BELARUS 2122.6

2122.6-0000010 OM

OPERATOR'S MANUAL

2014

This Operator's manual was composed by an engineer of the first Department of Constructive and Experimental Works (DCEW-1), A.V. Runov, with participation of key specialists of DCEW-1 of OJSC “Minsk Tractor Works”

Publication responsible person – Yu.M. Korotky, head of engineering office for design documentation of the DCEW-1.

Executive editor – N.I. Zezetko, chief designer of tractor production of OJSC “MTW”.

Editor-in-chief – A.G. Stasilevich, OJSC “MTW” general designer.

Operator's manual contains brief description and specifications of tractors “BELARUS-2122.6” produced by Minsk Tractor Works. The main operating rules for tractors are set forth, the information about their adjustments and maintenance is provided.

Operator's manual is meant for study of operation rules and maintenance of tractors “BELARUS-2122.6”.

In view of Minsk Tractor Works policy directed to constant upgrading of produced goods, the construction of some units and parts of Belarus tractor may undergo changes which are not reflected in the present edition. The detailed information may be obtained from “BELARUS” dealer.

CONTENTS

Introduction

The present manual is designed for studying the structure, operation rules and maintenance of tractors “BELARUS-2122.6”.

Scrutinize this manual. It will help you to study the rules of correct operation and maintenance.

Failure to follow these instructions can lead to operator's injury or a tractor breakdown.

Tractor operation, its maintenance and repair shall be carried out only by employees, familiar with all of its parameters and characteristics and informed about necessary safety requirements to prevent casualties.

Due to constant tractor development, some changes which are not specified in the present manual can be introduced in the structure of certain units and parts.

Any arbitrary changes made by a consumer release the manufacturer from responsibility for possible further injuries to the operator and a tractor breakdown.

Adopted abbreviations and conventional notations:
ADL – automatic differential lock;
AB – accumulator battery;
DL – differential lock;
RADL – rear axle differential lock;
PLU – pilot lamps unit;
FB – fuse block;
OPU for HLL – operation programming unit for hydraulic lift linkage;
FC – fast coupling;
PTO – power takeoff shaft;
PRS – power reception shaft;
HSC – hydrostatic steering control;
HLL – hydraulic lift linkage;
HS – hydraulic system;
FFVS – frequency fuel volume sensor;
STM – shift-time maintenance;
RPTO – rear power take-off shaft;
SPTA – spare parts, tools and accessories;
RA – rear axle;
RLL – rear lift linkage;
II – integrated indicator;
GB – gearbox;
HPC – heating plug controller;
CECS - complex electronic control system;
MI – multifunction indicator;
MTU – machine and tractor unit;
CC – coupling clutch;
LL – lift linkage;
CL – coolant;
IAC – inlet air cooler;
FDA – front driving axle;
FPTO – front power take-off shaft;
FLL – front lift linkage;
FDAD – front driving axle drive;
IICP – integrated indicator control module;
IEB – integrated electronic board;
HPH – high pressure hoses;
HP – heating plugs;
SM – seasonal maintenance;
SPU – switching and protection unit;
MS – maintenance service;
MS1 – maintenance service No1;
MS2 – maintenance service No2;

MS3 – maintenance service No3;
DH – drawbar hitch;
ECS – electronic control system;
EECS – engine electronic control system;
EE – electrical equipment.

The manufacturer uses standard international symbols regarding application of instruments and control units.

Given below are the symbols with indication of their meanings.

 see the manual;

 brake;

 handbrake;

 audible beep;

 alarm signaling;

 fuel;

 coolant;

 heating plugs;

 engine speed;

 oil pressure in the engine;

 temperature of engine coolant;

 off / stop;

 on / start;

 gradual adjustment;

 control manipulations;

 fast;

 slowly;

 forward;

 reverse;

 accumulator charging;

 cab dome light;

 parking lights;

 tractor turn indicator;

 tractor trailer turn indicator;

 upper beam;

 low beam;

 working lights;

 differential lock;

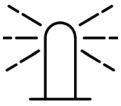
 PTO engaged;


front screen wiper;


rear screen wiper and washer;


brake fluid level in main cylinder tanks;


oil pressure in HSC


beacon


oil pressure in gearbox

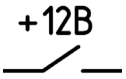

braking of gearbox


air pressure in pneumatic system

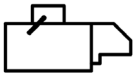

— swivel lever – up


— swivel lever – down


— instrument illumination



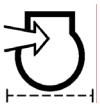
— +12V supply


— starter


— from working lights on handgrips and on roof


front driving axle drive;


fan;


air filter clogged;


engine start;


— road-train


— external cylinder – retracting

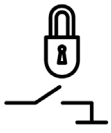

— external cylinder – protracting

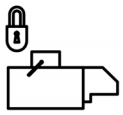

— external cylinder – floating

engine stop


— linkage control system


— instrument supply


— battery disconnection lock


— starter lock

1. TRACTOR DESCRIPTION AND OPERATION

1.1 Tractor assignment

Tractor “BELARUS-2122.6” is intended for performance of power-consuming agricultural operations in traction and traction-driven modes coupled with wide-span and multi-purpose units, including separated link implements: for basic and pre-sowing tillage, cereal and other crop sowing, forage conservation, root crop, grain crop and industrial crop harvesting; for transportation and stationary operations; for municipal service, construction, industrial operations.

Tractor “BELARUS-2122.6” is a general-purpose wheeled tractor of traction class 4 with the wheel arrangement 4X4.

Physical configuration of tractor “BELARUS-2122.6” in basic configuration is shown in figure 1.1.1.

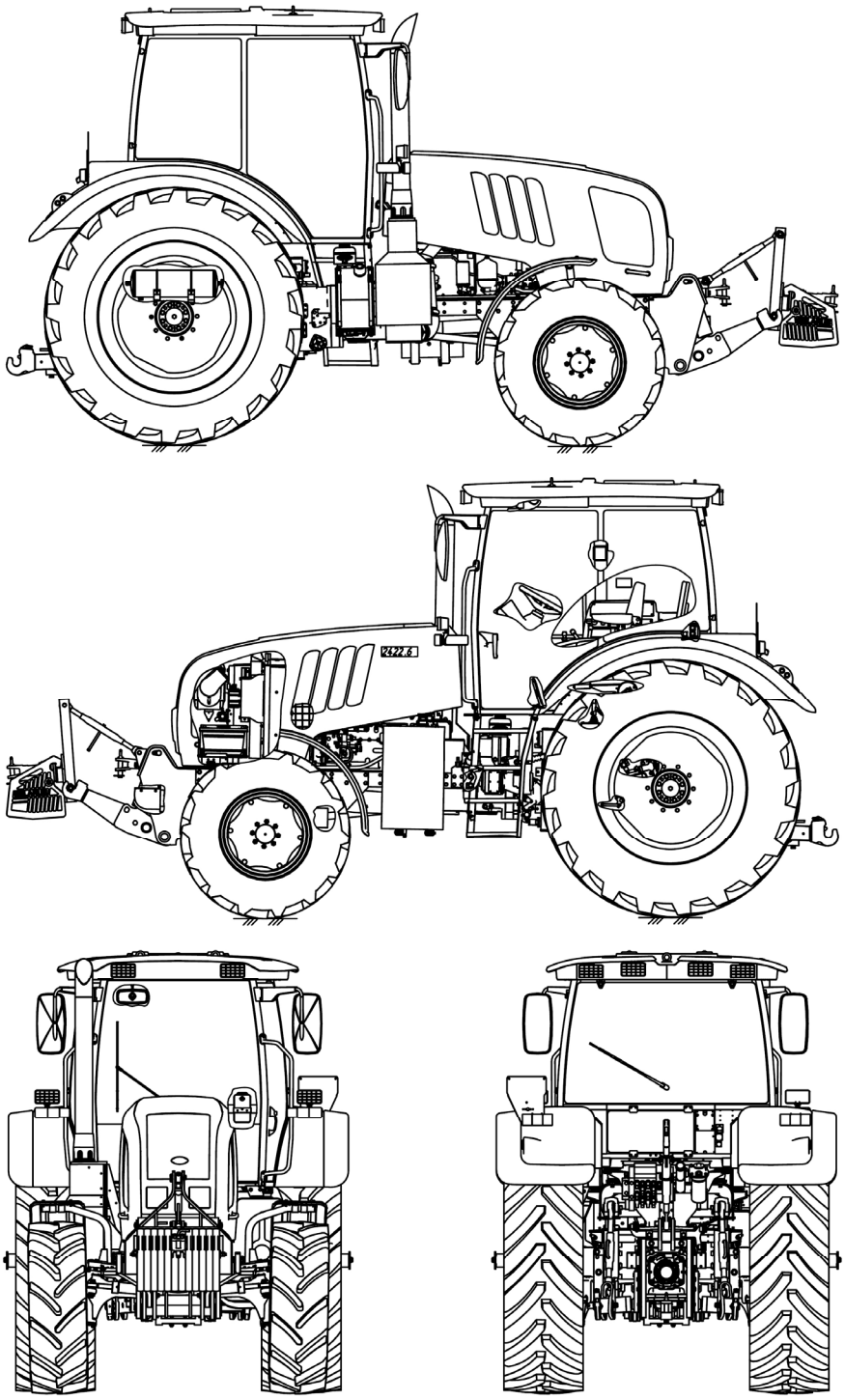


Figure 1.1.1 –Tractor “BELARUS -2122.6”

1.2 Technical specifications

Main parameters and specifications of tractor “BELARUS -2122.6” are given in table 1.2.1.

Table 1.2.1

Parameter (specification) designation	Parameter value for tractor “BELARUS -2122.6”
1 Traction class according to GOST 27021	4
2 Rated traction force, kN	40
3 Engine [1]	
a) model	D-260.4 S4
b) engine type [2]	turbocharged with intercooling of inlet air
c) number and arrangement of cylinders [2]	six, in-line, vertical
d) cylinder displacement, l [2]	7,120
e) engine power, kW:	
1) rated [2]	155,9
2) operating	150,0±3,0
f) crankshaft rated speed, rpm [2]	2100
g) specific fuel consumption at operating power, g/(kW·h)	224±11
h) rated factor of torque backup, at least, % [2]	30
i) max torque, N·m [2]	920
4 Number of gears:	
a) for forward travel	16
b) for reverse travel	8
5 Tractor travel speed (design) at crankshaft rated speed, km/h:	
a) for forward motion:	
1) least	2,8
2) highest	39,5
b) for backward motion:	
1) least	4
2) highest	18,6
6 Tractor weight, kg:	
a) tare weight (with FLL without ballast)	7160±100 (7830±100) [3]
b) operating (with FLL without ballast)	7720±100 (8390±100) [3]
c) max operating permitted when moving on public roads with a speed up to 40 km/h	10000
d) max operating permitted by process moving with mounted and semi-mounted implements on front and rear linkage up to 12 km/h;	13000
e) ex-works[4]	8000±100
7 Distribution of operating weight on axles, kg:	
a) on front (with FLL without ballast)	3160±40 [5]
b) on rear (with FLL without ballast)	4560±60 [5]

Table 1.2.1 continued

Parameter (specification) designation	Parameter value for tractor “BELARUS -2122.6”
8 Permissible load on axles, kN: a) on front b) on rear	 50 85
9 Max weight of the trailer, kg a) without brakes b) with independent brake c) with overrunning brake d) equipped with a brake system (trailer brakes are interconnected with tractor brakes)	 4000 4000 12000 25000
10 Road clearance under drawbar hitch bracket, mm (on tires of basic configuration), mm, at least:	435
11 Track dimensions (on tires of basic configuration), mm: a) for front wheels on 480/65R24 tires b) for front wheels on 420/70R24 tires c) for rear wheels	 1815, 2020 1725±20, 1790±20, 1890±20, 1940±20, 2040±20, 2105±20, 2205±20 from 1800 to 2010 and from 2230 to 2500
12 Least radius of turning circle (with braking), m	5,3
13 Tractor base, mm	2980±20
14 Maximum fordable depth, m	0,8
15 Service life, years	12
16 Overall dimensions, mm:	
a) length with loads and rear lift linkage in transport position	6040±50
b) width along the ends of rear wheel semi-axles	2450±20
c) cab height	3150±30
17 Tires (basic configuration):	
a) front wheels	480/65R24
b) rear wheels	580/70R42
18 Electrical equipment according to GOST 3940:	
a) rated supply voltage in on-board power system, V	12
b) rated ignition voltage, V	24

End of table 1.1

Parameter (specification) designation	Parameter value for tractor “BELARUS -2122.6”
19 Hydraulic system: a) pump displacement under crankshaft rated speed, l/min, at least b) safety valve operating pressure, MPa c) nominal volume factor, at least	 0 to 87 20,5±0,5 0,75
20 Operating equipment: a) rear power take-off shaft: b) front power take-off shaft: c) rear lift linkage: 1) load-lifting capacity of rear lift linkage on the suspension axle, kg, at least 2) rear lift linkage lifting time from lower-most to uppermost position with test load on the suspension axle, s, at least d) drawbar hitch:	 In subsection 3.2.7 “PTO use” In subsection 3.2.7 “PTO use” 6500 5 In section 4 “Coupling of implements”

[1] Engine parameters, not specified in table 1.2.1, shall comply with 260 S4 – 0000100 OM document.
[2] For referential use.
[3] With FLL and ballast mounted.
[4] To be specified depending on configuration.

1.3 Tractor composition

Tractor framework is semi-frame.

Undercarriage – front and rear wheels are driving, with pneumatic tires of low pressure. Front wheels are steering. Rear wheels can be twinned by means of a spacer.

The tractor is equipped with a 4-stroke piston six-cylinder inner combustion engine with in-line vertical arrangement of cylinders, with direct injection of diesel fuel and compression ignition, corresponding to environmental requirements of Stage 4.

The system of engine lubrication is combined, some parts are lubricated under pressure, some – by spattering. The lubrication system consists of an oil sump, oil pump, liquid-oil heat exchanger, centrifugal oil filter and oil filter with paper filtering element.

The engine fuel supply system consists of the following parts:

- accumulator system of fuel supply Common RAIL, including a high-pressure fuel pump, injectors, a fuel accumulator under high pressure, sensors of the engine working environment condition (pressure and temperature of fuel and air), electromagnetic actuating mechanisms (fuel governor, electromagnetic injection valves), electronic unit of control and communication check circuits, low-pressure pipelines, high-pressure pipelines;
- fuel fine filters;
- fuel coarse filters.

The system of engine start-up is an electric starter. A means of start-up facilitation under low environmental temperatures are heating plugs.

The system of air delivery consists of a turbocharger, an air pipeline and a system of inlet air cooling.

The turbocharger is executed as follows: a radial centripetal turbine and a centrifugal single-stage compressor with a cantilever arrangement of wheels in relation to supports.

The system of air purification consists of a dry-type air cleaner with a built-in unit “monocyclone” and two paper filtering elements. Air ingress with an air-cleaner is performed through the “monocyclone” unit which provides preliminary inertial air cleaning at the expense of tangential inflow and centrifugal forces, arising at spiral air rotation in relation to the axis of many small separate slots of “monocyclone” unit, discharging large-size dust particles.

The cooling system for inlet air is of a radiator type. The CAC radiator is intended for cooling the air, charged into the inlet collector.

The cooling system is closed-type with coolant compulsory circulation carried out by a centrifugal pump. The water pump is driven by a V-belt from the crankshaft pulley. Two thermostats TC-107 mounted at the delivery line are provided for acceleration of engine warming-up after start-up and for automatic control of a temperature mode at various loadings and ambient temperatures.

To provide the required chemical composition of exhaust fumes, corresponding to ecological requirements of Stage 4, the exhaust fumes system is additionally equipped with two stages of selective catalytic reduction (SCR1, SCR2).

The coupling clutch is frictional, dry, two-disk, spring-loaded. The clutch pads are ceramic-metal. The coupling control drive is hydrostatic with a hydraulic booster.

The gearbox is 16x8 hydromechanical, step-by-step, with constant-mesh gears, shifting of gears within the ranges is carried out by means of hydraulically-operated friction clutches; switching between ranges is carried out by toothed clutches and a synchronizer.

Shifting of GB reduction unit ranges is electrohydraulic.

Rear axle:

- with the main drive – a pair of bevel pinions with circular teeth;
- with the hub drive – a pair of cylindrical gears;
- with final drives – of planetary type;
- with a differential – with mechanical blocking, and electrohydraulic control.

Brakes: operating brakes are multi-disk, oil-lubricated, located on drive pinion shafts of hub drive. Operating brakes control is interlocked with pneumatic drive of trailer brakes. Operating brakes control drive is hydrostatic.

Parking brake is combined with operating brakes, with independent manual mechanical control. Parking brake control is interlocked with pneumatic drive of trailer brakes.

Trailer brakes control drive is a combined pneumatic one, interlocked with tractor operating brakes control. Against order, tractor can be not equipped with pneumatic drive of trailer brakes – tire inflation shall be carried out through a valve in the pneumatic compressor.

The rear power take-off shaft is continuous, four-speed, with smooth start, having two modes – standard and economic.

The direction of rotation is clockwise as viewed from the side of the shaft end extension butt end.

The first variant of supply:

The tractor is equipped with PTO 3 shaft end extension (20 splines) according to GOST 3480.

PTO 1c shaft end extension (8 splines) according to GOST 3480 and PTO 2 shaft end extension (21 splines) according to GOST 3480 and ISO500 are included into tractor SPTA.

The second variant of supply:

The tractor is equipped with PTO 2 (21 splines) according to GOST 3480 and ISO 500.

PTO 1 (6 splines) according to ISO500 and PTO 3 shaft end extension (20 splines) according to ISO500 are included into tractor SPTA.

Front PTO is continuous, one-speed. PTO 2 shaft end extension (21 teeth) complies with GOST 3480. The direction of rotation is clockwise as viewed from the side of the shaft end extension butt end.

The transmission hydraulic system provides the following:

- switching of GB reduction unit passes, engagement of GB friction clutches, RPTO drives, FPTO drive, FDA drive, differential lock;
- filtration of transmission oil;
- pressure feed lubrication of gearbox bearings, RA planetary gear reducer, FDA bearings;
- operation of the clutch hydraulic booster.

The steering is hydrostatic. The feed pump is gear-type, the direction of rotation is left. The dosing pump is gerotor-type with open center, without steering response. The type of rotation mechanism is two hydraulic cylinders (Ц50х250) of bidirectional action and a steering linkage.

The front driving axle is portal-frame, with planetary-cylindrical final gears. The main drive is a pair of bevel gears with circular teeth. The differential is self-locked, with increased friction. The FDA is driven from the gearbox through the frictional hydraulically-operated clutch and the crankshaft. The FDA control is electro-hydraulic.

The hydraulic lift linkage is universal with electrohydraulic control, on the basis of an axial-piston pump, providing depth, draft, position and combined adjustment for soil treatment. The hydraulics has got an integrated unit consisting of four operating service sections of the distributor with electrohydraulic joystick control, with a possibility to program functions (EHS) and a regular section of EHR23-LS type to operate the real lift linkage. Four pairs of rear independent outlets provide for adjustment of the work fluid supply at each outlet. There is a front pair of outlets, which is connected to any pair of rear outlets through fast coupling clutches, when there is a hydraulic implement coupled with the tractor FLL.

Free drain is available at the back and at the front for tractor operation with hydraulic units with constant delivery, for example, with hydraulic motors.

The rear lift linkage is a three-point linkage of category 3 under ISO 730 and a linkage 3 under GOST 10677. There are two cylinders Ц90х250.

Bushings and replaceable joints are included into tractor SPTA to provide an opportunity for coupling of implements of category 2 according to ISO 730 and lift linkage 2 according to 10677 to RLL.

The front lift linkage (against order) is a three-point linkage of category 2 under ISO 730 and a linkage 2 according to GOST 10677. There are two cylinders Ц90х250.

Drawbar hitches of a lift type:

- short towing yoke DH 2V – for coupling with semi-trailers and semi-trailed implements;
- long towing yoke DH 3V – for coupling with trailers and trailed implements;
- pin DH-2R (“Python”) – for coupling with semi-trailers and semi-trailed machines (against order);
- towing bar DH-1M-01 –for coupling with semi-trailed and trailed agricultural machines (against order);
- cross member DH-1 – for coupling with trailed and semi-trailed machines (against order).

