.011-04	1	Switching on the “Road train” sign
SA4	Switch F5.3709.011-177	1	Switching on the blink-ing beacon
SA5	Switch F5.3709.011-342	1	Switching on the rear wiper
SA6	Switch F5.3709.011-632	1	Switching on the hood working lights
SA7	Switch F5.3709.011-562	1	Sunblind control
SA9	Switch F5.3709.011-613	1	Switching on the shut-off valve
SA10	Switch F5.3709.011-504	1	Switching on the cab heaters
SA11	Switch F5.3709.011-149	1	Call diagnostics
SA12	Switch F5.3709.011-633	1	PTOM control
SB1	Push-button switch RDTACT-3017-D	1	
SB2	Push-button switch RDTACT-3017-U	1	
SL1	Fuel level sensor	1	
SK1	Coolant emergency temperature sensor TM-111-09 TU 37.003.271-76	1	
SK3	Alarm sensor of the h/s oil unacceptable temperature	1	
	Emergency air pressure sensor 6072.3829:	3	
SP1		1	Parking brake

Ref. designation	Description	Quantity	Note
SP9		1	Circuit 1 receiver
SP10		1	Circuit 2 receiver
SP2	Switch 2802.3829010 TU 37.453.092-93:	1	Stop light
SP3	Oil filter clogging detector	1	ICE set
SP4	Emergency oil pressure switch in the engine 6012.3829	1	
SP5	Pressure sensor DSDM-10MS	1	Brakes
SP6	Sensor of the gearbox filter clogging detector	1	
SP7	Coolant pressure sensor	1	Air conditioner receiver
SP8	Air filter clogging detector 131.3829	1	
SQ3	Limit switch PS-110 (AU-29)	1	
UZ	Voltage converter PN24/12-50A	1	
UZ1	Battery balancing device UBAB-02	1	
VD1	Diode KD243B	1	
	Pin shoes CPC:		Cylindrical power connectors (AMR)
XP1	Pin shoe 213905-1	1	3-pin
	Pin shoe 206044-1:	2	14-pin
XP17		1	
XP18		1	
	Pin shoe 206838-3:	3	24-pin
XP3		1	
XP6		1	
XP8		1	
	Pin shoe 206151-3:	4	37-pin
XP2		1	
XP4		1	
XP5		1	
XP7		1	
	Pin shoes Supersiel 1.5		
	282105-1	3	3-pin
XP13		1	
XP89		1	
XP90		1	
XP99	282108-1	1	6-pin
	Socket shoes CPC:		Cylindrical power connectors (AMR)
XS1	Socket shoe 213889-2	1	3-pin
	Socket shoe 182921-1:	4	4-pin
XS9		1	
XS26		1	
XS27		1	
XS28		1	
	Socket shoe 206043-1:	3	14-pin
XS11		1	
XS17		1	
XS18		1	
	Socket shoe 206837-1:	4	24-pin

Ref. designation	Description	Quantity	Note
XS3		1	
XS6		1	
XS8		1	
XS16		1	
	Socket shoe 206150-1:	4	37-pin
XS2		1	
XS4		1	
XS5		1	
XS7		1	
XS15		1	
	Socket shoes Supersiel 1.5		
XS33	282079-2	1	1-pin
	282087-1	3	3-pin
XS13		1	
XS89		1	
XS90		1	
XS32	282088-1	1	4-pin
	282090-1	5	6-pin
XS23		1	
XS70		1	
XS99		1	
XS114		1	
XS115		1	
XS91	Socket shoe DT06-2S	1	
	Socket shoe 601202	14	2-pin
XS26		1	
XS29		1	
XS38		1	
XS39		1	
XS43		1	
XS52		1	
XS53		1	
XS54		1	
XS55		1	
XS56		1	
XS63		1	
XS64		1	
XS96		1	
XS102		1	
	Socket shoe KDPA.732313.001:	9	For key switches
XS6.1		1	
XS6.2		1	
XS6.3		1	
XS6.4		1	
XS6.5		1	
XS6.6		1	
XS6.7		1	
XS6.8		1	
XS6.9		1	

