Operator Manual

MTZ-Kirovets K744 ©

MTZ® Equipment Ltd.

Introduction

1 INTRODUCTION

To the Owner of this MTZ Equipment Ltd. Tractor

Practical experience is the key to the successful design and manufacture of MTZ tractors. For over 70 years MTZ tractors have been operating in all types of conditions in many parts of the world. However, any product will only be as good as the care and service that is provided by the end user.

Use this manual as your guide. If you follow the instructions given in this manual, your MTZ tractor will work well for many years.

Because your tractor could have variations or modifications, it is extremely important to know and record your tractor model, tractor serial number and engine number when requesting information or assistance when referring to the tractor or when it is necessary to order replacement parts.

Use only genuine replacement parts for your tractor. Write the model and serial numbers of your tractor on the lines provided below.

Your local MTZ dealer can supply you with genuine MTZ and older Belarus tractor parts and have personnel with special training that have the equipment and know the best methods of repair and maintenance for your tractor.

Call your dealer if you need any assistance or require additional information

Tractor Model Identification (1) _____

Tractor Serial Number (2) _____

Engine Serial Number (3) _____

Gearbox serial number (4) _____

Pump Drive Reducer Serial Number (5) _____

Axle Serial Number (6) _____

Date Purchased _____ / _____ / _____

Location of serial numbers can be found on pages 10 and 11

Foreword

Foreword

The Operation Manual for MTZ-Kirovets K-744 tractor is intended for drivers, mechanics and other persons related to operation of such tractors. The manual contains a brief description of the design of tractors and their specifications, main procedures of operation and maintenance. The data on Mercedes-Benz engine is for model MTU Series / MB OM470,

Before proceeding to tractor operation, it is necessary to study its design and operation procedures. Long-term and reliable operation of MTZ-Kirovets tractors is ensured in case of proper operation and timely execution of maintenance.

Read this manual carefully to learn how to operate and service the tractor correctly. Personal injury and tractor damage can result from failure to understand proper tractor use, adjustment and maintenance. If this manual is lost or damaged contact your MTZ to obtain a replacement for your tractor. Contact your MTZ dealer for clarification of instructions for this tractor that are not understood by the reader. Manuals are available in multiple languages. If you need a manual in a different language contact your MTZ dealer for assistance. Your tractor has safety signs affixed at specific hazard locations to provide hazard identification and avoidance. These signs are illustrated with explanations in the SAFETY section of this manual. Replace damaged or illegible safety signs before continued use. These safety signs are available from your MTZ dealer.

This manual should be stored in the designated compartment in the operator station. This manual is a permanent part of your tractor and must remain with the tractor during ownership. The manual is to remain with the tractor if sold to a second owner.

Measurements and dimensions in this manual are provided in metric and customary US unit equivalents. Use only correct tools, parts and fasteners for replacement parts and repairs. Metric and inch fasteners are not interchangeable and must not be used interchangeably on this tractor.

Record the Product Identification Numbers (P.I.N.)s in the section provided for this information on page XYZ. Accurate PIN information is useful in tracking and verifying a stolen tractor and major components. Always provide the tractor PIN to your dealer when requesting assistance. Keep a separate PIN set in a secure file not located on the tractor.

MTZ warrants this tractor will operate for a warranty period when operated as intended to address a premature malfunction of the tractor not attributable to the intended use. The dealer will provide a certificate at reception providing conditions of compliance to the warranty agreement. If this tractor is judged to have been abused or modified for use other than that intended in the manual instructions and specifications the warranty will be voided and warranty denied. Any modification not approved by MTZ will void the warranty on the tractor. Increasing the engine fuel rate or increasing the power output above the level specified in this manual by any means will void the warranty.
Tire warranty is provided separately by the tire manufacturer. The MTZ will provide the tire warranty certificate at reception to the owner. Any tire defects should be directed to the tire manufacturer through their dealer organization.

MTZ reserves the right to provide tractor improvement programs for tractors beyond the warranty period, often without charge to the owner. It is important that a second owner contact the local MTZ dealer to register the tractor Product Identification Information under the new owner. Should an improvement program be made available for the tractor MTZ and the dealer will have the correct owner contact information.

Warranty service, maintenance and repair of your tractor are to be carried out by representatives of MTZ Equipment Ltd. dealer service centers;

Types of maintenance	Frequency
	In Engine hours of Operation
Maintenance at the preparation of a new or overhauled tractor for operation running-in	
Maintenance of tractor at the execution of running-in	10
Maintenance upon completion of running-in:	50
First maintenance (M-1)	125
Second maintenance (M-2)	500
Third maintenance (M-3)	1,000
Seasonal maintenance (M-SS), (M-AW)	At the transition to spring-summer or autumn-winter operation conditions
Maintenance in special operation conditions (sandy, stony or boggy soils, desert, low-temperature and high-mountain conditions)	It will be performed in the conditions drastically differing from typical ones
Maintenance during long-term storage	It will be performed in closed premises not less than once every 2 months, and under a canopy and at outdoor sites - once a month

Following the warranty period, it is also recommended to contact your dealer.

If maintenance and repairs are not carried out in specialized service centers of MTZ Equipment Ltd.,, the manufacturer will not bear responsibility within the warranty and post-warranty period for the quality of released products**.**

Before proceeding to work on your tractor please thoroughly read this instruction and operation manual for the engine installed on your tractor. Strictly follow the operation and maintenance guidelines.

IN ORDER TO PREVENT FRAME DESTRUCTION, BEFORE TRACTOR TRAVELLING IT IS REQUIRED TO DISMANTLE THE SHACKLE THAT LOCKS TRACTOR SEMI-FRAMES DURING TRANSPORTATION.

Dismantled shackle with fasteners should be installed at the front link bosses of the rear semi-frame.

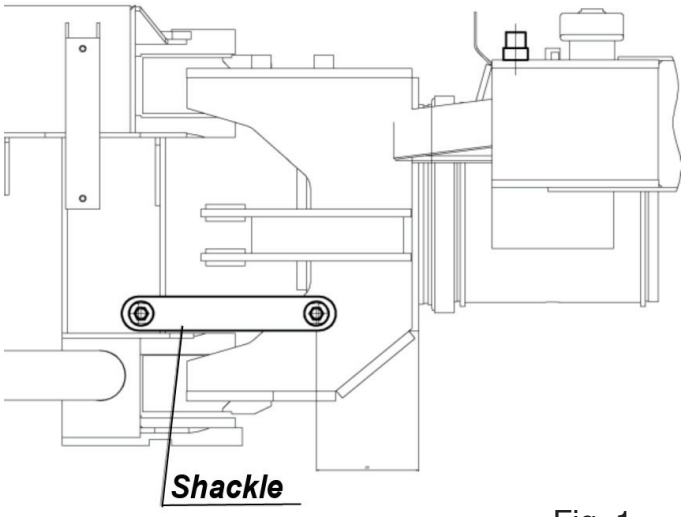


Fig. 1

Foreword

IMPORTANT

If this tractor is used by the owner OR an employee OR is loaned OR rented, make certain that prior to operating, the Operator(s);

1. Reviews and understands this manual pertaining to the tractor

   And

2. Is instructed in safe and proper use.

NOTICE

Because of design changes that may have occurred in the tractor since this manual was printed, it is possible that some of the pictures and/or the illustrations found within the manual may be different from those found on the product; however, the technical information found within this manual was correct at the time this manual was approved for publication.

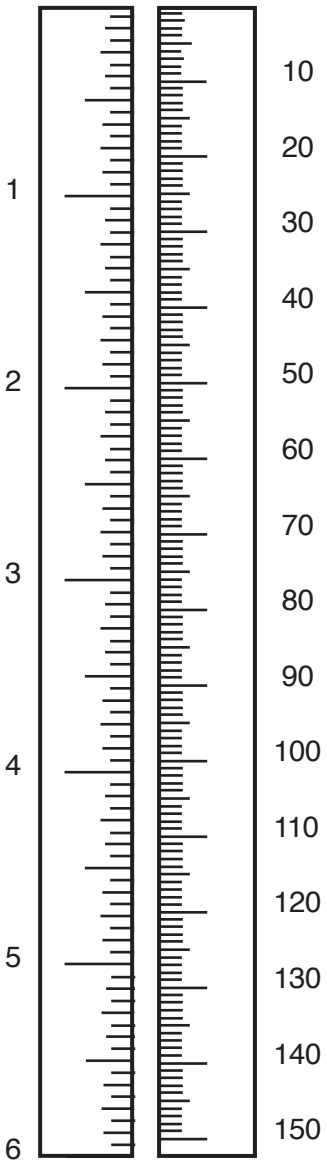
MTZ Equipment Ltd. reserves the right to modify design and specifications at any time without notice and without incurring any obligation to install them on tractors previously purchased.

If any information contained in this publication is not understood, the user should contact the MTZ Equipment Ltd. Dealer for assistance.

ABBREVIATIONS

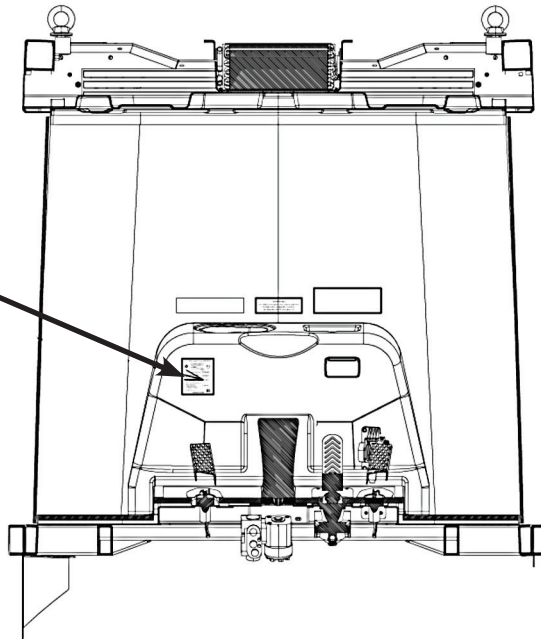
GB	gearbox	DM	daily maintenance
PW	aintwork (paint-and-lacquer coating)	M-1	first maintenanc
PTO	power take-off	M-2	second maintenance
ET	electric torch	M-3	third maintenance
PDR	pump drive reducer	M-SS	spring-summer maintenance
SPTA	spare parts, tools and accessories	M-AW	autumn-winter maintenance
TSS	tractor service station	DTC	Diagnostic Trouble Code
St	standard	CEL	Check Engine Lamp / Light
Pr	premium	SEL	Stop Engine Lamp / Light
SPN	Suspect Parameter Numbe	MIL	Malfunction Indicator Lamp / Light
FMI	Failure Mode Indicator		

1.1 Imperial / Metric Measurements - Conversion



IMPERIAL UNIT	METRIC EQUIVALENT (SI)
AREA	
1 square inch	6.45 cm^2 - square centimeter
1 acre	0.405 ha - hectare
FORCE	
1 pound (force)	4.45 newton
LENGTH	
1 foot	304.8 mm - millimeter, 30.5 cm - centimeter, 0.305 m - metre
1 inch	25.4 mm - millimeter, 2.45 cm - centimeter
1 mile	1609 m - metre, 1.61 km - kilometer
WEIGHT	
1 pound	0.4540 kg - kilogram
POWER	
1 horsepower	0.746 kW - Kilowatt
PRESSURE	
1 psi	6.89 kPa - kilopascal, 0.00689 Mpa - megapascal, 14.696 psi = 1 bar
TEMPERATURE	
1 degree Fahrenheit	$\frac{(F° - 32)}{1.8}$ = C degree Celsius
TORQUE	
1 lbs. (force) - ft.	1,356 Nm
VELOCITY	
1 mile per hour	1.61 km/h - kilometer per hour
VOLUME	
1 bushel	0.35 m^3 - cubic metre
1 gallon (imp)	4.55 L - litre
1 quart (imp)	1.14 L - liter

1.2 Serial Numbers of Tractor Components



The tractor nameplate with indication of the tractor make and model, name of manufacturer, country, manufacturer's trademark as well as year of manufacture is glued to the left pocket located at the front console of the cab.

Fig. 2

The tractor serial number is stamped on the front plane of the bumper in RH corner (in the direction of tractor travel). The number includes the tractor model, i.e K744, a letter denoting the year of manufacture, and subsequent four digits corresponding to the ordinal number of manufacture within the year.

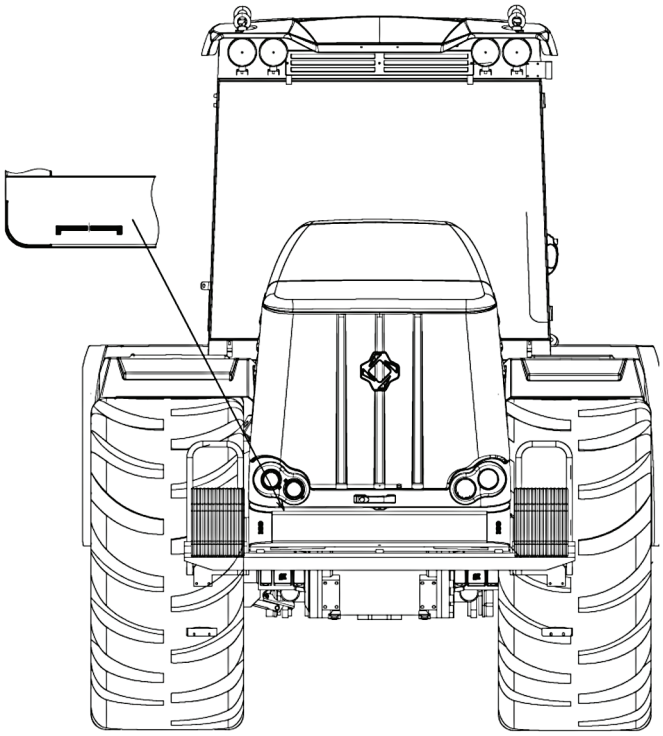


Fig. 3

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

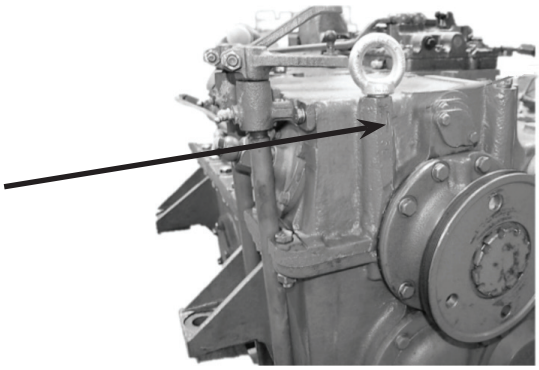


Fig. 4

The serial number of the pump drive reducer is stamped on the casing at the side, on the lateral lid.

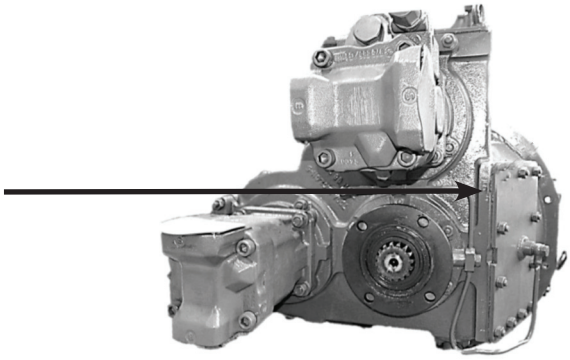


Fig. 5

The serial number of the axle is stamped on the bevel gear housing in the area of inlet flange on the left.

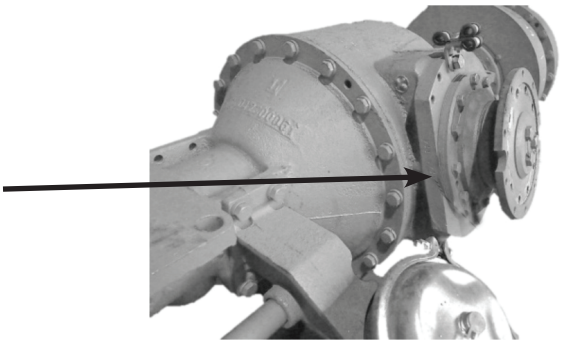
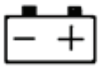
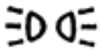


Fig. 6

1.2 SYMBOLS

Symbols being used on the tractor (instrument panel, fuse block, throw-in lever for lighting and signal units) are given below.

	fuel
	oil pressure in engine
	engine oil temperature
	engine cooling fluid emergency temperature
	emergency engine oil temperature
	engine oil filter
	engine fan coupling actuation
	engine error (for Mercedes engine)
	oil pressure in transmission
	gearbox oil filter
	actuation of stops
	storage battery
	heater fan
	front window washer
	front window wiper
	rear window wiper/washer
	left turn indicator activation
	right turn indicator activation

	air filter
	emergency air pressure in the 1st circuit
	emergency air pressure in the 2nd circuit
	oil level in the hydraulic system
	emergency oil temperature in the hydraulic system
	parking brake
	pressure in the pneumatic system
	marker lights
	front head lighting
	rear head lighting
	low beam
	high beam
N	neutral gear
	pressure filter of mounted implements
	pressure filter of steering control
	thermostart (electric torch ET)
	power take-off shaft engaged
	power take-off shaft disengaged


Emergency alarm


slow moving vehicle


horn


battery master switch


linkage lowering


floating position of linkage

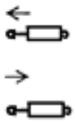

slower


faster


flasher lamp


linkage lifting


floating position of hydraulic paths to connect hydraulic implements


service operations of hydraulic implements

2 SAFETY REQUIREMENTS

2.1 Safety Information Alert

This Safety Alert Symbol is used on the tractor and in this operator manual to identify potential safety hazards that can cause personal injury. To avoid the hazard and personal injury risk recommended and safe operating practices associated with the Safety Alert Symbol.

Understanding Signal Words

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

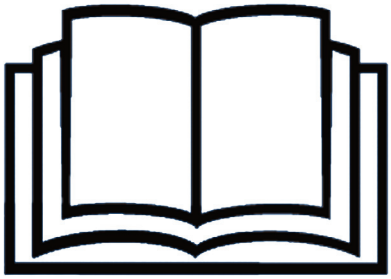
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

DANGER or WARNING safety signs are located at the specific hazard on the machine and these signal words are used throughout the manual text in identifying a potential hazard and recommended safe operating action. **CAUTION** describes general precautionary measures on safety signs on the machine and call attention to safety messages in this manual.

IMPORTANT indicates that equipment or property damage could result if instructions are not followed

NOTE gives helpful information

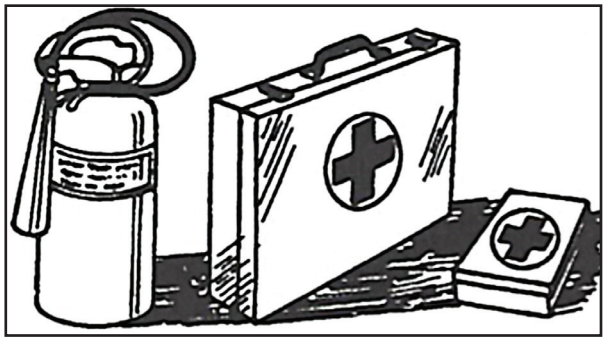
Observe and Follow Safety Instructions



Read this operator manual before operating this tractor. Understand and observe all safety messages in this manual on the tractor. Repair missing or illegible safety messages on the tractor before operating the tractor.

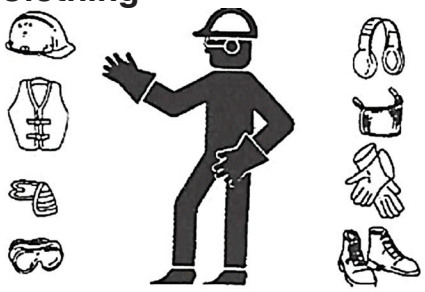
Replace a damaged or missing operator manual before operating the tractor. Contact your MTZ dealer for replacement safety messages decals and operator manual. Learn how to use the tractor properly and train others in proper use before permitting them to operate the tractor, Ensure that the person operating the tractor is emotionally and physically capable of understanding the operation and can use the controls. Maintain the tractor in serviceable condition as described in this manual. Repair and correct any malfunction before operating this tractor or permitting others to operate it. Unauthorized modification and/or repair of this tractor may alter the original functional design of this tractor compromising intended use and safe operation.

Emergency Preparedness



Keep a serviceable fire extinguisher on the tractor at the designated place shown in Section XXX, PAGE YYY, Figure WW for use in the event of a fire. Avoid fires by removing and keeping flammable materials from accumulating on the tractor. Repair oil and fuel leaks before using the tractor. Keep a complete first aid kit in the cab for emergency use. Inspect frequently to ensure the kit is complete and materials are within effective date codes. Keep a list of doctor, EMS, Fire Department and hospital in a visible place in the tractor. Keep a duplicate list on your mobile phone.

Clothing



Wear close fitting comfortable close and shoes during tractor operation. Additional protective clothing may be required based on the task the operator is performing. The operator needs to devote complete attention to tractor operation and avoid distractions such as music earphones, mobile phone use and unnecessary passengers in the tractor cab.

Fuel handling and Tractor Fueling

Fuel is highly flammable. Do not smoke around fuel, containers of fuel and during tractor refueling. Avoid exposing fuel and fueling operations to open flames and sparks. Always stop the tractor engine before refueling. Store bulk fuel outside in approved storage tanks. Transport fuel in approved containers. Do not transport fuel in unapproved containers made from glass, waxed cardboard, plastic household bottles. Old oil containers or any other unapproved container. Do not store fuel containers near open flames, sparks from any source and pilot lights. Always place transportable fuel containers on the ground before attempting to fill with fuel. Before removing the cap touch the nozzle to the container to discharge any potential static electricity. While filling the container keep the nozzle in contact with the container to avoid a static electricity discharge. This is particularly important when transferring ULTRA LOW SULPHUR FUEL.

Hearing Protection

The tractor cab environment provides a low noise level during operation with the door and window closed and does not require ear protection. Repair or replace any damaged door and window components to ensure the integrity of the cab when new. Consult your MTZ for repair and replacement. Operating machinery in excess of 90dBA noise levels for extended periods of time will cause hearing loss and requires hearing protection. Ear protection requires heightened awareness on the part of the user to offset the loss of auditory input. Remove the ear protection when no longer in the noisy area.

Starting Fluid Safety

Starting fluid is highly flammable. Do not smoke while using starting fluid. Remove all flame sources and potential spark generating devices from the area where the starting fluid will be used. It is particularly important to ensure jumper cable connections are secure and will not spark if the tractor battery is being boosted during starting. When not in use replace the cap firmly and store the container in a cool dry place. Do not leave exposed to sunlight. Do not store in the tractor cab. Starting fluid must not be used on diesel engines equipped with glow plugs or electric inlet heaters to avoid an explosion. Do not incinerate or puncture the container to avoid possible explosion and injury. Dispose of the container according to the manufacturer instructions on the container.

Fire Prevention

Inspect the tractor prior to use each day and remove flammable materials such as crop debris, bird nest, mice nests, oil, grease, fuel and any other types of flammable materials touching or near components that become hot during operation. In some agricultural tractor usage flammable material can be a constant hazard. Under these circumstances be vigilant and clear the material as frequently as necessary to avoid a fire hazard, Clean the tractor regularly to avoid the risk of fire. Before each use inspect the tractor and equipment used with the tractor for hydraulic and fuel leaks. If leaks are present repair the leak and clean the area of leaked oil from the tractor and equipment before operating the tractor. Inspect electrical components, batteries and cables. Repair or replace any frayed cables, damaged batteries or malfunctioning electrical components before using the tractor. Be particularly vigilant of leakage around hose connections and filters. Before cleaning the tractor refer to Section XXX, Page YYY in this manual for the recommended equipment and method of cleaning the tractor. In general, stop the engine, place the transmission in neutral, engage the park brake, lower implements if applicable and close the cab doors and windows. Wait until the hot components have cooled to a touchable temperature before proceeding with the inspection and cleaning.

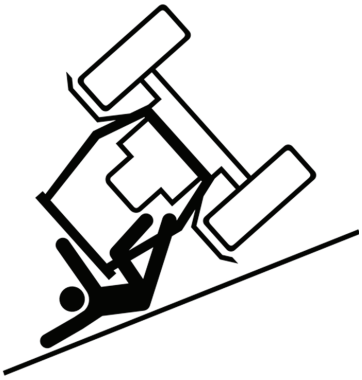
If a fire occurs;

- At the first sign of smoke or flames stop the tractor and the engine and leave the tractor,
- Call the fire department,
- Assess whether or not the fire is manageable with the fire extinguisher,
- When using the extinguisher keep your back to the wind to avoid smoke and flames,
- Before using the extinguisher ensure it is correct for the type of fire in progress,
- Local fire departments can assist with proper classification of the extinguisher and its use,
- Follow the extinguisher instructions,
    - Pull the retainer pin holding the nozzle away from you and release the lever,
    - Aim the nozzle low toward the base of the fire,
    - Squeeze the extinguisher lever slowly and evenly,
    - Sweep the nozzle from side to side
    -

Ultra Low Sulphur Fuel Hazard

Ultra low Sulphur fuel is a poor conductor of electricity. Static electricity can build up as the fuel is transferred from storage to a fuel tank building an electro static charge. Refineries incorporate an additive at the refinery to reduce the characteristic. The additive can degrade over a few months reducing the fuels ability to resist static charge build up when transferred. Ultra low Sulphur fuel storage requires a compliant grounded and bonded system to avoid the danger from a static charge igniting the fuel. A compliant system insures that every component of the fuel system from the storage tank to the discharge nozzle is grounded. Refer to tractor fueling Section XXX, Page YYY for the specific steps to follow in transferring ultra low Sulphur fuel to your tractor.

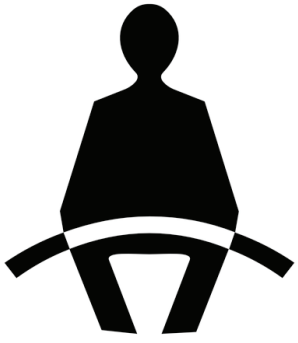
Roll Over Protective Structure



This tractor has a Roll Over Protective Structure (ROPS) incorporated in the cab enclosure. If your cab is damaged ask your MTZ dealer to inspect the damage before using the tractor. Any permanent deflection of the cab components or deformation of corner areas indicates that the ROPS is no longer capable of protecting the operator space in the event of a roll over incident. The Cab must be replaced before the tractor is used. Any permanent deflection of the frame mounting structure for the cab must also be examined and repairs made before using the tractor. Do not drill holes in the cab ROPS structure. Do not weld on the ROPS structure. Contact your MTZ dealer to determine where attachments can be made to the cab without causing damage to the ROPS. Any modification to the cab ROPS will invalidate the performance certification. A cab that has been involved in a fire is no longer a certified ROPS and must not be used on the tractor. The seat belt is an integral part of the safety system in a roll over incident for the operator and trainer.

Seat Belts

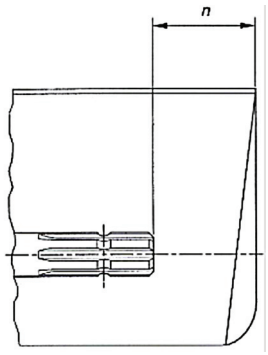
A seat belt is provided for the operator and trainer seat. During operation the operator and trainer if present must wear the seat belts provided. In the event of a roll over incident the seat belt will keep occupants within the protected zone of the ROPS reducing the potential injury severity. Proper seat belt use is explained in detail in Section XXX, Page YYY Seat Belt Usage. The general procedure for seat belt use is;



1. Sit in the seat and adjust it to the comfortable operating position,
2. Hold the latch and bull the seat belt across the lower torso area of the body,
3. Firmly insert the latch into buckle until a distinct click is heard,
4. Tug on the seat belt latch to ensure the belt is securely fastened,
5. Adjust the seat belt until it is snug across the torso.

Inspect the seatbelt each time it is used. If the latch malfunctions or webbing damage is visible repair the malfunction and frayed webbing before using the tractor. Use the MTZ specified hardware to fasten the seat belt components to the seat structure to ensure correct performance to the certified standard. Seat belt webbing exposure to sunlight will cause the webbing material color to fade. Faded material is an indication that exposure has weakened the material strength. Replace faded seat belt webbing material to ensure proper performance.

Avoid rotating Drivelines



Entanglement in rotating shafts and drivelines can cause serious injury or death.
Wear close fitting close and avoid the rotating shaft. Before approaching the shaft stop the driveline, engine and wait until the drive shaft has stopped before connecting/ disconnecting, adjusting or cleaning PTO driven equipment. Ensure that the undamaged tractor master shield is in place at all times with the proper safety message. If the master shield is damaged or the safety decal illegible replace to ensure original equipment performance before using the tractor. A rotating shield must turn freely. If not repair the malfunction before using the PTO driven equipment. Ensure that all guards and shields are in place on the PTO driven equipment before use. Do not install an adapter shaft that will permit connection of a 540 RPM

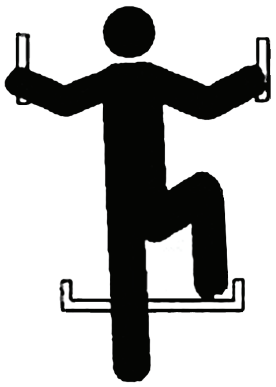
PTO machine to a 1000 PTO tractor output shaft. Do not install an adapter shaft that extends the end of the tractor driven shaft beyond the master shield. See accompanying shield illustration for the proper shield extension dimension by PTO type.

PTO Type	Diameter	Splines	n ± 0.20 in. - 5 mm
1	1.378 in. - 35 mm	6	3.35 in - 85 mm
2	1.378 in - 35 mm	21	3.35 in. - 85 mm
3	1.772 in - 45 mm	20	4.00 in - 100 mm
4	2.264 in - 57.5 mm	22	4.00 in. 100 mm

Make a trial connection for 3-point hitch implements driven by the tractor PTO. Slowly raise the implement to determine if the master shield will clear the PTO shaft in the fully raised position. If necessary restrict lift height to prevent damage to the master shield and other PTO shaft guarding components.

Steps and Handhold Use

Always face the tractor when using the steps and handholds for access to the tractor cab maintaining three-point contact with steps, handholds and handrails. Keep the steps clear of debris, mud and other slippery materials. Keep handhold sand handrails clean and free of slippery material such as grease, oil, ice and snow to prevent loss of grip during use. Do not attempt to use the access system if the tractor is moving. Do not jump from the tractor cab when exiting the machine.



ISOBUS Controllers

The use of controllers on this tractor compliant with ISO 11783 for tractor and implements.
The display and functions of the system are provided by the system manufacturer. Read the supplemental operation manual provided by the ISOBUS feature manufacturer to understand proper and safe operation before operation.

Safe Tractor Operation

- Follow these precautions to reduce the risk of injury incidents during use of this tractor:
- Use the tractor for the intended purpose performing agricultural work tasks related to agricultural crop and livestock production. Do not modify the tractor to use for any other purpose.
- Read and understand the operator manual before operating the tractor. Observe the safety and operational information provided in this manual. Train other operators before permitting them to operate the tractor.
- The tractor is not a recreational vehicle or substitute for a road vehicle. It can be used on public roads following the instructions provided in this manual related to agricultural tasks.
- Ballast limitations and instruction for use are provided in this manual. Follow the instructions unless local regulations reduce the amount of weight for use on public roads which may limit the amount of ballast added to the tractor including mounted implement.
- Follow all instructions provided in this manual for using mounted or towed implements. In addition, follow local regulations for lighting, marking, towing and braking of the tractor used traveling on public roads in combination.
- Survey the area around the tractor and attached equipment before entering the cab. Before starting the engine survey, the immediate are again to ensure that the area is clear and the tractor and equipment can be safely moved.
- Follow the instructions in the manual when attaching mounted or towed implements. Do not enter the area between the tractor and implement during tractor movement.
- Keep hands, feet and clothing away from rotating or moving parts.

Specific Safety Behavior:

- Complete any training before operating the tractor.
- Do not attempt to access a moving tractor or attached implement.
- Do not ride on this tractor unless seated in the operator or trainer seat with seat belt properly fastened as directed earlier in this Safety Section. Do not allow children to ride on the tractor or attached equipment.
- Keep all shields and guards in place and in serviceable condition as described in this manual.
- Follow all local regulations regarding travel on public roads including visual and audible signals in addition to all lighting and marking requirements.
- Do not park on public roads. Move off the travel lane onto the shoulder before stopping. Ensure the hazard warning signals are operating.
- Reduce speed when operating on rough or hilly terrain before turning. Adjust speed on slippery surfaces to maintain proper control of the tractor and attached implement if applicable.
- Reduce turning speed with raised mounted equipment (3-point hitch as well as towed) to avoid

the risk of tipping over.

- Pump the brake pedal when stopping on slippery surfaces to avoid locking the wheels and skidding.
- Keep the tractor and implements clean. Before traveling on public roads remove mud and debris that can cause hazards for normal road vehicles if deposited on the road surface.

Towing Implements and Trailers:

- Do not tow loads that exceed the tractor rating provided in this manual for unbraked and braked towed equipment.
- Hitch the towed implement or trailer to the drawbar as instructed in this manual.

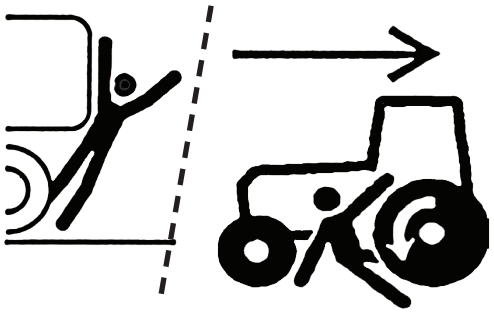
Parking the Tractor:

- Stop the tractor in a secure location, stop the PTO, lower attachments/implements to the ground, place the transmission in neutral, set the parking brake, stop all other cab accessories, stop the engine and remove the starting key.
- If the tractor is to be left for a period of time lock the cab door and disconnect the battery switch.

Most Common Incidents Involving Tractor:

1. Tractor rollover.
2. Collision with vehicles in road traffic.
3. Bypass starting procedures
4. Entanglement in PTO shafts
5. Falling from the tractor.
6. Crushing and/or pinching during attachment/implement hitching.

Runover Incidents

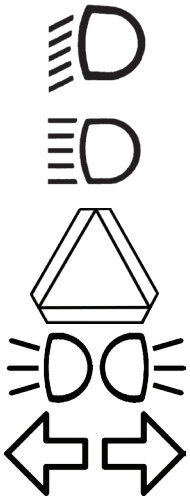


Before moving the tractor and any attached equipment survey the immediate area to determine that the area is clear and that the tractor can move forward or backward as desired. If the immediate area is obscured or the area is confined seek the assistance of a person on the ground to direct actions and ensure bystanders are clear of the intended path. Do not rely completely on cameras to show the complete picture. Cameras are subject to blind spots.

Instructional Seat

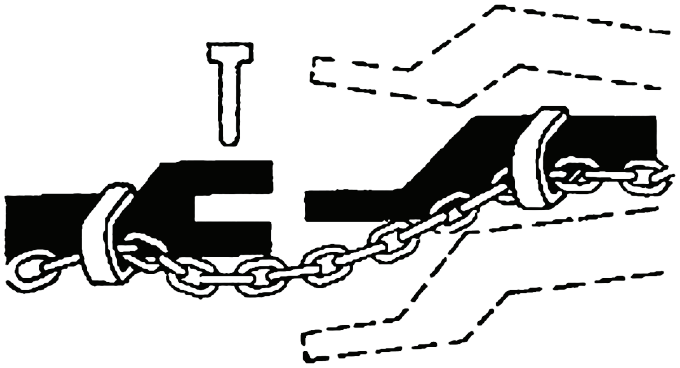
The seat adjacent to the operator seat is intended for occupancy by a person instructing the operator on proper and safe tractor use. The seat is not intended for use by a passenger in the tractor. When an instructor uses the seat the seat belt must be worn following the guidelines provided in the Safety Section under Seat Belts. This seat may also be used to facilitate diagnosis of a tractor malfunction permitting a qualified technician to observe the tractor malfunction in simulated operation.

Lighting and Marking Devices



Before traveling on public roads ensure that all lighting and marking devices are in working order and clean so as to be visible. Repair any malfunctioning device before operating on public highways. While traveling on public roads use the required devices to avoid incidents with normal road traffic. Use the rearview mirrors to monitor traffic approaching from the rear. Before turning use the appropriate turn signal and confirm that following traffic has recognized the signal and intent before turning. Before turning in front of traffic confirm that you have adequate time to complete the turn with the tractor and implement without forcing on coming traffic to take evasive action. Comply with all local, state and federal regulations regarding use of public roads. Your MTZ dealer can provide repair parts and service to correct a device malfunction.

Safety Chain for Towed Implements and Trailers



Use a safety chain to control the towed implement/trailer in the event the drawbar hitch pin malfunctions causing separation between the drawbar and the towed implement/trailer. Detailed instructions are provided in the tractor operating section of this manual to accomplish the safety chain attachment. The safety chain needs to be attached to the designated location on the tractor drawbar support and specified location on the towed implement or trailer. Leave enough slack to permit turning. The safety chain must be rated to match the load of the towed implement/vehicle. Contact your MTZ dealer for advice matching the chain to the load. Do not use the chain to tow the implement/trailer should the drawbar connection malfunction or at any other time. If disconnection occurs take all necessary precautions to reduce speed and move out of the traffic lane to a safe place.

Safe Transport Speed

Do not exceed the safe transport speed of the mounted or towed equipment. This tractor may be capable of traveling in excess of the save towed equipment speed limit. Exceeding the recommended speed limit of the equipment can cause:

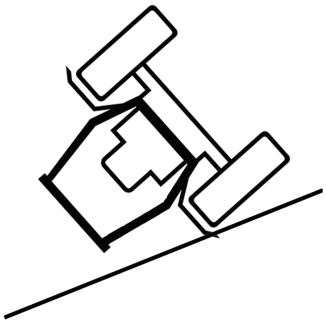
- Loss of directional control of the tractor and the implement combination.
- Reduced or no ability to stop the tractor and the implement combination.
- Implement tire failure.
- Damage to the to the implement structure or components.

Do not transport implements or trailers without brakes in excess of 20 MPH. If the implement weight exceeds 1.5 times the tractor weight the implement needs brakes when transported by the tractor. The factor 1.5 is an accepted standard and best practice regarding ability of a tractor to stop under controlled conditions an un-braked implement. Do not tow implements/trailers with brakes over 25 MPH unless the equipment operating manual specifies a different maximum speed. When transporting equipment with brakes up to 25 MPH the equipment weight cannot exceed 4,5 times the tractor weight.

When transporting equipment or trailers between 25 - 31 MPH the equipment weight cannot exceed

3 times the tractor weight. Test the brake system and combination reaction several times at various speeds to become familiar with how the combination responds to braking action. Stop and correct any malfunction if the brake system does not respond normally.

Operating Caution on Slopes, Uneven Terrain and Rough Ground



Use caution operating on narrow elevated roads. Confirm that all bridges are adequate to support the tractor and combinations of mounted attachments or towed equipment. The following operational actions can cause a rollover or tip over leading to serious injury or death:

- Avoid holes, ditches and obstructions.
- Do nor sharply steer up hill.
- Reduce speed of operation on slopes and rough terrain if the tractor wheel tread is closely spaced.
- Operating on a slope requires operator attention. Avoid starting, shifting, stopping or turning on a slope. If the tires loose traction, disengage the PTO if active and turn the tractor down slope at 90 degrees to the slope and proceed slowly. Move gradually on slopes avoiding any sudden changes in operation.
- Reduce speed operating on uneven terrain and rough ground to avoid loss of control.
- Avoid driving close to the edge of embankments along ditches and bodies of water. The tractor can roll over if a wheel slips off the embankment or the embankment soil fails causing the tractor to suddenly drop.
- It is not possible to list every possible hazard associated with operating on slopes, rough terrain and uneven ground. The operator must observe the conditions carefully and apply sound judgement before proceeding to operate under these conditions.

Recovering the Stuck Tractor

Attempt to dig ramps in the soil behind the back tires after unhitching the implement from the tractor. Use a second tractor and strong chain to recover the towed implement rearward until it can be attached to a tractor and moved out of the zone needed to free the tractor. Dig a ramp behind the rear and front tires to help ease the tractor out of the stuck position. It may be possible to back the tractor out of the stuck position. If assistance from a second tractor is required choose a chain with adequate rating to withstand the force of the towing tractor. Inspect the chain to confirm there are no flaws. After hitching the tractors drawbar to drawbar remove the slack in the chain and ensure all bystanders are removed from the towing zone hazard should a chain of component malfunction occur. Both tractor operators should coordinate a smooth power application to both tractors during recovery. The towing tractor operator must be alert to tipping backward due to the forces on the towed tractor and act accordingly.

Tractors can be recovered by driving forward using the same procedure of removing the equipment and digging ramps in front of the tires. Attach the tow chain to the stuck tractor at an approved towing point and the other end of the chain to the drawbar of the towing tractor.
It is impossible to assume all f the recovery scenarios possible. Each recovery requires careful analysis and thoroughly though out actions to avoid hazards leading to serious injury or death.

Agricultural Chemicals

Agricultural chemicals such as fungicides, insecticides, pesticides, rodent exterminators and fertilizer must be used carefully according to the manufacturer instructions to avoid harm to health and environment. Follow the chemical manufacturer safety instructions for compliance to effective, safe and legal use of the chemical.

Avoid contact with agricultural chemicals and follow chemical manufacturer instructions for storage, use and disposal. The tractor cab can become contaminated by soils and liquid from the application site carried in on shoes and clothes. The enclosed cab will not prevent inhalation of vapor, dust or aerosol ingredients. Wear an appropriate respirator in the cab when applying pesticides that advise that a respirator must be worn to protect the operator. Reduce the risk of contaminating the cab by removing protective clothing before entering the cab and storing in a sealable plastic container. Likewise, remove all dirt from shoes outside the cab before entering.

Reduce the risk of exposure and injury

by following these best practice actions when handling chemicals:

- Always follow the chemical manufacturer guidelines for recommended protective equipment. The words DANGER, Warning and CAUTION on the chemical container require the following protective equipment;
  - △ **DANGER** identifies the most toxic chemicals generally requiring the use of goggles, respirator, gloves and skin protection,
  - △ **WARNING** identifies less toxic chemicals requiring the use goggles, gloves and skin protection.
  - △ **CAUTION** identifies the least toxic chemicals requiring gloves and skin protection.
- Avoid inhaling dust, vapor and aerosols.
- When mixing and applying chemicals keep soap, water and a clean towel nearby. Wash face and skin with soap and water immediately if exposed to chemicals. Flush eyes immediately with water. Contact a medical doctor or facility for additional treatment actions.
- Wash hands before eating, drinking, smoking and performing any other bodily functions.
- Do not smoke, eat or drink while mixing and applying chemicals.
- Bathe/shower after applying and mixing chemicals to remove chemicals from your body. Wash the clothes before wearing them in the future.
- Store chemicals in the original containers. Do not store chemicals or chemical mixtures in unmarked containers.
- Food and drink must not be stored in an empty chemical container.
- Chemical and chemical mixtures must be kept in a secure storage area in accessible to the general public, children, pets and animals.
- Dispose of containers in accordance with the chemical manufacturer procedure. In lieu of a specific procedure, triple rinse the chemical container and puncture or crush the container.

Battery Care and Maintenance

This tractor uses batteries to meet the electrical demands for operation. Battery electrolyte contains sulfuric acid which will burn skin on contact and eat clothing material. Sulfuric acid splashed into eyes can cause blindness. If acid contacts skin or eyes immediately;

- Wash the skin with water,
- Apply baking soda or lime to neutralize the acid,
- Flush eyes with water for 15 minutes and seek immediate medical attention.

If acid is swallowed;

- Do not induce vomiting,
- Drink up to 2 quarts of water or milk.
- Seek immediate medical attention.

Warning battery posts and terminals contain lead and lead compounds which are identified by the State of California as potential causes of cancer and reproductive harm. After touching a battery terminal or post wash your hands with soap and water.

Battery gas can explode. Use a flashlight to check electrolyte level. Keep batteries away from sparks and open flames. Always use a voltmeter or hydrometer to determine the charge level of a battery. Do not short the positive and negative terminal with a metal object. When servicing or removing a battery from the tractor remove the grounded (-) terminal first and ensure it will not touch the post during removal or installation of the battery. When reinstalling the battery cables install the grounded (-) terminal last.

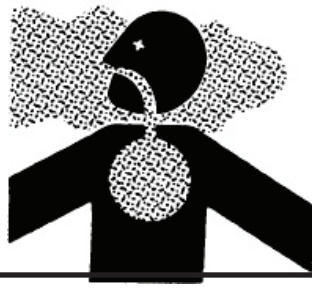
Avoid battery related incidents:

- Check electrolyte level and add electrolyte/water in a well ventilated area.
- Wear eye protection and rubber gloves.
- Do not use forced air to clean batteries.
- Avoid breathing fumes from the open battery cell while servicing.
- Avoid spilling or dripping electrolyte. Use a suitable container for filling the battery cells.
- Use the proper charger voltage and charge rate for the battery. Do not over charge or charge too rapidly.
- Do not attempt to use a battery that has been frozen.
- During long idle periods check battery condition biweekly and add a trickle charge to restore voltage to the maximum. The electrolyte in a discharged battery will freeze causing internal damage.
- Replace a battery if there are leaks in the case or the case is bulged due to freezing.

Fuel and Hydraulic Lines and Hoses

Fuel and hydraulic lines are filled with pressurized fluids. Do not apply heat from welding, soldering or a torch near these lines. The heat can cause expansion leading to a fluid leak or explosion which can cause severed burn injury. Your MTZ dealer has the knowledge and skilled technicians capable of safely performing repair work such as welding, soldering or heating in the vicinity of high pressure fluid lines.

Preparation of Surfaces to be Welded or Heated



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Preparation of Surfaces to be Welded or Heated

Before performing service work, understand the procedures and all tools necessary to safely perform the work in a clean, dry well-ventilated area. Use an external exhaust venting system to route the exhaust to the exterior of the building if the tractor engine must be operated for diagnosis and confirmation of the repair during the service procedure keep the area clean and dry to reduce the risk of slipping and falling.

Move the tractor to the area selected for the service and disengage all power and operate controls to neutralize the control functions and relieve pressure in hydraulic circuits. Lower any attached equipment to the ground. Place the transmission in neutral and engage the park brake. Stop the engine and remove the starting key. Place a tag on the steering wheel that the tractor is in service condition and is not to be started or moved until this tag is removed. Contact your MTZ dealer for tags for this purpose. Do not attempt to perform service on a moving tractor or equipment.

Use the lift points designated on the tractor to raise the tractor and use proper supports rated for the load. Do not work under a raised tractor supported by a jack. Always install supports after using the jack to raise the tractor.

Disconnect the grounded (-) battery cable and restrain it from making contact with the battery terminal during service and repair work to the electrical system. Disconnect the electrical connections between the tractor and implement before making welding repairs on the implement to protect the tractor electrical systems.

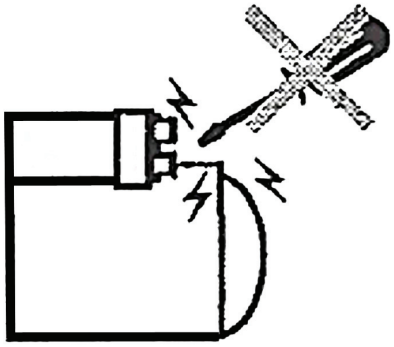
Use MTZ parts from your MTZ dealer in performing service and repairs to ensure factory specified performance. Confirm that the repair has corrected the malfunction and restored the tractor and implement to serviceable condition. Always use new or certified remanufactured parts from your MTZ dealer to repair damaged or worn parts. After completing the repair lean the tractor removing an oil, grease, fuel and flammable material before placing the tractor in service.

Use a sturdy approved letter or step stool as a work platform to perform service on the tractor above the floor. When performing service or repair on a ladder or platform ensure that all motions necessary to perform the work is within comfortable reach and does not require an off-balance position. Adjust the location of the ladder or platform to find a comfortable position. Some tractor service can be performed from authorized tractor access ladders and platforms as described in the manual operating section. Wear tight fitting clothing and clean footwear when using ladders, stools and tractor access features to service the tractor. Use handholds and rails when using tractor access ladders.

Hot Tractor Components

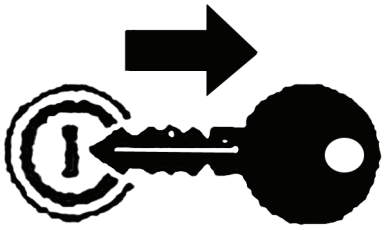
During operation tractor components such as the engine, hydraulic components and drivetrain components can cause burn injuries if touched, Avoid contact with these components until the engine has been stopped and sufficient time has elapsed to cool the surfaces of these components. Avoid exhaust gases during operation to prevent burn injuries and inhaling harmful vapors. Confirm that implement hydraulic couplers are cool enough to grasp before attempting to disconnect the couplings. Tractors and equipment parked in strong sunlight can become hot enough to cause minor burn injuries. Wear protective clothing to access the tractor cab and perform maintenance or adjustments. The cab interior can become hot enough to cause discomfort from leaving the tractor exposed to strong sunlight. Use protective clothing to enter the cab and start the engine. Confirm the transmission and PTO controls are in neutral. Activate the air conditioner and allow the cab temperature to reach a comfortable level before operating the tractor.

Unintentional Movement from Bypass Starting



Start the tractor engine seated in the operator seat with the transmission in neutral, parking brake engaged and PTO control off. If an implement is attached to the 3-point hitch or drawbar ensure that the implement controls are all positioned in neutral. This tractor has bypass start protection compliant with SAE J 1493 to prevent using a metal object to make direct contact with the starter terminals. Do not remove the protective cover from the terminals. Starting the tractor from the ground at the starter bypasses the neutral start safety switch preventing engine cranking if the transmission is in gear. Cranking the engine standing at the starter by removing the protective cover can result in the engine starting. If the engine starts in gear the tractor will move and can result in serious injury or death from a run over incident.

Parking the Tractor



Do not park the tractor and implement on a public road or right of way except in emergency. If necessary to temporarily park move the tractor and implement as far from the road travel lanes as possible. Notify police for assistance and use emergency hazard signals.

Park the tractor and its attached implements in a secure safe condition if the operator will leave the tractor. Stop the tractor and implement in as level position as possible and away from a low utility lines that could be entangled by the implement and/or tractor. Reduce the engine speed to low idle. Place the transmission in neutral, engage the parking brake. lower the implement to the ground and place all other controls in neutral or the off position. Stop the engine and remove the starting key. Use the key to lock the cab door. Disengage the battery disconnect switch isolating the battery from the tractor electrical system.

Transporting the Tractor

A malfunctioning tractor can be towed short distances at speeds less than 6 MPH to move it from a vulnerable or inaccessible place to a secure accessible place for loading on a suitable on road transport truck. Check the specification section of this manual and determine the weight of your tractor configuration. Include

ballast and any other added weights on the machine. Determine the width and height of your tractor and make necessary adjustments to meet highway traffic restrictions for weight, height and width. After loading on a suitable trailer truck combination close and lock the doors and windows. Ensure that the tractor hood is securely retrained. If necessary add a suitable restraining strap to prevent sudden movement during transport. During transport place the transmission in neutral and engage the park brake. Never transport the tractor with the engine running. Locate the tractor tie down points and secure the tractor to the trailer from these points. Install the articulation locking linkage.

Cooling System Service

The tractor cooling system operates under pressure and at temperatures exceeding 200 degrees F. Do not attempt to remove the coolant system cab while the engine is running or is at operating temperature. The loosened cap can explosively release Scalding liquid that could cause serious injury and death. The coolant system cap can be removed after the engine has been stopped and the system allowed to cool until comfortable to touch. Twist the cap slowly counter clockwise to release any negligible residual pressure. It is now safe to remove the cap by continuing to twist it counter clockwise.

Servicing the Accumulator

This tractor utilizes an accumulator. Accumulator function, maintenance and repair is explained in the operating and maintenance sections of this manual. Accumulators are pressurized reservoirs that store energy for certain tractor functions. Such as brakes and hydraulic controls. Serious injury or death could occur if connecting hoses/lines and fittings are cut or loosened while the accumulator is pressurized. Extreme heat from nearby sources such as welders or torches can cause the accumulator to explode. Keep extreme heat sources from accumulators and prevent damage to hoses and lines of the accumulator system. Contact your MTZ dealer for accumulator service by a trained technician. Do not loosen connection in the accumulator system until all pressure has been slowly released as instructed by the accumulator manufacturer. Do not repair a damaged accumulator.

Tire and Wheel Service

Check and confirm tire pressure before working with the tractor. Adjust the pressure to the recommended level in the specification section for the tire and ballast weight. Do not operate the tractor with tire pressures above or below the specified pressure. Do not move a tractor with a flat tire unless an emergency exists to avoid damage to the tire side wall structure.

Contact your local tire service company for tire repair. It is necessary to use specialized equipment to service the tires. Before removing a tire for service follow the parking procedure and use a jack stand to support the tractor at a designated jack point as described in the operating and maintenance section of this manual.

Do not support the tractor with concrete blocks or random pieces of wood. Unless proper tire servicing equipment is used during the tire repair sequence serious injury or death can result from an incident. Use adequate lifting equipment to remove the tire and wheel assembly if necessary to make repairs.

Before inflation place the tire in a cage designed specifically to restrain a tire and wheel parts if the assembly explodes during inflation. Use a clip-on chuck to attach the air hose to the valve stem during inflation. Do not stand facing the tire during inflation. Stand to the side of the tire. Do not over inflate the tire and confirm the proper pressure from the specification chart in this manual as well as the maximum pressure rating molded into the tire. Mount the tire and wheel assembly to the tractor and torque the wheel retaining bolts to specifications in the operating section of this manual.

Replace tire that:

- Will not maintain pressure after repair.
- Exhibit cuts particularly in the side walls
- Exhibit bubbles
- Exhibit severe cracking.

Welding a wheel assembly with a mounted tire can cause an explosion resulting in serious injury or death. Welding can cause deformation of a wheel assembly. Heating a rim to eliminate a deformation can weaken the steel leading to a sudden failure in use. Replace a damaged rim.

High Pressure Hydraulic Fluid

Inspect the tractor before use. NOTE hydraulic leaks and sources. Tighten leaking fittings. Repair or replace:

- Kinked hose.
- Cut hose.
- Cracked hose.
- Abraded hose.
- Blistered hose.
- Hose with braid visually apparent
- Corroded steel or aluminum components.
- Crushed, crimped or otherwise damaged steel lines.

Contact your MTZ dealer for the correct performing replacement part.
Use a piece of cardboard to search for leaks to avoid serious injury or death from oil penetration into the body. Have a second person present in the operator seat if the diagnosis will be made with the engine running.

Oil penetrating the skin can cause gangrene and the affected skin area requires immediate medical attention to determine the course of treatment necessary. Surgery may be necessary to remove damaged tissue penetrated by the oil.

High Pressure Fuel System

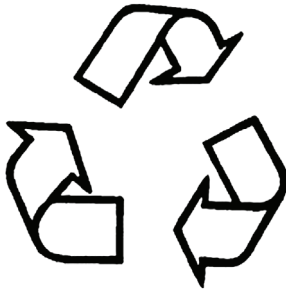
The diesel engine of this tractor uses a high pressure common rail fuel system and electronic sensing system integrated into the US EPA Tier 4 final diesel engine emission certification. The system operates at very high pressure and can cause serious injury or death if a leak occurs. If a leak is detected move the tractor to a secure parking location quickly and park the tractor as described

in Parking the Tractor. Contact your MTZ dealer for assistance by a trained technician to diagnose and repair the malfunction. Only a trained technician can perform this service safely and preserve the EPA certification.

Tractor Accessory Storage

Accessories such as dual wheels, ballast wheel weights and front ballast weights should be properly stored when not in use to prevent serious injury or death. Store the items in a secure location and restrained to prevent falling if disturbed. When not in use store mounted and towed attachments and equipment in secure and safe configurations. Prevent access by children and bystanders. Follow recommended storage and removal from storage instructions for all tractor related accessories and equipment.

Decommissioning - Proper End of Life Tractor Disposal of Fluids and Components



Throughout the service life of your tractor It will require routine maintenance and replacement parts to compensate for wear and restore performance. Advice is provided in the operations section to dispose of fluids and materials responsibly. When in doubt contact your local MTZ dealer and local recycle facility to clarify how to dispose of the used fluids and materials without harming the environment. Air conditioning systems require a professional technician certified with the proper skill and equipment to prevent Escape of refrigerant into the environment.

When the tractor can no longer be maintained and prepared for productive use it must be decommissioned responsibly to prevent environmental harm and recycle materials that reduce the impact on resources to create new materials. Follow instructions in this manual to secure the tractor in a safe state neutralizing all controls and releasing all residual control pressure. Ensure that the machine remains stable though the disassembly process to avoid potential entanglement and crushing injuries.

Determine the correct protective clothing and devices necessary to perform the decommissioning activity such as eye protection, rubber gloves, foot protection, hard hat, respirator and protective clothing. Do not use cutting torches without proper protective clothing and functional fire extinguishers standing by. Do not use cutting torches to dismantle fuel and hydraulic tanks or any other tractor reservoirs that have contained flammable fluids. Use cutting torches in well ventilated areas. Support structures properly before using a cutting torch to dismember. Do not use a cutting torch to remove accumulators. Rubber parts and hydraulic hose assemblies are flammable and can be ignited by a cutting torch. Do not use a cutting torch near the tires nor to heat and cut the tractor wheels while tires are mounted to the wheel assembly.

Drain all fluids from the engine, drivetrain, brakes and hydraulic system into suitable labeled containers avoiding spillage. Spilled liquids must be treated and removed from the spill area. Dispose of the specific fluids at a recycle center approved to accept the fluids.

Remove glass carefully. Safety glass will break, but resist breaking into small pieces. Tempered glass will fracture into very small pieces without slivers. Always wear protective clothing when

removing glass from the cab windows. The small pieces of glass must be placed in a container to avoid potential injury from ingestion or contact with eyes.

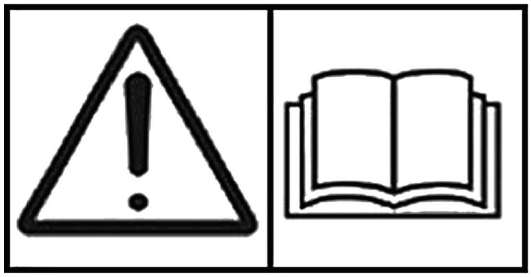
Tractors utilize microprocessors and sensors can contain hazardous material. Dispose of these components at a recycle center for electronic devices. If a hazardous warning is discovered during disassembly, stop and determine the correct steps to proceed. Contact your MTZ dealer for this information. Batteries contain Sulfuric acid. Remove batteries and return to an approved battery disposal facility. Do not attempt to drain the electrolyte. Do not crack or fracture the battery case that would cause the loss of electrolyte to the environment. Do not touch the battery posts ar battery terminals with your hands. They contain lead and can be harmful if ingested through contamination of fingers.

Determine the types of recycled materials that will result such as steel, iron, rubber tires, fluids, batteries, hose assemblies, glass electronic components, plastic, copper, aluminum, and fiber. Ensure that the appropriate recycling action is taken for each material to protect the environment. Dispose of contaminated protective clothing as instructed by the manufacturer.

Before decommissioning understand the task, materials, tools, protective clothing and facility required to safely recycle the tractor. Contact your MTZ dealer for advice to safely comply with the process. Contact local environmental agencies to determine local rules and locations accepting recyclable materials.

2.2 General Safety Requirements

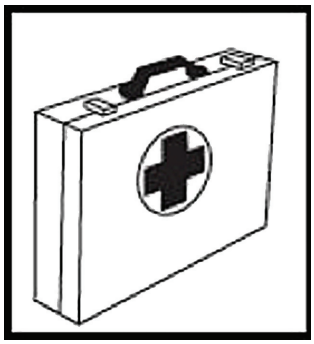
Tractor design ensures safety of tractor operations.



In order to avoid accidents, strictly observe the “Road traffic rules” and safety measures set forth in this section.

A failure to observe the safety regulations can lead to an accident or injuries.

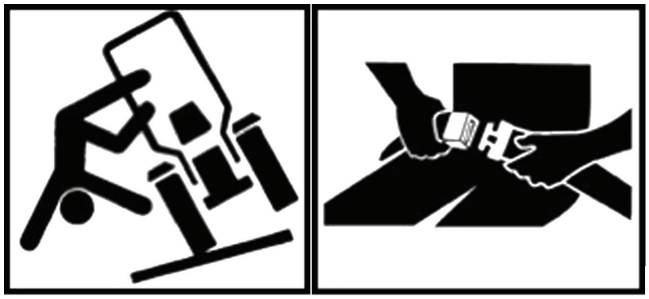
Only properly trained personnel should be admitted to work with the tractor.
The tractor should be completely equipped and serviceable.



A first aid kit stocked in accordance with effective regulatory documents should be installed and fixed in the tractor cab.

If needed to use cab windows as an escape exit, break the glasses with the hammer provided for in the cab.

Keep the cab clean; no foreign objects are allowed in the cab.



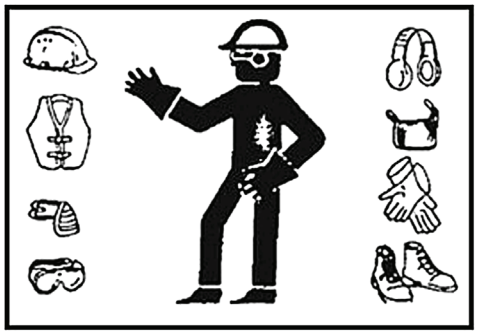
Allowing more than two persons including the driver in the tractor cab nit recommended

The seats should be in good working condition.

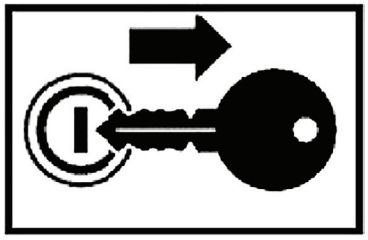
The driver and the passenger should be fastened by safety belts.

In case any fault occurs, the tractor should immediately be stopped in order to eliminate them.

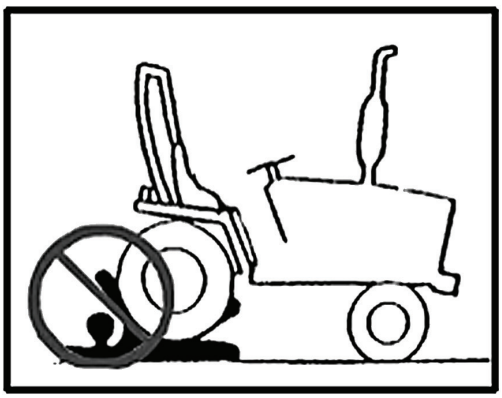
2.3 Safety Measures During Depreservation, Installation, Test Operation and Running-In

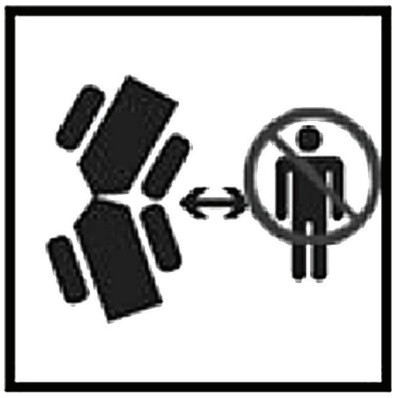


In the course of tractor washing, application and removal of lubricants and paintwork coatings the workers should be provided with aprons, gantlets and protective goggles.



Prepare the tractor for operation only with the engine being shut down and the parking brake being pulled up; mounted implements should be lowered.





Do not be under the tractor as well as in the area under the hinge pivot device of the frame with the engine being in operation.

During depreservation, installation, assembly, test operation and running-in follow the guide-lines set forth in the corresponding sections.

Perform depreservation and preservation of the tractor in a specially equipped room with observance of all occupational and industrial safety regulations and fire safety regulations.

2.4 Safety Measures During Tractor Operation

Before starting the engine, the change-gear lever and the change-mode level should be in the “Neutral N” position (Fig.15); levers of the hydraulic distributor of mounted implements should be in the “Neutral” position; the parking brake should be pulled up.

Before taking off, make sure that the road is free, that there are no people between the tractor and the agricultural implements as well as in the area of frame hinge pivot device. Issue a warning sound signal at the beginning of movement.

Before leaving the tractor, set the change-gear lever and the change-mode level into the “Neutral N” position (Fig.5); levers of the hydraulic distributor of mounted implements - into the “Neutral” position; pull up the parking brake and shut down the engine.

In order to avoid overheating of the hydraulic system, do not leave the tractor in the position of full swing (up to the stop) of the semi-frames to the right or to the left.

When working with cables on towing hooks, do not stand in the cable radius area.

Do not to use parking brake during motion.

Don’t to tow the tractor by suspension unit.

When the tractor is moving with linkage being lifted incompletely, it is necessary to adjust the horizontal brace struts for a length preventing from touching the elements of the linkage of the rear wings.

Look at the digital output of monitoring devices and their operability. Make sure not to work with the tractor having faulty devices.

Do not open plug of the expansion tank at the cooling fluid with temperature over 70°C.

In case of accident or excessive increase of the engine crankshaft rotation rate, immediately deactivate the fuel feed using the shutdown handle.

Do not work with the tractor having faulty steering control, brake system, electrical lighting and alarm signaling.

All tractor control levers should admit fixing in the corresponding positions.

Tractor brakes are to be in good working condition. When braking the tractor traveling over dry and hard ground using the service brake, the braking distance should not exceed 13 m at the speed of 8.33 m/s (30 km/h) and 6.5 m at the speed of 5.6 m/s (20.2 km/h). The brake pedal being fully depressed should not bump up against the cab floor.

Air pressure in the pneumatic system of brakes in the course of operation should be equal to 0.65-0.8 MPa (6.5 – 8.0 kgf/cm^2).

The storage batteries should be reliably fastened, closed with a lid and should have no electrolyte leaks.

Before switching on the “battery disconnect” switch after a period of not running the tractor (over 24h), especially in summer season, open the lid of the storage battery container for a period of not less than 5 min in order to remove the explosive hydrogen-air mixture generated in the self-discharge process.

Look at the condition of electrical equipment. Sparking, break of wires and terminals, especially near heated parts and at places of possible ingress of oil and fuel thereon are not al-lowed.