Drawbar hitches of a lift type, purchasing and mounting of which onto “BELARUS-2122.6” tractors is allowed to be carried out by a customer individually, are as follows:

- automated yokes KU2000/329NB33 or KU5410/329-33 (manufactured by company “Walterscheid”) with a spherical pin – for coupling with trailers and semi-trailers, as well as with agricultural machines based on trailers and semi-trailers;
- coupling device “python” PB5329NNB33 (manufactured by company “Walterscheid”) – for coupling with agricultural machines having a tail piece with an ear on the towing beam;
- ball coupling devices KI8329NB33 and KB8329NB33 (manufactured by company “Walterscheid”) – for coupling with agricultural machines having a tail piece with a spherical seat on the towing beam.

In coordination with “MTW”, a customer is allowed to purchase and mount onto the tractor an automated yoke, coupling device “python” and ball coupling device manufactured by other companies if parameters and coupling dimensions of the above mentioned devices correspond to parameters and coupling dimensions, specified in corresponding tables 4.4.6, 4.4.7, 4.4.8, 4.4.9, 4.4.10 of subsection 4.4 “Drawbar hitches”.

The cabin is a one-seated with a protective rigid framework, having thermal, noise and vibration insulation, with heating, conditioning and ventilation systems, equipped with a sprung seat adjustable for operator's height and weight, with rear-view mirrors, with a sun visor, with electrical wipers for front and rear screens, with front and rear screen washers, with a roof lamp and a place to install a stereo, with a seat. The cab doors have got locks, there are keys for the left door. The right door is for emergency exit. The cab complies with category 2 under EN 15695-1:2009.

The electrical equipment complies with GOST 3940. The rated power supply voltage for on-board network is 12V. The rated voltage for the start-up is 24V.

Instruments are a combination of devices; an integrated indicator; informational display; pilot lamps (glow lamps and light emitting diodes), located on the block of pilot lamps, control board of the electronic unit of CECS and on the integrated electronic panel.

1.4 Vibration level at the operator's working place of the tractor “BELARUS -2122.6”

Vibration level at the operator's seat complies with the Council Directive 78/764/EEC. Values for vibration level are given in the EU type approval on each type of a seat.

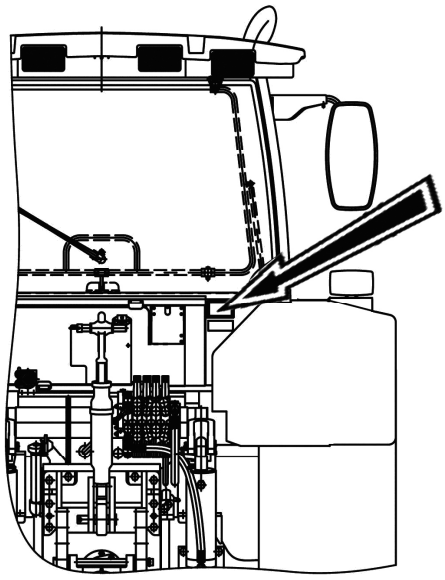
1.5 Noise level at the operator's working place of the tractor “BELARUS -2122.6”

Noise level at the operator's workplace conforms to Directive 2009/76/EC, Appendix 2, and does not exceed the value 86 dB (A). External noise level conforms to Directive 2009/63/EC and does not exceed the value 89 dB (A).

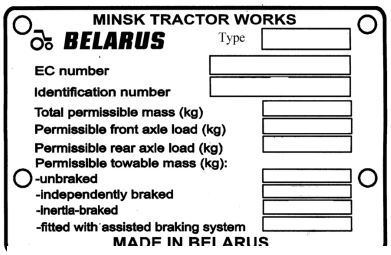
1.6 Tractor and its components marking

A metal nameplate is fixed at the rear of the cab on the right side, as shown in figure 1.6.1.

Additionally, the tractor serial number is applied by means of percussion on the right side member and duplicated on the right plate of the front ballast weight.



Nameplate for tractors exported to countries not included into the EU



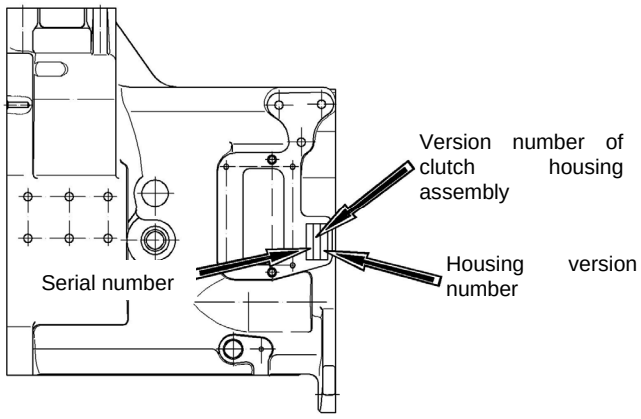
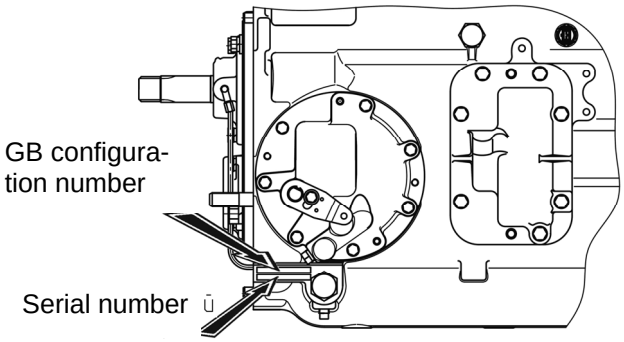
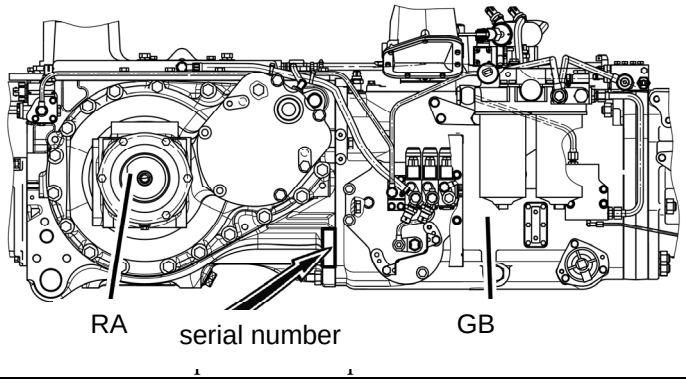
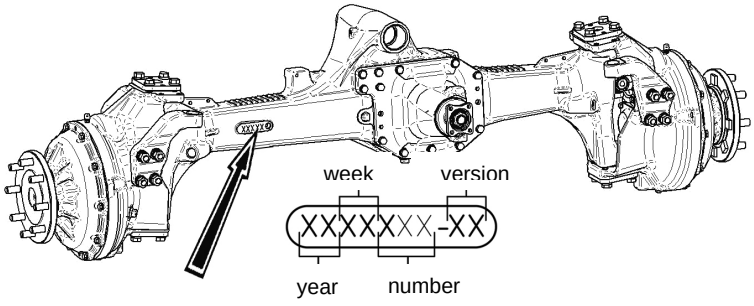
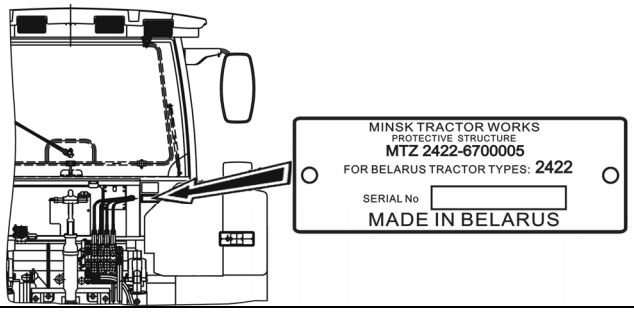
Nameplate for tractors exported to countries included into the EU

Figure 1.6.1 – The place of the tractor nameplate application

Engine number and numbers of its components are given in engine operation manual.

Numbers of tractor components are given in table 1.6.1.

Table 1.6.1 – Numbers of tractor components

Number of clutch casing (to the left along tractor movement)	
Number of gear box (to the left along tractor movement)	
Transmission and rear axle serial number (at front lower pad on the right side of rear axle housing)	
FDA number (on the tube of the bar)	
Cab serial number	

2. CONTROLS AND INSTRUMENTS

2.1 Layout of controls and instruments of the tractor

Controls and instruments located in the tractor cab are shown in figure 2.1.1.

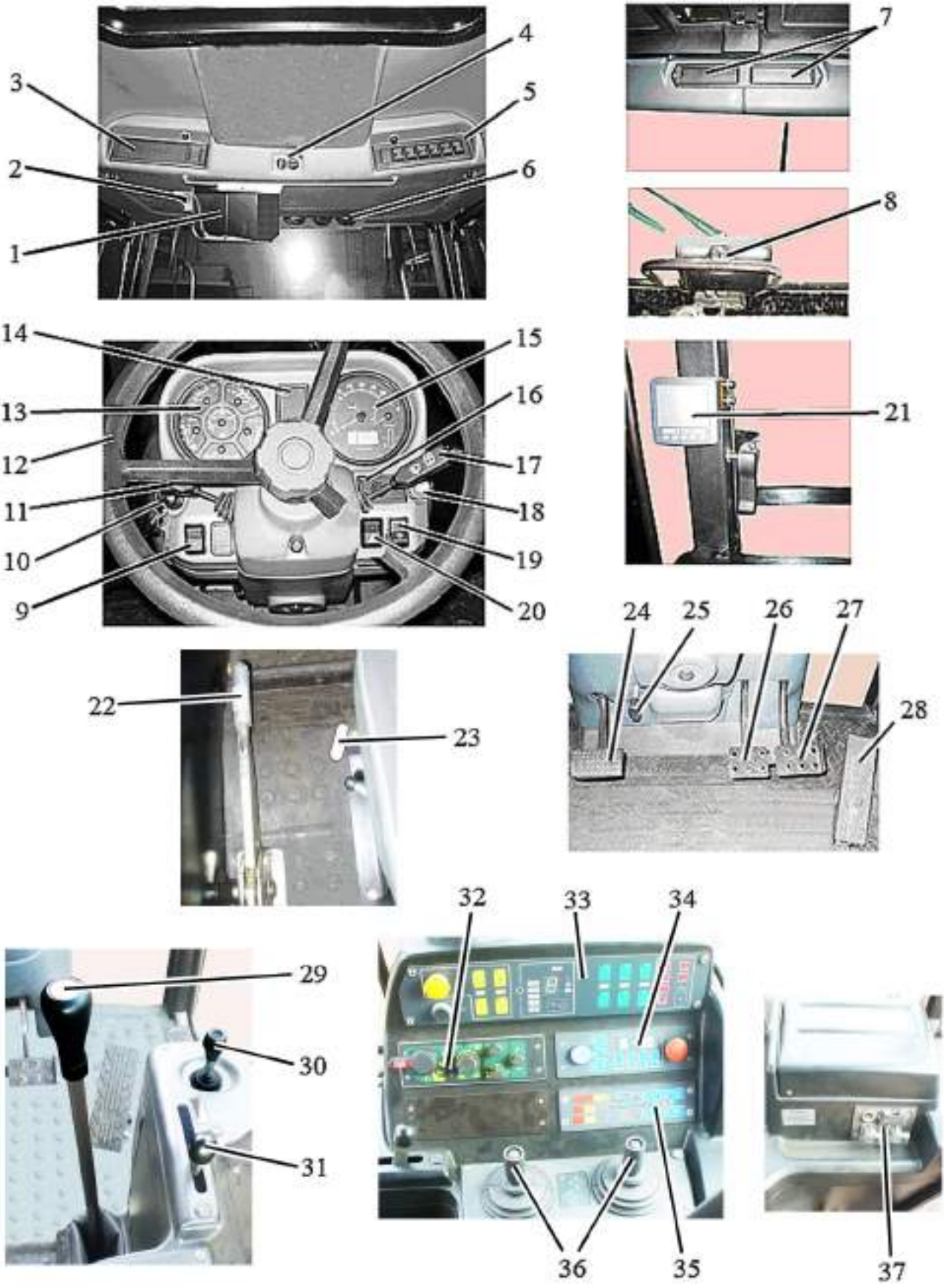


Figure 2.1.1 – Tractor controls and instruments

To the figure 2.1.1 – Layout of controls and instruments of the tractor:
1 – sun visor; 2 – dome light with a switch for cab lighting; 3 - place for radio receiver (car stereo) installation; 4 – air conditioner control panel; 5 – upper shield key switch block; 6 – deflectors; 7 – recirculation shutters; 8 – additional rear windscreen wiper switch; 9 – accumulator battery remote switch; 10 – starter and instruments switch; 11 – multifunctional under-wheel switch on the left; 12 – steering wheel; 13 – instrument board; 14 – pilot lamps unit; 15 – integrated indicator; 16 – integrated indicator control panel; 17 – multifunctional under-wheel switch on the right; 18 – emergency flashing switch; 19 – central light switch; 20 – switch of front working lights mounted on the front lights brackets; 21 – information display; 22 – parking brake control lever; 23 – rear PTO drive engaging handle; 24 – clutch control pedal; 25 –steering rake fixing handle; 26 – left brake control pedal; 27 – right brake control pedal; 28 – fuel supply control pedal; 29 – range and pass shifting lever of gearbox; 30 – joystick for shifting gears and passes of reduction gear group; 31 – fuel feed control lever; 32 – RLL control handle; 33 – complex electronic control system; 34 – programming unit for HLL operations; 35 – integrated electronic board; 36 – electronic joystick unit; 37 – receptacle unit.

2.2 Switches of the instrument board

1 – starter and instruments switch; 2 – multifunctional under-wheel switch on the left; 3 – multifunctional under-wheel switch on the right; 4 – emergency flashing switch; 5 – central light switch; 6 – switch of front working lights mounted on the front lights brackets; 7 – accumulator battery remote switch.

Figure 2.2.1 – Switches of the instrument board

The starter and instruments switch 4 (see fig. 2.2.1) has four positions:
- «0» – off;
- «I» – instruments, pilot lamps unit, heating plugs are on;
- «II» – starter is on (non-fixed position);
- «III» – radio set is on.

The layout of key positions of the starter and instruments disconnect switch is given in figure 2.2.2 and on the informational plate of the switch.

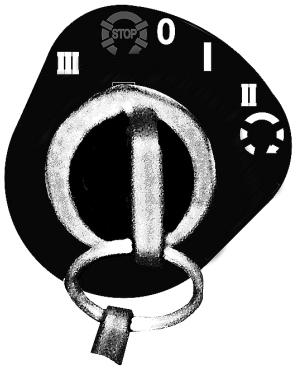


Figure 2.2.2 – Layout of key positions of the starter and instruments disconnect switch

ATTENTION: THE REPEATED STARTER ENGAGEMENT IS POSSIBLE ONLY AFTER RETURN OF THE KEY INTO THE POSITION “0” OF THE SWITCH. TO TURN THE STARTER AND INSTRUMENTS SWITCH INTO THE POSITION “III” IT IS NECESSARY TO PRESS IN THE KEY WHEN IN “0” POSITION AND TURN IT CONTRACLOCKWISE!

The multifunctional under-wheel switch 2 on the left (fig 2.2.1) provides activation of turn blinkers, switching between upper and lower beam of headlights, upper beam signalling (blinking), audible beep.

Turn blinkers are activated when shifting under-wheel switch 2 lever from the intermediate position forward (“a” – right turn) or backwards (“b” – left turn) according to figure 2.2.3. After tractor turning, the lever automatically returns to the initial position.

To switch on road headlights, set central light switch 5 (fig. 2.2.1) into the position “III” as it is shown below, and set the under-wheel switch lever into the intermediate position “в” – “lower beam” according to figure 2.2.3. For switching on “upper beam”, push the switch lever against the stop (position “г”). The positions of a lever “lower/upper beam” shall be fixed.

When pulling the lever against the stop (position “д”, fig.2.2.3) from the position “lower beam”, non-fixed engagement of upper beam is carried out, upper beam blinking, irrespective of the central light switch position.

The audible beep is activated when pressing the lever in axial direction (the switch lever axle). The beep can be activated in any position of the switch lever.

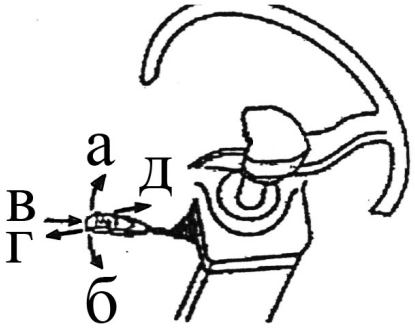


Figure 2.2.3 – The operation scheme of the multifunctional under-wheel switch on the left

Multifunctional under-wheel switch on the right 3 (figure 2.2.1) provides the engagement of two-speed windscreen wiper and washer.

The windscreen wiper is activated by moving under-wheel switch lever 3 (fig. 2.2.1) from "off" position (“0” position according to fig. 2.2.4) into “а” position (first speed) or “б” (second speed). All positions shall be fixed.

The windscreen washer is activated (in a non-fixed position) by moving the switch lever upward from any of three positions of the switch.

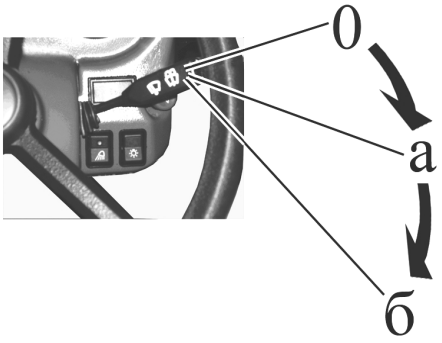


Figure 2.2.4 – The operation scheme of the multifunctional under-wheel switch on the right

Pressing emergency flashing button 4 (fig. 2.2.1) activates emergency flashing. A pilot lamp, built in the button, flashes simultaneously with emergency flashing lights. Repeated pressing button 4 deactivates emergency flashing.

Central light switch 5 (fig.2.2.1) has three positions:

- position “I” – “off” (the upper part of the button is pressed as in fig 2.2.1);
- position ”II” – “front and rear parking lights, license plate lights, lighting of instruments on the dashboard and also parking lights on a trailed machine are on” (intermediate position);
- position “III” – “all consumers of “II” position and road headlights are on” (lower part of the button is pressed against the stop as in fig. 2.2.1).

While pressing the button of front working lights switch 6 (fig. 2.2.1) two front working lights, located on front light brackets, are actuated together with a light indicator built in the button.

While pressing the button (non-fixed position) of the accumulator battery remote disconnect switch 7 (fig. 2.2.1) accumulator batteries are powered, the repeated pressing deactivates accumulator batteries.

It is possible to activate and deactivate accumulator battery 2 (figure 2.2.5) with the help of the accumulator battery manual switch, located in the area of accumulator battery 1 installation. To activate and deactivate the accumulator battery it is necessary to open hood 3 and to press the button of the accumulator battery manual switch 4.

1 – accumulator battery; 2 – AB manual disconnect switch; 3 - hood; 4 - button of AB manual disconnect switch

Figure 2.2.5 – Mounting of the accumulator battery manual disconnect switch

2.3 Upper shield unit of button switches

Pressing cut-out button 1 (fig 2.3.1) activates a flash beacon (if available).

Pressing cut-out button 2 activates two front working lights, mounted on the cab roof, and an indicating lamp built in the button.

Pressing cut-out button 3 activates two rear working lights (inner) and an indicating lamp built in the button.

Pressing cut-out button 4 activates two rear working lights (outer) and an indicating lamp built in the button.

Pressing cut-out button 5 activates the rear screen wiper or the wiper and the washer of the rear screen simultaneously.

Cut-out button 5 has three positions:

- position “I” – “off”;
- position “II” – “rear screen wiper is on” – fixed position;
- position “III” – “rear screen wiper and rear screen washer are on simultaneously – non-fixed.