Ref. designation	Description	Quantity	Note
	Socket shoes ISO 10487:		
XS79	962189-1	1	Type A
XS80	962191-1	1	Type B
	Socket shoes OST 37.003.032-78		
XS36	602601	1	
	602602	7	
XS14		1	
XS21-12V		1	
XS22-24V		1	
XS65		1	
XS88		1	
XS97		1	
XS98		1	
	602604	2	
XS19		1	
XS58		1	
	602606	3	
XS(KV20)		1	
XS34		1	
XS37		1	
XS88, XS89	Socket with electronics DIN 43650 type A	2	
	617605	21	
XS(KV1)		1	
XS(KV2)		1	
XS(KV3)		1	
XS(KV4)		1	
XS(KV5)		1	
XS(KV6)		1	
XS(KV7)		1	
XS(KV8)		1	
XS(KV9)		1	
XS(KV10)		1	
XS(KV11)		1	
XS(KV13)		1	
XS(KV14)		1	
XS(KV15)		1	
XS(KV16)		1	
XS(KV17)		1	
XS(KV18)		1	
XS(KV19)		1	
XS(KV20)		1	
XS(KV21)		1	
XS(KV22)		1	
	Socket shoe 8-968970-2:	2	MRS 2.8
XS116		1	
XS117		1	
	USB charging connector RDU-2013:	2	
XS65.1		1	
XS119		1	

Ref. designation	Description	Quantity	Note
XS65, XS118	Cigarette lighter socket RDU-S	2	
XS120	Socket shoe F57.830.037	1	
XS121	Socket connector RD155-24S	1	
XS122	Socket connector RD155-12S	1	
XS10	Portable lamp socket PS400-24.3723	1	Remote 12 V
XS12 (12V)	Socket PS-300A3-2381	1	Right fender
XS24 (24V)	Socket PS325-2470	1	Left fender
YA1	Solenoid valve (lift)	1	
YA2	Solenoid valve (lowering)	1	
YA3	PTOM solenoid valve	1	
YA4, YA5	Changeover valve solenoid VDEC-P2-16C-D24-V1-3/4 or VDEC-P2-16C-D24-M1-3/4	2	
YC1	GPP solenoid valve	1	ICE set
YC2	Compressor solenoid valve	1	Air conditioner set
	EHR system (Meter) – option (not included to the basic configuration)		Figure 1 in the wiring diagram
A10	Controller MK 04-06 LBIE426469.046	1	EHR set
A11	Control panel PU-03 LBIE422411.003-01	1	EHR set
SQ2	Position sensor DP-01P	1	EHR set
	EHR system (Bosch) – option (not included to the basic configuration)		Figure 2 in the wiring diagram
A10	Control unit SRC4-5 R917P10522	1	EHR set
A11	Control panel CAN/BUS R917000349	1	EHR set
R2, R3	Resistor S2-23-0.5-120 Om	2	
SQ2	Position sensor R917008163	1	EHR set

Appendix I

(mandatory)

List of electrical equipment components to the tractor electric diagram in Standard configuration

Ref. designation	Description	Quantity	Note
A1	Steering column BP-TLJ-U2-06 or KR101-003.2	1	
A2	Electronic unit M240	1	ICE set
A5	Electronic suspended pedal PEP-02	1	
A6	Conditioning system	1	
A8	Car audio JVC KD-X-163	1	
A9	Antenna	1	
A12	Protection device UZP-35P	1	
A13	Manual throttle 351H008A6	1	
BA1, BA2	Loudspeaker PS422	2	
BP1	Pressure transmitter Trafag 8252-60 bar	1	Transmission oil
BP2	Pressure sensor 3902.3829010 GOST 1701-75	1	Air in PS
BV1	Pulse sensor PD8093-8 TU BY 300125187.211-2006	1	
EK3	Pressure controller heating element with adsorber	1	Pneumatic system
EK4	Fuel filter heating element	1	Fuel filter
EL1a, EL2a	Headlight 1BL 247 042-017 (Hella)	2	D90 mm, H1, 24 V, low beam
EL1, EL2	Headlight 1KO 247 042-037 (Hella)	2	D90 mm, H1, 24 V, high beam
	Working headlights FR 01-18/7:		
EL3, EL4		2	Right front
EL5, EL6		2	Left front
EL7, EL8		2	Right rear
EL9, EL10		2	Left rear
EL11	Under-hood light ALO-L4-E13T	1	Replacement with 18W Flood-S headlight is allowed
EL12	Plafond with EC06-022 switch	1	
EL14	Registration plate illumination light ONZ 00-02	1	
EL15-EL18	Optional headlight, H7, 24 V, 505 598-24	4	Eurolight
FU1, FU2	Fuse box 41.3722 TU 37.469.013-95	3	
FU3			
	Fuses TU 37.469.013-95:		
FU2.13	35.3722 (5 A)	1	
FU6	351.3722 (7.5 A)	1	
	352.3722 (10 A)	16	
FU1.1, FU1.2			
FU1.5–FU1.7			
FU1.9			
FU2.1–FU2.3			
FU2.8			
FU2.10, FU2.11			
FU3.1, FU3.2			
FU3.4, FU3.6			
	353.3722 (15 A)	7	