The permissible tractor speed at access driveways and passageways should not exceed 10 km/h.

When turning, select the speed providing for a safe traffic. Do not enter tight turns at a gear exceeding the first gear of the fourth mode.

When crossing dams, dikes and bridges, make sure of the possibility to drive ahead and use only low gears.

Before passing route portions requiring engagement of both driving axles (ascents, heavy-going areas), actuate the rear axle beforehand.

When working on slopes, exercise caution, carefulness in tractor driving and meet the following conditions:

Do not shut off the engine and do not change gears and modes on steep ascents and descents; during motion down the slope, don’t coast;

It is allowed to operate across the slope that doesn’t exceed 5° angle and only in modes I...II, avoiding sharp turns and not driving over obstacles.°

Only drive across water obstacles after a thorough preparation and inspection of the route of travel. Fording is allowed with the maximum depth of 3.28’ - 1.00 m

Coupling to, and mounting of agricultural machines and implements on the tractor should be carried out by persons operating such machines. Coupling worker who mounts a machine should stay aside until full stop of the tractor and begin coupling (mounting) only after driver’s signal.

During operation of the tractor with agricultural machines and implements, follow the safety rules set forth in the operation manual for such machines or implements.

Approach the agricultural machines, implements or trailers on the tractor at the minimum speed with the drain gate drive pedal being depressed incompletely, having honked in advance.

Having connected the trailing implements and pumped through the hydraulic system, check the level of oil in the hydraulic tank and, if necessary, refill it.

Do not stay under an agricultural implement being lifted.

In case of long-term shutdown, do not leave the mounted agricultural implement in the lifted position. Don't stay under the implement being lifted.

When working with hydraulic agricultural machines and implements, it is necessary to re-member that the maximum working pressure at the outlet of quick lock rupture devices is at least 15.0 MPa (150 kgf/cm^2).

Trenches, hillocks and other obstacles can be crossed by tractors with mounted implements at the right angle, at a low gear, avoiding sharp pounding and large rolls of the tractor.

Do not travel on trailing implements and mounted machines not designed for this purpose, and outside the tractor cab.

Trailing implements and trailers should have rigid couplers preventing their falling on the tractor.

In case of tractor disconnection from trailing implements or trailers, first disconnect the pneumatic systems and electrical equipment.

Only those persons who are aware of the rules should be permitted to work with trailers, semi-trailers and other vehicles.

When hooking up trailers and semi-trailers, connect their safety chains to the connecting links located on the lifting nuts of the linkage braces.

When using the tractor in hauling operations, it is necessary to take the following precautions:

When traveling off farm, make sure the "Slow Moving" sign is switched on;

Check reliability of the pneumatic system operation;

Pay special attention to the choice of travel speed with the account of road conditions, radiuses of turn, visibility, features and condition of vehicles and the load being conveyed;

When operating the tractor on snowy, wet and other roads with a low adhesion coefficient as well as on slopes, turns, hillsides, glaze ice, etc., travel at low gears, do not brake abruptly and turn;

When moving on roads with a low adhesion coefficient, it is recommended to drive the tractor train "stretched out" - to this end, brake the hooked-up vehicle first by means of the hand brake valve 17, Fig. 34, page XX, and then use the tractor service brakes;

In case of occurrence of a danger for driving, take measures to decrease the speed and stop the road-train;

In case of a sudden stop of the tractor on the surfaced portion of roadway, switch on the alarm signaling. To this end, press the button pos. 1 on the control panel Fig. 68, Page 96. At the same time, both turn indication lights on the instrument panel (Fig. 61) start blinking;

Trailer brakes should be adjusted in accordance with the requirements set forth in the operation manual for trailers;

Travel of the tractor train at maximum speed of 8.39 m/s (30 km/h) is allowed only on roads with dry hard pavement;

In case of first signs of jack-knifing or skid of the road-train, release the brake pedal and brake by means of the control handle for trailer brakes until the jack-knifing or skid are eliminated;

At a road-train parking, during loading (unloading) of trailers, set the handle of manual brake valve into the “pulled” position. Before the beginning of travel, set the brake valve handle into the “pushed” position;

When hooking up the tractor with vehicles having 12V equipment, it is necessary to replace electrical lights on the vehicles;

When driving with a vehicle:

Periodically check brake operability of the trailer by braking with the trailer brake control handle;

Do not use the manual fuel feed lever; set the fuel feed lever into the position of minimum fuel feed; transportation of people on trailers is prohibited.

Do not work with the power take off without installation of all protective enclosures. In case of short-term stops for inspection of the implement which is operated with the power take off shaft, it is necessary to disengage the power take off shaft.

The connection and disconnection of the PTO reducer shaft to the slotted bushing of the agricultural implement drive should be performed with the engine being stopped.

Do not leave operating pre-start heating system unattended;

When working with the tractor:

Watch the readings of instruments and signal devices. The readings of instruments and signaling of indicator lights should correspond to the directives set forth in the “Controls” section;

Do not permit engine operation under load at the cooling fluid temperature below 70°°C;

Do not connect uncleaned pipelines and hydraulic fittings of agricultural machines and implements to the hydraulic system of the tractor;

Check the oil level in GB after engagement of the PTO shaft, if necessary, refill it.

Comply with the following procedures of operation for pneumatic tires:

a) do not permit tractor operation with significant wheel slip;
b) do not permit tractor operation and parking with damaged and blown-out tires;
c) do not permit travelling on tires with decreased internal pressure even for small distances as it leads to tire failures;
d) in order to avoid increased wear of tires, operate the tractor on roads with hard pavement during not more than 30% of the total period of operation;
e) protect tires from the ingress of fuel, oil and other petroleum products therein;

NOTE!

In order to prevent untimely failure of the rear axle cardan gear and to reduce the wear of tires, it is necessary to engage the rear axle only in case of tractor operation with agricultural implements and during travel in heavy road conditions.

NOTE!

When driving in good road conditions (on roads with compact ground or with pavement), the rear axle should be disengaged.

2.5 Safety Measures During Maintenance, Trouble-shooting and Placement for Storage

Before proceeding to maintenance and troubleshooting, it is recommended to clean the tractor from dust and dirt.

Execute maintenance, troubleshooting and dirt cleaning operations only with the engine being shut off, parking brake being pulled up and mounted implements being lowered. IT IS PROHIBITED to be under the tractor as well as in the area under the hinge pivot device of the frame with the engine being in operation.

When jacking the tractor, use reliable jacks with the carrying capacity of at least 120,000 N (12,000 kgf); perform jacking as per jacking diagram using “DK” marks on the tractor. In order to avoid jack-knifing of tractor semi-frames in the course of tractor jacking, install split bushings on the swing hydraulic cylinder stems preventing the movement of stems.

When carrying out maintenance in the area of horizontal pivot tube, prevent jack-knifing of tractor semi-

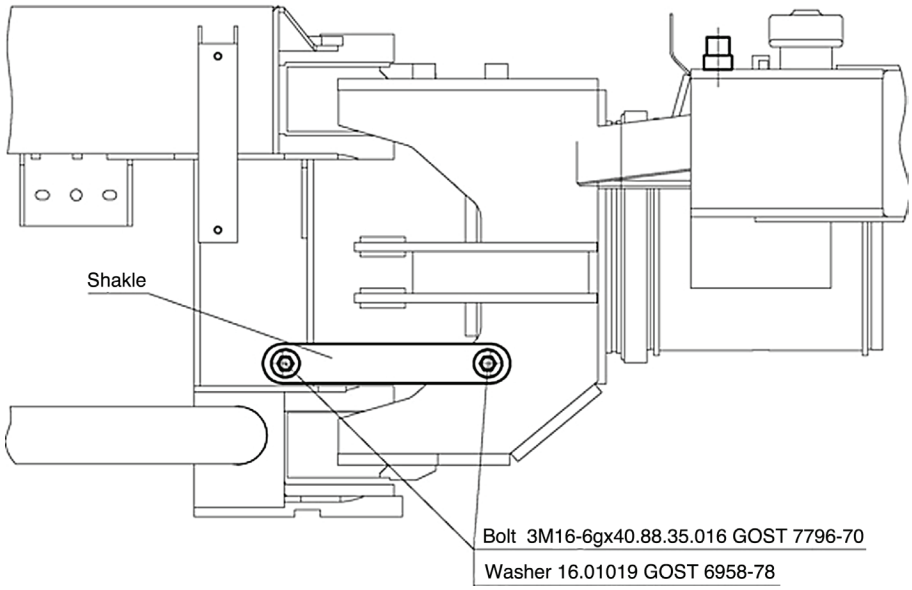


Fig. 7

frames by connecting (locking) them using the shackle fixed on the rear semi-frame.

When using lifting and transporting equipment, it is necessary to strictly comply with the corresponding safety requirements.

The tools and attachments should be operable, conform to their designated purpose and ensure safe execution of work.

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

When installing and dismantling wheels, strictly follow the procedures set forth in the corresponding subsection. On each type of wheels install a tire of the proper size only, which is determined by the

technical specification for such wheel.

All repair operations related to the use of electrical welding directly on the tractor should be executed with the battery disconnect switch being switched off.

When carrying out maintenance for storage batteries, it is necessary to comply with the following procedures:

Avoid the ingress of electrolyte on the hands;

When cleaning the battery, wear gauntlets and use a wiping cloth soaked in ammonia solution (ammonia spirit);

Do not check the degree of battery charging by short-circuiting the terminals;

Do not use open fire when checking the electrolyte level;

Never pour water into acid in order to avoid acidic splashes;

Upon completion of work related to maintenance of storage batteries, a disappearing stair should be installed and fixed on the tractor.

In case of tractor placement for storage, inspection and maintenance during the storage period and in case of withdrawal from storage, it is necessary to obey the corresponding guide-lines set forth in the “Storage regulations” section.

During storage it is necessary to take measures preventing turnover and inadvertent displacement of the tractor. The tractor should be installed on strong, specially prepared stands.

Remember that cooling automotive fluids and antifreeze agents are poisonous and the ingress of even a small amount of them into human body can cause a heavy intoxication.

NOTE!

If needed to dismantle the starter, cut out the protective bracket welded to the side member at the face end side of the starter.

2.6 Fire Safety Requirements

Every driver must be aware of fire safety regulations, fire-extinguishing methods and must fulfill fire prevention measures.

The tractor is to be equipped with fight-fighting inventory including fire-extinguisher and shovel. The place for fire-extinguisher attachment is provided for in the rear part of the left side wall of the cab.

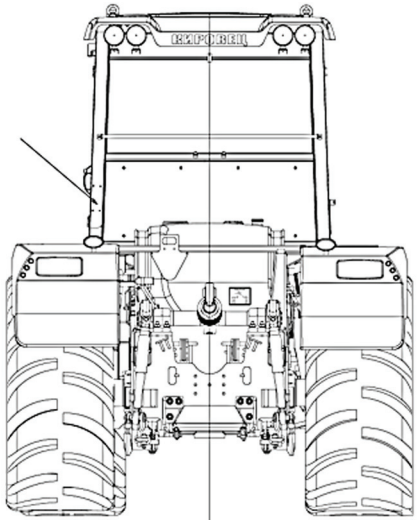


Fig. 8

Safety

The spaces to park the tractor and store fuels and lubricants should be plowed around with a strip of at least 10’ - 3 m width and provided with fire-extinguishing means.

In tractor storage areas do not to smoke, make fires and execute works related to the use of open fire.

Fill fuels and lubricants by a mechanized method. When filling oil and checking the oil and fuel level, do not use open fire and do not smoke.

If needed to perform a repair in field conditions with the use of electrical gas welding, the parts and assembly units should be pre-cleaned and washed to remove the fuel and lubricants.

When washing the parts and assembly units with kerosene or petrol, take measures to pre-vent inflammation of washing fluid vapors.

Do not admit accumulation of straw products on the engine.

Check for the serviceability and timely charging of the fire-extinguisher.

When the engine shuts down, switch off the battery master switch.

Periodically clean the exhaust pipe from sludge and carbon deposit.

Do not use open flame to heat pipelines, oil in the engine tray, and when filling fuel and oil.

In case of occurrence of a fire source, it is necessary to do the following:

Switch off the battery master switch (de-energise the system);

Stop the fuel feed;

Extinguish the center of fire with the use of the fire-extinguisher or any other means at hand.

Do not pour water onto burning fuel.

In order to avoid an explosion of storage batteries, do not work with the tractor at a voltage exceeding the voltage controller level set in accordance with the ambient temperature.

Do not use fuses with a rated value contradicting to the electrical diagram value.

When working with the tractor, do not wear a uniform impregnated with oil and fuel.

Do not admit leaks of fuel and oil at pipeline connection joints. Spilled fuel and oil should be wiped up.

Do not permit sparking from the exhaust pipe, which can be the cause of fire and serve as the evidence of abnormal operation of the fuel equipment.

3 GENERAL DESCRIPTION AND TECHNICAL FEATURES

3.1 Purpose and Scope of Application of the Tractor

MTZ-Kirovets K744 tractors for general purposes serve for the execution of various agricultural operations with mounted, semi-mounted and trailing machines and implements, hooking up with which allows to perform plowing, reclamation, harrowing, sowing, scuffing, disk harrowing, deep plowing, tilting the soil without or before plowing, snow capture and other kinds of work. In addition, the tractors can be effectively used in transport operations performed on field and ground roads as well as on roads with hard pavement. The tractors are designed for broad use in most climatic areas.
The description of design, installation and procedures of operation of the above-mentioned equipment are set forth in the instructions to be attached to each type of equipment.
Tractor hooking-up with agricultural machines or implements and vehicles, their operation shall be performed according to the instructions issued by the manufacturers of such machines.

List of implements approved for use with MTZ-Kirovets K744 TRACTOR

IMPORTANT!
Agricultural machines and implements designed for hooking up with K-744 tractors and not mentioned in the following list must checked and confirmed with your dealer re the compatibility of your preferred implement for this tractor. Use of a non-approved implement may cause damage to K744 tractor or injury to operator and void the warranty.

Table 1

Model	Description	Quantity of Implements in the hookup	Method of connection
PVR-3,5	Attachment to 7 to 9 furrow plows for soil compaction	1	3pt Hitch
OP-12	Implement for pre-sowing preparation of soil	1	Drawbar
PTK-9-35 (40)	9 furrow plow	1	Drawbar
PNL-8-40	8 furrow plow	1	3pt Hitch
PRK-8-4	8 furrow plow	1	The same
PGP-7-40	7 furrow plow	1	3pt Hitch
PN-8-35	Mounted 8 furrow plow	1	3pt Hitch
PUN-8-40	Multipurpose mounted 8 furrow plow	1	3pt Hitch
PRUN-8-45	Multipurpose mounted 8 furrow plow ripper	1	3pt Hitch
PRK-8-40	Combined 8 furrow plow ripper	1	3pt Hitch
PCH-4,5	Chisel-type plow	1	3pt Hitch
PD-4-35	Tier-type plow	1	3pt Hitch
PPN-4-40	Deep plow	1	3pt Hitch
PTN-3-40/40A	Tier-type plow	1	3pt Hitch
PNI-8-40	Plow with adjustable width of catch	1	3pt Hitch
OPT-3-5	Implement for tilting the soil without or before plowing	1	3pt Hitch
---	Plow of “paraplow” type	1	3pt Hitch

General Description

Make	Name	Quantity of Implements in the hookup	Method of connection
PBN-6-50	Plow for reclaiming cultivated bogs	1	3pt Hitch
RVK-7,2	Combined broad-catching hookup for pre-sowing soil preparation	1	3pt Hitch
AKP-5	Combined hookup for main preparation of soil for winter crops	1	3pt Hitch
MSP-2	Machine for mixing carbonate and solonetz horizons	1	3pt Hitch
ALS-2,5	Meadow hookup for solonetz soils	1	3pt Hitch
FP-4,2	Mill for pastures	1	3pt Hitch
PS-2,9	Ripper	1	3pt Hitch
PG-3-5	Subsurface plow	1	3pt Hitch
GUN-4	Subsurface plow - fertilizer distributor	1	3pt Hitch
MIK-1.4	Stone extracting machine	1	3pt Hitch
DE-227	Snow plow of mill type	1	3pt Hitch
VNK-11	Pushing drag harrow	1	3pt Hitch
PK-10	Engineless combined grain harvester	1	3pt Hitch
KPSH-11	Subsurface cultivator	1	3pt Hitch
KTS-10-02	Heavy sectioned cultivator	1	3pt Hitch
KLSH-10/15	Rod-type cultivator	1	3pt Hitch
SVSH-10	Snow ridger	1	3pt Hitch
SVU-2,6A	Snow ridger	3	Coupler SP - 16/16A
KPS-4	Cultivator	4 - 5	Coupler SP - 16/16A
KPE-3,8A	Heavy-duty cultivator	3	Coupler SP - 16/16A
KSHU-18	Broad-catching cultivator	1	Drawbar
LDG-15	Disc-type scuffer	1	Drawbar
LDG-20	Scuffer	1	Drawbar
LDS-6	Scuffer-sower (with attachment for connecting two LDS-6 units)	2	Drawbar
SP-16/16A	Coupler	1	Drawbar
2KPG-2.2	Connection	1	Drawbar
SG-21	Harrow-type coupler	1	Drawbar
BDT-720	Heavy-duty disc-type harrow	1	Drawbar
BDT-7	Disc-type harrow	1	Drawbar
BDT-10	Heavy-duty disc-type double-gang harrow	1	Drawbar
BD-10A	Disc-type harrow	1	Drawbar

Make	Name	Quantity of Implements in the hookup	Method of connection
PBN-6-50	Plow for reclaiming cultivated bogs	1	Drawbar
RVK-7,2	Combined broad-catching hookup for pre-sowing soil preparation	1	Drawbar
AKP-5	Combined hookup for main preparation of soil for winter crops	1	Drawbar
MSP-2	Machine for mixing carbonate and solonetz horizons	1	Drawbar
ALS-2,5	Meadow hookup for solonetz soils	1	Drawbar
FP-4,2	Mill for pastures	1	Drawbar
PS-2,9	Ripper	1	Drawbar
PG-3-5	Subsurface plow	1	Drawbar
GUN-4	Subsurface plow - fertilizer distributor	1	Drawbar
MIK-1.4	Stone extracting machine	1	Drawbar
DE-227	Snow plow of mill type	1	Drawbar
VNK-11	Pushing drag harrow	1	Drawbar
PK-10	Engineless combined grain harvester	1	Drawbar
KPSH-11	Subsurface cultivator	1	Drawbar
KTS-10-02	Heavy sectioned cultivator	1	Drawbar
KLSH-10/15	Rod-type cultivator	1	Drawbar
SVSH-10	Snow ridger	1	Drawbar
SVU-2,6A	Snow ridger	3	Coupler SP - 16/16A
KPS-4	Cultivator	4 - 5	Coupler SP - 16/16A
KPE-3,8A	Heavy-duty cultivator	3	Coupler SP - 16/16A
KSHU-18	Broad-catching cultivator	1	Drawbar
LDG-15	Disc-type scuffer	1	Drawbar
LDG-20	Scuffer	1	Drawbar
LDS-6	Scuffer-sower (with attachment for connecting two LDS-6 units)	2	Drawbar
SP-16/16A	Coupler	1	Drawbar
2KPG-2.2	Connection	1	Drawbar
SG-21	Harrow-type coupler	1	Drawbar
BDT-720	Heavy-duty disc-type harrow	1	Drawbar
BDT-7	Disc-type harrow	1	Drawbar
BDT-10	Heavy-duty disc-type double-gang harrow	1	Drawbar
BD-10A	Disc-type harrow	1	Drawbar

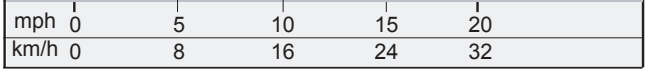
General Description

Make	Name	Quantity of Implements in the hookup	Method of connection
CTA-10	Disc-type harrow	1	Drawbar
PSE-45	Trailer tank	1	Drawbar
PZHU	Machine for distribution of liquid fertilizers and pesticides	1	Drawbar
RUM-14	Machine for fertilizer distribution	1	Drawbar
RUM-16	The same	1	Drawbar
RUM-20	-- “ --	1	Drawbar
PRT-24	Machine for distribution of solid organic fertilizers	1	Drawbar
PRT16	The same	1	Drawbar
MZHT-24	Machine for distribution of liquid organic fertilizers	1	Drawbar
MZHT-16	The same	1	Drawbar
MVB-12	Machine for intrasoil distribution of mineral fertilizers	1	Drawbar
CTA-30	Tank	1	Hydraulic pick-up hitch
AVA-1	Hookup for fertilizer distribution	1	Hydraulic pick-up hitch
---	Hookup for fertilizer distribution on meadows and pastures	1	Hydraulic pick-up hitch

Speed Charts

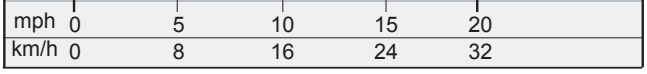
Speed - Standard Tires 710/70R38

R	G	mph	km/h
1	1	2.6	4.3
1	2	3.3	5.4
1	3	3.9	6.2
1	4	4.6	7.5
2	1	5.4	8.7
2	2	5.7	9.4
2	3	6.5	10.6
2	4	7.1	11.5
3	1	7.8	12.6
3	2	8.6	13.8
3	3	9.5	15.4
3	4	10.2	16.5
4	1	11.8	19.0
4	2	14.1	23.2
4	3	17.2	27.8
4	4	21.3	34.4



Speed - Optional Tires 800/65R32

R	G	mph	km/h
1	1	2.3	3.7
1	2	2.9	4.7
1	3	3.4	5.4
1	4	4.0	6.5
2	1	4.7	7.6
2	2	5.0	8.2
2	3	5.7	9.2
2	4	6.2	10.0
3	1	6.8	11.0
3	2	7.5	12.0
3	3	8.3	13.4
3	4	8.9	14.4
4	1	10.3	16.6
4	2	12.3	20.2
4	3	15.0	24.2
4	4	18.6	30.0



3.2 Basic Specification Data

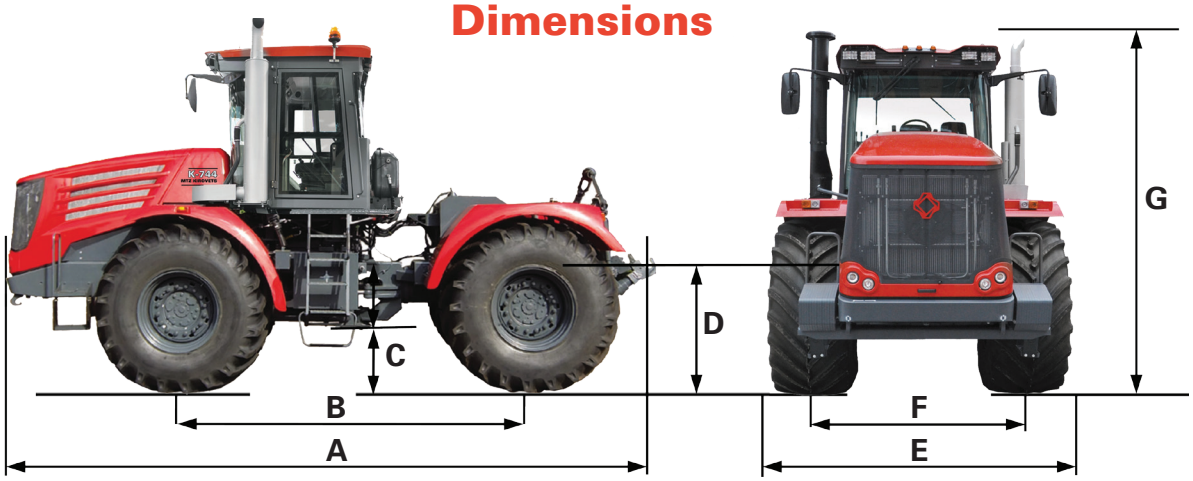
Parameters	K744 Premium	
Tractor make	Kirovets	
Engine	MB OM470 E3A/5	
Type	wheeled, agricultural general purpose	
Hauling class as per GOST 27021	6…8	
Nominal tractive force, kN, (tf)	75 (8)	
Wheel arrangement	4x4	
Engine capacity, hp - kW, at least:		
- rated engine capacity	428 hp	315 kW
- operating engine capacity	405 hp	298 kW
Engine crankshaft speed at the rated capacity, RPM	1800 (+50/-20)	
Specific fuel consumption, (g/(hp/h)) - g/(kW/h):		
- at the rated capacity, not more than *	151 g/(hp/h)	205 g/(kW/h)
- at the operating capacity, max	157 g/(hp/h)	213 g/(kW/h)
- at the maximum capacity on the PTO shaft, max	166 g/(hp/h)	225 g/(kW/h)
Maximum capacity on the PTO shaft at the engine crankshaft rated speed, kW (h.p.), at least	380 g/(hp/h)	279 g/(kW/h)
Relative oil consumption of the engine, %, max:		
- for fuel burning	0.25	
- total, in operation, with regard to grease change	0.5	
Efficiency factor of the transfer from the engine outlet shaft to the power take-off (PTO) shaft end, at least	0.92	
Tractor speed without regard to slippage, mph - km/h:		
forward drive		
- the least, decreased speed	2.93 mph	4.75 km/h
- the highest, operating speed	11.08 mph	17.84 km/h
- the highest, hauling speed	18.18 mph	29.26 km/h
reverse drive		
- the least speed	3.64 mph	5.86 km/h
- the highest speed	13.91 mph	22.38 km/h
Number of gears		
- forward drive	16	
- reverse drive	8	

* The parameters are determined at the engine manufacturer plant

Tractor weight, lbs. - kg, max:		
- design weight (in basic configuration)	35,274 lbs.	16000 kg
- operating weight (in basic configuration)	37,479 lbs.	17000 kg
- operating weight with the wheel dual kit	42,328 lbs.	19200 kg
Weight distribution over axles in the basic configuration, lbs. - kg:		
- front axle	21,825 lbs.	9900 kg
- rear axle	20,502 lbs	9300 kg
The biggest of mean conventional pressure values for driving machines, kPa (kgf/cm^2), max		
- with single wheels	110 kPa	1.12 kgf/cm^2
- with dual wheels	80 Kpa	0.08 kgf/cm^2
Road clearance, in. - mm		
- under the main gear of the driving axle	22.0 in.	560 mm
- under the axle of the vertical hinge of pivot of the frame	19.6 in.	500 mm
Tractor wheel spacing, in. - mm		
- with single wheels	82.7 in.	2100 mm
- with dual wheels	121.6 in.	3090 mm
The least radius of turn (by the trace of the outer wheel with rear axle disengaged), ft. - m	26.1 ft.	7.98 m
Tractor base, in. - mm	147.6 in.	3750 mm
Fordable depth, ft. - m, max	3.3 ft.	1.0 mm
Linkage carrying capacity (at the distance of 610 mm from the suspension axis as per GOST 19677), kgf, min	5500	
Implement carrying capacity depending upon the operating weight of the tractor as per GOST 19677, %, min	20	
Fluid pressure in the hydraulic system for control over the linkage and hydraulic mechanisms of agricultural machines, MPa (kgf/cm^2):		
- maximum pressure (valve opening completion)	18…20 MPa	180…200 kgf/cm^2
- at the hydraulic system outlet, at least	15 MPa	150 kgf/cm^2
Duration of continuous operation without fuel refill at the engine load by 70% of the rated operating capacity, engine hours, at least	13	
Overall dimensions, ft. - mm:		
length (with the linkage lifted)	24.1 ft.	7.35 m
- width with single wheels (at the wheel level)	9.4 ft.	2.88 m
- width with dual wheels (at the wheel level)	12.7 ft	3.87 m
- height	12.7 ft	3.88 m

Tractor braking distance at the speed of 8.3 m/s (18 mph) (30 km/h), ft, m, max	43’	13m
Static lateral stability angle, degrees, min	35º	
Ascent and descent angle, degrees, max	20º	
Angle of tractor holding by parking brake, degrees, min	20[a]	
Tractor semi-frame turn angle, degrees, at least		
- around the horizontal hinge pivot	±16	
- around the vertical hinge pivot	±32	
Lifetime until the first overhaul at T=80, engine hours, at least:		
- for tractor	8000	
- for engine	8000	
- for transmission	8000	
- for undercarriage	full period for tractor	
- for tires	5000	
Service life	10 Years	
Power take-off	option	
Dual Wheels kit	option	
Floating drawbar	option	
EHR (linkage control)	option	
Linkage	basic configuration	

Dimensions



Length A	Wheelbase B	Ground Clearance C	Fordable Depth D	Width E	Wheel Tread F	Height G	Minimum turning radius
7.35 m 24.1 ft	3.75 m 12.3 ft	0.50 m 1.64 ft	1.00 m 3.28 ft	2.88 m 9.4 ft	2.10 m 6.9 ft	3.88 m 12.7 ft	7.96 m 26.1 ft

3.3 Location of Instruction Plates

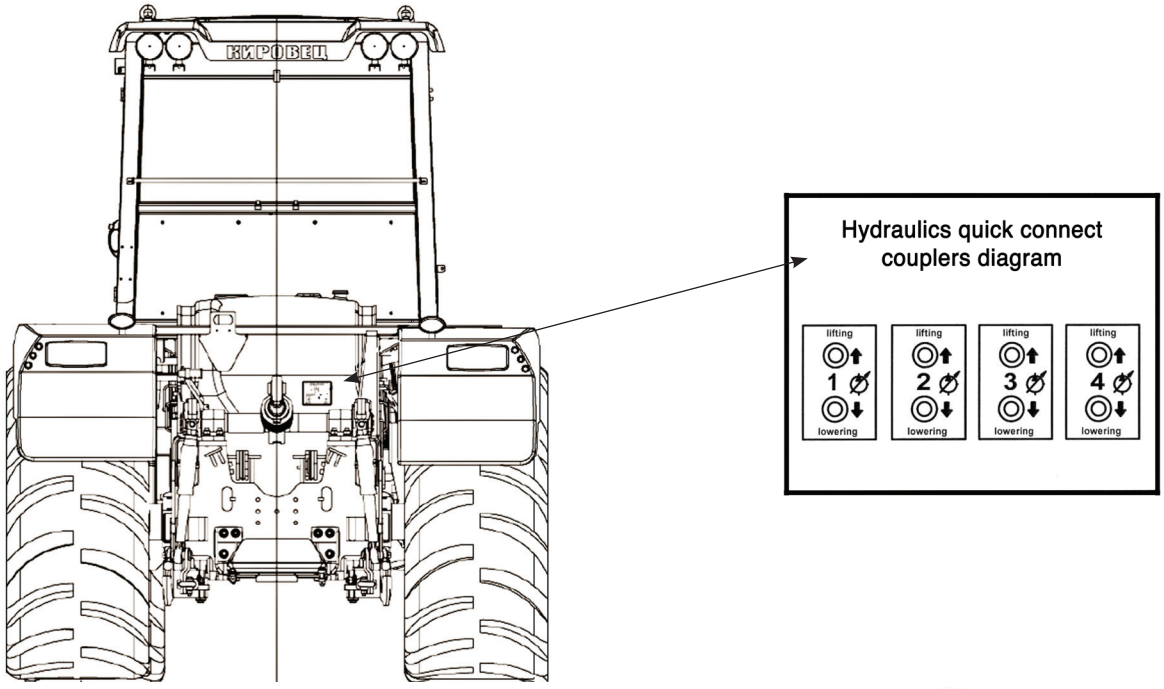


Fig. 9

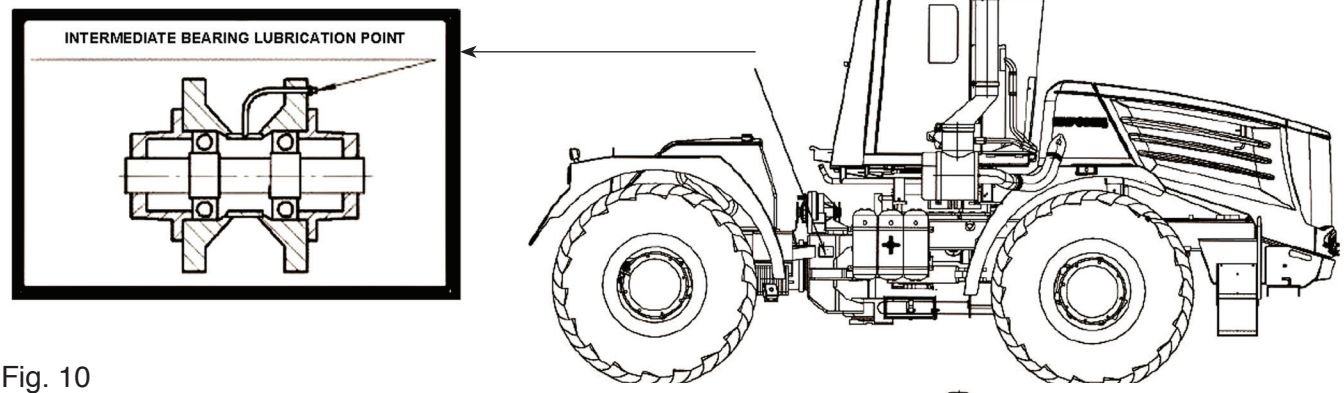


Fig. 10

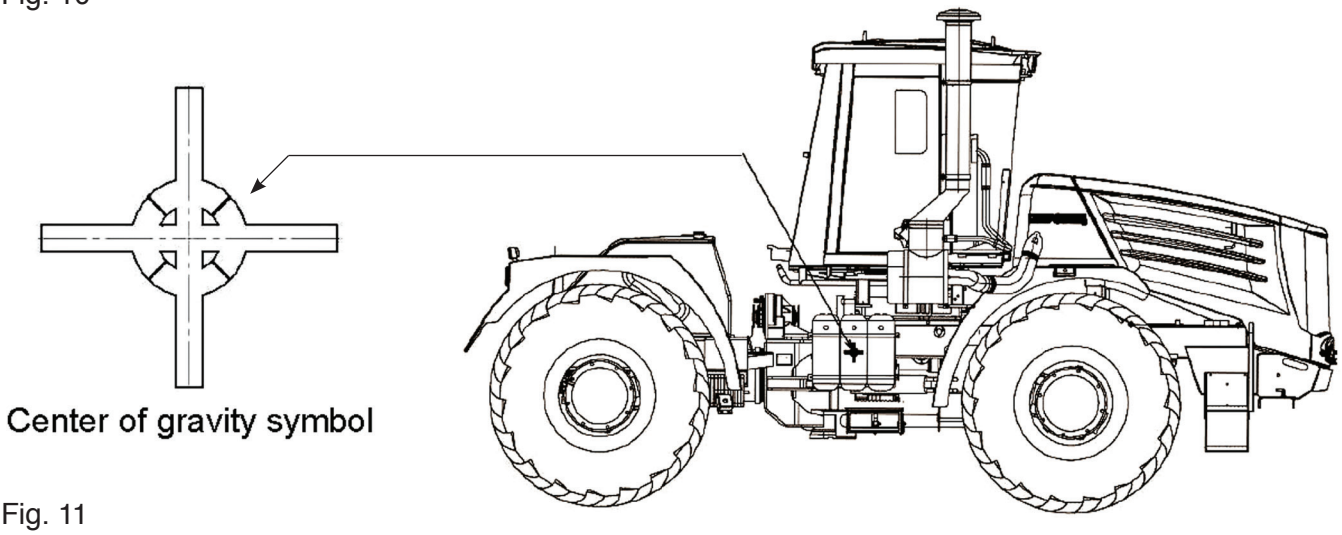


Fig. 11

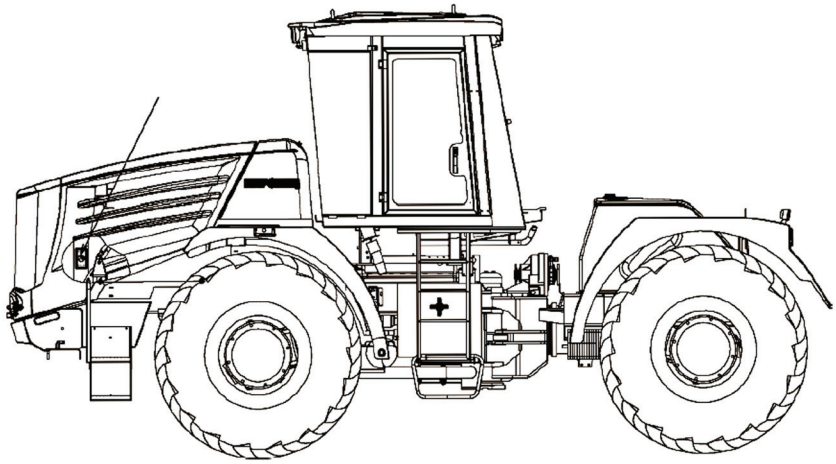
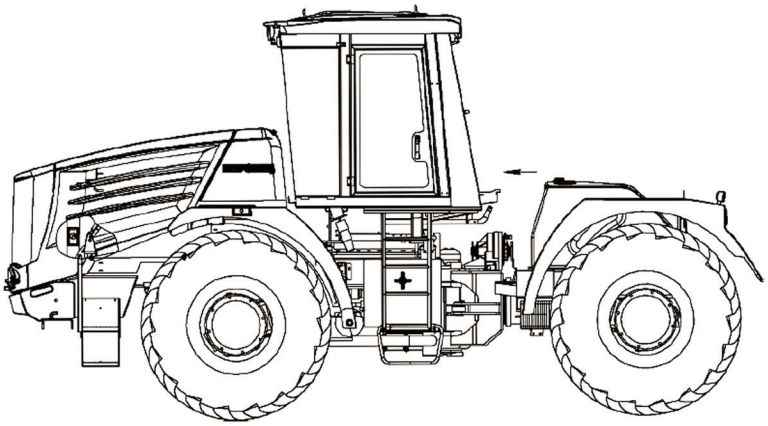


Fig. 12



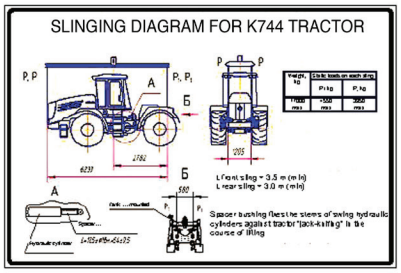


Fig. 13

MAIN SAFETY RULES

- When moving, select the speed providing for timely stoppage and safe turning of the tractor (tractor train).
- Maximum speed of a tractor train motion (up to 30 km/h) is allowed only on roads with dry hard pavement.
- • Do not switch modes in GB during tractor (tractor train) motion on steep ascents and descents.
- • Be especially careful during tractor motion across the slope: do not perform operations at the speed exceeding 13.4 km/h (modes I and II), avoid sharp turns and driving over obstacles.
- When uncoupling pieces of equipment and trailers, disconnect the connectors of electrical, hydraulic and pneumatic systems.

IT IS PROHIBITED TO DO THE FOLLOWING:

- Enter tight turns at speeds over 18 km/h (gear 1 of mode IV).
- Switch off the engine during motion on sharp ascents and descents.
- Use coasting during motion down the slope.
- Use the manual fuel feed lever (hand throttle) in hauling operations.
- Drive the tractor at the speed over 20 km/h with the tyre pressure below 1.7 km/cm.
- Operate the tractor in motion across the slope with the slope angle exceeding 5 degrees.

FIRE EXTINGUISHING PROCEDURE

- De-energise the electrical system - press the "Battery disconnect switch" button.
- Stop the engine.
- Extinguish the center of fire, using a fire-extinguisher or any other available means.

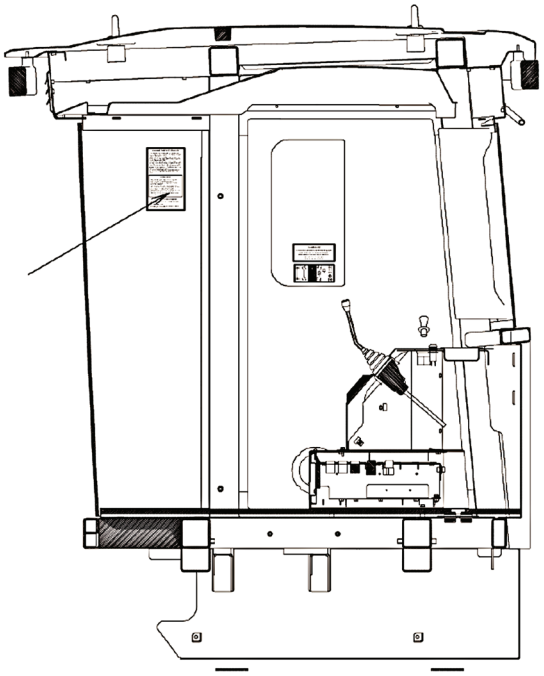
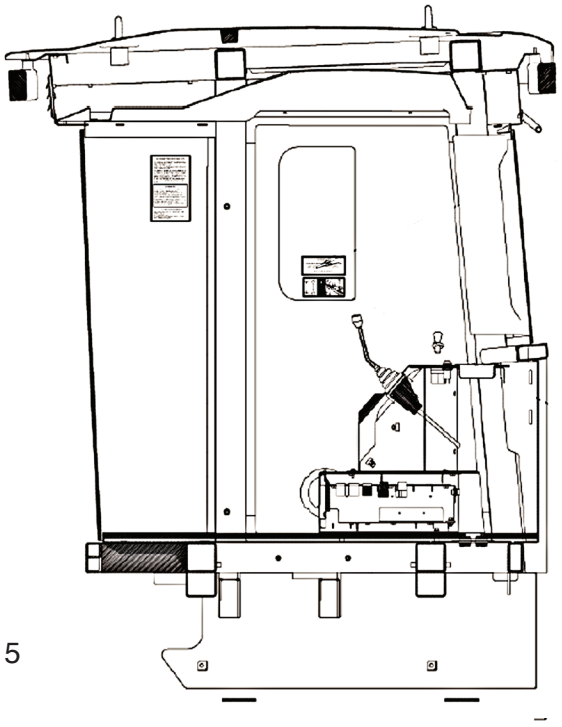


Fig. 14




ATTENTION!
Use the “neutral gear after stop only” position of the gear-change lever (switching on the synchroniser brake) only when changing over the modes

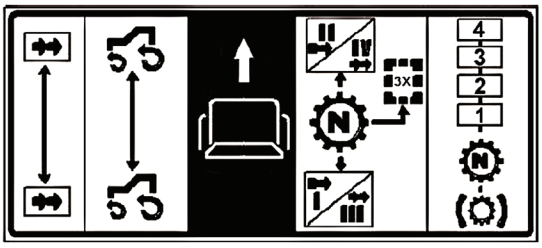

3X
4
3
2
1
N

Fig. 15

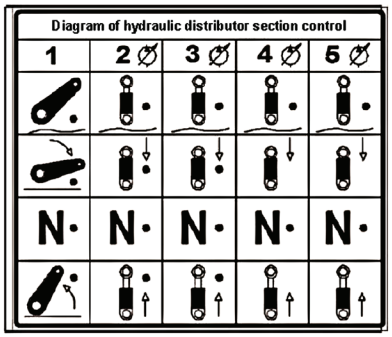
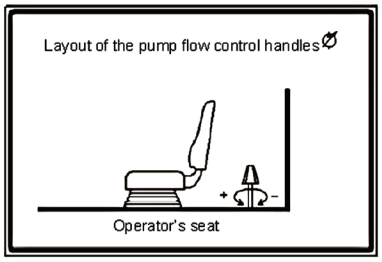
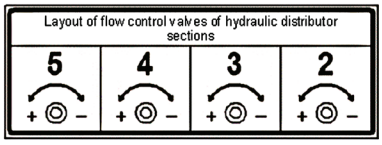


Diagram of hydraulic distributor section control
1
2
3
4
5
N
N
N
N
N


Layout of the pump flow control handles
Operator's seat


Layout of flow control valves of hydraulic distributor sections
5
4
3
2
+
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+
–
+
–

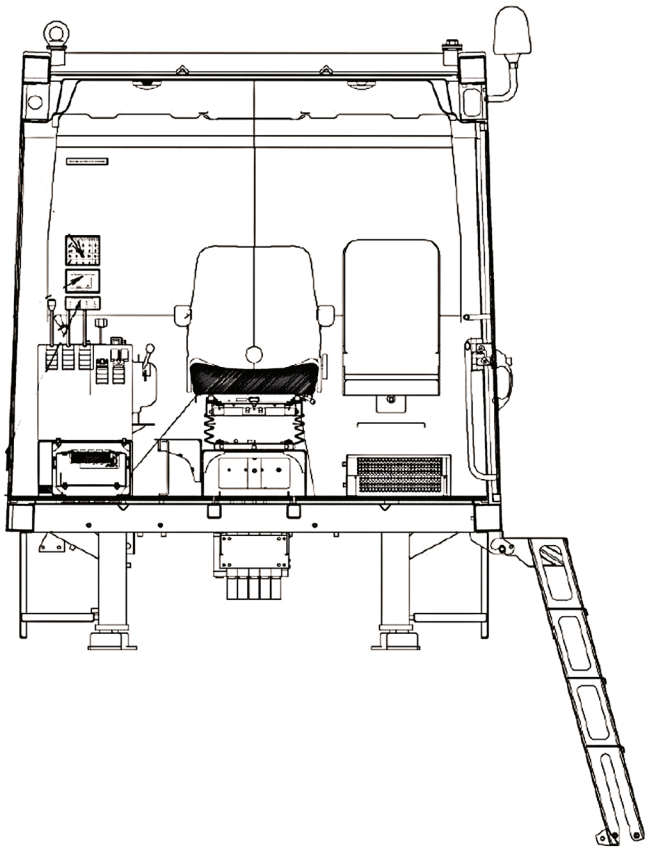


Fig. 16

3.4 Brief Design Data

Engine

This tractor is equipped with a Mercedes-Benz six cylinder in-line Engine, model MTU Series / MB OM470 Tier 4F.

NOTE

1. *In order to ensure a long-term and reliable operation of the engine, use only certified diesel fuel grades. Avoid the ingress of water and foreign matter into the fuel.*

2. *In case of welding operations tractors with Mercedes engines, it is necessary to disconnect the power wires "+" and "-" from storage batteries (wires 3, 3.1 and 7, see the wiring diagram). Connect wire terminals between each other by means of M10 bolt with nut.*

   Non-fulfilment of this requirement can lead to a failure of the engine electronic control system. When connecting storage battery to the tractor electric circuit, first connect "+", then "-".

Engine start-up is performed by electrical starter.

Oil and cooling fluid should be chosen in accordance with the Operation Manual for the engine and with the appendix ("Specification for operating materials").

Fuel strainer is located behind the cabin on the left at the hydraulic tank face and is equipped with a boosting pump and heating (24 V). A fuel sediment drain valve is located at the lower part of the filter bowl;

AIR CLEANING SYSTEM is dry, double-stage, combined, with dust suction into the exhaust pipe. Air cleaner manufactured by Donaldson is used on the tractor.

COOLING SYSTEM of the engine is closed, with compensating circuit, with forced circulation of the cooling fluid. In order to maintain the best possible heat conditions, the engines are provided with an automatic fan control system.

FUEL SYSTEM consists of the fuel tank, fuel lines, fuel strainer with in-built fuel priming pump, low pressure fuel pump, fine mesh filter, fuel cooler, high pressure pumps, fuel rail, nozzles.

EXHAUST SYSTEM is equipped with catalyst where exhaust gases are split under a chemical impact (ADblue) for reduction of their toxicity.

TRANSMISSION includes semi-rigid coupling and pump drive reducer, gearbox, cardan drive, intermediate bearing and driving axles.

THE CARDAN DRIVE consists of cardan shaft of the gearbox, cardan shaft of the front axle, intermediate shaft of the rear axle, intermediate bearing and cardan shaft of the rear axle.
The intermediate bearing connects cardan shafts transmitting the torque from the gearbox transfer shaft to the rear axle.

PNEUMATIC SYSTEM - combined, with possibility of connecting single - and double - line trailer system. 2 air receivers for 40 /each are installed instead of 3 receivers for 20 / each.

Three two-way protection valves are installed instead of one three-way protection valve.

Fig. 17 Braking system pneumatic diagram.

Braking System Pneumatic Diagram.

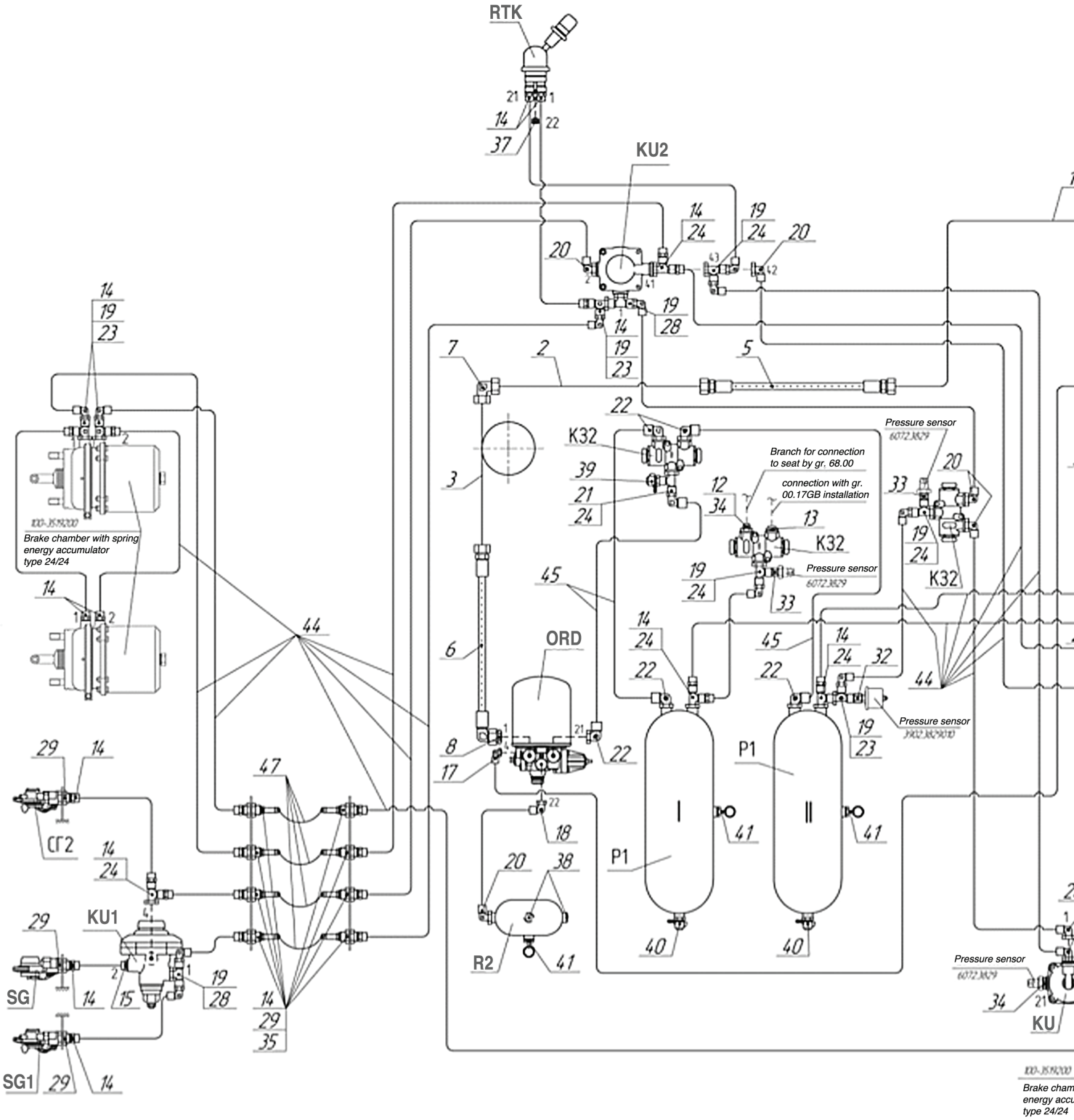
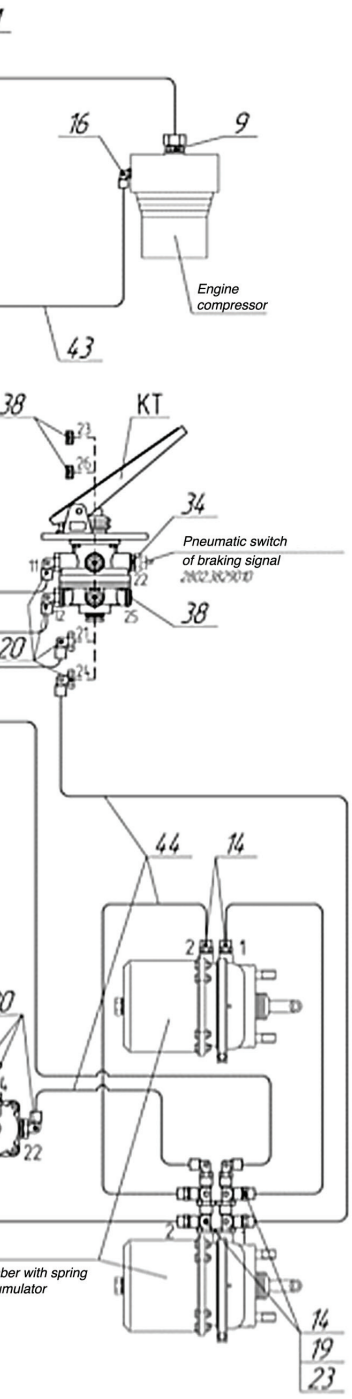


Fig. 17



Pos.	Name	Q-ty	Note
K32	Three-way protection valve 100-3515110	3	
KT	Two-section brake valve with pedal 11.3514 308	1	Plant PAAZ
RTK	Manual brake valve 961 723 100 0	1	WABCO
SG	Connection head (black) 452 300 031 0	1	WABCO, M22×1.5, can be replaced with 12.3521010-01
SG1	Connection head (red) 452 200 211 0	1	WABCO, M22×1.5
SG2	Connection head (yellow) 452 200 212 0	1	WABCO, M22×1.5
KU	Acceleration valve 11.3518010	1	Plant PAAZ
KU1	Trailer brake control valve with single-line deive 100-3522010	1	
KU2	Trailer brake control valve with double-line drive 100-3522010	1	
ORD	Air dehumidifier with pressure controller 432 410 007 0	1	WABCO
R1	Receiver 950 740 002 0	2	WABCO 401
R2	Regeneration cylinder 950 105 001 0	1	WABCO, 51
1	Pipe 743PU-3-35 00 050	1	
2	Pipe 743PU-3-35 00 060	1	
3	Pipe 743PU-3-35 00 070	1	
5	Hose 1SN20 CEL-CEL L = 480 тт	1	
6	Hose 1SN20 DK0L 90-CEL L = 385 тт	1	
7	Angle XW22LHz3	1	
8	Nozzle XGE22M22ZLWDPz3	1	
9	Nozzle XGE22M26ZIWDPz3	1	
12	Straight fitting 9512 6-M12x1.5	1	
13	Straight fitting 9512 8-M22x1.5	1	
14	Straight fitting 9512 10-M16x1.5	31	
15	Straight fitting 9512 10-M22x1.5	1	
16	Elbow fitting 9502 6-M10×1.5	1	
17	Elbow fitting 9502 6-M12×1.5	1	
18	Elbow fitting 9502 10-M12×1.5	1	
19	Elbow fitting 9502 10-M16×1.5	13	
20	Elbow fitting 9502 10-M22×1.5	12	
21	Elbow fitting 9502 15-M16×1.5	1	
22	Elbow fitting 9502 15-M22×1.5	5	
23	Vertical T-piece 02072 M16×1.5 - M16×1.5	8	with internal thread
24	Vertical T-piece 02072 M16×1.5 - M22×1.5	8	with internal thread
28	Horizontal T-piece D2062 M16×1.5 – M22×1.5	2	with internal thread
29	Adapter D2502 M22×1.5 – M22×1.5	11	
32	Adapter D2531 M16×1.5 - 1/4NPTF-RU01	1	
33	Adapter D2531 M16×1.5 - M12x1.5	2	
34	Adapter D2532 M22×1.5 - M12×1.5	3	
35	Adapter D2602 13 - M16×1.5 – S02	6	
37	Plug D2612 M16×1.5	1	
38	Plug D2612 M22×1.5	5	
39	Control output valve VPC2 M16×1.5 - M16×1.5	1	
40	Control output valve VPC2 M22×1.5 - M16×1.5	2	
41	Condensate drain valve VDC2 M22×1.5-PF01	3	
43	Tube 6/4 DIN 74324	3.2	m
44	Tube 10/8 DIN 74324	?	m
45	Tube 15/12 DIN 74324	?	m
47	Hose 12×20-1.6 GOST 10362-76	4.0	(4x1.0) m

General Description

Both axles of the tractor are driving and serve for increase of the torque to be driven to them from the gearbox and for its transfer to the wheels. On the tractors, the front driving axles are suspended to the frame on two semi-elliptic carriage springs with telescopic hydraulic shock absorbers. The rear axles of all tractors are fastened rigidly to the frame.

The service brakes are dry, of block type, with a separate pneumatic drive to the front and rear wheels; they are installed in rear-axle drives of the leading axles.

The parking brake has spring energy accumulators combined with service pneumatic chambers of the front and rear axles.

Both leading axles have wheels with low-pressure tries installed. Tries 710/70R38 standard with 800/65R32 optional.

The tractor turn control system has a power drive.

The tractor turns using two hydraulic cylinders due to swinging the tractor semi-frames against each other around the vertical hinge pivot. On new tractors, the total free play in the connections of “hydraulic cylinder - semi-frame lifting eyes” (along the hydraulic cylinder axis) can not exceed 0.9 mm. The permissible total free play in the course of operation should not exceed 1.8 mm. The feed of working fluid to the hydraulic cylinders, which is proportional to the angle of turn and the rotational speed of the steering wheel, is performed by the steering mechanism RM 2000 installed on the steering column.

A pump with adjustable flow rate is installed in the hydraulic system of the operating equipment.
Two pressure filters provide cleaning of the working fluid to be fed from the pumps to the hydraulic system units.

Diagram of the hydraulic system for steering control and mounted implements is given in Appendix 2.

The frame consists of two semi-frames, the front and the rear one, connected by a hinge pivot device. The semi-frames can rotate against each other around the horizontal and vertical hinge pivots.

The Cab has a built-in protection framework, is all-metal, two-seat, air-tight, noise-proof, with extended visibility sector. It has heating, ventilation, air conditioning and audio systems. The cab is fitted with one entry door on the left side. Cab door and side window and almost completely transparent and fitted with convenient small vent windows.

Fig. 18

Two seats fitted with safety belts are installed in the cab. The driver's seat is spring-supported, adjustable depending on driver's weight and height as well as by the angle of back inclination in the longitudinal direction, it has convenient fold-back arm rests.

Steering column with integrated instrument panel can be adjusted by tilt: rated tilt of the column is 25° towards horizon. The steering column tilt is adjustable by 2° in forward direction and by 21° in backward direction against the rated angle.

Fig. 19

Tilt angle should be fixed using the handle located at the left side of the column.

It is possible to install steering column with steering wheel adjustment by height.

The pneumatic braking system is three-circuit, ensuring braking of the tractor front and rear axle wheels as well as trailer wheels.

The system provides for simultaneous operation of the brake drives of the front and rear tractor wheels, the energy accumulator drive, the parking brake, air extraction for tire pumping and at tractor towing, blowing off air cleaner cassettes and the entire tractor. In addition, the equipment for trailer brake control is installed on the tractor, which serves both for reducing speed of the trailer as a part of the road-train and for its automatic braking in case of a break of the coupling with the hauler.

In the brake pneumatic drive system there are three mutually independent circuits, e.g. in case of failure of one circuit, the remaining ones will keep functioning. The circuit independence is provided by installation of a triple protection valve 3 into the mainline downstream of the pressure controller 1, which ensures the "cut-off" of the failed circuit from serviceable ones. In doing so, the serviceable circuits will keep functioning and will provide for tractor braking.

The first circuit performing the function of rear wheel braking consists of receiver 2 (I) connected with brake valve 4; service braking chambers 16 and 17 of the rear axle; and hose 18. The connection is provided by plastic tubes and fittings. The second circuit providing for front wheel braking consists of receiver 2 (II) and service braking chambers 16 of the front axle. The third circuit serving to control energy accumulators of the parking brake and control the trailer brakes consists of receiver 2 (III), hand brake valve 5, acceleration valve 6, three energy accumulators of braking chambers 16, control valve for trailer brakes with single-wire drive 7, separation valve 10, connecting head 11, and two hoses 18.

During start-up of the engine, air is supplied over the feeding mainline pipes from the compressor to pressure controller 1 which deactivates the feed of compressed air into the system in case when the

pressure is exceeded, connecting the compressor discharge mainline with the atmosphere. The controller automatically maintains the operating air pressure in the pneumatic system within specified limits as well as serves for protection against overload and contamination.

When the brake pedal is pressed, air will get through the brake valve into the service brake chambers which, via the stem, drive the actuators that press the blocks to the brake drums, and the tractor wheels will get braked. When the pedal is returned into the initial position, a brake release of the braking chambers will take place by their connection with the atmosphere and filling of air cylinders from the compressor.

The system is equipped with acceleration valve 6 designed for reduction of the pickup time of the energy accumulator drive due to shortening of the mainline of compressed air admission from the receiver to the actuator and air discharge directly through the acceleration valve into the atmosphere. With valve 5 being open, air is supplied through valves 6 and 7 to the energy accumulators of the tractor brake chambers and brake head 11. The wheels are not braked. Upon valve closing (or with the engine shut down), the air pressure becomes less than the pressure of energy accumulator spring which moves the stem acting upon the actuators. The wheels get braked; in doing so, the pressure in the brake head decreases to zero.

With no pressure in the chambers with spring accumulator, wheel brakes are braked. In order to the tractor with a faulty pneumatic system, it is required to screw out the bolts located on the accumulator casing

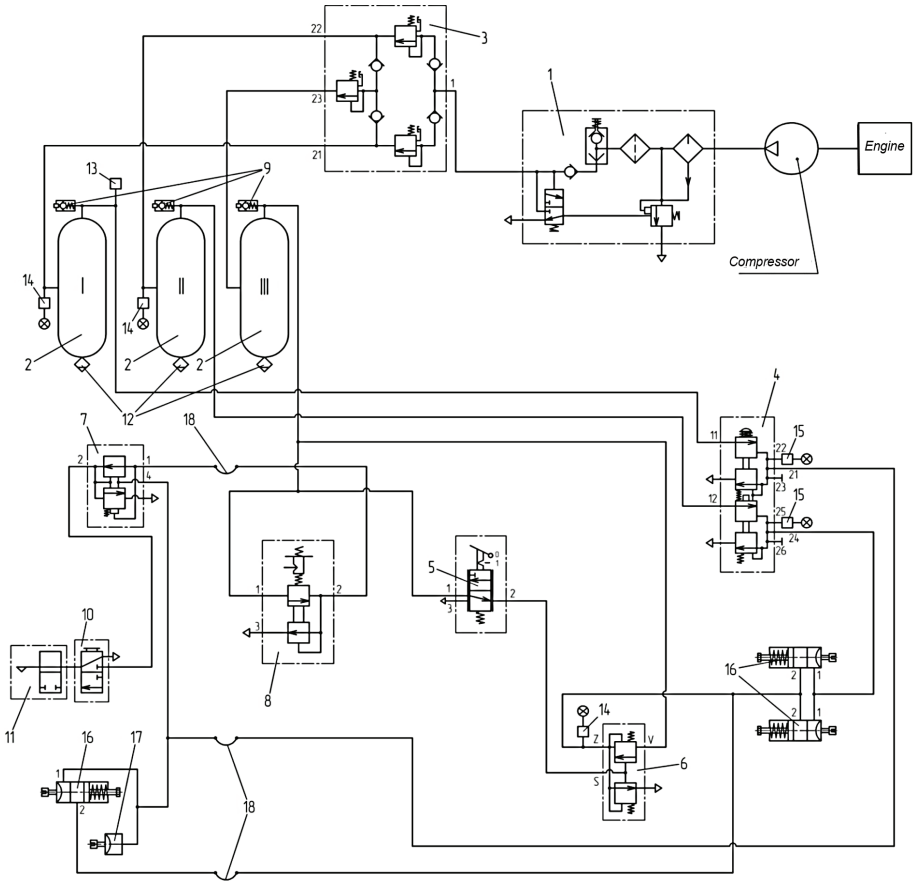


Fig. 20

Schematic pneumatic diagram of the braking system

1 - pressure regulator; 2 - receiver; 3 - triple protection valve; 4 - two-section brake valve with pedal; 5, 8 - reverse-acting brake valve with manual control; 6 - acceleration valve; 7 - trailer brake control valve single-wire drive; 9 - control output valve;10 - cut-out valve; 11 - connecting head of “A” type; 12 - condensate drain valve; 13, 14 - pressure sensor; 15 - pneumatic switch; 16- brake chamber with spring energy accumulator; 17 - brake chamber of “30” type; 18 - hose

Tractors with pneumatic shift control of gearbox have pressure controller with absorber installed instead of regular pressure controller, the former is designed to dehumidify and clean the compressed air discharged by the compressor to the tractor pneumatic system, to maintain the pressure in the system within 0.65 to 0.8 MPa range, and to protect the system from overloads.

The controller is connected to regeneration receiver serving to restore adsorbent properties inside the controller.