During tractor operation on forward motion, cut-out switch 8 (fig. 2.1.1) shall be in “on” position (i.e. in the upper position).

Pressing cut-out button 6 (fig. 2.3.1) activates “Road-train” signal lights and an indicating lamp built in the button (the “Road-train” lights are installed against order).

1 – flash beacon cut-out button; 2 – cut-out button of front working lights, mounted on the cab roof; 3 – cut-out button of rear inner working lights; 4 – cut-out button of rear outer working lights; 5 – cut-out button for rear screen wiper and washer; 6 – cut-out button of “Road-train” signal lights.

Figure 2.3.1 – Upper shield unit of button switches

Note: instead of rear windshield wiper shown in figure 2.1.1, it is allowed to mount on the tractor rear windshield wiper shown in figure 2.3.2.

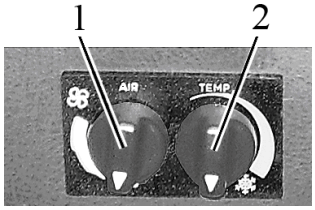
1 – rear windshield wiper A18-45.00.100; 2 – cut-out button for rear windshield wiper A18-45.00.100.

Figure 2.3.2 – Rear windshield wiper A18-45.00.100

2.4 Conditioner control

2.4.1 Conditioner control in the conditioning mode

Conditioner control unit 4 (figure 2.1.1) has switches 1 and 2 (figure 2.4.1).



1 – switch for air flow adjustment;
2 – conditioner cut-out switch and cooling capacity adjustment;

Figure 2.4.1 – Conditioner control unit

With the help of switch 1 you can change air flow by changing fan speed. Switch 2 allows to change temperature of cold and dry air coming from deflectors 6 (fig. 2.1.1) in the conditioning mode.

ATTENTION: AIR CONDITIONER CAN BE SWITCHED ON AND CAN OPERATE ONLY WITH THE ENGINE ON!

To switch on the conditioner, it is required to do the following:

- turn cut-out switch 2 (figure 2.4.1) clockwise to ≈180° until a blue scale begins;
- then turn switch 1 to one of three marked positions (the fan rotor has three kinds of rotation speed). After 3-5 minutes adjust the required temperature in the cab by means of switch 2;
- it is possible to adjust a mixture of outer air and recirculation air with recirculation shutters 7 (figure 2.1.1) if available.

To switch off the conditioner, it is required to turn both switches 1 and 2 (figure 2.4.1) contraclockwise into “0” position.

ATTENTION: MAKE SURE THE CONDITIONER IS SWITCHED OFF BEFORE STOPPING THE ENGINE!

ATTENTION: WHEN THE CONDITIONER OPERATES IN THE COOLING MODE MAKE SURE THAT THE HEATER CONTROL VALVE IS SHUT OFF IN ORDER TO PREVENT THE SYSTEMS OF HEATING AND COOLING FROM SIMULTANEOUS OPERATION!

2.4.2 Conditioner control in the heating mode

ATTENTION: REFILLING OF THE ENGINE COOLING SYSTEM SHALL BE CARRIED OUT ONLY WITH LOW-FREEZING LIQUID SPECIFIED IN SUBSECTION 5.8 “TRACTOR FILLING AND LUBRICATION WITH FUEL AND LUBRICATION MATERIALS”!

To set the conditioner into the heating mode, do the following:

- after refilling the cooling system with the cooling fluid, start the engine and let the engine run at medium idle without opening the heater control valve to reach 60-80°C of cooling system temperature;
- then open the heater control valve with handle 2 (figure 2.4.2), to do this turn handle 2 contraclockwise against the stop;
- increase engine speed and let it run for one-two minutes until the heater radiator is filled up with the fluid. Make sure the fluid circulates through the heater. The heater radiator must warm up. In this case the cooling fluid level in the cooling system radiator will decrease;
- refill the cooling fluid into the expansion tank until the fluid level in the expansion tank is 50 to 60 mm below the upper edge of the filler neck;
- to warm up the cab quickly, switch on the heater fan and open recirculation shutters.

ATTENTION: WHEN OPERATING IN THE HEATING MODE, SWITCH 2 (FIGURE 2.4.1) SHALL BE COMPLETELY OFF TO PREVENT THE COOLING SYSTEM AND THE HEATING SYSTEM FROM SIMULTANEOUS OPERATION!

.

1 – sun visor, 2 – handle of heater control valve; 3 – upper shield unit of button switches.

Figure 2.4.2 – Assembly of heater control valve

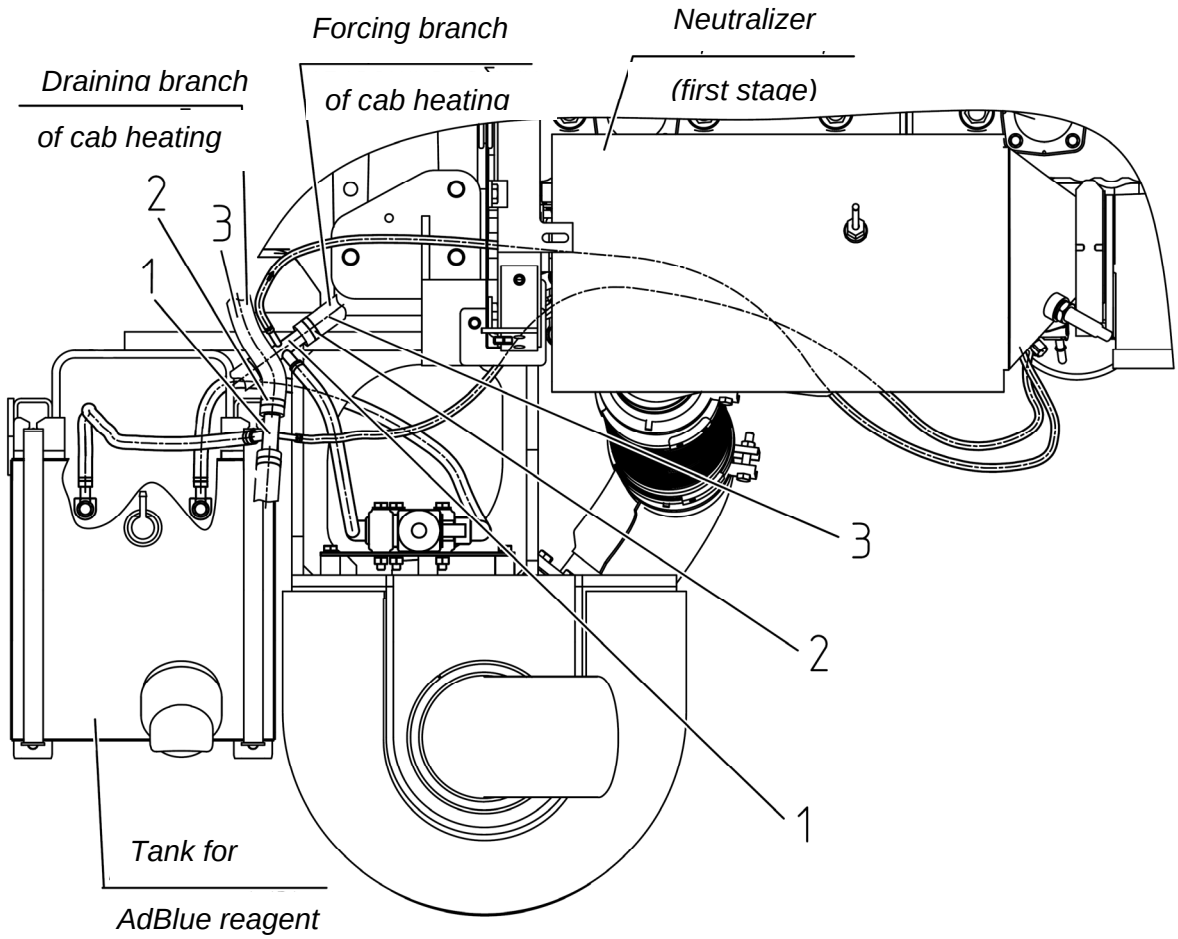
2.4.3 Cab ventilation

During the conditioner operation in the cooling and heating modes, cab ventilation is carried out at the same time. To make the conditioner operate only in the ventilation mode it is necessary to close the heater control valve, set switch 2 (figure 2.4.1) in the position “0” and switch 1 in any of three marked positions.

2.5 Cooling liquid drain from heating system

To drain cooling liquid from heating system, it is required to disconnect cab heater pipes 3 (figure 2.5.1) from T-connectors 1, unscrewing clamps 2, and drain CL into a special container. After cooling liquid drain, it is required to blow off the system with compressed air. After blowing off, connect cab heater pipes 3 with T-connectors 1 and tighten clamps 2.

Cab heater pipes 3 are located on the right of tractor cab.



1 – T-connector; 2 – clamp; 3 – cab heater pipe

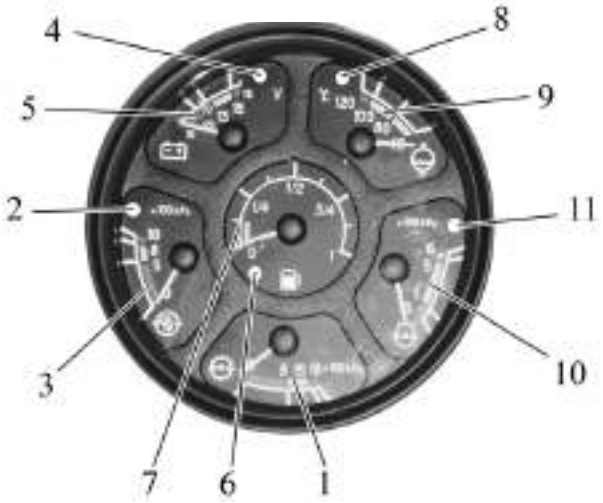
Figure 2.5.1 – Cooling liquid drain from heating system

2.6 Instrument board

Instrument board 13 (figure 2.1.1) includes six gauges with five signal lamps as shown in figure 2.6.1.

Variant 1

Variant 2



1 – gauge to indicate oil pressure in the transmission system; 2 – signal lamp of emergency air pressure in the pneumatic system; 3 – gauge to indicate air pressure in the pneumatic system; 4 – pilot lamp of additional accumulator battery charge, 24 V voltage; 5 – voltage gauge; 6 – signal lamp of reserve fuel volume in the tank; 7 – gauge to indicate fuel volume in the tank; 8 – signal lamp of emergency temperature of engine coolant; 9 – gauge to indicate temperature of engine coolant; 10 – gauge to indicate oil pressure in the engine lubrication system; 11 – signal lamp of emergency oil pressure in the engine lubrication system;

Figure 2.6.1 – Instrument dashboard

2.6.1 The gauge of oil pressure in the transmission hydraulic system 1 (figure 2.6.1) indicates oil pressure in the hydraulic system of friction clutches control in tractor transmission.

The scale of oil pressure gauge has three zones:

- operating — from 800 to 1500 kPa (green color);
- emergency (two) — from 0 to 800 kPa and from 1500 to 1800 kPa (red color).

Rated operating oil pressure in the hydraulic system of the transmission is from 1100 to 1200 kPa.

2.6.2 The scale of the gauge of oil pressure in the pneumatic system has three zones:

- operating – from 500 to 800 kPa (green color);
- emergency (two) — from 0 to 500 kPa and from 800 to 1000 kPa (red color).

Signal lamp 2 (red color) is built in the gauge scale which lights up when the pressure in the pneumatic system drops below 500 kPa.

2.6.3 Voltage gauge 5 (figure 2.6.1) indicates accumulator batteries voltage with the engine stopped when the key of starter and instruments switch (figure 2.2.2) is set in position “I”. With the engine running the voltage gauge indicates voltage on generator terminals. Into voltage gauge is build in pilot lamp 4(red color). This lamp indicates the process of additional 24 V battery charging – makes diagnosis of voltage converter operability.

The state of power supply system, depending on the position of gauge pointer on the scale, is given in table 2. 6. 1.

Table 2.6.1 – The state of power supply system

Zone on voltage gauge scale 5 (figure 2.6.1), color	States of power supply system	
	with the engine running	with the engine stopped
13,0 – 15,0 V green	normal mode of charge	-
10,0 – 12,0 V red	the generator is out of order	accumulator battery discharged
12,0 – 13,0 V yellow	No AB charge (low charging voltage)	AB has a normal charge
15,0 – 16,0 V red	AB recharge	-
white line in the yellow zone	-	Rated AB electromotive force is 12,7 V

ATTENTION: IF THE VOLTAGE GAUGE INDICATES ABSENCE OF AB CHARGE, CHECK THE STATE AND TENSION OF THE GENERATOR DRIVE BELT!

2.6.4 The scale of the gauge indicating fuel volume in tank 7 (figure 2.6.1) has divisions “0-1/4-1/2-3/4-1”. Signal lamp 6 (orange color) is built in the gauge scale, which lights up when fuel volume in the tank drops below 1/8 of the total tank volume.

ATTENTION: DO NOT LET THE TANK BECOME EMPTY (THE GAUGE POINTER IS IN THE ZONE OF ORANGE COLOR)!

2.6.5 The gauge of engine coolant temperature 9 has three zones:

- operating – from 80°C to 105 °C (green color);
- informational – from 40 °C to 80 °C (yellow color);
- emergency – from 105 °C to 120 °C (red color);

Emergency temperature lamp (red color) 8 is built in the scale, which operates in two modes:

- lights up and operates in a flashing mode with coolant values from 109 up to and including 112 °C.
- glows in a continuous mode with coolant temperature values from 113 °C and higher.

2.6.6 The oil pressure gauge in the engine lubricating system 10 has three zones:

- operating – from 100 to 500 kPa (green color);
- emergency (two) – 0 to 100 kPa and from 500 to 600 kPa (red color).

Signal lamp of emergency oil pressure drop 11 (red color) is built in the gauge scale, which lights up when the pressure drops below 100 kPa.

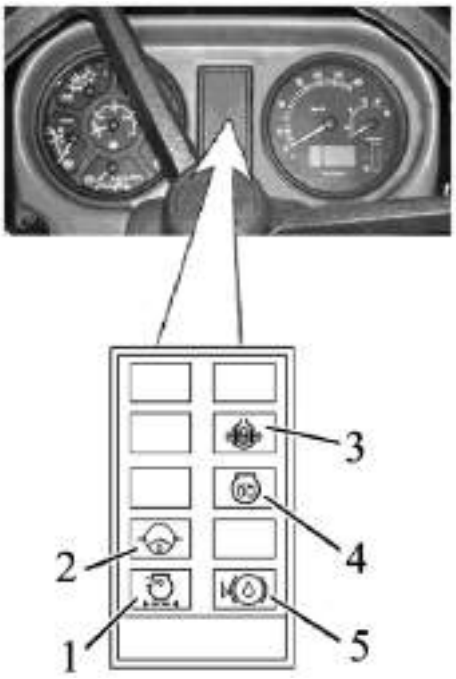
ATTENTION: WHEN THE COLD ENGINE IS STARTED THE PRESSURE CAN REACH 800 kPa!

ATTENTION: IF THE EMERGENCY PRESSURE LAMP IS ON WITH THE ENGINE RUNNING, STOP THE ENGINE IMMEDIATELY AND ELIMINATE THE FAILURE!

2.7 Pilot lamps unit

2.7.1 General information

Pilot lamps unit 14 (figure 2.1.1) includes five lamps. The allocation scheme is shown in figure 2.7.1.



1 – pilot lamp to indicate that the air cleaner filter is clogged to the max. (orange color); 2 – pilot lamp to indicate emergency oil pressure drop in the system of hydrostatic power steering (red color); 3 – pilot lamp to indicate rear axle differential lock (orange color); 4 – pilot lamp to indicate operation of heating plugs (orange color) 5 – pilot lamp to indicate emergency brake fluid level (orange color).

Figure 2.7.1 – Pilot lamps unit

The operating principle of the pilot lamps of PLU is the following:

- pilot lamp 1 to indicate that the air filter is clogged to the max. (figure 2.7.1) lights up when the max. permissible level of filter dirtiness is exceeded and the filter requires cleaning;
- pilot lamp 2 to indicate emergency oil pressure drop in the system of hydrostatic power steering lights up when the oil pressure in the system of hydrostatic power steering drops below 0,08 MPa, which indicates that oil is not coming to the pilot circuit of the hydrostatic power steering (periodic lighting up of the lamp 2 with engine minimal speed is assumed – when revolutions are increased the lamp 2 will go out);
- pilot lamp 3 to indicate rear axle differential lock lights up when activating rear axle differential lock;
- pilot lamp 5 to indicate emergency brake fluid lights up when brake fluid level in the tanks of master brake cylinders is below the permissible level;
- pilot lamp of heating plugs 4 indicates heating plugs operation (functioning algorithm of the pilot lamp indicating heating plugs operation is provided in the manual below).

2.7.2 Functioning algorithm of pilot lamp to indicate operation of heating plugs

As a means of start facilitation, heating plugs (HP) are used in tractors “BELARUS – 2122.6” which are mounted in the cylinder unit head. For individual control of heating plug operation modes and indication of their operation, a heating plug control unit is used.

Heating plugs are not activated, if the engine temperature exceeds +5°C. In this case heating plug pilot lamp 4 (figure 2.7.1) lights up for 2 sec. or does not light up at all.

If the engine temperature is below +5°C, the heating plugs are activated automatically as the key of starter and instrument switch is turned from position “0” (off) into position “I” (Instruments on). In this case heating plug pilot lamp 4 lights up in the pilot lamp unit of the dashboard. The heating plug operation time depends on the engine temperature according to table 2.7.1. It is necessary to start the engine as lamp 4 goes out after the time specified in table 2.7.1 After the engine start-up, the heating plugs remain activated for some time, then they go out. The heating plug operation time after the engine start-up depends on the engine temperature at the moment of the heating plug activation. (see table 2.7.1).

The heating plug operation algorithm has the following emergency modes:

- as the key of starter and instrument switch is turned from position “0” (Off) into position “I” (Instruments on) the heating plug pilot lamp starts to flash continuously with ≈ 2 Hz frequency. This means that there is a failure in the heating plug operation – all heating plugs are closed-circuit or their connection is disturbed (disconnected from the heating plug control unit), the heating plug control unit is not powered or the power supply wire is damaged. In case of short circuit, the heating plug control unit cuts power supply to the heating plugs.

- after the engine start-up the heating plug pilot lamp 4 starts flashing for one minute with 3 sec. of cycle duration and 0,25 sec. of flash duration. The number of flashes can be different. The start-up procedure runs in an ordinary way. This means that one or more (but not all) heating plugs are faulty. The number of flashes within one cycle equals to the number of faulty heating plugs;

If the specified failure is not eliminated, it may be difficult to start the engine at low temperature.

- during the pre-start heating before the engine start-up, pilot lamp 4 flashes with 1 Hz frequency. This points at short-circuit of the heating plug temperature sensor, or breakage in the heating plug temperature sensor circuit, or sensor failure. In this case the time of engine pre-start heating as well as plug heating after engine start-up is specified in table 2.7.1.

TRACTOR OPERATION IS FORBIDDEN UNTIL FAILURES OF THE HEATING PLUG SYSTEM ARE DETECTED AND ELIMINATED. OTHERWISE IT MAY LEAD TO DISCHARGE OF ACCUMULATOR BATTERIES!