Ref. designation	Description	Quantity	Note
FU1.8			
FU2.4, FU2.5			
FU2.7, FU3.5			
FU3.7, FU4			
FU1.3	354.3722 (20 A)	1	
	355.3722 (25 A)	5	
FU1.4, FU2.9			
FU3.3, FU3.8			
FU3.9			
	356.3722 (30 A)	3	
FU2.6			
FU2.12			
FU5			
FU22	Fuse 542.3722 (60 A) TU 37.469.056-2002	1	
G	Generator 4512.3771-20	1	ICE set
GB1, GB2	Battery 6ST-190L TU 3481-043-51760155-2016 or Battery 6ST-190L TU 3481-001-57586209-2010	2	
	Hornless sound signals TU 37.003.688-75:		
HA1	C313	1	
HA2	C314	1	
	Front light 37.23.3712-01 TU RB 0588255010-95:		
HL1		1	Right
HL2		1	Left
	Side turn indicator repeater 641.3726-01 TU 37.001.2164-2006:	2	Front fenders
HL3		1	Right turn
HL4		1	Left turn
HL5–HL7	Turn indicator repeater UP C-24V	3	“Road train” sign
HL21,HL22	Rear light 7313.3716-01 TU RB 600124825026-2002	2	
KM	Switch 1212.3737-07 TU RB 07513211.006-97	1	
	Relay 751.3777 TU 37.003.1418-94:	20	
KV1		1	Starter actuation permit
KV2		1	Air conditioner fan
KV3		1	Air conditioning compressor
KV4		1	Stop light
KV5		1	Low beam
KV6		1	High beam
KV7		1	EHR activation (D+)
KV8		1	EHR activation (term. 15)
KV9		1	Sound signal
KV10		1	Battery breaker interlock
KV11		1	Shut-off valve relay
KV12		1	Term. 15
KV13		1	Term. 15
KV14		1	Stop light 12 V
KV15		1	Right marker light 12 V
KV16		1	Left marker light 12 V
KV17		1	Right turn 12 V
KV18		1	Left turn 12 V
KV19		1	Inversion relay N+