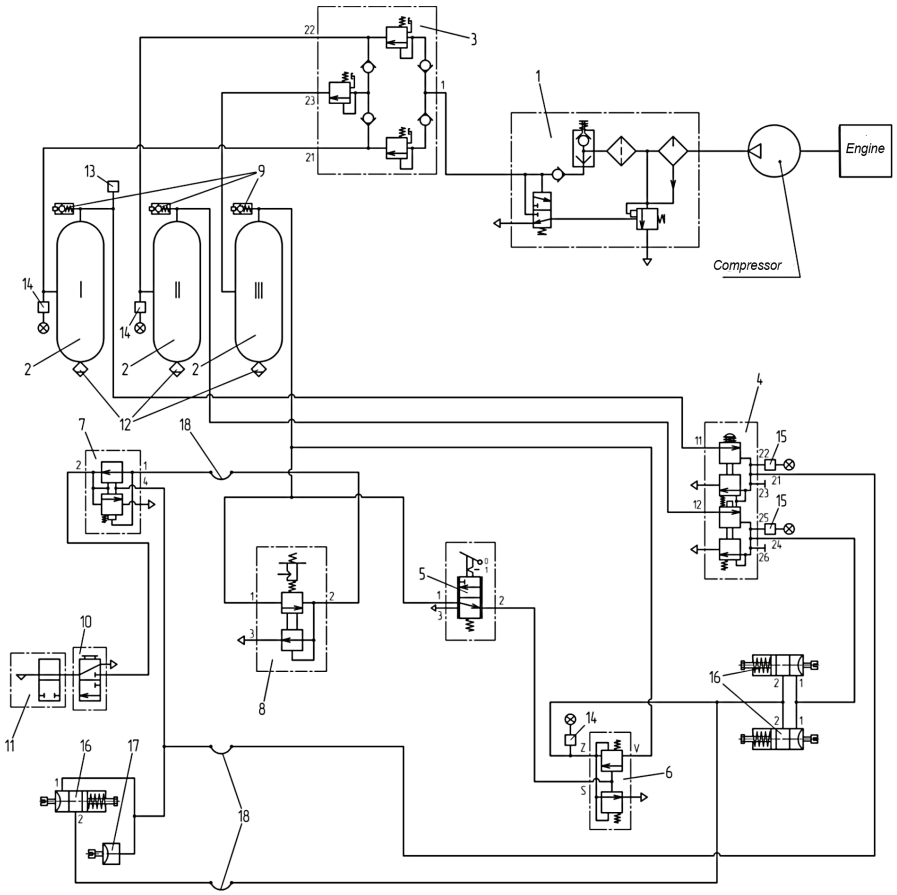


Fig. 21

Schematic pneumatic diagram of the braking system with compressed air dehumidification

1 - pressure controller with absorber; 2 - single protection valve;
3 - triple protection valve; 4 - two-section brake valve with pedal;
5, 8 - reverse-acting brake valve with manual control; 6 - acceleration valve;
7 - trailer brake control valve with single-wire drive; 9 - reference outlet valve;
10 - cut-out valve; 11 - connecting head of “A” type; 12 - condensate drain valve;
13, 14 - pressure sensor; 15 - braking signal pneumatic switch;
16 - brake chamber with spring energy accumulator;
17 - brake chamber of “30” type; 18 - receiver; 19 - regeneration receiver; 20 - hose

3.5 Pressure Controller with Absorber

The controller provides for dehumidification of the compressed air discharged by the compressor to the tractor pneumatic system and maintaining the pressure in the system within 0.65 to 0.8 MPa range. The controller is fitted with electric heating.

Operation description

The figure illustrates a simplified diagram of the controller, showing the principle of its operation.

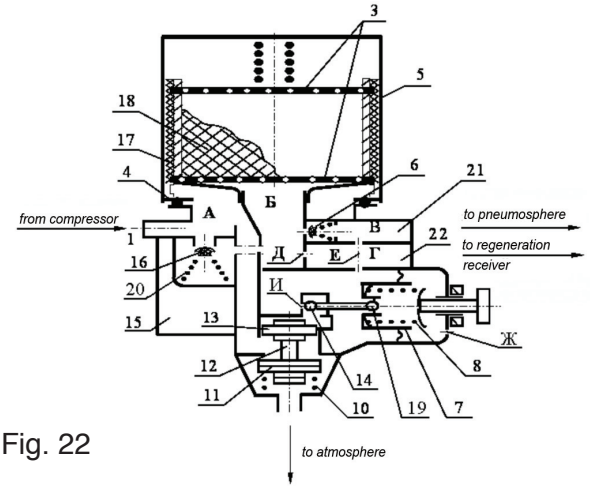


Fig. 22

Diagram of pressure controller with absorber

1, 21, 22 - outputs; 3 - filter gasket; 4 - seal;
5 - casing; 6 - check valve;
7 - servo piston; 8, 10 - springs;
11 - safety valve; 12 - pull rod;
13 - piston; 14, 19 - ball valves;
15 - heating unit; 16 - relieve valve;
17 - urethane-foam filter;
18 - celite absorber;
20 - spring; А, Б, В, Г - cavities; Д, Е, И - channels;
Ж - atmosphere vent

Compressed air from the discharge pipeline of the compressor should be supplied to outlet 1 and then to cavity A, successive passes through filters 17 and 3, celite absorber 18, and gets to cavity Б. At the same time, compressed air from cavity A is supplied to safety valve 11.

Cleaned and dehumidified air in cavity Б forces check valve 6 away, gets to cavity B and to the pneumatic system vehicle through outlet 21. At the same time, compressed air from cavity Б is supplied via channel Д to cavity Г and further to the regeneration receiver (outlet 22).

Compressed air pressure is supplied from cavity B via channel E to servo piston 7 and control ball valve 14. Deflection-and-pressure parameter of spring 8 of servo piston 7 is selected so as to have control ball valve 14 tightly pressed against the seat with the pressure in the vehicle pneumatic system being less than 0.8-0.05 MPa, so the compressed air pressure would not be transmitted to piston 13 connected by pull rod with safety valve 11 which is pressed against its seat by the force of spring 10.

Upon excess of air pressure in the vehicle pneumatic system beyond 0.8-0.05 MPa value, servo piston 7 moves to the right while compressing spring 8, and valve 14 in the course of its spring pre-compression reduction move away from its seat jointly with servo piston 7 while transmitting the compressed air pressure to piston 13 of safety valve 11.

At the same time, an additional force is transferred to safety valve 11 via pull rod 12, disturbing a balance between the compressed air pressure of cavity A and spring 10, which results in safety valve 11 opening, thus connecting cavity A to the atmosphere.

At the same time, check valve 6 gets pressed against its seat, preventing compressed air re-lease from the vehicle pneumatic system to the atmosphere. Simultaneously, purified air from the regeneration receiver (outlet 22) via cavities Г and Б enters the absorber from below (and recovers the adsorbent), to cavity A

and then to the atmosphere via discharge valve 11, jointly with excessive moisture and impurities.

When compressed air pressure in the vehicle pneumatic system drops to the value of 0.65+0.05 MPa, servo piston 7 under the impact of spring 8 moves to the left, and control ball valve 14 gets pressed against its seat and blocks the compressed air access to piston 13 of safety valve 11. As a result, spring 10 presses safety valve 11 to the seat, isolating cavity A from the atmosphere.

Relieve valve 16 is provided for in case of absorber clogging; with a pressure drop in cavities A and Б being 0.20 to 0.25 MPa, it connects the said cavities. At the same time, air from the compressor is supplied directly to the vehicle pneumatic system.

NOTE!

Recommended interval for regeneration holder maintenance (adsorbing envelope replacement) - 2 years max.

IMPORTANT!

When finding liquid in receivers, it is recommended to carry out immediate maintenance of the regeneration holders as per the method below.

Disassembly

- disassemble the holder by installing and clamping it in vice with soft pads on jaws to prevent deformation of cap 1, as shown in Fig. 23, Page 58.
- screw out screw 8 by rotating ring 2 around the holder axis, combining catches of base 3 with grooves of the ring, after which move the ring downward.
- take out the base, unclamp the holder in vice and perform the final disassembly.

Assembly

Assemble the holder as per Fig. 23, Page 58.

- install mesh 6, filter 13, drying envelope 10, second filter 13, sleeve cover 5 and spring 7 in sleeve 4. Glue filters 11, 12 onto the sleeve, put cap 1 with ring 2 on top. Turn the sub-assembly over, install and clamp it in vice with soft pads on jaws.
- put rings 16, 17 onto base 3. Install the base with the rings at the sub-assembly, aligning base grooves with cap grooves. The base should be tightly pressed against the cap, spring 7 should be compressed.
- move ring 2 all the way up, rotate it around the holder axis, align semi-circular groove of the ring with M3 threaded hole. Install washer 9 and screw 8. Install gasket 14 and ring 15.
- perform the assembly under conditions preventing the possibility of ingress of chips, grit, etc, on the parts being assembled.
- surfaces of all rubber parts should be lubricated with a thin layer of grease ZHT-72 ЕГ 38101345-77 (consumption rate is 0.01 - 0.012 g/cm^2). Replacing material is grease Agrinol ZHT-72 TU U 26.4-30802090-058:2006.
- when installing rubber parts, prevent the possibility of a damage to them. Cuts, marks, etc. on the surfaces of rubber parts are not allowed.

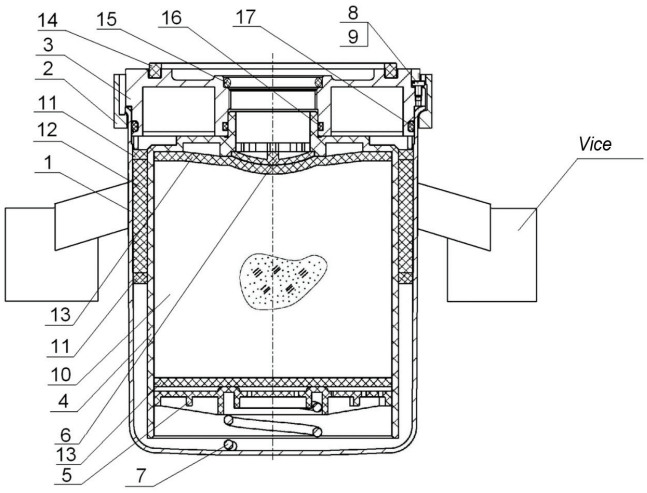


Fig. 23

Regeneration holder 8043.35.12.460

1- 8043.35.12.115 cap; 2- 8043.35.12.122 ring; 3- 8043.35.12.121 base;
4- 8043.35.12.139 sleeve; 5- 8043.35.12.141 sleeve cover; 6- 8043.35.12.142 mesh;
7- 8043.35.12072 spring; 8 - screw M3-3gx5.58A 016 GOST 1491-80;
9- washer 3.65Г,016 GOST 6402-70; 10- 8043.35.12.520-01 drying envelope;
11 - 8043.35.12.071 filter; 12 - 8043.35.12.073 filter; 13 - 8043.35.12.143 filter;
14 - 8043.35.12.074 gasket; 15 - ring 036-044-46-2-3 GOST 9833-73/GOST 18829-73;
16 - ring 040-045-30-2-3 GOST 9833-73/GOST 18829-73;
17 - ring 120-126-36-2-2 GOST 9833-73/GOST 18829-73

Replacement of components

Perform a replacement using one of the repair kits below, depending on technical condition of the components.

Repair kit 8673.00.00.00-03:	**Repair kit 8673.00.00.00-01:**
Drying envelope 8043.35.12.520-01 - 1 pc.	Drying envelope 8043.35.12.520-01 - 1 pc.
Repair kit 8673.00.00.00-05:	Filter 8043.35.12.071 - 2 pcs.
	Filter 8043.35.12.073 - 1 pc.
Drying envelope 8043.35.12.520-01 - 1 pc.	Filter 8043.35.12.143 - 2 pcs.
Filter 8043.35.12.071 - 2 pcs.	Gasket 8043.35.12.074 - 1 pc.
Filter 8043.35.12.073 - 1 pc.	Spring 8043.35.12.072 - 1 pc.
Filter 8043.35.12.143 - 2 pcs.	Ring 036-044-46-2-3 GOST 9833-73/18829-73 - 1 pc.
Gasket 8043.35.12.074 - 1 pc.	Ring 040-045-30-2-3 GOST 9833-73/18829-73 - 1 pc.
Spring 8043.35.12.072 - 1 pc.	Ring 120-126-36-2-2 GOST 9833-73/18829-73 - 1 pc.

Electrical equipment system has the voltage of 24 V and is single-wire, the minus terminals are connected with the tractor “frame”. Two storage batteries and an alternating current generator with integral voltage controller serve as power supply sources. Power consumers’ electrical circuits are protected against short-circuits by fuse blocks. On the tractors, there is the possibility of connection to power supply with the voltage of 12 V. Plug sockets for the connection are located at the control unit and outside the cab base. The diagram of electrical equipment is given in Appendixes 10, 10A, 10B, 10C.

3.6 Hydraulic System

1 Hydraulic tank of 250 l/min capacity.

2 To prevent oil drainage from the hydraulic tank upon Hydraulic system repair, valves are installed at suction lines of the pumps.

3 Steering control system has additionally installed emergency pump NSh-10 at the rear part of GB and priority valve at the cabin base. With a supply from the main pump of the steering control system (installed at the engine), pump NSh-10 supplies oil to the radiator and further to the hydraulic tank. With no oil supply from the main pump, priority valve guides the supply from pump NSh-10 to the flow amplifier in order to perform a turn; in doing so, the force at steering wheel increases.

4 Two-section pump of the working equipment Hydraulic system is installed at the front gearbox part. Pump maximum capacity is 280 l/min.

5 Hydraulic distributor of the working equipment system is five-section, one of the sections (EHR) controls the linkage. Linkage “LIFTING - LOWERING” handle is located at the front part of the control panel (armrest), controllers and handles for linkage lowering speed limitation, lifting height limitation, soil cultivation depth setting and adjustment type selection are located under the armrest cover. Four remaining sections with electric and hydraulic control are connected to four pairs of quick-lock coupling outputs with flow passage of 3/4 inch. Section control handles (with 1, 2, 3 and 4 symbols) are also located at the control unit, along with flow controller handles for these four sections. Flow controller allows to set the flow rate through section in the range of 0...140 l/min. The timer allows to control the time of operation actuation from 2 seconds, until a permanent activation.

6 For a free (bypassing the hydraulic distributor) drainage to the tank from implement hydraulic motor, two slots are provided for at T-pieces of drain filters (M30x2 fitting is closed with plug).

7 Two fittings M18x1.5 (closed with plugs) are provided for at the upper part of hydraulic tank to guide the drain line from implement hydraulic motor to the tank.

The hydraulic system diagram Fig. 24

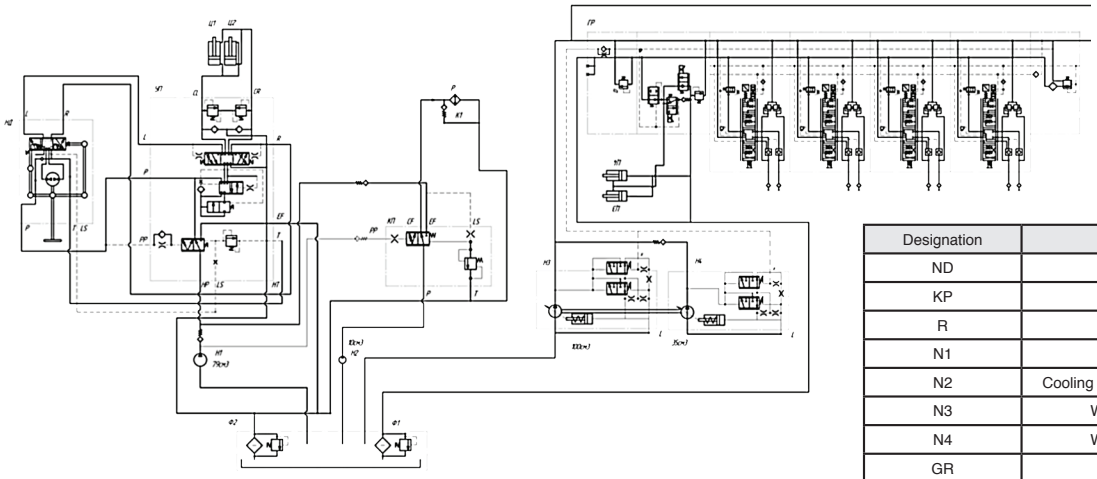


Fig. 24 **Hydraulic system diagram**

Designation	Name
ND	Dosing pump
KP	Priority calve
R	Radiator
N1	Steering control pump
N2	Cooling system pump/Emergency pump
N3	Working equipment pump
N4	Working equipment pump
GR	Hydraulic distributor
Ts1, Ts2	Steering hydraulic cylinders
Ts3, Ts4	Mounted equipment hydraulic cylinders
F1, F2	Drain filters

3.7 Rear Linkage Control (EHR)

The system is designed for control over operating parts of mobile machines, including rear linkage of the tractor.

The system provides for operation with mounted implements in the following modes: manual control with external buttons, positional, power and combined control, floating, transportation and transportation with vibration dampening.

Composition of the system:

- controller designed for assurance of stabilized power supply for force cells and position sensors, processing of output signals from these sensors and generation of control actions for electric and hydraulic distributor, and for system diagnostics;
- force cells - 2 pcs, designed to measure the force at hinge pivots of tractor linkage lower links in the course of soil cultivation operations;
- position sensor designed for non contact measurement of the coordinate of linkage position;
- cam located at turning shaft of the tractor, operating jointly with position sensor and ensuring a linear dependence of the position sensor output signal on the turning angle of the linkage turning shaft;
- control panel designed to assign modes of control over the tractor linkage;
- electric and hydraulic distributor (not included in the scope of delivery) with two control channels with proportional solenoids fed by 12 V, that implements such functions as linkage retaining at a given position, linkage lifting, linkage lowering by gravity.

3.8 Design And Operation

Logic diagram of tractor plowing unit with automated control of linkages Fig. 25.

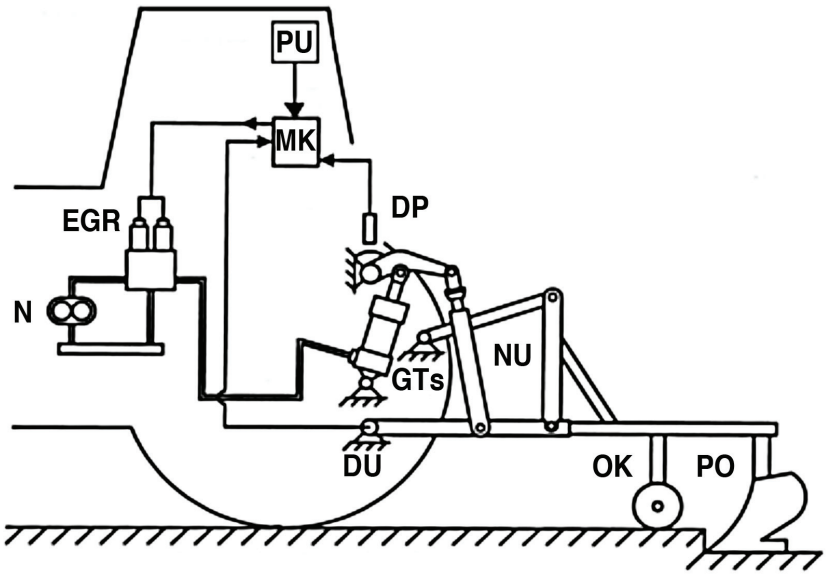


Fig. 25 **Logic diagram of tractor plowing unit**

Tractor plowing unit contains a soil-tilling implement PO that is kinematically connected with linkage NU and power hydraulic cylinders GTs.

The plowing unit also includes two force cells DU, non contact position sensor DP, hydraulic fluid feed

pump N for the control of hydraulic cylinders GTs via electric and hydraulic distributor EGR, as well as microprocessor controller MK implementing the control and adjustment algorithm, and control panel PU to set control modes in the course of operation.

Depending on the control type selected by operator, the system in the automatic control mode allows maintaining the given position of soil-tilling implement PO against the tractor, stabilize the drawbar resistance force in the draft links of linkage NU mechanism.

Electric signals from position sensor DP (with positional adjustment) or composite signal of position sensor DP and two force cells DU (with combined control) come into controller MK where they are compared with the signal set by operator at control panel PU. In case of a mismatch of these signals, controller MK generates a control action for solenoids of electric and hydraulic distributor EGR that performs a corrective movement of soil-tilling implement PO up or down via power hydraulic cylinders GTs, and so the set parameter (position, force) gets stabilized.

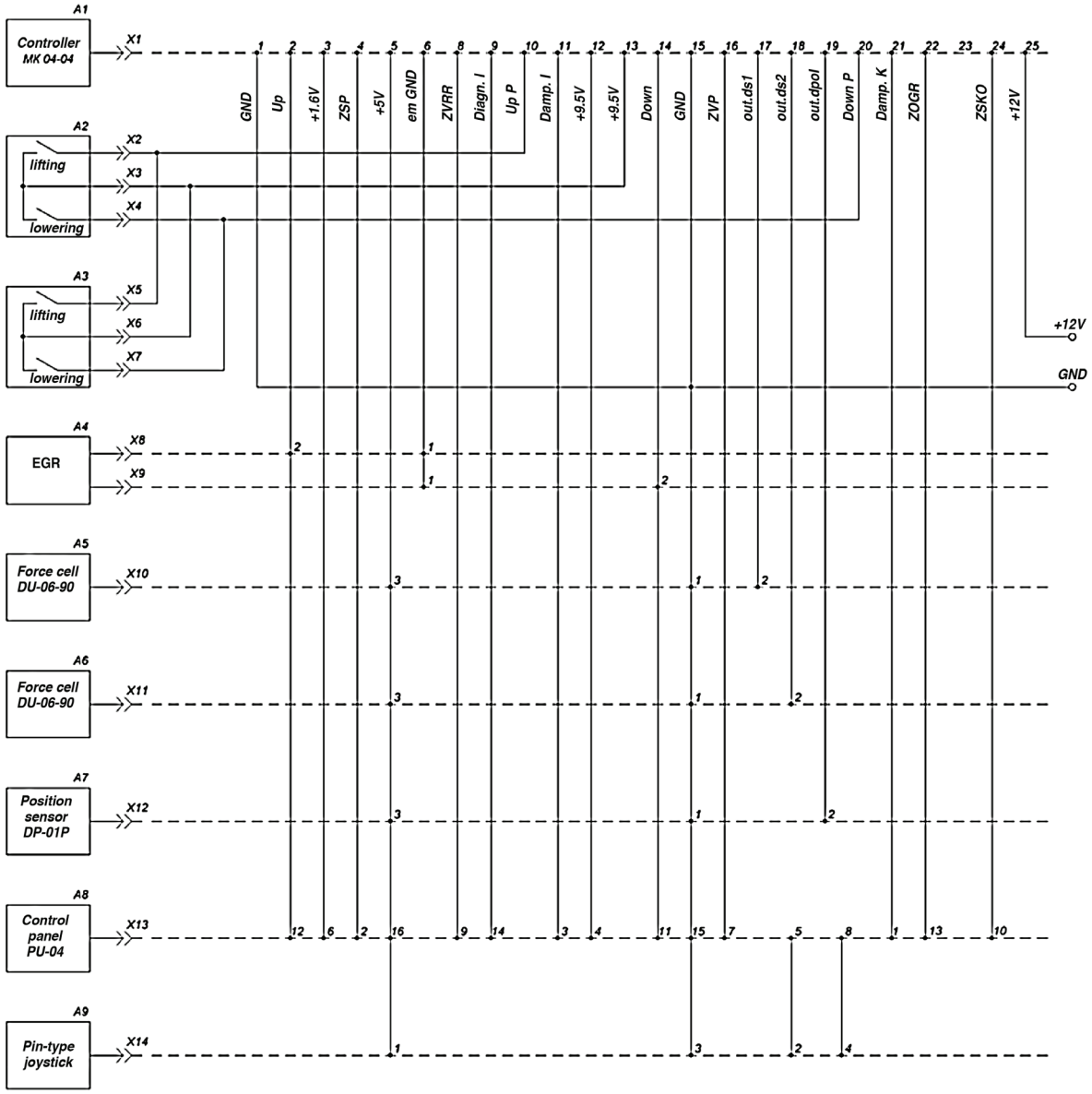


Fig. 26 **Diagram for connection of system components**

4 FINGERTIP CONTROL PLATFORM

4.1 Fingertip Controls

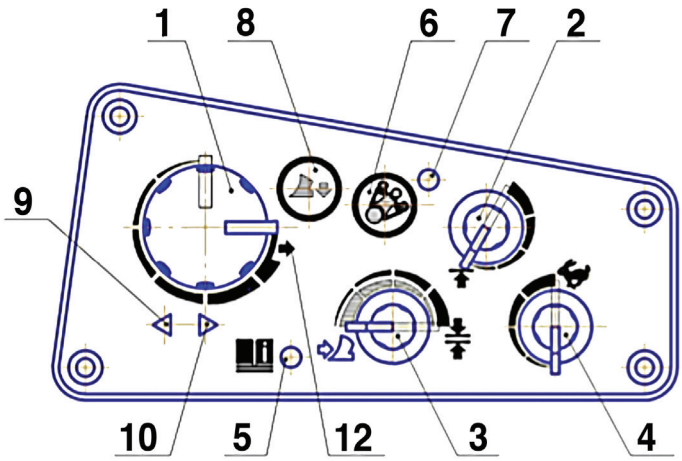


Fig. 27

Appearance of Fingertip control panel PU-04

1 - soil cultivation depth control handle;
2 - lifting height limitation control handle;
3 - control method selection handle: extreme left position - power control mode, extreme right position - positional control mode, between them - combined control mode;
4 - lowering speed control handle;
5 - indicator DIAGNOSTICS (red light);
5 - indicator DAMPING (green light);
6 - button DAMPING;
8 - mode button FLOATING (without locking);
9 - indicator LIFTING (red color);
9 - indicator LOWERING (green color)

When the power supply system receives 12 V, indicators DIAGNOSTICS and DAMPING should light up, then indicator DAMPING should go out.

System operation modes (Table 2) Page 63

Table 2

Operation mode	Position of controls and indication of mode
STOP	In case of system configuration with control panel PU-04, operation mode selection functions are provided for by the pin-type handle (mounted outside panel PU-04) and button FLOATING (located at panel PU-04). Mode STOP should be set at mid-position of the mode selection handle, mode TRANSPORTATION - at upper position of the handle, mode AUTOMATIC CONTROL - at lower position of the handle.
TRANSPORTATION (linkage lifting)	Set the mode selection handle of the control handle to position TRANSPORTATION (mid-position of the handle). Adjust linkage lifting height with the lifting height limitation handle. Indicator LIFTING illuminates at the control panel upon linkage lifting. If needed, press button DAMPING to activate the mode of damping mechanical vibrations in the course of transportation.
FLOATING (linkage lowering).	Adjust linkage lowering speed with the lowering speed adjustment handle. Set position FLOATING with the respective button on panel PU-04. Indicator LOWERING illuminates at the control panel upon linkage lowering. Extreme left position of the lowering speed adjustment handle is lowering prohibition.
AUTOMATIC CONTROL	Shift the mode selection handle to position AUTOMATIC CONTROL (lower position of the handle). Set control method with the control method selection handle - positional, power or combined. Set required cultivation depth with the soil cultivation depth adjustment handle. In the course of operation, indicators LIFTING and LOWERING light up and go out by turns. Extinction of both indicators LIFTING and LOWERING means that the minimum mismatch between set and measured parameters is achieved in the system and the system is in the dead zone.

4.2 System Diagnostics And Troubleshooting

System controller provides for diagnostics of operability of system components and, in case of a fault, blocks the system operation in automatic mode from the main control panel and returns a fault code.

System diagnostics is not performed in mode STOP (system operation is blocked).

The fault code lights up at indicator DIAGNOSTICS as per diagram given in Fig. 28.

Fault code “24” is given as an example.

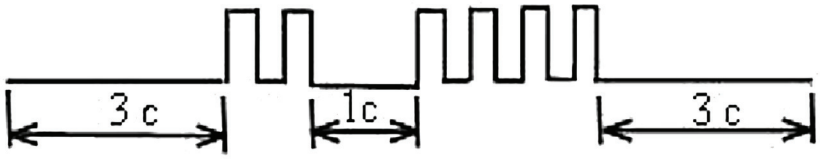


Fig. 28 **Diagram of fault code “24”**

Fault codes are given in Table 3.

Table 3

Code	Short Description of Fault	Troubleshooting Method
11	Open circuit of upper solenoid	Check wires connected to the solenoid. If they are not faulty check the solenoid. Replace it in case of fault.
12	Open circuit of lower solenoid	Check wires connected to the solenoid. If they are not faulty check the solenoid. Replace it in case of fault.
13	Short circuit (SC) in solenoid circuits	Check the system solenoid circuits for SC.
14	SC of button LIFTING of the remote panel	Check the button for SC.
15	SC of button LOWERING of the remote panel	Check the button for SC.
16	Voltage at power supply source +9.5 V (for controllers MK-03-03 and MK-04-04) below 9.25 V or above 9.75 V. Voltage at power supply source +5 V (for controller MK-04-04) below 4.7 V or above 5.2 V	Check supply circuits for a short circuit to in-vehicle network, frame. Eliminate SC, if found.
19	System power supply value is below 10.7 V or above 16 V	Check electric equipment of the tractor (storage battery, relay controller). Check voltage at the storage battery. If needed, recharge or replace it. Fault code triggering is also possible at a long-term starter operation (low voltage for more than 6 seconds). If this is the case, switch over the operation mode selection potentiometer after a successful engine start-up to position ‘transport’, ‘automatic control’, ‘stop’ several times before the fault code goes out.

Code	Short Description of Fault	Troubleshooting Method
22	Position sensor failed	Check that there is a supply voltage at the sensor connector pins. When it is there and there are no visible damage to the cable, adjust the sensor position as per method of its installation (section METHOD OF CAM AND POSITION SENSOR INSTALLATION). If that doesn't help, replace the sensor.
23	Soil cultivation depth control potentiometer failed	Replace the control panel
24	Height limitation control potentiometer failed	Replace the control panel
28	Operation mode selection potentiometer failed	Replace the control panel
31, 32	Force cell 1, force cell 2 failed, respectively	Check that there is a supply voltage at the sensor connector pins. When it is there and there are no visible damage to the cable replace the cell
34	Lowering speed control potentiometer failed	Replace the control panel
36	Control method selection potentiometer failed	Replace the control panel
97	No solenoid current via channel LOWERING in the absence of solenoid open circuit and SC between controller contacts 14, 6 (earth of solenoids)	Check contacts 14, 1 for SC When there is a short circuit (resistance below 1.5 Ohm), eliminate it or otherwise replace the controller
98	No solenoid current via channel LIFTING in the absence of solenoid open circuit and SC between controller contacts 2, 6 (earth of solenoids)	Check contacts 2, 1 for SC When there is a short circuit (resistance below 1.5 Ohm), eliminate it or otherwise replace the controller
99	Current drain via one or two channels LIFTING, LOWERING.	Replace the controller
-	No lowering or lifting of the linkage when controlled from the main control panel. No indication of fault.	Check EGR. If it's not faulty, replace the controller.

After mode DIAGNOSTICS, the system should be returned to operating condition as follows:

- option a) switch off power supply and in 3-4 s switch it back on.

  When the power supply system receives 12 V, indicators DIAGNOSTICS and DAMPING should light up, then indicator DAMPING should go out;

- option b) shift the mode selection handle to mode STOP and then to the required mode.

4.3 Maintenance of Platform

The system is to be regularly maintained.

Once per month, service personnel must carry out:

- system cleaning from dust and dirt;
- control of indication elements.

4.4 Method of Cam and Position Sensor Installation

For a correct installation of cam and position sensor, do the following:

1. Using remote buttons, lift the linkage for the maximum height (pump operation for safety reduction valves is not allowed at the point of maximum lifting).

2. Mount the cam on the turning shaft roughly, with a partial tightening of cam fastening screws, so as to have the bracket threaded part hole on the same axis with the hole for cam adjusting screw

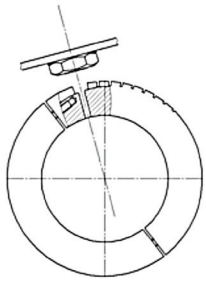


Fig. 29

3. While turning the cam, screw in the adjusting so that it would enter the cam hole

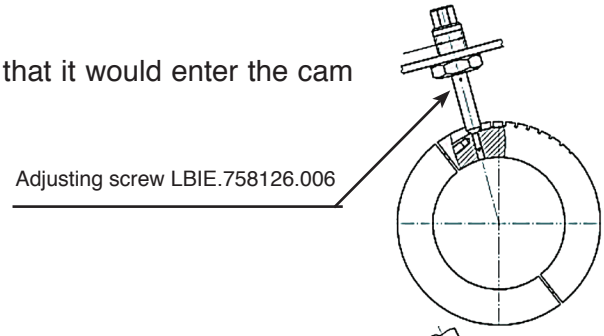


Fig. 30

4. Press the cam screws

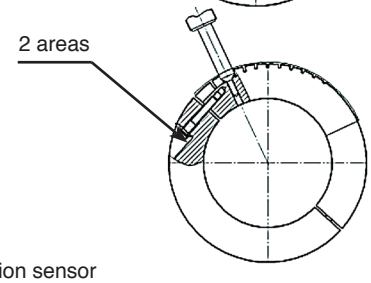


Fig. 31

5. Screw out the adjusting screw and screw in the position sensor instead all the way in the cam, then screw out the position sensor by 1.5 turns back to provide for a clearance between the sensor and cam.

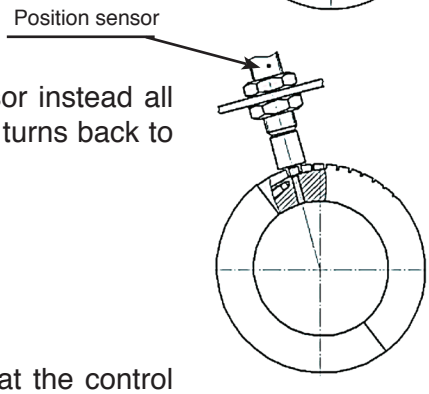


Fig. 32

6. Start the tractor, shift the lifting height limitation programmer at the control panel to the maximum lifting height position.

7. Switch on the linkage control system, shift the operation mode selection handle to position TRANSPORTATION. In case of a non-stopping correction for height (seen by indicator LIFTING at the linkage control panel), lower the linkage and screw out the position sensor a little bit (approximately by 30°). Repeat such screwing out of the sensor until a successful completion of the correction for height (indicator 'lifting' should go out at the upper position of the linkage). At the same time, output signal of the sensor should not exceed the limits followed by diagnostics of its improper mounting or malfunction (fault code "22").

8. Fix the position sensor with lock nut.

NOTE.

1. *After correct installation of the sensor its output signal at the uppermost position of the linkage should be about 4.5 V.*
2. *In case fault code "22" appears in the course of system operation with non-faulty position sensor, this may mean that output signal of the sensor at extreme positions exceeds the threshold limits set in the system. In case it happens at the lower position of the linkage (output signal of the sensor exceeds the lower threshold limit - 0.5 V), the position sensor must be screwed out a little bit, and if fault code "22" appears at the uppermost position (output signal of the sensor exceeds the upper threshold limit - 4.5 V), the position sensor must be screwed in a bit.*
3. *Said adjustments of the position sensor are based on the fact that its output signal depends on the value of clearance between its face end and operating surface of cam KR-01. The closer the operating surface of cam is to the sensor face end the lower is the sensor output signal, and vice a versa.*
4. *Position sensor of type DP-01 measures the linkage lifting height by a non contact method, while interacting with the operating surface of cam. Rotation of KR-01 type cam from 0° to 87° corresponds to cam operating surface movement against a sensitive face end surface of the position sensor within the range from 1.8 mm to 7.5 mm. At the same time, change of position sensor output signal for DP-01P sensor is 0.5 - 4.5 V and for DP- 01 sensor it is 2.3 - 7.1 V.*

   Criterion for a correct installation of the position sensor is the maximum usage of the entire range of linkage movements from the lowermost to the uppermost position without overloading hydraulic pump at the end of lifting and without bringing the linkage to a safety stop. At the same time, corrections for linkage lifting and lowering should be time-restricted.
5. *In case of inoperable condition or improper mounting of DP-01 type position sensor (fault code "22" appears), linkage lifting and lowering can be controlled by remote buttons. When a remote button is pressed, linkage movement will not be continuous unlike the case when position sensor channel is properly adjusted but discrete with a duration of about 3 s*.

4.5 Electronic System for Hydraulic Distributor Section Control (EHS)

General

EHS system installed in the tractor serves to control sections of hydraulic distributor SB33LS EHS EHR installed at the tractor fuel tank. When control unit SRC4-5 receives power the electronic system performs self-diagnostics of control elements. When finding faults, the system indicates them with light codes of faults.

Each hydraulic distributor section has the fault code, the code indicator located at its upper part, in the area of electric connector.

When there is a fault in sections the indicator provides a code information about fault in the section. Fault code consists of two digits - see Table 3, Page 64.

The code is to be read out by counting the number of indicator flashes: number of flashes with a short pause in between - first digit - long pause - number of flashes with a short pause in between - second digit.

For example, the system would indicate fault code “23” by activating the indicator as follows: two flashes - pause - three flashes. In the absence of faults in the distributing section the indicator should be off.

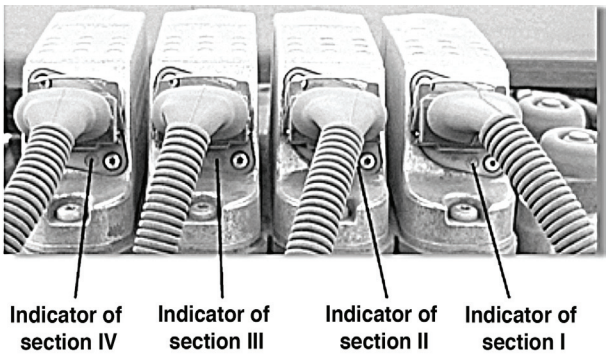


Fig. 33

Besides, the faults of EHS electronic control systems are indicated by the fault code indicator (EHS symbol at the system activation switch). The guidelines for read-out of diagnostic light codes - see Table 4, Page 66 - are the same as the guidelines for read-out of diagnostic light codes from distributor sections. 9 Diagnostic codes from the switch and from distributor sections are not redundant and display different faults even if the codes are the same.

For example:

– fault code “21” at the switch - resistance of the oil feed limitation controller for the valve of section No. 2 out of the permissible range, or open circuit fault;

– fault code “21” at distributor section - unacceptably low level of supply voltage (from 8V to 11V) at distributing section.

4.6 Hydraulic Distributor Section Control EHS

Hydraulic distributor section control EHS includes the following elements:

– electronic control unit of system EHS SRC4-5;
– EHR system activation switch;
– 4 flow controllers of each section (I / II / III / IV) of the hydraulic distributor;
– 4 controllers of operation actuation time upon activation of a section ((I / II / III / IV) of the hydraulic distributor;
– 4 control handles of I, II, III, IV hydraulic distributor sections;
– connection wire harnesses.

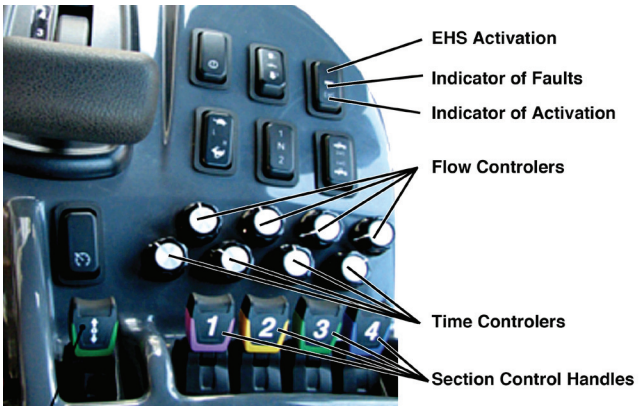


Fig. 34

Section control handles have 5 activation positions

1. Central position - neutral.
2. Unlocked forward position (towards the engine) - implement lowering.
3. Unlocked reverse position (towards the load semi-frame) - implement lifting.
4. Locked forward position (towards the engine) - activation of floating section mode.
5. Unlocked reverse position (towards the load semi-frame) - activation of constant oil flow through the section. This position of the handle allows to set up the required oil flow using the flow controller and the operation activation time using the time controller.

Flow controller operation ranges are 0…92 l/min:

- the flow reduces with controller handle turning clockwise;
- the flow increases with controller handle turning counter-clockwise

Ranges of time controller operation at unlocked positions are 2…60 s:

- the operation actuation time increases with controller handle turning counter-clockwise;
- the operation actuation time reduces with controller handle turning clockwise.

Hydraulic outputs should be connected to external consumers as per the drawing.

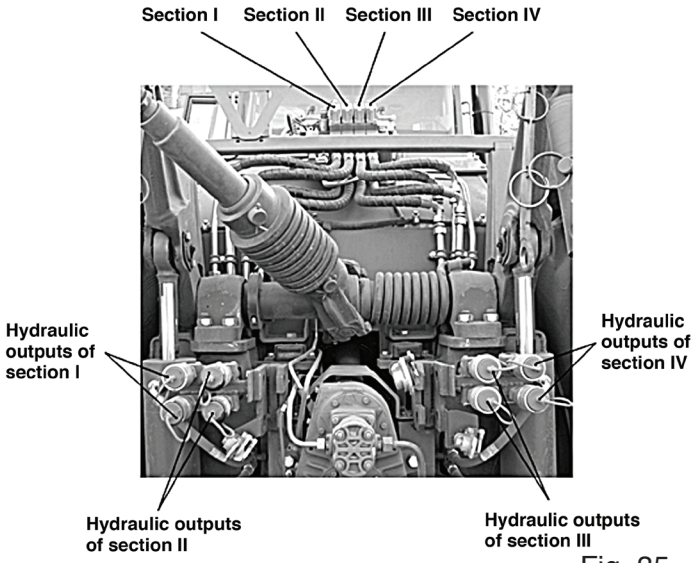


Fig. 35

Fault codes of EHS distributor and electronic system for hydraulic distributor section control through diagnostic light code of the fault code indicator at EHS hydraulic distributor section.

Table 4

Fault Code	Possible cause and nature of malfunction
11 12 13 14 15	No control signal at CAN-bus. Central gate valves of distributing section inadvertently returns to “neutral” position. CAN-protocol doesn’t conform with the required one.
16	Memory fault discovered at activation of hydraulic distributor section. Central gate valve of distributing sections remains at “neutral” position.
17	Control signal doesn’t conform with “neutral” position at system start-up
23	Clogging of fine mesh filter or ceramic metal strainer is extreme, or no voltage at the closing electromagnet of the reducing valve, or clogging of the reducing valve of the section for hydraulic distributor signal preparation. At the same time, distributor section gate valve doesn’t move when controlled from the handles or moves slowly and not to the full extent. Code is indicated at all sections the control signal is supplied to. With no control signal or cease of its supply, code indication stops.

24	Movement of distributing section gate valve exceeds the established limits, or the gate valve doesn't return to "neutral" position under the spring force.
25	Floating" position doesn't activate over a certain period of time due to mechanical seizure of the central gate valve or fault of the control valve, low control pressure. In case of code "25" indication at all distributing sections, see code "23". Central gate valve of the distributor inadvertently returns to "neutral" position. Operation of distributing section from joysticks is blocked into position "lowering", "floating". Code is indicated only at faulty section, both with the control signal on and after its removal before the appearance of the control signal for "lifting"
26	Section gate valve was engaged in position "lowering" or "floating" due to control valve seizure in position "lowering" or "floating", respectively. In case the control valve seizes in the position corresponding to oil supply for gate valve shifting to position "lifting", the section gate valve will move to position "lifting" after the tractor start-up.
31	Unacceptably low level of supply voltage (below 8V)
32	Unacceptably low level of supply voltage (over 18V)
41	Supply voltage exceeds limiting level (over 45V). At the same time, central gate valve of distributor section inadvertently returns to "neutral" position. Control from handles is not possible. Fault code is indicated at all sections regardless of presence (absence) of the control signal
42	Value of current at the control valve is out of the permissible or expected range. At the same time, section gate valve is always at "neutral" position. Control from handles is not possible. A code is indicated at faulty sections with the control signal on
43	Fault of gate valve position inductive sensor. Fault code is indicated only at faulty section of the distributor immediately after energizing the system
44	Control valve is open at the system start-up. At the same time, central gate valve moves to the open channel position
81	Gate valve of distributing section moves back to neutral position. At the same time, the control from handles is not possible. Central gate valve is stuck at "lifting", "lowering" or "floating" position. With the faults above, code "24" is indicated one time and then code "81" shows permanently
82	Central gate valve of distributing section is not at "neutral" position from the beginning, or a false signal comes from the sensor. At the same time, the control from joysticks is not possible. Fault code is indicated only at faulty distributing section immediately after energizing The code is indicated only if the gate valve is at "lifting" or "lowering" position from the beginning
83	Logic error in the section memory

Fault codes of EHS distributor, electronic system for electric-hydraulic distributor EHS section control through diagnostic light code of the code indicator located at "EHS Activation" switch.

Table 5

Fault Code	Possible cause and nature of malfunction
11	Resistance of the oil feed limitation controller for the valve of section No.1 out of the permissible range, or open circuit fault

Fault Code	Possible cause and nature of malfunction
12	Non-compliance or absence of the signal from handle to controller via section No.1
14	No communication with section No.1. The following light codes may appear at the indicator of section fault codes: 26, 31, 32, 41, 42, 81, 82
21	Resistance of the oil feed limitation controller for the valve of section No. 2 out of the permissible range, or open circuit fault
22	Non-compliance or absence of the signal from handle to controller via section No. 2
24	No communication with section No. 2. The following light codes may appear at the indicator of section fault codes: 26, 31, 32, 41, 42, 81, 82
31	Resistance of the oil feed limitation controller for the valve of section No. 3 out of the permissible range, or open circuit fault
32	Non-compliance or absence of the signal from handle to controller via section No. 3
34	No communication with section No. 3. The following light codes may appear at the indicator of section fault codes: 26, 31, 32, 41, 42, 81, 82
41	Resistance of the oil feed limitation controller for the valve of section No. 4 out of the permissible range, or open circuit fault
42	Non-compliance or absence of the signal from joystick to controller via section No. 4
44	No communication with section No. 4. The following light codes may appear at the indicator of section fault codes: 26, 31, 32, 41, 42, 81, 82
72	Supply voltage out of the permissible range (7£Uп³18) V. The system gets blocked
77	Temperature of oil passing through integral unit section exceeds 210ºF / 100ºC

4.7 Wiring Diagram of Hydraulic Distributor Section Control System (EHS)

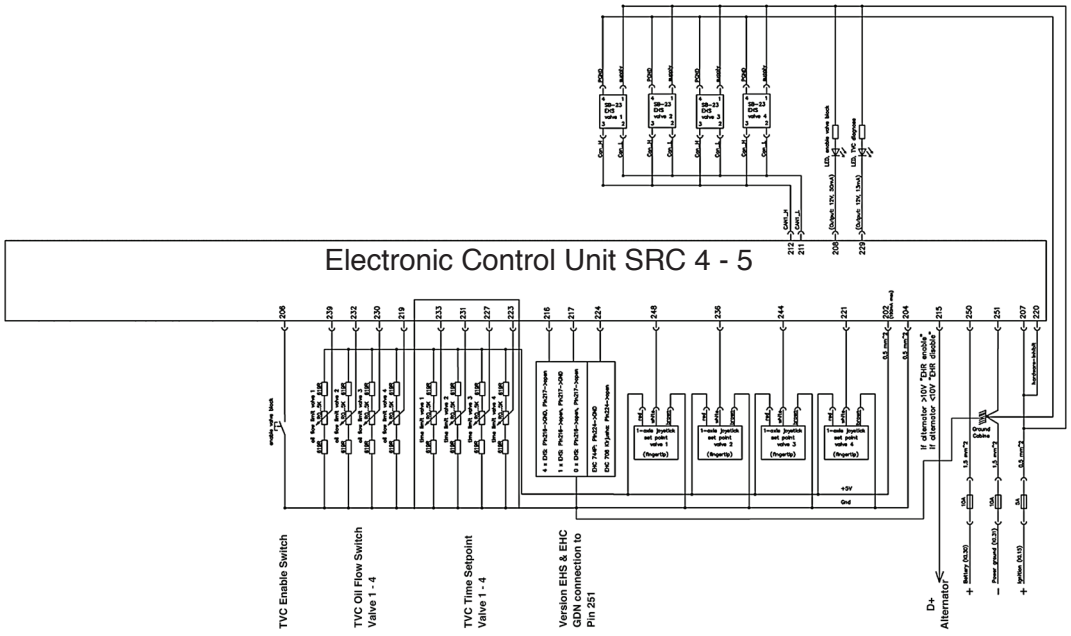


Fig. 36

5 GEARBOX PNEUMATIC CHANGEOVER

5.1 GB Pneumatic Changeover

PNEUMATIC CHANGEOVER STRUCTURE

GB operation modes should be changed over with the help of 4 air-actuated cylinders installed at upper section of the case (see the figure). Pneumatic cylinders F-R - 1-N-2 can be controlled only when the gear change lever is in “T” position (synchronizing brakes are on).

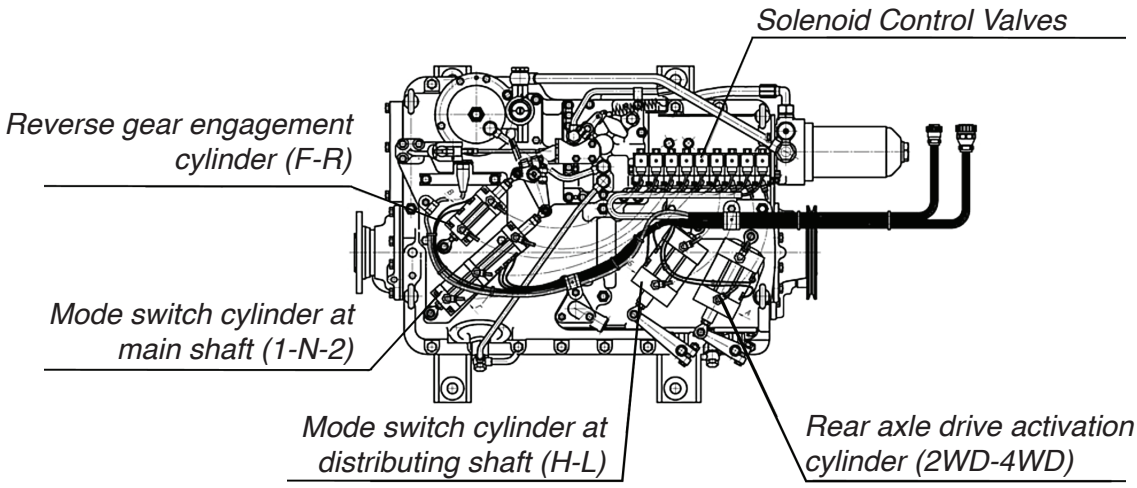
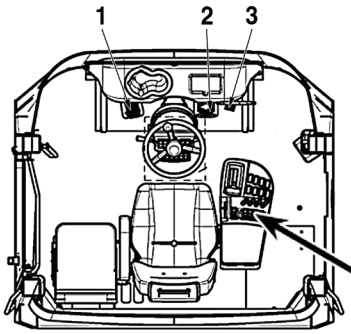


Fig. 37

5.2 Operating Principle



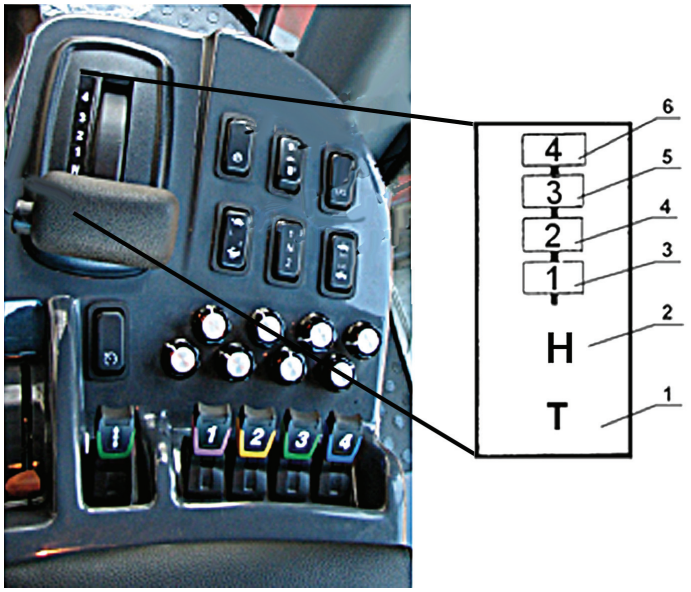
1 - Drain (Clutch) Pedal
2 - Brake Pedal
3 - Accelerator Pedal

Fig 38

Controls

(1), (2), (3), (4) - mode switches;
(5) - shift lever;
(6) - abnormal engine start-up switch;
(7) - fixation button

Gears are changed by the lever via cable drive. Lever (5) should be shifted to position “T” (synchronizing brakes are on) only with retainer 7 pressed.	If the drain pedal is pressed while at 2nd, 3rd and 4th gear, the pedal will get blocked in pressed state and can return to the initial position only with 1st gear or NEUTRAL engaged.
To switch to 1st gear from position NEUTRAL GEAR, depress the drain pedal. Switching from 1st to 4th gear and from 4th to 1st is done with the drain pedal lowered.	Modes are changed over by application of electric signal from the controls to corresponding solenoid-operated pneumatic valves which, in turn, are channeling air inside pneumatic cylinders cavities, setting into motion their stems linked to GB mode switching levers.
Switching from first gear to NEUTRAL GEAR is possible only with drain pedal depressed.	Engaged condition is displayed at indication module as a result of triggering of magnetic contacts for pneumatic cylinder stems positioning.



Layout of gear change lever positions

(1) - Synchronizing brakes are on, “T” position
(2) - neutral “N”;
(3) - 1st gear;
(4) - 2nd gear;
(5) - 3rd gear;
(6) - 4th gear

Fig. 39

5.3 Interlocks

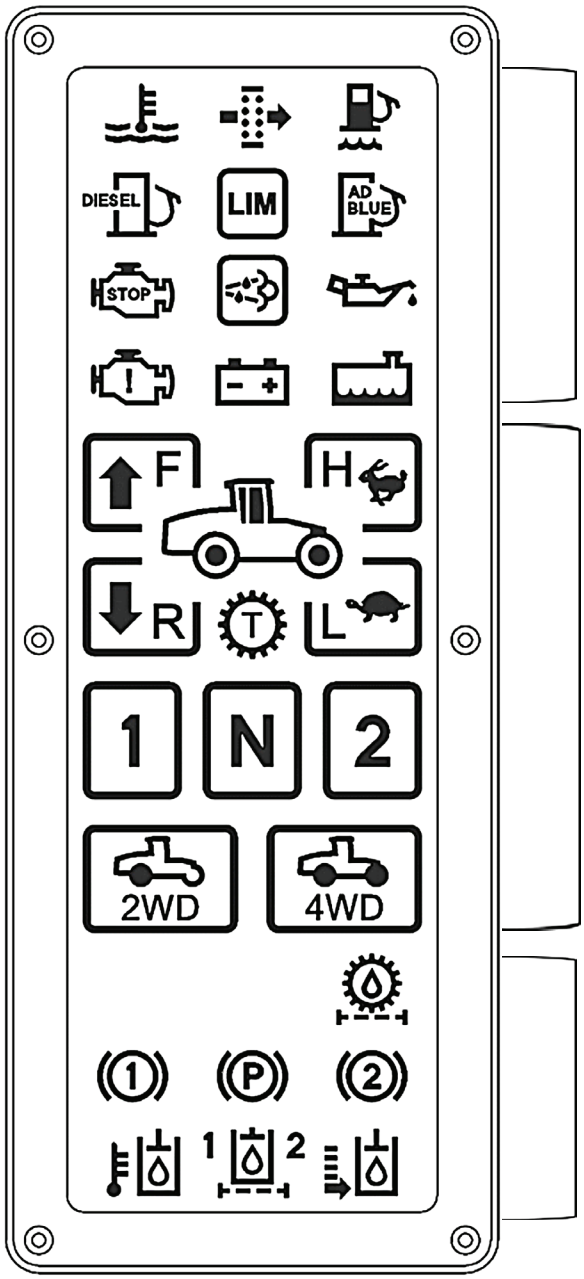
Unless synchronizing brakes are on (lever (5) is not engaged at “T” position (see the Diagram of gear change lever positions)), it is impossible to switch on any modes except 2WD, 4WD.	Engine start is only possible at NEUTRAL GEAR of modes (“N”) and at mode “F” (forward**).**
Reverse movement (“R”) can be switched on only from NEUTRAL GEAR (“N”) at main shaft.	
With reverse movement on, it is impossible to switch to the first and second modes at main shaft (“1” and “2”).	

5.4 Indication Panel

An electronic display, located on the right pillar casing in the cab indicates the engagement of couplings of GB operation modes and controlled states of other tractor systems.

The tractor indication panel is divided into 3 zones:

- **Zone 1** - indication of emergency engine parameters
- **Zone 2** - indication of control over pneumatic changeover of GB modes
- **Zone 3** - indication of operating and emergency parameters of pneumatic and hydraulic systems



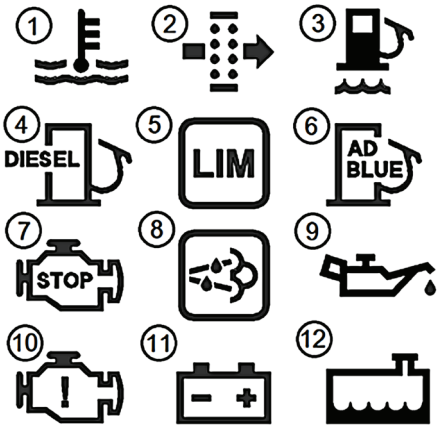
Zone 1
Indicates emergency engine parameters

Zone 2
Indicates control over pneumatic changeover of GB modes

Zone 3
Indicates operating and emergency parameters of pneumatic and hydraulic systems

Fig. 40

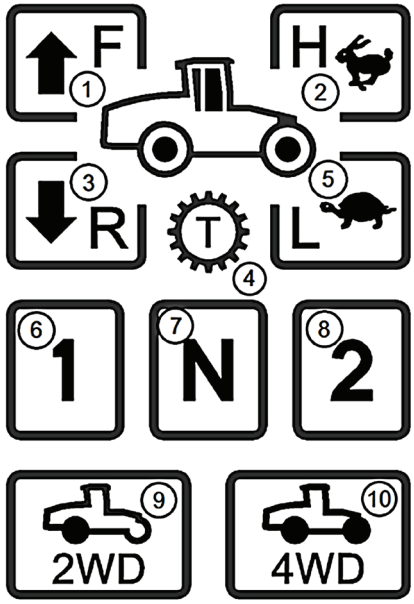
Zone 1 Indication of emergency engine parameters



Symbols for indication of emergency engine parameters

1. Critical temperature of cooling fluid	(red)
2. Engine air filter is clogged	(yellow)
3. Water in fuel	(yellow)
4. Low fuel level	(yellow)
5. Limitation of engine speed	(yellow)
6. Low carbamide level	(blue)
7. Engine must be shut down	(red)
8. Carbamide injection	(yellow)
9. Critical engine oil pressure	(red)
10. Parameters of engine systems must be checked	(yellow)
11. Battery charge	(red)
12. Low cooling fluid level	(yellow)

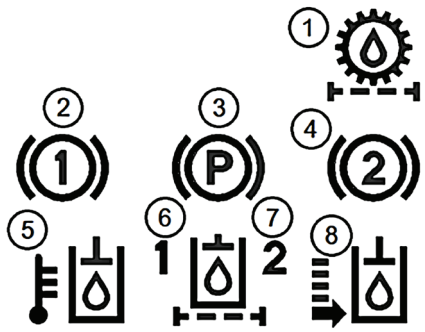
Zone 2 Indication of control over pneumatic changeover of GB modes



Symbols for indication of control over pneumatic changeover of GB modes

		(green)
1. Forward running	(“F”)	(green)
2. High mode	(“H”)	(green)
3. Reverse running	(“R”)	(yellow)
4. Synchronizing brakes are on	(“T”)	(green)
5. Low mode	(“L”)	(green)
6. Mode 1	(“1”)	(green)
7. Neutral of modes	(“N”)	(green)
8. Mode 2	(“2”)	(green)
9. Forward drive engaged	(“2WD”)	Green
10. Four-wheel drive engaged	(“4WD”)	

Zone 3 (indication of operating and emergency parameters of pneumatic and hydraulic systems)



Symbols for indication of operating and emergency parameters of pneumatic and hydraulic systems

1. GB filter is clogged	(red)
2. Emergency pressure in 1st circuit of the pneumatic system	(red)
3. Parking brake is pulled up	(red)
4. Emergency pressure in 2nd circuit of the pneumatic system	(red)
5. Critical temperature of oil in the hydraulic system	(red)
6. Drain filter of the working equipment hydraulic system is clogged	(red)
7. Drain filter of the steering control hydraulic system is clogged	(red)
8. Critical oil level in the hydraulic system	(red)

Fig. 41

5.5 Engine Start-up

Make sure all controls are in neutral before starting:

– switch (1) - at “N” (NEUTRAL) position; mid-position;
– switch (3) - at “F” position (forward);
– lever (5) - at “H” position (NEUTRAL);
– switches (2) and (4) can be at any position, e.g., switch (2) at “L” position (low mode), switch (4) - “2WD” position (rear axle is disengaged).

CAUTION!
To avoid accidents, make sure that there are no obstacles in the direction of planned driving.

Push horn, turn the ignition key to position 2 and start the engine. Let the engine work on idle for engine lubrication system to fill and engine to warm up to the operating temperature. (Fig. 24)

1 - Forward

Make sure there are no obstacles along the way.	
Push horn button	Move lever (5) to “T” position. The lever can be moved to “T” position only with shifter button 7 pressed in advance. The lever can be returned without pressing fixation button (7) - Fig. 22
Activate the required mode by moving switch 1 to position “1” or “2”. When the mode is activated the corresponding symbol will be illuminated at the indication panel. Fig 23	Further gear switching should be performed sequentially forward as per the diagram of gear change lever positions. The speed is controlled with pedal (3) - Fig 22
If mode switching is hindered, turn the steering wheel to the right and left at a small angle. Move lever (5) from “T” position to “H” position. Depress the drain pedal (1) - Fig, 23 and get into the 1st gear by moving lever (5)-Fig 22 to position “1”. Disengage the parking brake. Smoothly release the drain pedal and perform tractor take-off.	
Increase forward speed by shifting switch (1) to position “2” or switch (2) to position (H) - Fig 22	

2 - Stopping

Smoothly brake the tractor before its stopping	Release the drain pedal
Move lever (5) to the 1st gear position, depress the drain pedal, move lever (5) to “H” position, release the drain pedal	Move switch (1) to “N” position (mid-position). “N” symbol will be illuminated at the indication module. Move lever (5) to “H” position.
By braking the tractor with service brakes, get it to a full stop.	Pull up the parking brake.

Move lever (5) to “T” position (ONLY AFTER COMPLETE STOP OF THE TRACTOR!). In case of emergent stop of the tractor it is allowed to simultaneously push the brake and drain pedals, followed by moving lever (5) to “T” position with both pedals pushed and tractor at full stop.	

3 - Reverse

Stop the tractor as per i. 2. Move lever (5) to “T” position (ONLY AFTER COMPLETE STOP OF THE TRACTOR!).	Shift switch (3) to “R” position. When the mode is activated the “R” symbol will be illuminated at the indication module
Push the horn and make sure there are no obstacles for reverse running.	Press the drain pedal. Move lever (5) to the 1st gear position, disengage parking brake and smoothly release the pedal and start moving in reverse.
Increase reverse speed by shifting lever (5) to position “2”, “3”, or “4”, OR shifting switch (2) to position “H”	

4 - Stopping after reverse

Stop tractor as above: 2 - Stopping.	Shift switch 3 to “F” position (when this mode is activated “R” symbol will fade and “F” symbol will light up).
Depress the drain pedal, move the gear change lever to end back position “T”. The “T” symbol will be illuminated at the indication module and buzzer will be activated.	Move lever (5) to “H” position. Pull up the parking brake.

IMPORTANT!

Use the “T” position of the gear change lever (synchronizing brakes are on) only when changing over the modes. Long-term parking of the tractor braked by small brakes with engine in operation is forbidden. A sound signal will go off after 10 s of “small brakes” position activation with engine in operation.

6 - Rear axle engagement

Rear axle should be engaged by pressing and holding switch (4) in “4WD” position until “4WD” symbol lights up at the indication module.	Rear axle should be disengaged by pressing the switch to “2WD” position

NOTE!

The rear axle can be engaged and disengaged as you travel.

7 - Engine shutdown

Engine can be shut down after the tractor stops (see 2).	*If the engine was operating at a high speed, before the shutdown, let it run at idle for 2 or 3 minutes to allow turbocharger decelerating to the minimum speed and engine temperature stabilizing. This measure will increase the service life of turbocharger.*
Turn ignition key to OFF	

5.6 Engine Start-up in Abnormal Situation

If the tractor engine shuts down at a mode engaged and there is no (or insufficient) air pressure in receiver cylinders, an abnormal situation occurs when it becomes impossible to start up the engine (no NEUTRAL of modes at main shaft). When this is the case, start up the engine as follows:
– shift gear change lever (5) to position “T”;
– push horn;
– press switch (6) and, with the switch pressed, turn the ignition key to position 2 starter;
– after engine starts up and when air pressure of at least 6 bar is established, shift switch (1) to “N” position (mid-position) and gear change lever (5) - to “H” position.

NOTE!

Modes 1 -N- 2, F - R, L - H will be changed over only when the tractor is standing still and the gear change lever is in “T” position.

NOTE!

For the avoidance of GB breakdown, do not transfer the gear change lever into position ENGAGEMENT OF SYNCHRONIZING BRAKES when tractor is driving.

NOTE!

In case of oil pressure jump or fall in GB, stop operation of the tractor and check the pressure using a mechanical instrument (pressure gauge).

List of electric equipment elements and diagram of electric equipment for GB pneumatic changeover system see below.

IMPORTANT!

Turn the steering wheel to the right and left at a small angle for facilitation of mode switchover as well as for rear axle engagement with the tractor stopped.