Table 2.7.1. – Heating plug operation time depending on engine temperature

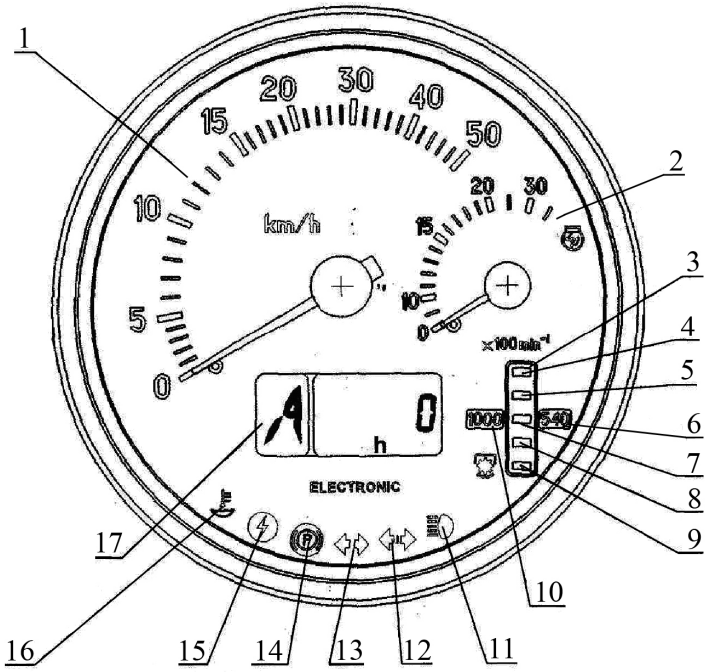
Engine temperature, °C	Time of engine pre-start heating, sec., at least	Time of heating after engine start-up, sec., at least
above 5	0	0
from + 5 to 0	15	25
from 0 to -10	20	50
from -10 to -15	25	75
from -15 to -20	35	100
from -20 to -25	42	125
under -25	50	150
short-circuit failure or sensor breakout, sensor malfunction	50	150

2.8 Integrated indicator and integrated indicator control panel

2.8.1 General information

Integrated indicator 15 (figure 2.1.1) (further in the text II) and integrated indicator control panel 16 (figure 2.1.1) (further in the text IICP) display information on operational parameters of systems and units of the tractor and provide operator with data on violation of operation or breakdown of any system.

II includes gauges and signal lamps according to figure 2.8.1



1 – velocity gauge (needle indicator); 2 – engine speed gauge (needle indicator); 3 – RPTO speed gauge (light indicator); 4, 9 – segments of RPTO speed scale (yellow color); 5, 7, 8 – segments of RPTO speed scale (green color); 6 – annunciator of RPTO speed scale range «540 min^{-1}» (yellow color); 10 – annunciator of RPTO speed scale range «1000 min^{-1}» (yellow color); 11 – pilot lamp to indicate headlights upper beam switching (blue color); 12 – pilot lamp to indicate switching of trailer turn blinkers (green color); 13 – pilot lamp to indicate switching of tractor turn blinkers (green color); 14 – pilot lamp to indicate parking brake engagement (red color); 15 – pilot lamp to indicate increased voltage in on-board system (red color); 16 – pilot lamp to indicate low level of coolant (yellow color); 17- multifunction indicator.

Figure 2.8.1 – Integrated indicator

Note – On tractors “BELARUS-2122.6” the pilot lamp to indicate low level of coolant 16 is not used.

While switching on the instrument scale lighting, i.e. while shifting the central dip-switch control into the position II “Instrument scale lighting, parking lights are on” and the position III “Consumers of the position II and front road headlights are on”, light intensity of multifunction display and PTO indicator segments is automatically reduced.

The integrated indicator control panel is shown in figure 2.8.2.

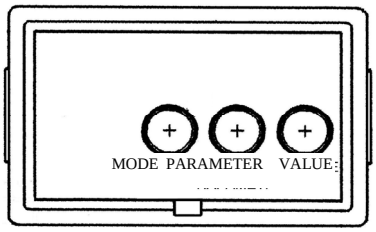


Figure 2.8.2 – Integrated indicator control panel

Control panel 16 (figure 2.1.1) allows to carry out manual programming of the indicator with buttons “Parameter” and “Value” (see figure 2.8.2), and also to change the mode of showing data entered on the multifunction display with “Mode” button. The “Mode” button is also used to enter a non-fixed parameter value when programming the device.

The rules on IICP use in the mode of displaying operational parameters and failure messages on the multifunction display are given below in subsection 2.8.2 “Assignment and operation principle of II gauges”.

The rules on IICP use in the II programming mode are given below in subsection 2.8.5 “The order of Integrated Indicator programming”.

To get access to buttons “Parameter” and “Value” it is necessary to remove cover of II control panel.

2.8.2 Assignment and operation principle of integrated indicator gauges

2.8.2.1 Velocity gauge 1 (figure 2.8.1) indicates tractor design speed on a needle indicator. Design speed exceeds the actual one as tractor skidding is not taken into account.

Velocity gauge 1 is actuated by signals coming from pulse sensors of rotation frequency of toothed gears of final drives of right and left rear wheels. The speed is indicated in accordance with the signal from the sensor installed on the final drive gear of the wheel rotating with a less speed.

In case one of the speed sensors is faulty, the integrated indicator shows speed readings in accordance with the signal coming from the correct sensor. Specific faults of circuits or speed sensors when the signals from them are missing are displayed in liquid crystal display as “0” digit, characterizing the fault location – to the right or to the left (see below).

2.8.2.2 Engine speed gauge 2 (figure 2.8.1) indicates rotation frequency of the engine crankshaft on a needle indicator.

Information on engine speed comes from the electronic control unit. The range of speed indications is from 0 to 3500 (rpm).

2.8.2.3 RPTO speed gauge 3 (figure 2.8.1) displays the RPTO speed on a light indicator.

The rear PTO speed gauge is actuated by signals coming from a pulse speed sensor, installed above the toothed washer of the rear PTO reduction unit.

Upon engaging the rear PTO in the mode of “540 min^{-1}” the integrated indicator operates in the following way:

- the annunciator of “540 min^{-1}” of rear PTO speed scale range 6 lights up;
- as the speed of the rear PTO shaft end extension reaches 320 min^{-1}, a lower segment of the rear PTO gauge 9 lights up in combination with the annunciator 6.
- as the speed further increases, together with annunciator 6 the rear PTO indicator segments light up successively from bottom upward in the following order: 8 – 7 – 5 – 4;
- then in the process of the rear PTO operation, the rear PTO speed is displayed on indicator 3 in accordance with the upper lighting segment of the RPTO according to table 2.8.1.

When switching the mode “540 rpm economic” the operating order of the rear PTO speed indicator 6 is the same as for the mode “540 rpm”.

Upon engaging the rear PTO in the mode of “1000 rpm” the integrated indicator operates in the following way:

- the annunciator of “540 rpm” of rear PTO speed scale range 6 lights up (figure 2.8.1);
- as the speed of the rear PTO shaft end extension reaches 320 rpm, a lower segment of the rear PTO gauge 9 lights up in combination with the annunciator 6.

- as the speed further increases, together with annunciator 6 the rear PTO indicator segments light up successively from bottom upward in the following order: 8 – 7 – 5 – 4;

- as the speed of the RPTO shaft extension exceeds 750 rpm annunciator 6 as well as segments 9, 8, 7, 5, 4 go out. Then annunciator 10 and lower segment 9 light up;

- as the speed further increases, together with annunciator 10 the rear PTO indicator segments light up successively from bottom upward in the following order: 8 – 7 – 5 – 4;

- then in the process of the rear PTO operation the rear PTO speed is displayed on the indicator 3 in accordance with the upper lighting segment as per table 2.8.1.

When switching on the mode “1000 rpm economic”, the operating order of the rear PTO speed indicator 6 is the same as for the mode “1000 rpm”.

Note – A precise value for the RPTO speed can be checked on multifunction display 17 (table 2.8.1).

Table 2.8.1. – Correspondence of parameters of indicator 3 (figure 2.8.1) to the speed of the rear PTO shaft end extension

Active annunciator of ranges of the rear PTO speed scale		Upper (as per fig. 2.8.1) active segment of the rear PTO speed scale
Annunciator 6 (figure 2.8.1) “540 rpm” [1)]	Annunciator 10 (figure 2.8.1) “1000 rpm”	
650	1150	4
580	1050	5
500	950	7
420	850	8
320	750 [2)]	9

[1)] the annunciator of the range of “540 rpm” of the rear PTO speed scale is actuated only if there is a signal from the sensor, and switches off when the annunciator of the range of “1000 rpm” of the rear PTO speed scale turns on or when the signal from the sensor is missing for more than 3 sec.

[2] speed value, whereby the annunciator of the range of “1000 rpm” of the rear PTO speed scale turns on.

2.8.2.4 Multifunction display 17 (figure 2.8.1) is a liquid-crystal display that shows information in two fields 1 and 2 at the same time (figure 2.8.3).

1 – digital symbol of the gear engaged; 2 – current numeric value of one of tractor system parameters.

Figure 2.8.3 – Information fields of the multifunctional display

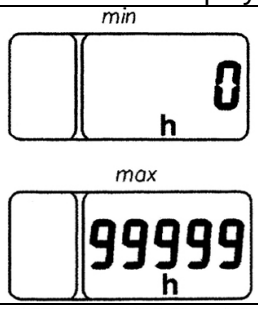
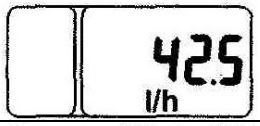
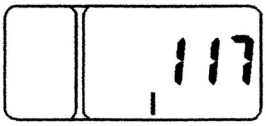
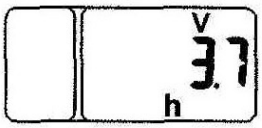
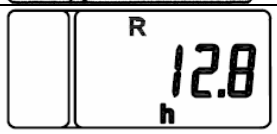
1 – the digital symbol of the gear engaged (digits from 0 to 4) within the limits of the chosen range on the corresponding reduction unit pass.

The following parameters are displayed in information field 2 (figure 2.8.3):
- total elapsed engine time;
- instant fuel flow;
- on-board voltage;
- remaining fuel volume;
- time of running with remaining fuel;
- rear PTO speed;
- engine operating time for the specified period;
- testing of speed sensors workability;
- testing of frequency fuel volume sensor (FFVS) workability;
- testing of CAN-bus workability and connection to the Integrated Indicator.

Switching between indication modes of “Total elapsed engine time“, “Instant fuel flow”, “Remaining fuel volume”, “Time of running with remaining fuel”, “On-board voltage”, “Rear PTO speed”, and switching between messages on faults is carried out with “Mode” button of the control panel (figure 2.8.2).

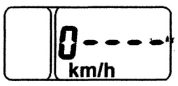
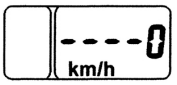
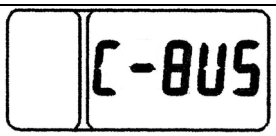
Samples of displaying operating parameters of the tractor on the multifunction display and their short description are given in table 2.8.2.

Table 2.8.2 – Samples of displaying operating parameters of the tractor on the multifunction display

Parameter	Sample of displaying parameter on the multifunction display	Parameter description
Total elapsed engine time, h		The counter accumulates information on the total elapsed engine time with uploading a message “engine speed” from the engine control unit and stores it when the power supply is off. The range of engine time indications is from 0 to 99999 hours.
Instant fuel flow, l/h		In this mode a current value of the instant fuel flow with a resolution of 0,1 l/h is displayed.
On-board voltage, V		In this mode a current value of on-board voltage with an accuracy of 0,1 V is displayed in a digital form.
Remaining fuel volume in the tank, l		In this mode current fuel volume remaining in the tank is displayed in liters. This mode is available only when the tractor is stopped (i.e. when there are no signals from the speed sensors).
Time of running on remaining fuel, h		In this mode assessed engine time, calculated for current values of the instant fuel flow and remaining fuel volume is displayed
Rear PTO speed, rpm		In this mode a precise speed of the rear PTO shaft end extension depending on the signal from the rear PTO speed sensor is displayed.
Engine operating time for the specified period		In this mode engine operating time for the specified period with an accuracy of 1/10 of an hour is displayed. If necessary, it is possible to zero the value of a meter by pressing the button “Mode” and holding it pressed for at least 2 sec.

Samples of displaying fault messages on the multifunctional display and a short description of the tractor fault displayed are given in table 2.8.3.

Table 2.8.3 – Samples of displaying messages on tractor faults on the multifunction display

Parameter tested	Sample of fault displaying on the Integrated Indicator	Fault description
Testing of speed sensors workability	 – Left wheel sensor  – Right wheel sensor	In case there are no signals coming from the speed sensor for 10-12 sec. a message in the form of “0” digit is displayed on the multifunctional display characterizing the location of the faulty sensor (left or right) or breakage in the circuit of the given sensor.
Testing of frequency fuel volume sensor (FFVS) workability		If there is no signal coming from the frequency fuel volume sensor for two sec. a message “FUEL” is displayed on the screen.
Testing of CAN-bus workability and connection to the Integrated Indicator		If there are no signals through CAN-bus of the integrated indicator a message “C-BUS” appears on the multifunction display.

If there are no signals from the engine control unit, missing the respective indication modes are switched off automatically and the message C-BUS appears in information field 2 of the multifunction display (figure 2.8.3).

Each of the above stated fault messages is displayed according to the priority on information field 2 of the multifunction display irrespective of the information currently displayed. With successive pushing the “Mode” button of the integrated indicator control module, the messages shall be listed in turn. After listing the last message and the repeated pressing “Mode” button, the multifunction display changes into displaying the cyclic mode of the operating parameters specified before.

The fault messages are displayed on the LCD-screen every time the device is actuated until the cause is eliminated.

When the integrated indicator is turned on, the multifunction display shows information in the indication mode chosen before the moment of turning off the integrated indicator.

2.8.3 Pilot lamps of the integrated indicator

The operating principle of pilot lamps on the integrated indicator is the following:

- pilot lamp to indicate switching on the road lights upper beam 11 (figure 2.8.1) lights up when switching on the upper beam;
- indicators of tractor turns and trailer turns 13 and 12 operate in the flashing mode when actuated with the under-wheel multifunction switch 2 (figure 2.2.1) or when emergency button 4 is turned on;
- pilot lamp to indicate the actuation of parking brake 14 (figure 2.8.1) operates in the flashing mode with 1 Hz frequency when the parking brake sensor goes off;
- pilot lamp to indicate increased on-board voltage 15 gets activated when the tractor on-board supply voltage goes up above 19V and goes out when the voltage falls below 17V;
- pilot lamp to indicate low level of coolant 16 is not used on “BELARUS – 2122.6” tractors.

ATTENTION: WHEN THE TRACTOR ON-BOARD SUPPLY VOLTAGE GOES UP ABOVE 19V THE INTEGRATED INDICATOR FULLY GOES OUT AND RECOVERS WHEN THE ON-BOARD VOLTAGE FALLS BELOW 17V!

ATTENTION: PILOT SIGNALING LAMPS ARE ACTIVATED AND DEACTIVATED SYNCHRONOUSLY WITH CHANGING THE STATE OF SYSTEM SENSORS!

2.8.4 Description of testing the integrated indicator performance

Each time the power supply is on, testing of needle pointers and scale elements of the rear PTO indicator is carried out in the integrated indicator. In this case the indicator needle pointers move away from zero marks for one sec. (or the pointers flutter for not more than one second on indicator zero marks) and also both annunciators of the rear PTO scale range 6 and 10 get actuated (figure 2.8.1) as well as all segments of the rear PTO scale.

2.8.5 The order of the integrated indicator programming

2.8.5.1 Integrated indicator control panel

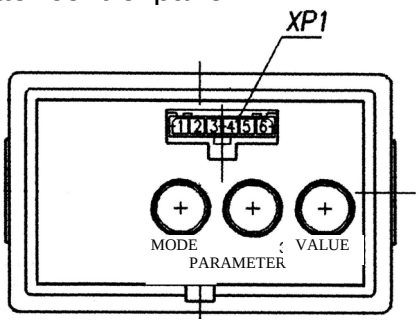


Figure 2.8.4 – Integrated indicator control panel

Control panel 16 (figure 2.1.1) makes it possible to perform manual programming of the integrated indicator with buttons “Parameter” and “Value” (figure 2.8.4) and to change the mode of displaying the parameters on LCD.

To get access to buttons “Parameter” and “Value” it is necessary to remove cover of II control panel.

A diagnostic connector XP1, located on the front surface of the control panel, makes it possible to perform automatic programming (reprogramming) of the integrated indicator (II) by means of a special device (if provided). In case such a device is not provided, the programming shall be performed by means of the above mentioned buttons. On “BELARUS-2122.6” tractors, the XP1 connector is not provided.

2.8.5.2 The algorithm of the integrated indicator programming

When choosing a fixed value of the parameter, the II programming is carried out in the following way:

- when the “Parameter” button is pressed for the first time (see figure 2.8.4), multifunction indicator 17 (figure 2.8.1) switches to the mode of viewing the programmed parameter and its numerical value. When the button is pressed repeatedly, the numerical value of the set programmed parameter is changed;
- when the “Value” button is pressed repeatedly, the numerical value of the set programmed parameter is changed;
- when neither the “Parameter” nor “Value” button is pressed for 7.0 seconds, the mode is exited automatically.

When exiting the mode, the last set parameter values chosen with the “Value” button are saved.

When choosing an unfixed parameter value of the integrated indicator programming, it is necessary to do the following:

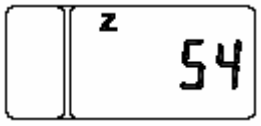
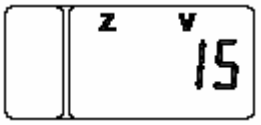
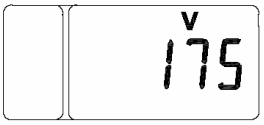
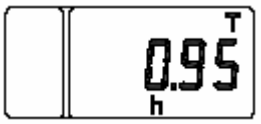
- press the “Parameter” button (figure 2.8.4) to choose the parameter value to be set;
- press the “Mode” button twice, after which the low-order digit will start blinking on multifunction indicator 17 (figure 2.8.1);
- to change the blinking digit of the parameter, press the “Value” button (figure 2.8.4);
- to select the high-order digit, press the “Parameter” button;
- to exit the programming mode of an unfixed parameter value, press the “Mode” button twice;
- after exiting the specified mode (entering an unfixed parameter value), the digits of the set parameter value stop blinking.

The newly set value is put the last in the list of allowed values for programming.
When the “Mode” button is pressed once in the programming mode, entering of an arbitrary parameter value is not possible.
When none of the buttons “Mode”, “Parameter” or “Value” is pressed for seven seconds in the mode of unfixed value input, the II automatically switches to the main multifunction indicator operation mode, and all set parameter values are saved.
It is allowed to enter one unfixed parameter value in the following ranges:

- for “Z” – from 23 to 69;
- for “I” – from 1,000 to 4,000;
- for “R” – from 400 to 1000;
- for “KV2” – from 0.346 to 0.600;
- for “ZV”– from 12 to 99;
- for “V” – from 0 to 1000.

The list of programmed parameter values for tractors “BELARUS-2122.6” (graphic examples of parameter presentations and their values on the multifunction indicator in the programming mode) is given in Table 2.8.4.

Table 2.8.4 – The list of programmed parameter values for tractor “BELARUS-2122.6”

	“Z” parameter Z is the number of teeth of final gears of the rear wheels (right and left), over which the travel speed (rotation speed) sensors are installed.
	“I” parameter I is the gear ratio multiplier of the wheel-hub drive
	“R” parameter R is the rear axle rolling radius, mm. When reprogramming, this parameter can be modified with a 5 mm step[1)].
	“KV2” parameter KV2 is the PTO gear ratio[2)]
	“ZV” parameter ZV is the number of teeth of the RPTO reduction unit toothed washer
	“V” parameter V is the fuel tank volume, l [3)]
	Also, when the “Parameter” button is pressed in the programming mode, the list of programmed parameters contains an independent “T” parameter of precise readout of the astronomic service hours of the engine. This parameter cannot be modified, it is the precise number (to 0,01 of hour) of engine service hours.

[1)] “910” is the value for tires 580/70R42. When mounting another type of tires, it is required to set the parameter value “R” which corresponds to the rolling radius of the mounted tires.

[2)] On tractors “BELARUS-2122.6» readout of RPTO revolutions is carried out with the help of PTO speed sensor. Considering this, any value, except for number “000”, can be set in parameter “KV2”.

[3)] On tractors “BELARUS-2122.6» only the value of the side fuel tank volume (175 litres) shall be set, so the data about the operation time on the remaining fuel and etc. are formed without considering the fuel volume in the tank (the volume of the fuel tank under the cab is 130 litres).

During operation, it is allowed to modify the parameter value of wheel rolling radius “R”, which is determined based on the tires installed on the tractor by measuring the distance from the wheel center to the mounting surface.