Ref. designation	Description	Quantity	Note
KV20		1	Inversion relay 48.1
KV21	Relay 738.3747-20 TU 37.003.1418-94	1	ICE start
K22	Relay 46.3747010	1	Wiper relay
M1	Starter	1	ICE set
M2	Air conditioner fan	1	Air conditioner set
M3, M4	Windscreen washer pump	2	Front/Rear
M5	Wiper motor reducer	1	Front
M6	Wiper motor reducer	1	Rear
M7	Heater fan OS-7	1	
R1	Resistor S2-33N-5-220 Om	1	
	Force sensor DU-06-90:	2	
RF1		1	
RF2		1	
SA1	Switch F5.3709.011-344	1	Switching on the front working lights
SA2	Switch F5.3709.011-343	1	Switching on the rear working lights
SA3	Switch F5.3709.011-04	1	Switching on the “Road train” sign
SA4	Switch F5.3709.011-177	1	Switching on the blinking beacon
SA5	Switch F5.3709.011-342	1	Switching on the rear wiper
SA6	Switch F5.3709.011-632	1	Switching on the hood working lights
SA9	Switch F5.3709.011-613	1	Switching on the shut-off valve
SA11	Switch F5.3709.011-149	1	Call diagnostics
SA12	Switch F5.3709.011-633	1	PTOM control
SB1	Push-button switch RDTACT-3017-D	1	
SB2	Push-button switch RDTACT-3017-U	1	
SL1	Fuel level sensor	1	
SK3	Alarm sensor of the h/s oil unacceptable temperature	1	
	Emergency air pressure sensor 6072.3829:	3	
SP1		1	Parking brake
SP2		1	Circuit 1 receiver
SP3		1	Circuit 2 receiver
	Switch 2802.3829010 TU 37.453.092-93:	2	
SP4		1	Stop light (lamps)
SP5		1	Stop light (engine)
SP6	Sensor of the gearbox filter clogging detector	1	
SP7	Coolant pressure sensor	1	Air conditioner receiver
SP8	Air filter clogging detector 131.3829	1	
SP9	Oil filter clogging detector	1	ICE set
SP10	Pressure sensor DSDM-10MS	1	Brakes
SQ3	Limit switch PS-110 (AU-29)	1	
UZ1	Voltage converter PN24/12-50A	1	
UZ2	Battery balancing device UBAB-02	1	
VD1	Diode KD243B	1	
	Pin shoes CPC:	2	Cylindrical power connectors (AMR)
XP1	Pin shoe 213905-1	1	3-pin
XP12	Pin shoe 206705-1	1	9-pin
	Pin shoe 206044-1:	2	14-pin
XP17		1	

Ref. designation	Description	Quantity	Note
XP18		1	
	Pin shoe 206838-3:	4	24-pin
XP3		1	
XP6		1	
XP7		1	
XP8		1	
	Pin shoe 206151-3:	5	37-pin
XP2		1	
XP4		1	
XP5		1	
XP10		1	
XP35		1	
	Pin shoes Supersiel 1.5		
	282105-1	3	3-pin
XP13		1	
XP89		1	
XP90		1	
XP99	282108-1	1	6-pin
	Socket shoes CPC:		Cylindrical power connectors (AMR)
XS1	Socket shoe 213889-2	1	3-pin
	Socket shoe 206043-1:	3	14-pin
XS11		1	
XS17		1	
XS18		1	
	Socket shoe 206837-1:	5	24-pin
XS3		1	
XS6		1	
XS7		1	
XS8		1	
XS16		1	
	Socket shoe 206150-1:	5	37-pin
XS2		1	
XS4		1	
XS5		1	
XS10		1	
XS15		1	
XS35		1	
	Socket shoes Supersiel 1.5		
XS33	282079-2	1	1-pin
	282087-1	3	3-pin
XS13		1	
XS89		1	
XS90		1	
XS32	282088-1	1	4-pin
	282090-1	5	6-pin
XS23		1	
XS70		1	
XS99		1	
XS114		1	
XS115		1	
XS91	Socket shoe DT06-2S	1	
	Socket shoe 601202	14	2-pin
XS26		1	
XS29		1	
XS38		1	

Ref. designation	Description	Quantity	Note
XS39		1	
XS43		1	
XS52		1	
XS53		1	
XS54		1	
XS55		1	
XS56		1	
XS63		1	
XS64		1	
XS96		1	
XS102		1	
	Socket shoe KDPA.732313.001:	9	for key switches
XS6.1		1	
XS6.2		1	
XS6.3		1	
XS6.4		1	
XS6.5		1	
XS6.6		1	
XS6.7		1	
XS6.8		1	
XS6.9		1	
	Socket shoes ISO 10487:		
XS79	962189-1	1	Type A
XS80	962191-1	1	Type B
	Socket shoes OST 37.003.032-78		
XS36	602601	1	
	602602	7	
XS14		1	
XS21-12V		1	
XS22-24V		1	
XS65		1	
XS88		1	
XS97		1	
XS98		1	
	602604	2	
XS19		1	
XS58		1	
	602606	3	
XS(KV22)		1	
XS34		1	
XS37		1	
	617605	20	
XS(KV1)		1	
XS(KV2)		1	
XS(KV3)		1	
XS(KV4)		1	
XS(KV5)		1	
XS(KV6)		1	
XS(KV7)		1	
XS(KV8)		1	
XS(KV9)		1	
XS(KV10)		1	
XS(KV11)		1	
XS(KV12)		1	
XS(KV13)		1	
XS(KV14)		1	