5.7 List of Components

of the electric equipment for GB pneumatic changeover system

Table 6

Zone	Pos. designation	Name	Quantity	Note
	D1...D4	Diode KD243B UZh3.362.036TU	4	
	HG1	Indication panel 7KhЭPU-3-3799 150	1	
	K16 - K26	Relay 753.3777-01 TU 37.003.14 18-94	11	
	SA9	Switch F5.3709.011-418	1	Plant Kopir
	SA10	Switch F5.3709.011-416	1	Plant Kopir
	SA11	Switch F5.3709.011-X 17	1	Plant Kopir
	SA12	Switch F5.3709.011-419	1	Plant Kopir

Zone	Pos. designation	Name	Quantity	Note
	3B1	Push-button switch 28223710 TU 37.003.911-79	1	
	SQ0 - SQ8	Position sensor SUA 70-1303-24 14	9	
	SQ9	Inductive sensor ISN F2A-31N-4-L	1	
	V1	Diode assembly 702MB-37 99 650-4	1	
	V2	Diode assembly 744P-37 17 640-3	1	
	V3	Diode assembly 744P-37 17 650-3	1	
		Pin contact blocks OST 37.003.032-78		
	XP20, XP27	502601	2	
	XP30	502602	1	
	XP11, AP18, XP19	50260X	3	
		Pin contact blocks AMR		
	XP10	206151-1		
	XP14, XP21	206044-1		
	XP15	182651-1		
	XP16	282105-1		
	XP23	1-480586-0		
	XP31	282 105-1	1	Super seal
		Receptacles OST 37.003.032-78		
	XS25, XS27	602601		
	XS30	602602	1	
	XS18, XS19	602604	2	
	XS12	602606	1	
	X-K16 - X-K26	617605	11	
		Receptacles AMP		
	XS10	206150-1	1	
	XP14, XS31	206043-1	2	
	XS26	1-480585-0	1	
	X-SQ0 - X-SQ88, XS31	Receptacle 282087-1	10	Super seal
	X-SA9, X-SA10, X-SA11,X-SA12	Contact block KDP A .732313.001	4	Plant Kopir

GB Pneumatic Changeover

Zone	Pos. designation	Name	Quantity	Note
	X0 - X8	G1NU 3000D 43650-A	8	for SOPV
	Y0 - Y8	Solenoid valve 638M-101-A63S04	9	

5.6 Electric Diagram of GB Peumatic Changeover System

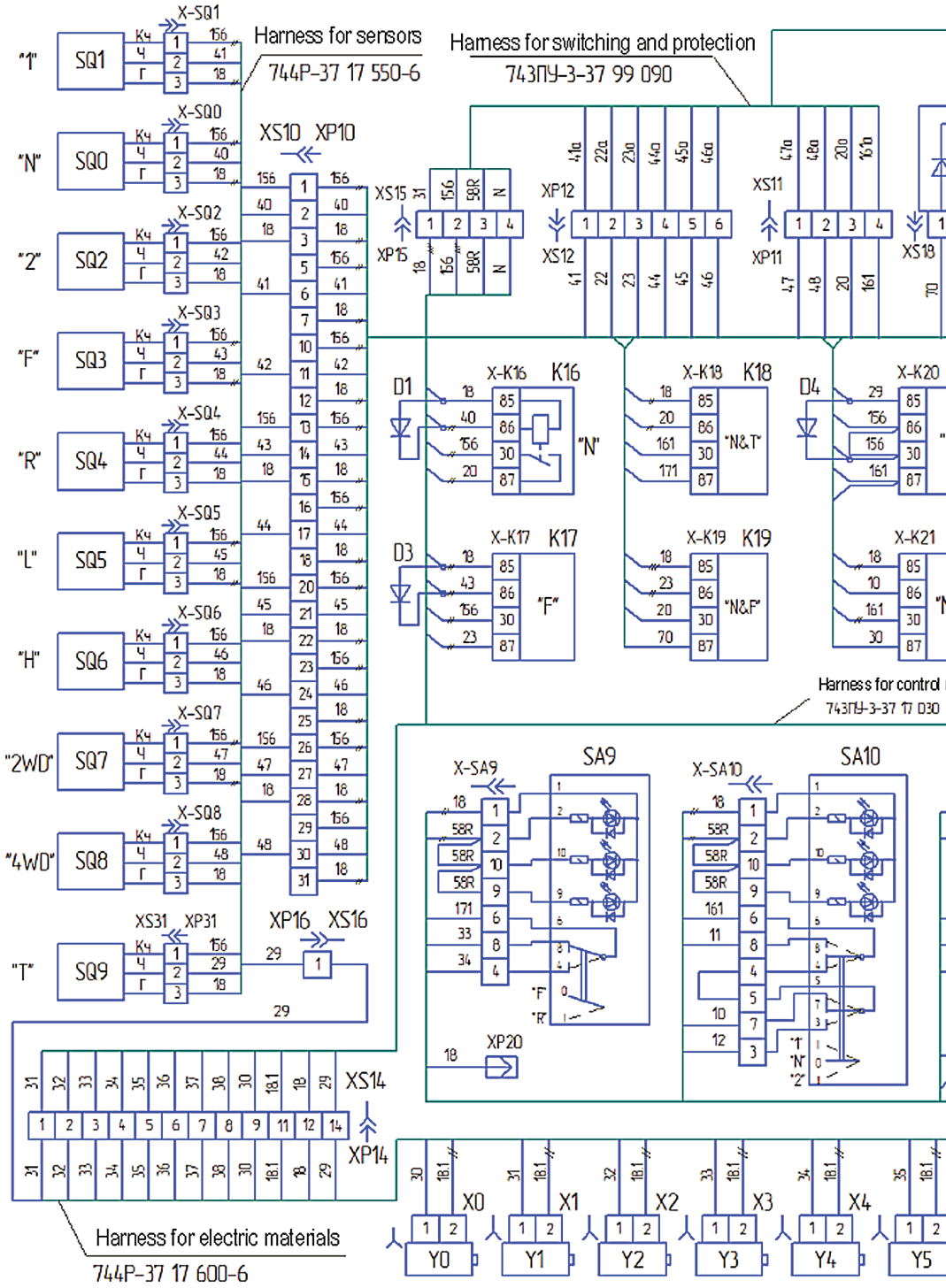
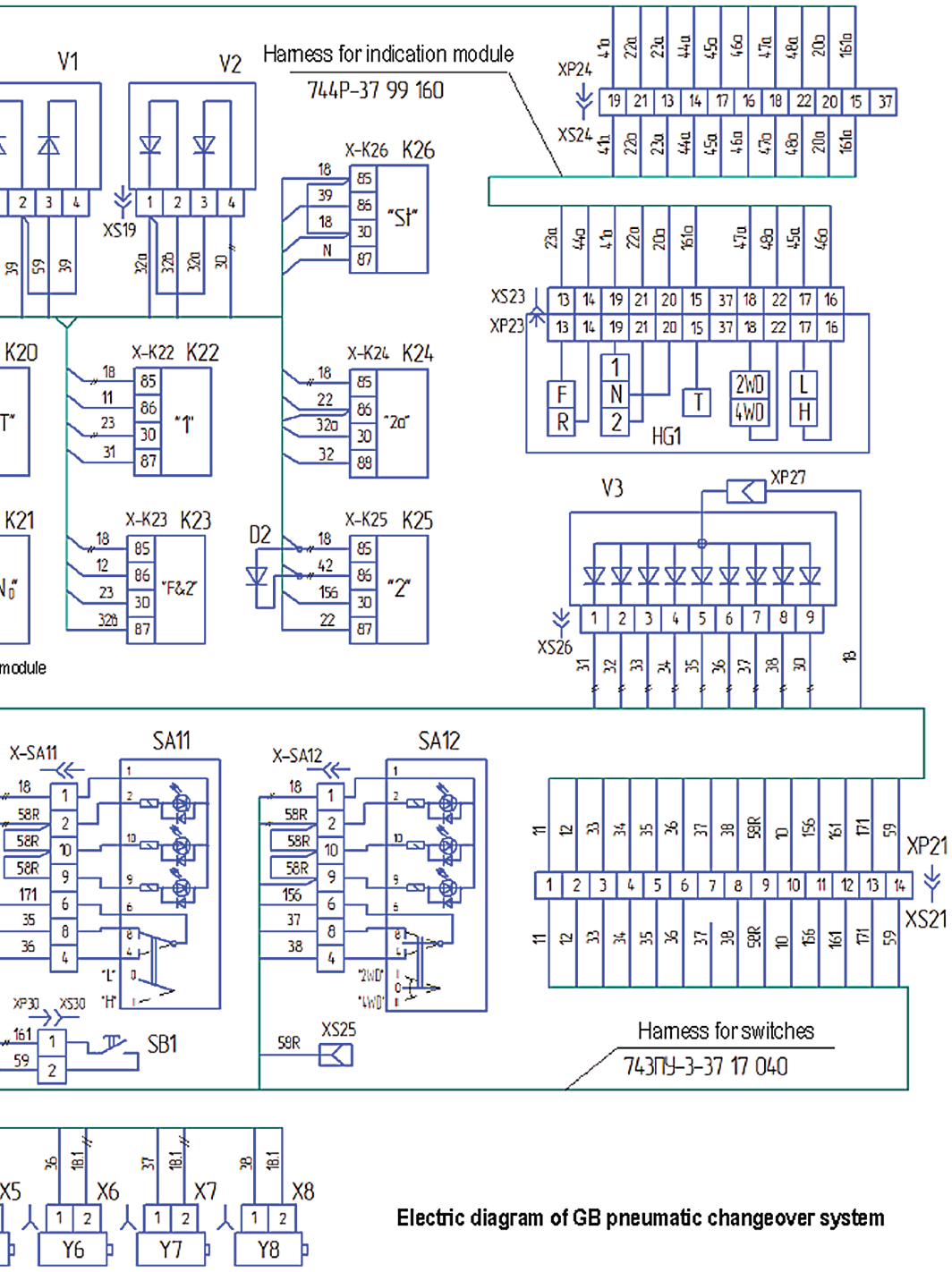


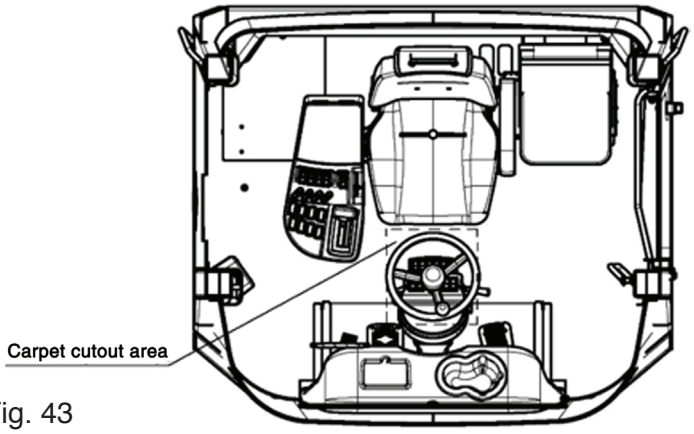
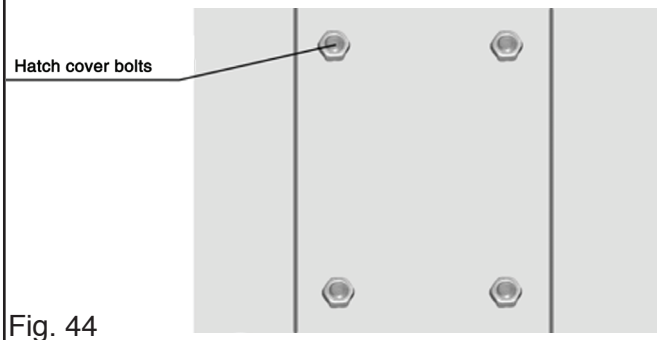
Fig. 42



Electric diagram of GB pneumatic changeover system

GB Pneumatic Changeover

5.9 Possible Faults of GB Pneumatic Changeover System

Fault, failure indications	Reason, troubleshooting
Modes can't be switched, "T" letter is not lit at synchronizing brakes activation mode.	SMALL BRAKES NEUTRAL position sensor failed. Adjust the sensor or change it with a new one.
Fail to switch GB to neutral "N" from "2" mode. Flashing of sectors at number "2".	"2" SQ2 mode sensor failure Bring magnet close to the sensor. If there is no reaction (LED lamp is not lit), change it with a sensor from the SPTA kit.
Fail to switch GB to neutral "N" from "2" mode. All three LED lamps at cylinder 1-N-2 are lit. "30 Ohm between "frame" and negative wire.	Poor contact at power socket, contact oxidation. Clean up the contacts at 4-pin power socket.
When attempting to switch from "1" mode to neutral "N" mode, GB switches to "2" and vice versa, from "2" mode to "1" (no "neutral" mode). Letter "N" doesn't light up.	No voltage supply to "NEUTRAL OF MODES" solenoid due to poor connection at solenoid connector. Press and screw the solenoid connector under the cabin all the way in.
Failure of the tractor stopped for engagement of another mode with the forward running mode on.	1. Set the implement to the transport position. 2. Keep moving to the parking area with the forward running mode engaged.  Fig. 43
	3. Take off the cut out part, undo 4 bolts and take off the hatch cover to provide the access to the pneumatic cylinders for forward and reverse running activation.  Fig. 44

4. Disconnect stems of the pneumatic cylinders for forward and reverse running activation from levers B and A of the main shaft couplings control drive.

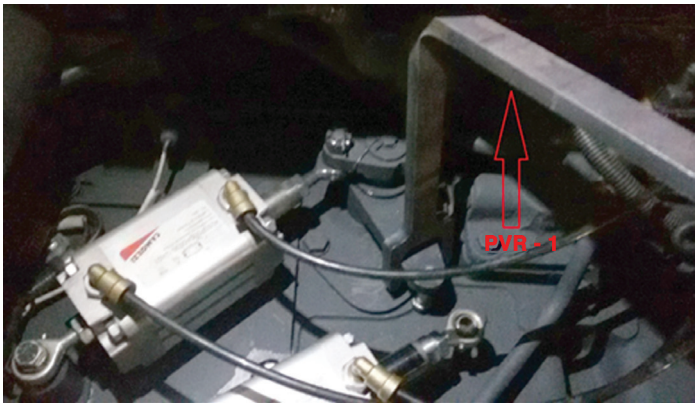


Fig. 45

5. Disengage the reverse running with the use of PVR-1 key by turning lever A counter-clockwise to a fixed position.

Fig. 46

6. Pull up the parking brake.

7. To check the neutral of modes, start up the engine and make sure of the stoppage by engaging the first gear.

GB Pneumatic Changeover

8. Shift lever 5 (Fig. 47) to position “T”.

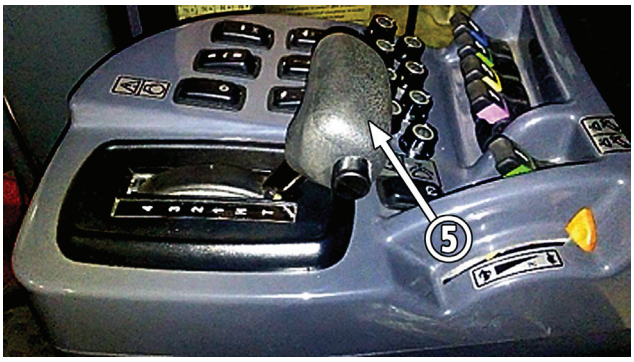


Fig. 47

9. Engage a low mode with the use of PVR-1 key by turning lever B counter-clockwise to the fixed position III.

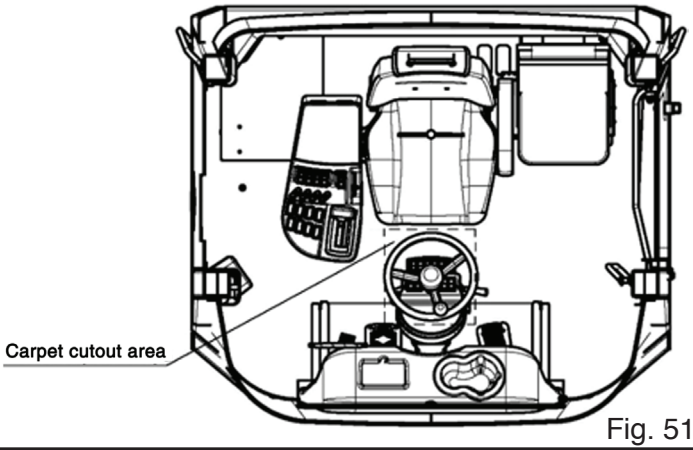
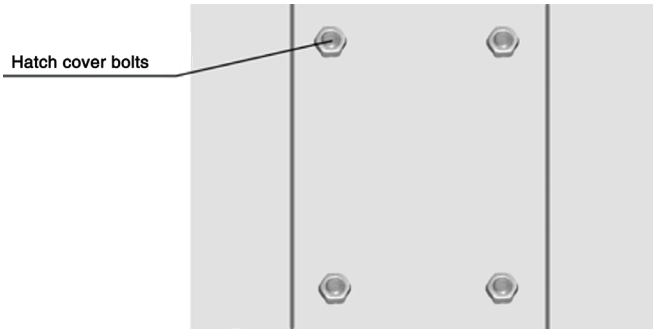
Fig. 48

10. Do not switch modes at distributing shaft.

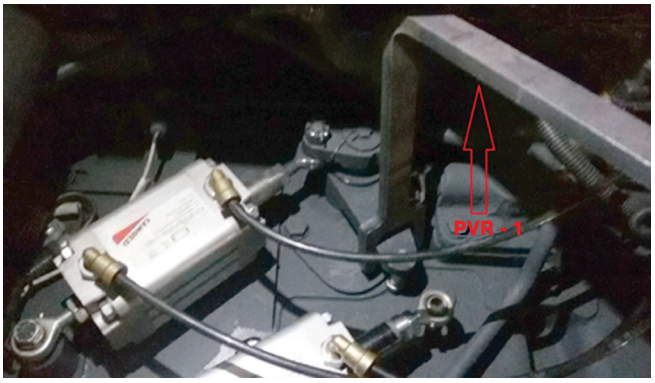
11. Close the hatch and start driving.

When it’s impossible to disengage reverse running with the engine stopped the engine shall be started up as follows:
Move lever 5 to position “T” (NEUTRAL MODE WITH SMALL BRAKES), press button 6 (located on the right side surface of the control rack - Fig. 49) and turn the ignition switch to position STARTER with the button pressed.

Fig. 49

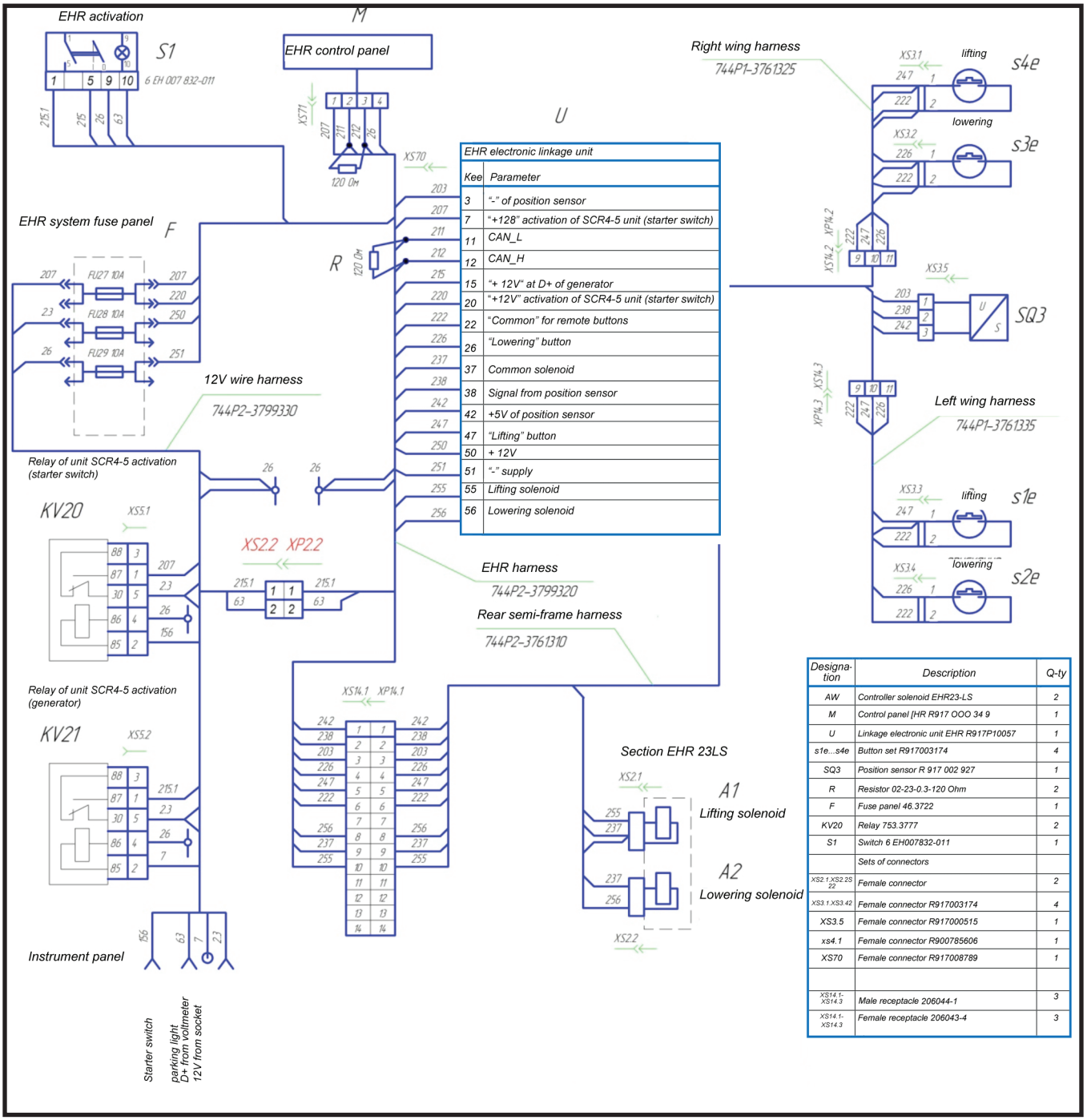
	Having started up the engine, disengage the reverse running with the use of PVR-1 key by turning lever A counter-clockwise to a fixed position.  Then proceed as per items 7…11. Fig. 50
Failure of the tractor stopped for engagement of the forward or reverse running mode with the neutral of modes on.	1. Stop the engine.
	2. Cut out a part of the carpet on the cabin floor, which is marked by intermittent incisions.  Fig. 51
	3. Take off the cut out part, undo 4 bolts and take off the hatch cover to provide the access to the pneumatic cylinders for forward and reverse running activation.  Fig. 52

GB Pneumatic Changeover

	4. Disconnect stems of the pneumatic cylinders for engagement of the main shaft couplings control drive, the one in front of lever B.  Fig. 53
	5. Pull up the parking brake.
	6. Start the engine.
	7. Move lever 5 (Fig. 47) to “T” position.
	8. Engage a low mode with the use of PVR-1 key by turning lever B counter-clockwise to the fixed position III.  Fig. 54
	9. Do not switch modes at distributing shaft.
	10. Close the hatch and start driving.

5.10 EHR System Siring Diagram

For outer illumination and signaling, four headlights are installed on the tractor with high and low beams as well as eight lights for service illumination, four turn indicators, four fender lights, “slow moving vehicle sign”, two lateral repeaters of turn indicators, two “stop signal” lights.



Designation	Description	Q-ty
AW	Controller solenoid EHR23-LS	2
M	Control panel [HR R917 OOO 34 9	1
U	Linkage electronic unit EHR R917P10057	1
s1e...s4e	Button set R917003174	4
SQ3	Position sensor R 917 002 927	1
R	Resistor 02-23-0.3-120 Ohm	2
F	Fuse panel 46.3722	1
KV20	Relay 753.3777	2
S1	Switch 6 EH007832-011	1
	Sets of connectors	
XS2.1,XS2.2S 22	Female connector	2
XS3.1,XS3.42	Female connector R917003174	4
XS3.5	Female connector R917000515	1
xs4.1	Female connector R900785606	1
XS70	Female connector R917008789	1
XS14.1-XS14.3	Male receptacle 206044-1	3
XS14.1-XS14.3	Female receptacle 206043-4	3

Fig. 55

6 INSTRUMENT PANELS AND CONTROLS

6.1 Instrument Panel

Fig. 56

Instrument panel

1. Menu recall button
2. Escape/Back button.
3. Indicator for audio signal muting in case of failure
4, 5. Menu selection buttons
6. Indicator for instrument panel illumination

The control is operated by 4 keys:

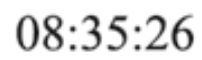
Buttons 4 and 5 in the main window serve for the following:

– arrow “UP” (button 5) - illumination of keys (main page), pressing button 5 (“UP”) - going through menu tabs;
– arrow “DOWN” (button 4) - buzzer muting (main page), pressing button 4 (“SOWN”) - going through menu tabs.

				
Left turn indicator	Head light high beam indicator light	Head light low beam indicator light	Parking brake pulled up indicator light	Right turn indicator

	Indicator light for engine error	
	Indicator light for parking lights	
	Battery discharge indicator light	Lights up when there is no charging current from the generator.
	Indicator light for signaling on emergency air pressure in the 2nd circuit of pneumatic system	Lights up at air pressure drop of 4.5…5.5 kgf/cm^2
	Indicator light for signaling on emergency air pressure in the 1st circuit of pneumatic system	Lights up at air pressure drop of 4.5…5.5 kgf/cm^2
	Indicator light for emergency oil temperature in the hydraulic system	Lights up when the oil temperature in the hydraulic system reaches the emergency value of 85+2 °C
	Indicator light for inadmissible oil level in the hydraulic system	The light starts flashing at oil level drop below the critical value; at the same time, the instrument panel provides an intermittent sound signal. Short-term “flashing” of the indicator light is allowed in case of travelling over road irregularities causing oil level changes in the hydraulic tank.
	Indicator light for clogging of the engine oil filter	
	Indicator light for clogging of the engine oil filter	Short-term activation of the indicator light for clogging of the pressure filter of steering control hydraulic system is allowed until the operating temperature of the hydraulic system oil reaches ~40-50°C.
	Indicator light for clogging of the mounted equipment pressure filter	

	Engine oil emergency pressure indicator	At the engine oil pressure: MB OM470 (Mercedes) - <0.05 MPa Emergency oil pressure sensor actuates. *Upon actuation of the emergency oil pressure sensor, light starts blinking in 5 s and the instrument panel provides an intermittent sound signal.*
	Indicator light for GB filter clogging	
	Indicator light for air filter clogging	MB OM470 engine - 95°°C. *When the cooling fluid temperature reaches 95°C the light starts blinking and the instrument panel provides an intermittent sound signal.*
	Indicator light for cooling fluid emergency temperature.	
	Neutral gear engagement	
	Maintenance	Lights up after every 250 lifetime hours. To deactivate M indication, it is required to press Escape/back button (lower right button) on the instrument panel and hold it for over 3 sec
	Actuation of small brakes	With engine in operation, it is not allowed to keep the mode of small brakes activation on for more than 50 s. Otherwise, *the light will start blinking and the instrument panel will provide an intermittent sound signal*



- local (astronomical) time (should be set in menu “Time setting”)

- tractor speed

- lifetime hours (provided that engine is started)

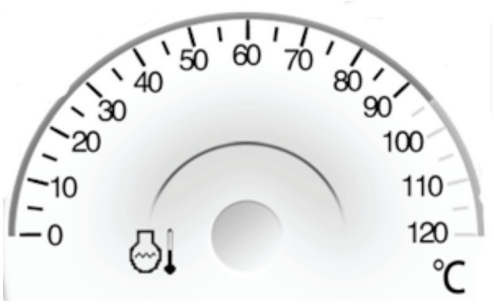
- indicator of oil pressure in GB

Oil pressure in the GB hydraulic system at gears with the crankshaft rotation rate of 900-1800 RPM should be:
1.1 - 1.3 MPa (11 - 13 kgf/cm^2) - for K744.

Oil pressure growth at each gear should be rapid. The pressure on neutral gear and at engagement of synchronizer brakes should not be less than on transmission gears.

Upon pressure falling in the hydraulic system below 10 kgf/cm^2 for at least 30 sec, indicator starts blinking and the instrument panel provides an intermittent sound signal on low pressure in GB. When a buzzer sounds in the course of operations, it should be stopped; using mechanical pressure gauge, make sure that the pressure in GB corresponds to the operating pressure.

1632 1/min - engine RPM speed

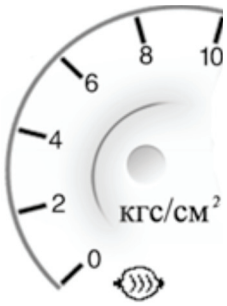


- engine cooling fluid temperature indicator (letter “C” = “Cold” in the beginning. This mark corresponds to +40°C)

Maximum operating temperature of cooling fluid:
MB OM470 (Mercedes) engine - 95°°C.

Do not permit operation of MB OM470 engines under load at the cooling fluid temperature below 70°°C

. - fuel level indicator



- indicator of air pressure in the pneumatic system

In the course of operation, air pressure in the pneumatic system should be 0.65 - 0.8 MPa (6.5 - 8 kgf/cm^2).

When pressing button 1 for menu indication (Fig. 7), the following data window opens; it consists of the following sections:

– mechanism condition;
– time adjustment;
– extra adjustments;
– device information.

Fig. 57 **Data window of the instrument panel**

Oil pressure in the mainline of the unit of heated MB OM470 (Mercedes) engine should be within the range of 0.25 - 0.5 MPa (2.5 - 5.0 kgf/cm^2) at the nominal rotation rate.

A short-term lighting of the symbol for indicator lamp of the emergency oil pressure in the engine is allowed at minim n rotation rate with the engine being heated.

Oil pressure in the mainline of the unit of heated 8481.10 engine shall be within the range of 0.38 – 0.5 MPa (3.8 – 5.0 kgf/cm^2) at the nominal rotation rate.

Oil pressure in the mainline of the unit of heated OM470LA (Mercedes) engine shall be within the range of 0.25 – 0.5 MPa (2.5 – 5.0 kgf/cm^2) at the nominal rotation rate.

Mechanism condition

This section indicates the main parameters of sensors in digital form (Fig. 45).

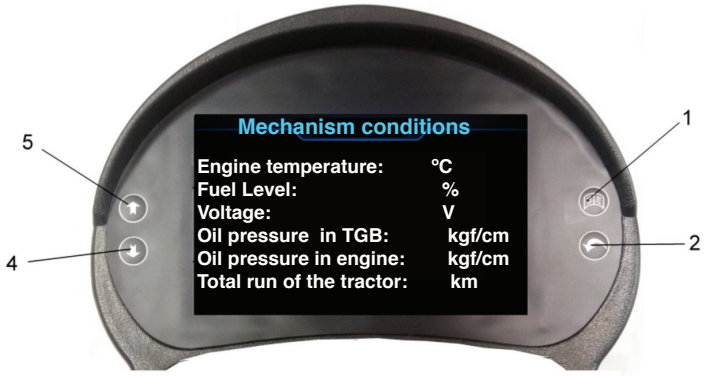


Fig. 58 **Section “Mechanism condition”**

Time adjustment

This section is to set up the real time and date (Fig. 9). The adjustment is made with buttons 4, 5 and 1. Then reset display to save the settings.

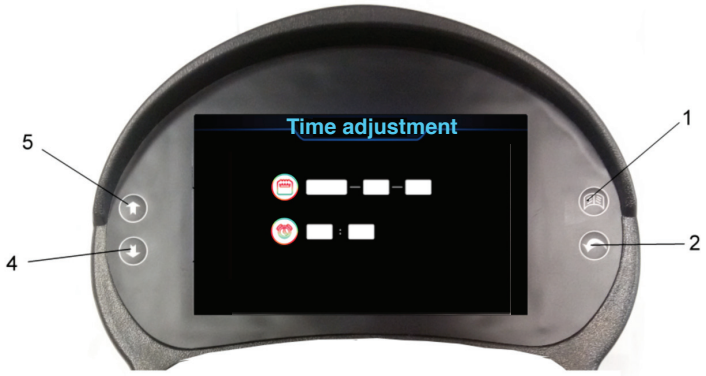


Fig. 59 **Section “Time adjustment”**

Extra adjustments

In order to enter this section, it is required to enter the password with controls (buttons 4, 5 and 1). The password is “8888”. Then press button 1 for menu indication. A page of additional menu opens; it is given in Fig. 11.

Fig. 60 **Section “Extra adjustments”. Password entry**

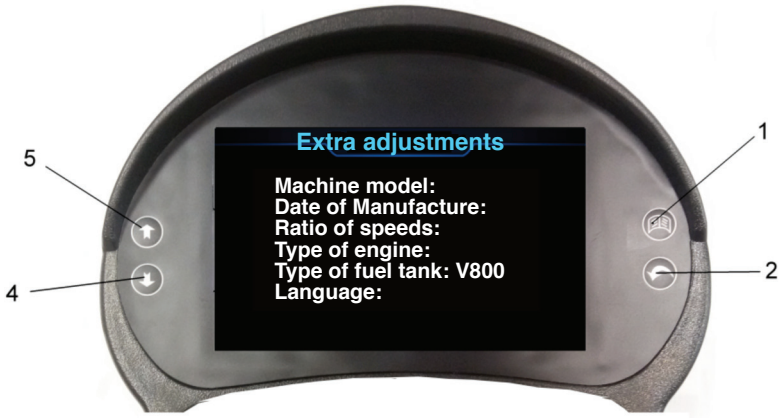


Fig. 61 **Section “Extra adjustments”. Additional menu**

“Machine model” - K744 - - - -” - default parameter, with possibility to add symbols 1, 2, 3, 4…..

“Date of manufacture” - 2016. - -. - - (year.month.day) “ - shipment date.

“Rotation of speeds” - 03.67 - tractor tachometer setup (03.67 - default value, used for tractors with Mercedes -Benz engine.

“Engine type” - “1 (engine Mercedes OML - 470) for Mercedes -Benz engines.

“Type of fuel tank” - V800 - 780 l tank volume is assumed. NOTE! The value should not be changed.

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

Device information (Fig. 62)

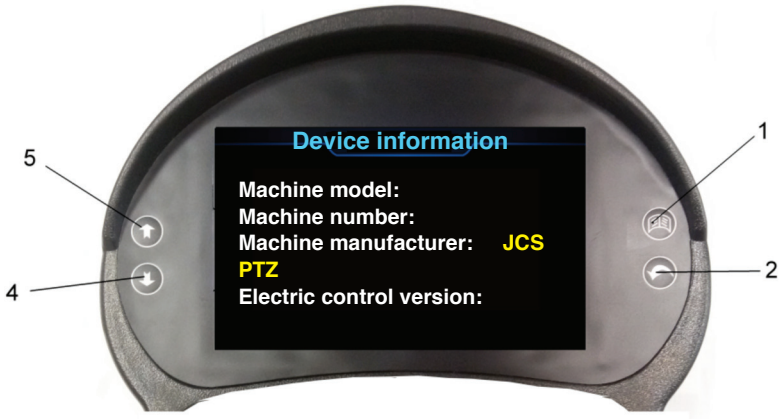


Fig. 62 **Section “Device information”**

This section displays the following data lines:

“Machine model” - the parameter should be set up in additional settings.

“Machine number” - assigned as per tractor number before the shipment.

“Machine manufacturer” - JSC PTZ - by default.

“Electric control version” - boot file (firmware).

6.2 Steering Column Control Panel

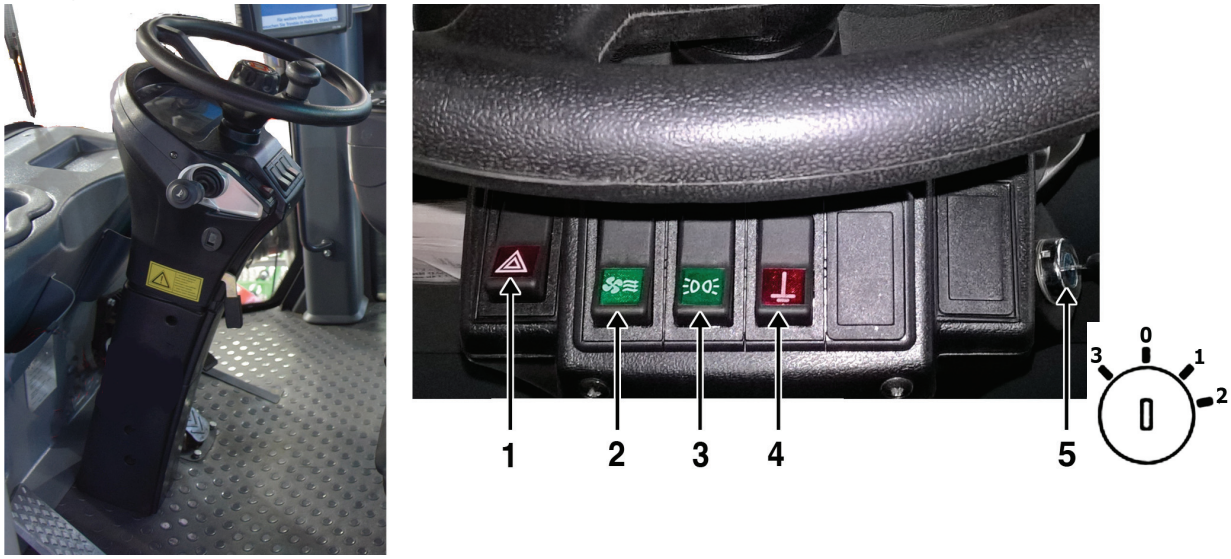


Fig. 63 **Steering column control panel**

1. Flashing hazard lights toggle switch
2. Cab heater toggle switch
3. Parking and Headlights toggle switch
4. Ground toggle switch
5. Key switch

1 - Hazard Lights toggle switch

Turns on the left and right turn indicators in flashing mode for travelling on road below speed limit or in case of inadvertent stopping of the tractor on the road.

2 - Cab heater toggle switch

Upper position of the switch - HEATER IS OFF.

Middle position of the switch - FIRST SPEED OF HEATER IS ON.

Lower position of the switch- SECOND SPEED OF HEATER IS ON.

3.- Parking and Headlights toggle switch

Upper position of the switch - OFF.

Middle position of the switch - PARKING LIGHTS ARE ON.

Lower position of the switch - LOW/HIGH BEAM IS ON.

4 - Ground switch

When this switch is in the “open” (off) position, electrical power is removed from all electrical circuits, including the starting circuit.

5 - Ignition Key switch

The engine is started by turning the ignition key into position “2”.

NOTE:

Whenever the tractor is shutdown and parked, the key switch should be in the “off” (0) position to prevent battery discharge through the alternator windings and to discourage unauthorized tractor operation.

IMPORTANT!

In case of engine warming up and tractor parking with engine in operation, the gear change lever and the mode change lever (5) Fig. 38, Page 72 shall be in position "Neutral N".

IMPORTANT!

The mode change lever, as well as the levers of slow and fast mode engagement, should be used only with the tractor stopped. In doing so, the gear change lever shall be in position "Engagement of synchronizer brakes". In case of mode engagement difficulties, it is necessary to depress the drain pedal shortly.

If necessary (for facilitation of mode change as well as for rear axle engagement with the tractor stopped), it is allowed to turn the steering wheel (to the right/left).

IMPORTANT!

In case of oil pressure jump or fall in GB, immediately stop operation of the tractor and check the pressure using a mechanical instrument (pressure gauge).

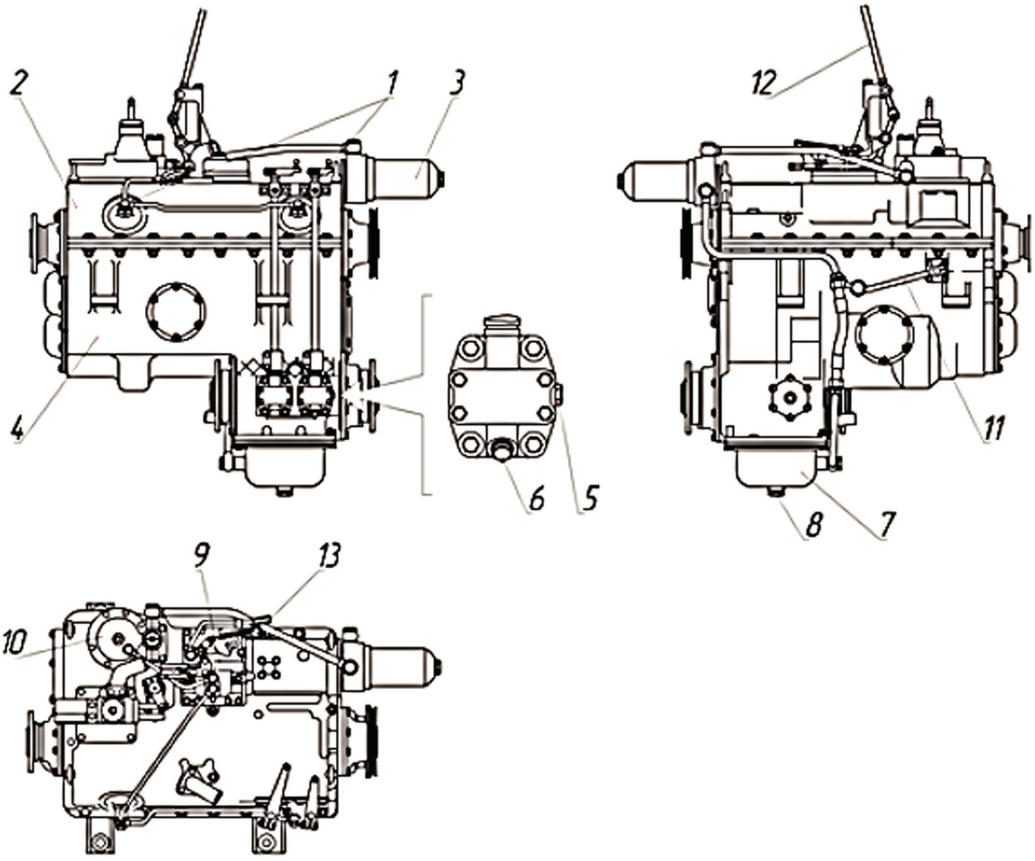


Fig. 64 **Gearbox**

1 – synchronizer brakes; 2 – upper half of the case; 3 – GB filter;
4 – lower half of the case; 5 – upper reference plug; 6 – lower reference plug;
7 – tray with pump; 8 – drain plug; 9 – gear change mechanism;
10 – hydraulic accumulator; 11 – towing changeover lever;
12 – gear change lever; 13 – working pressure measurement point in the hydraulic system of GB and sensor installation

6.3 Multifunction Lever on Steering Column

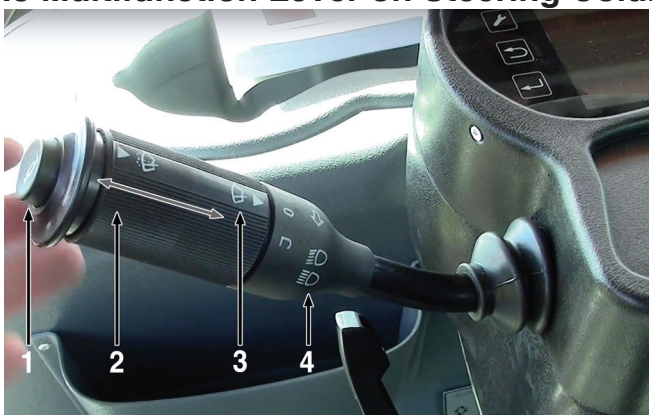


Fig. 65

1. Horn.
2. Front window washer switch. Push the ring towards the steering column.
3. Front windshield wiper switch. Push the ring further towards the steering column.
4. High beam headlight

Positions:

"0" - OFF;

"I" - first speed of the wiper;

"II" - second speed of the wiper;

"J" - intermittent mode of the wiper and washer control on.

Turn indicators are activated with handle moving clockwise and counter-clockwise.

High beam headlight is activated by pulling lever towards operator.

If needed, the possibility of short-term high beam activation ("winking") is activated for by pushing lever away from operator.

6.4 Switches and Accessories at the Overhead Panel in the Cab

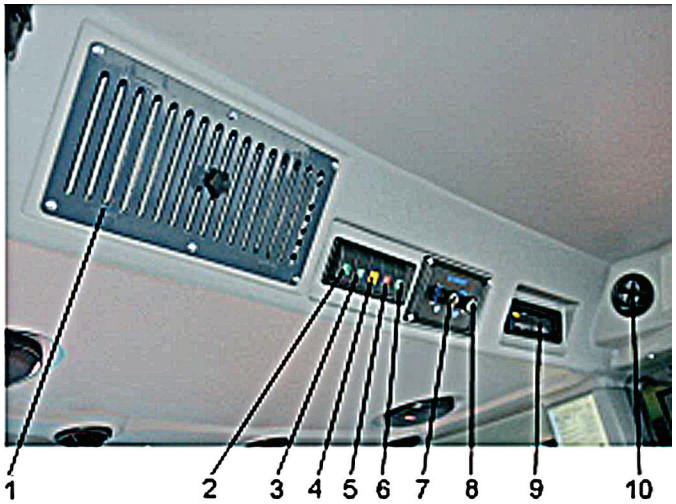


Fig. 66

1. Air circulation louvre
2. Front service headlight activation key
3. Rear service headlight activation key.
4. Flasher light activation key.
5. "Road-train" sign activation key.
6. Rear window wiper activation key.
7. Temperature controller. It controls the temperature of air flowing from the evaporator into the Cab.
8. Fan switch. It serves to adjust the velocity of air flow passing through the air conditioner.
9. Radio.
10. Round louvre with variable clear opening, 10 pcs.

If the temperature controller is in position OFF and the fan switch is not in position OFF, then the air conditioner will operate only for inflow of the outer air into the Cab.

NOTE!

It is not recommended to cool down air in the Cab by more than 42ºF / 6ºC in respect to the ambient temperature, as it can be the cause of cold-related diseases.

6.5 Driver's Seat and Additional Seat and Fuse Panel Box

Driver's seat (Fig.19) is adjustable by height, angle of back inclination in the longitudinal direction and by weight of the driver.

Perform the adjustment by weight by moving handle 4.

Adjust the back installation at the required angle by pressing handle 1.
In order to adjust seat position in the longitudinal direction, lift handle 2, set the seat in the required position and lower the handle.

Having seated on the seat, adjust the load according to your own weight. To increase the load weight, rotate knob 4 clockwise; to decrease the weight, rotate it counter-clockwise.

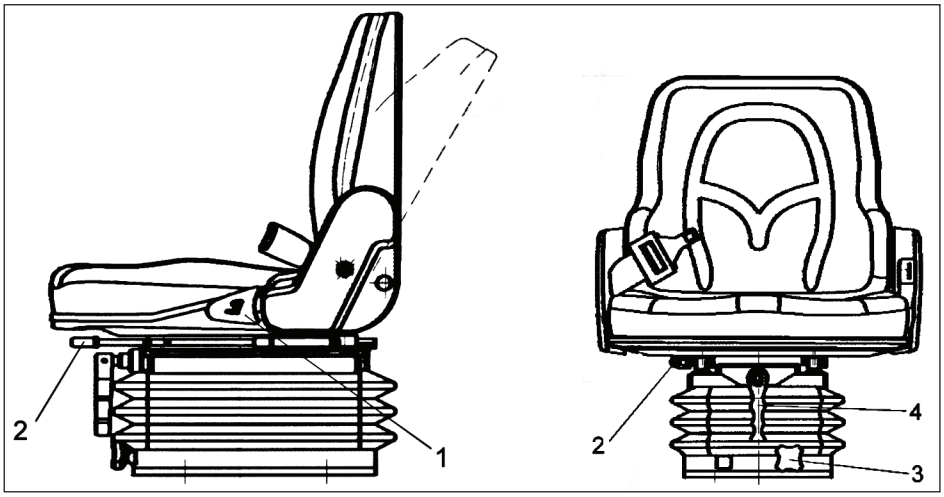


Fig. 67 **Driver's seat**

1 - back inclination lever; 2 - lever for seat longitudinal movement adjustment (adjust the seat position in longitudinal direction with the handle lifted upwards); 3 - handle for seat adjustment over height; 4 - handle for load adjustment by the operator's weight

Additional seat - soft, unsprung, fastened on the rear wall of the Cab.

Location of Fuse and Relay Panel

Fuse Panel Fig. 68

6.6 Fuse and Relay Panel

Fuse and relay panel is located in box under passenger seat. Fig 55, Page 78.

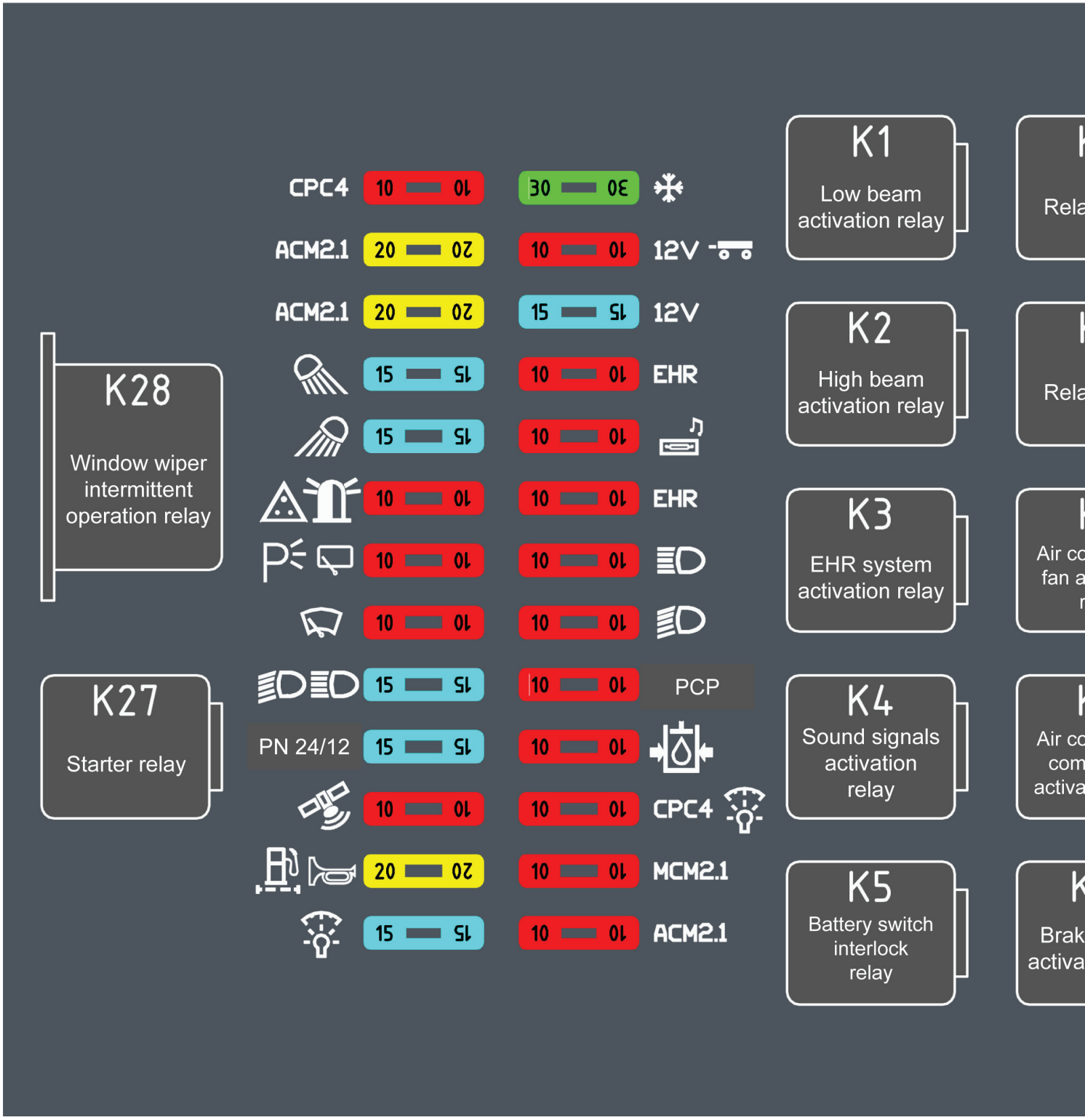
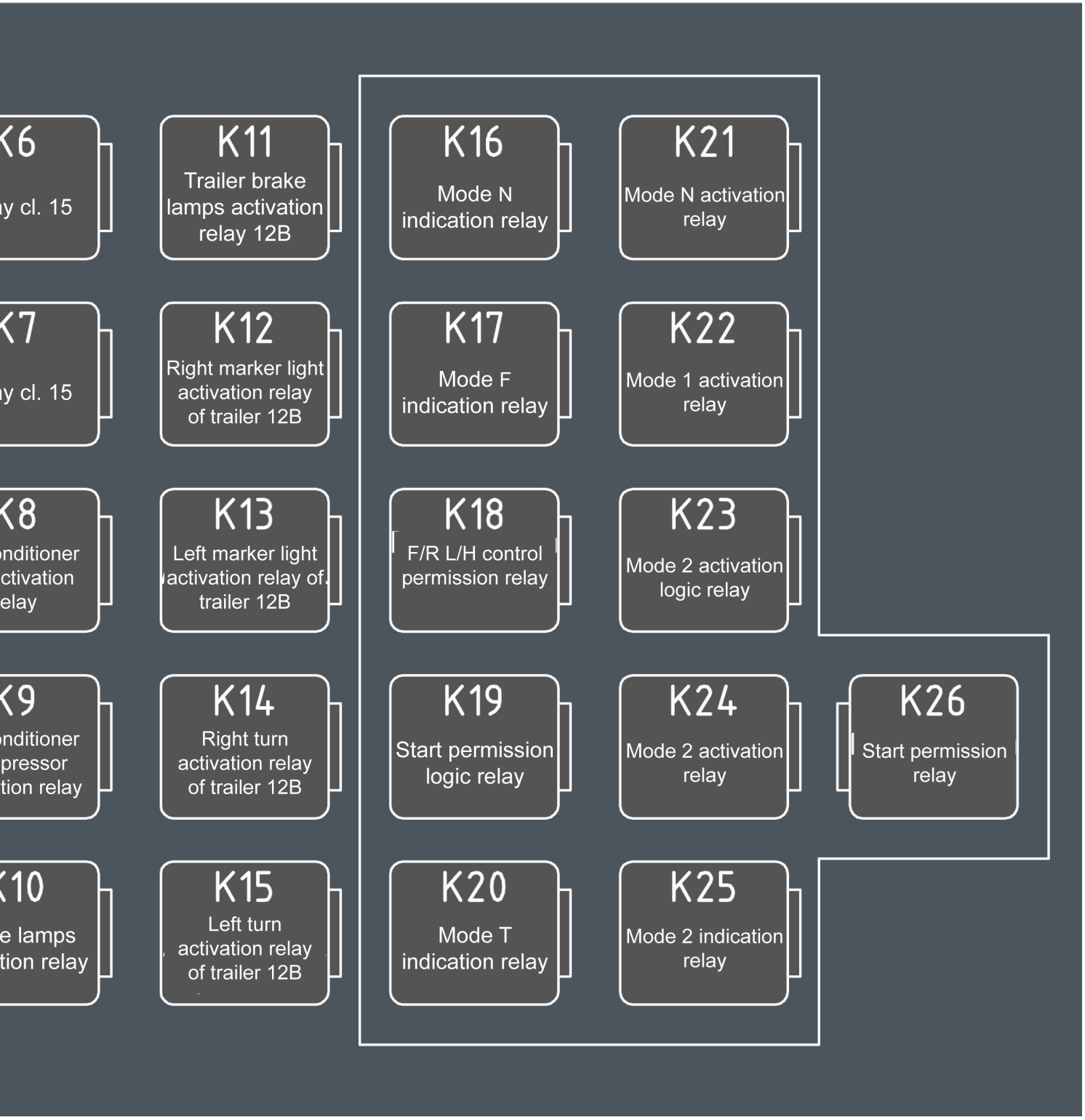


Fig. 69 Fuse panel of K-744

To access the fuses, with passenger seat in the upright position, open the panel box lid.



6.7 Lighting and Alarms

Four headlights are installed on the tractor for nighttime travel.

The following elements are installed for illumination of the work area:
- four rotary headlights on the front of the Cab;
- four rotary headlights on the back of the Cab.

In accordance with traffic safety requirements, the tractor is equipped with the following light signal devices:
- front lights with two sections: one with a colorless diffuser for designation of tractor end markers, the other one with orange diffuser for tractor turn signaling;
- rear lights with three sections: extreme outer sections - turn indicator (orange) and then - stop signal (ruby), end marker (red);
- Road-train" sign consisting of three lights with orange-colored diffusers installed on the Cab;
- license plate illumination light installed on the bracket above the left wing of the tractor.

On the supporting beam of the rear left wing, a plug socket is installed to connect electrical equipment of trailers.

A plug socket 12 V is installed under the Cab on the bottom right to connect the lighting fixture.

Two dome lights with a switch are installed at the ceiling of the Cab.

NOTE;

When traveling over roads, only front traffic headlights are used, which have low and high beam modes. In order to avoid blinding oncoming vehicles and vehicles moving behind, do not switch on the front and rear service headlights during transportation activities. When hooking up the tractor with trailer (semi-trailer), it is obligatory to switch on the "Road-train" sign.

6.8 Engine Preparation and Start-up

6.8.1 Before engine start-up;

Make sure that the levers of hydraulic distributor of the linkage hydraulic system are in the neutral position, the parking brake is engaged and the engine shutdown handle is pushed all the way in. Gear change lever and mode change lever should be in the "Neutral N" position. Set the manual fuel feed lever into the position corresponding to the minimum engine crankshaft speed.

6.8.2 Perform the engine start-up in the following sequence:

- if necessary, fill the engine system with fuel. To this end, pump out the system for 2...3 min by manual fuel boosting pump;
- turn on the ground switch .
- set GB mode to neutral position ('N' indicator will light up on the instrument panel)
- turn the key clockwise to position 2 see Fig 50, page 74

The tractor engine can be started when the instrument panel front board looks as follows and with following indicators displayed:

(2) - emergency pressure in the second pneumatic system circuit;

(1) - emergency pressure in the first pneumatic system circuit;

In all other cases, eliminate the fault as per indication of alarm parameters.

Fig. 70

6.8.3 After the start-up, warm up the engine to the cooling fluid temperature of 104-113ºF / 40-45ºC, first at the minimum speed and then at average speed of the crankshaft. Oil pressure in the mainline of the heated engine unit should be within the range of 0.45-0.6 MPa (4.5 -6 kgf/cm^2) at the rated speed and at least 0.1 MPa (1 kgf/cm^2) at the minimum speed.

At the same time, indicator lights (1), (2), , engine oil pressure indicator light will go out, the flashing light for the emergency parameter of one of the tractor systems will stop.

NOTE!

If the emergency parameter indicator light of one of the tractor systems keeps flashing permanently, one of the parameters must be checked:

- *oil pressure in the engine is below the standard value;*
- *pressure in air cylinders of both circuits is below the standard value;*
- *cooling fluid temperature is above the standard value;*
- *parking brake is pulled up.*

6.9 Engine Start-up at Negative Temperatures

Electrical torch (ET) of the tractor ensures start-up of the engine at the outdoor temperature down to -4ºF / - minus 20 °C.

Engine start-up at such outdoor temperatures should be performed in the following sequence:

1. Meet the requirements set forth in Item 4.10.1 of subsection 4.10.
2. Turn on the ground switch Fig. 13, page xx) .
3. Engine will be switched on automatically when the ignition key turned into the second position.
4. Meet the requirements set forth in item 4.10.3 of subsection 4.10.

6.9.1 Safety measures when using the heater

Pre-start heater control panel is located under the hood, to the left in the direction of tractor travel, behind the cooling unit.

Fig. 71

Only those persons that have thoroughly read the operation manual for the heater should be admitted to use it.

When using the heater, always remember that breaches of heater operation regulations or heater faults can be the cause of fire.

During operation of the heater the driver should permanently monitor the system operation. In case of a flame or smoke appearing at the gas inlet of the gas discharge pipe, it is necessary to immediately switch off the heater and proceed to fault elimination or adjustment after its shutdown.

IMPORTANT!

Do not warm up the engine by the heater in closed premises with poor ventilation in order to avoid poisoning of people by off gases.

Do not switch on the heater without cooling fluid.

Do not switch on the heater immediately after the shutdown or unsuccessful attempt to activate it without blowdown of the gas duct for at least 15-20 seconds.

The valve for feeding fuel to the heater will be open only for the time of heater operation. For the remaining time, the valve for feeding fuel to the heater must be closed.

6.9.2 Heater Operation

Preparation for operation

6.9.2.1 Check the availability and level of non-freezing fluid in the engine cooling system by short-term opening of the release valve on the boiler and on the heater pump set and the level in the expansion tank of the engine.

Before starting the heating boiler, check the availability of fuel in the boiler fuel tank. If necessary, refill diesel fuel to the tank according to GOST 305-82, wherefore do the following:

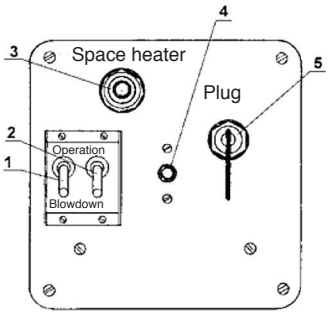
- open the hood and undo the cap of the tank filler port (the tank is located at the left-hand side on the fan housing);
- insert a funnel into the tank filler port and refill fuel into the tank (capacity of tank is 7 liters. For 30...40 minutes of boiler operation the fuel consumption is 3...4 l);
- take out the funnel and screw in the tank filler port cap.

In case when fuel drops get onto the outer surface of the tank, wipe the tank surface with a dry rag.

6.9.2.2 Open the valve for feeding fuel into the heater and pump out the heater fuel system with a manual engine fuel pump.

Activation of the heater

6.9.2.3 Blowdown the boiler gas duct - run the pump unit for 15-20 seconds by setting motor switch 1 (Fig. 77) into position OPERATION.



Heater panel board
1 - motor switch;
2 - solenoid valve switch;
3 - fuel electrical heater button;
4 - power circuit automatic shutdown button;
5 - spark plug switch.

Fig. 72

6.9.2.4 Press electrical heater button 3 and hold it in the ON state depending upon the ambient temperature according to Table 7.

Table 7

Ambient temperature	to -4ºF to minus 20°C	to To -22ºF to minus 30°C	to -40ºF to minus 40°C	to -76ºF to minus 60°C
Electrical heater running time, sec	20	30	60	90

6.9.2.5 Upon heating time expiry, set motor switch 2 and solenoid valve switch 2 into position OPERATION. At the same time, turn plug activation flag 5 clockwise and hold it (for 30 s max) until a typical hum appears in the boiler, indicating the ignition of fuel in the burner.

6.11.2.6 Unless the heater starts running in 20-30 seconds, set the electromagnetic valve switch into position BLOWDOWN and release the plug activator. Switch off the motor in 90-150 seconds. Then repeat the start-up. Unless as a result of two attempts the heater begins running steadily, it is necessary to determine and eliminate the fault, after which start the heater up.

Operation and shutdown of the heater

General design of PZhD-30 heater is given in Fig. 78 to 80.

6.9.2.7 The duration of heater operation for heating the engine to the condition ensuring the engine start-up depends upon the ambient temperature.

6.9.2.8 The heater should be switched off when the temperature in the engine cooling system (by the standard thermometer in the Cab) exceeds 90°C.

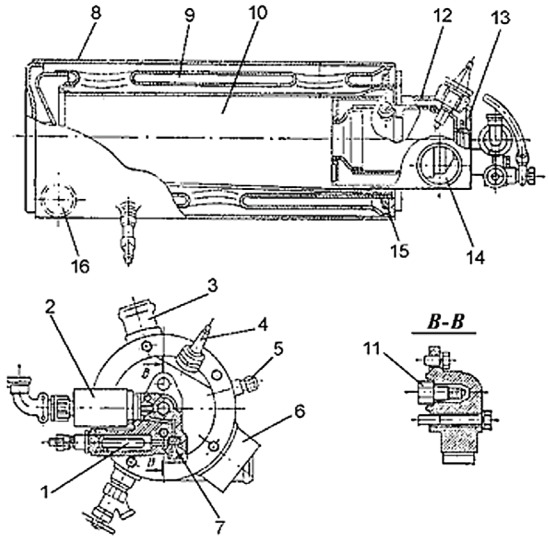
6.9.2.9 To shut down the heater it is necessary to set the solenoid valve switch into position BLOWDOWN and switch off the motor in 90-150 seconds later. Close the heater fuel valve.

Start the engine up after its heating in the same manner as at positive temperatures with the account of the features below.

At a negative ambient temperature the duration of continuous operation of the starter should not exceed 20 seconds. Perform start-up after disengagement of the gearbox, wherefore push the lever on the pump drive reducer all the way forward in the direction of tractor travel, set the manual fuel feed lever to the middle position. After warming up connect the gearbox to the engine, having preliminarily shut it off, set the manual fuel feed lever to the position corresponding to the minimum engine crankshaft speed.

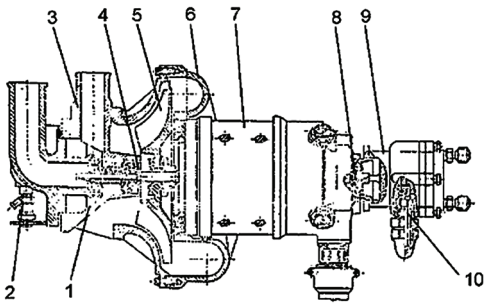
In case of unsuccessful start-up, pull out the engine shutdown handle and then retract it, after which repeat the start-up.

Heating Boiler



1 - fuel electrical heater;
2 - solenoid fuel valve;
3 - fluid outlets;
4 - spark plug;
5 - fuel inlet to the heater;
6 - gas outlet;
7 - fuel filter;
8 - boiler casing;
9 - gas cavities;
10 - gas cavities;
11 - nozzle;
12 - burner;
13 - air swirler;
14 - air inlet;
15 - fuel heater;
16 - fluid outlets;

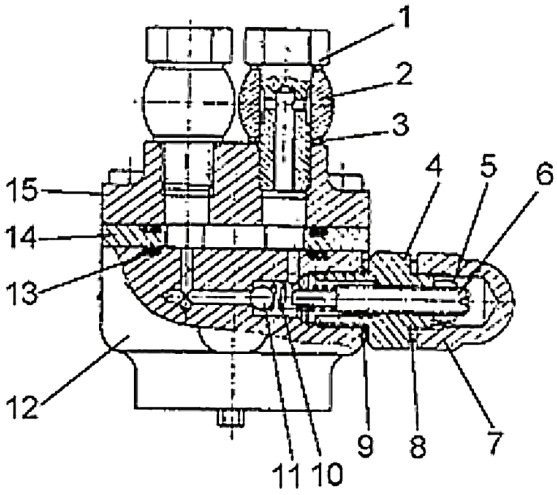
Fig. 73



Pump Unit
1 - fluid pump impeller;
2 - drain valve;
3 - fluid pump;
4 - collar;
5 - fan impeller;
6 - fan housing;
7 - motor;
8 - coupling;
9 - fuel pump;
10 - reducing valve.

Fig. 74

Fuel pump reducing valve



1 - fuel line bolt;
2 - rotating angle joint;
3, 8, 9, 13 - O-rings;
4 - union;
5, 7 - nuts;
6 - adjustment screw;
10 - spring;
11 - ball;
12 - fuel pump casing;
14 - spacer;
15 - fuel pump cover.