IT IS FORBIDDEN TO MODIFY THE ENTERED VALUES OF ALL OTHER PARAMETERS (FACTORY DEFAULTS)!

2.9 Information display and combined electronic panel

2.9.1 General information

Information display 21 (figure 2.1.1) is designed to display engine actual parameters, indication of the engine electronic control system (EECS) faults and to display SCR parameters.

When the key of starter and instrument switch is set into “I” position (figure 2.2.2) the supply voltage is delivered to the engine electronic control system. After the supply voltage is delivered, the EECS constantly performs self-testing. If there are no faults in the EECS operation, the information display functions in the operating mode – it displays actual parameters of engine operation.

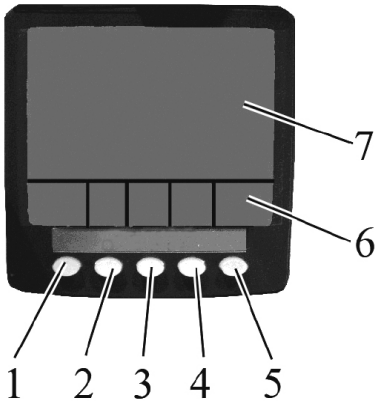
When the error is detected, the information display produces an acoustic signal and a brief description of the identified errors (the error code designation and its description) appears on the screen, also a fault testing annunciator lights up or flashes on engine control panel 33 (figure 2.1.1). The interpretation of error codes and the recommended actions to be taken to eliminate the identified faults are given in the engine operation book.

ATTENTION: IT IS REQUIRED TO ELIMINATE THE DETECTED ERRORS! TO ELIMINATE THE ERRORS, CONTACT YOUR DEALER!

2.9.2 Adjustment of brightness and sharpness of the information display

To enter the mode of adjustment of screen brightness and sharpness 7 (figure 2.9.1) press button 5. Images of buttons are given in the screen lower part. Pressing button 1 decreases brightness, pressing button 2 increases brightness, pressing button 3 decreases sharpness, pressing button 4 increases sharpness, and pressing buttons 1,2,3,4 at the same time adjusts to an average value of sharpness and max. brightness. Repeated pressing button 5 exits the mode of brightness and sharpness adjustment.

2.9.3 Call-up of changeable images and parameters on the screen of the information display



1 – button to activate the main (three-segment) image and choose between displayed parameters; 2 – button to activate four-section image and choose between displayed parameters; 3 – button to enter SCR parameters menu and to activate graphic display and choose between displayed parameters; 4 – button to activate indication of error (fault) list and choose between displayed parameters; 5 – button to enter/exit the mode of adjustment of sharpness, brightness and configuration menu; 6 – changeable display of buttons functional purpose; 7 – screen.

Figure 2.9.1 – Information display

Monitor buttons 1, 2, 3, 4, 5 (figure 2.9.1) are of multifunctional purpose. When pressing any of buttons 2, 3, 4 during the monitor operation, an image of button panel 6 appears on the screen, the icons denoting the current functions of each button. Pressing button 1 on the monitor activates the main three-segment image on the screen. In this case an engine speed scale is displayed in the upper left corner and a scale of oil pressure in the engine lubrication system is displayed in the upper right corner, cooling fluid temperature - in the lower right corner, current fuel flow per hour - in the lower left corner. When the three-segment imaging is indicated, the displayed parameters in the lower left corner are chosen with button 1. To exit the mode of choosing between the displayed parameters in the upper right corner it is required to press button 5 after activation of the button panel 6. After that the parameters are chosen between with buttons 1 and 2.

After calling up button panel 6, a four-segment imaging of parameters on screen 7 is activated with button 2. After the first pressing button 2, four parameters are displayed in the digital mode on the screen:

- in the upper left corner – engine speed;
- in the upper right corner – coolant temperature;
- in the lower left corner – on-board voltage;
- in the lower right corner – oil pressure in the lubrication system.

When pressing button 2 for the second and third time, four parameters are displayed on the screen in an analog form.

Using the mode of choosing between the displayed parameters, the customer can activate if necessary displaying of various engine parameters on the screen according to table 2.9.1. The mode of parameter choosing is activated after calling up the button panel with short-time pressing button 5. Successive pressing button 1 changes the parameters displayed in the upper left corner, pressing button 2 changes the parameters in the upper right corner, button 3 – in the lower left corner, button 4 – in the lower right corner. The parameter choosing mode is exited with short-time pressing button 5.

After calling up the button panel by pressing button 3, menu of SCR system is activated.

Displaying of SCR system parameters and viewing of critical modes of SCR system operation are given in subsection 2.27 “SCR system operation”.

Such parameters of SCR as “AdBlue level in tank”, ‘’AdBlue temperature in tank”, “temperature of exhaust gases before SCR catalyst” can be displayed without input to the menu of SCR system parameters. Look-up of other SCR system parameters, indicated in table 2.9.1, is possible only through menu of SCR system parameters.

If you press button 3, when being in menu, graphical displaying of engine parameters in course of time is activated (functions as a parameter analogue recorder). The required graphic parameters are chosen with a successive pressing button 3 according to table 2.9.1.

A temporary net can be adjusted in a configuration menu from 2, 10 or 30 min. to 1, 2, 4 or 8 hours. To enter the configuration menu it is necessary to press button 5 and hold it pressed for more than 3 sec. Also it is possible to choose metric and British units of measurement in this menu, among available languages it is possible to choose English, Spanish, Swedish, French, German, Italian, Dutch, Portuguese and Russian.

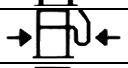
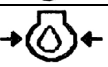
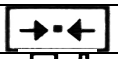
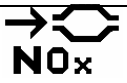
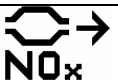
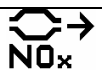
ATTENTION: ONLY DEALERS ARE AUTHORIZED TO CHANGE SETTINGS OF THE CONFIGURATION MENU!

When errors (faults) are detected during the operation, the monitor produces a sound signal and a rhombic flashing window with an exclamation mark appears on the screen.

After calling up the button panel, a list of active errors (faults) is invoked with button 4. Moving over the list is carried out with buttons 1 and 2.

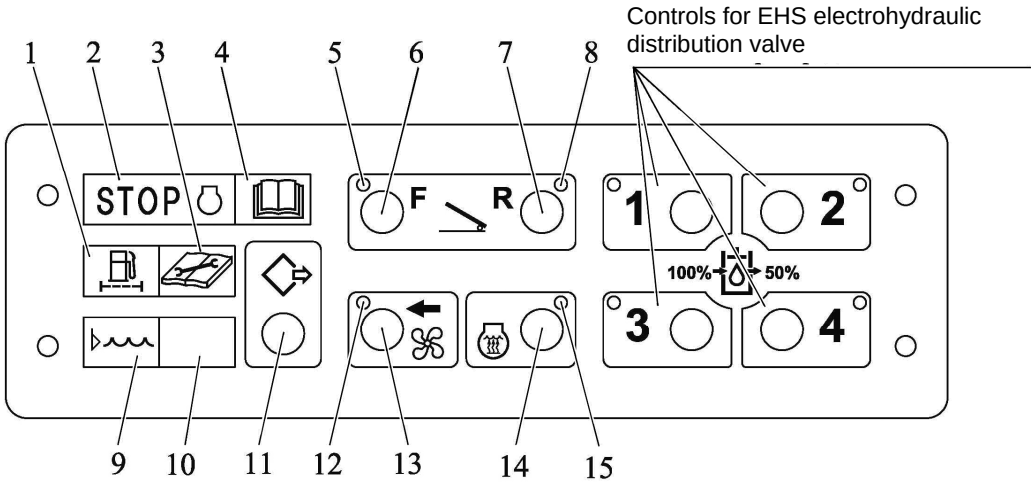
To exit displaying of the lift of active errors, it is necessary to confirm the reception of all errors by pressing button 3. After the errors stop appearing on the display, they are automatically deleted from the list.

Table 2.9.1 – Lift of parameters of four-segment and graphic indication of engine operation

Pos. No.	Parameters	Four-segment imaging	Graphic imaging	Symbol
1	Electric voltage directly on terminals of information monitor connection, V	✓	✓	
2	Voltage on the accumulator battery terminals, measured by the engine electronic control unit, V	✓	✓	
3	Fuel consumption, l/h	✓	✓	
4	Fuel delivery pressure, kPa	✓	✓	
5	Air pressure at the inlet pipe, kPa	✓	✓	
6	Engine oil pressure, kPa	✓	✓	
7	Barometer pressure, kPa	✓		
8	Engine oil temperature, °C	✓	✓	
9	Fuel temperature, °C	✓		
10	Temperature of coolant in the engine, °C	✓	✓	
11	Air temperature at the inlet pipe, °C	✓	✓	
12	Accelerator position, %	✓		
13	Use of turning torque, rpm	✓		
14	Engine torque, requested by the driver, %	✓		
15	Torque consumption, %	✓		
16	Engine speed, rpm	✓	✓	
17	Exhaust gases temperature to SCR catalyst, °C	✓		
18	AdBlue temperature in the tank, %	✓		
19	Level of AdBlue reagent in the tank, %	✓		
20	Number of nitrogen oxids NOx in emissions before SCR catalyst, ppm	✓		
21	Number of nitrogen oxids NOx in emissions afeter SCR catalyst, ppm	✓		
22	Quantity of injected AdBlue, g/h	✓		-
23	AdBlue quality (percentage of urea in water 32.5%)	✓		
24	Rated quantity of NOx emissions, g/kWh			
25	SCR system status			-

2.9.4 Combined electronic panel

2.9.4.1 Functions of CEP elements



1, 2, 3, 5, 8, 9, 10, 12, 15 – unused annunciators; 4 – annunciator for troubleshooting; 6, 7, 13, 14 – unused buttons; 11 – button for troubleshooting activation.

Figure 2.9.2 – Combined electronic panel

Button for troubleshooting activation 11 (figure 2.9.2) is designed to call active errors from the memory of electronic engine control unit by means of blink codes displayed by annunciator for troubleshooting 4. This means of troubleshooting is alternative in comparison with information display 21 (figure 2.1.1). According to read-out and decoding of errors blink codes as well as recommended activities for troubleshooting see the engine operator's manual attached to the tractor. The detected errors shall be eliminated. To eliminate the detected failures, it is required to address the dealer.

When pressing button 11 (figure 2.9.2), an audible warning device comes into action for a short time.

Note – The rules of using controls for EHS electrohydraulic distribution valve are given in subsection 2.19.4 "Flow restriction".

2.9.4.2 Description of check for CEP operation

At each connection to power supply, a check of annunciators operation is carried out in CEP. By doing so, all LED annunciators switch on within two seconds and an audible warning device gets activated. Then LED annunciators and an audible warning device pass into the operating mode – only annunciator 5 or 8 (figure 2.9.2) remains switched on, an audible warning device gets switched off.

Note: tractors "BELARUS-2122.6" can be equipped with CEP without a check of LED annunciators 5, 8, 12, 15 operation and annunciators for flow restriction of EHS electrohydraulic distribution valve.

2.10 Steering

2.10.1 General information

Tractor "BELARUS-2122.6" is equipped with hydrostatic steering control (HSC), designed for control of guide wheels turn and decrease of steering force while the feed pump is operating. If the feed pump fails to operate or to supply oil to the system control circuit (the engine is off or there is a failure in HSC), the turn is carried out in the manual mode at which significant steering effort is required.

2.10.2 Steering wheel adjustments

The steering wheel has the following adjustments:

- according to the horizon tilt angle;
- according to the height, along the steering shaft axis.

To change height positioning of the steering wheel, do the following:

- unscrew chuck 2 (figure 2.10.1) by 3-5 revolutions;
- set wheel 1 to a position comfortable for work;
- screw in chuck 2 with max. possible force of hand fingers.

The range of the steering wheel height adjustment is 100 mm, stepless.

To change the steering column tilt angle, do the following:

- pull handle 3.
- tilt the steering column to reach the position comfortable for work and releasing handle 3, swing the steering column smoothly in longitudinal direction until fixed firmly.

The steering column can be tilted and fixed in four positions from 25° to 40° with 5° interval.

1 – steering wheel; 2 – chuck; 3 – handle to fix the tilt of the steering column.

Figure 2.10.1 – Steering wheel adjustment

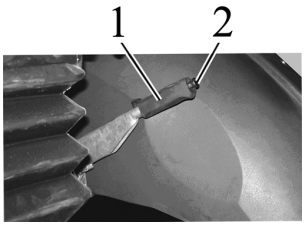
ATTENTION: WHEN FIXING THE STEERING COLUMN IN THE EXTREME FRONT POSITION, SET THE GEAR SWITCH LEVERS OF GEARS AND RANGES INTO A NEUTRAL POSITION, START THE ENGINE AND WITH THE TRACTOR NOT MOVING MAKE SURE THE STEERING CONTROL OPERATES WELL!

2.11 Parking brake control

Upper position of lever 1 (figure 2.11.1) – parking brake “On”;

Lower position of lever 1 – parking brake “Off”.

To disengage the parking brake, press button 2 on lever 1 and lower the lever against the stop.



1 – parking brake control lever; 2 – button.

Figure 2.11.1 – Parking brake control

2.12 Handle for fuel supply manual control

When moving handle 31 (figure 2.1.1) into the extreme front position, max. fuel supply is provided, when moving the handle into the extreme rear position – min. fuel supply is provided which corresponds to the minimum idle speed.

2.13 Tractor pedals

2.13.1 Pressing pedal 24 (figure 2.1.1) disengages the clutch.

2.13.2 Pressing pedal 26 (figure 2.1.1) brakes the rear left wheel.

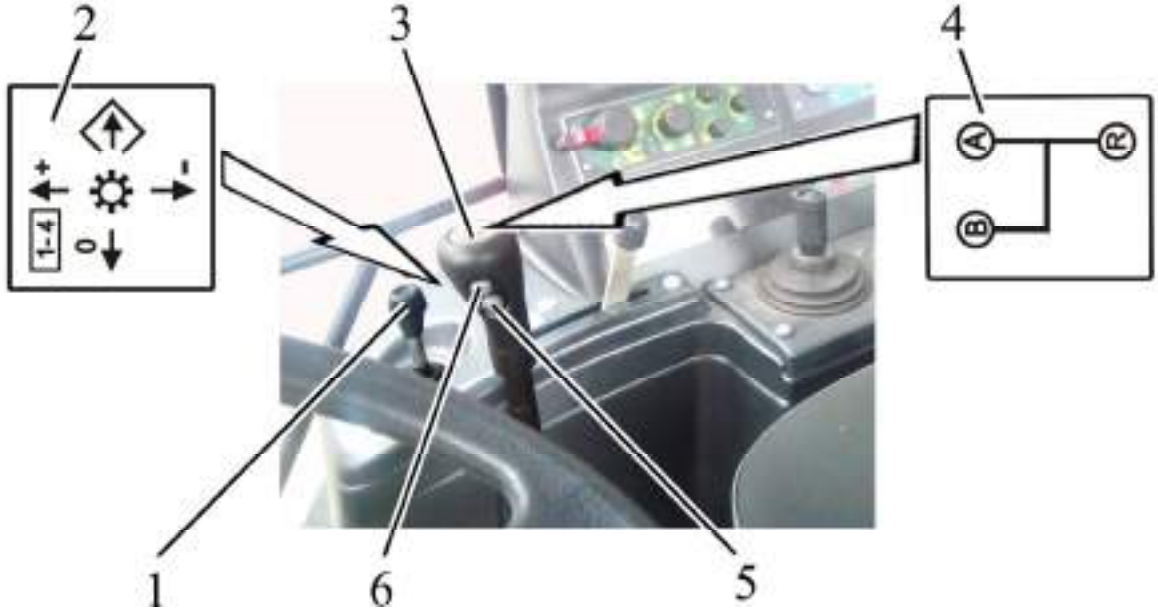
2.13.3 Pressing pedal 27 (figure 2.1.1) brakes the rear right wheel. A joint plate of the brake pedals is intended for simultaneous braking with the right and left brakes.

2.13.4 Pressing pedal 28 (figure 2.1.1) increases the engine speed.

2.14 Switching of ranges, gears and passes on GB reduction unit

2.14.1 General information

Setting of the required gear is carried out by means of a lever, joystick and a button: lever for range switching 3 (figure 2.14.1), joystick for gear switching 2, button for switching reduction unit passes 5.



1 – joystick for gear switching; 2 – scheme for switching GB gears; 3 – lever for range switching; 4 – scheme for switching GB ranges; 5 – button for switching GB reduction unit passes; 6 – start button for mode “partial braking”.

Figure 2.14.1 – Switching of ranges, gears and passes of GB reduction unit

2.14.2 Switching of GB ranges

Before movement start, first it is necessary to set the required GB range according to scheme 4 (figure 2.14.1) using lever for switching ranges 3, switching on the GB mode “partial braking” before that. Switching on of “partial braking” mode is carried out when the following conditions are observed:

- operator depressed button 6 on the handle of the lever for switching ranges and holds it depressed;
- lever for switching ranges 3 is located in neutral position;
- the clutch is disengaged.

“Partial braking” mode is switched on only in case when symbol “P” is displayed on digital indicator 7 (figure 2.15.1) located on CECS (GB “partial braking” on) and the corresponding switching on segments for first and fourth gears of annunciator 6 burn in the mode of continuous glow. Each burning segment of symbol “P” means fulfillment of this or that condition for switching on GB “partial braking” mode, specified above. If while pressing button 6 (figure 2.14.1), one of two remaining segments of symbol “P” fails to burn, then the signal from one of the sensors failed to come in accordance with the scheme shown in figure 2.14.2. If button 6 is not pressed, then none of the segments of symbol “P” fail to burn, even when the lever for switching ranges is in neutral position and the clutch is disengaged. The lower segment of symbol “P” starts to burn only when all three conditions for switching on “partial braking” mode are fulfilled.

In case of detecting failures in the electric circuit of first and fourth gears, the corresponding segments of annunciator 6 display the corresponding code, as shown in clause 2.15.8.

Failures detected in the process of switching on “partial braking” mode shall be eliminated.

ATTENTION: SWITCH ON THE RANGE ONLY AFTER SWITCHING ON GB “PARTIAL BRAKING” MODE! RANGE SWITCHING SHALL BE CARRIED OUT THROUGH THE NEUTRAL POSITION WITH SWITCHING ON OF GB “PARTIAL BRAKING” MODE!

ATTENTION: SWITCH ON THE RANGE ONLY WITH THE TRACTOR STOPPED, WITH THE FULLY DEPRESSED CLUTCH PEDAL!

IT IS FORBDDEN TO SWITCH THE RANGES WHEN THE TRACTOR IS MOVING!

ATTENTION: SWITCH OFF THE REDUCTION UNIT RANGE TO THE NEUTRAL POSITION AFTER SETTING THE GB TO GEAR “0” WITH THE CLUTCH DISENGAGED!

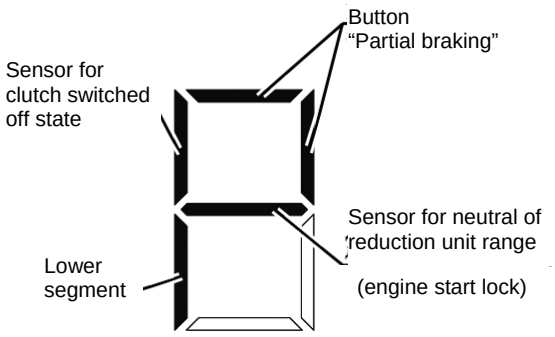


Figure 2.14.2 – Indication scheme for operation of sensors and button when setting “partial braking” mode on a digital indicator

2.14.3 Switching of GB gears

Gear switching is carried out by means of joystick 1 (figure 2.14.1). Indication of the engaged gear is carried out by annunciator of gear “0” 33 (figure 2.15.1) and corresponding segments of annunciator 6 as well as digital indicator 7 which are mounted on CECS.

In the initial state, when operator shifts the starter and instruments switch to the position “I” – instruments on” – all gears are disengaged. On CECS front panel annunciator 33 of gear “0” lights up, and number “0” is shown on digital indicator 7. This certifies that power is supplied to the gear switching system, and the system does not give control signal to any of electric solenoids for electric hydraulic distribution valve for gear switching. After engine start, the transmission hydraulic system pump starts to operate. Indication of “0” gear remains unchanged.