Ref. designation	Description	Quantity	Note
XS(KV15)		1	
XS(KV16)		1	
XS(KV17)		1	
XS(KV18)		1	
XS(KV19)		1	
XS(KV20)		1	
	Socket with electronics DIN43650 type A	2	
XS88		1	
XS89		1	
XS120	Socket shoe F57.830.037	1	
XS10.1	Portable lamp socket PS400-24.3723	1	Remote 12 V
XS65	Socket 3106.3715	1	Internal 12 V
XS12 (12V)	Socket PS-300A3-2381	1	Right fender
XS24 (24V)	Socket PS325-2470	1	Left fender
YA1	Solenoid valve (lift)	1	
YA2	Solenoid valve (lowering)	1	
YA3	PTOM solenoid valve	1	
YA4, YA5	Changeover valve solenoid		
	VDEC-P2-16C-D24-V1-3/4		
	or VDEC-P2-16C-D24-M1-3/4	2	
YC2	Compressor solenoid valve	1	Air conditioner set
	EHR system (Meter) – option (not included to the basic configuration)		Figure 1 in the wiring diagram
A10	Controller MK 04-06 LBIE426469.046	1	EHR set
A11	Control panel PU-03 LBIE422411.003-01	1	EHR set
SQ2	Position sensor DP-01P	1	EHR set
	EHR system (Bosch) – option (not included to the basic configuration)		Figure 2 in the wiring diagram
A10	Control unit SRC4-5 R917P10522	1	EHR set
A11	Control panel CAN/BUS R917000349	1	EHR set
R3	Resistor S2-23-0.5-120 Om	1	
SQ2	Position sensor DP-01P	1	EHR set

Appendix J

(recommended)

Values of tightening torques for fixing the main tractor units

Mounting location	Torque, kg·m
Bolts fastening the brackets to the engine	7–9
Bolts fastening the engine spacer to the frame	15
Bolts fastening the semi-rigid coupling to the engine flywheel	3
Bolts fastening the gearbox AKSS	10
Bolts fastening the GB crankcase to AKSS	25
Bolts fastening the intermediate support clamps	3
Nuts of the stepladders for fastening the drive axles	50
Nuts fastening the wheels	14–20
Hoses of the steering and working equipment hydraulic system:	
- hoses with inner diameter dy20	10^{+1}
- hoses with inner diameter dy16	$7.4^{+0.74}$
- hoses with inner diameter dy12	$4.5^{+0.45}$
- hoses with inner diameter dy10	$3.8^{+0.38}$
- hoses with inner diameter dy8	$2^{+0.2}$
Bolts fastening the “carrier–hub” joint of the axles by PZM LLC	28–38
Bolts fastening the casings to the drive gear housing of T400 series axles	21.8–25.7
Bolts fastening the casings to the crankcase of the drive gear of axles manufactured by PZM LLC	28–38
Bolts fastening the T400 series axle caliper	43.8–46.9
Nuts fastening the cardan shafts:	
– M12x1.25-8-A3P DIN 980 fastening the cardan shafts to flanges of axles and the gearbox camshaft	7.5–9.5
– M12-8-A3P DIN 980 fastening the cardan shaft to the semi-rigid coupling	10.0–12.5
– M16x1.5-8-A3P DIN 980 fastening the cardan shafts to the flange of the drive shaft of the gearbox	18.0–20.0

Appendix K
(recommended)