Fig. 75

6.10 Engine Start-up from External Power Supply

If the engine cannot be started from storage batteries due to their discharged state, it is permitted to start the engine from an external power supply of from storage battery of another tractor.

IMPORTANT

In case of engine start-up from storage battery of another tractor, it is necessary to strictly obey the following procedures:

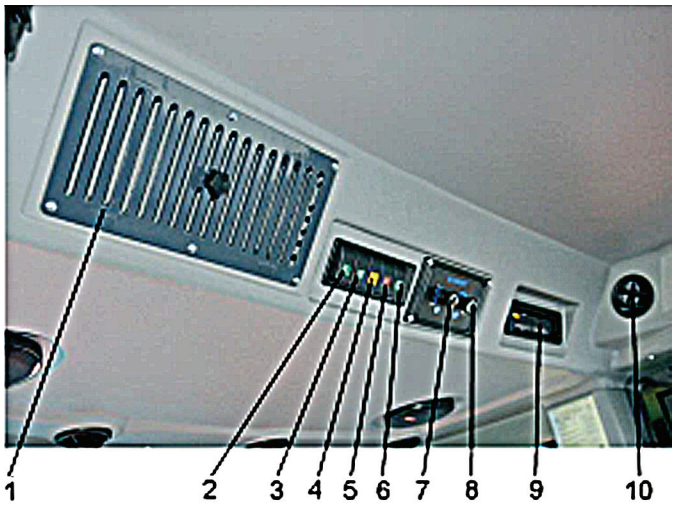
1. *Start the engine up with switched off battery master switch of the tractor, which engine is to be started from an external power supply. It is necessary to switch on the battery master switch immediately upon the start of a steady operation of the engine being started.*
2. *Engine of the tractor, which accumulator is used as an external power supply, is to be shut off.*

Failure to follow these procedures can lead to increased discharge of storage battery of the vehicle, from which the start-up is performed, or to a failure of its generator.

6.11 HVAC System Operation

The system can be operated in the mode of ventilation, heating and air conditioning.

Ventilation



To perform forced air supply to the Cab, switch the fan (handle 8) on to position 1, 2 or 3.

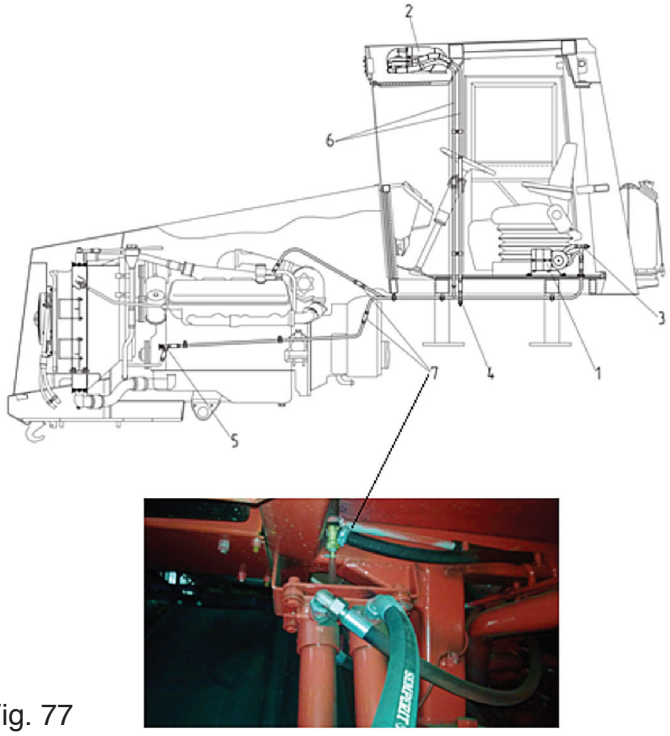
Fig. 76

Heating

Two heaters serve for Cab heating. Autonomous heater, pos. 1, Fig. 63 (below), is located to the left of the driver's seat. Heater fans can be activated by button 2, Fig. 50, Page 74.

Second heater, pos. 2, is located under the Cab roof with an evaporation-heating unit of the air conditioner. The hot fluid supply is performed by activation of the valves - one valve (pos. 3) located at the supply line to the heater, and the other valve (pos. 4) located under the left front pillar of the Cab.

Heating system



1 - heater;
2 - heater of the evaporation-heating unit;
3, 4, 5 - valve VS11;
6 - pipes;
7 - connecting hoses

Fig. 77

Air conditioning

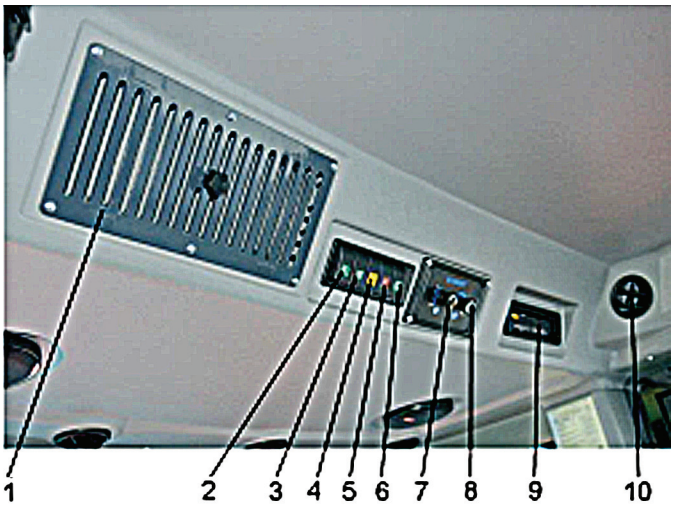


Fig. 78

Air conditioner can be activated by handles 8 (air supply rate) and 7 (air cooling degree). Fig. 64

In order to activate the upper heater, it is necessary to open the valve for coolant supply pos. 7, Fig. 63, Page 84 (under the left front pillar of the Cab). Adjust the heat flux by handle 8.

IMPORTANT!

In order to maintain a reliable operation of the air conditioning system, before its shutdown, the engine should operate at a minimum idle run speed for 3 - 5 minutes.

7 FINAL ASSEMBLY, ADJUSTING AND RUNNING-IN

7.1 General - PDI

When shipping from the plant, certain parts and assemblies are not installed on the tractor and stowed separately for convenience of transportation and better safe-keeping. Tractor preparation for operation consists of depreservation, installation of the assemblies and parts attached, execution of works relating to maintenance, start-up and running-in of the tractor.

Most dealers will have performed a PDI, but in case it wasn't done then before the beginning of operation of a new tractor execute the following operations:

- remove process plug from the adapter;

- install air intake pipe on the tractor;

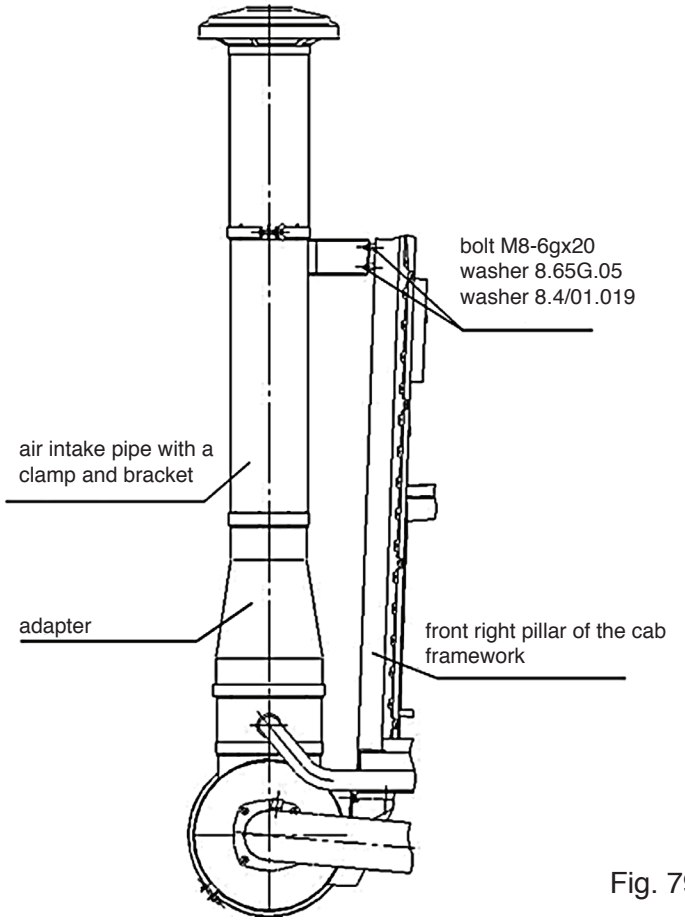


Fig. 79

Assembly

- install muffler on the tractor;

When installing muffler, screw in the nut, pos. 1, to the full contact between the parts, pos. 2, 3, 4, 5, after which screw in the nuts, pos. 1, for another 1...2 turns and lock them with nut B.

The tolerance for coaxiality of the exhaust pipe in respect of the muffler branch pipe is ØØ2 mm. Provide it by movement of the bracket, pos. 6, with nuts Д, perform locking with nuts E, after which tighten the bolts, pos. Ж.

Gas blow-by in the connection between exhaust pipe and muffler during the engine start-up and operation is not allowed.

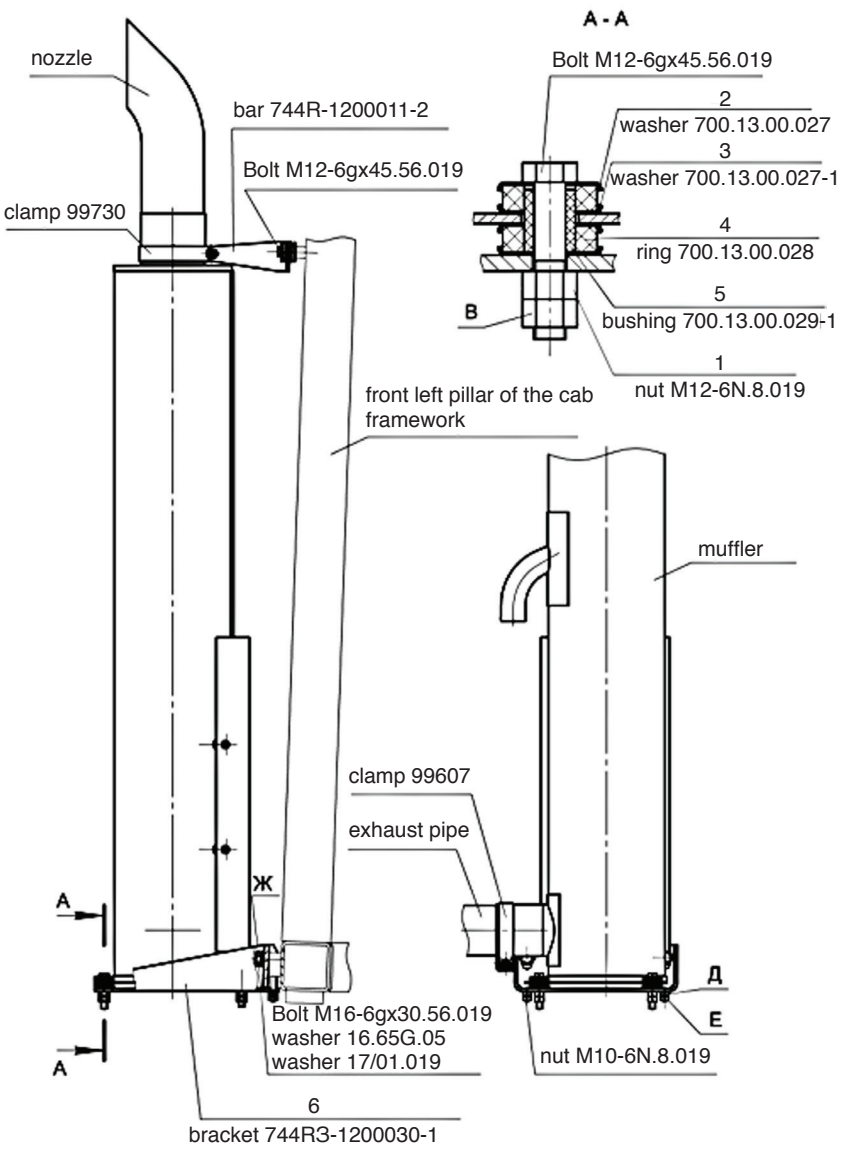
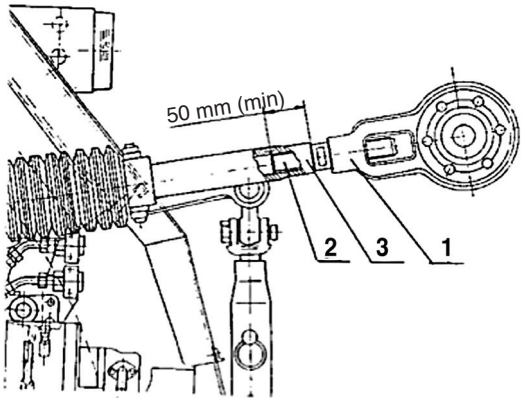


Fig. 80

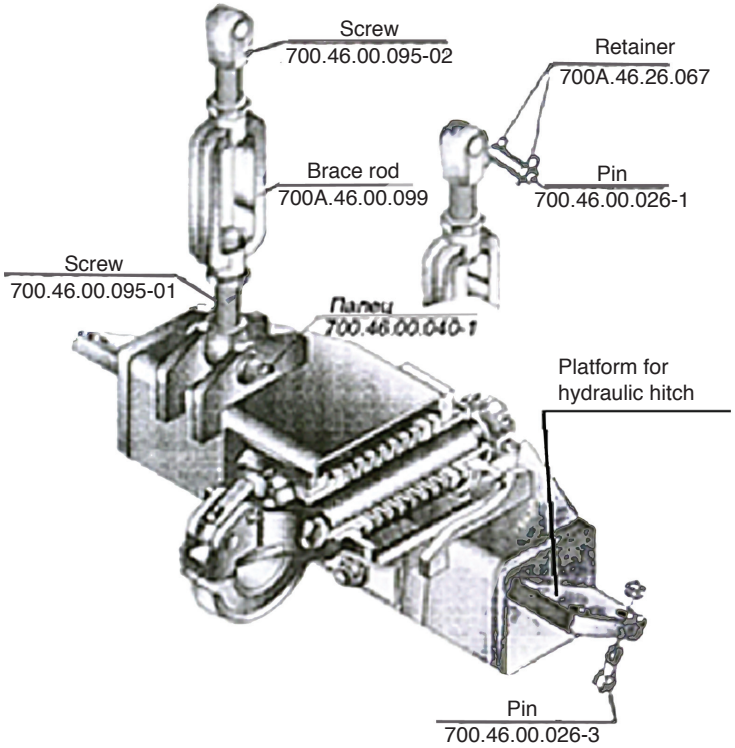
- in order to enhance reliability of leak-tightness over the “exhaust pipe - muffler” joint during installation of muffler on the tractor, it is necessary to apply a sealant layer on the exhaust pipe over the circumference (it is available in the tractor SPTA), using a solid roller with the thickness of 5...7 mm in 5...10 mm from the pipe end;
- install headlights, hinge pivot of central pull rod, mirrors, window wiper brushes, safety belts, muffler, nozzle and air intake pipe; warmth-keeper in winter season;
- connect the minus bar to the battery master switch terminal;
- remove shims from under the spring attachment;
- fill settled fuel to the tractor;
- disengage the rear axle. Engage the rear axle in case of tractor operation with agricultural implements or under heavy road conditions;
- adjust the traffic headlights (see subsection 5.1.3).

Before operation of the tractor it is necessary to bring the linkage to the operating position (Fig. 25, 26, 27) and reinstall the light signal equipment removed earlier.



Installation of the linkage center rod pivot
1 - pivot;
2 - tightening screw;
3 - center rod pipe

Fig. 81



Installation of hydraulic hitch

Fig. 82

Hydraulic hitch platforms should be installed below the bottom rod platforms.

Upon completion of preparatory works, perform maintenance when preparing the tractor for operating running-in.

7.1.1 Adjustment of Lower Rods

Lower linkage rods (Fig.27) are to be adjusted as follows:

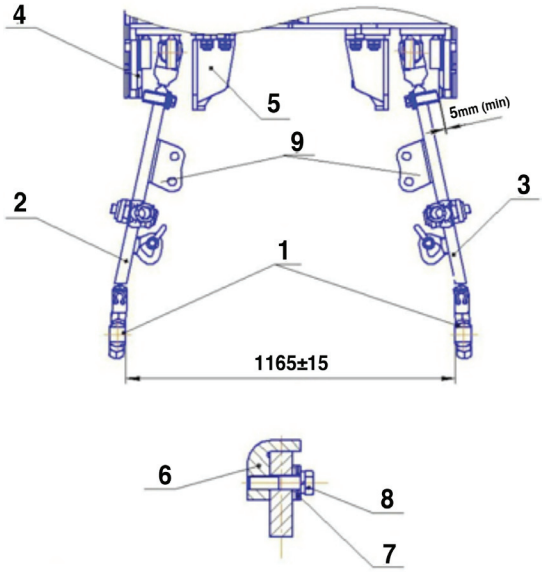


Fig. 83

Adjustment of lower linkage rods

1 - rear hinge pivots;
2 - lower rod - left;
3 - lower rod - right;
4 - external stop;
5 - internal stop;
6 - stop;
7 - washer;
8 - bolt;
9 - platforms for hydraulic hitch

- fix lower rods 2 and 3 with each other, providing the size of 1165±1.5 mm between lifting eyes of rear hinge pivots 1.
- lift the linkage, providing for the distance of 1180...1280 mm from the supporting surface to the lower rods; in doing so, the rods 2 and 3 should be located between out-er stop 4 and internal stop 5 (Fig. 27). Stops 744R3-46 28021-1, pos. 6, should be in-stalled at the side of outer stops.
- by means of moving washers 7 from under the head of bolt 8 under stop 6, if need-ed, provide for the lateral movement of lower rods of 5 mm max.

7.1.2 Installation of Light Signalling Equipment

IMPORTANT!

During final assembly of the tractor with regard to light signaling equipment, it is necessary to thoroughly ensure that electrical harnesses and wires do not touch sharp edges, moving parts of the tractor, and are not clamped against sharp edges during erection operations.

Perform installation of light signaling equipment with the battery master switch switched off. The front and rear service headlights should be mounted on the installation brackets at the upper part of the cabin, fore and aft, respectively.

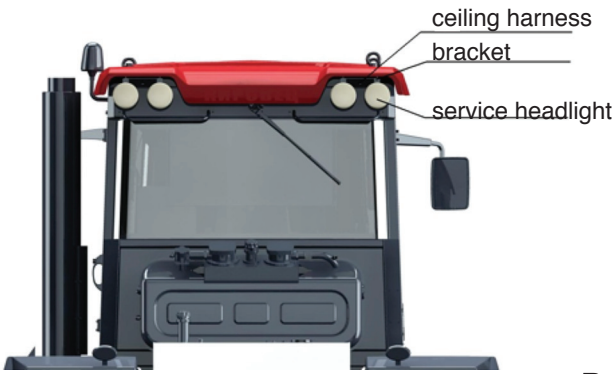
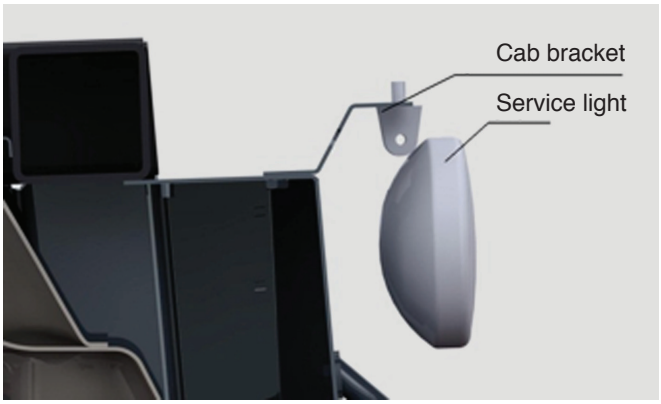


Fig. 84 **Rear service lights**



Installation and connection of service light

Fig. 85

Perform connection of the front and rear service headlights, front and rear lights, lateral turn repeaters and road-train sign as per the wiring diagram (see Appendix).

7.1.3 Adjustment of Headlights

Headlights (outer - low beam, internal - high beam) are built into the hood. Primary direction of the light beam is adjusted at the manufacturing plant as per GOST R 41.48-2004. However, when changing lights in the course of operation, the direction of light beams can change and require an additional adjustment of headlights.

In order to adjust the headlights light, put the tractor onto an even horizontal ground in 5 m from a screen (wall). Adjust the headlights in fairly dark conditions.

Mark the screen to adjust the position of headlight spots according to Fig.28. Align the position of vertical axis O on the screen (it should be in the longitudinal axis of the tractor symmetry). In accordance with recommendations set forth in GOST R 41.48-2004 (item 6.26.1.2), select the value of B=5” for 16’, B=125 mm for 5 m distance to the screen.

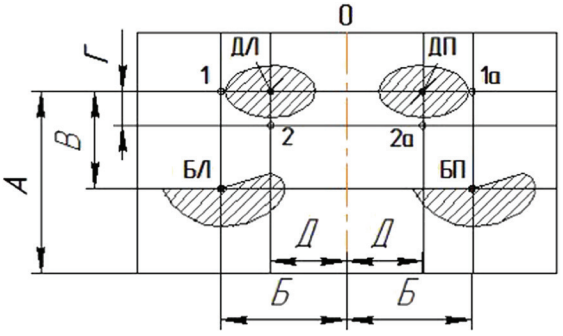


Diagram of screen marking for headlight adjustment

O is the vertical axis of symmetry;
1, 1a, 2, 2a are the projections of geometric centers of lights to the screen; BL, BP are the points combining the centers of the front and rear headlight spots; (A=4.33’ - 1320 mm; B=1.9’ - 570 mm; C=0.5’ - 125 mm; D=2” - 50; E=1.5’ - 450)

Fig. 86

Headlights must be adjusted using the head of TORX E5 wrench with the internal “star”. The layout of adjustment screws at left headlights is given in Fig.29 (view from inside the hood). Screws of the right headlights are arranged in the mirror image.

Layout of adjustment screws on left headlights (view from inside the hood).

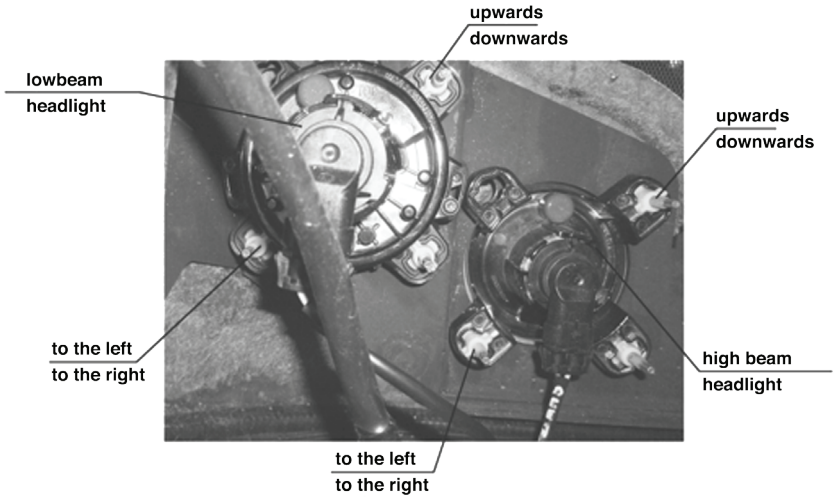


Fig. 87

To adjust the direction of the headlight beam it is necessary to lift the hood, put TORX E5 head onto the adjustment screw and turn it in the required direction.

For the left headlights, a turn of the upper headlights adjustment screw clockwise (counter-clockwise) leads to a turn of the light beam upwards (downwards) respectively, and a turn of the lower headlight adjustment screw clockwise (counter-clockwise) leads to a turn of the light beam to the left (to the right) respectively. Having lowered the hood, compare the result obtained to the required value. The adjustment is performed several times until a situation similar to the screen marking diagram is achieved.

The adjustment should be performed for each light separately; in doing so, a flare from other lights is prevented by installation of non-transparent screens or by disconnection of connectors from the respective lights.

The lights can be adjusted without opening the hood. To this end, it is necessary to take off the protective casing of the radiator and carry out the adjustment in accordance with the manual above.

7.2 Tractor Running-in

New tractor requires a running-in to make sure that friction parts are well run in to each other while being operated under low loads.

Perform the tractor running-in as per requirements set forth herein as well as in the Operation Manual for the engine.

Running-in when correctly performed is a prerequisite for a long-term operation of the tractor. Running-in is also required after a tractor overhaul.

Running-in should be performed within:
- the first 50 engine hours of operation for K-744R1St tractor;
- the first 30 engine hours of operation for tractors of the remaining models.

The tractor should be run in by hooking up with the trailer or agricultural machines and implements under modes preventing the possibility of engine overloads. Running-in mode can be changed by selecting the implement type; limiting the grip width, soil cultivation depth and unit speed.

In the course of tractor operation with mounted agricultural machines and implements, check the linkage hydraulic system, wherefore carry out several lifting and lowering operations for the implement at the average and maximum speed of the engine crankshaft.
During the running-in, see for engine operation, avoid its overload. To prevent the engine from smoking, do not admit a crankshaft speed drop, watch operation of the transmission units, hydraulic systems and electrical equipment; in addition, check for the leaks from under seals and pipelines, and for air inflow in the suction mainline.

The list and contents of maintenance operations in the course of preparation, conduction and after the completion of operation running-in are set forth in the corresponding subsections of the manual as well as in the service logbook.

8 OPERATION AND ADJUSTMENT REGULATIONS

8.1 Procedure for Tractor Work Preparation

When preparing the tractor for operation:

1) Prepare the tractor for operation only with the engine being shut down (except for special inspection operations) and the parking brake being pulled up; mounted agricultural implements should be lowered;

2) Check the tractor condition by external inspection, making sure there are no leaks of fuel, oil, coolant, electrolyte; if required, eliminate the leaks;

3) Check the level and, if necessary, refill oil into the engine lubrication system and hydraulic system, cooling fluid into the expansion tank to the level visible through the glass;

4) Check the engine condition by external inspection;

5) Before switching on the battery master switch, after not running the tractor (over 24h), especially in summer season, open the lid of the storage battery container for a period of not less than 5 min in order to remove the explosive hydrogen-air mixture; the storage batteries should be reliably fixed and closed with a lid;

6) Fill fuel into the tractor. Before filling, the fuel should be settled for 10 days (at least). Necks of the tanks and other reservoirs should be completely closed and the vents should be protected against any ingress of dust therein. The intake hose should be at a height excluding suction of mechanical impurities and water. Grades of the fuel being used are given in Appendix 6 “Filling reservoirs”. Before every filling, drain the fuel sludge from the fuel tank. When filling oil manually, use the filter;

7) Check the engine operation by ear and according to the readings of instruments; the heated engine should operate steadily, without foreign rattle and noise;

8) Check the operation of tractor control mechanisms, operation of the braking system, lighting and signaling, of the hydraulic system for control over turns and linkage. To this end:

   a) pedals, handles and levers should operate without jamming, pedals should freely return to the initial position under the action of springs, levers will provide reliable fixing against spontaneous engagement and disengagement;

   b) make sure of reliable and simultaneous action of brakes during tractor motion. Service brakes should ensure full stop of the tractor on dry hard pavement providing good adhesion of wheels with the road;

   c) perform 2-3 full turns of the tractor on the spot on a concrete or asphalt ground. Turns should be made smoothly, without jerks, vibrations, oscillations;

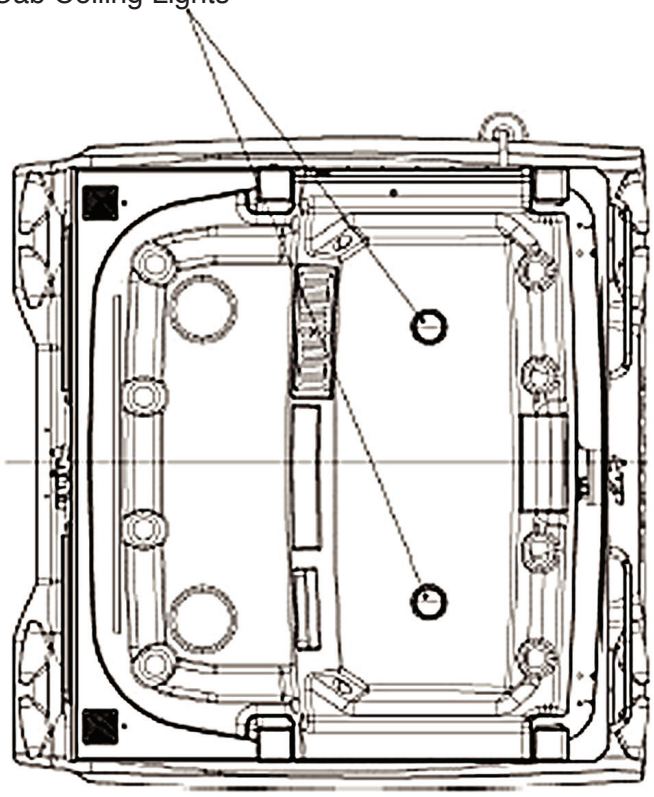
   d) perform 1-2 lifting and lowering operations of the linkage; in doing so, the handle of hydraulic distributor should be fixed in the LIFTING and FORCED LOWERING positions and automatically return to NEUTRAL position, and from FLOATING position - return to NEUTRAL position after manual release from the locking. Perform checking at the rated speed of the engine crankshaft. No fixing of the handle in FORCED LOWERING position is allowed in case the linkage is not loaded;

   e) push the ground toggle switch Fig 50 Page 74..

   f) if necessary, on the basis of your own convenience, make adjustments of the position of mode change levers 2, Fig. 38, Page 58 and rear axle engagement lever 4, Fig. 36 Page 57.

Switch on the corresponding switches for illumination of the instrument panel, internal lighting of the Cab, outer lights. When turned on, the lights of corresponding instruments should light up.

Cab Ceiling Lights



When ceiling lights are turned to the right the light comes on, to the left - the light goes off

Fig. 88

Activation of the turn signal handle “right” - “left”; at the same time, the instrument panel light should flash in correspondence with the signal light..

Press the brake pedal; in doing so, the rear lights should illuminate bright red. Check that the air pressure in the pneumatic system is not below 0.45 MPa (4.5 kgfc/cm^2).

Pull up the parking brake; in doing so, signal light (Ⓟ) on the instrument panel should flash.

Having switched on the “frame” and turned the starter and instruments switch to position “I”, counter of tractor lifetime hours on the instrument panel should show a digital value.

After the engine start, battery charging indicator should go out on the instrument panel.

Tractor condition menu represents the current voltage value in the battery circuit, it should be 27±0.7 V;

9) adjust the driver’s seat depending upon weight and height;

10) set the required air pressure in tires.

SELECTION OF THE BEST POSSIBLE INTERNAL PRESSURE IN TIRES, DEPENDING UPON OPERATION CONDITIONS AND LOAD ON TRACTOR AXLES

Selection of the best possible pressure in the tires of wheel tractors and degree of its influence on the road depend on the type of soil and the load acting on tractor axles. Air pressure in the tires impacts the support spot of wheel contact with the soil and, depending on soil conditions, influences its road properties and tractor productivity in operation. Tire load standards for selection of operation mode with various internal pressures and speeds should be set by the tire manufacturer and given in Table 8, Page 119.

Pressure value depends on the speed and loads on tractor axles, created by the weight of hooked-up

machines with regard to own operation weight of the tractor and ballast, and to operation conditions.

Internal pressure in tires for each specific tractor hook-up case is different. That is why, when tractor operation conditions are changed, it is required to check and, if needed, adjust the pressure in tires. Non-observance of the pressure standards significantly reduces the tire operation period.

It is possible to select the tire pressure and to determine the need for ballasting, weight and type of ballast only after determining the value of loads on tractor axles. The exact value of load on front or rear tractor wheels in a specific case of tractor usage can be determined only by the way of actual weighing of the tractor with the hooked-up machine.

When selecting the standards for operating modes of the tire, follow the data given in Tables 8 and 9.

Best possible tire pressure should be determined by tractor weighing using the following method:

– determine the weight on the front axle with operating equipment lowered;
– determine the weight on the rear axle with operating equipment lifted;

Set the tire pressure as per measured weight. When operation conditions are changed, tire pressure and ballasting may need an adjustment'.

IMPORTANT!

Set tire pressure, taking into consideration, the loads and speeds that are in effect for work the being performed

Keep the records for each tire separately. To this end, a "Tire operation registration card" is to be established (Appendix 8), which is the main document characterizing the tire operation in case of reclamation, write-off to scrap as well as in other cases. The internal pressure in tires should be registered in the "Logbook for registration of measurements of the internal air pressure in tires" (Appendix 7).

Pressure is measured at least once in every five days before tractor traveling for work execution. The results should be registered in the logbook.

Check the tire pressure using serviceable instruments with division value of 10 kPa max, which would provide for credibility of measurements. Acceptable maximum pressure deviations in tires are ± 10 kPA by readings of the pressure gauge that must be systematically checked for the reading accuracy. Air pressure in tires should be controlled in cold state.

Mounted controls add a lot of load on the rear axle that is why take this additional weight into account when selecting the tire pressure. For the tractors with heavy mounted implements, it is required to reduce the rear tire pressure to assume an additional load during transport movement.

Procedures For Pneumatic Tire Operation

Traveling speed of the tractor with mounted implements should not exceed 15 km/h in motion over an even road and 10 km/h in motion over a bumpy road or off-road.

When the tractor is moving with a tire pressure below 0.17 MPa, the speed should not exceed 20 km/h.

To prevent an untimely failure of tires, observe the following procedures:

– do not permit tractor operation with significant wheel slip;
– do not permit tractor operation and parking on damaged and blown-out tires;
– do not permit travelling on tires with decreased internal pressure even for small distances as it leads to tire failures;
– in order to avoid increased wear of tires, operate the tractor on roads with hard pavement for 30% of the total period of operation max;
– protect tires from the ingress of fuel. oil and other oil products thereon;

– do not admit tractor operation with internal tire pressure not corresponding to the prescribed standard for specific case of its use;

– adjust the tire pressure value when tractor operation conditions are changed, since pressure change impacts the tractor operation properties and efficiency.

IMPORTANT!

When working with significant traction forces, a slippage against tractor sides may be observed. It can be remedied by increasing pressure in the tires, however the traction force reduces with that.

Standards for loads on single tire to select operational modes of work with various internal pressures

Table 8

Tire Manufacturer	Load on a single tire, kg, with internal pressure, MPa, At the speed designated by the symbol										
	0.06	0.08	0.1	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.19*
710/70R38 169A8											
Voltair-Prom		3400	3800	-	4300	-	4800	-	5300	-	-
	3715	4230	4715	-	5170	-	5510	-	5800	-	-
800/65R32 167A8											
Voltair-Prom	-	3650	4160	-	4660	-	5076	-	5450	-	-
Altaisky	-	3650	4136	-	4660	-	5075	-	5450	-	-
* - internal pressure in tire, corresponding to the maximum permissible load for transport works on roads with improved pavement											

Standards for air pressure in tries at the actual load and speed

Table 9

Load on the axle, kg	Speed, mph - km/h	Tire Pressure, MPa	
		710/70R38 169A8	800/65R32 187A8
6500	0 V ≤6 - 0 V ≤10	0,6*	0,10*
	6 < V≤12 - 10 < V≤20	0,8	0,10
	12 <V≤25 - 20 <V≤40	0,8	0,10
7500	0 V ≤6 - 0 V ≤10	0,6*	0,10*
	6 < V≤12 - 10 < V≤20	0,8	0,10
	12 <V≤25 - 20 <V≤40	0,10	0,10
8500	0 V ≤6 - 0 V ≤10	0,6*	0,10*
	6 < V≤12 - 10 < V≤20	0,10	0,10
	12 <V≤25 - 20 <V≤40	0,12	0,12
9000	0 V ≤6 - 0 V ≤10	0,8*	0,10*
	6 < V≤12 - 10 < V≤20	0,10	0,10
	12 <V≤25 - 20 <V≤40	0,14	0,12
10000	0 V ≤6 - 0 V ≤10	0,8*	0,10*
	6 < V≤12 - 10 < V≤20	1,12	0,11
	12 <V≤25 - 20 <V≤40	1,16	0,15
10500	0 V ≤6 - 0 V ≤10	0,10*	0,10*
	6 < V≤12 - 10 < V≤20	1,12	0,12
	12 <V≤25 - 20 <V≤40	1,16	0,16
Attention! Values marked by the symbol "*" will be applied only in cases when tires are not continuously operated at high torques. Use the values given in table 8 for field operations and other continuous operation conditions at high torques!			

8.2 Operation procedures and control over tractor during operation

When working with the tractor:

Check the readings of instruments and signal devices. Readings of instruments and signals of indicator lights should correspond to the directives set forth in the “Controls” section. When working, make sure the emergency lights on the instrument panel are off;

Keep the Cab clean; no presence of foreign matters should be in the Cab;

All tractor control levers should allow fixing in the corresponding positions;

In case of accident or excessive increase of the engine crankshaft speed, immediately stop the fuel feed by switching off the ignition;

Do not allow engine operation under load at the cooling fluid temperature below 158ºF / 70ºC;

In case of the engine oil and cooling fluid temperature rising above the permissible value, stop the tractor and set the minimum engine crankshaft speed; continue traveling when the normal values are achieved;

In order to avoid the overheating of cooling fluid, it is necessary to make sure there is no clogging of the water radiator plates. To this end, when working in dusty conditions, it is necessary to perform radiator blowdown every shift with compressed air under the pressure of 5...7 kgf/cm^2 during every shift or (in case of contamination not removable by purging) rinse the radiator core with water under 5…7 kg/cm^2 pressure as per cl. 7.5.4.

Brakes should be in good working order. When braking the tractor, traveling over dry and hard ground, use the service brake, the braking distance should not exceed 13 m at the speed of 8.33 m/s (30 km/h) and 6.5 m at the speed of 20.2 km/h. The brake pedal being fully depressed should not bump up against the Cab floor;

Do not to drive the tractor under facilities with the driving clearance height below 4 metres;

When turning, select the speed providing for a safe traffic. Do not to enter tight turns at a gear exceeding the first gear of the fourth mode;

In the course of tractor traveling with the pressure in tires below 170 kPa (1.7 kgf/cm^2), the speed should not exceed 5.56 m/s (20 km/h);

Do not use parking brake when moving.

Do not tow the tractor by suspension unit.

While moving downhill, do not use coasting;

See for the absence of leaks of cooling fluid, oil, fuel, electrolyte; in case of a leak being detected, eliminate it;

Regularly clean the tractor from dust and dirt, check the tractor configuration, reliability of all outer fasteners;
Never connect uncleaned pipelines and hydraulic cylinders of agricultural machines and implements to the hydraulic system;

Check the oil level in GB after engagement of the PTO shaft, if necessary, refill it.

Carry out the following procedures of operation for pneumatic tires:

a) do not permit tractor operation with significant wheel slip;

b) do not permit tractor operation and parking with damaged and blown-out tires;

c) do not permit travelling on tires with decreased internal pressure even for small distances as it leads to tire failures;

d) in order to avoid increased wear of tires, operate the tractor on roads with hard pavement for 30% of the total operation period max;

In case of execution of hauling operations, set the fuel supply lever into the position of minimum fuel feed;

Strictly obey the instructions set forth in the “Safety requirements” section.

IMPORTANT!

In order to prevent untimely failure of the rear axle cardan gear and to reduce the wear of tires, it is necessary to engage the rear axle only in case of tractor operation with agricultural implements and during travel in heavy road conditions.

When moving in good road conditions (on roads with compact ground or with pavement), the rear axle should be disengaged.

8.3 Installation and Dismantling of Wheels with Tires

Tries should be operated and stored in accordance with the tire operation instructions for tractors and agricultural machines.

Mount only serviceable tries, inner tubes and rims corresponding by size and type.

Fig. 89

Tries should be clean, dry. Before installation, pour talc into tries and inner tubes Installation and dismantling of tractor wheels will be carried out by two workers using one tire iron each.

The first tire iron is a lever, one end of which is fork-shaped and serves only for removing the tire shoulders from the rim shelves and the other end serves for tire installation. One end of the second tire iron is bent, ensuring reliable grip by the rim lip as well as removal of tire shoulders from the rim shelves paired with the fork end of the first tire iron, the other end is a box wrench for the locking screw of hydraulic jack.

When mounting a tire, make sure that the direction of wheel rotation in the course of wheel installation on the tractor coincides with the arrow on the tire surface. Installation, dismantling and insertion of tire shoulders are possible only when the diametrically opposite part of the tire is flush-mounted into the rim groove in respect of the shoulder to be inserted. Application of soap solution onto the tire shoulders during installation and dismantling operations considerably facilitates the installation and dismantling and extends the tire lifetime.

Operation

Instal the tire on the rim in the following sequence:

	put the tire onto an even ground and fit the rim thereon with the lip located closer to the groove facing downwards, so as to have a part of the tire shoulder entering the rim groove;
	insert the first tire iron between the upper shoulder of the tire and the rim to make the bent end reliably grip the tire shoulder and, using it as a lever, introduce the tire shoulder being mounted behind the rim lip. Repeat this operation several times until the introduction of the shoulder being mounted stops causing difficulties;
	in order to facilitate further mounting, use the second tire iron. Insert it between the tire shoulder and the rim and press out the rim upwards, insert the other tire iron closer to the tire shoulder introduced and repeat the previous operation. In a continuous circular motion, repeat this operation several times until the rim lip gets into the tire cavity;
	introduce the last rim segment into the tire by smoothly pressing both tire irons simultaneously;
	put the tire inclined against the wall, press out the rim towards the wall to make the tire cavity completely free and bring the inner tube into the tire cavity having taken the tube at the valve side;

	insert the valve into the valve hole and fix it with a nut; in doing so, see for the correct position of the valve, do not admit its warping; Put the inner tube fully on the rim, pull the rim and inflate the tube in order to avoid the possibility of its jamming between the tire shoulders and the rim;
	put the tire on the floor. At the opposite side of the valve, insert both tire irons in 250-300 mm from each other in a way ensuring their reliable grip on rim lip and introduce the tire shoulder behind the rim lip by pressing the tire irons down;
	holding one tire iron in such position, take out the second tire iron and insert it in 50-100 mm from the first one so that it will grip the lip and introduce the tire shoulder behind the rim lip by pressing the tire iron down. The mounting will be much easier if you press the tire by foot at the same time. In order to facilitate the process of introduction of the tire upper shoulder, sink in by feet into the rim groove the tire part being opposite to the shoulder introduced;
	the installation should be finished by two tire irons at the valve;

Inflate the tire to the normal pressure, then fully release air from the tire, inflate it again to the pressure of 0.28 MPa (2.8 kgf/cm^2), keep this pressure until the tire shoulders seat on the rim shelves; then release air until the recommended pressure in the tire gets established. Inflate the tires within a protective fencing (area).

Dismantle the tire from the rim in the following sequence:

	fully release air from the tire;
	take off the tire shoulders from both conic rim shelves by means of the fork end of the first tire iron and the bent end of the second one. Take off the shoulders from the shelf being opposite to the valve hole first, in the following sequence:
	insert the bent end of the second tire iron between the shoulder lip of the rim and the tire and press out the tire shoulder down-wards;

	insert the fork end of the first tire iron into the gap appeared be-tween the shoulder lip of the rim and the tire to have the bent end of the second tire iron in the groove of the fork-shaped tire iron;
	press out the tire shoulder downwards with the first tire iron. Repeat the operations set forth in Items 1, 2, 3 over the whole rim circumference until a complete removal of the tire shoulders from the seat shelves;
	insert the tire irons at both sides of the valve hole at the distance of 100 mm and extract a part of the tire shoulder by the rim lip, pushing the opposite shoulder of the tire by feet into the installation groove of the rim;
	step aside from the part of tire shoulder extracted over the circumference for a distance where it is possible to introduce the bent end of the second tire iron between the rim lip and the tire shoulder without difficulties, and again extract the tire shoulder by the rim lip;
	repeating the operation as per Item 5, take off the upper shoulder of the tire;
	put the tire inclined against the wall and extract the inner tube;
	lift the rim upwards to be able to insert both tire irons between the tire shoulder and the rim with 200-250 mm between the tire irons, press out the rim upwards, first by one tire iron, then by the other one, get the second tire iron free, leaving the rim in the pressed-out state;
	insert the bent end of the second tire iron into the gap between the shelf and the tire shoulder in 150-200 mm from the first blade and extract the rim from the tire, gripping the shoulder lip of the rim. Repeat this operation several times until the rim completely leaves the tire.

CAUTION!

When removing and mounting the wheels, in order to avoid injury, install the temporary pins located on the driving axle pinion cage in the vertical plane. Before removal of dual wheels from the hub (or one of them) release air from both wheels.

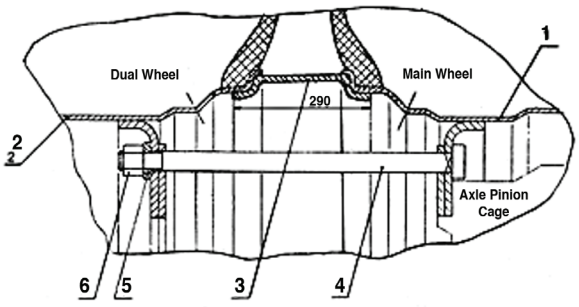
Installation of Dual wheels on tractors

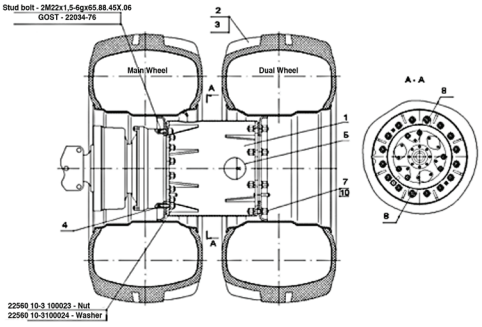
To ensure tractor operation on soils with increased moisture content (early spring, etc.), installation of dual wheels on tractors is provided for with parts for their installation in order to reduce specific pressure on the soil and improve the tractor's passing ability.

The kit includes the following:

4-disk wheel assembly (2 left and 2 right wheels), 4 spacing collars, 32 special bolts, 32 nuts, 32 washers;

4-disk wheel assembly (2 left and 2 right wheels), 4 spacers, 56 stud bolts, 32 nuts, 32 washers.

<table>
<tr><td colspan="3">MTZ-Kirovets K744</td></tr>
<tr><td colspan="3">Installation of the wheel set</td></tr>
<tr><td colspan="2"></td><td>“ridged” parking mechanism</td></tr>
<tr><td>1</td><td> 

Installation of Dual wheel
1-main wheel, 2-dual wheel, 3-distance ring, 4-special bolt, 5-washer, 6-nut</td><td> 

Installation of Dual wheel
1-spacer, 2-right wheel, 2-left wheel, 4-stud bolt, 7-washer, 10-nut</td></tr>
<tr><td>2</td><td>Hang main wheel 1 of the tractor above the ground.</td><td>Tractor operation with installed kit for wheel pairing at haulage range gears is not recommended.</td></tr>
<tr><td>3</td><td>Install distance ring 3 into the main tractor wheel having ensured its uniform seating over the entire diameter.</td><td>Before spacer installation it is required to replace fourteen standard stud bolts (2M22x1,5-6gx65.88.45X.06 GOST 22034-76) at each pinion cage of both axles with stud bolts 4. At the same time, two stud bolts remaining at the axle pinion cage must be located in opposition to each other, as shown in Section A-A. Stud bolts 4 should be installed on thread locker. Tightening torque for stud bolts 4 is 200 N·m (20 kgf·m).</td></tr>
<tr><td>4</td><td>Install dual wheel 2 on distance ring 3 so as to have grooves in the dual wheel disk in opposition to grooves of the main wheel disc.</td><td>Hang main wheel of the tractor above the ground</td></tr>
</table>

5	Introduce the head of special bolt 4 through disc recesses of (dual and main) wheels, turn it by 90°° around the axis, and engage it with the square bolt head and recess of the main wheel disc.	Install spacer 1 on the main tractor wheel, providing the alignment of the inner tube valve with hole Б in the spacer. Tightening torque of the nuts for spacer fastening to the main wheel (nut 2256010-3100023) is 350 N·m (35 kgf·m), the tightening should be performed crosswise.
6	Install washers 5 and pull up the dual wheel to the main one using nuts 6	Install dual wheel 2 or 3 on spacer 1, meeting the following requirements: - inner tube valve should coincide with hole Б in spacer 4; - direction of dual wheel tread pattern should be the same as one of the main wheel.
7	Nut tightening should be performed crosswise, using standard wrench with tightening torque of 14...20 kgf·m	Install washers 7 and tighten nuts 10 for dual wheel attachment to the spacer. Tightening torque of the nuts is 10 - 600 N·m (60 kgf·m), the tightening should be performed crosswise.
Running-in and maintenance		
1	Set air pressure in tires: - in main tires - 1.1 kgf/cm^2; - in dual tires - 0.8 kgf/cm^2.	Set air pressure in tires: - for main tires - (0.1±0.01) MPa [(1.1±0.1)] kgf/cm^2; - for dual tires - (0.078±0.01) MPa [(0.8±0.1)] kgf/cm^2.
2	Perform an 8-hour running-in of the tractor on dual wheels with tightening of dual wheel fasteners every 2 hours.	Tractor with installed wheel pairing kit should be run in for at least two hours without load, then the tightening torque of main and dual wheel nuts should be checked.
3	During shift maintenance (no more than in 10 engine hours of tractor	During shift maintenance (no more than in 10 engine hours of tractor operation), check the tightening torque of main and dual wheel nuts. Tractor main wheels should be tightened at the first maintenance (M-1, once in every 125 engine hours).
4	Tractor main wheels should be tightened at the first maintenance (M-1, once in every 125 engine hours).	

Tire operation record-keeping

Keep the records for each tire separately. To this end, a “Tire operation record card” is to be established, which is the main document characterizing the tire operation in case of a reclamation as well as in other cases. The internal pressure in tires should be registered in the “Logbook for registration of measurements of the internal air pressure in tries” The results should be recorded in the logbook as per tire operation procedures for tractors.

8.4 Connecting Agricultural Machines, Implements and Vehicles to the Hydraulic System

The connection is ensured by means of eight hydraulic quick-lock cutoff couplings (Fig.30) installed on the rear semi-frame of the tractor and connected to four service sections of hydraulic distributor.

Connect the hydraulic system with no pressure in hoses only.

Connection of the hydraulic system of the tractor and agricultural implement shall be per-formed in the following sequence:

- Before the connection, set hydraulic distributor levers into position FLOATING.
- Pull hose 9 all the way in; by doing so, balls 7 will settle opposite the groove of closing sleeve 3;
- Install valve 5 all the way in clutch 1;
- Release hose 9; clutch 1 under the action of spring 8 will return into the initial position;
- Make sure of reliability of valve 5 attachment in housing 1.

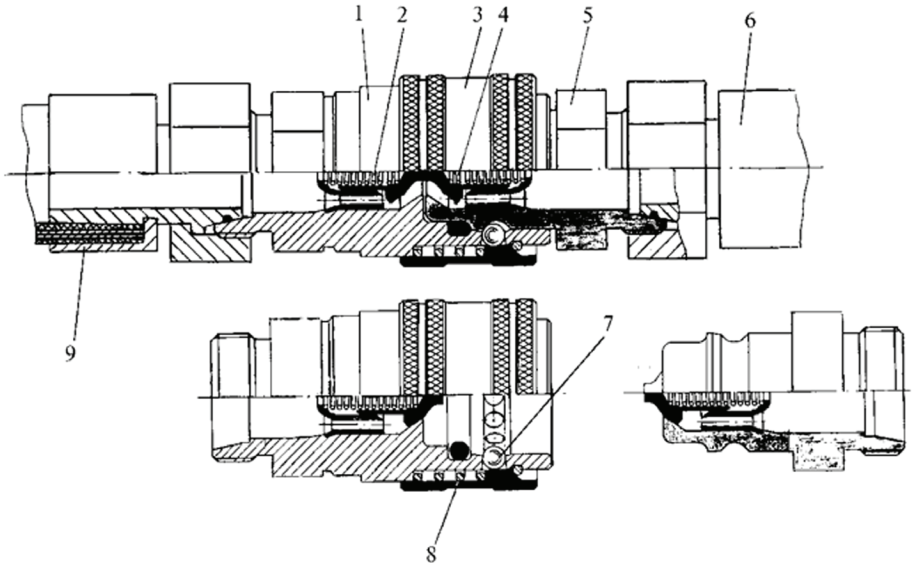


Fig. 90

Diagram of operation of quick-lock cutoff devices
1 – couplings, 2, 4, 8 – springs; 3 – closing sleeve; 5 – valve;
6, 9 – hoses; 7 – balls

8.5 Connecting Agricultural Machines, Implements and Vehicles to Tractor with Drawbars.

The following elements are provided for to connect the tractor with agricultural machines, implements and vehicles (see Table 1, page 39): mounted 3-point device, hitch iron, hydraulic hook.

Linkage provides for connection to mounted agricultural machines and implements having three connecting elements, as well as coupling with the central pull rod and lower links with Walterscheid connection; to semi-mounted implements having two connecting elements, as well as coupling with lower links with Walterscheid connection. The connection shall be implemented as follows:

a) install globe joints on the axles of trailing agricultural machines or implements;

b) set the agricultural machine or implement in the operating position on even ground and smoothly approach in reverse so as to have the trailing device of lower links be-low the globe joints;

c) lift lower links 7 (Fig. 31) by means of hydraulic cylinders until the locks actuate;

d) using vertical strut 6, adjust the difference over the height of trailing implement axles;

e) disconnect central pull rod 1 from bracket 3, connect it to the pillar on the frame of agricultural machine (implement) and fix it with axle-pins.

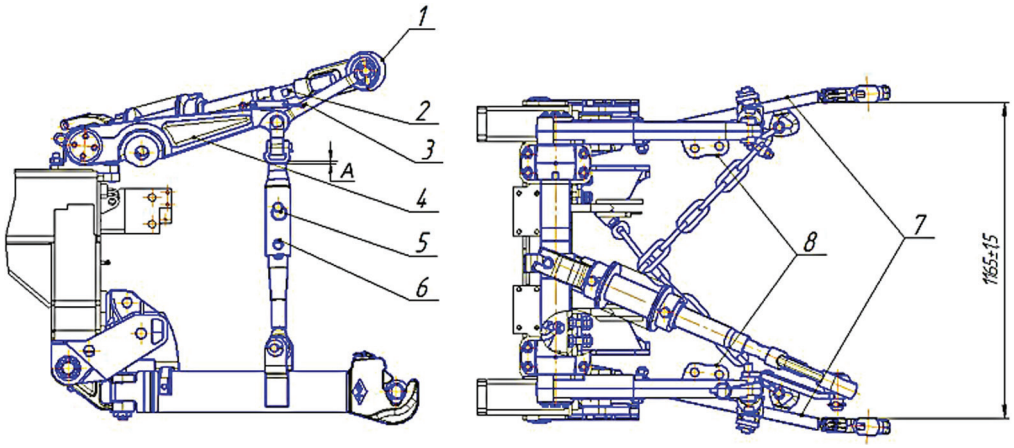


Fig. 91

Linkage

1 – central pull rod; 2 – tightening screw; 3 – bracket; 4 – main lever; 5 – pin; 6 – vertical brace strut; 7 – lower links; 8 – platform for hydraulic hook

Having connected a mounted agricultural machine (implement) to the tractor at three points, or a semi-mounted one at two points, perform preliminary installation of its frame into the horizontal position. Perform installation by changing the length of vertical brace struts and central pull rod.

When connecting mounted or semi-mounted agricultural machines and implements, the length of vertical strut 6 (Fig. 94) shall be minimum to ensure the maximum traffic clearance.

NOTE!

Perform connection of the lower link and the central pull rod to coupling elements of agricultural machine (implement) with the tractor parking brake being pulled up.

When disconnecting a machine or implement from tractor linkage mechanisms, disconnect the central pull rod and fix it, then disconnect the lower links.

Linkage is adapted for hooking up with implements with the following categories of coupling:

– NU-4 (cat. 4 ISO 730) – main;

– NU-3 (cat. 3 ISO 730) – additional;

– Kirovets – additional.

The parameters of coupling dimensions of the linkage categories are given in Fig. 95 and in table 10.

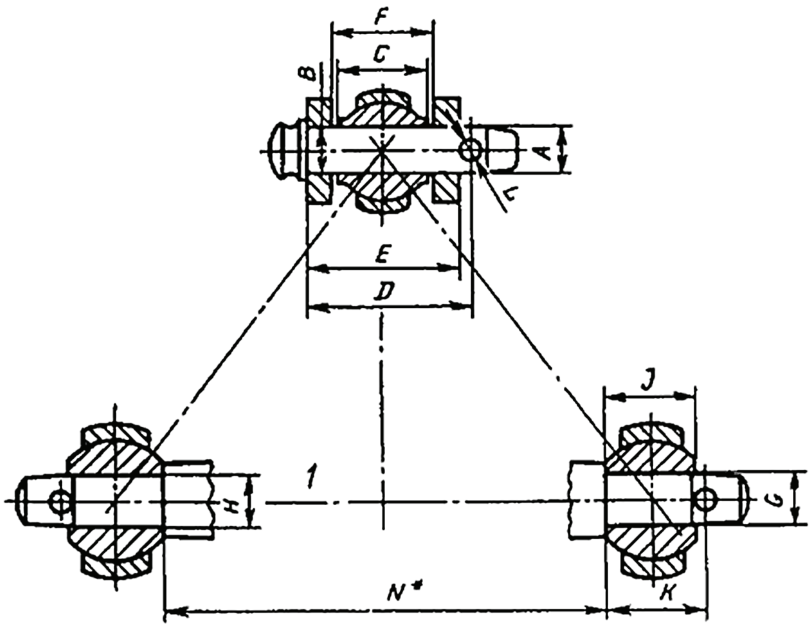


Fig. 92

Table 10

Designation of linkage parameters					
Parameter according to the figure	Kirovets	GOST 10677-2001		ISO	
				ISO 730/1	ISO 730/3
		NU-3	NU-4	Cat. 3	Cat. 4
Hinge pivot of the upper (central) pull rod					
A (rod pin	$39.5_{-0.8}$	$31.75_{-0.2}$	$45_{-0.8}$	$31.75_{-0.25}$	$45_{-0.8}$
B (implement lifting eyes)	$40^{+0.62}$	$32^{+0.25}$	$45.2^{+0.3}$	$32^{+0.25}$	$45.2^{+0.3}$
C	$98^{-0.97}$	51 max	64 max	51 max	64 max
E	183 max	95 max	132 max	95 max	132 max
F	99 min	52 min	65 min	52 min	65 min
Hinge pivot of the lower links					
G (pin)		$36.6_{-0.2}$	$50.8_{-0.1}$	$36.6_{-0.2}$	$50.8_{-1.1}$
H (hole for pin)	$60^{+0.46}$	$37.4^{+0.35}$	$51^{+0.5}$	$37.4^{+0.35}$	$51^{+0.5}$
J	$80_{-0.74}$	$45_{-0.2}$	$57.5_{-0.5}$	$45_{-0.2}$	$57.5_{-0.5}$
General dimensions					
M (height of pillar on the implement)	1100	685-700 (900 for plows)	1100	560 min (recom.)	1100 min (recom.)
N	1120	965±1	1165±1.5	965±1	1168_{-3}

Dimensions of linkage connecting elements on the tractor

Hydraulic hook provides for connection of the tractor to vehicles and process transport carriers. The

connection by means of a hydraulic hook installed under platforms 8 (see Fig. 94, Page 128) of the linkage should be implemented as follows:

Approach the hitch of the transported machine at a low speed with lowered hydraulic hook which has a latch set into “open” position. In doing so, it is necessary to visually combine the planes of symmetry of “hook-hitch” coupling units; when the distance be-tween their connecting elements equals to 0.6 – 1.0 m, leave the cabin and make sure of coincidence of the hook mouth and the hitch in the vertical plane; if needed, provide for such coincidence by steering wheel rotation; continue tractor approach until the hook stops in the hitch, then, operating the hydraulic distributor lever, lift the linkage in order to introduce the hook mouth into the hitch and lift the hook into the transportation position to the height of 700 mm;

Close the latch and install drawbars;
connect the machine hydraulic system to the tractor hydraulic system;

Join the connecting heads of the pneumatic system. Before connecting the tractor pneumatic system

Press the valve of the tractor connecting head and, having opened the separating valve, blow down the system until condensate is removed. At negative temperatures, repeat this operation after the completion of work as well;

Connect electrical equipment.

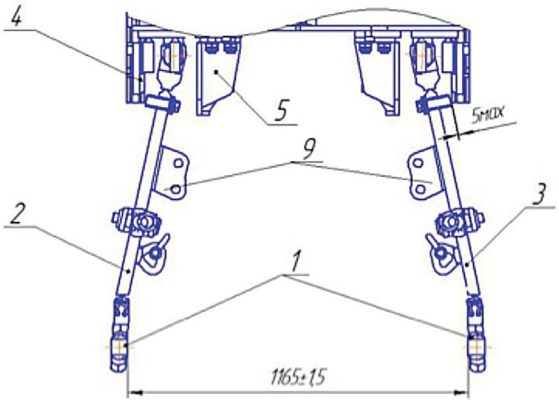
If a road train is composed (with semi-trailer and trailer), reconnect the marker lights to the trailer;

Connect safety chains of the vehicle (semi-trailer or trailer) to the connecting links located on the lifting eyes of lower links of the linkage.

IMPORTANT!

The latch and arrestor catch of the hook are to be located in the longitudinal vertical plane above the hook mouth and locked with splint pin.

Hitch iron provides connection of the tractor with trailing agricultural machines (implements) having hitch frames with coupling hitches.



Hitch iron shall be installed into hinge pivots 1 of lower links 2 and 3 of the linkage and fastened by axle-pins. In doing so, the length of vertical struts shall be adjusted so as to have the pins connecting the outer and internal pipes pass through the lower hole of the outer pipe and the upper hole of the inner pipe. Hitch iron shall be installed at the height of 400-500 mm from the ground surface to the lower plane of the hitch iron mouth.

Fig. 93

IMPORTANT!

When hooking up the tractor, with trailing agricultural machines, to be connected by means of hitch iron, the horizontal struts in the transverse plane shall be adjusted for movement by 150-200 mm. When transporting the above-mentioned machines, lower links of the linkage shall be fully locked against transverse movements by horizontal struts.

8.6 Procedure of Operation with Agricultural Machines (Implements) and Vehicles

8.6.1 Tractor operation with mounted and semi-mounted agricultural machines (implements)

When hooking up mounted and semi-mounted agricultural machines and implements, comply with the following procedures:

a) lower and lift agricultural machines and implements only when the tractor moves directly;

b) avoid turns of the tractor with agricultural machines (implements) whose operating parts are in soil.

c) in order to avoid failures of 28,1R-26 tries, it is not recommended to perform hauling of K-744R1 tractors with heavy mounted implements at the speed over 10 km/h.

CAUTION!

Turning a machine with landed operating parts can lead to an accident.

d) during operation of the tractor unit IT IS PROHIBITED to set the hydraulic distributor handles into position FORCED LOWERING for the operating position of agricultural machines (implements).

When transporting an agricultural machine or implement, their operating parts shall be in the transport position and the hydraulic distributor handles shall be in position NEUTRAL.

IMPORTANT!

When hooking up the tractor, with mounted and semi-mounted agricultural machines, to be connected to three or two points of the linkage, the length of horizontal struts shall be adjusted so as to have rear hinge pivots of lower links of the linkage freely moving in the transverse plane by 150-200 mm.

The final adjustment and setting of agricultural machines and implements shall be carried out in the field (in case of plowing - at passing the third furrow; in case of other operations - at the first passage).

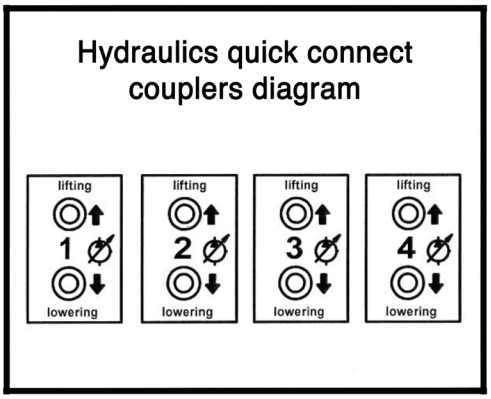
In the furrow, adjust mounted machines first for the same landing of the front and rear operating parts and then set the required depth of cultivation and finally align them in the longitudinal plane by means of the central pull rod and in the transverse plane - by changing the length of vertical struts.

NOTE!

The adjustment procedure for operating parts of agricultural machines (implements), their operation modes as well as their transfer into the transportation position are indicated in the operation manuals for these machines and implements.

Drain line from the hydraulic motor shall be connected via a hose with the inner diameter of 20 mm, length of 3,200 mm (available in the SPTA kit) directly to the cover of the hydraulic tank filter being on the right in the direction of tractor travel, bypassing the hydraulic distributor.

When hooking up with implements equipped with hydraulic motors (e.g. fan), their hydraulic lines should be connected to the 2nd and 3rd pair of couplings of the tractor hydraulic system. Connect the hydraulic motor pressure line to position LOWERING. Shut the hydraulic motor down by setting the handle of hydraulic distributor into position FLOATING.



8.6.2 Tractor Operation with Plows

Depth of plowing under the front and rear housings of the plow shall be set only by screws of the front and rear mechanisms of plow carrier wheels.

When preparing the plow for long-term transportation, the length of central pull rod shall be decreased so that have the outermost point of the plow in the lifted state not exceeding the external height of the tractor.

When hooking up with a mounted plow, in order to provide for the floating mode, pins of vertical struts of the linkage shall be installed in a manner allowing them to pass through lower holes of outer, and longitudinal grooves of inner pipes of vertical struts (open strut). In doing so, dimension A (Fig.31) on the top and on the bottom shall not exceed 60 mm.

8.6.3 Procedure of operation with vehicles

IMPORTANT!

Road-train with the following sequence and composition: tractor, semi-trailer (1PTS-9B or OZTP-8573) and trailer (ZPTS-12B or OZTP-8572) is designed for carriage of cargoes over any types of roads. With unfavorable road conditions, the tractor hooks up only with one semi-trailer or trailer.