To start the movement, before choosing the required GB gear, it is necessary to switch on the chosen GB range using lever for switching ranges 3 (figure 2.14.1), switching on “partial braking” mode before that, as specified in clause 2.14.2 “Switching of GB ranges”.

After switching on the required range, gear switching is carried out without interruption in torque delivery by means of joystick 1 (figure 2.14.1), except for exit from the state “Gears off” (gear “0”). Exit from the state “Gears off” is allowed only with the clutch pedal fully depressed against the stop (activation of the sensor for clutch switched off state). Successive pressing the handle of joystick 1 forward against the stop provides successive increasing gear switching (each pressing forward against the stop – plus one gear). Successive pressing the handle of joystick 1 backwards against the stop provides successive decreasing gear switching (each pressing backwards against the stop – minus one gear). Quick exit from any gear to the position “gears off” (gear “0”) is carried out by shifting the handle of joystick 1 to the left against the stop. When pressing the handle of joystick 1 to the right against the stop and holding it in this position for more than two seconds, memorizing of the engaged gear takes place. Repeated (quick, less than one second) pressing the handle of joystick 1 to the right against the stop with the clutch pedal fully depressed – call of the memorized gear (for example, it is possible to engage the memorized gear from the position “0”). Description of the operation principle for indication of the engaged gear is given in subsection 2.15 “CECS”.

ATTENTION: IT IS ALLOWED TO SWITCH GEARS WITHIN ONE RANGE ON A MOVING TRACTOR WITHOUT DEPRESSING THE CLUTCH PEDAL!

While tractor movement, there is a possibility of automatic switching of reduction unit passes on range “B” (without tractor stop).

To speed up the tractor, it is required to depress the clutch pedal on the fourth gear of pass “L” and hold it in this position, press the joystick handle forward against the stop. In this case, automatic switching to the second gear and changing of the pass from “L” to “H” take place. After switching is carried out, CECS switches on the built-in buzzer for a short time, after which it is required to release the clutch pedal smoothly.

To slow down the tractor, it is required to depress the clutch pedal on the first gear of pass “H” and hold it in this position, press the joystick handle backwards against the stop. In this case, automatic switching to the fourth gear and changing of the pass from “H” to “L” takes place. After switching is carried out, CECS switches on the built-in buzzer for a short time, after which it is required to release the clutch pedal smoothly.

2.14.4 Switching of GB reduction unit passes

When turning the starter and instruments switch to the position “I” – instruments on” an annunciator of GB reduction unit 17 (figure 2.15.1) engaged state on CECS switches on. The pass, which was switched on before engine stop, is in the engaged state – consequently, the switching on annunciator for the corresponding pass of GB reduction unit 15 or 26 lights up.

Switching of GB reduction unit passes “L” (lower) and “H” (higher) is possible only after engine start, when the transmission hydraulic system pump starts to operate.

ATTENTION: SWITCHING OF GB REDUCTION UNIT PASSES SHALL BE CARRIED OUT ONLY WITH THE TRACTOR STOPPED AND THE LEVER FOR SWITCHING GB RANGES SHALL BE SET IN THE NEUTRAL POSITION!

Switching on of GB reduction unit lowest pass “L” shall be carried out with button 25 (figure 2.15.1) located on CECS. By doing so, annunciator 17 burns on CECS and annunciator for switching on GB reduction unit 26 lowest pass lights up. Annunciator 15 goes out.

Switching on of GB reduction unit highest pass “H” shall be carried out with button 16 (figure 2.15.1) located on CECS. By doing so, annunciator 17 burns on CECS and annunciator for switching on GB reduction unit 15 highest pass lights up. Annunciator 26 goes out.

Switching of GB reduction unit passes (“L”/”H”) is also possible by pressing button 5 (figure 2.14.1) located on the lever for switching ranges 3.

2.14.5 Diagram of tractor velocity

The table of “BELARUS-2122.6” tractor velocity diagram (figure 2.14.3) on tires of basic configuration is attached to the cab right window.

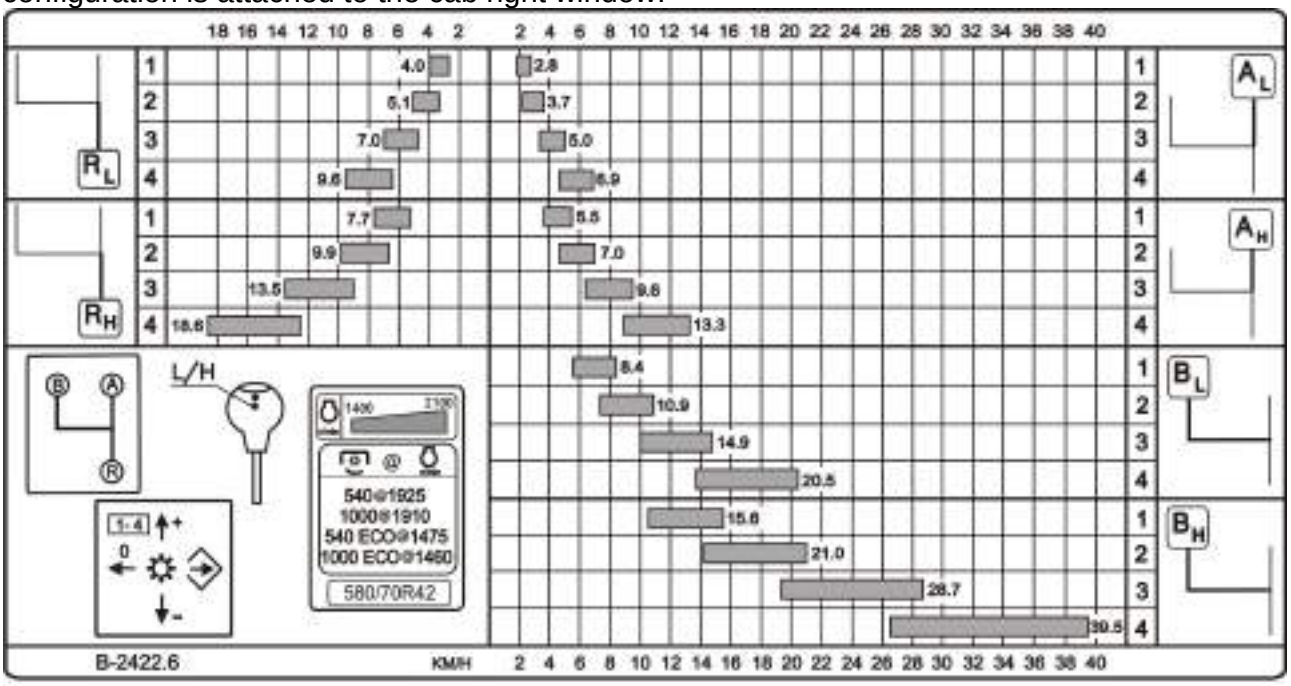


Figure 2.14.3 – Diagram of tractor “BELARUS-2122.6” velocity

2.15 Complex electronic control system

2.15.1 General information on complex electronic control system functions

Complex electronic control system (CECS) on tractors “BELARUS-2122.6” is designed for carrying out the following functions:

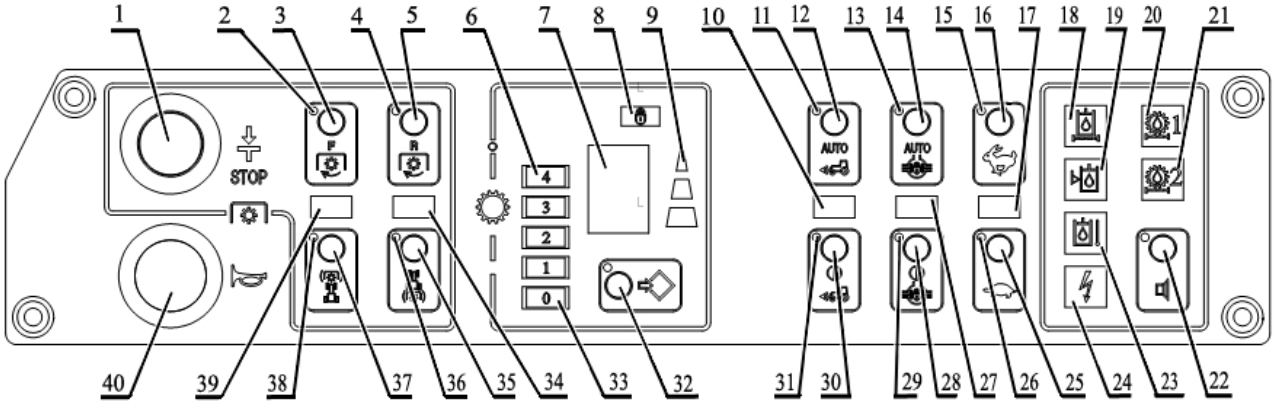
- indication of the GB engaged gear and control of the mode for GB gear switching;
- rear and front power take-off control;
- control of front driving axle drive;
- control of rear axle differential lock;
- control of switching GB reduction unit passes, indication of GB reduction unit operation;
- warning on accident conditions of the transmission hydraulic system and HLL, troubleshooting of emergency on-board circuit voltage;
- troubleshooting of failures in electronic control systems for RPTO, FPTO, FDAD, rear axle DL, control for gear switching, GB reduction unit.

The layout of CECS controls, indicators and annunciators is shown in figure 2.15.1.

Confirmation of setting drives operation modes from buttons is accompanied by short-time actuation of audible warning device.

When switching on marker lights, light intensity of CECS indicators and annunciators decreases.

ATTENTION: PILOT LAMPS-ANNUNCIATORS GET SWITCHED ON AND OFF SIMULTANEOUSLY WITH CHANGES IN THE STATE OF SYSTEM SENSORS!



1 – emergency stop button for front power take-off (FPTO) and rear power take-off (RPTO); 2 – annunciator for FPTO switching on; 3 – button for FPTO switching on; 4 – annunciator for RPTO switching on; 5 – button for RPTO switching on; 6 – annunciators for gear actuation (from first to fourth); 7 – digital indicator; 8 – annunciator for GB emergency operation mode; 9 – indicator for gear switching mode; 10 – annunciator for FDAD engaged state; 11 – annunciator for switching on FDAD automatic mode; 12 – button for switching on FDAD automatic mode; 13 – annunciator for switching on RADL automatic mode; 14 – button for switching on RADL automatic mode; 15 – annunciator for switching on GB reduction unit highest pass; 16 – button for switching on GB reduction unit highest pass; 17 – annunciator for GB reduction unit engaged state; 18 – annunciator for HLL pump filter dirtiness and emergency oil temperature in the HLL pump (or, when mounting a corresponding sensor, only for dirtiness of HLL pump filter); 19 – annunciator for emergency oil level in the HLL tank (or, when mounting a corresponding sensor, annunciator for emergency oil temperature in the HLL tank); 20 – annunciator for duplex filter dirtiness of transmission hydraulic system; 21 – backup alarm; 22 – button for switching off audible warning device (buzzer); 23 – annunciator for emergency oil temperature in the HLL tank; 24 – annunciator for CECS emergency voltage supply; 25 – button for switching on GB reduction unit lowest pass; 26 – annunciator for switching on GB reduction unit lowest pass; 27 – annunciator for RADL engaged state; 28 – button for switching on RADL forced mode; 29 – annunciator for switching on RADL forced mode; 30 – button for switching on FDAD forced mode; 31 – annunciator for switching on FDAD forced mode; 32 – option button for gear switching mode; 33 – annunciator for zero gear (gear “0”); 34 – annunciator for RPTO engaged state; 35 – button for RPTO switching off; 6 – annunciator for RPTO switching off; 37 – button for FPTO switching off; 38 – annunciator for FPTO switching off; 39 – annunciator fpr FPTO engaged state; 40 – button for audible beep switching on.

Figure 2.15.1 – Complex electronic control system

2.15.2 Indication of the engaged gear and control for GB gear switching mode

In the initial position, when operator shifts the starter and instruments switch to the position “I” – instruments on”, a moderate mode for gear switching is set by default – two upper segments burn on indicator 9 (figure 2.15.1).

Pressing option button for gear switching mode 32 by method of circular search, it is possible to set easy, heavy or return to moderate mode of gear switching depending on the type of work carried out. An easy mode can be used when operating the tractor with minimal load, for example on transport when moving with empty trailer, and a heavy mode - when carrying out energy-consuming work with maximal load. If one upper (smaller) segment burns on indicator 9 – an easy mode is set; if two upper segments burn – a moderate mode is set, if all three segments burn – a heavy mode for gear switching is set.

Also, when operator shifts the starter and instruments switch to the position “I” – instruments on” – all gears are disengaged. Annunciator for gear “0” 33 (figure 2.15.5) lights up on CECS front panel, and number “0” lights up on digital indicator 7.

Then, when switching gears in the operation process, digital indicator 7 displays the GB gear number, set with the help of a joystick, and annunciator 6 displays the gear on which the tractor is moving at the moment.

So, if during tractor movement on the first gear, a fourth gear is successively set with the joystick, then digital indicator 7 immediately displays number “4” and annunciators of the engaged gear 6 light up successively (first lower, then the rest, last – upper) in accordance with actuation of the corresponding pressure sensors.

At normal operation mode, indicator 7 indicates the number of chosen gear, and the corresponding annunciator 6 constantly burns which confirms actuation by pressure.

Digital indicator 7 also indicates switching on of GB “partial braking” mode, as specified in subsection 2.14.2 “Switching of GB ranges”.

2.15.3 Rear power take-off shaft control

Rear power take-off shaft control is carried out by means of buttons 5 and 35 (figure 2.15.1). Indication of RPTO operation is carried out by means of annunciators 4, 34, 36 and integrated indicator 15 (figure 2.1.1).

Note – Operation of integrated indicator in the display mode of RPTO revolutions is specified in subsection 2.8.2 “Assignment and operation principle of integrated indicator gauges”.

In the initial position, when operator shifts the starter and instruments switch to the position “I” – instruments on”, RPTO disengaged state is set by default – indicator 36 (figure 2.13.5) burns which confirms RPTO disengaged state.

To engage RPTO, it is required to press button 5. Immediately after pressing button 5, annunciator 4 gets actuated which informs the start of RPTO spinning up. Then, after some time when RPTO gets to the normal operation mode, annunciator for RPTO 34 engaged state lights up additionally.

To disengage RPTO, it is required to press button 30. By doing so, annunciators 4 and 34 go out and annunciator for RPTO switching off 36 lights up which confirms that RPTO is in the disengaged state.

CECS allows RPTO repeated switching on only 30 sec after its switching off.

ATTENTION: FOR REAR POWER TAKE-OFF EMERGENCY SWITCHING OFF, IT IS REQUIRED TO PRESS BUTTON 1 (FIGURE 2.15.1)!

Note – Additional information on operating rules with RPTO are specified in subsection 2.16 “Additional information on rear power take-off control” and subsection 3.2.7 “PTO use”.

2.15.4 Front power take-off shaft control

Front power take-off shaft control is similar to RPTO control.

Front power take-off shaft control is carried out by means of buttons 3 and 37 (figure 2.15.1). Indication of FPTO operation is carried out with annunciators 2, 38, 39.

In the initial state, when operator shifts the starter and instruments switch to the position “I” – instruments on”, FPTO disengaged state is set by default – indicator 38 burns which confirms FPTO disengaged state.

To engage FPTO, it is required to press button 3. Immediately after pressing button 3, annunciator 2 gets actuated which informs the start of FPTO spinning up. Then, after some time when FPTO gets to the normal operation mode, annunciator for FPTO 39 engaged state lights up additionally.

To disengage FPTO, it is required to press button 37. By doing so, annunciators 2 and 39 go out and annunciator for FPTO switching off 36 lights up which confirms that FPTO is in the disengaged state.

ATTENTION: FOR FRONT POWER TAKE-OFF EMERGENCY SWITCHING OFF, IT IS REQUIRED TO PRESS BUTTON 1 (FIGURE 2.15.1)!

Note – Additional information on operating rules with FPTO are specified in subsection 3.2.7 “PTO use”.

2.15.5 Front driving axle drive control

Front driving axle drive (FDAD) control is carried out by means of buttons 12 and 30 (figure 2.15.1). Indication of FDAD control is carried out with annunciators 10, 11, 31.

In the initial state, when operator shifts the starter and instruments switch to the position “I” – instruments on”, FDAD disengaged state is set by default.

Mode “FDAD off” shall be used on the transport when moving on roads with hard surface at a speed of over 13 km/h to avoid increased wear of front wheels tires.

When pressing button 12 “AUTO” with the position of guide wheels corresponding to straight-forward movement and with excess of skidding limit for rear wheels, FDA drive gets actuated in an automatic mode. Simultaneously, annunciators 11 and 10 light up.

FDAD disengagement is carried out automatically when guide wheels turn for the angle over 25° or at a speed of over 16 km/h, or at reduction of rear wheels skidding below the permissible limit. At speed reduction less than 13 km/h or excess of rear wheels skidding limit during straight-forward tractor movement, FDA drive shall switch on automatically. Annunciator for switching on FDAD automatic mode 11 shall constantly burn up to the moment of switching off this mode, and annunciator for FDAD engaged state 10 shall burn only during FDAD operation.

Mode “FDAD automatic control” shall be used at different types of field work, including reverse movement.

ATTENTION: AVOID FRONT WHEELS TURNING AT ANGLES CLOSE TO 25° IN THE MODE “FDAD AUTOMATIC CONTROL” WITH REAR WHEELS SKIDDING, AS BY DOING SO CONSTANT AUTOMATIC FDAD SWITCHING ON AND OFF TAKES PLACE, WHICH CAN CREATE ABRUPT DYNAMIC LOADS IN TRANSMISSION AND FDA DRIVE!

Disengagement of mode “FDAD automatic control” is carried out by repeated pressing button 12 “AUTO” or by pressing and releasing button for switching on FDAD forced mode 30. By doing so, annunciators 10 and 11 go out.

In case FDAD forced switching on is required, regardless of tractor speed and front wheels turning angle, press button 30. Simultaneously, annunciators 10 and 31 light up. At repeated pressing button 30, FDAD forced switching off takes place and annunciators 10, 31 go out.

To pass from the automatic mode of FDAD switching on to the forced mode, it is enough just to press button 30 and hold it in this position.

ATTENTION: DURING TRACTOR OPERATION AT BAD COUPLING CONDITIONS WITH REAR WHEELS SKIDDING, INCLUDING WHILE TURNING, USE ONLY FORCED FDA SWITCHING ON TO PROVIDE SMOOTH FDA SWITCHING ON, FOR WHICH DO THE FOLLOWING:

- STOP THE TRACTOR, DEPRESSING THE CLUTCH COUPLING PEDAL;
- SWITCH ON FDA IN THE MODE “FORCED FDA DRIVE SWITCHING ON”, HOLDING BUTTON 30 IN PRESSED POSITION;
- RELEASE THE CLUTCH COUPLING PEDAL SMOOTHLY.

ATTENTION: AUTOMATIC FDA DRIVE SWITCHING ON TAKES PLACE WHEN DEPRESSING THE INTERLOCKED BRAKE PEDALS, REGARDLESS OF THE MODE SET (INCLUDING IN THE MODE “FDAD OFF”)!

ATTENTION: DURING OPERATION ON ROADS WITH HARD SURGACE, IT IS REQUIRED TO SWITCH OFF FDA DRIVE TO AVOID INCREASED WEAR OF FRONT WHEELS TIRES!

ATTENTION: VIOLATION OF RULES FOR USING FDA DRIVE CONTROL MODES CAN LEAD TO BREAKAGE IN DOUBLE FDA HINGE JOINTS AND OTHER TRANSMISSION PARTS!

TRACTOR OPERATION WITH FDA DRIVE SWITCHED ON AT A SPEED OVER 13 KM/H IS FORBIDDEN!

2.15.6 Rear axle differential lock control

Rear axle differential lock (RADL) control is carried out by means of buttons 14 and 28 (figure 2.15.1). Indication of RADL operation is carried out with annunciators 13, 27, 29.