Filling Containers

<table>
<tr><th>Container description</th><th colspan="2">Volume (mass), l (kg)</th><th>Working fluid brand</th></tr>
<tr><td>Fuel tank</td><td colspan="2">800 (675)</td><td>Diesel fuel Euro of YaMZ engines as per GOST 32511-2013 (environmental classes K4, K5 in terms of sulfur content):
- summer, grades A, B, C, D brand DT-L-K4 (K5);
- inter-season, grades E, F brand DT-E-K4 (K5);
- winter, grades 0, 1, 2, 3, brand DT-Z-K4 (K5);
- arctic, grade 4, brand DT-A-K4 (K5).
For tractors operated abroad, it is allowed to use diesel fuel according to EN-590 (type II, III in terms of sulfur content) or a standard of other countries identical to EN-590.</td></tr>
<tr><td colspan="4">N o t e – Diesel fuels complying with GOST R 52368-2005, GOST 32511-2013 and EN-590:2009 standard shall be used depending on climatic conditions:
- for regions with moderate climate – grades A, B, C, D, E, F at ambient temperature not lower than plus 15 °C, plus 10 °C, plus 5 °C, 0 °C, minus 5 °C, minus 10 C, respectively;
- for regions with cold climates – grades 0; 1; 2; 3; 4 at ambient air temperature not lower than minus 10 °C, minus 16 °C, minus 22 °C, minus 28 °C, minus 34 °C, respectively (the temperature of diesel fuel application can be specified according to the test results).</td></tr>
<tr><td>Engine lubrication system:</td><td colspan="2"></td><td></td></tr>
<tr><td>- YaMZ</td><td colspan="2">32 (29)</td><td rowspan="2">According to the engine Operation Manual</td></tr>
<tr><td>- TMZ</td><td colspan="2">33 (30)</td></tr>
<tr><td>- OM460LA</td><td colspan="2">39 max (35 max)
34 min (30.6 min)</td><td>Shell Rimula engine oil (refilled at the factory) or other brand oil in accordance with the engine Operating Manual and Mercedes-Benz operating material requirements</td></tr>
<tr><td rowspan="2">Engine cooling system:</td><td colspan="2">With cooling unit manufactured by:</td><td rowspan="2"></td></tr>
<tr><td>Orenburgsky Radiator LLC</td><td>Avtomash-Radiator LLC</td></tr>
<tr><td>- YaMZ;
- TMZ
- OM460LA</td><td>60
71
58</td><td>74
93
76</td><td>According to the engine Operation Manual

Glysantin (refilled at the factory) or other brand antifreeze in accordance with the engine Operating Manual and Mercedes-Benz operating material requirements</td></tr>
</table>

Container description	Volume (mass), l (kg)	Working fluid brand
Steering and hitch equipment control hydraulic system	165 (140)	See Table 26, Appendix A
Gearbox hydraulic system	37 (32) without PTOM 38 (33) with PTOM	
Housing of the drive axle drive gear (1 housing)	24 (22) for T400 series axles 10 (9) for PZM series axles	
Housing of the drive axle final drive (1 housing)	11 (10) for T400 series axles; 5 (4.5) for 750 PZM axle; 6 (5.5) for 751/755 PZM axles	
Conditioning system:		
- Freon R134a;	According to the air conditioner Operation Manual or Certificate	
- refrigerating oil		

Appendix L

(recommended)

Logbook for recording measurements of the internal inflation pressure

Tractor type and brand									Reg. No.	
Measurement date	Tire serial No.		Tire serial No.		Tire serial No.		Tire serial No.		Note	Inspector's signature
	Position	Pressure	Position	Pressure	Position	Pressure	Position	Pressure		

N o t e – If an increased pressure is detected in the tire, when it is brought to the operating norm, the numerator indicates the value of the internal air pressure in the tire at the moment of measurement, and the denominator – the pressure value after it is brought to the norm.

Appendix M

(recommended)

Tire performance record card

Size _____ Tire installation date _____

Model _____ Tire dismantling date _____

Serial No. _____ Car brand and its reg. No.

Garage No. _____ _____

Date of inspection	Tire position (front right, front left, rear right, rear left)	Tire mileage since the beginning of operation				Inflation pressure at the time of inspection, MPa	Technical condition of the tire at the time of inspection	Circumstances of the defect
		in kilometers		in hours				
		Total	Including transport works	Total	Including transport works			

Responsible for recording _____

(signature)