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

a) the load on tractor wheels shall not exceed the values indicated in Table 3;

b) all machines to be used for transportation of cargoes shall be equipped with pneumatic or pneumatic-hydraulic brakes securing traffic safety;

c) braking system of the trailing vehicle shall provide for natural deceleration of trailers with cargo at an emergency braking of at least 5.5 m/s2.

The time from the moment of pressure drop at the connecting head level to 90% of the initial value until the moment when the pressure in the trailing vehicle actuator being in the least favorable conditions reaches 75% of the steady-state value with the control member being fully operated shall not exceed 0.4s;

d) total weight of the cargo being transported with the trailer shall not exceed 36 t.

When the tractor travels with any types of vehicles, use the fuel feed pedal and set the manual feed handle at the same time into the position ensuring tractor taking off with the vehicle, with allowance for the cargo weight.

8.6.4 Operation with power take-off (PTO)

Power take-off (PTO) is designed to transfer the engine power to operating parts of the machines to be hooked up with the tractor.

PTO consists of coupling with valve, single-speed reducer with oil pump, front and rear car-dan shafts.

Comply with the following requirements in the course of operation:

a) with the coupling disengaged, rotation of the rear cardan shaft is not allowed;

b) engage the coupling on load with the steady-state pressure in the gearbox hydraulic system of at least 10 kgf/cm^2.

CAUTION!

To avoid accidental jack-knifing, do not perform a U-turn with installed power take-off attachments at the maximum angle of semi-frames jack-knifing with the power take off coupling being engaged.

8.7 Winter Operation Features

It is recommended to combine the preparation for winter operation and the execution of M-AW (autumn-winter) with regular M-2 or M-3.

In order to ensure trouble-free operation of the tractor in winter season, timely replace the summer oil and fuel grades with winter ones according to the lubrication table and appendix 6 (“Filling tanks”). Preliminarily wash up the fuel tank.

To maintain tractor systems in good working order during a long of not running the tractor in the autumn-winter period, after 2 or 3 weeks of tractor shutdown, it is recommended to check tractor system functioning in travel within 60 minutes at all GB modes and gears in sequence.

Start up the engine at negative ambient temperatures as per guidelines set forth in Item 4.12.

After engine start-up, before taking off:

a) let the engine operate for 4 min, gradually increasing the crankshaft rotation rate;

b) Do not run the engine for full power at the cooling fluid temperature below 70°C;

c) make sure of normal operation of the hydraulic system for control over turns and brakes;

d) if it is supposed to operate the hydraulic system for linkage control, then prepare it for operation. To this end, run the system for 3-4 min, gradually increasing the crank-shaft rotation rate, then perform several system activations for LIFTING and FORCED LOWERING and make sure of normal operation of the system.

Maintain storage batteries in the charged state avoiding their discharge by more than 25%.

Remove storage batteries from the tractor in the following cases:

a) at the ambient temperature of minus 25 – 30°C with an interruption in operation for more than 24 hours;

b) at the ambient temperature below minus 30°C with an interruption in operation for 10 hours. Store the batteries as per operation manual “Lead starting storage batteries”.

Protect removed storage batteries from allowing dirt and metal objects into terminals and electrical connection areas.

In order to prevent engine overrun, do not pour hot water over the high-pressure fuel pump before the start-up. Throughout the entire operation period, do not wash the fuel pump with water under pressure.

At the end of working shift, drain the sludge from fuel filters and fuel tank as well as condensate from air cylinders; fully fill the fuel tank with fuel. The engine shutdown handle shall be advanced.

When using the tractor in winter season, it shall be provided with heated parking.

8.8 Procedures of Tractor Transportation, Towing and Jacking

The tractors are transported mainly by railway. Apart from railway transport, it is possible to use water (river or sea) transport as well as special trailers for transportation of tractors.

The tractor being loaded into an open rolling stock (flat car), with the account of packing and fastening, shall be placed within the main external dimensions for loading.

Install the tractor onto a flat car with wooden floor cleared from debris, dirt (snow, ice) in advance, check the condition of decking. Pour a thin layer of clean dry sand onto the areas supporting wheels, bumping posts, cases with SPTA.

Before placing the tractor onto flat car, it is necessary to do the following:

1) Lift the linkage all the way up;
2) Bring the pressure in tries to 2.3 kgf/cm^2;
3) Set the control levers into neutral position;
4) Drain fuel from the fuel tank and condensate from air cylinders;
5) Switch off the battery master switch;
6) Disconnect the negative bus bar from the battery master switch terminals and fix it using the standard bolt on the frame;
7) Remove the air intake and exhaust pipes, protect the holes on the parts removed and on the tractor against the ingress of dust and moisture. Fix the air intake pipe and silencer on the flat car.
8) In order to avoid jack-knifing of tractor semi-frames in the course of its loading or unloading, use a crane to fit split bushings onto swing hydraulic cylinder stems;
9) When transporting the tractor on flat railway car, prevent jack-knifing of tractor semi-frames by connecting (locking) them using the shackle fixed on the rear semi-frame.

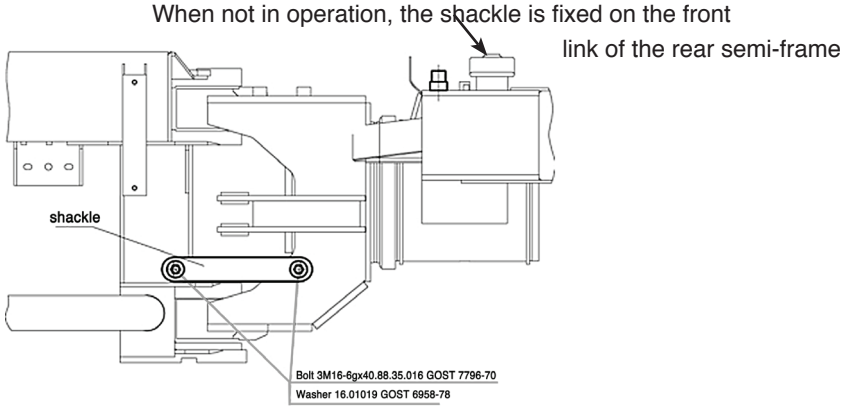


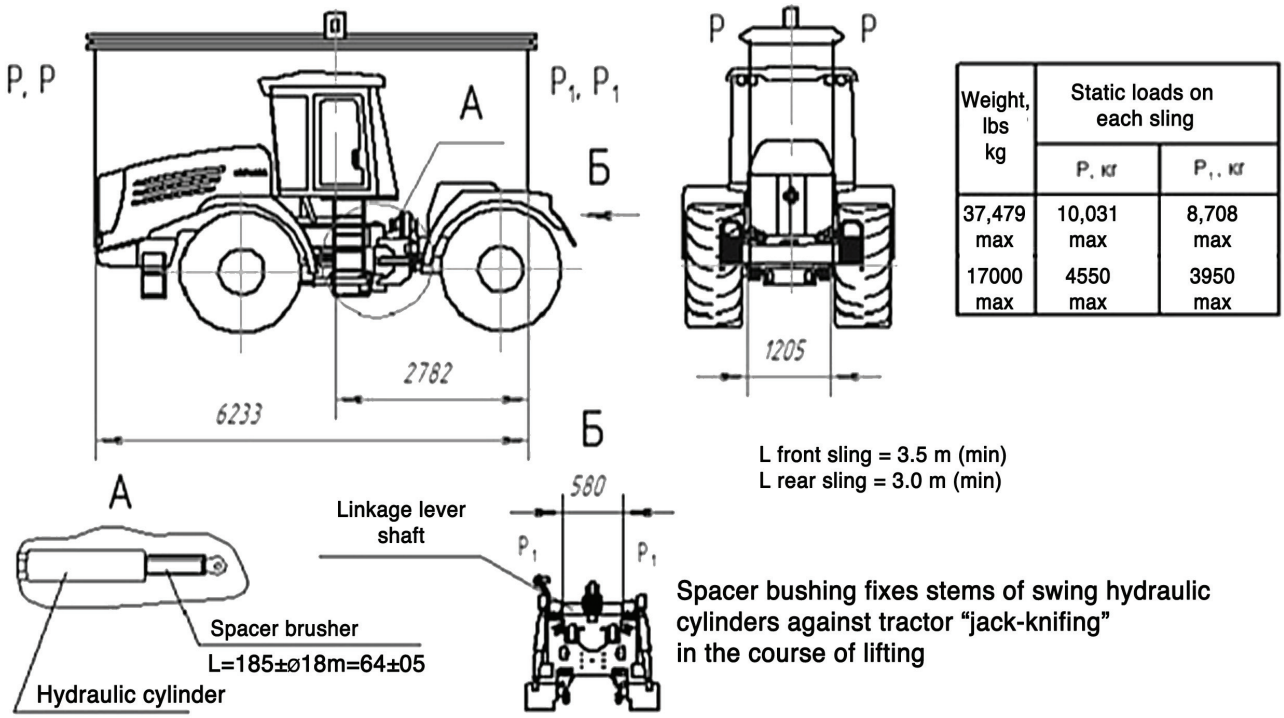
Fig. 94

10 Pull up the parking brake after installation of the tractor onto the flat car.

When loading and unloading the tractor, observe the corresponding guidelines set forth in the “Safety requirements” section. Perform placement, fastening and lead-sealing of the tractor on the flat railway car in accordance with the “Specification for placement and fastening of loads in cars and containers”.

Load and unload the tractor by crane with the carrying capacity of at least 20,000 kgf according to the slinging diagram (Fig. 33). When slinging the tractor, IT IS PROHIBITED to stay under the tractor, use faulty tools and ropes.

8.8.1 Slinging the tractor (in basic configuration)



Weight, lbs kg	Static loads on each sling	
	P, кг	P1, кг
37,479 max	10,031 max	8,708 max
17000 max	4550 max	3950 max

Fig. 95 Slinging diagram of the tractor (in basic configuration)
Maximum static loads on each sling:
P=4550 kg; P1=3950 kg

Towing the tractor with only a rigid coupler according to the requirements of “Road traffic regulations”. In doing so, the towing speed shall not exceed 15 km/h.

For towing the tractor with faulty engine, turn the transmission disengagement lever on the pump drive reducer (PDR) all the way towards the engine. Towing switchover lever 11 (Fig. 67) shall be lifted upwards and the mode and gear selected in GB of the tractor being towed shall conform to the tow car speed during towing.

To jack the tractor up (Fig. 34), set it on even horizontal ground, insert pads under the wheels after shutting off the engine, pull up the parking brake, set the mode change lever into the position N, gear change lever - into position ACTIVATION OF SYNCHRONIZER BRAKES, levers of the hydraulic distributor of the mounted equipment hydraulic system - into position NEUTRAL.

In order to avoid jack-knifing of tractor semi-frames, install split bushings on the swing hydraulic cylinder stems or locking shackle on the frame, preventing the movement of stems.

Use only a serviceable jack. Do not get under a tractor lifted on the jack. When jacking the tractor, use reliable jacks with the carrying capacity of at least 12,000 kgf; follow the jacking diagram using “DK” marks on the tractor.

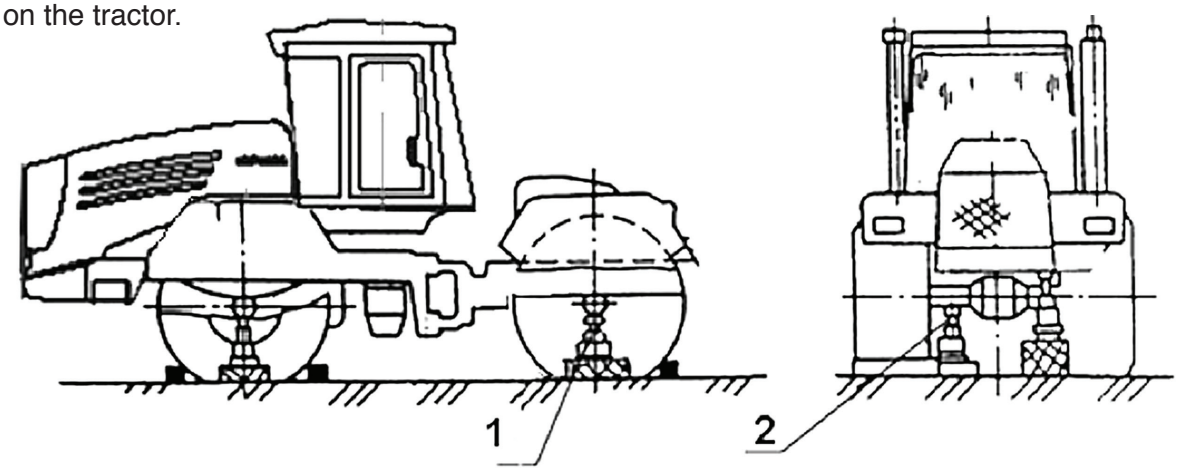


Fig. 96 Tractor jacking diagram

1 – under casing of rear axle semi-frame; 2 – under casing of front axle semi-frame.

8.9 Gearbox Pressure Control and Adjustment

In the course of tractor operation, the GB pump performance decreases.

In order to extend the GB repair interval, periodically check and adjust the pressure in GB.

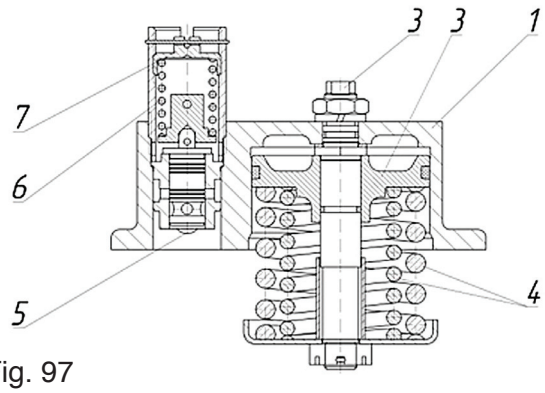
Pressure monitoring is carried out by means of mechanical pressure gauge with the upper measurement limit of 1.6 MPa (16 kgf/cm^2). Accuracy class - at least 1.5. Measurement point - see Fig. 67.

Oil pressure in the hydraulic system of heated GB at gears with the crankshaft rotation rate of 900-1800 RPM shall be as follows:

1.1 - 1.3 MPa (11 - 13 kg/cm^2).

The pressure on neutral gear and at engagement of synchronizer brakes shall not be less than on transmission gears.

Pressure shall be adjusted by turning plug 7 (Fig. 101).



GB hydraulic accumulator with pressure control valve
1 – housing; 2 – stem; 3 – piston; 4 – hydraulic accumulator spring; 5 – valve; 6 – valve spring; 7 – adjustment plug

IMPORTANT!

Hydraulic accumulator springs are always in the compressed state. Hydraulic accumulator should be dismantled by a qualified specialist.

Fig. 97

9 MAINTENANCE

9.1 Types and Frequency of Maintenance

Types and frequency of maintenance are given in Table 11 for the tractor and in the engine operation manual for the engine.

Using the tractor without execution of regular maintenance is not recommended. Deviation in the actual frequency (advancing or delay) of M-1, M-2 is allowed to be up to 10%, of M-3 - up to 5% from the prescribed frequency.

Seasonal maintenance (SM) of tractors should be performed twice a year: M – SS (spring – summer) – at steady-state ambient temperature of at least plus 5°C, and M – AW (autumn – winter) – of less than plus 5°C. Seasonal maintenance of tractors shall be combined with regular maintenance operations.

Company must have a time schedule of M-1, M-2 and M-3 for each month, and of M-SS and M-AW - for their respective months.

Service logbook of the tractor must indicate date and type of all executed maintenance operations except ShM (shift maintenance), as well as lifetime hours from the beginning of operation of new or overhauled tractors.

Types and frequency of maintenance

Table 11

Types of maintenance	Frequency in engine hours of tractor operation
Maintenance at the preparation of a new or overhauled tractor for operation running-in	---
Maintenance of tractor at the execution of running-in	10
Maintenance upon completion of running-in:	
K-744 tractor	30
Shift maintenance (ShM)	10
First maintenance (M-1)	125
Second maintenance (M-2)	500
Third maintenance (M-3)	1,000
Seasonal maintenance (M-SS), (M-AW)	At the transition to spring-summer or autumn-winter operation conditions
Maintenance in special operation conditions (sandy, stony or boggy soils, desert, low-temperature and high-mountain conditions)	It shall be performed in the conditions drastically differing from typical ones
Maintenance during long-term storage	It shall be performed in closed premises not less than once every 2 months, and under a canopy and at outdoor sites — once a month

9.2 List and Contents of Work by Types of Maintenance to be Performed by Operator In the Process Sequence

IMPORTANT!

Engine maintenance shall correspond to the engine operation manual.

Maintenance when preparing new tractor for running-in, carrying out running-in, upon completion of running-in

Job description	Preparation for running-in	Execution of running-in	Completion of running-in	Notes
Inspect and clean the tractor from dust and dirt	•		•	
Wipe preservation grease off open parts of hydraulic cylinder stems, spherical surfaces and threaded connections of the linkage	•			
Check the tractor condition by visual inspection, paying attention to the absence of leaks of fuel, oil, cooling fluid and electrolyte, absence of extraneous noise, rattle in the engine and in transmission units; if necessary, eliminate all faults	•	•	•	Upon leak detection and elimination it is necessary to check the level of respective fluids
Check the level and, if necessary, refill:				
- oil into tank of hydraulic systems of the linkage and for steering control	•		•	
- oil into the gearbox hydraulic system	•			
- oil into cases of the main and final gears of driving axles	•			
- cooling fluid into expansion tank	•	•	•	
oil to the engine lubrication system	•	•		
- electrolyte (or distilled water) into storage batteries			•	
Wash:				
- filter for centrifugal cleaning of engine oil			•	
- gearbox filter			•	
- breathers of driving axles, PDR (pump drive reducers), fuel tank, single-speed PTO reducer (if any)			•	
Replace cardboard filter elements and wash up the housings of hydraulic tank filters			•	
Drain:				
- condensate from air cylinders		•	•	
- 0.1 l of fuel from strainers and fine mesh fuel filters		•	•	

Job description	Preparation for running-in	Execution of running-in	Completion of running-in	Notes
Check and adjust, if required:				
- drive belt tension			•	
- travel of brake chamber stems of the service brakes			•	
Replace oil:				
- in the engine lubrication system			•	
- in the gearbox hydraulic system			•	
- in cases of the main and final gears of driving axles			•	
Set the pressure in tires	•			
Check the condition of tires and air pressure;			•	
Check the engine drive belt tension and adjust it, if required		•		
Check the electrolyte level, condition of terminals and vents in storage battery plugs. If necessary, refill distilled water. Lubricate the non-contact parts of terminals and wire lugs with petroleum jelly	•		•	
Check the electrolyte density and, if necessary, bring it to the required value depending upon the climatic area where the tractor is operated	•			
Check the condition of filter elements of the 1st and 2nd air cleaner stages and, if necessary, perform their maintenance			•	
Check threaded connections and other connections of the engine and the entire tractor and tighten them, if needed	•		•	Pay special attention to tightening the wheel fastening nuts, driving axle brackets, wedge joints of the frame's vertical hinge pivot axles, clamp fastening bolts for intermediate bearing
Check how does the engine work by ear and by monitoring instruments		•	•	Perform the operation in the course of tractor's work

Job description	Preparation for running-in	Execution of running-in	Completion of running-in	Notes
Check the operation of tractor control mechanisms, operation of brakes, window wipers, lighting and signaling, hydraulic systems of the linkage and for steering control	•	•	•	
Upon shutdown of the engine, immediately check the operation of turbocompressor and engine centrifugal oil filter by ear		•	•	

Additional maintenance operations after running-in

Job description	Notes
Tighten mounting bolts of intermediate bearing holders	Tightening torque is 29.42 Nm / 3 kgf·m
Check and, if needed, tighten the fasteners:	
- of tractor wheels	Carry out the operations at the first two maintenance sessions from the beginning of operation (M-1) (125, 250 engine hours)
- drive axle clamp nuts;	Carry out the operations at the first two maintenance sessions from the beginning of operation (M-1) (125, 250 engine hours)
- bolts for fastening the “pinion carrier - hub” joint at final gears of driving axles	Carry out the operation at the first maintenance from the beginning of operation (M-1) (125 engine hours)
- bolts for fastening cases to the main gear casing	Carry out the operation at the first maintenance from the beginning of operation (M-1) (125 engine hours)
cardan shaft flanges	Carry out the operation within the first 1000 engine hours at M-1 (once in every 125 engine hours)
- spring eye and spring clip plate nuts	Carry out the operation at the first maintenance from the beginning of operation (M-1) (125 engine hours)
Check the tightness of the air supply line from air cleaner to engine.	

Shift maintenance (ShM)

Job description	Notes
Clean the tractor from dust and dirt	
Check the tractor condition by visual inspection, paying attention to the absence of leaks of fuel, oil, cooling fluid and electrolyte, absence of extraneous noise, rattle in the engine and in transmission units; if necessary, eliminate the faults	
Check the level and, if necessary, refill:	
- cooling fluid into expansion tank	
oil to the engine lubrication system	
Drain condensate from air cylinders	Drain sludge daily in winter and at least once a week in summer

Job description	Notes
Check the engine condition by external inspection	
Perform a check of air conditioning:	Execute the operations once a week.
- coolant filling level.	
- electrical contacts for magnetic coupling connection	
- check hoses for damage	
Blow down the magnetic coupling with compressed air in order to remove dust.	
Check how does the engine work by ear and by monitoring instruments	
Check the operation of tractor control mechanisms, operation of brakes, window wipers, lighting and signaling, hydraulic systems of the linkage and for steering control	
Upon shutdown of the engine, immediately check the operation of turbocompressor and engine centrifugal oil filter by ear	

First maintenance (M-1), second maintenance (M-2), third maintenance (M-3)

Job description	M-1 (125 engine hours)	M-2 (500 engine hours)	M-3 (1000 engine hours)	Notes
Inspect the tractor and wash it over:	●	●	●	
Check the tractor condition by visual inspection, paying attention to the absence of leaks of fuel, oil, cooling fluid and electrolyte, absence of extraneous noise, rattle in the engine and in transmission units; if necessary, eliminate the faults	●	●	●	
Wash:				
- filter for centrifugal cleaning of engine oil	●	●	●	
- gearbox filter		●	●	
- breathers of driving axles and single speed PTO, PDR			●	
Check the level and, if necessary, refill:				
- oil into the engine lubrication system;	●			
- oil into tank of hydraulic systems of the linkage and for steering control;	●	●		
- oil into the gearbox hydraulic system;	●	●		
- oil into cases of the main and final gears of driving axles;	●	●		
- cooling fluid into expansion tank	●			

Job description	M-1 (125 engine hours)	M-2 (500 engine hours)	M-3 (1000 engine hours)	Notes
Replace oil:				
- in the engine lubrication system;	**As per engine operation manual**			
- in hydraulic system of the linkage and for steering control;			●	execute the operation every other M-3 session
- in the gearbox hydraulic system;			●	
- in cases of the main and final gears of driving axles				execute the operation every other M-1 session (250 engine hours)
Replace				
- filter elements and wash up hydraulic tank filter housings				execute the operation every other M-1 session (250 engine hours)
- filter element and wash up the filter housing, oil filter of the engine	**As per engine operation manual**			
- filter elements of pressure filters of the hydraulic system and wash up the filter housings	●	●	●	When the indicator lamp for filter element clogging is alight at the working fluid temperature above 20°C
- oil filter of the engine	**As per engine operation manual**			
- fuel strainer			●	
- fine mesh fuel filter	**As per engine operation manual**			
Drain:				
- condensation from air cylinders	●	●	●	
0.1 l of fuel each from strainer and fine mesh filter	●	●	●	
Check and adjust, if required:				
- drive belt tension	●	●	●	
- drain pedal drive		●	●	
- blocking the engine start-up with engaged gear	●	●	●	
- fuel injection lead angle		●	●	
Expansion gaps in the valve mechanism, after tightening the nuts of cylinder heads	**As per engine operation manual**			
Check the condition of tires and air pressure;	●	●	●	
Check the electrolyte level, condition of terminals and vents in storage battery plugs. If necessary, refill distilled water. Lubricate the non-contact parts of terminals and wire lugs with petroleum jelly	●	●	●	

Job description	M-1 (125 engine hours)	M-2 (500 engine hours)	M-3 (1000 engine hours)	Notes
Check the electrolyte density and degree of charge of storage batteries and, if necessary, charge or replace them with those charged		●	●	
Check the condition of filter elements of the 1st and 2nd air cleaner stages and, if necessary, perform their maintenance		●	●	Carry out maintenance in case when indication light 29, - 1, 2, 3, or 4 for filter element clogging lights up
Check the condition of cabin ventilation filter elements and, if necessary, perform their maintenance	●			
Lubricate the following:				
- pins of hydraulic cylinders in hydraulic systems of the linkage and for steering control	●	●	●	
- supports of service brake cams	●	●	●	execute the operation every other M-1 session (250 engine hours)
- main lever shaft supports of the linkage mechanism	●	●	●	
- frame's vertical hinge pivot axles		●	●	
- frame's horizontal hinge pivot;			●	
- cardan shaft crosspiece bearings	●	●	●	execute the operation every other M-1 session (250 engine hours)
Check and, if needed, tighten the fasteners:				
- of tractor wheels	●	●	●	see Appendix 4
- drive axle clamp nuts	●	●	●	see Appendix 4
- cardan shaft flanges	●	●	●	see Appendix 4
- bolts for fastening the "pinion carrier - hub" joint			●	see Appendix 4
- bolts for attaching housings to the main gear case			●	see Appendix 4
- wedge connections of the frame's vertical hinge pivot axles		●	●	
- mounting bolts of intermediate bearing holders		●	●	see Appendix 4
- spring eye and spring clip plate nuts		●	●	
Check how does the engine work by ear and by monitoring instruments	●	●		

Job description	M-1 (125 engine hours)	M-2 (500 engine hours)	M-3 (1000 engine hours)	Notes
Check the operation of tractor control mechanisms, operation of brakes, window wipers, lighting and signaling, hydraulic systems of the linkage and for steering control	●	●		
Upon shutdown of the engine, immediately check the operation of turbocompressor and engine centrifugal oil filter by ear	●	●		
Check the tightness of the air supply line from air cleaner to engine.	●			
Check the tightness of the clean air supply line to engine and of the dust removal line from air cleaner.		●	●	
Perform maintenance for engine nozzles	●			Execute the operation for YaMZ-238ND5 engine after the first 250 engine hours
Drain condensate from the engine supercharge air cooler (SAC).	●			
Check the operation of all tractor's mechanical parts at idle run and under load			●	Perform the operation in the course of tractor's work
Check the ease of rotation of the turbocharger rotor and, if necessary, perform its maintenance			●	

IMPORTANT!

In case of tractor operation under climatic conditions requiring no seasonal maintenance (M-SS, M-AW), perform oil change in the gearbox hydraulic system once in every 1000 engine hours.

Seasonal maintenance - spring-summer (M-SS) and autumn-winter (M-AW)

Job description	M-SS	M-AW	Notes
Bring the density of electrolyte in storage batteries to the summer standard value.	●		
Check the operation of the service brake pneumatic system	●	●	
Replace oil of winter grades with summer grades according to the lubrication table:			
- in the engine lubrication system	●		
- in the gearbox hydraulic system	●		

Job description	M-SS	M-AW	Notes
- in the tank of hydraulic systems of the linkage and for steering control	•		Perform the operation once in every 2000 engine hours
- in cases of the main and final gears of driving axles	•		
Lubricate the spring eyes			
Check the cooling liquid density		•	If needed, refill concentrated anti-freeze agent of Tosol AM brand
Bring the density of electrolyte in storage batteries to the winter standard value.		•	
Replace oil of summer grades with winter grades according to the lubrication table.		•	When using seasonal oil
- in the engine lubrication system		•	
- in the gearbox hydraulic system		•	
- in the tank of hydraulic systems of the linkage and for steering control		•	
- in cases of the main and final gears of driving axles ❖		•	
Prepare and check the operation of the pre-start heating system		•	

❖ Do not replace oil in case when all-season oil grades are used

9.3 Types and Lists of Maintenance Operations During Storage

Maintenance during long-term storage in closed premises, under canopy and at outdoor sites

Job description	Notes
Check the correctness of tractor positioning on props or on pads	
Check the availability of lead-seals and completeness of tractor configuration (taking into account the tractor parts and assemblies taken off and being kept at the warehouse)	
Check the density of electrolyte and, if necessary, recharge the batteries	Perform the operation once a month
Check the air pressure in tires	
Check leak-tightness of components	
Check the availability of protective grease, integrity of painting, absence of corrosion on the surfaces	

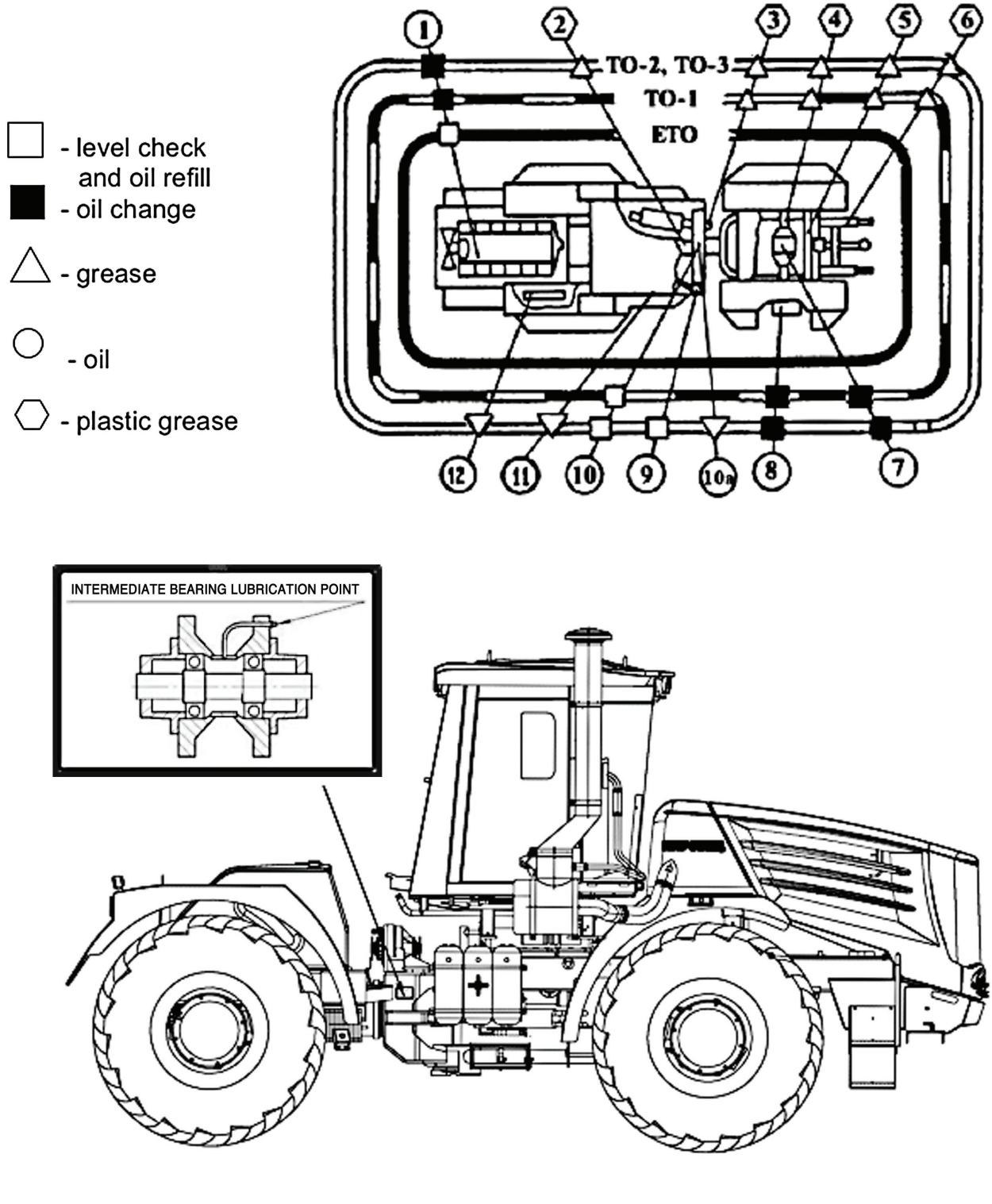


Fig. 98

Tractor lubrication diagram

9.4 Lubrication Table

Position No. in lubrication (filling) diagram, Fig.102	Name of lubrication points	Description of grade and designation of standard lubrication and filling during operation temperature	
		from minus 40°C to +5°C	from minus 40°C to +5°C
1.	Engine lubrication system	As per operation manual for the engine	
2.	Frame's vertical hinge pivot axles	Loctite 8103 grease	
		Substitutes:	
		Grease No.158 TU 38.101.320-77	
3.	Hydraulic cylinder pins of the hydraulic system for steering control	Litol-24 grease GOST 21150	
		Substitutes:	
		Cup grease G Solid oil G GOST 1033	
		Cup grease S Solid oil S GOST 4366	
4	Supports of service brake cams	Litol-24 grease GOST 21150	
		Substitutes:	
		Cup grease G Solid oil G GOST 1033	
		Cup grease S Solid oil S GOST 4366	
4	Supports of main levers' shaft of the mounted equipment	Litol-24 grease GOST 21150	
		Substitutes	
		Cup grease G Solid oil G GOST 1033	
		Cup grease S Solid oil S GOST 4366	
5	Supports of main levers' shaft of the mounted equipment	Litol-24 grease GOST 21150	

d for lubricants and fluids	lubrication during storage	Number of lubrication points and their capacity	Frequency of grease (engine hours, maintenance type)		Notes
			main greases	substitutes	
			250		
	Main grease be-ing used	2 by 0.3 l each	500		
				250	
	Main grease be-ing used	4 by 0.05 l each	125	60-65	
	Main grease be-ing used	8 by 0.05 l each	250	125	
	Main grease being used	2 by 0.05 l each	250	125	
	Main grease being used	2 by 0.05 l each	125	60-65	

Position No. in lubrication (filling) diagram, Fig.102	Name of lubrication points	Description of grade and designation of standard lubrication and filling during operation temperature	
		from minus 40°C to +5°C	from minus 40°C to +5°C
		Substitutes:	
		Cup grease G Solid oil G GOST 1033	
		Cup grease S Solid oil S GOST 4366	
6	Hydraulic cylinder pins of the link-age	Litol-24 grease GOST 21150	
		Substitutes:	
		Cup grease G Solid oil G GOST 1033	
		Cup grease S Solid oil S GOST 4366	
7	Cases of main gears of driving axles	For all-seasonal use: Transmission oil TSp-15K GOST 23652	
		Substitutes: Shell Spirax AD SAE 80W90; Shell Spirax S3 AX 80W90; Shell Donax TD 10W30; Shell Spirax S4 TXM TS3p-8 TU 38.1011280-89 For all seasons to the temperature of mi-nus 15°C Tap-1	
8	Cases of final gears of driving axles	For all-seasonal use: Transmission oil TSp-15K GOST 23652	
		Substitutes: Shell Spirax AD SAE 80W90; Shell Spirax S3 AX 80W90; Shell Donax TD 10W30; Shell Spirax S4 TXM TS3p-8 TU 38.1011280-89 For all seasons to the temperature of mi-nus 15°C Tap-1	
9.	Gearbox hydraulic system	Engine oil M-8V2 GOST 8581	Engine oil M-10V2 GOST 8581
		Substitutes: see Appendix 5	

d for lubricants and fluids		Number of lubrication points and their capacity	Frequency of grease (engine hours, maintenance type)		Notes
	lubrication during storage		main greases	substitutes	
	Main grease being used	4 by 0.05 l each	125	60-65	
	See Section 9	2 by 10 l each	250		
5V	See Section 9			250	every other M-1
	See Section 9	4 by 3.5 l each	250		
5V	See Section 9			250	every other M-1
		1 by 23 l each	TSS		
				TSS	

Position No. in lubrication (filling) diagram, Fig.102	Name of lubrication points	Description of grade and designation of standard lubrication and filling during operation temperature	
		from minus 40°C to +5°C	from minus 40°C to +5°C
10.	Hydraulic system of the linkage and for steering control	For all-seasonal use: RW X-Hydraulic S Force HV-ZF 32	
		Substitutes	
		Oil VMGZ TU 38.101479-86	MGE-46V TU 38.001347-83
11	Supports of vertical rollers for gearbox mode switchover	Litol-24 GOST 21150	
		Substitutes	
		Solid oils as per GOST 1033 and GOST 4366	
12	Spring eyes	Litol-24 grease GOST 21150	
		Substitutes	
	Frame's horizontal hinge pivot	Loctite 8103	
		Substitutes	
		Grease No.158 TU 38.101.320-77	
	Brake lever	Litol-24 grease GOST 21150	
		Substitutes	
		Grease No.158 TU 38.101.320-77	
10a	Bearings of intermediate support	Litol-24 grease GOST 21150	
		Substitutes	
		Grease No.158 TU 38.101.320-77	
	Cardan shaft crosspiece bearings	Litol-24 grease GOST 21150	
		Substitutes	
		Grease No.158 TU 38.101.320-77	
	Slotted connections of cardan shafts	Litol-24 grease GOST 21150	
		Substitutes	
		Grease No.158 TU 38.301-40-25-94	

Note.

1. Volume of the waste oil collected upon oil change is 80% of the filling tanks volume.

2. When using Litol-24 grease, it is not allowed to mix it with calcium (solid oils), sodium and aluminum gr

3. At the ambient temperature of 41°F / 5°C and over, use summer oil grades throughout the year.

d for lubricants and fluids	lubrication during storage	Number of lubrication points and their capacity	Frequency of grease (engine hours, maintenance type)		Notes
			main greases	substitutes	
	Oil to be used	1 by 175 l each	2000		
	Oil to be used			2000	
	Main grease be-ing used	2 by 0.05 l each	500		
				250	
	Main grease be-ing used	2	500		
	Main grease be-ing used	1 by 2.8 l each	for assembly dismantling		
	Main grease be-ing used	4	for assembly dismantling		
	Main grease being used	4	for assembly dismantling		
	Main grease being used		for assembly dismantling		
	Main grease being used	2 by 0.3 l each	once in every 250 engine hours		
	Main grease being used				
	Main grease being used	8 by 0.15 l each	as per maintenance		
	Main grease being used				
	Main grease being used		for assembly dismantling		Change the grease in cardan shaft of front driving axle once in every 4000 engine hours.
	Main grease being used				

reases.

9.5 Plastic Hood Opening Mechanism

To open the plastic hood, it is necessary to do the following:

Holding the hood with one hand, shift the latch to the right until the click with the other hand. The lock will get unblocked and the hood will begin opening under the action of gas springs

In the course of opening, it is necessary to hold the hood by the belt in order to avoid jerks in case of wind gusts.

The inertial mechanism of the belt structure al-lows to fix the hood in open position at any angle. In the process of opening, it would be sufficient to accelerate the belt in the upward direction, and it will get blocked, thus holding the hood at the required height. In order to release blocking, it is necessary to slightly pull the belt downwards, and the hood will keep opening.

Fig. 99

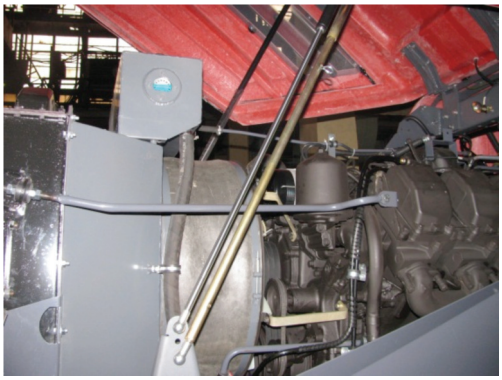
In order to close the plastic hood, it is necessary to do the following:

Smoothly, without jerks, pull the hood by the belt downwards. At the initial moment of movement an additional resistance can arise, caused by the de-sign of gas shock absorber (built-in damper). When lowering, the belt will automatically be rewinding until the closing

Having lowered the hood to the chest level, it is necessary to re-catch the handle and close the hood until the lock operates.

Fig. 100

Safety measures



In order to observe safety measures with regard to prevention of inadvertent hood closing, stops are provided for in the boot design, they are located in parallel to the gas springs.

In order to bring the stop into the fixed position, it is necessary to open the hood, take off the spring locking splint pin from the lower part of the stop and install the splint pin into a special hole in the upper part of the stop. Release the locking in the reverse sequence.

Fig. 101

9.6 Contents and Procedure of Maintenance Operations

9.6.1 Changing engine oil

Put the tractor on a flat horizontal ground. In order to achieve better results, operate engine for a short period of time to warm oil..

1. In order to drain oil, undo the drain plug on the oil drip pan of the engine and take off the lid of oil filler port after cleaning it from dust and dirt.

   After full drainage, screw in the plugs.

2. Clean the oil filler port from dust and dirt before filling oil therein. Through the oil filler port, fill oil into the engine. Check tightening of drain plug of the oil drip pan.

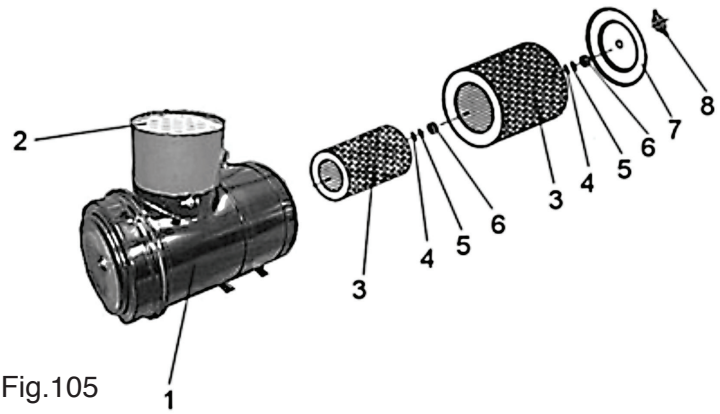
   Use oil probe to monitor the oil level.

3. In order to fill oil into the engine lubrication system, run the engine for 2...3 minutes and refill oil in 10...15 minutes after the stop.

9.6.2 Air cleaner maintenance

Perform maintenance of flat filter elements (cartridges) of the air cleaner in case when the clogging alarm indicator actuates.

To dismantle cartridges 3 (Fig. 105), it is necessary to undo nut 8, take off cover 7, undo nuts 6 one-by-one and remove them from the air cleaner housing.



Air cleaner
1 - air cleaner housing;
2 - cyclone unit;
3 - filter elements (cartridges);
4 - sealing gasket;
5 - washer; 6 - nut; 7 - cover;
8 - nut

Fig.105

Cleaning the cartridges by blowdown with compressed air (Fig. 103) or by washing (Fig.104) in a detergent solution.

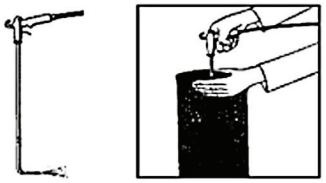


Fig. 103 Cartridge blowdown

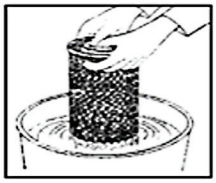


Fig. 104 Cartridge washing

Assemble air cleaner in the order reverse to the sequence described above.

Cartridge blowdown

a) Connect the hose to compressed air source with the pressure of (0.2-0.3) MPa [(2-3) kgf/cm^2] max.

b) Start the air supply;

c) Direct a dry air jet to the rear end of the filter element (at the safety filter element side), perform air-blasting of the filter element until all dust is removed. Adjust the air-blasting intensity by adjusting the air supply. During air-blasting be careful in order to avoid fractures of the filtering material. If there are fractures or any other through defects, replace the filter element.

5-6 cleaning operations of filter elements are allowed.

IMPORTANT!

In order to avoid the ingress of dust into the cylinder piston group of the engine, it is necessary to pay special attention to the following:

1. *When cleaning (blowing down) the filter element, do not allow ingress of dust into the internal cavity of the cartridge and the suction path of the engine.*
2. *Do not allow mounting cartridges with defected seals at the ends, in particular, with seals not being glued and with the filter paper damaged.*
3. *See for firm adherence of the end rubber seals of the cartridges to the air cleaner housing.*
4. *Regularly check the reliability of tightening and, if necessary, retighten the clamps fastening the corrugated branch pipe that connects the air cleaner with the suction branch pipe of the engine turbocharger. During maintenance of the air cleaner, check the suction path downstream the air cleaner for the absence of any traces of dust therein. In case of detection of dust, immediately eliminate the causes of its occurrence.*

Check the tightness of clean air supply line to the engine and dust removal line from the air cleaner.

After each removal and installation of air cleaner in the tractor or its disconnection from the engine, it is necessary to check tightness of connector areas of the cleaned air supply line to the engine as well as of the dust removal line from the air cleaner. To perform this check, use KI-4870-GOSNITI device or U-shaped water manometer. Before the check, tighten all clamps of line hoses. Perform the check with the engine operating on idle run at the crankshaft rotation rate of 30.0 s-1 (1800 RPM). Press the device tip to the area of connector or assumed leak-tightness fault. Water level variation in the tube gives evidence of a leak-tightness fault.

Upon elimination of the fault, check the leak-tightness again. IT IS PROHIBITED to operate the engine with non-tight air feed channels from the air cleaner to the engine and dust suction channels from the air cleaner.

In the course of operation of the tractor, it is necessary to check leak-tightness of the cleaned air supply line to the engine in the course of M-1.

Do not work with clogged or ice-covered grill of the air intake pipe cover and without free gas outlet from the exhaust pipe, as it leads to the ingress of exhaust gases through the dust suction pipe to the air cleaner cartridges.

9.6.3 Cooling system maintenance

Filling and check of the cooling fluid:

a) Fill in the tractor cooling system through the expansion tank filler to a level visible via the sight hole of the tank. When working, do not allow level reduction beyond the permissible level.

b) Avoid leaks of cooling fluid;

c) In order to prevent premature clogging of the cooling system, cooling fluid shall be filled and drained into a clean reservoir; ingress of oil products therein must be prevented;

d) A drain valve located on the pipe connecting the radiator to the water pump is provided under the radiator to drain the cooling fluid from engines;

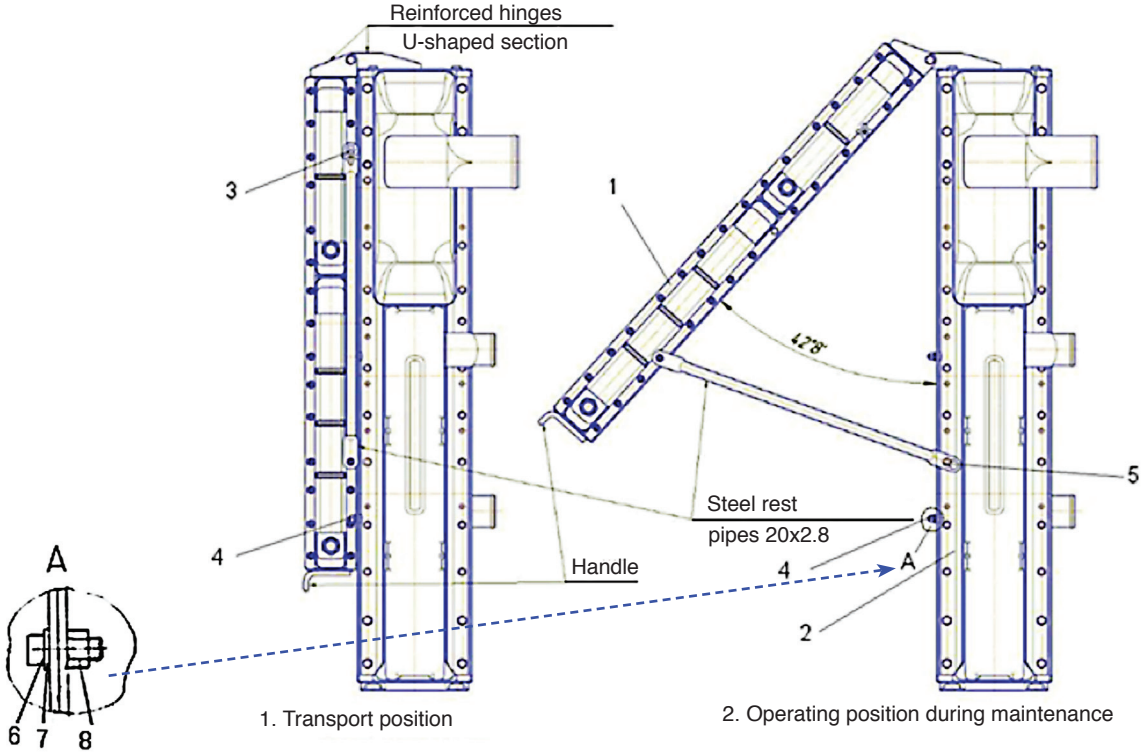
e) Fill and refill the cooling system only using automotive cooling fluids specified in the manual for the engine.

IMPORTANT!

In order to avoid overheating of the cooling fluid, it is necessary to see for the absence of fouling of the water radiator plates. To this end, when working in dusty conditions, it is necessary to perform radiator blowdown with compressed air under the pressure of 5...7 kgf/cm^2 during every shift at both sides - from the radiator's front and from the fan casing side.

In case of a repeated overheating of the engine, it is necessary to thoroughly check the condition of the radiator core. In particular, see for the absence of fouling between radiator plates by checking clearances therein with the help of a standard portable lamp. If needed, blow down or (in case when dirt is not removed with blowdown) wash the radiator core with water under the pressure of 5...7 kgf/cm^2.

In order to enhance the effectiveness of cleaning of the radiator block cores from dust, chaff, etc., the possibility of separation of oil radiator block 1 from engine cooling block 2 is provided for the tractors.



Tractor radiator block
1 - oil radiator block; 2 - engine cooling block;
Fig. 105 3 - screw; 4 - stud; 5 - axle; 6 - bolt; 7 - washer; 8 - nut

Oil radiator block is fastened to the engine cooling block in the upper part by hinges.

In the lower part of the cooling block, there are one stud 4 on its both side walls each.

In the initial position, oil radiator block 1 is installed on cooling block 2 by means of fasteners 6, 7, 8 (view A - Fig. 105, Page 158).

In order to clean the radiator cores, it is necessary to do the following:

1. Undo nuts 8 and bring the lower part of the oil radiator block away from the cooling block, then, holding the block brought away, move the rest into the lower position and fix it on axle 5.
2. When cleaning the radiator cores, the operator should not stay in the area blocked off by the oil radiator block.
3. Upon completion of maintenance of the cores, hold the oil radiator block and, in doing so, move the rest into the initial position and fix it with screw 3.
4. Fasten oil radiator block 1 to cooling block 2 by means of nuts 8 and washers 7.
5. Check reliability of fastening of the hydraulic system hoses to the oil radiator block.

Condenser 2

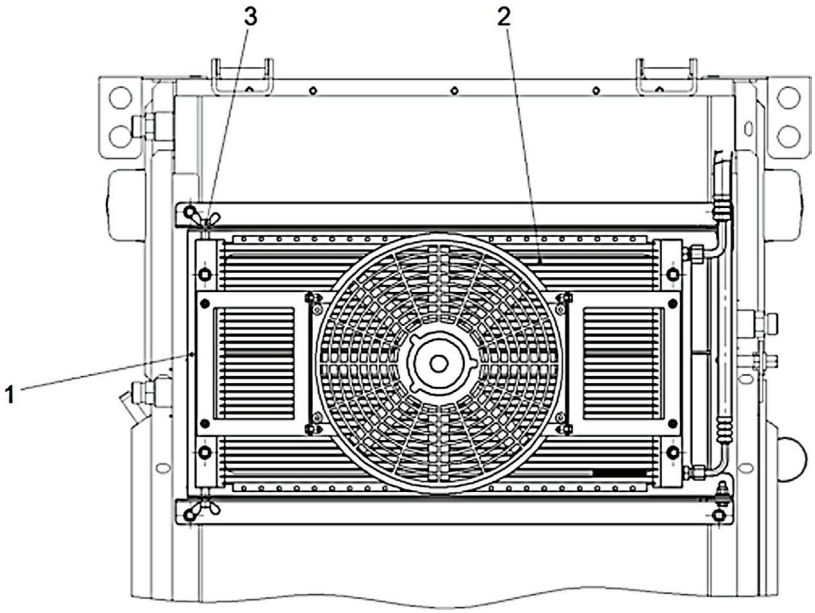


Fig. 106 1 - condenser frame; 2 - condenser with fan; 3 - winged screw

In order to clean the cells of condenser 2 and of the oil radiator, a mechanism allowing to clean the radiator core is provided for.

For a rapid cleaning without condenser dismantling and system depressurization, it is required to loosen two screws 3 and extend the left-hand part, having turned the condenser jointly with frame 1 around the fastening axle. After the maintenance return everything to the initial positions.

9.7 Gearbox Maintenance

Level check and oil filling, with the tractor on flat horizontal ground.

The oil level can be checked by undoing the plugs of the reference ports: upper one 5 and lower one 6 (Fig.18). Before checking the oil level, start the engine and run it for 3...5 min at the crankshaft rotation rate of 11.7...16.7 s-1 (700...1000 RPM). Shut off the engine and monitor the oil level within 3 minutes max. The level shall be between the reference ports. If necessary, refill oil.

If the tractor is equipped with PTO, check the oil level in GB after operation of the engine with the PTO coupling engaged.

Oil change

a) Undo drain plug 8 (Fig. 64, Page 96), drain oil. For better removal of spent oil and sludge, perform drainage immediately after engine shutdown. Clean the plug magnet. Put the plug back in place.
b) Wash up filter 3 of the gearbox.
c) Install the filter onto the gearbox. Pay attention to the fact that pack of filter elements 10 (Fig. 107) in the assembled filter shall be firmly tightened with nut 13.
d) Undo the plug of the oil filler port.
e) Fill clean oil into the gearbox.
f) Check the oil level in GB.
g) Screw in the plug of the oil filler port.

Washing of the gearbox filter

a) Undo plug 9 (Fig. 107) of the filter and drain oil.
b) Unscrew base 6 and detach cup 7 of the filter assembly from housing 1.
c) Undo nut 13 that fastens filter sections and take out locking nut 12, bushings 4, 11 and filter elements 10.
d) Wash cup 7 and all parts of the filter in diesel fuel.
e) Assemble the filter. Pay attention to the fact that pack of filter elements 10 (Fig. 107) in the assembled filter shall be firmly tightened with nut 13.

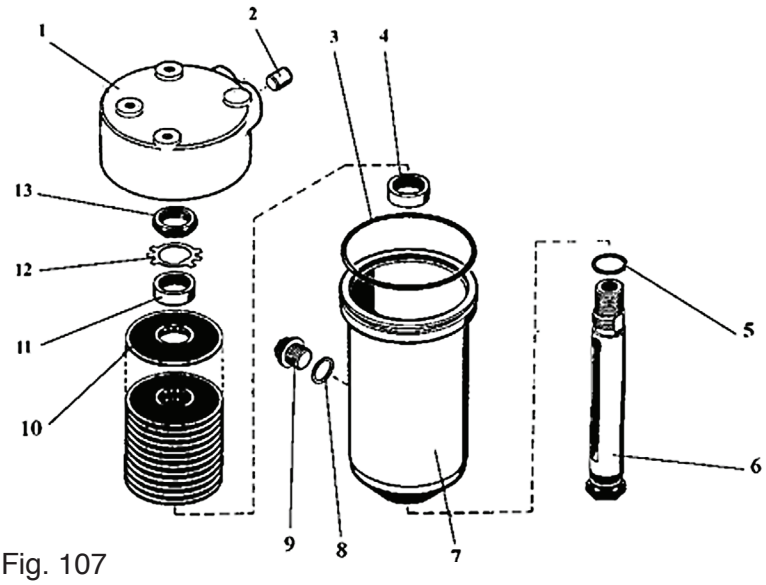


Fig. 107

Gearbox filter with pressure valve

1 - housing;
2 - blind plug;
3 - ring;
4 - bushing;
5 - ring;
6 - base;
7 - cup;
8 - gasket;
9 - plug;
10 - filter element;
11 - bushing;
12 - washer;
13 - nut

Adjustment of drain pedal drive

In the course of M-2 and M-3 sessions (after 500 engine hours of operation) it is necessary to adjust the drain pedal drive:

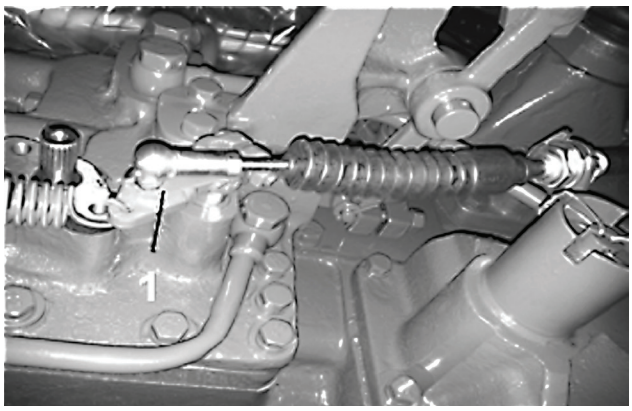


Fig. 111

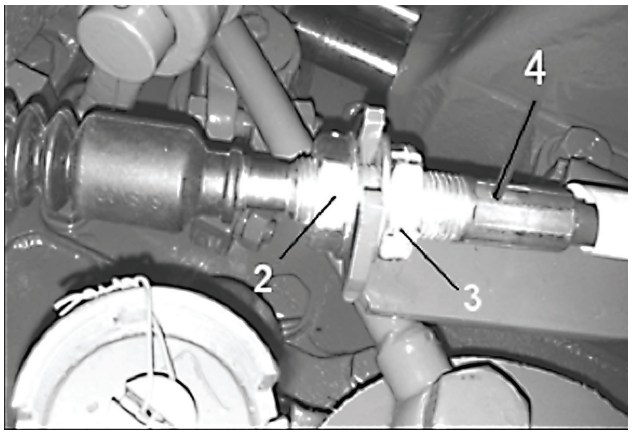


Fig. 108

- install the gear control rack in the fixed position corresponding to the neutral gear engagement;

- with loosened nut, pos. 2, screw in the adjustment nut, pos.3, until the beginning of turn of the lever, pos.1, under the action of cable, pos. 4;

- undo the adjustment nut, pos.3, by one turn;

- lock the adjustment nut, pos.3, by means of the nut, pos.2;

- check functioning of the wire rope drive - with the drain pedal pressed, changeover from neutral to 1st gear and vise versa shall be performed without jamming. After pressing the pedal a slow pedal return into the initial position is not allowed.

9.8 Maintenance of Driving Axles, Service Brakes

Level check, filling and change of oil in main gear cases, with the tractor on flat horizontal ground.

In order to check oil level, undo the plug from the reference port. Oil level in the main gear case shall coincide with the lower edge of the reference port. Fill oil through the reference port by means of a funnel with hose and drain oil through the port in the bottom part of the case. Unscrew the breather and close the port with a plug before oil filling. Wash the breather in diesel fuel, blow it down with compressed air and mount it back in place.

Level check, filling and change of oil in final gears

In order to check the level and fill oil in final gears, it is necessary to set one of the two triangular marks 1 (Fig.113) on the pinion carrier to the extreme lower position and undo plug 2. Fill oil by means of funnel. Drain oil through the drain port (reference port) when it is located in the bottom position, using the attachment for oil drainage.

Change oil in the following sequence:

- set one of the pinion carriers to the oil drainage position;
- drain oil from the final gear;
- set the second pinion carrier to the oil drainage position;
- drain oil from the second final gear;
- fill fresh oil into the first final gear and screw in the plug.

Change oil in the remaining final gears in a similar manner.

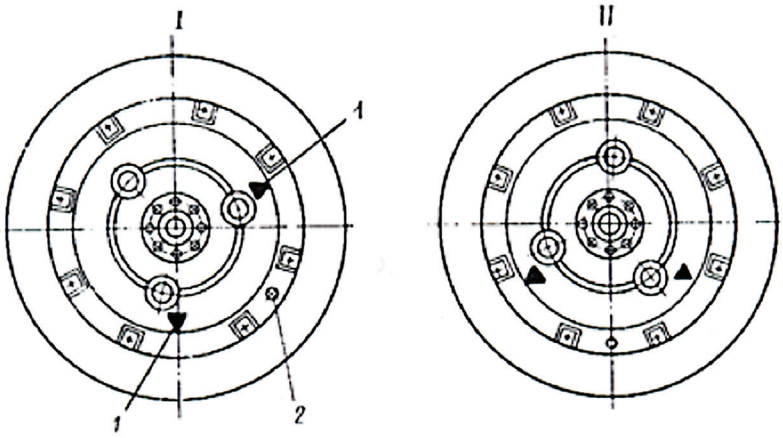


Fig.109

Final gear
1 - triangular mark; 2 - reference port plugs
I - pinion carrier position for oil level check and refilling;
II - pinion carrier position for oil drainage

Check and adjustment of the travel of brake chamber stems in service brakes

a) Check air pressure in the pneumatic system; if necessary, fill the system to the pressure of 6.5 - 8 kgf/cm^2.

b) Depress the brake pedal and check the travel of brake chamber stems 6 (Fig. 114). Stem travel shall be within 30-45 mm, travel difference between the right-hand and left-hand stems shall not exceed 7 mm.

If necessary, perform the following adjustment: rotate axle 5 to reach the travel value of 30-45 mm, rotate the worm each time at 1/6 of turn (60°) to the next fixed position. Thereafter check the tractor in driving.

Make sure of reliable and simultaneous action of brakes, absence of heating of brake drums 1 when the tractor drives without using brakes.

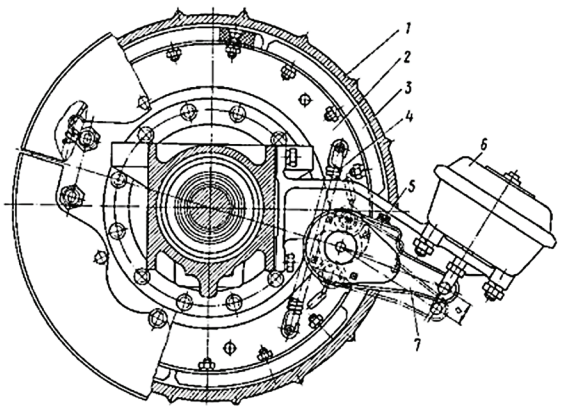


Fig. 110

Service brake
1 - brake drum;
2 - brake shoe;
3 - pad;
4 - spring;
5 - worm axle;
6 - brake chamber;
7 - brake lever;
a - brake chamber stem travel

9.9 Cardan Chaft Maintenance

In the process of operation observe the following rules of maintenance for cardan shafts:
a) at the end of each shift check the degree of heating of bearing assemblies using a pyrometer. The heating temperature shall not exceed 60°C. In case of overheating, take off the cardan shaft. Eliminate faults at TSS or in a workshop. In case of removal of cardan shafts from the tractor or their installation on the tractor, one cannot use tyre iron or any other items to be inserted into the joint for cardan shaft barring. This entails a damage of seals, which can lead to premature failure of cardan joints;

b) systematically check fastening of cardan joint flanges. All nuts shall be reliably tightened.

9.10 Maintenance of Tractor Pneumatic System

Condensate drainage from air cylinders

In order to ensure normal operation of the pneumatic drive, remove condensate from air cylinders after the completion of work, as condensate may get into tubes and instruments of the braking system and lead to their failure.

To remove condensate, move aside plug stem at the lower part of the cylinder.

In winter it is necessary to see for condensate absence with special attention in order to avoid its freezing in the drive tubes.

Tractor pneumatic system operation check

a) Fully release air from the pneumatic air by pressing the brake pedal several times.

b) Start the engine, set the manual fuel feed into the position of maximum crankshaft speed and switch on the chronometer.

c) Fill air into the system to reach the maximum pressure being determined by termination of movement of the air pressure gauge pointer, which is noticeable by eye. When in serviceable condition and with a normally adjusted pressure controller, the compressor shall fill the system up to the pressure of 0.65-0.8 MPa (6.5-8.0 kgf/cm^2) within 180 s (3 min) max.

d) Press the brake pedal; in doing so, the pressure should sharply fall and then there should be no movement of the air pressure gauge pointer, which is noticeable by eye while the pedal is shifted.

e) Press and depress the brake pedal to bleed air down to the pressure of 0.65 MPa (6.5 kgf/cm^2) min. Then check the pressure drop; it shall not exceed 0.05 MPa (0.5 kgf/cm^2) over (30±2) min with a free position of the pedal and over (15±1) min - with the pedal being fully pressed. If the pressure falls to a greater extent, visually find the air leakage point and eliminate the fault. If the limits for air pressure adjustment in the pneumatic system do not conform to the specified values, i.e. are not within the range of 0.65 - 0.8 MPa (6.5 - 8.0 kgf/cm^2), then it is necessary to perform maintenance of the pressure controller.

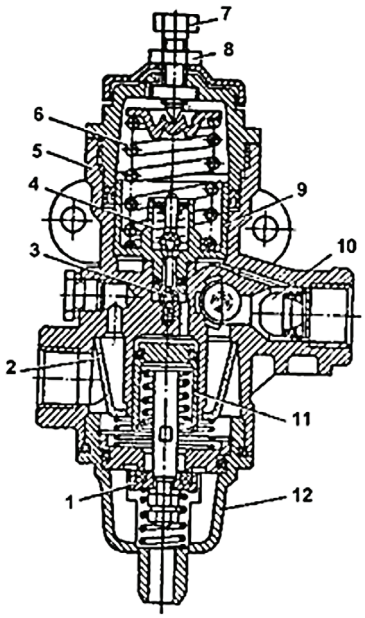
Pressure controller maintenance

Before maintenance of the pressure controller, inspect and clean it from dust and dirt.

Using the adjustment bolt, adjust the compressor activation pressure for air discharge into the pneumatic

system, which shall be 0.65 MPa (6.5 kgf/cm^2), and the pressure for compressor disconnection from the pneumatic system, which shall be 0.8 MPa (8.0 kgf/cm^2).

Bolt 7 (Fig. 115) with locking nut 8 located at the upper part of the controller shall be used for adjustment. The adjustment bolt should be screwed in with low air pressure and screwed out - with high air pressure. If one cannot manage to correctly adjust the pressure limits, the con-troller should be dismantled for repair. It is recommended to clean and wash the pressure controller filter periodically, once in every two months. It is especially important in case when oil gets into condensate due to a compressor fault.