In the initial state, when operator shifts the starter and instruments switch to the position “I” – instruments on“, RADL disengaged state is set by default.

In order to avoid increased wear of rear wheels tires and rear axle differential lock, use the mode “RADL off” on the transport when moving on roads with hard surface at a speed over 10 km/h.

When pressing button 14 “AUTO” with the position of guide wheels corresponding to straight-forward movement, RADL gets actuated in an automatic mode. Simultaneously, annunciators 13 and 27 light up.

RADL disengagement takes place automatically when guide wheels turn for the angle over 13° or at a speed over 16 km/h, as well as when pressing either or both brake pedals. At speed reduction less than 13 km/h, RADL shall switch on automatically.

Annunciator for switching on RADL automatic mode 13 shall constantly burn up to the moment of switching off this mode, and annunciator for RADL engaged state 27 shall burn only during RADL operation.

Disengagement of mode “RADL automatic control” is carried out by repeated pressing button 14 “AUTO” or by pressing and releasing button for switching on RADL forced mode 28. By doing so, annunciators 13 and 27 go out.

In case forced short-time RAD lock is required, regardless of tractor speed and front wheels turning angle, press button 28 and hold it in this position. Rear axle differential lock remains switched on for the time of holding button 28 in pressed position. Simultaneously, annunciators 27 and 29 light up. When button 28 is released, return to RADL initial (disengaged) position takes place and annunciators 27, 29 go out.

To pass from the automatic mode of RADL to the forced mode, it is enough just to press button 28 and hold it in this position.

ATTENTION: AUTOMATIC RADL SWITCHING OFF TAKES PLACE WHEN DEPRESSING EITHER OR BOTH BRAKE PEDALS, REGARDLESS OF THE MODE SET!

TRACTOR OPERATION WITH REAR AXLE DIFFERENTIAL LOCK SWITCHED ON AT A SPEED OVER 13 KM/H IS FORBIDDEN!

TRACTOR OPERATION ON THE TRANSPORT ON ROADS WITH HARD SURFACE WITH CONSTANTLY SWITCHED ON REAR AXLE DIFFERENTIAL LOCK IS FORBIDDEN!

2.15.7 Annunciation for accident conditions of transmission and HLL hydraulic system, troubleshooting of emergency on-board voltage

Annunciator for duplex filter dirtiness of transmission hydraulic system 20 (figure 2.15.1) gets actuated at high level of duplex filter dirtiness. It is necessary to replace the duplex filter filtering cartridges for transmission hydraulic system and rinse the mesh filter of transmission hydraulic system.

Annunciator for HLL pump filter dirtiness 18 gets actuated (and further operates in the mode of continuous glow) at high level of HLL pump filter. It is necessary to replace the HLL pump filter.

ATTENTION: SHORT-TIME ACTUATION OF ANNUNCIATORS 18 AND 20 IS ALLOWED WITH COLD OIL IN THE TRANSMISSION AND HLL HYDRAULIC SYSTEM WHICH IS NOT A SIGN OF FAILURE!

Annunciator for emergency oil level in HLL tank 19 gets actuated at oil level decrease in the HLL tank below the permissible level.

Annunciator for emergency oil temperature in HLL tank 23 gets actuated at oil temperature increase in the HLL tank above the permissible level. Apart from that, at oil temperature increase in the HLL tank above the permissible level, annunciator 18 lights up and operates in flashing mode.

In case emergency annunciators for hydraulic system 19 or 23 light up, it is required to stop operation, detect and eliminate the reasons for accident condition appearance in order to avoid breakage and failure of hydraulic system units.

Note – Annunciators 18, 19 and 23 get actuated at combined sensors layout as follows:

- of level/temperature in the HLL tank;
- dirtiness/temperature on the HLL pump.

If an emergency temperature sensor is mounted in the HLL tank, then annunciator 19 (figure 2.15.1) gets actuated at permissible temperature excess. By doing so, annunciator 23 does not switch on.

If a dirtiness sensor for pump filter is mounted on the HLL pump, then annunciator 18 lights up at its actuation. By doing so, emergency oil temperature control in the pump is not carried out.

ATTENTION: AT VOLTAGE SUPPLY INCREASE OVER 18V, ANNUNCIATOR FOR EMERGENCY VOLTAGE SUPPLY LIGHTS UP, CECS GETS COMPLETELY SWITCHED OFF (CONTROL FOR ALL DRIVES AND GEAR BOX IS REMOVED) AND OPERABILITY IS RECOVERED AT POWER VOLTAGE DECREASE LESS THAN 17V!

AT VOLTAGE SUPPLY DECREASE LESS THAN 9V, CECS GETS COMPLETELY SWITCHED OFF (CONTROL FOR ALL DRIVES AND GEAR BOX IS REMOVED) AND OPERABILITY IS RECOVERED AT POWER VOLTAGE INCREASE OVER 9V!

When any of annunciators 18, 19, 20, 23 or 24 is switched on, an audible device (buzzer) gets actuated. It is possible to switch off an audible device for some time, for which it is required to press button 22 for a short time, by doing so an annunciator for buzzer switching off, located on the left of button 22, gets switched on and goes out. It is necessary to keep in mind that during further CECS switching on and actuation of accident condition sensors, an audible device shall get switched on until the corresponding failure is eliminated or the corresponding filter cartridge is replaced.

2.15.8 Troubleshooting of electronic control systems failures for RPTO, FPTO, FDAD, RADL, gear switching control

Apart from indication of the engaged state of the corresponding drive or gear, annunciators 6, 10, 27, 34, 39 (figure 2.15.1) in CECS carry out troubleshooting of the following failures in the electronic control system of this drive or gear:

- short circuit of the distribution valve electric solenoid is indicated with the corresponding annunciator for the drive or gear engaged state by one-time flash;
- open circuit to the distribution valve electric solenoid is indicated with the corresponding annunciator for the drive or gear engaged state by double flash;
- pressure sensor failure to operate is indicated with the corresponding annunciator for the drive or gear engaged state by three-time flash;
- “sticking” of the distribution valve is indicated with the corresponding annunciator for the drive or gear engaged state by four-time flash. Apart from that, at “sticking” of the GB distribution valve, annunciator for GB emergency operation mode 8 lights up in addition.

At three-time annunciator 17 flash – there is no signal from the sensor for switching on GB reduction unit lowest pass, at four-time flash – there is no signal from the sensor for switching on GB reduction unit highest pass.

Note – Annunciator for GB emergency operation mode also lights up when switch “EMERGENCY” 3 (figure 3.5.1) gets actuated.

Annunciator for failures in drives and gear switching operation is accompanied by a continuous signal of the audible device. It is possible to switch off the audible device for some time, for which it is required to press button 22 for a short time, by doing so annunciator for buzzer switching off, located on the left of button 22, gets switched on and goes out. It is necessary to keep in mind that during further CECS switching on and actuation of the corresponding pressure sensors, an audible device shall get switched on until the corresponding failure is eliminated.

In case of simultaneous detecting several failures, the corresponding annunciators indicate failure codes in the following sequence:

a) short circuit to the proportional valve electric solenoid;
b) open circuit to the proportional valve electric solenoid;
c) pressure sensor failure to operate;
d) electrohydraulic valve “sticking”.

Time pause between failure codes is three times longer than the pause between annunciator flashes inside the code.

The detected failures shall be eliminated in accordance with instructions given in subsection 6.3 “Possible failures in the electronic control system for gear box, rear axle differential lock, front driving axle drive, front and rear power take off shafts and instructions for their troubleshooting”.

2.15.9 Description of the check for CECS operability

At each connection to power supply, the check of indicators and annunciators is carried out in CECS. By doing so, all LED annunciators and indicators light up within about two seconds, digital indicator 7 (figure 2.15.1) displays number “8”, an audible device gets actuated. Then LED indicators and annunciators, a digital indicator and an audible device pass to the operating mode – annunciators 33, 36, 38 remain switched on, an indicator for gear switching mode displays a moderate operation mode, and digital indicator 7 displays number “0”, the rest of LED annunciators and an audible device get switched off.

2.16 Additional information on rear PTO control

Note – The rules for rear power take-off switching on and off are specified in clause 2.15.3 “Rear power take-off shaft control”.

The handle to engage rear PTO 23 (figure 2.1.1) has two positions:

- upper position – “PTO drive off”;
- lower position – “PTO drive engaged”.

ATTENTION: PTO DRIVE SHALL BE ENGAGED ONLY WITH THE ENGINE STOPPED OR AT MIMINAL ENGINE IDLE SPEED! PTO DRIVE SHALL BE DISENGAGED IN THE SAME WAY!

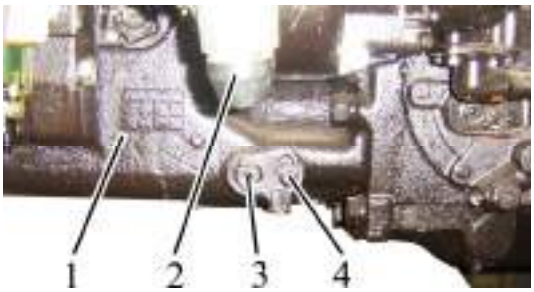
Switching between the rear PTO speed of 540 and 1000 rpm is carried out exclusively by installing the corresponding PTO shaft end extensions that have corresponding markings of “540” and “1000”. “BELARUS-2122.6” tractors do not have a special switch between the speeds of 540 and 1000 rpm of the rear PTO.

The rear PTO drive on tractors “BELARUS-2122.6” has two operation modes:

- standard – 540 and 1000 rpm;
- economic – 770 and 1460 rpm under engine rated speed.

Shaft 3 (figure 2.16.1) located on the left of the clutch coupling housing under the HLL pump, is designed for switching the modes of the RPTO drive.

Switching between the modes of the rear PTO (standard and economic) shall be carried out only when the engine is off or with the engine min. idle speed. To do this, it is required to loosen fixing bolt 4 (figure 2.16.1) and turn shaft 3 until engaged into the clutch, after that tighten the fixing bolt. To engage the standard mode, it is necessary to turn shaft 3 contraclockwise against the stop; to engage the economic mode it is required to turn shaft 3 clockwise against the stop.



1 – clutch coupling housing; 2 – pressure control group of the pneumatic system; 3 – shaft; 4 – fixing bolt.

Figure 2.16.1 – Switching between the RPTO standard and economic modes

Note – In figure 2.16.1 the position “PTO standard mode on” is set.

Note - The RPTO operation is controlled with the integrated indicator, as specified in sub-section 2.8.2 – “Assignment and operation principle of the integrated indicator gauges”.

While tractor operation without using the RPTO, it is required to set the handle of the RPTO drive activation into the position “PTO drive off”. Annunciator 36 (figure 2.15.1) shall glow on CECS, which means that rear PTO is switched off. The RPTO guard hood shall be mounted.

Note – Additional information on the RPTO operation rules is given in subsection 3.2.7 “PTO use”.

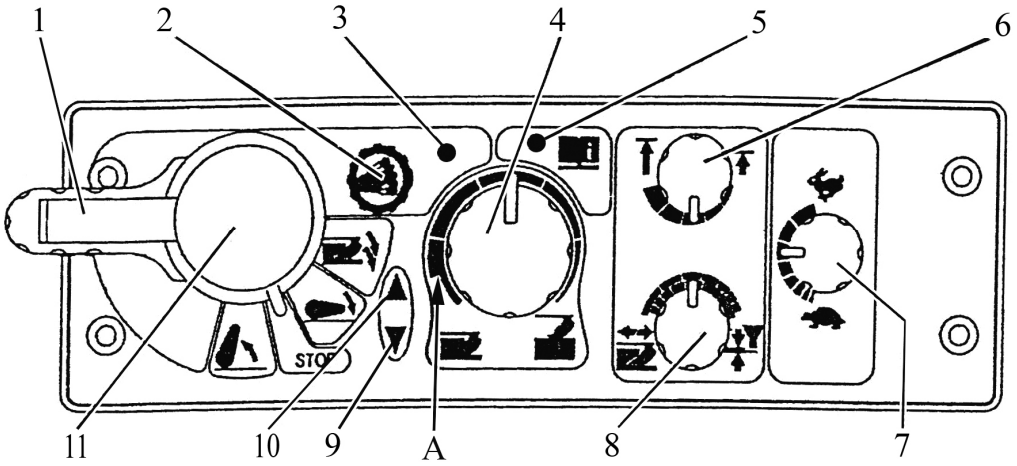
2.17 Lift linkages control

2.17.1 General information on rules of RLL control

RLL is controlled with control panel (figure 2.17.1) and remote buttons 4 and 5 (figure 2.17.3). If there are any failures in the RLL electronic-hydraulic control system, a diagnostics annunciator 5 (figure 2.17.1) displays information on the failure and, if necessary, the operation of RLL control system is blocked.

2.17.2 RLL control panel

RLL control panel, located on a side console in tractor cab, is shown in figure 2.17.1.



1 – retainer of RLL control handle blocking; 2 – button of "dampening" mode activation; 3 – annunciator of "dampening" mode activation (orange color); 4 – handle to adjust depth of soil tillage; 5 – troubleshooting annunciator (red color); 6 – handle to adjust height limit of linkage uplifting; 7 – handle to adjust speed of lowering; 8 – handle to select control method; 9 – annunciator of linkage lowering (green color); 10 – annunciator of linkage uplifting (red color); 11 – handle of RLL control.

Figure 2.17.1 – RLL control panel

The order of RLL control is the following:

- set a method of control depending on type of operation with handle 8 (figure 2.17.1). Turning the handle clockwise against the stop is a position method of control; contraclockwise against the stop – draft control; in between – combined control; the combined control is preferential;
- set the required admissible height of implement uplifting in transport condition with handle 6. Turning the handle clockwise against the stop corresponds to max. uplifting, contraclockwise against the stop - to min. uplifting;
- set the tillage depth with handle 4. Turning the handle clockwise against the stop corresponds to min. depth, contraclockwise up to "A" position corresponds to max depth; turning the handle contraclockwise against the stop corresponds to floating position;
- lower the linkage by moving handle 7 to a lower fixed position.

Then, during the operation it is required to adjust an implement for optimal operation conditions:

- with handle 8 – combination of control methods;
- with handle 4 – depth of soil tillage.
- with handle 7 – speed of RLL lowering. Turning of the handle clockwise against the stop corresponds to the max. speed of lowering, turning the handle contraclockwise corresponds to min. speed lowering.

Handle 11 has four positions:

a) middle position – off;

b) upper position – uplift;

c) lower position – lowering (in operation – automatic control);

d) moving the handle downward (nonfixed) from “в” position – implement penetration (in this case the automatic control is off).

During RLL lowering or penetration, annunciator 9 turns on and during uplifting – annunciator 5 turns on.

The system automatically limits frequency of correction under draft control to an average of 2 Hz. In case of intensive heating of oil in the hydraulic system, it is necessary to reduce frequency of correction by moving handle 8 towards the position method of control and handle 7 towards the “turtle”. In case of raising (“working out”) of the agricultural implement when moving over consolidated soil or ruts, deepen the implement by pressing handle 11 downwards. After releasing handle 11 it comes back to its fixed position of "lowering". In this case the agricultural implement returns to the mode of the depth set before with handle 4. The implement is raised by moving handle 11 into upper position.

When height adjustment of RLL is carried out during operation, annunciators 10 or 9 turn on.

ATTENTION: IN ORDER TO AVOID HLL PUMP FAILURE, TRACTOR OPERATION IS FORBIDDEN IF ANNUNCIATOR 10 (FIGURE 2.17.1) DOES NOT GO OUT AFTER THE IMPLEMENT UPLIFTING!

ATTENTION: AT THE EMERGENCY STOP OF THE TRACTOR, IN ORDER TO AVOID FURTHER PENETRATION OF THE AGRICULTURAL IMPLEMENT, SHIFT CONTROL HANDLE 11 (FIGURE 2.17.1) INTO THE POSITION ”OFF”. AFTER STARTING THE MOVEMENT, SHIFT THE HANDLE INTO THE POSITION “LOWERING” – THE IMPLEMENT WILL PENETRATE TO THE DEPTH SET BEFORE!

It Is required to know the following operation peculiarities of RLL control system:

- after the engine start, diagnostics annunciator 5 lights up, indicating the control system workability and blocking;

- to unblock the system, set handle 11 into the operating position for one time (uplift or lowering). In this case diagnostics annunciator 5 goes out.

- after unblocking the system during the first activation, automatic speed limitation for RLL uplift and lowering is provided for safety reasons. Setting handle 11 into the position “Off” and then into the position “Uplift” or “Lowering” removes the speed limitation.

Beside the functions described above, the RLL electronic control system has a mode “dampening” – suppression of oscillations of the agricultural implement in a transport mode.

Turn on the “dampening” mode in the following order:

- set handle 11 into the “uplift” position – in this case RLL lifts to the extreme upper position and automatically gets deactivated;

- press button “dampening” 2 – in this case RLL moves form the extreme upper position down by 3% of full RLL stroke and annunciator of “dampening” activation 3 turns on;

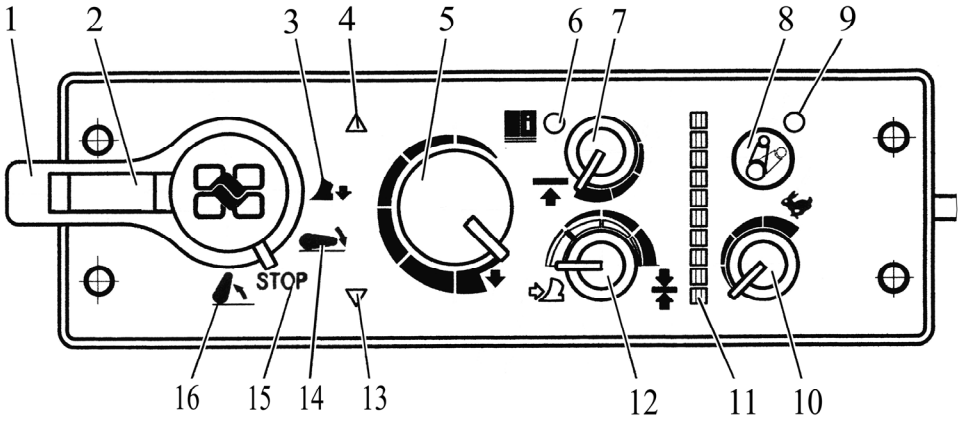
- then to prevent accidental shifting of handle 11 during transportation, move blocking retainer 1 to the rotation axis of handle 11. In this case handle 11 gets mechanically blocked in the upper position (“uplift”).

To turn off the “dampening” mode, press button 2. The annunciator of “dampening” activation goes out, and RLL returns to the upper position. Move retainer 1 to its initial position.

ATTENTION: THE “DAMPENING” MODE IS ACTIVE ONLY WHEN HANDLE 11 IS IN THE “UPLIFT” POSITION!

ATTENTION: DURING FIELD WORK (TILLAGE, CULTIVATION, ETC.) THE “DAMPENING” MODE SHALL BE TURNED OFF!

Your tractor can be equipped with the RLL control panel PU-03 manufactured by “Izmeritel” plant and shown in figure 2.17.2.



1 – handle of lift linkage control (position 16 – uplift; position 15 – off; position 14 – lowering (in operation – automatic control); position 3 – mode of implement deepening in case it raises (non-fixed)); 2 –retainer to lock the lift linkage control handle; 4 – annunciator of linkage uplifting (red color); 5 – handle to adjust depth of soil tillage; 6 – troubleshooting annunciator (red color); 7 – handle to adjust height limit of linkage uplifting; 8 – “dampening” button; 9 – “dampening” annunciator (green color); 10 – handle to adjust speed of lowering; 11 – RLL position indicator (green color, upper scale point – RLL in max. raised position, lower scale point – RLL fully lowered); 12 – handle to select control method; 13 – annunciator of linkage lowering (green color).

Figure 2.17.2 – Rear lift linkage control panel PU-03

Note – RLL position indicator 11 (figure 2.17.2) is not used on “BELARUS-2122.6” tractors.