Pressure controller

1 – pressure relief valve;
2 – filter;
3 – inlet valve;
4 – outlet valve;
5 – housing;
6 – spring;
7 – adjustment bolt;
8 – locking nut;
9 – servo piston;
10 – check valve;
11 – pressure relief piston;
12 – cover

Fig. 111

In order to clean the filter, undo cover 12 and carefully take it off along with pressure relief piston 11 and filter 2. Wash the filter in benzine and blow it down with compressed air. Per-form the assembly in the reverse order.

Brake system unit maintenance

Taps and valves do not need any special maintenance. Replace taps in case of any defects detected in the course of operation.

Maintenance of connecting heads consists of systematic inspection, cleaning from dirt. Connecting heads are closed with covers protecting them against the ingress of dirt, snow, moisture.

9.11 Maintenance of Hydraulic Systems of the Linkage and For Steering Control

Level check and change of oil in the hydraulic tank of the hydraulic systems of the linkage and for steering control.

With the tractor on a flat horizontal ground, check oil level in the hydraulic tank via the sight hole 25 (Fig. 116, Page 163); oil should be visible through the sight hole. Fill clean oil through the grill of filler port 7. When checking oil level in the hydraulic tank, make sure of the absence of foam generation.

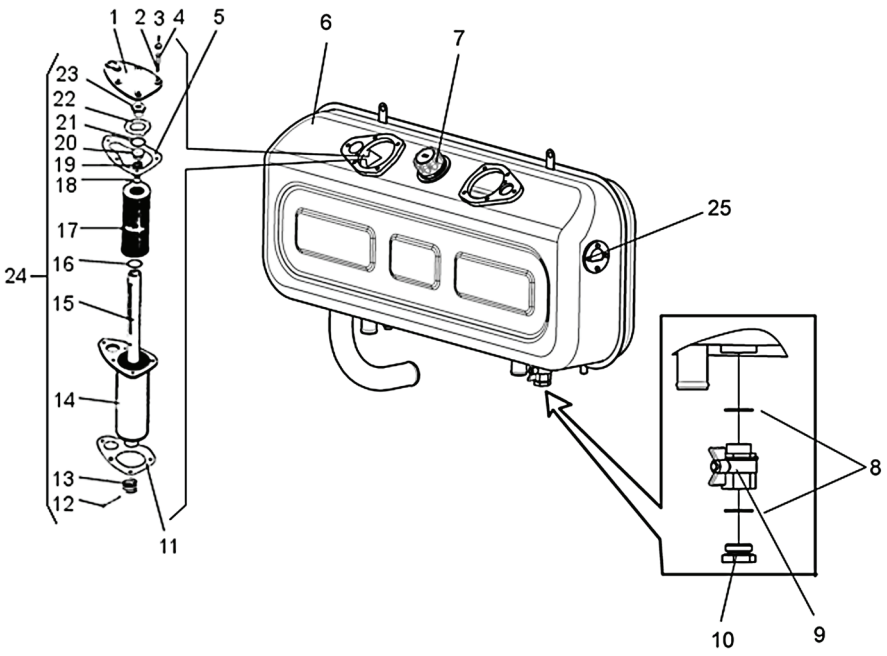


Fig. 112

Hydraulic tank

1 - cover; 2 - stud; 3 - nut; 4 - washer; 5 - gasket; 6 - tank housing; 7 - oil filler port; 8 - O-ring; 9 - ball valve; 10 - plug; 11 - gasket; 12 - splint pin; 13 - spring; 14 - filter housing; 15 - pipe; 16 - ring; 17 - filter element; 18 - washer; 19 - spring; 20 - valve; 21 - ring; 22 - washer; 23 - valve socket; 24 - filter assembly; 25 - sight hole

Keep clean during oil change; the oil is used not only as a service fluid but at the same time it performs lubrication of pump bearings; therefore the contamination of working fluid with mechanical impurities or water causes formation of burrs on the surface of journal bearings and results in pump failures.

Change oil in the following sequence:

a) immediately after shutdown of the engine undo plug 10, open ball valve 9 and drain heated oil;

b) replace filter elements 17, wash the filler port grill;

c) wash filler port 7 in diesel fuel and blow it down;

d) fill oil into the hydraulic tank, start the engine and run it for 2...3 minutes at a low crankshaft speed without rotating the steering wheel. Hydraulic distributor levers shall be in “Neutral” position;

e) increase the engine crankshaft speed and make several turns of the tractor all the way to the right and left; lift up and lower down the linkage several times;

f) shut off the engine and check oil level in the hydraulic tank and leak-tightness of connections; if necessary, refill oil into the tank.

Change of filter elements of the hydraulic tank main filters

a) Undo fastening nuts 3 (see Fig. 46) and take off cover 1.

b) Dismantle filter 24 with filter element and install it on the base of housing 14 (with splint pin 12 upwards).

c) Having compressed spring 13, take out splint pin 12 and take off the spring.

d) Take off pipe 15 along with filter element 17 from housing 14.

e) Take off lower rubber ring 16 and filter element 17.

f) Wash the filter housing in diesel fuel.

g) Change the filter element and assemble the filter in reverse sequence.

The second element shall be changed in a similar manner.

Pressure filter maintenance

Pressure filter

1 - electrical visual indicator of filter clogging DE-500;
2 - filter cup

In order to enhance the operating reliability of the hydraulic system for steering control, pressure filter HMM422C25XNR (Fig. 117) with filter element CHP422C25XN is installed in the tractor.

Perform maintenance of the pressure filter in case when indicator lamps 24 and 26 light up on the lower block of indicator lamps of the instrument panel (Fig.1, 2, 3, 4).

In order to perform maintenance of the pressure filter, unscrew the filter cup, replace the filter element and wash the cup. Replace filter element of CHP422C25XN filters on appearance of the clogging sensor signal on the instrument panel.

Fig. 113

Elimination of leaks in pipelines, hoses and seals of hydraulic units of the hydraulic systems for steering control and of the linkage

When there are leaks in seals of low-pressure hoses, execute the following operations:

a) dismantle the low-pressure hose, having drained the working fluid from hydraulic system pipelines;

b) check the quality of internal surface of the hose, replace it if any damage is detect-ed,

c) examine the pipeline surface and “zigs” on the pipe; if any surface damage is detected, file the damaged area and grind the sealing surface;

d) install the hose and tighten the clamps again in the prescribed order.

In case of leaks in unions and angles of hydraulic units, perform the following operations:

a) take off the union or angle;

b) remove rubber rings and thoroughly see for the absence of cuts or tears on their working surface; if the defects above are detected, replace the ring;

c) examine the surfaces being sealed; if any notches, signs of treatment are detected, dress them by scraper and grind them;

d) wash the surfaces being sealed with diesel fuel;

e) assemble the union or angle with nut and rubber rings, lubricate the sealing surface in the housing with oil and screw the union or angle into the housing until the nut contacts the housing, avoiding cuts of the ring being sealed. Perform final installation of the angle with the nut being in fixed position.

In order to prevent leakage in the hydraulic system during operation, it is necessary to take into account the following:

- tightening of high-pressure pipe connections and hoses with one wrench without supporting the second connection element is not allowed and can lead to destruction of welded joints of pipelines as a result of deformation;
- when dismantling low-pressure hoses, it is necessary to avoid damage of the internal rubber layer;
- leak-tightness of round-section rubber rings providing seals for parts of hydraulic system units depends upon cleanness of sealing surfaces, conservation of ring integrity upon mounting and depth of installation grooves;
- most leaks cannot be eliminated by tightening.

IMPORTANT!

In order to increase the lifetime of pump operation, the hydraulic system shall be refilled after drainage of the working fluid from the oil intake pipe as follows:

1. *Refill oil into the hydraulic tank through the oil filler port; in doing so, oil level shall reach the middle of housing of filter 11 (Fig.46).*
2. *Start the engine.*
3. *Pump out the system by making 3...5 tractor turns from end to end and by moving the linkage up and down 4 times.*
4. *Refill oil into the hydraulic tank.*

Installation and operation of high-pressure hoses

During installation and operation of hoses observe the following rules:

a) do not admit any twist of hoses during installation and dismantling, check the correctness of installation of hoses by straightness of the marking strip;

b) install hoses on the tractor in a manner preventing their rubbing or damaging by parts of assemblies of the tractor in operation;

c) do not expose hoses to mechanical loads as it can lead to their destruction;

d) do not permit the ingress of fuel and lubricants on the outer rubber layer of hoses.

9.12 Maintenance of Tractor Wheels

Check of the condition of tires and wheels

a) Every day before tractor departure examine the tires and wheels, clean the tires from foreign matter jammed in tire treads. Wheel parts with cracks and tires with defects reaching the cord or passing through should not be permitted for operation.

b) Protect tires from the ingress of fuel, oil and other petroleum products.

c) Tighten wheel nuts crosswise in a uniform manner, using a special wrench sup-plied along with the tractor.

d) To provide for a more uniform wear of the tire tread pattern, once in every 1900 - 2000 engine hours interchange positions of the front and rear wheels while observing the direction of rotation of wheels in view of the arrow applied on the tire surface.

Check of air pressure and tire inflation pressure

a) Undo the valve cap.

b) Measure the air pressure in tires by tire pressure gauge.

c) Take off the protection cap from the reference outlet valve located on the air cylinder and connect the hose for tire inflation to the valve.

d) Connect a union to the tip of this hose.

e) Connect the union tip to the tire valve.

f) Start the engine.

g) Inflate the tire to the required pressure (in accordance with recommendations set forth in Table 8, Page 119).

h) Take off the hose and check the pressure.

i) Screw in the valve cap.

9.13 Electrical Equipment Maintenance

Execute the maintenance operations for storage batteries in accordance with their operation manual to be supplied with the tractor.

Check of the battery charging rate

With the engine shut off:

Switch on the headlights for 2 minutes, switch them off, wait for a minute and check the battery by means of a load diagnostics instrument, for example, N-2001

To this end, connect the “-” clip to the “-” battery clamp, then make contact by the probe on the “+” battery clamp without pressing. – Battery voltage reading will appear on the digital indicator. In order to exactly determine the battery charging rate, follow the table:

Voltage, V	Charge level, %
12.72	100
12.50	75
12.35	50
12.10	25

In case of a contact of the battery clamp “+” with pressing, the load of 200A will be connected. Hold the probe on the “+” clamp with pressing for 5 s. Unless the voltage on the screen is below 9V, the battery is in good working order.

If a diagnostic device is missing, then monitor the voltage by the digital voltmeter on the instrument panel.

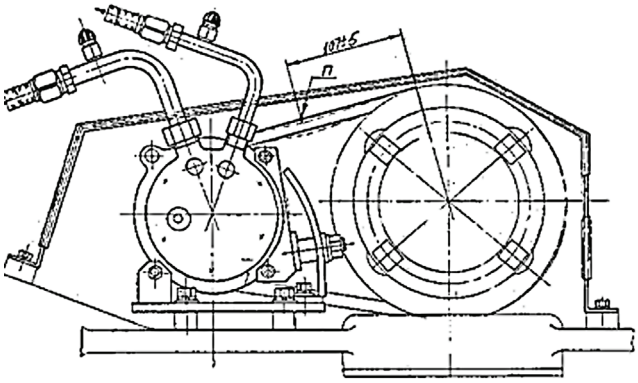
With the headlights switched off, the voltmeter voltage shall not be less than 24.5V. If the voltage is less, it is necessary to take off the battery and charge it from a fixed charger.

If the voltage is higher than or equal to 24.5V, then start the engine up. Run the engine for at least 2 minutes at idle. Then increase the speed to 1500 RPM and give the full load (service lights, headlights, salon heaters are on). If the voltmeter readings are between 27.2V and 28.8V, the generator is operating normally.

Maintenance of air conditioning system

In operation with the use of air conditioner, it is necessary to do the following:

1. Every day perform an inspection of the condenser and remove chaff, vegetation particles, stuck dirt from the plates and interplate cavities and blow the condenser down with compressed air, as well as check the tension of V-belt of the compressor drive.
2. When performing M-1, M-2, M-3, check the tension of the compressor drive belt and, if necessary, make adjustments. When the force of 4±0.2 kg is applied at point “P”, belt deflection (Fig.114) shall be within 9...14 mm.



Adjustment of the tension of the compressor drive belt

Fig. 114

3. In winter season it is necessary to take off the compressor drive belt from the sheaves.
4. Dehydration filter of the moisture and oil separator must be changed once a year.
5. The frequency of air filter replacement in the air conditioning system shall be once in every 500 engine hours but at least once a year.
6. The frequency of air filter cleaning and purging in the air conditioning system shall be once in every 125 engine hours during M-1.

Maintenance

IMPORTANT!

During operation of the tractor it is necessary to take into account the following features of the air conditioning system.

1. At the ambient temperature below 0°C the system does not operate (the system is deactivated by the sensor).

2. In order to prevent a system failure during tractor operation and non-use of air conditioner within this period, it is necessary to do the following:

2.1. Once in every two weeks run the compressor for 5 min.

2.2. At the ambient temperature below 0°C run the compressor for 5 minutes once in every two weeks in a room with the temperature above 0°C.

3. In case of warehousing storage (at the ambient temperature above or below 0°C), periodic start-up of the compressor is not required.

NOTE!

In order to prevent compressor jamming after winter period or a long-term service interruption, perform manual barring of compressor shaft for 10 turns clock-wise (to this end, supply +12/+24V to the compressor coupling for its activation). This operation is required to supply oil from compressor case to the cylinders and lubricate them.

Recommendations for maintenance of the air conditioning system

1. Fill the system with 950 g* of R134a halocarbon.
2. System filling with halocarbon and replacement of system units shall be performed only by specialists dealing with air conditioning maintenance and repair.
3. Do not mix R134a halocarbon with any other refrigerants or use any refrigerant except the permissible one.
4. Do not:
   work with one (out of 2) faulty fan of the evaporator unit;
   fill the engine cooling system and air conditioning system with water.
5. Use oil of ZXL100PG or PAG-100 grade for compressor lubrication. The volume of oil to be filled is 200 ml (with compressor Sanden SD7H15) or 150 ml (with compressor Zexel TM-14HD)*. It is not allowed to store or keep it open for more than 30 min. In case when the above-mentioned period is exceeded, oil shall not be suitable for use.
6. It is not allowed to use spent oil.
7. The ingress of moisture into oil is not allowed.
8. In case of depressurizing upon system refilling, it is necessary to replace the dehydration filter of the moisture and oil separator.

NOTE!

The data on the amount of halocarbon and refrigerating oil are given for the system filled at the manufacturer's plant. In case of system refilling in the course of operation, in order to determine the required amount of oil in the compressor, it is necessary to consult with your MTZ Equipment Ltd. dealer or a specialised company dealing with maintenance and repair of air conditioners.

IMPORTANT!

Air conditioning system shall be operated and maintained in accordance with the instruction for air conditioner supplied with the tractor.

10 STORAGE REGULATIONS

Perform preparation, storage and depreservation of the tractor in accordance with the provisions set forth in this section and operation manuals for the engine and storage batteries supplied with the tractor.

Station the tractors for:

storage between shifts	- service interruption up to 10 days;
short-term storage	- from 10 days to two months;
long-term storage	- over two months.

Operations related with the tractor preparation for storage shall be executed by specialised teams or mechanical workers under supervision of the person responsible for storage. Mechanical workers shall put the prepared tractor for storage and the responsible persons shall accept it for storage. The placement of tractor for, and its withdrawal from a long-term storage shall be documented by certificates.

Tractors shall be stored indoors or under canopy. It is allowed to store them at equipped out-door grounds with obligatory execution of the activities related to preservation, pressurization of the tractor and removal of its components to be kept in the warehouse.
Check the tractor condition during the period of storage at least once in two months in case of indoor storage and once a month in case of storage outdoors and under canopy. After strong winds, rains and snow drifts see for and eliminate the detected flaws immediately. The results of periodic checks shall be recorded in the inspection logbook. Maintenance during the storage shall be performed in accordance with the guidelines set forth in item 7.3.

10.1 Tractor Preparation for Short-Term and Long-Term Storage

The tractor shall be placed for short-term and long-term storage immediately after the completion of works and activities as per M-1.

The tractor preparation for a short-term storage consists of the following:

- clean the tractor from dust, dirt, leaks of oil, vegetative and other remains. After the cleaning and washing, blow off the tractor with compressed air in order to remove moisture;
- check the level of oil and, if necessary, refill it into the gearbox and cases of main and final gears of driving axles.

If the tractor is stored at negative temperatures, it is necessary to replace oils of summer grades with winter grades in the engine and gearbox lubrication systems and driving axles according to the lubrication table.

After drainage of sludge from air cylinders, wipe the valves dry, apply plastic grease;

- undo plugs of hydraulic tank in the hydraulic systems of the linkage and for steering control, PDR, expansion tank, PTO; wash them up and wipe dry; lubricate the threaded joints of plugs with plastic grease and screw them back in place; wrap (cover) them with polyethylene film and bind them with packing twine;

Storage

- blow off filter element of the air cleaner with compressed air. Wrap polyethylene film around the upper part of the exhaust and air intake pipes along with the above-mentioned plugs of filler ports and bind them with packing twine.
- apply preservation oil or grease on threaded connections of the central pull rod, vertical struts, spherical surfaces of the central pull rod and lower links of the linkage, protruding parts of the stems of hydraulic cylinders in hydraulic systems for steering control and of the linkage; pre-clean and remove traces of corrosion; wash up, de-grease and dry up the surfaces. Having applied the preservation oil or grease, wrap the above-mentioned threaded joints, spherical surfaces and parts with a polyethylene film of paraffin paper, bind them with packing twine;
- set the levers and pedals of control mechanisms to the position preventing inadvertent activation of the tractor and its units into operation;
- put the tractor on props or pads in a position where semi-frames and other assemblies cannot be warped or bent and pneumatic wheels and springs can be unloaded. Clearance between the tires and seating area shall be 80 - 100 mm;
- disconnect the storage batteries; clean and remove traces of corrosion and electrolyte; clean up vents, lubricate connection terminals with plastic grease. Determine the level and density of electrolyte in accordance with the operation manual “Lead starting storage batteries”. In case when the tractor is to be stored at low temperatures or storage period exceeds one month, take off storage batteries and deliver them to the warehouse. Headlights, generator, starter shall be cleaned, blown off with compressed air; their fasteners and connecting terminals shall be lubricated with plastic grease;

11 TROUBLESHOOTING

11.2 General Troubleshooting

Fault	Troubleshooting
Transmission faults	
Increased heating of the pump drive reducer: no grease, clogging of oil channels.	Clean the oil supply channels
No or insufficient oil pressure in the gearbox:	
Oil leak at oil pipeline connections.	Eliminate the leak.
Decreased oil level in GB.	Refill oil.
Oil pressure sensor or gauge is faulty.	Replace it.
Hydraulic system pressure valve is stuck.	Wash up and adjust the pressure valve. Adjust the pressure valve with rated engine speed at any gear for the pressure of 11-12 kgf/cm^2 by screwing the plug in. Use pressure gauge of at least 2.5 class with the measurement scale limit of 15-20 kgf/cm^2. Oil pressure in the GB hydraulic system at gears with the engine crankshaft speed of 1800 RPM shall be 1.0 – 1.2 MPa (10 – 12 kgf/cm^2) for K-744R1, K-744R2 tractors and 1.1 – 1.3 MPa (11 – 13 kgf/cm^2) for K-744R3, K-744R4 tractors at the engine crankshaft speed of 900-1800 RPM. Oil pressure growth at each gear shall be rapid. The pressure on neutral gear and at engagement of synchroniser brakes shall not be less than on transmission gears.
Loss of GB pump performance.	Check and adjust pressure in accordance with item 6.9. If necessary, replace the pump.
increased noise at the pressure valve area when the gear change lever is in Neutral position or with the drain pedal fully pressed.	Check the oil level in GB. If the tractor is equipped with PTO, perform the level check with PTO engaged.
Constant increase of the oil level in gearbox, oil discharge from the GB breather tube, rapid overheating of oil in GB, loss of power (GB overfilling with oil due to "overflow" from the hydraulic tank through PDR pump seals).	Find the pump with "overflow", perform a replacement or repair to eliminate the flow.
Tractor imbalance with the load shaft gear coupling engaged and the gear change lever in "actuation of synchronizer brakes" position:	
Disc warping.	Replace the discs.
Wear of synchronizer brake shoes.	Replace the synchronizer brake shoes.

Troubleshooting

Fault	Troubleshooting
Maladjustment of the drain gate valve control drive:	
Slow return of the drain pedal. Increase of the shifting force, jamming at changeover N-1, 1-N with the drain pedal fully pressed. Drain pedal stuck at the 1st gear.	Adjust the drain pedal drive. With the wire rope drive adjusted correctly, the drain pedal in the depressed position shall rest against the bolt with the gear control drain lever turned all the way in clockwise. With the drain pedal released, the drain lever should be turned all the way in clockwise. If necessary, replace the remote control wire rope.
Oil leaks from driving axles:	
- increased oil level;	Drain the excess of oil.
- breather contamination; - failure of seals.	Wash and blow off the breather. Replace the seals.
Jerks at taking off and hammering - loosened attachment of the connecting flanges of cardan shafts.	Tighten the nuts.
Increased heating of shafts at the area of bearing assemblies of cardan shafts - absence of lubricants, ingress of dust and dirt due to collar damage and wear.	Clean and wash oil-conducting channels of the crossbar. Replace worn and damaged parts.
Faults of the steering control hydraulic system	
Oil foaming and discharge through the filler port of the hydraulic tank:	
- insufficient amount of oil; - air inflow in pipelines connecting the hydraulic tanks to pumps.	Refill oil. Eliminate the air inflow to the connecting pipelines or over the plug of siphonal device at the center of the upper wall of hydraulic tanks.
Tractor and the steering wheel do not turn:	
- insufficient amount of oil in the hydraulic tank;	Fill oil into the hydraulic tank until the level appears in the sight hole.
- the pumps do not rotate due to engine shutdown.	Turn the lever on the engine shutdown PDR towards the cabin.
Jamming of the gate valve or hydraulic motor of the hydraulic steering wheel.	Replace the hydraulic steering wheel.
Difficult steering control:	
- the pump performance is low or the flow controller throttle is clogged;	Check the time of full tractor turn from one extreme position to the other at the engine crankshaft speed of 1300 and 1900 RPM and at the maximum possible rotation speed of the steering wheel.

Fault	Troubleshooting
	If the time of turn is the same (and is over 5 s), then the cause of fault is the ingress of foreign particles into the gap between the throttle and the adjustment screw of the flow controller. It is necessary to dismantle the flow controller (installed on the left-hand pump in the direction of tractor travel) and wash its parts in diesel fuel without disturbing the adjustment screw. If the time of turn is still more than 5 s, it is necessary to replace the pump of steering control system.
- internal oil overflows over hydraulic cylinder seals;	Replace the hydraulic cylinders with repaired (or new) ones that have been checked for leak-tightness.
Increased vibrations of tractor semi-frames at turns on the spot and in motion:	
- presence of air in service cavities of hydraulic cylinders and hydraulic units;	By running the engine at the maximum idle run speed, heat up the hydraulic system to the temperature of 50 – 60°C and pump out the hydraulic system until a smooth turn of semi-frames and the safety valve are achieved (reaching the “stop”) by turning the steering wheel to the right and to the left three revolutions each without achieving the safety valve (without reaching the “stop”). Perform the works with the rear axle disengaged. When pumping out the hydraulic system, turn the steering wheel at the maximum speed in order to exclude its vibrations. Eliminate any occurring leaks.
- the grade of service oil in the hydraulic system does not correspond to the specified grade.	Replace oil as per lubrication table.
Excessive free travel of the steering wheel:	
- presence of air in the hydraulic system.	Heat and pump out the hydraulic system as mentioned above.
Faults of the hydraulic system for linkage control	
Excessive heating of oil in the hydraulic system:	
- insufficient amount of oil; - fault of oil radiator of the hydraulic system for steering control.	Refill oil. Replace the faulty radiator.
The linkage is lifting slowly:	
- insufficient amount of oil; - air inflow in hydraulic pipelines connecting the hydraulic tank with the pump.	Refill oil. Eliminate the air inflow.
- excessive oil leak in the pump, hydraulic distributor; - Seals of the hydraulic cylinder piston are not leak-tight enough.	Replace the defective assembly. Restore the piston seals or replace the hydraulic cylinder.

Troubleshooting

Fault	Troubleshooting
The handle of hydraulic distributor does not return to position "Neutral" from position "Lifting" or "Forced lowering" at the end of operating travel:	
- excessive oil heating; - jamming of gate valves in the housing of hydraulic distributor irrespective of the oil temperature.	Eliminate the fault as specified above. Replace the hydraulic distributor.
Increased draft of implement in the transportation position with hydromechanical valves closed - insufficient leak-tightness of the hydraulic cylinder piston.	Check the leak-tightness of hydraulic cylinders for lifting.
Faults of pneumatic system	
Lighting up of the "parking brake is activated" indicator lamp with the engine in operation and the parking brake deactivated:	
- air leak in the parking brake circuit.	Eliminate the air leak.
No pressure in one or two air cylinders.	
The triple safety valve is faulty (see the diagram in the appendix).	Replace the valve.
Pressure controller often actuates with the pneumatic system filled.	
Air leak through connections of the pneumatic system.	Eliminate the leak by tightening the connections (determine the leak area "by ear" or "by touch").
Air leak through one of the pneumatic units.	Replace the unit.
Ineffective braking or no braking with the brake pedal fully pressed.	
Travel of brake chamber stems is not adjusted.	Adjust it.
Brake valve is faulty.	Connect pressure gauges to the valves of reference outlet of the brake valve upper and lower sections. If the pressure by pressure gauge readings is less than by the instrument panel indicator (Fig. 6) at the full travel of the brake valve lever, replace the brake valve.
Air leak from brake chambers.	Replace the chamber membrane.
Electrical equipment faults	
Electrolyte level decreases very fast:	
- leak of electrolyte from battery jars;	Repair or replace the storage battery.
- the voltage controller maintains a high level of voltage in the electrical system of the tractor.	Replace the generator.
The turn indicator lights are faulty:	
- the fuse is blown;	Eliminate a short-circuit in the wiring, after which replace the fuse.

Fault	Troubleshooting
- a faulty contact in the terminal connections or a wire break;	Restore the contact in the terminal connections, check the electric wiring serviceability.
- faulty disconnecting relay of the turn indicator;	Replace the disconnecting relay.
- light lamps are burnt out.	Replace the lamps
Rattling noise of the sound signal:	
- loosened fasteners of signal connection, cover or coil;	Tighten the fasteners.
- cracks in the membrane.	Replace the signal.
The sound signal does not activate:	
- the fuse is blown; - faulty contact in the signal button.	Eliminate a short-circuit in the wiring, after which replace the fuse. Restore the contact.
Instrumentation does not provide readings or provides incorrect readings:	
- the fuse is blown; - faulty contact in the indicator-sensor circuit; - faulty indicator or sensor.	Eliminate a short-circuit in the wiring, after which replace the fuse. Check the reliability of wire connection to indicators and sensors. Replace the indicator or sensor.
The indicator lamp "Battery charging" is on (at the instrument panel) with the engine in operation:	
- tension of the generator drive belt is not sufficient;	Tighten the belt.
- break in the power circuit of excitation winding, oxidation of adapter terminals, loosening of terminal clamps;	Restore the circuit integrity, clean and tighten the adapter terminals.
- hanging up, wear of brushes, fracture of springs in brush holders;	Check the condition of brush assembly; if necessary, replace the brushes, springs.
- earth fault of the wires feeding the generator excitation winding;	Eliminate a short circuit in the power circuit of the generator excitation winding
- voltage controller has decreased the level of voltage being controlled in the electrical network of the tractor.	Replace the generator.

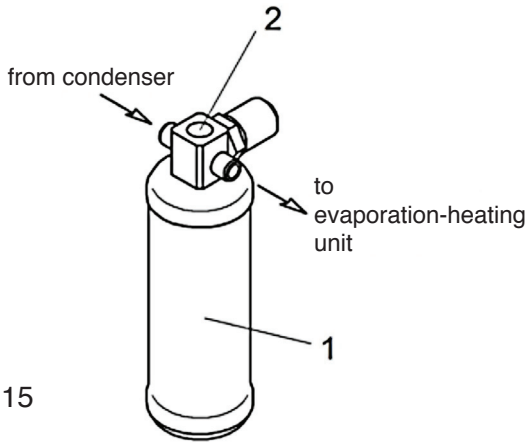


Fig. 115

Receiver of air conditioning system
1 – receiver; 2 – sight hole

Condition of refrigerant in sight hole 2 Fig. 115			
Description	Almost transparent fluid Some gas bubbles may appear	Transparent fluid. No bubbles Refrigeration capacity is not sufficient	Milk-colored fluid Large amount of gas bubbles
Condition of the system	The system is filled normally	It is possible that the system is overfilled Contact Dealer	The amount of refrigerant is insufficient. Contact Dealer

Fig. 116 Check the amount of refrigerant via the sight hole

Fault	Troubleshooting
Inefficient operation of air conditioner	Clean the condenser, compressor with coupling and air filters under the cabin roof with compressed air in order to remove dust and dirt. Activate air conditioner and check the level of refrigerant in the receiver (Fig. 50). Contact the service center in case of insufficient or excess level of halocarbon.
Air conditioner cannot be activated	Electric wiring is faulty. Check the contacts of electric wiring harness. Fuse defect. Replace the fuse. Low pressure in the system. ***Check the pressure. If needed, check the system for leaks and refill the system.*** Excessive pressure in the system. Check the condition of condenser; if necessary, blow it down with compressed air.
The air conditioner gets activated and switches to cyclic operation with the operating cycle of 0.5-1.0 s.	If the temperature in the cabin is high, a low performance of the fan is possible. ***Check the pressure in the system (perhaps it is overfilled) and, if necessary, bleed the excessive amount of refrigerant.*** Check the air filters; if needed, replace them.
The air conditioner gets activated and switches to cyclic operation with the operating cycle of 5 s min.	If the temperature in the cabin is not high, then the evaporator overcooling protection picks up, which is not a fault. Check the fan performance (replace it, if needed).
Loud noise of the compressor.	Ball bearing defect. ***Replace the compressor.*** Electromagnetic coupling defect. ***Replace the coupling.***
V-belt noise.	The belt is worn out, replace it.

N o t e . The works selected in bold type shall be executed only by certified specialists.

11.3 Engine Electronic Control System Error Codes

Color	Description
	relevant for vehicles with Daimler Transmission (Tier4 Powerpack) only
	relevant for EU6 vehicles only

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
70	2	460002	Park Brake Status Not Plausible (Vehicle Moving)	Check J1939 link connection to Park Brake Switch Check Parameter 13/28 (Park Brake Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	
70	13	46000D	J1939 Park Brake Switch Signal from Source CCVS1, CCVS2 or CCVS3 is missing or not available = SNA (signal not available)	Check J1939 link connection to Park Brake Switch Check Parameter 13/28 (Park Brake Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	ON	OFF	OFF	
70	19	460013	J1939 Park Brake Switch Signal from Source CCVS1, CCVS2 or CCVS3 is erratic = undefined value but not SNA	Check J1939 link connection to Park Brake Switch Check Parameter 13/28 (Park Brake Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	ON	OFF	OFF	
84	0	540000	Vehicle Speed above programmable Threshold #1. This is not a system failure/fault.	This is an information-only fault. It indicates the vehicle is above a programmable threshold. Check Parameter 08/23 (vss driving diagnostic limit).	ON	OFF	OFF	
84	2	540002	Vehicle Speed Signal lost	Unexpected Loss of hard-wired Vehicle Speed signal. Check wiring of associated pin and cables.	OFF	OFF	OFF	Pin 3/13
84	3	540003	Vehicle Speed Sensor Circuit shorted to Ubat	Check wiring of associated pin	ON	OFF	OFF	Pin 3/13
84	4	540004	Vehicle Speed Sensor Circuit shorted to GND	Check wiring of associated pin	ON	OFF	OFF	Pin 3/13
84	5	540005	Vehicle Speed Sensor open Circuit (broken wire, terminal floating)	Check wiring of associated pins	ON	OFF	OFF	Pin 3/13 (Supply) Pin 3/02 (GND)
84	6	540006	Vehicle Speed Sensor Anti-Tamper Detection via ABS Vehicle Speed Comparison (ABS speed and Vehicle Speed Sensor are not consistent)	Check wiring of ABS Module and VSS (Pin 3/13). Check max. Parameter 40/01(ABS Diff Thresh Veh Speed).	ON	OFF	OFF	Pin 3/13
84	7	540007	Hall effect Vehicle Speed Sensor wiring mismatch, rationality fault	Check wiring of hall effect Vehicle Speed Sensor	ON	OFF	OFF	
84	11	54000B	Vehicle Speed above programmable Threshold #2. This is not a system failure/fault.	This is an information-only fault. It indicates the vehicle is above a programmable threshold. Check Parameter 08/15 (vss absolute diagnostic limit).	ON	OFF	OFF	
84	13	54000D	J1939 Wheel-Based Vehicle Speed Signal from Source CCVS1, CCVS2 or CCVS3 is missing or not available = SNA (signal not available)	Check J1939 link connection to Wheel-Based Vehicle Speed Sensor Check Parameter 08/13 (Vehicle Speed Sensor) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	
84	14	54000E	Hall effect Vehicle Speed Sensor supply voltage out of range	Check wiring of hall effect Vehicle Speed Sensor	ON	OFF	OFF	
84	19	540013	J1939 Wheel-Based Vehicle Speed Signal from Source CCVS1, CCVS2 or CCVS3 is erratic = undefined value but not SNA	Check J1939 link connection to Wheel-Based Vehicle Speed Sensor Check Parameter 08/13 (Vehicle Speed Sensor) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	
84	20	540014	Vehicle Speed Sensor Drifted High Error (VSS signal not plausible)	Check wiring of associated pin	ON	OFF	OFF	Pin 3/13
84	21	540015	Vehicle Speed failure (VSS Signal Not Plausible)	Check wiring of associated pin	ON	OFF	OFF	Pin 3/13

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
91	0	5B0000	Accelerator Pedal Circuit shorted to Ubat	Check wiring of associated pins	ON	OFF	OFF	Pin 1/07 (Supply) Pin 1/04 (GND)
91	2	5B0002	Accelerator Pedal out of adjustment (Learn error)	Check wiring and calibration; Restart learning routine (chapter 7.4, routines 1 to 3)	ON	OFF	OFF	Pin 1/07
91	4	5B0004	Accelerator Pedal Circuit shorted to GND	Check wiring of associated pins	ON	OFF	OFF	Pin 1/07 (Supply) Pin 1/04 (GND)
91	7	5B0007	2-Channel Accelerator Pedal Idle Not Recognized (idle area not evaluated)	Check wiring of associated pins. Check Idle Position	ON	OFF	OFF	Pin 1/03 Pin 1/04 Pin 1/06 Pin 1/07
91	8	5B0008	2-Channel Accelerator Pedal Signal 1 missing	Check wiring of associated pins	ON	OFF	OFF	Pin 1/03
91	10	5B000A	Throttle pedal rationality check failed	Rationality check routine for throttle pedal position: If current throttle pedal value is above a certain calibratable value (i.e. 10%) while service brake is actuated in conjunction with a real strong vehicle deceleration, throttle pedal position is recognized as erroneous and a fault will be logged. The position furthermore is ramped down to 0%. As soon as original pedal position is back again to 0% the fault is deactivated.	OFF	OFF	OFF	
91	13	5B000D	J1939 EEC2 message is missing or not available	Check J1939 link connection and devices: Turbocharger	ON	OFF	OFF	
91	14	5B000E	2-Channel Accelerator Pedal Not Learned	Start learning routine (chapter 7.4, routines 1 to 3): – Accelerator Pedal Learning: Start – Accelerator Pedal Learning: Stop – Accelerator Pedal Learning: Request Results Status	ON	OFF	OFF	Pin 1/03 Pin 1/04 Pin 1/06 Pin 1/07
91	31	5B001F	2-Channel Accelerator Pedal Learned Range to Large	Check wiring and calibration; Restart learning routine (chapter 7.4, routines 1 to 3): – Accelerator Pedal Learning: Start – Accelerator Pedal Learning: Stop – Accelerator Pedal Learning: Request Results Status	ON	OFF	OFF	Pin 1/03 Pin 1/04 Pin 1/06 Pin 1/07
96	13	60000D	Fuel Level Sensor Missing or Not Available	Check CPC4 PT-CAN link connection. Check MCM functionality / PT-CAN link connection. Check J1939 CAN message PGN 65276 (Dash Display) and according ECU (e. g. Dashboard)	OFF	OFF	OFF	
96	19	600013	Fuel Level Sensor Received Network Data in Error	Check CPC4 PT-CAN link connection. Check MCM functionality / PT-CAN link connection. Check J1939 CAN message PGN 65276 (Dash Display) and according ECU (e. g. Dashboard)	OFF	OFF	OFF	
107	0	6B0000	Air Filter Restriction High	Check air cleaner for restriction. Perform pressure check/visual inspection of plugged inlet air filters, charge air cooler leaks or restriction, leaking or plugged intake manifold, exhaust leaks/plugging. Replace Air filter and delete fault code memory via service tool or instrument cluster if supported.	OFF	OFF	OFF	
107	2	6B0002	Air Filter Sensor plausibility error	Check wiring of associated pin Check parameter 13/11 (3 01 AI Selection) for correct configuration of input pin 3/01 Check air cleaner for restriction. Perform pressure check/visual inspection of plugged inlet air filters, charge air cooler leaks or restriction, leaking or plugged intake manifold, exhaust leaks/plugging. Replace Air filter and delete fault code memory via service tool or instrument cluster if supported.	ON	OFF	OFF	Pin 3/01
107	3	6B0003	Air Filter diff.-pressure Sensor or switch shorted to Ubat	Check wiring of associated pin Check parameter 13/11 (3 01 AI Selection) for correct configuration of input pin 3/01 Check air cleaner for restriction. Perform pressure check/visual inspection of plugged inlet air filters, charge air cooler leaks or restriction, leaking or plugged intake manifold, exhaust leaks/plugging. Replace Air filter and delete fault code memory via service tool or instrument cluster if supported.	ON	OFF	OFF	Pin 3/01

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
107	4	6B0004	Air Filter diff.-pressure Sensor or switch shorted to GND	Check wiring of associated pin Check parameter 13/11 (3 01 AI Selection) for correct configuration of input pin 3/01 Check air cleaner for restriction. Perform pressure check/visual inspection of plugged inlet air filters, charge air cooler leaks or restriction, leaking or plugged intake manifold, exhaust leaks/plugging. Replace Air filter and delete fault code memory via service tool or instrument cluster if supported.	ON	OFF	OFF	Pin 3/01
111	1	6F0001	Coolant Level below safe operating level – (SEL Condition)	Check coolant level in reservoir. If coolant level is not within limit, refill coolant to proper level. If it is within proper level, change coolant level sensor. Check coolant leak at cylinder head gasket, coolant leak at air compressor head gasket, external coolant leak at hose connections, coolant in oil, lose or faulty radiator cap, heating system for leaks.	ON	ON	OFF	
111	3	6F0003	Coolant Level Circuit shorted to Ubat	Check wiring of associated pins	ON	OFF	OFF	Pin 3/02 (GND) Pin 3/11 (Supply)
111	4	6F0004	Coolant Level Sensor Circuit Failed Low	Check wiring of associated pins	ON	OFF	OFF	Pin 3/02 (GND) Pin 3/11 (Supply)
111	6	6F0006	Coolant Level Sensor Circuit shorted to GND	Check wiring of associated pins	ON	OFF	OFF	Pin 3/02 (GND) Pin 3/11 (Supply)
111	13	6F000D	Coolant Level Sensor Data not received or Data not available (SNA)	Check coolant level sending data / device on Network	ON	OFF	OFF	
111	18	6F0012	Coolant Level below operating level (pre-warning condition)	Check coolant level in reservoir. If coolant level is not within limit, refill coolant to proper level. If it is within proper level, change coolant level sensor. Check coolant leak at cylinder head gasket, coolant leak at air compressor head gasket, external coolant leak at hose connections, coolant in oil, lose or faulty radiator cap, heating system for leaks.	ON	OFF	OFF	
111	19	6F0013	Coolant Level Sensor Received Data in Error Range	Check coolant level sending data / device on Network	ON	OFF	OFF	
120	13	78000D	J1939 Retarder Fluid Message is missing or not available (J1939 Cabin Message is missing or not available?)	Check J1939 link connection to transmission retarder	OFF	OFF	OFF	
158	2	9E0002	KL15 ignition switch status of CPC and MCM do not match.	Check KL15 wiring at Pin 2/03	ON	OFF	OFF	Pin 2/03
168	0	A80000	Battery Voltage High	Check Voltage KL15 and KL30 (Fault Condition Battery Voltage > 35V) Check wiring of associated pins	ON	OFF	OFF	Pin 2/01 Pin 2/03
168	1	A80001	Battery Voltage Very Low	Check Voltage KL15 and KI30 (Fault Condition Battery Voltage < 9.8V) Check wiring of associated pins If vehicle Is equipped with a battery disconnect switch, it must be inspected	ON	OFF	OFF	Pin 2/01 Pin 2/03
168	9	A80009	Main battery connection lost	Check battery main switch and battery wiring (KL30)	ON	OFF	OFF	Pin 2/01 Pin 2/03
168	14	A8000E	ECU powerdown not completed (Main Battery Terminal Possibly Floating)	Check wiring of associated pins If vehicle Is equipped with a battery disconnect switch, it must be inspected	OFF	OFF	OFF	Pin 2/01 Pin 2/03
168	18	A80012	Battery Voltage Low	Check Voltage KL15 and KL30 (Fault Condition Battery Voltage < 19.2V) Check wiring of associated pins	ON	OFF	OFF	Pin 2/01 Pin 2/03

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
171	2	AB0002	Ambient Temperature Sensor Data Erratic	Check ambient temperature sensor (wiring and associated pin) Check parameter 31/01 (Ambient Air Temp Sensor Enable) for correct configuration of Ambient Temperature Sensor	ON	OFF	OFF	Pin 3/15
171	3	AB0003	Ambient Temperature Sensor shorted to Ubat	Check ambient temperature sensor (wiring and associated pin) Check parameter 31/01 (Ambient Air Temp Sensor Enable) for correct configuration of Ambient Temperature Sensor	ON	OFF	OFF	Pin 3/15
171	4	AB0004	Ambient Temperature Sensor shorted to GND	Check ambient temperature sensor (wiring and associated pin) Check parameter 31/01 (Ambient Air Temp Sensor Enable) for correct configuration of Ambient Temperature Sensor	ON	OFF	OFF	Pin 3/15
171	19	AB0013	J1939 AMB message has not been received within it's expected time	Check ambient message sending data/ device on Network	ON	OFF	OFF	
191	8	BF0008	Transmission Output Shaft Speed Signal is missing or not available	Check Transmission wiring	OFF	OFF	OFF	
191	9	BF0009	J1939 ETC1 Message is missing or not available	Check J1939 link connection to Transmission Controller / Check if Electronic Transmission Controller is CAN capable	ON	OFF	OFF	
191	13	BF000D	J1939 Transmission Output Shaft Speed Signal is missing or not available = SNA (signal not available)	Check J1939 link connection to Transmission Controller / Check if electronic Transmission Controller is CAN capable	OFF	OFF	OFF	
191	19	BF0013	J1939 Transmission Output Shaft Speed Signal erratic = undefined value but not SNA	Check J1939 link connection to Transmission Controller	OFF	OFF	OFF	
247	0	F70000	MCM Engine Hours Data higher than expected	Check MCM.	OFF	OFF	OFF	
247	1	F70001	MCM Engine Hours Data lower than expected	CPC or MCM. The internal clocks of the CPC or MCM do not match. Check MCM.	OFF	OFF	OFF	
247	9	F70009	MCM Engine Hours Data not received or stopped arriving	Check MCM.	OFF	OFF	OFF	
247	10	F7000A	MCM Engine Hours Data increasing at an implausible rate	CPC or MCM. The internal clocks of the CPC or MCM do not match. Check MCM.	OFF	OFF	OFF	
247	14	F7000E	ACM Reported Ash Mileage is Lower than the CPC Stored Value	Use diagnostic service to clear the ash content value.	ON	OFF	OFF	
523	13	0B020D	J1939 Transmission Current Gear Signal is missing or not available	Check J1939 link connection to Transmission	ON	OFF	OFF	
523	19	0B0213	J1939 Transmission Current Gear Signal is erratic = undefined value but not SNA	Check J1939 link connection to Transmission	OFF	OFF	OFF	
524	9	0C0209	J1939 ETC2 message is missing or not available	Check J1939 link connection to Transmission Controller / Check if Electronic Transmission Controller is CAN capable	ON	OFF	OFF	
525	7	0D0207	Transmission gear selection switch reports internal error.	Check J1939 link connection to Transmission Controller / Check if Electronic Transmission Controller is CAN capable. Check LIN wiring / stalk switch.	ON	OFF	OFF	
525	9	0D0209	J1939 Powertrain Message (transfer case / PTO) is missing	Check wiring of OEM ICU and related J1939 link connection	ON	OFF	OFF	
525	19	0D0213	Transmission gear selection switch reports unplausible engine brake stage requests.	Check J1939 link connection to Transmission Controller / Check if Electronic Transmission Controller is CAN capable. Check LIN wiring / stalk switch.	ON	OFF	OFF	

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
527	9	0F0209	J1939 CCVS is missing or not available	Check J1939 link connection to Cruise Control Check Parameter 13/22 (CC ON OFF Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	
556	9	2C0209	J1939 RC Message from Transmission Retarder is missing	Check J1939 link connection to Transmission Retarder. Check if Transmission Retarder is enabled and correct configured, Parameter 55/01. (Trans Ret Number of Stages)	ON	OFF	OFF	
558	2	2E0202	Idle Validation Switch Inputs Reversed.	Check Idle Validation switch wiring	ON	OFF	OFF	Pin 1/03 Pin 1/06
558	3	2E0203	Idle Validation Switch 1 Circuit shorted to Ubat. The two idle switches are not synchronous (check AP)	Check wiring of associated pin Check parameters 35/01 (Selection), 35/20 (Fault Detection) and 35/38 (Configuration) for correct configuration of output pin 1/04 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 13	ON	OFF	OFF	Pin 1/04
558	4	2E0204	Idle Validation Switch 1 Circuit shorted to GND. The two idle switches are not synchronous (check AP)	Check wiring of associated pin Check parameters 35/01 (Selection), 35/20 (Fault Detection) and 35/38 (Configuration) for correct configuration of output pin 1/04 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 13	ON	OFF	OFF	Pin 1/04
558	5	2E0205	Idle Validation Switch 2 Circuit shorted to GND. The two idle switches are not synchronous (check AP)	Check wiring of associated pin Check parameters 35/01 (Selection), 35/20 (Fault Detection) and 35/38 (Configuration) for correct configuration of output pin 1/04 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 13	ON	OFF	OFF	Pin 1/04
558	6	2E0206	Idle Validation Switch 2 Circuit shorted to Ubat. The two idle switches are not synchronous (check AP)	Check wiring of associated pin Check parameters 35/01 (Selection), 35/20 (Fault Detection) and 35/38 (Configuration) for correct configuration of output pin 1/04 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 13	ON	OFF	OFF	Pin 1/04
569	9	390209	J1939 EAC1 Message is missing or not available	Check J1939 link connection to Electronic Axle Control	ON	OFF	OFF	
571	4	3B0204	Engine Brake Disable push-button shorted to Ground or pressed too long	Check wiring of associated pin Check parameters 13/19 (Selection), 13/62 (Fault Detect Ena) for correct configuration of input pin 4/18	ON	OFF	OFF	Pin 4/18
596	13	54020D	J1939 Cruise Control Enable Switch Signal from Source CCVS1, CCVS2 or CCVS3 missing or not available = SNA (signal not available)	Check J1939 link connection to Cruise Control Check Parameter 13/22 (CC ON OFF Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	
596	19	540213	J1939 Cruise Control Enable Switch Signal from Source CCVS1, CCVS2 or CCVS3 erratic = undefined value but not SNA	Check J1939 link connection to Cruise Control Check Parameter 13/22 (CC ON OFF Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	
597	13	55020D	J1939 Service Brake Switch Signal from Source CCVS1, CCVS2 or CCVS3 missing or not available = SNA (signal not available)	Check J1939 link connection to Cruise Control Check Parameter 13/29 (Service Brake Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
597	19	550213	J1939 Service Brake Switch Signal from Source CCVS1, CCVS2 or CCVS3 erratic = undefined value but not SNA	Check J1939 link connection to Cruise Control Check Parameter 13/29 (Service Brake Switch Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	
598	2	560202	Clutch switch status not plausible	Check wiring of Clutch Switch and Driveline Open Status	ON	OFF	OFF	
599	4	570204	Cruise Control SET and RESUME Circuits shorted to GND (SET and RESUME applied at the same time)	Check wiring of associated pins	ON	OFF	OFF	Pin 1/12 Pin 1/16
600	13	58020D	J1939 Cruise Control Coast Switch Signal from Source CCVS1, CCVS2 or CCVS3 missing or not available = SNA (signal not available)	Check J1939 link connection to Cruise Control Check Parameter 13/24 (CC Set Cst Res Accel Sw Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	
600	19	580213	J1939 Cruise Control Coast Switch Signal from Source CCVS1, CCVS2 or CCVS3 erratic = undefined value but not SNA	Check J1939 link connection to Cruise Control Check Parameter 13/24 (CC Set Cst Res Accel Sw Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	
602	13	5A020D	J1939 Cruise Control Accelerator Switch Signal from Source CCVS1, CCVS2 or CCVS3 = SNA (signal not available)	Check J1939 link connection to Cruise Control Check Parameter 13/24 (CC Set Cst Res Accel Sw Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	
602	19	5A0213	J1939 Cruise Control Accelerator Switch from Source CCVS1, CCVS2 or CCVS3 erratic = undefined value but not SNA	Check J1939 link connection to Cruise Control Check Parameter 13/24 (CC Set Cst Res Accel Sw Config) for correct source Check Parameter 01/04 (CC1 Source Address SAE J1939), 01/05 (CC2 Source Address SAE J1939) and 01/06 (CC3 Source Address SAE J1939) for correct Source Address	OFF	OFF	OFF	
609	12	61020C	CPC electronics are defect (EEPROM, CPU…)	Try reprogramming the CPC with the new software release. Replace CPC4 and reprogram with the latest software.	OFF	OFF	OFF	
609	13	61020D	the CPC SW is corrupt (CPC Software Diagnostics)	Source address setting conflict. Messages with more than one source address (e.g. “CM1 Fan Source Addr1” , ”CM1 Fan Source Addr2”, *AIR1 Source Address 1 SAE J1939*, *AIR1 Source Address 2 SAE J1939*, CC1 Source Address J1939, CC2 Source Address SAE J1939, CC3 Source Address SAE J1939, EBC1 Source Address SAE J1939, ABS Source Address SAE J1939, TSC1 Source Address SAE J1939 has to be parameterized with different addresses. Check calibration for these addresses (PGR 01 “Communication”)	OFF	OFF	OFF	
609	16	610210	Internal temperature of CPC4 too high.	Check CPC4 case and cooling measurements. Turn off vehicle.	ON	OFF	OFF	
625	2	710202	PTCAN Incorrect MCM System ID received	MCM Sys ID not valid (MCM initialization not finished). Check MCM.	ON	OFF	ON	
625	8	710208	MCM PT-CAN DM1 Message Not Received or has Stopped Arriving	Check CPC4 PT-CAN link connection. Check MCM functionality / PT-CAN link connection	ON	OFF	ON	
625	9	710209	ACM PT-CAN DM1 Message Not Received or has Stopped Arriving	Check CPC4 PT-CAN link connection. Check ACM functionality / PT-CAN link connection	ON	OFF	ON	

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
625	13	71020D	TCM System ID Not Received or Stopped Arriving (TCM Outage -> Check Translamp)	Check CPC4 PT-CAN link connection. Check TCM functionality / PT-CAN link connection	OFF	OFF	OFF	
625	14	71020E	PTCAN: MCM System ID Not Received or Stopped Arriving (ECAN ID_596/7 not received or it has stopped arriving)	Check PT-CAN link connection. Check MCM functionality / PT-CAN link connection	ON	OFF	ON	
628	2	740202	EEPROM Checksum Failure	Try reprogramming the CPC with the new software release. Reset EEPROM values to default. Redownload CPC parameter set. Replace CPC4 and reprogram with the latest software.	ON	OFF	OFF	
628	14	74020E	XFLASH Static Fault Code Memory Page Read Write Failure (XFLASH Failure.)	Replace CPC4 box due to XFLASH failure and reprogram with the latest software.	OFF	OFF	OFF	
628	17	740211	1000ms ECU OS Task Timed out Prior to Completion. (Indication of a critical resource allocation issue. Task restructuring required.)	Try reprogramming the CPC with the new software release. Replace CPC4 and reprogram with the latest software.	OFF	OFF	OFF	
629	2	750202	CPC Hardware / Software Mismatch (Incorrect Hardware Configuration - NAFTA Vs. EUROPE)	Try reprogramming the CPC with the new software release. Reset EEPROM values to default. Redownload CPC parameter set. Replace CPC4 and reprogram with the latest software.	ON	OFF	OFF	
629	12	75020C	DDEC Data Xflash Write Error. Replace CPC. (XFLASH Failure.)	Try reprogramming the CPC with the new software release. Replace CPC4 and reprogram with the latest software.	OFF	OFF	OFF	
639	13	7F020D	HDMS Fan is configured and the J1939 message was not received or has stopped arriving.	Check J1939 link connection to the air conditioner transducer. Check if CPC4 parameters correct for the vehicle configuration.	OFF	OFF	OFF	
639	14	7F020E	J1939 Data Link Failure (CPC is no longer sending or receiving data from the J1939 link.)	Check J1939 data link connection	ON	OFF	OFF	Pin 2/16 Pin 2/17 Pin 2/18
667	3	9B0203	Starter Pin 1/18 Circuit shorted to Ubat (KL50)	Check KL50 wiring at Pin 1/18	ON	OFF	OFF	Pin 1/18
684	8	AC0208	Maneuver mode request error	Check activation timing or wiring	ON	OFF	OFF	
684	9	AC0209	Rock out mode request error	Check activation timing or wiring	ON	OFF	OFF	
701	3	BD0203	Digital Output 3/07 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/06 (Selection), 35/25 (Fault Detection) and 35/42 (Configuration) for correct configuration of output pin 3/07 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 9	ON	OFF	OFF	Pin 3/07
701	4	BD0204	Digital Output 3/07 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/06 (Selection), 35/25 (Fault Detection) and 35/42 (Configuration) for correct configuration of output pin 3/07 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 9	ON	OFF	OFF	Pin 3/07
701	5	BD0205	Digital Output 3/07 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/06 (Selection), 35/25 (Fault Detection) and 35/42 (Configuration) for correct configuration of output pin 3/07 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 9	ON	OFF	OFF	Pin 3/07

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
702	3	BE0203	Digital Output 3/08 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/07 (Selection), 35/26 (Fault Detection) and 35/43 (Configuration) for correct configuration of output pin 3/08 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 10	ON	OFF	OFF	Pin 3/08
702	4	BE0204	Digital Output 3/08 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/07 (Selection), 35/26 (Fault Detection) and 35/43 (Configuration) for correct configuration of output pin 3/08 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 10	ON	OFF	OFF	Pin 3/08
702	5	BE0205	Digital Output 3/08 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/07 (Selection), 35/26 (Fault Detection) and 35/43 (Configuration) for correct configuration of output pin 3/08 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 10	ON	OFF	OFF	Pin 3/08
703	3	BF0203	Digital Output 3/09 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/08 (Selection), 35/27 (Fault Detection) and 35/44 (Configuration) for correct configuration of output pin 3/09 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 14	ON	OFF	OFF	Pin 3/09
703	4	BF0204	Digital Output 3/09 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/08 (Selection), 35/27 (Fault Detection) and 35/44 (Configuration) for correct configuration of output pin 3/09 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 14	ON	OFF	OFF	Pin 3/09
703	5	BF0205	Digital Output 3/09 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/08 (Selection), 35/27 (Fault Detection) and 35/44 (Configuration) for correct configuration of output pin 3/09 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 14	ON	OFF	OFF	Pin 3/09
704	3	C00203	Digital Output 4/07 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/16 (Selection), 35/35 (Fault Detection) and 35/52 (Configuration) for correct configuration of output pin 4/07 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 15	ON	OFF	OFF	Pin 4/07
704	4	C00204	Digital Output 4/07 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/16 (Selection), 35/35 (Fault Detection) and 35/52 (Configuration) for correct configuration of output pin 4/07 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 15	ON	OFF	OFF	Pin 4/07
704	5	C00205	Digital Output 4/07 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/16 (Selection), 35/35 (Fault Detection) and 35/52 (Configuration) for correct configuration of output pin 4/07 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 15	ON	OFF	OFF	Pin 4/07
705	3	C10203	Digital Output 1/13 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/03 (Selection), 35/22 (Fault Detection) and 35/40 (Configuration) for correct configuration of output pin 1/13 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 1	ON	OFF	OFF	Pin 1/13

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
705	4	C10204	Digital Output 1/13 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/03 (Selection), 35/22 (Fault Detection) and 35/40 (Configuration) for correct configuration of output pin 1/13 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 1	ON	OFF	OFF	Pin 1/13
705	5	C10205	Digital Output 1/13 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/03 (Selection), 35/22 (Fault Detection) and 35/40 (Configuration) for correct configuration of output pin 1/13 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 1	ON	OFF	OFF	Pin 1/13
706	3	C20203	Digital Output 3/10 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/09 (Selection), 35/28 (Fault Detection) and 35/45 (Configuration) for correct configuration of output pin 3/10 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 2	ON	OFF	OFF	Pin 3/10
706	4	C20204	Digital Output 3/10 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/09 (Selection), 35/28 (Fault Detection) and 35/45 (Configuration) for correct configuration of output pin 3/10 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 2	ON	OFF	OFF	Pin 3/10
706	5	C20205	Digital Output 3/10 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/09 (Selection), 35/28 (Fault Detection) and 35/45 (Configuration) for correct configuration of output pin 3/10 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 2	ON	OFF	OFF	Pin 3/10
707	3	C30203	Digital Output 2/10 Circuit shorted to Ubat (CEL / AWL Lamp)	Check wiring of associated pin Check parameters 35/04 (Selection), 35/23 (Fault Detection) and 35/41 (Configuration) for correct configuration of output pin 2/10 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 3	OFF	OFF	OFF	Pin 2/10
707	4	C30204	Digital Output 2/10 Circuit shorted to GND (CEL / AWL Lamp)	Check wiring of associated pin Check parameters 35/04 (Selection), 35/23 (Fault Detection) and 35/41 (Configuration) for correct configuration of output pin 2/10 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 3	OFF	OFF	OFF	Pin 2/10
707	5	C30205	Digital Output 2/10 Open Circuit (broken wire, terminal floating / CEL / AWL Lamp)	Check wiring of associated pin Check parameters 35/04 (Selection), 35/23 (Fault Detection) and 35/41 (Configuration) for correct configuration of output pin 2/10 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 3	OFF	OFF	OFF	Pin 2/10
708	3	C40203	Digital Output 3/12 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/10 (Selection), 35/29 (Fault Detection) and 35/46 (Configuration) for correct configuration of output pin 3/12 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 4	ON	OFF	OFF	Pin 3/12
708	4	C40204	Digital Output 3/12 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/10 (Selection), 35/29 (Fault Detection) and 35/46 (Configuration) for correct configuration of output pin 3/12 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 4	ON	OFF	OFF	Pin 3/12

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
708	5	C40205	Digital Output 3/12 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/10 (Selection), 35/29 (Fault Detection) and 35/46 (Configuration) for correct configuration of output pin 3/12 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 4	ON	OFF	OFF	Pin 3/12
709	3	C50203	Digital Output 3/16 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/11 (Selection), 35/30 (Fault Detection) and 35/47 (Configuration) for correct configuration of output pin 3/16 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 5	ON	OFF	OFF	Pin 3/16
709	4	C50204	Digital Output 3/16 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/11 (Selection), 35/30 (Fault Detection) and 35/47 (Configuration) for correct configuration of output pin 3/16 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 5	ON	OFF	OFF	Pin 3/16
709	5	C50205	Digital Output 3/16 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/11 (Selection), 35/30 (Fault Detection) and 35/47 (Configuration) for correct configuration of output pin 3/16 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 5	ON	OFF	OFF	Pin 3/16
710	3	C60203	Digital Output 4/06 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/15 (Selection), 35/34 (Fault Detection) and 35/51 (Configuration) for correct configuration of output pin 4/06 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 6	ON	OFF	OFF	Pin 4/06
710	4	C60204	Digital Output 4/06 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/15 (Selection), 35/34 (Fault Detection) and 35/51 (Configuration) for correct configuration of output pin 4/06 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 6	ON	OFF	OFF	Pin 4/06
710	5	C60205	Digital Output 4/06 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/15 (Selection), 35/34 (Fault Detection) and 35/51 (Configuration) for correct configuration of output pin 4/06 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 6	ON	OFF	OFF	Pin 4/06
711	3	C70203	Digital Output 1/05 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/02 (Selection), 35/21 (Fault Detection) and 35/39 (Configuration) for correct configuration of output pin 1/05 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 12	ON	OFF	OFF	Pin 1/05
711	4	C70204	Digital Output 1/05 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/02 (Selection), 35/21 (Fault Detection) and 35/39 (Configuration) for correct configuration of output pin 1/05 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 12	ON	OFF	OFF	Pin 1/05
711	5	C70205	Digital Output 1/05 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/02 (Selection), 35/21 (Fault Detection) and 35/39 (Configuration) for correct configuration of output pin 1/05 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 12	ON	OFF	OFF	Pin 1/05

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
712	3	C80203	Digital Output 1/04 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/01 (Selection), 35/20 (Fault Detection) and 35/38 (Configuration) for correct configuration of output pin 1/04 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 13	ON	OFF	OFF	Pin 1/04
712	4	C80204	Digital Output 1/04 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/01 (Selection), 35/20 (Fault Detection) and 35/38 (Configuration) for correct configuration of output pin 1/04 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 13	ON	OFF	OFF	Pin 1/04
712	5	C80205	Digital Output 1/04 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/01 (Selection), 35/20 (Fault Detection) and 35/38 (Configuration) for correct configuration of output pin 1/04 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 13	ON	OFF	OFF	Pin 1/04
714	3	CA0203	Digital Output 4/10 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/18 (Selection), 35/37 (Fault Detection) and 35/54 (Configuration) for correct configuration of output pin 4/10 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 11	ON	OFF	OFF	Pin 4/10
714	4	CA0204	Digital Output 4/10 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/18 (Selection), 35/37 (Fault Detection) and 35/54 (Configuration) for correct configuration of output pin 4/10 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 11	ON	OFF	OFF	Pin 4/10
714	5	CA0205	Digital Output 4/10 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/18 (Selection), 35/37 (Fault Detection) and 35/54 (Configuration) for correct configuration of output pin 4/10 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 11	ON	OFF	OFF	Pin 4/10
715	3	CB0203	Frequency Output 4/12 Circuit shorted to Ubat	Check wiring of associated pin Run Service Routine (chapter 7.4, routines 8 to 10): – Analog Output Pin Under Software: Start with Signal Parameter 1, Frequency in Hz, Width in %	ON	OFF	OFF	Pin 4/12
715	4	CB0204	Frequency Output 4/12 Circuit shorted to GND	Check wiring of associated pin Run Service Routine (chapter 7.4, routines 8 to 10): – Analog Output Pin Under Software: Start with Signal Parameter 1, Frequency in Hz, Width in %	ON	OFF	OFF	Pin 4/12
715	5	CB0205	Frequency Output 4/12 Open Circuit (broken wire, terminal floating) (refer to chapter 3.6.6)	Check wiring of associated pin Run Service Routine (chapter 7.4, routines 8 to 10): – Analog Output Pin Under Software: Start with Signal Parameter 1, Frequency in Hz, Width in %	OFF	OFF	OFF	Pin 4/12
716	3	CC0203	Frequency Output 1/09 Circuit shorted to Ubat	Check wiring of associated pin Run Service Routine (chapter 7.4, routines 8 to 10): – Analog Output Pin Under Software: Start with Signal Parameter 2, Frequency in Hz, Width in %	ON	OFF	OFF	Pin 1/09
716	4	CC0204	Frequency Output 1/09 Circuit shorted to GND	Check wiring of associated pin Run Service Routine (chapter 7.4, routines 8 to 10): – Analog Output Pin Under Software: Start with Signal Parameter 2, Frequency in Hz, Width in %	ON	OFF	OFF	Pin 1/09
716	5	CC0205	Frequency Output 1/09 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Run Service Routine (chapter 7.4, routines 8 to 10): – Analog Output Pin Under Software: Start with Signal Parameter 2, Frequency in Hz, Width in %	ON	OFF	OFF	Pin 1/09
904	9	880309	J1939 EBC2 Message from ABS is missing or not available = SNA (signal not available)	Check J1939 link connection to the ABS and Devices Brake System Controller	OFF	OFF	OFF	

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
904	13	88030D	J1939 Front Axle Speed Signal is missing or not available = SNA (signal not available)	Check J1939 link connection to Front Axle Speed Sensor	OFF	OFF	OFF	
904	19	880313	J1939 Front Axle Speed Signal is erratic = undefined value but not SNA	Check J1939 link connection to Front Axle Speed Sensor	OFF	OFF	OFF	
924	3	9C0303	Digital Output 4/09 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/17 (Selection), 35/36 (Fault Detection) and 35/53 (Configuration) for correct configuration of output pin 4/09 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 7	ON	OFF	OFF	Pin 4/09
924	4	9C0304	Digital Output 4/09 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/17 (Selection), 35/36 (Fault Detection) and 35/53 (Configuration) for correct configuration of output pin 4/09 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 7	ON	OFF	OFF	Pin 4/09
924	5	9C0305	Digital Output 4/09 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/17 (Selection), 35/36 (Fault Detection) and 35/53 (Configuration) for correct configuration of output pin 4/09 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 7	ON	OFF	OFF	Pin 4/09
925	3	9D0303	Digital Output 3/17 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/12 (Selection), 35/31 (Fault Detection) and 35/48 (Configuration) for correct configuration of output pin 3/17 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 8	ON	OFF	OFF	Pin 3/17
925	4	9D0304	Digital Output 3/17 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/12 (Selection), 35/31 (Fault Detection) and 35/48 (Configuration) for correct configuration of output pin 3/17 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 8	ON	OFF	OFF	Pin 3/17
925	5	9D0305	Digital Output 3/17 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/12 (Selection), 35/31 (Fault Detection) and 35/48 (Configuration) for correct configuration of output pin 3/17 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 8	ON	OFF	OFF	Pin 3/17
926	3	9E0303	Digital Output 4/01 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/13 (Selection), 35/32 (Fault Detection) and 35/49 (Configuration) for correct configuration of output pin 4/01 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 16	ON	OFF	OFF	Pin 4/01
926	4	9E0304	Digital Output 4/01 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/13 (Selection), 35/32 (Fault Detection) and 35/49 (Configuration) for correct configuration of output pin 4/01 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 16	ON	OFF	OFF	Pin 4/01
926	5	9E0305	Digital Output 4/01 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/13 (Selection), 35/32 (Fault Detection) and 35/49 (Configuration) for correct configuration of output pin 4/01 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 16	ON	OFF	OFF	Pin 4/01

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
970	3	CA0303	Engine Aux. Shutdown Input shorted to Ubat	Check wiring of associated pin. Check parameters 13/03 (Selection) and 13/35 (Fault Detection) for correct configuration of input pin 1/01.	ON	OFF	OFF	Pin 1/10
970	4	CA0304	Engine Aux. Shutdown Input shorted to GND	Check wiring of associated pin. Check parameters 13/03 (Selection) and 13/35 (Fault Detection) for correct configuration of input pin 1/01.	ON	OFF	OFF	Pin 1/10
972	2	CC0302	Throttle inhibit switch signal not plausible due to excess vehicle speed	Check wiring of associated pin. Check parameters 13/05 (Selection) and 13/43 (Fault Detection) for correct configuration of input pin 1/17.	ON	OFF	OFF	Pin 1/17
973	2	CD0302	EvoBus 5stage retarder level position not plausible	Check wiring of associated pin. Check parameters 13/08 (Selection) and 13/49 (Fault Detection) for correct configuration of input pin 2/13.	ON	OFF	OFF	Pin 2/13
973	9	CD0309	J1939 EBC1 Message is missing or not available	Check J1939 link connection and Devices Turbocharger. Check Parameter 01/10 (EBC1 Source Address SAE J1939)	ON	OFF	OFF	
973	13	CD030D	J1939 Engine Retarder Selection Signal Missing or not available = SNA (signal not available)	Check J1939 link connection to Engine Retarder	ON	OFF	OFF	
973	19	CD0313	J1939 Engine Retarder Selection Signal erratic = undefined value but not SNA	Check J1939 link connection to Engine Retarder	ON	OFF	OFF	
974	2	CE0302	Remote Accelerator Pedal Supply Voltage Out of Range	Check wiring of associated pins	ON	OFF	OFF	Pin 3/03 Pin 3/04
974	3	CE0303	Remote Accelerator Pedal Circuit shorted to Ubat	Check wiring of associated pins	ON	OFF	OFF	Pin 3/02 Pin 3/03 Pin 3/04
974	4	CE0304	Remote Accelerator Pedal Circuit shorted to GND	Check wiring of associated pins	ON	OFF	OFF	Pin 3/02 Pin 3/03 Pin 3/04
979	9	D30309	J1939 PTO Message Not Received This Ignition Cycle	Check J1939 link connection. Check Parameter 01/52 (PTO Source Address SAE J1939) for proper configuration.	ON	OFF	OFF	
986	9	DA0309	J1939 CM1 DPF Message is missing or not available	Check J1939 link connection and Devices Cab Controller 1 and Climate Control. Check Parameter 01/07 (CM1 DPF Source Address SAE J1939) for proper configuration.	OFF	OFF	OFF	
986	13	DA030D	J1939 CM1 Fan SPN986 Signal from source address #1 or #2 is missing or not available = SNA (signal not available)	Check J1939 link connection. Check Parameter 01/08 (CM1 Fan Source Address #1 SAE J1939) and Parameter 01/09 (CM1 Fan Source Address #2 SAE J1939) for proper configuration.	OFF	OFF	OFF	
986	19	DA0313	J1939 CM1 Fan SPN986 Signal from source address #1 or #2 is erratic = undefined value but not SNA	Check J1939 link connection. Check Parameter 01/08 (CM1 Fan Source Address #1 SAE J1939) and Parameter 01/09 (CM1 Fan Source Address #2 SAE J1939) for proper configuration.	OFF	OFF	OFF	
1089	9	410409	J1939 AIR1 Message (Air Supply Pressure) is missing from first source address	Check J1939 link connection Check Parameter 01/96 (AIR1 Source Address 1 SAE J1939)	ON	OFF	OFF	
1089	13	41040D	J1939 AIR1 Message (Air Supply Pressure) is missing from second source address	Check J1939 link connection Check Parameter 01/102 (AIR1 Source Address 2 SAE J1939)	ON	OFF	OFF	
1121	2	610402	J1939 Powertrain Message (AMT – Detroit transmission) is missing	Check wiring of J2CC and related J1939 link connection	ON	OFF	OFF	
1121	13	61040D	J1939 Service Brake Switch Signal from EBC1 is missing or not available = SNA (signal not available)	Check J1939 link connection to Service Brake. Check Parameter 01/10 (EBC1 Source Address SAE J1939)	OFF	OFF	OFF	

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
1121	19	610413	J1939 Service Brake Switch Signal from EBC1 is erratic = undefined value but not SNA	Check J1939 link connection to Service Brake. Check Parameter 01/10 (EBC1 Source Address SAE J1939)	OFF	OFF	OFF	
1237	4	D50404	Stop Engine Override Switch shorted to Ground (if applied more than 5 sec this error flags)	Check wiring of associated pin. Check parameters 13/04 (Selection) and 13/41 (Fault Detect Enable) for correct configuration of input pin 1/15.	ON	OFF	OFF	Pin 1/15
1243	14	DB040E	ABS fault restricts automatic gear selection functionality.	Check ABS for proper function. Combination of ABS and ASC error. ABS error = v > 1km/h and req-gear < current gear and ABS in stat "not fully operable"	OFF	OFF	OFF	
1482	9	CA0509	J1939 TC1 Message (Transmission Mode) is missing	Check J1939 link connection to Transmission Control	ON	OFF	OFF	
1484	9	CC0509	J1939 Message was lost (Message Counter Error)	Check J1939 link connection	OFF	OFF	OFF	
1484	13	CC050D	J1939 Message was lost (CRC Error)	Check J1939 link connection	OFF	OFF	OFF	
1592	9	380609	J1939 HRW Message from ABS is missing (HRW not received in case newAMT Transmission used)	Check J1939 link connection to ABS. Check correct configuration (parameter 02/09 (Transmission Type)) if newAMT Transmission is used	ON	OFF	OFF	
1592	13	38060D	J1939 HRW Wheel Speed Signal Missing (HRW received but at least one signal not available)	Check J1939 link connection to ABS. Check correct configuration (parameter 02/09 (Transmission Type)) if newAMT Transmission is used	OFF	OFF	OFF	
1592	19	380613	J1939 HRW Wheel Speed Signal Erroneous (HRW received but at least one signal erroneous)	Check J1939 link connection to ABS. Check correct configuration (parameter 02/09 (Transmission Type)) if newAMT Transmission is used	OFF	OFF	OFF	
1623	9	570609	J1939 Tachograph Output Shaft Speed Signal is erratic = undefined value but not SNA	Check wiring of associated pin	OFF	OFF	OFF	
1623	13	57060D	J1939 Tachograph Output Shaft Speed Signal is missing or not available = SNA (signal not available)	Check wiring of associated pin	OFF	OFF	OFF	
1624	9	580609	J1939 TCO1 Message is missing or not available	Check J1939 link connection to Vehicle Speed Sensor. Check Parameter 08/13 (Vehicle Speed Sensor Configuration) for proper configuration	OFF	OFF	OFF	
1624	13	58060D	J1939 Tachograph Vehicle Speed Signal is missing or not available = SNA (signal not available) + J1939 TCO1 speed sensor selected	Check J1939 link connection to Vehicle Speed Sensor. Check Parameter 08/13 (Vehicle Speed Sensor Configuration) for proper configuration	OFF	OFF	OFF	
1624	19	580613	J1939 Tachograph Vehicle Speed Signal is erratic = undefined value but not SNA + J1939 TCO1 speed sensor selected	Check J1939 link connection to Vehicle Speed Sensor. Check Parameter 08/13 (Vehicle Speed Sensor Configuration) for proper configuration	OFF	OFF	OFF	
1681	9	910609	J1939 BM Message (Battery Main Switch) is missing	Check J1939 link connection	ON	OFF	OFF	
1716	9	B40609	J1939 ERC1 Message is missing or not available	Check J1939 link connection to Retarder	OFF	OFF	OFF	
1716	13	B4060D	EvoBus 5stage retarder level calibration not plausible	Check wiring of associated pin. Check parameters 13/08 (Selection) and 13/49 (Fault Detect Enable) for correct configuration of input pin 2/13.	ON	OFF	OFF	Pin 2/13

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
1814	9	160709	J1939 VDC1 Message was not received or has stopped arriving.	Check J1939 link connection. Check Parameter 01/57 (VDC1 Source Address SAE J1939)	OFF	OFF	OFF	
1845	9	350709	J1939 TCFG2 Message is missing or not available	Check J1939 link connection to Transmission Control	OFF	OFF	OFF	
2003	9	D30709	J1939 Message is missing from source Address 3 (3dec = Transmission #1 ECU missing)	Check J1939 link connection to Cruise Control ECU	ON	OFF	OFF	
2011	9	DB0709	J1939 Message is missing from source address 11 (dec).		OFF	OFF	OFF	
2017	9	E10709	J1939 Message is missing from source address 17 (17dec = Cruise Control ECU missing)	Check J1939 link connection to Cruise Control ECU	OFF	OFF	OFF	
2023	9	E70709	J1939 Message is missing from source 23 (23dec = Instrument Cluster ECU missing)	Check J1939 link connection to Instrument Cluster ECU	OFF	OFF	OFF	
2025	9	E90709	J1939 Message is missing from source 25 (25dec = Passenger-Operator Climate Control ECU missing)	Check J1939 link connection to Passenger Operator Climate Control ECU	OFF	OFF	OFF	
2033	9	F10709	J1939 Message is missing from source 33 (33dec = Body Controller ECU missing)	Check J1939 link connection to body Controller ECU	ON	OFF	OFF	
2042	9	FA0709	J1939 Message is missing from source 42 (42dec = Headway Controller (forward-looking collision warning, collision avoidance, speed Controller, or speed matching) ECU is missing)	Check J1939 link connection to Headway Controller ECU	ON	OFF	OFF	
2049	9	010809	J1939 Message is missing from source 49 (49dec = Gab Controller - Primary ECU missing)	Check J1939 link connection to Gab Controller – Primary ECU	ON	OFF	OFF	
2596	9	240A09	J1939 CM1 Message (Maximum Vehicle Speed Limit) is Missing or Not Available	Check J1939 link connection	ON	OFF	OFF	
2623	2	3F0A02	2-Channel Accelerator Pedal "in-range" fault (AP Ch1 and Ch2 values differ to much)	Check wiring of associated pins and calibration; Restart learning routine. (chapter 7.4, routines 1 to 3): Check Accelerator Pedal for proper behavior regarding voltage of the 2 channels.	ON	OFF	OFF	
2623	8	3F0A08	2-Channel Accelerator Pedal Signal 2 Missing	Check wiring of associated pin	ON	OFF	OFF	Pin 1/06
2646	3	560A03	Digital Output 4/02 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 35/14 (Selection), 35/33 (Fault Detection) and 35/50 (Configuration) for correct configuration of output pin 4/02 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 9	ON	OFF	OFF	Pin 4/02
2646	4	560A04	Digital Output 4/02 Circuit shorted to GND	Check wiring of associated pin Check parameters 35/14 (Selection), 35/33 (Fault Detection) and 35/50 (Configuration) for correct configuration of output pin 4/02 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 9	ON	OFF	OFF	Pin 4/02

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
2646	5	560A05	Digital Output 4/02 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check parameters 35/14 (Selection), 35/33 (Fault Detection) and 35/50 (Configuration) for correct configuration of output pin 4/02 Run Service Routine (chapter 7.4, routines 15 to 17): – Digital Output Pin Under Software Control: Start Response with Signal Parameter 9	ON	OFF	OFF	Pin 4/02
2882	13	420B0D	Off-Highway Engine Configuration Selection message on J1939 was not received or has stopped arriving.	Check the J1939 link connection Check parameter 01/72 for configuration of OHECS source address Check parameter 05/06 for proper configuration	ON	OFF	OFF	
2900	9	540B09	J1939 ETC7 Message is missing or not available	Check J1939 link connection to Transmission Controller / Check if Electronic Transmission Controller is CAN capable	ON	OFF	OFF	
3187	9	730C09	Transmission Shift Console Datalink (LIN)	Check LIN wiring / stalk switch	ON	OFF	OFF	
3353	2	190D02	Generator (Charging System) D+ terminal failure	Check wiring of Generator Terminal D+ or check Generator functionality	OFF	OFF	OFF	
3460	2	840D02	PTO 2 feedback, but not activated	Check feedback switch and PTO2 mechanics	ON	OFF	OFF	
3460	7	840D07	PTO 2 feedback, but not feedback	Check PTO2 feedback wiring	ON	OFF	OFF	
3461	2	850D02	PTO 1 feedback, but not activated	Check feedback switch and PTO1 mechanics	ON	OFF	OFF	
3461	7	850D07	PTO 1 activated, but no feedback	Check PTO1 feedback wiring	ON	OFF	OFF	
3510	4	B60D04	Accelerator Pedal Supply Voltage Circuit shorted to GND	Check wiring of associated pins	ON	OFF	OFF	Pin 1/08 Pin 3/03
3510	7	B60D07	Accelerator Pedal Supply Voltage Circuit shorted to Ubat	Check wiring of associated pins	ON	OFF	OFF	Pin 1/08 Pin 3/03
3511	3	B70D03	Remote Accelerator Pedal Supply Voltage circuit shorted to Ubat	Check wiring of associated pins	ON	OFF	OFF	Pin 3/03 (Supply) Pin 3/02 (GND)
3511	4	B70D04	Remote Accelerator Pedal Supply Voltage circuit shorted to GND	Check wiring of associated pins	ON	OFF	OFF	Pin 3/03 (Supply) Pin 3/02 (GND)
3606	9	160E09	J1939 PROP04 Message is missing or not available	Check J1939 link connection to Diesel Particulate Filter	ON	OFF	OFF	
3645	9	3D0E09	J1939 TCI Message (Transfer Case Information) is missing	Check J1939 link connection	ON	OFF	OFF	
3695	9	6F0E09	J1939 DPF Regen Inhibit MUX Switch Message Stopped Arriving	Check J1939 link connection to Diesel Particulate Filter. Check Parameter 46/10 (DPF J1939 Inhibt Sw Enable) and 46/11 (DPF J1939 Regen Sw Enable).	ON	OFF	OFF	
3695	13	6F0E0D	J1939 DPF Regen Inhibit MUX Switch Message Contains SNV(SNA) Indicator	Check J1939 link connection to Diesel Particulate Filter. Check Parameter 46/10 (DPF J1939 Inhibt Sw Enable) and 46/11 (DPF J1939 Regen Sw Enable).	ON	OFF	OFF	
3695	14	6F0E0E	J1939 DPF Regen Inhibit MUX Switch Message Not Received this Ignition Cycle	Check J1939 link connection to Diesel Particulate Filter. Check Parameter 46/10 (DPF J1939 Inhibt Sw Enable) and 46/11 (DPF J1939 Regen Sw Enable).	ON	OFF	OFF	
3695	19	6F0E13	J1939 DPF Regen Inhibit MUX Switch Message Contains Data Error(erratic) Indicator	Check J1939 link connection to Diesel Particulate Filter. Check Parameter 46/10 (DPF J1939 Inhibt Sw Enable) and 46/11 (DPF J1939 Regen Sw Enable).	ON	OFF	OFF	

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
3696	4	700E04	J1939 DPF Regeneration Switch Circuit shorted to GND (if applied more than 5 sec this error flags)	Check J1939 link connection to Diesel Particulate Filter. Check Parameter 46/10 (DPF J1939 Inhibt Sw Enable) and 46/11 (DPF J1939 Regen Sw Enable).	ON	OFF	OFF	
3696	9	700E09	J1939 DPF Regen Force MUX Switch Message Stopped Arriving	Check J1939 link connection to Diesel Particulate Filter. Check Parameter 46/10 (DPF J1939 Inhibt Sw Enable) and 46/11 (DPF J1939 Regen Sw Enable).	ON	OFF	OFF	
3696	13	700E0D	J1939 DPF Regen Force MUX Switch Message Contains SNV(SNA) Indicator	Check J1939 link connection to Diesel Particulate Filter. Check Parameter 46/10 (DPF J1939 Inhibt Sw Enable) and 46/11 (DPF J1939 Regen Sw Enable).	ON	OFF	OFF	
3696	14	700E0E	J1939 DPF Regen Force MUX Switch Message Not Received this Ignition Cycle	Check J1939 link connection to Diesel Particulate Filter. Check Parameter 46/10 (DPF J1939 Inhibt Sw Enable) and 46/11 (DPF J1939 Regen Sw Enable).	ON	OFF	OFF	
3696	19	700E13	J1939 DPF Regen Force MUX Switch Message Contains Data Error(erratic) Indicator	Check J1939 link connection to Diesel Particulate Filter. Check Parameter 46/10 (DPF J1939 Inhibt Sw Enable) and 46/11 (DPF J1939 Regen Sw Enable).	ON	OFF	OFF	
3719	0	870E00	DPF Filter Soot Level is very high	Check DPF Filter.	OFF	ON	OFF	
3719	16	870E10	DPF Filter Soot Level is High	Check DPF Filter. Start manual regeneration.	ON	OFF	OFF	
3840	3	000F03	Frequency Output 4/15 Circuit shorted to Ubat	Check wiring of associated pin. Check Parameters 09/07 (Selection), 09/13 (Fault Detection) and 09/17 (Output Configuration) for correct configuration.	ON	OFF	OFF	Pin 4/15
3840	4	000F04	Frequency Output 4/15 Circuit shorted to GND	Check wiring of associated pin. Check Parameters 09/07 (Selection), 09/13 (Fault Detection) and 09/17 (Output Configuration) for correct configuration.	ON	OFF	OFF	Pin 4/15
3840	5	000F05	Frequency Output 4/15 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin. Check Parameters 09/07 (Selection), 09/13 (Fault Detection) and 09/17 (Output Configuration) for correct configuration.	ON	OFF	OFF	Pin 4/15
3841	3	010F03	Frequency Output 4/11 Circuit shorted to Ubat	Check wiring of associated pin. Check Parameters 09/07 (Selection), 09/13 (Fault Detection) and 09/17 (Output Configuration) for correct configuration.	ON	OFF	OFF	Pin 4/11
3841	4	010F04	Frequency Output 4/11 Circuit shorted to GND	Check wiring of associated pin. Check Parameters 09/07 (Selection), 09/13 (Fault Detection) and 09/17 (Output Configuration) for correct configuration.	ON	OFF	OFF	Pin 4/11
3841	5	010F05	Frequency Output 4/11 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin. Check Parameters 09/07 (Selection), 09/13 (Fault Detection) and 09/17 (Output Configuration) for correct configuration.	ON	OFF	OFF	Pin 4/11
3842	3	020F03	Analog Ground 3/02 Circuit shorted to Ubat	Check wiring of associated pin Check Parameters 35/05 (Selection) and 35/24 (Fault Detection) for correct configuration.	ON	OFF	OFF	Pin 3/02
3842	4	020F04	Analog Ground 3/02 Circuit shorted to GND	Check wiring of associated pin Check Parameters 35/05 (Selection) and 35/24 (Fault Detection) for correct configuration.	ON	OFF	OFF	Pin 3/02
3842	5	020F05	Analog Ground 3/02 Open Circuit (broken wire, terminal floating)	Check wiring of associated pin Check Parameters 35/05 (Selection) and 35/24 (Fault Detection) for correct configuration.	ON	OFF	OFF	Pin 3/02
3843	3	030F03	Digital Input 1/01 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/01 (Selection), 13/35 (Fault Detect Ena) for correct configuration of input pin 1/01	ON	OFF	OFF	Pin 1/01
3843	4	030F04	Digital Input 1/01 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/01 (Selection), 13/35 (Fault Detect Ena) for correct configuration of input pin 1/01	ON	OFF	OFF	Pin 1/01
3844	3	040F03	Digital Input 1/02 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/01 (Selection), 13/35 (Fault Detect Ena) for correct configuration of input pin 1/02	ON	OFF	OFF	Pin 1/02

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
3844	4	040F04	Digital Input 1/02 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/02 (Selection), 13/36 (Fault Detect Ena) for correct configuration of input pin 1/02	ON	OFF	OFF	Pin 1/02
3845	3	050F03	Digital Input 1/12 Circuit shorted to Ubat	Check wiring of associated pin Check parameter 13/39 (Fault Detect Ena) for correct configuration of Fault Detection of pin 1/12	ON	OFF	OFF	Pin 1/12
3845	4	050F04	Digital Input 1/12 Circuit shorted to GND	Check wiring of associated pin Check parameter 13/39 (Fault Detect Ena) for correct configuration of Fault Detection of pin 1/12	ON	OFF	OFF	Pin 1/12
3846	3	060F03	Digital Input 1/14 Circuit shorted to Ubat	Check wiring of associated pin Check parameter 13/40 (Fault Detect Ena) for correct configuration of Fault Detection of pin 1/12	ON	OFF	OFF	Pin 1/14
3846	4	060F04	Digital Input 1/14 Circuit shorted to GND	Check wiring of associated pin Check parameter 13/40 (Fault Detect Ena) for correct configuration of Fault Detection of pin 1/12	ON	OFF	OFF	Pin 1/14
3847	3	070F03	Digital Input 1/15 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/04 (Selection), 13/41 (Fault Detect Ena) for correct configuration of input pin 1/15	ON	OFF	OFF	Pin 1/15
3847	4	070F04	Digital Input 1/15 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/04 (Selection), 13/41 (Fault Detect Ena) for correct configuration of input pin 1/15	ON	OFF	OFF	Pin 1/15
3848	3	080F03	Digital Input 1/16 Circuit shorted to Ubat	Check wiring of associated pin Check parameter 13/42 (Fault Detect Ena) for correct configuration of Fault Detection of pin 1/16	ON	OFF	OFF	Pin 1/16
3848	4	080F04	Digital Input 1/16 Circuit shorted to GND	Check wiring of associated pin Check parameter 13/42 (Fault Detect Ena) for correct configuration of Fault Detection of pin 1/16	ON	OFF	OFF	Pin 1/16
3849	3	090F03	Digital Input 1/17 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/05 (Selection), 13/43 (Fault Detect Ena) for correct configuration of input pin 1/17	ON	OFF	OFF	Pin 1/17
3849	4	090F04	Digital Input 1/17 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/05 (Selection), 13/43 (Fault Detect Ena) for correct configuration of input pin 1/17	ON	OFF	OFF	Pin 1/17
3850	3	0A0F03	Digital Input 1/11 Circuit shorted to Ubat	Check wiring of associated pin Check parameter 13/38 (Fault Detect Ena) for correct configuration of Fault Detection of pin 1/11	ON	OFF	OFF	Pin 1/11
3850	4	0A0F04	Digital Input 1/11 Circuit shorted to GND	Check wiring of associated pin Check parameter 13/38 (Fault Detect Ena) for correct configuration of Fault Detection of pin 1/11	ON	OFF	OFF	Pin 1/11
3851	3	0B0F03	Digital Input 2/09 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/07 (Selection), 13/46 (Fault Detect Ena) for correct configuration of input pin 2/09	ON	OFF	OFF	Pin 2/09
3851	4	0B0F04	Digital Input 2/09 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/07 (Selection), 13/46 (Fault Detect Ena) for correct configuration of input pin 2/09	ON	OFF	OFF	Pin 2/09
3852	3	0C0F03	Digital Input 2/11 Circuit shorted to Ubat	Check wiring of associated pin Check parameter 13/47 (Fault Detect Ena) for correct configuration of Fault Detection of pin 2/11	ON	OFF	OFF	Pin 2/11
3852	4	0C0F04	Digital Input 2/11 Circuit shorted to GND	Check wiring of associated pin Check parameter 13/47 (Fault Detect Ena) for correct configuration of Fault Detection of pin 2/11	ON	OFF	OFF	Pin 2/11
3853	3	0D0F03	Digital Input 2/12 Circuit shorted to Ubat	Check wiring of associated pin Check parameter 13/48 (Fault Detect Ena) for correct configuration of Fault Detection of pin 2/12	ON	OFF	OFF	Pin 2/12
3853	4	0D0F04	Digital Input 2/12 Circuit shorted to GND	Check wiring of associated pin Check parameter 13/48 (Fault Detect Ena) for correct configuration of Fault Detection of pin 2/12	ON	OFF	OFF	Pin 2/12
3854	3	0E0F03	Digital Input 2/13 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/08 (Selection), 13/49 (Fault Detect Ena) for correct configuration of input pin 2/13	ON	OFF	OFF	Pin 2/13
3854	4	0E0F04	Digital Input 2/13 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/08 (Selection), 13/49 (Fault Detect Ena) for correct configuration of input pin 2/13	ON	OFF	OFF	Pin 2/13
3855	3	0F0F03	Digital Input 2/14 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/09 (Selection), 13/50 (Fault Detect Ena) for correct configuration of input pin 2/14	ON	OFF	OFF	Pin 2/14

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
3855	4	0F0F04	Digital Input 2/14 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/09 (Selection), 13/50 (Fault Detect Ena) for correct configuration of input pin 2/14	ON	OFF	OFF	Pin 2/14
3856	3	100F03	Digital Input 2/15 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/10 (Selection), 13/51 (Fault Detect Ena) for correct configuration of input pin 2/15	ON	OFF	OFF	Pin 2/15
3856	4	100F04	Digital Input 2/15 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/10 (Selection), 13/51 (Fault Detect Ena) for correct configuration of input pin 2/15	ON	OFF	OFF	Pin 2/15
3857	3	110F03	Digital Input 2/07 Circuit shorted to Ubat	Check wiring of associated pin Check parameter 13/44 (Fault Detect Ena) for correct configuration of Fault Detection of pin 2/07	ON	OFF	OFF	Pin 2/07
3857	4	110F04	Digital Input 2/07 Circuit shorted to GND	Check wiring of associated pin Check parameter 13/44 (Fault Detect Ena) for correct configuration of Fault Detection of pin 2/07	ON	OFF	OFF	Pin 2/07
3858	3	120F03	Digital Input 2/08 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/06 (Selection), 13/45 (Fault Detect Ena) for correct configuration of input pin 2/08	ON	OFF	OFF	Pin 2/08
3858	4	120F04	Digital Input 2/08 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/06 (Selection), 13/45 (Fault Detect Ena) for correct configuration of input pin 2/08	ON	OFF	OFF	Pin 2/08
3859	3	130F03	Digital Input 4/16 Circuit shorted to Ubat	Check wiring of associated pin Check parameter 13/60 (Fault Detect Ena) for correct configuration of Fault Detection of pin 4/16	ON	OFF	OFF	Pin 4/16
3859	4	130F04	Digital Input 4/16 Circuit shorted to GND	Check wiring of associated pin Check parameter 13/60 (Fault Detect Ena) for correct configuration of Fault Detection of pin 4/16	ON	OFF	OFF	Pin 4/16
3860	3	140F03	Digital Input 4/18 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/19 (Selection), 13/62 (Fault Detect Ena) for correct configuration of input pin 4/18	ON	OFF	OFF	Pin 4/18
3860	4	140F04	Digital Input 4/18 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/19 (Selection), 13/62 (Fault Detect Ena) for correct configuration of input pin 4/18	ON	OFF	OFF	Pin 4/18
3861	3	150F03	Digital Input 4/13 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/17 (Selection), 13/59 (Fault Detect Ena) for correct configuration of input pin 4/13	ON	OFF	OFF	Pin 4/13
3861	4	150F04	Digital Input 4/13 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/17 (Selection), 13/59 (Fault Detect Ena) for correct configuration of input pin 4/13	ON	OFF	OFF	Pin 4/13
3862	3	160F03	Digital Input 1/10 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/03 (Selection), 13/37 (Fault Detect Ena) for correct configuration of input pin 1/10	ON	OFF	OFF	Pin 1/10
3862	4	160F04	Digital Input 1/10 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/03 (Selection), 13/37 (Fault Detect Ena) for correct configuration of input pin 1/10	ON	OFF	OFF	Pin 1/10
3863	3	170F03	Digital Input 4/17 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/18 (Selection), 13/61 (Fault Detect Ena) for correct configuration of input pin 4/17	ON	OFF	OFF	Pin 4/17
3863	4	170F04	Digital Input 4/17 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/18 (Selection), 13/61 (Fault Detect Ena) for correct configuration of input pin 4/17	ON	OFF	OFF	Pin 4/17
3864	3	180F03	Digital Input 3/18 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/12 (Selection), 13/52 (Fault Detect Ena) for correct configuration of input pin 3/18	ON	OFF	OFF	Pin 3/18
3864	4	180F04	Digital Input 3/18 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/12 (Selection), 13/52 (Fault Detect Ena) for correct configuration of input pin 3/18	ON	OFF	OFF	Pin 3/18
3865	3	190F03	Digital Input 4/08 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/16 (Selection), 13/58 (Fault Detect Ena) for correct configuration of input pin 4/08	ON	OFF	OFF	Pin 4/08
3865	4	190F04	Digital Input 4/08 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/16 (Selection), 13/58 (Fault Detect Ena) for correct configuration of input pin 4/08	ON	OFF	OFF	Pin 4/08
3866	3	1A0F03	Digital Input 4/04 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/14 (Selection), 13/56 (Fault Detect Ena) for correct configuration of input pin 4/04	ON	OFF	OFF	Pin 4/04

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
3866	4	1A0F04	Digital Input 4/04 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/14 (Selection), 13/56 (Fault Detect Ena) for correct configuration of input pin 4/04	ON	OFF	OFF	Pin 4/04
3867	3	1B0F03	Digital Input 4/05 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/15 (Selection), 13/57 (Fault Detect Ena) for correct configuration of input pin 4/05	ON	OFF	OFF	Pin 4/05
3867	4	1B0F04	Digital Input 4/05 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/15 (Selection), 13/57 (Fault Detect Ena) for correct configuration of input pin 4/05	ON	OFF	OFF	Pin 4/05
3868	3	1C0F03	Digital Input 4/03 Circuit shorted to Ubat	Check wiring of associated pin Check parameters 13/13 (Selection), 13/55 (Fault Detect Ena) for correct configuration of input pin 4/03	ON	OFF	OFF	Pin 4/03
3868	4	1C0F04	Digital Input 4/03 Circuit shorted to GND	Check wiring of associated pin Check parameters 13/13 (Selection), 13/55 (Fault Detect Ena) for correct configuration of input pin 4/03	ON	OFF	OFF	Pin 4/03
3869	3	1D0F03	Digital Input 4/01 Circuit shorted to Ubat	Check wiring of associated pin Check parameter 13/53 (Fault Detect Ena) for correct configuration of Fault Detection of pin 4/01	ON	OFF	OFF	Pin 4/01
3869	4	1D0F04	Digital Input 4/01 Circuit shorted to GND	Check wiring of associated pin Check parameter 13/53 (Fault Detect Ena) for correct configuration of Fault Detection of pin 4/01	ON	OFF	OFF	Pin 4/01
3870	3	1E0F03	Digital Input 4/02 Circuit shorted to Ubat	Check wiring of associated pin Check parameter 13/54 (Fault Detect Ena) for correct configuration of Fault Detection of pin 4/02	ON	OFF	OFF	Pin 4/02
3870	4	1E0F04	Digital Input 4/02 Circuit shorted to GND	Check wiring of associated pin Check parameter 13/54 (Fault Detect Ena) for correct configuration of Fault Detection of pin 4/02	ON	OFF	OFF	Pin 4/02
3871	3	1F0F03	Transmission Speed Sensor 4/04 or 3/13 Circuit shorted to Ubat	Check wiring of associated pin	ON	OFF	OFF	Pin 4/04 or 3/13
3871	4	1F0F04	Transmission Speed Sensor 4/04 or 3/13 Circuit shorted to GND	Check wiring of associated pin	ON	OFF	OFF	Pin 4/04 or 3/13
3871	5	1F0F05	Transmission Speed Sensor Circuit Open (broken wire, terminal floating)	Check wiring of associated pin	ON	OFF	OFF	Pin 4/04 or 3/13
3872	3	200F03	Analog Output 01 shorted to Ubat	Check wiring of associated pin. Check parameters 09/03 (Selection) and 09/09 (Fault Detection) for correct configuration of output pin 3/05. Run Service Routine (chapter 7.4, routines 8 to 10): – Analog Output Pin Under Software Control: Start with Signal Parameter 5, Frequency in Hz, Width in %	ON	OFF	OFF	Pin 3/05
3872	4	200F04	Analog Output 01 shorted to GND or Circuit Open (broken wire, terminal floating)	Check wiring of associated pin. Check parameters 09/03 (Selection) and 09/09 (Fault Detection) for correct configuration of output pin 3/05. Run Service Routine (chapter 7.4, routines 8 to 10): – Analog Output Pin Under Software Control: Start with Signal Parameter 5, Frequency in Hz, Width in %	ON	OFF	OFF	Pin 3/05
3873	3	210F03	Analog Output 02 shorted to Ubat	Check wiring of associated pin. Check parameters 09/04 (Selection) and 09/10 (Fault Detection) for correct configuration of output pin 3/06. Run Service Routine (chapter 7.4, routines 8 to 10): – Analog Output Pin Under Software Control: Start with Signal Parameter 6, Frequency in Hz, Width in %	ON	OFF	OFF	Pin 3/06
3873	4	210F04	Analog Output 02 shorted to GND or Circuit Open (broken wire, terminal floating)	Check wiring of associated pin. Check parameters 09/04 (Selection) and 09/10 (Fault Detection) for correct configuration of output pin 3/06. Run Service Routine (chapter 7.4, routines 8 to 10): – Analog Output Pin Under Software Control: Start with Signal Parameter 6, Frequency in Hz, Width in %	ON	OFF	OFF	Pin 3/06

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
3948	9	6C0F09	J1939 PTODE Message (PTO Drive Engagement) is missing or not available	Check J1939 link connection Check Parameter 01/108 (PTODE Source Address SAE J1939)	ON	OFF	OFF	
4041	0	C90F00	Indication of a critical software (logic) failure. (20ms ECU OS Task Locked in an Endless Loop)	Try reprogramming the CPC with the new software release. Replace CPC4 and reprogram with the latest software.	OFF	OFF	OFF	
4041	9	C90F09	Indication of a critical resource allocation issue. Task restructuring required. (20ms ECU OS Task Timed out Prior to Completion)	Try reprogramming the CPC with the new software release. Replace CPC4 and reprogram with the latest software.	OFF	OFF	OFF	
4041	16	C90F10	Indication of a critical software (logic) failure. (1000ms ECU OS Task Locked in an Endless Loop)	Try reprogramming the CPC with the new software release. Replace CPC4 and reprogram with the latest software.	OFF	OFF	OFF	
4206	2	6E1002	TSC1 Message Counter indicates lost Messages	Try reprogramming the CPC with the new software release. Replace CPC4 and reprogram with the latest software.	ON	OFF	OFF	
4207	2	6F1002	TSC1 Message Checksum wrong	Try reprogramming the CPC with the new software release. Replace CPC4 and reprogram with the latest software.	ON	OFF	OFF	
524275	19	F3FFF3	RCM Message not received or stopped arriving	Check CPC4 PT-CAN link connection. Check RCM functionality / PT-CAN link connection	OFF	OFF	OFF	
524276	13	F4FFED	MCM fuelmap to GVC emission standard calibration (02/23) mismatched	Check parameter 02/24 (GVC Emission Standard Conf) for correct setting.	ON	OFF	OFF	
524277	13	F5FFED	Super Structure Cabin Mode ENABLE-State ERROR	Check CPC4 PT-CAN link connection. Check if vehicle speed has plausible value. Check park brake state. Check if gearbox sends valid values for current and selected gear. Check if CC is deactivated.	OFF	OFF	OFF	
524277	14	F5FFEE	Driving from SuperStructure IMPLAUSIBLE Condition	Check CPC4 PT-CAN link connection. Check engine mode. Check service brake state. Check if gearbox sends valid values for current and selected gear. Check if CC is deactivated.	OFF	OFF	OFF	
524277	19	F5FFF3	Super Structure Cabin Mode DISABLE-State ERROR	Check CPC4 PT-CAN link connection. Check if vehicle speed has plausible value. Check park brake state. Check if gearbox sends valid values for current and selected gear. Check if CC is deactivated.	OFF	OFF	OFF	
524278	13	F6FFED	2-Channel RAT Accelerator Pedal Signal 1 Missing	Check wiring of associated pins. Check parameter 09/01 (1 9 FPO_02 Selection) and parameter 09/06 (4 12 FPO_01 Selection) Check parameter 09/12 (4 12 FPO_01 Fault Detection) for correct configuration of Fault Detection of pin 4/12 and parameter 09/08 (1 9 FPO_02 Fault Detection) for correct configuration of Fault Detection of pin 1/09. Check parameter 09/14 (1 9 FPO_02 Resistor Enable) for pin 1/09 resistor activation.	ON	OFF	OFF	Pin 4/12 Pin 1/09
524278	14	F6FFEE	2-Channel RAT Accelerator Pedal Signal 2 Missing	Check wiring of associated pins. Check parameter 09/01 (1 9 FPO_02 Selection) and parameter 09/06 (4 12 FPO_01 Selection) Check parameter 09/12 (4 12 FPO_01 Fault Detection) for correct configuration of Fault Detection of pin 4/12 and parameter 09/08 (1 9 FPO_02 Fault Detection) for correct configuration of Fault Detection of pin 1/09. Check parameter 09/14 (1 9 FPO_02 Resistor Enable) for pin 1/09 resistor activation.	ON	OFF	OFF	Pin 4/12 Pin 1/09
524278	15	F6FFEF	RAT Accelerator pedal "in-range" fault.	Deviation between RAT Ch1 and Ch2 too high. Check RAT AP Sensor.	ON	OFF	OFF	
524279	2	F7FFE2	Expansion tank pressure sensor data erratic	Check wiring of associated pins. Check parameter 13/63 (3 04 AI_02 Selection) and parameter 13/64 (4 14 AI_03 Selection)	ON	OFF	OFF	Pin 3/04 Pin 4/14

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
524279	3	F7FFE3	Expansion tank pressure sensor circuit shorted to Ubat	Check wiring of associated pins. Check parameter 13/63 (3 04 AI_02 Selection) and parameter 13/64 (4 14 AI_03 Selection)	ON	OFF	OFF	Pin 3/04 Pin 4/14
524279	4	F7FFE4	Expansion tank pressure sensor circuit shorted to GND	Check wiring of associated pins. Check parameter 13/63 (3 04 AI_02 Selection) and parameter 13/64 (4 14 AI_03 Selection)	ON	OFF	OFF	Pin 3/04 Pin 4/14
524279	11	F7FFEB	Expansion Pressure Tank Pressure Set Fault	Inspect Expansion Pressure Tank for leaks	OFF	OFF	OFF	
524279	18	F7FFF2	Expansion Pressure Tank Pressure Loss	Inspect Expansion Pressure Tank for leaks	OFF	OFF	OFF	
524280	2	F8FFE2	Remote Accelerator Pedal Idle Validation Switch inputs reversed	Check wiring of associated pins. Check Parameters 13/08, 13/09, 13/10 and 13/65	ON	OFF	OFF	Pin 2/11 Pin 2/14 Pin 2/13 Pin 2/15
524280	3	F8FFE3	Remote Accelerator Pedal Idle Validation Switch 1 circuit shorted to Ubat	Check wiring of associated pins. Check parameter 13/09 (2 14 DI Selection) and parameter 13/65 (2 11 DI Selection) Check parameter 13/47 (2 11 Diflex10 Fault Detect Enable) for correct configuration of Fault Detection of pin 2/11 and parameter 13/50 (2 14 Diflex13 Fault Detect Enable) for correct configuration of Fault Detection of pin 2/14	ON	OFF	OFF	Pin 2/11 or Pin 2/14
524280	4	F8FFE4	Remote Accelerator Pedal Idle Validation Switch 1 circuit shorted to GND	Check wiring of associated pins. Check parameter 13/09 (2 14 DI Selection) and parameter 13/65 (2 11 DI Selection) Check parameter 13/47 (2 11 Diflex10 Fault Detect Enable) for correct configuration of Fault Detection of pin 2/11 and parameter 13/50 (2 14 Diflex13 Fault Detect Enable) for correct configuration of Fault Detection of pin 2/14	ON	OFF	OFF	Pin 2/11 or Pin 2/14
524280	5	F8FFE5	Remote Accelerator Pedal Idle Validation Switch 2 circuit shorted to Ubat	Check wiring of associated pins. Check parameter 13/08 (2 13 DI Selection) and parameter 13/10 (2 15 DI Selection) Check parameter 13/49 (2 13 Diflex12 Fault Detect Enable) for correct configuration of Fault Detection of pin 2/13 and parameter 13/51 (2 15 Diflex14 Fault Detect Enable) for correct configuration of Fault Detection of pin 2/15	ON	OFF	OFF	Pin 2/13 or Pin 2/15
524280	6	F8FFE6	Remote Accelerator Pedal Idle Validation Switch 2 circuit shorted to GND	Check wiring of associated pins. Check parameter 13/08 (2 13 DI Selection) and parameter 13/10 (2 15 DI Selection) Check parameter 13/49 (2 13 Diflex12 Fault Detect Enable) for correct configuration of Fault Detection of pin 2/13 and parameter 13/51 (2 15 Diflex14 Fault Detect Enable) for correct configuration of Fault Detection of pin 2/15	ON	OFF	OFF	Pin 2/13 or Pin 2/15
524281	9	F9FFE9	J1939 Powertrain Message (Engine Droop Control) is missing (PropB50)	Check J1939 link connection	ON	OFF	OFF	
524283	2	FBFFE2	Generator (Charging System) terminal W – Low Voltage	Check wiring of Generator Terminal W or check Generator functionality	OFF	OFF	OFF	
524283	14	FBFFEE	Generator (Charging System) terminal W – allocation error (pulse / rev signal)	Check wiring of Generator Terminal W or check Generator functionality	ON	OFF	OFF	
524285	4	FDFFE4	CM1 DPF Regeneration Switch shorted to GND (if applied more than 5 sec this error flags)	Check parameter 01/07 (CM1 DPF Source Addr SAE J1939) for correct configuration	ON	OFF	OFF	
524286	1	FEFFE1	Automatic gear selection: automatic mode is not available (multiple causes for error: AT is in manual mode, no automatic mode possible)	Check MCM, ACM, TCM and CPC Failure (calibration wrong)	OFF	OFF	OFF	

SPN	FMI	DTC	Fault description	Recommended Action	CEL	SEL	MIL	Fault location
524286	2	FEFFE2	Automatic gear selection: incompatible or missing dataset (calibration error, wrong calibration data set for this vehicle)	Check if CAL-Dataset version fits to the software version, engine and transmission type	OFF	OFF	OFF	
524286	3	FEFFE3	Automatic gear selection: EcoRoll is not available (multiple errors, no EcoRoll available)	Check MCM, ACM, TCM and CPC Failure	OFF	OFF	OFF	
524286	4	FEFFE4	Automatic gear selection: Gear shift not plausible (multiple errors, no optimal gear shift possible)	Check MCM, ACM, TCM and CPC Failure	OFF	OFF	OFF	
524286	5	FEFFE5	Automatic gear selection: No gear shiftable.	Check TCM for proper function and fault codes. Possible gearbox error.	OFF	OFF	OFF	
524286	6	FEFFE6	ITPM error: vehicle calibration is inconsistent	Check parameterization of PTCONF (PGR 048)	OFF	OFF	OFF	
524286	7	FEFFE7	ITPM error: drivetrain speed signal is inconsistent. (One or more speed signals incorrect)	Check parameterization of PTCONF (PGR 048) Check signals as follows: - engine speed - transmission input speed - transmission output speed - TCO vehicle speed - ABS/EBS vehicle speed	OFF	OFF	OFF	
524287	1	FFFFE1	EvoBus cruise control lever position not plausible	EvoBus only. Check associated Pins.	ON	OFF	OFF	

12 APPENDIX

Appendix 1

12.1 Hydraulic schematic diagram of the systems for steering control and operating equipment

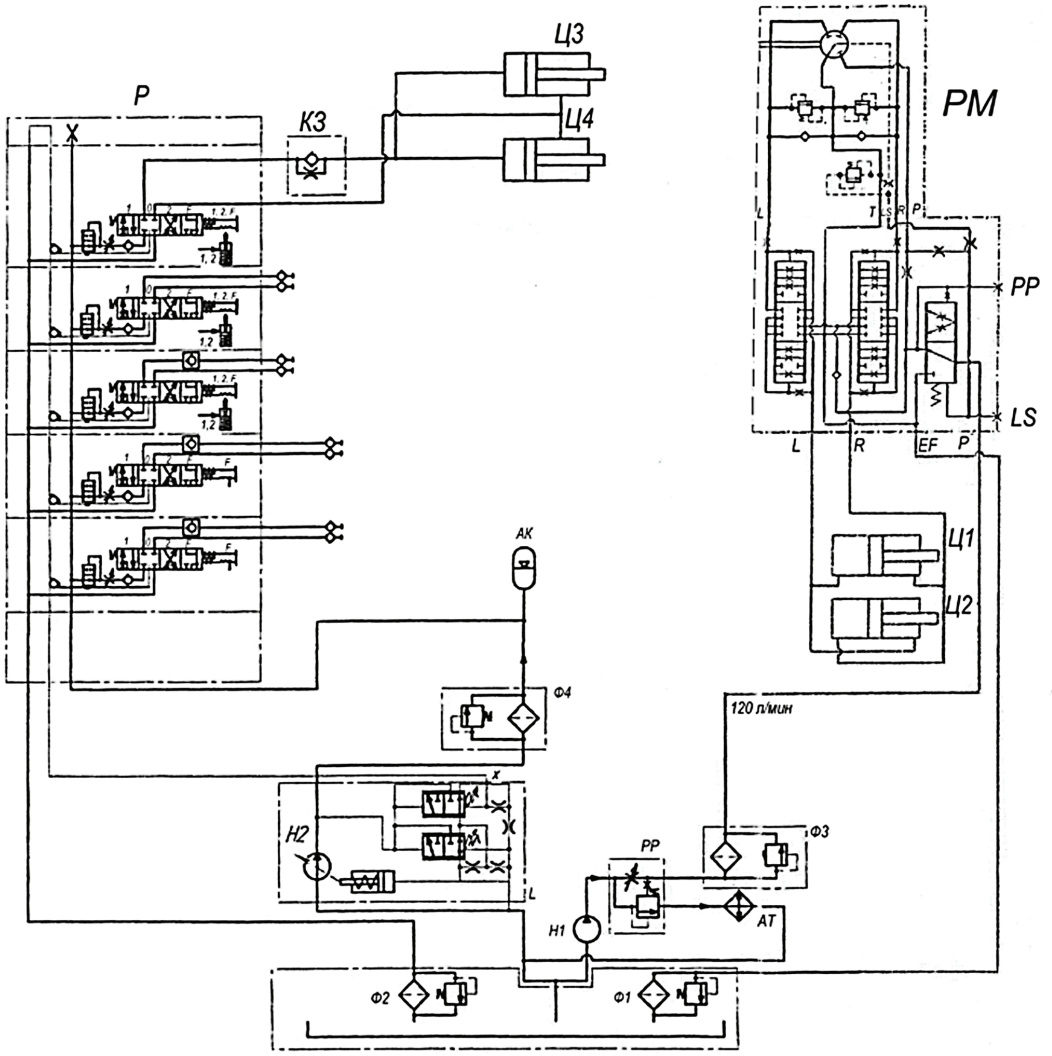


Fig. 118

Pos, Designation	Name	Q-ty	Application		Pos. Designation	Name	Q-ty	Application
AT	Oil radiator	1			F1, F2	Filter 700A.46.14.190-2	2	
B	Hydraulic tank 700A.46.14.000-3	1			F2, F4	Filter 700A.46.14.190-2	2	
KZ	Decelerating valve	1			Ts1, Ts2	Hydraulic cylinder Ts125.50x400	2	
N1	1 Pump NSh of steering control system	1			Ts3, Ts4	Hydraulic cylinder Ts125.50x200	2	Turn
N2	Pump of operating equipment system	1			RR	Flow controller	1	Lifting 0 Lowering
R	Hydraulic distributor	1			Rm	Steering mechanism	1	

Appendix 2

12.2 Kinematic diagram of transmission

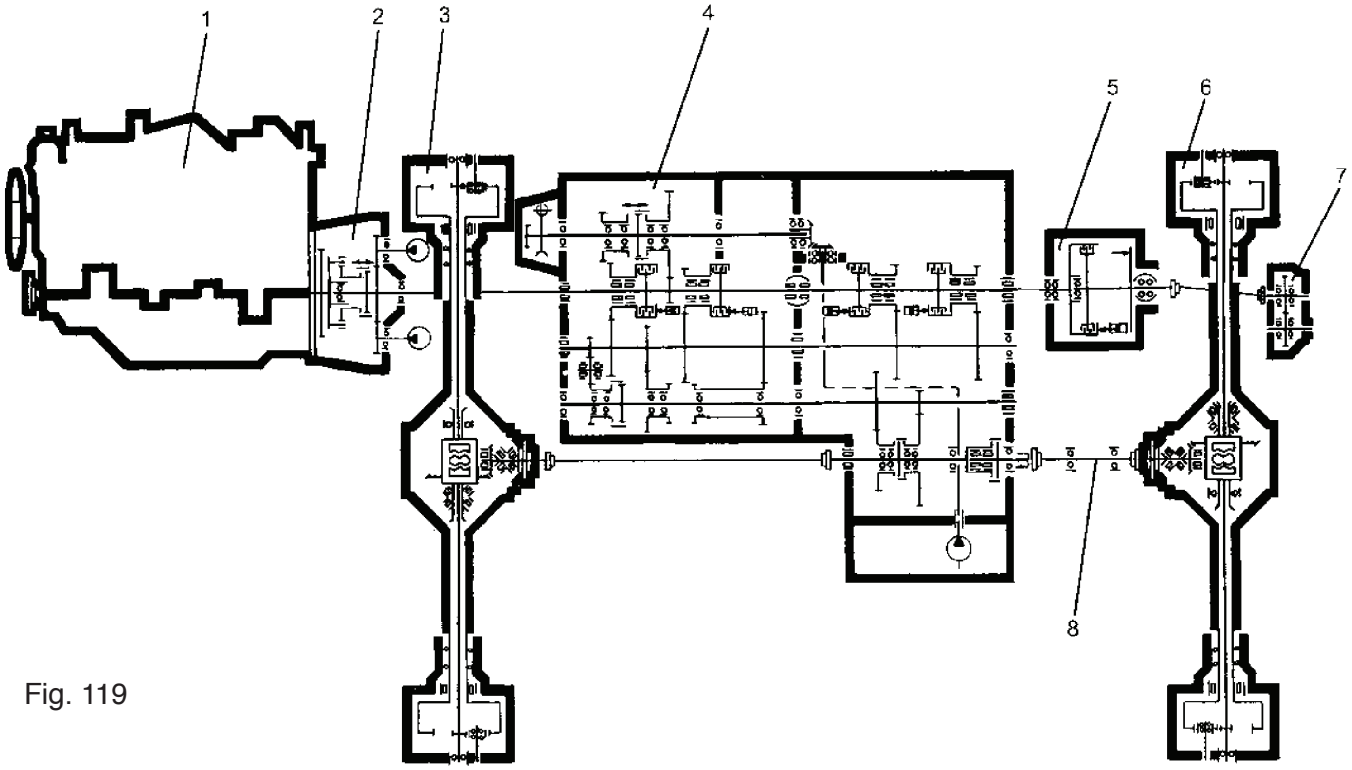


Fig. 119

Kinematic diagram of transmission
1 - engine; 2 - reducer with semi-rigid coupling; 3 - front driving axle;
4 - gearbox; 5 - PTO connecting coupling; 6 - rear driving axle;
7 - single-gear PTO reducer; 8 – intermediate bearing

Appendix 3

12.3 Tighten Torgue Values for Fasteners of Mian Assemblies

No.	Point of fastening	Torgue, kg·m
1	Bolts attaching brackets to the engine	7 ... 9
2	Bolts attaching engine spacers to the frame	15
3	Bolts attaching semi-rigid coupling to the engine flywheel	3
4	Nuts attaching the housing of pump drive reducer to the engine	6
5	Bolts attaching the gearbox AKSS	10
6	Bolts attaching GB case to AKSS	25
7	Bolts attaching the intermediate bearing holders	3
8	Drive axle clamp nuts	50
9	Wheel nuts	14 ... 20
10	Hoses of the hydraulic system of steering control and op-erating equipment:	
	- hoses with internal diameter DN 20	10^{+1}
	- hoses with internal diameter DN 16	$7.4^{+0.74}$
	- hoses with internal diameter DN 12	$4.5^{+0.45}$
	- hoses with internal diameter DN 10	$3.8^{+0.38}$
	- hoses with internal diameter DN 8	$2^{+0.39}$
11	Bolts fastening the “pinion carrier - hub” joint	28
12	Bolts attaching housings to the main gear case	28
13	Bolts attaching cardans from the engine to GB, from GB to PTO	15^{+6}
14	Bolts attaching cardans from GB to axles	7.5^{+2}

Appendix 4

12.4 List of Permissible Changes for Oils and Lubricants

It is allowed to fill the tractor systems and perform lubrication of mechanisms wit the following oils and lubricants.

- list of oils allowed to be replaced in GB

Designation	Standard	Applied with environment temperature	Notes
M-10V_2; M-10G_2; M-10G_2K	GOST 8581	minus 12°C min	Summer
M-10DM		minus 16°C min	
M-8G_2		minus 23°C min	Winter
M-8V_2; M-8G_2K; M-8DM		minus 28°C min	
SAE 30 (mineral oil)		minus 16°C min	Summer
SAE 10W (mineral oil)		minus 25°C min	Winter
SAE 15W-30; SAE 15W-40 (mineral oil)	SAE J300	minus 20°C min	All-season
SAE 10W-30; SAE 10W-40 (mineral oil)		minus 25°C min	
SAE 5W-30 (mineral oil)	SAE J300	minus 30°C min	
Grade “A” oil	TU 38.101.1282	minus 38°C min	Winter
Shell Spirax S3 TLV, Shell Spirax S2 ATF AX		minus 43°C min	
TS3p8	TU 38.101.1280	minus 48°C min	

Appendix 4

12.5 Refill Reservoirs

Description of reservoir	Capacity (a), l (kg)	Working fluid brand *
Fuel tank	800 (675)	For OM470LA engines - as per manufacturer’s recommendations.
Lubrication system	39 max (35 max) 34 min (30.6 min)	Engine oil Shell Rimula (filled at the manufacturer’s plant) or oil of any other brand in accordance with prescriptions issued by Mercedes-Benz for operating materials
Cooling system	55 (50% - antifreeze agent 50% - distilled water)	Glyco Shell (filled at the manufacturer’s plant) or antifreeze agent of any other brand as per prescriptions issued by Mercedes-Benz for operating materials
Hydraulic system for steering control and of the linkage	175 (158)	See Lubrication table
Gearbox hydraulic system	24 (22)	
Main gear case of driving axle (case 1)	10 (9)	
Final gear case of driving axle (case 1)	3.5 (3.25)	
Air conditioning system:		See Lubrication table
*Working fluids for OM470LA (Mercedes) engine only in accordance with the instruction for the engine and prescriptions for operating materials		
- halocarbon R134a; - refrigerating oil ZXL 100PG	950 g 200 ml	

Note. The data on the amount of halocarbon and refrigerating oil are given for the system filled at the manufacturer’s plant. In case of system overfilling in the course of operation, it is necessary to consult your MTZ Dealer or a specialised company dealing with maintenance and repair of air conditioners in order to determine the required amount of oil in the compressor.

Appendix 5

12.6 Logbook of Measurements of the Internal Air Pressure in Tires

Date of Measurement	Serial number of Tire		Serial number of Tire		Serial number of Tire		Serial number of Tire		Notes	Inspector's signature
	Postion	Pressure	Postion	Pressure	Postion	Pressure	Postion	Pressure		

Note!

If any increased or decreased pressure is detected in the machine, then in bringing it to the operating standard value it is necessary to indicate the following: in the numerator - the value of internal air pressure in tyres at the moment of measurement; in the denominator - the value of pressure after its bringing to the standard level.

Appendix 6

12.7 Tire Operation Record Card

Size Tire _____ installation date _____

Model _____ Tire dismantling date _____

Serial number _____ Make of the machine and its inventory No.

Garage No. _____ _____

Date of inspection	Tyre position (FR (front right), FL (front left), RR (rear right), RL (rear left))	Tire run from the beginning of operation				Pressure in tyre at the moment of inspection, kgf/cm2	Technical condition of tire at the moment of inspection	Technical condition of tire at the moment of inspection
		In miles or kikometres		In hours				
		Total	including that dur-ing hauling opera-tions	Total	including that dur-ing hauling opera-tions			

Person responsible for record-keeping _____

(signature)

Appendix 7

12.8 List of Electrical Equipment Elements for the Electrical Diagram

Pos. name	Name	Q-ty	Notes
A1	Steering column KF00W0D-ELS-PK	1	
A2	Electronic unit MR	1	Supply with engine
A3	Electronic unit FLA A000 446 1207	1	Supply with engine
A4	Electronic unit ADM2FR	1	Supply with engine
A5	Pedal A9413000104	1	Supply with engine
A6	Air conditioner control panel	1	
A7	Avgust air conditioner	1	
A8	Car audio	1	
A9	Antenna 7691260014	1	Bosch
BA1;BA2	Loud speakers ACV SP-420	2	
BP1	Pressure sensor TKH1.6-T184	1	Gearbox oil
BP2	Pressure sensor 3902.3829010 GOST 1701-75	1	Air in PS (pneumatic system)
BV2	Speed sensor 11.3843-Y-HL TU37.003.1148-83	1	
EK1	Plug	1	Thermostatic control
EK2	Filter heating element	1	Fuel filter
EL1;EL2	Headlamp 1BL 247 042-017 (Hella)	2	D90 mm, H1, 24V low beam
EL1;EL2	Headlamp 1KO 247 042-037 (Hella)	2	D90 mm, H1, 24V high beam
	Service lamps 8724.3-10-01		
EL3; EL4		2	Front right lamps
EL5; EL6		2	Front left lamps
EL7; EL8		2	Rear right lamps
EL9; EL10		2	Rear left lamps

Pos. name	Name	Q-ty	Notes
EL11	Under-h lamp PD308A-U-HL TU37.003.187-80	1	
EL12…EL16	Switch illumination lamp		Hella
EL18	9FF 713 627 011	6	
EL20, EL21	Ceiling lamp 2JA 003 231-001	2	
EL22	License plate lighting lamp OH3 00-02	1	
FU1,FU2	Fuse panel 41.3722 TU37.469.013-95	3	
	Fuses 35.3722 TU37.469.013-95		
	35.3722 (5A)		
FU2.3,FU2.6			Used with fuse panel 41.3722
FU2.7, FU2.8			
FU2.9		5	
	352.3722 (10A)		
FU1.2-FU1.13			
FU2.1,FU2.2			
FU2.4,FU2.5			
FU2.10,FU2.13			
FU3.2,FU3.6		25	
FU1.2,FU1.13	356.3722 (30A)	2	
FU22	Fuse 542.3722-60A TU37.469.056-2002	1	
FU29	Sealed fuse (20A)	1	
G	Generator	1	Supply with engine
GB1, GB2	Battery 6ST-190A PZ ZhYuIK.563414.013TU	2	
	Hornless sound signals TU37.003.688-75		
HA1	C313	1	
HA2	C314	1	
	Front light 3723.3712-01 TU RB 0588255010-95		
HL1		1	Right
HL2		1	Left
	Side repeater lamp 641.3726-01 TU37.001.2164-2006		
HL3		1	Right turn
HL4		1	Left turn

Appendix

Pos. name	Name	Q-ty	Notes
HL5… HL7	Turn indicator repeater UP C-24V	3	“Road-train” sign
HL22	Rear light 7313.3716-01		
HL23	TU RB 600124825026-2002	2	
KM	Switch 1420.3737 TU37.003.574-74	1	
	Relay 751.3777 TU37.003.1418.94:		
KV1		1	Battery switch locking
KV2		1	ET lamp activation
KV3		1	Sound signal
KV4		1	EHR activation (cl. 15)
KV5		1	HER activation (D+)
KV6		1	High beam
KV7		1	Low beam
KV8		1	Brake lamp
KV9		1	Air conditioner compressor
KV10		1	Air conditioner fan
KV11		1	Starter
KV12	Relay 711.3747 TU37.003.1418-94	1	CI15
KV13	Relay 46.3747010	1	Window wiper relay
M1	Starter	1	Supply with engine
M2	Air conditioner fan	1	Supply with air conditioner
M3,M4	Washer	2	Front/rear
M5	Window wiper motor gearbox A16-60.08	1	front
M6	Window wiper motor gearbox A18-50.00	1	rear
M7	OS-8 heater fan	1	Avgust
R1	Resistor C2-23-0.5-120 Ohm	1	
SA1	Switch 6RH 007 832-461	1	Front service headlight activation

Pos. name	Name	Q-ty	Notes
SA2	Switch 6RH 007 832-461	1	Rear service headlight activation
SA3	Switch 6EH 007 832-011	1	“Road-train” sign activation
SA4	Switch 6EH 007 832-011	1	Flasher lamp activation
SA5	Switch 6RH 007 832-411	1	Rear window wiper activation
SA7	Switch 6GM 007 832-241	1	Growth/reducti on of engine RPM value
SL1	Fuel level sensor DT7.3-51-800-00	1	
SL2	Hydr. system impermissible oil level alarm sensor	1	
SK3	Hydr. system impermissible oil temperature alarm sensor	1	
SP1	Emergency air pressure sensor DADV-02 TU RB 07513211.004-94	1	Parking brake
SP2	Switch 2802.3829010 TU 37.453.092-93	1	Brake lamp
SP6	TGB filter clogging alarm sensor	1	
SP7	Halocarbon pressure sensor	1	Supply with air conditioner
SP8	Air filter clogging alarm sensor XX770050	1	Donaldson
SP9, SP10	Emergency air pressure sensor 6072.3829	2	1st and 2nd circuit receivers
SP11	Mounted equipment pressure filter clogging alarm	1	Supply with filter
SP12	Steering control pressure filter clogging alarm	1	Supply with filter
SQ1	Neutral mode switch VK 12-41 TsIKS.642241.023	1	Starter activation chain locking
UZ	Voltage transformer PN24/12.5	1	
VD1	Diode KD243B	1	
	Pin contact blocks SRS		Cannon-type power connectors (AMR)
XP1	Pin contact block 213905-1	1	3-contact

Appendix

Pos. name	Name	Q-ty	Notes
	Pin contact block 206838-3	5	24-contact
XP3		1	
XP4		1	
XP6		1	
XP8		1	
XP16		1	
	Pin contact block 206151-3	4	37-contact
XP2		1	
XP5		1	
XP7		1	
XP15		1	
	Pin contact blocks Supersiel 1.5 282105-1	3	3-contact
XP13		1	
XP89		1	
XP90		1	
XP99	282108-1	1	6-contact
	Pin contact blocks OST37.003.032-78		
XP81	502601	1	
XP76	Pin contact block 1-480586-0	2	9-contact
XP17		1	
XP18		1	
	Receptacles SRS		Cannon-type power connectors (AMR)
XS1	Receptacle 213889-2	1	3-contact
XS9	Receptacle 182921-1	1	4-contact
XS11	Receptacle 206043-1	1	14-contact
	Receptacle 206837-1	5	24-contact
XS3		1	
XS4		1	
XS6		1	
XS8		1	
XS16		1	
	Receptacle 206150-1	4	37-contact
XS2		1	
XS5		1	

Pos. name	Name	Q-ty	Notes
XS7		1	
XS15		1	
	Receptacles Supersiel 1.5		
XS33	282079-2	1	1-contact
	282087-1	4	3-contact
XS13		1	
XS69		1	
XS69		1	
XS90		1	
XS32	282088-1	1	4-contact
	282090-1	2	6-contact
XS70		1	
XS99		1	
	Receptacle 601202	4	2-contact
XS56		1	
XS63		1	
XS64		1	
XS66		1	
XS71	Receptacle AX-333	1	Hydr. system oil level sensor
	Receptacle 8JA 713631-001	7	For key switches
XS6.1		1	
XS6.2		1	
XS6.3		1	
XS6.4		1	
XS6.5		1	
XS6.6		1	
XS6.7		1	
XS1-21	A013 545 6526	1	Supply with engine
XS2-18	A013 545 6426		
XS70		2	
XS3-15	A013 545 6326	1	
XS4-12	A013 545 6226	1	
XS67	A013 545 6226	1	
XS9.1	A001 545 5626	1	
XS50	A015 545 6726	1	
XS51	A000 153 0022	1	

Appendix

Pos. name	Name	Q-ty	Notes
	Receptacles ISO 10487		
XS79	962189-1	1	Type A
XS80	962191-1		Type B
XS(KV12)	Receptacle KR3702	1	Relay 711.3747
	Receptacles OST 37.003.032-78:		
	602601	9	
XS26		1	
XS36		1	
XS38		1	
XS39		1	
XS43		1	
XS52		1	
XS53		1	
XS54		1	
XS55		1	
	602602	11	
XS14		1	
XS21-12V		1	
XS22-24V		1	
XS61		1	
XS62		1	
XS65		1	
XS96		1	
XS97		1	
XS98		1	
XS114		1	
XS115		1	
XS58	602604	1	
	602606	3	
XS12		1	
XS34		1	
XS37		1	
	617605	11	
XS(KV1)		1	
XS(KV2)		1	
XS(KV3)		1	
XS(KV4)		1	

Pos. name	Name	Q-ty	Notes
XS(KV5)		1	
XS(KV6)		1	
XS(KV7)		1	
XS(KV8)		1	
XS(KV9)		1	
XS(KV10)		1	
XS(KV11)		1	
YC1	ET solenoid valve	1	Supply with engine
YC2	Solenoid valve of compressor	1	Supply with air conditioner

NOTES

NOTES

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