The rules on using the RLL control panel PU-03 manufactured by “Izmeritel” plant are similar to the rules on using the RLL control panel produced by “BOSCH” company, shown in figure 2.17.1.

2.17.3 Remote buttons of RLL control system

Remote buttons of RLL control are used as a rule for coupling agricultural implements and machines to the rear lift linkage.

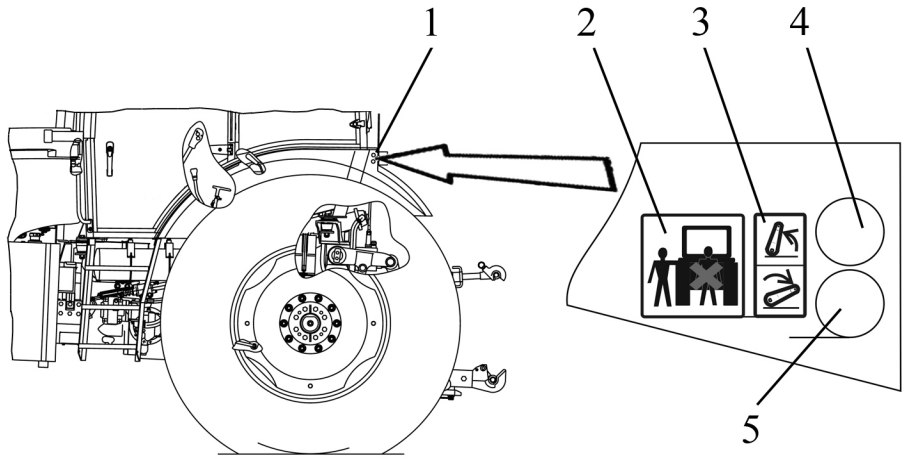
Uplift and lowering of the rear lift linkage with remote buttons on rear wheel fenders can be carried out at different control modes – handles 4, 6, 7, 8, 11 (figure 2.17.1) and similar handles of the RLL control console PU-03 can be left in any position, as the system of control from inside the cab is blocked in this case.

To lift the RLL, press any of buttons 4 (figure 2.17.3) and hold it pressed. To lower the RLL, press any of buttons 5 and hold it pressed.

For safety reasons control with remote buttons shall be performed with interruption of work. Pressing uplift button 4 (lowering button 5) and holding it pressed lifts up (lowers) the RLL for 5 sec., then it stops. For further uplifting (lowering) it is necessary to press the corresponding button once again and hold it pressed!

Then after attaching the implement, activation and operation with RLL shall be performed in accordance with subsection 2.17.2.

WARNING: WHEN USING REMOTE BUTTONS OF RLL CONTROL DO NOT STAND BETWEEN THE TRACTOR AND THE ATTACHED IMPLEMENT! TO PREVENT ACCIDENTS IT IS FORBIDDEN TO USE BUTTONS OF MECHANICAL SHIFTING OF ELECTRIC VALVES OF REGULATOR EHR23-LS!



1 – RLL remote control console; 2 – instruction plate on safety regulations; 3 – instruction plate on RLL control diagram; 4 – RLL uplift button; 5 – RLL lowering button.

Figure 2.17.3 – RLL controlled with remote buttons

2.17.4 Troubleshooting of RLL electronic control system

The electronic control system installed on your tractor has an option of self-testing and if any failures are detected, it provides the operator with code information by means of troubleshooting annunciator 5 (figure 2.17.1) on RLL control panel. After the engine start, as specified in subsection 2.17.2, annunciator 5 is constantly on, if no failures are detected in the RLL control system. Moving handle 11 up or down deactivates annunciator 5.

If any failures are detected in the system after the engine start, annunciator 5 begins to show code information of the failure. If necessary the system gets blocked.

The failure code is displayed as a two-digit number, where the first digit is equal to the number of flashings of annunciator 5 after the first long pause, and the second digit is equal to the number of flashings after the second long pause. For example, the operation algorithm of annunciator 5 is the following:

- engine start;
- continuous glowing;
- after unblocking the system, the annunciator goes out;
- three-time flashing of the annunciator;
- long pause (glow missing);
- six-time flashing of the annunciator;
- long pause (glow missing).

It means that the system has a failure with a code “36”. If several failures are detected at the same time, the system indicates failure codes one after another dividing them with a long pause.

All failures are divided by the system into three groups: complex, medium and light.

If complex failures are detected, the control is stopped and the system gets deactivated. The system is not controlled with the control panel or with the remote buttons.

The troubleshooting annunciator shows a failure code. After elimination of the failure and the engine start, the system recovers.

If medium failures are detected, the control is stopped and the system gets blocked. The system is controlled only with the remote buttons and is not controlled from the main console. The troubleshooting annunciator shows a failure code. After elimination of the failure and the engine start, the system recovers.

If light failures are detected, the troubleshooting annunciator shows a failure code, but the system remains controlled and is not blocked. In case of light failures, the RLL control system operates improperly – there is no correct soil sensing. After elimination of the failure, the troubleshooting annunciator goes out.

If the system detects a failure related to any group of complexity, the following actions shall be taken:

- read the code;
- stop the engine;
- contact your dealer and inform him of the read code in order to eliminate the problem;
- after your dealer eliminates the problem, start the engine and if there are no failures, get down to work.

If the RLL control panel PU-03 manufactured by “Izmeritel” plant is installed (troubleshooting annunciator 6 (figure 2.17.2), RLL control handle 1), troubleshooting of the RLL electronic control system is the same.

2.17.5 Front lift linkage control

The front lift linkage is controlled by joystick 4 (figure 2.19.3) on section of hydraulic distribution valve No.3, if electronic joystick unit BED-01 is mounted. If electronic joystick unit “BOCORO” is mounted, FLL control is carried out by joystick 3 (figure 2.19.4) on section of hydraulic distribution valve No.3.

Note – HPH for FLL control are connected to section No.3 of the hydraulic distribution valve EHS.

2.18 HLL pump control

The HLL pump drive is located on the coupling clutch body to the left.

The HLL pump switching shaft 1 (figure 2.18.1) has two positions:

- “shaft on” – the shaft is turned contraclockwise against the stop;
- “shaft off” – the shaft is turned clockwise against the stop.

Before turning shaft 1 to any of two positions, loosen bolt 3 by 1,5…2 revolutions and turn shaft 1 together with locking plate 2. Tighten bolt 3.

1 – shaft; 2 – locking plate; 3 – bolt; 4 – HLL tank; 5 – pressure adjustor in the pneumatic system.

Figure 2.18.1 – HLL pump control

Note – Figure 2.18.1 shows the position “HLL pump on”.

ATTENTION: THE PUMP SHALL BE TURNED ON AND OFF ONLY AT THE MINIMAL IDLE SPEED OF THE ENGINE!

In case of failures in the HLL that lead to oil leakage out of the hydraulic lift linkage, the pump shall be turned off when moving the tractor to repair facilities.

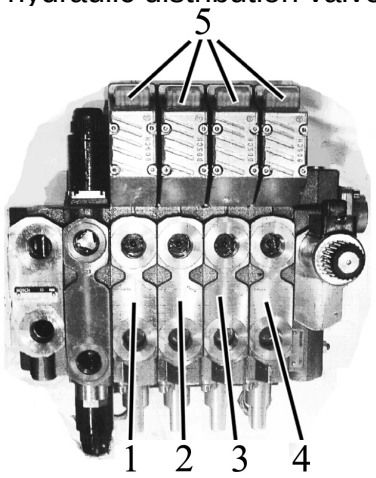
2.19 Electronic control system for hydraulic distribution valve EHS sections

2.19.1 General information on electronic control system for hydraulic distribution valve EHS sections

Control system for hydraulic distribution valve EHS sections includes the following elements:

- electronic joystick unit 36 (figure 2.1.1);
- programmer unit for hydraulic lift linkage 34 operations;
- buttons for switching on the function “flow restriction”, located on the right part of electronic combined panel 35.

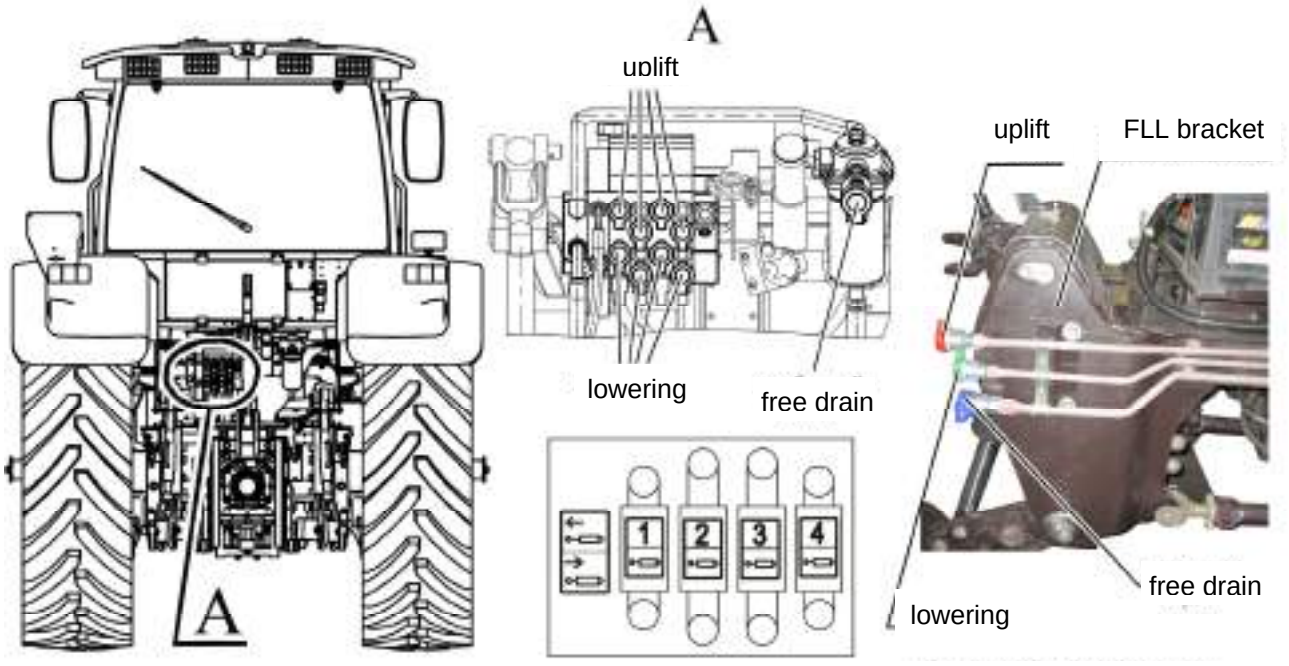
Layout of sections for the hydraulic distribution valve EHS is shown in figure 2.19.1.



1 – section №1 of the hydraulic distribution valve EHS; 2 – section №2 of the hydraulic distribution valve EHS; 3 – section №3 of the hydraulic distribution valve EHS; 4 – section №4 of the hydraulic distribution valve EHS; 5 – annunciators for operation failures in the corresponding sections of hydraulic distribution valve EHS.

Figure 2.19.1 – Layout of sections for the hydraulic distribution valve EHS

Connection diagram for rear and front hydraulic outlets in the hydraulic distribution valve EHS to external consumers, as well as an instruction plate with the connection diagram for rear hydraulic outlets in the hydraulic distribution valve EHS to external consumers mounted on the protective cover of the hydraulic distribution valve electric connectors, are shown in figure 2.19.2.



a) connection of HLL rear outlets

b) connection of HLL front outlets

Figure 2.19.2 – Connection diagram for rear and front hydraulic outlets in the hydraulic distribution valve EHS to external consumers

Electronic part of the system operates in the following way. After engine start, voltage supply gets onto the operations programmer unit for the hydraulic lift linkage system (OPU for HLL) 34 (figure 2.1.1). OPU for HLL carries out the check of control system elements functioning and after the analysis it informs about the system condition. System control is carried out by means of joysticks 36 (figure 2.1.1) or OPU for HLL. With the help of OPU for HLL, programming of work sequence in EHS hydraulic distributive valve sections or tryout of pre-programmed control algorithms, stored in the memory of OPU for HLL, is carried out. Control of EHS hydraulic distributive valve sections is only possible by means of joysticks, with OPU for HLL disengaged.

ATTENTION: FOR OPERATION WITH THE CONTROL SYSTEM FOR EHS HYDRAULIC DISTRIBUTIVE VALVE SECTIONS, SWITCH “STOP” OF OPU FOR HLL 7 (FIGURE 2.19.6) SHALL BE LOCATED IN THE NON-DEPRESSED POSITION!

2.19.2 Electronic joystick unit

2.19.2.1 General information.

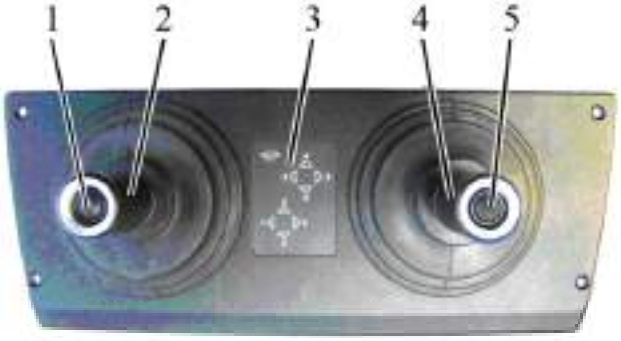
Your tractor can be equipped with two types of electronic joystick units – BED-01 or “BOCORO” which are interchangeable, but have some differences on control of EHS hydraulic distributive valve sections.

In case of arising any failures in the hydraulic distributive valve, the failure code pops up along the sections with the corresponding annunciator 5 (figure 2.19.1).

The detected failures shall be eliminated in accordance with the guidelines of subsection 6.13.1 “Failures of EHS hydraulic distributive valve. Failure indication, reasons and methods for their elimination”.

2.19.2.2 Electronic joystick unit BED-01

Electronic joystick unit BED-01 is shown in figure 2.19.3.



1, 5 – button for fixed flow start; 2 – control joystick for EHS hydraulic distributive valve sections No.1 and No.2; 3 – annunciator panel for BED operation modes; 4 – control joystick for EHS hydraulic distributive valve sections No.3 and No.4.

Figure 2.19.3 – Electronic joystick unit BED-01

Joystick 2 (figure 2.19.3) controls sections No.1 and No.2, joystick 4 – sections No.3 and No.4. Shifting of joystick 2 handle forward is “lowering” on section No.1. Shifting of joystick 2 handle backward is “uplift” on section No.1. Shifting of joystick 2 handle to the right is “lowering” on section No.2. Shifting of joystick No.2 handle to the left is “uplift” on section No.2. Shifting of joystick 4 handle forward is “lowering” on section No.3. Shifting of joystick 4 handle backward is “uplift” on section No.3. Shifting of joystick 4 handle to the right is “lowering” on section No.4. Shifting of joystick 4 handle to the left is “uplift” on section No.4. Upon execution of the above listed operations, the corresponding annunciators pop up on panel 3 and, if OPU for HLL is engaged, the corresponding annunciators and indicators pop up on OPU for HLL. The amount of oil flow is directly proportional to the travel of joystick handle shifting.

"Floating" mode on section No.1 is switched on by shifting joystick 2 handle forward against stop and by holding it in this position for more than two seconds. Switching on of "floating" mode on section No.2 is carried out by shifting joystick 2 handle to the right against stop and by holding it in this position for more than two seconds. "Floating" mode on section No.3 is switched on by shifting joystick 4 handle forward against stop and by holding it in this position for more than two seconds. Switching on of "floating" mode on section No.4 is carried out by shifting joystick 4 handle to the right against stop and by holding it in this position for more than two seconds. "Floating" mode switching on is indicated by three-time flashing of two annunciators on panel 3 along the axis of the corresponding section. This pair of annunciators continues to glow until the hydraulic distributive valve sections go out of "floating" mode.

The set "floating" mode is memorized by the joystick and remains switched on after shifting the joystick handle into neutral position. To go out of "floating" mode, it is required to shift the handle of the corresponding joystick from the neutral position along the control axis for this hydraulic distributive valve section.

To set a fixed flow on the hydraulic distributive valve section, it is necessary to set the handle of the corresponding joystick into the position of the required flow and, holding it in this position, press button 1 (or 5) on the joystick handle. Fixed flow switching on is indicated by three-time flashing of the corresponding annunciator towards the set flow. This annunciator continues to glow until the hydraulic distributive valve sections go out of fixed flow mode.

After releasing the button and shifting the joystick handle into neutral, the joystick memorizes the set flow. To go out of this mode, it is required to deflect the joystick handle to the side of the set control for the corresponding section of the hydraulic distributive valve with the fixed flow and press button 1 (or 5). To set a new fixed flow, it is required to return the joystick handle into the neutral position and then carry out setting of flow amount, as described above.

2.19.2.3 Electronic joystick unit "BOCORO"

Electronic joystick unit "BOCORO" is shown in figure 2.19.4.

1, 2 – start button for "floating" mode; 3 – control joystick for EHS hydraulic distributive valve sections No.3 and No.4; 4 – control joystick for EHS hydraulic distributive valve sections No.1 and No.2; 5 – instruction plate for control circuit of EHS hydraulic distributive valve sections.

Figure 2.19.4 – Electronic joystick unit "BOCORO"

Joystick 4 (figure 2.19.4) controls sections No.1 and No.2, joystick 3 – sections No.3 and No.4. Joysticks 4, 3 control for setting the corresponding sections of the hydraulic distributive valve into the neutral position, “uplift” and “lowering” is analogical to joysticks BED-01 control and described in clause 2.19.2.2.

“Floating” mode on section No.1 is switched on by shifting joystick 4 forward against stop with further pressing of button 1, located on joystick 4 handle. Switching on of “floating” mode on section No.2 is carried out by shifting joystick 4 handle to the right against stop with further pressing of button 1. The set “floating” mode is memorized by the joystick and remains unchanged after shifting the joystick handle into the neutral position. To go out of “floating” mode, it is required to carry out any manipulation by this joystick handle on this section after shifting the joystick handle into the neutral position. Setting of hydraulic distributive valve sections No.3 and No.4 into “floating” mode and exit from “floating” mode is carried out by joystick 3 and button 2 analogically to the above said.

In case tractors “BELARUS-2122.6” are equipped with joysticks “BOROCO”, setting of the fixed flow mode on the hydraulic distributive valve sections is only possible by means of OPU for HLL.

For the reason of unavailability of annunciator panel for BED operation modes on the electronic joystick unit “BOROCO”, operation control for EHS hydraulic distributive valve sections is only possible by means of operations programmer unit for the hydraulic lift linkage system. By doing so, OPU for HLL shall be switched on.

Control circuit for the hydraulic distributive valve sections with joysticks “BOCORO” is specified on instruction plate 5 and shown in figure 2.19.5.

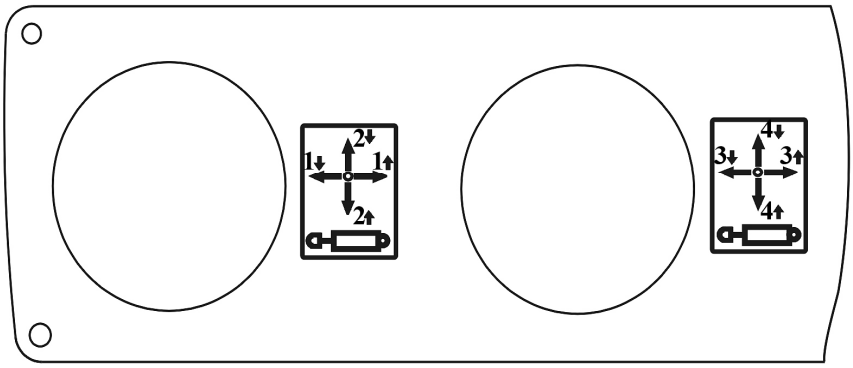


Figure 2.19.5 – Control circuit for the hydraulic distributive valve sections with joysticks

2.19.3 Operations programmer unit for hydraulic lift linkage system

2.19.3.1 General information

OPU for HLL reflects EHS hydraulic distributive valve operation and controls EHS hydraulic distributive valve sections in accordance with the set operation modes and control algorithms.

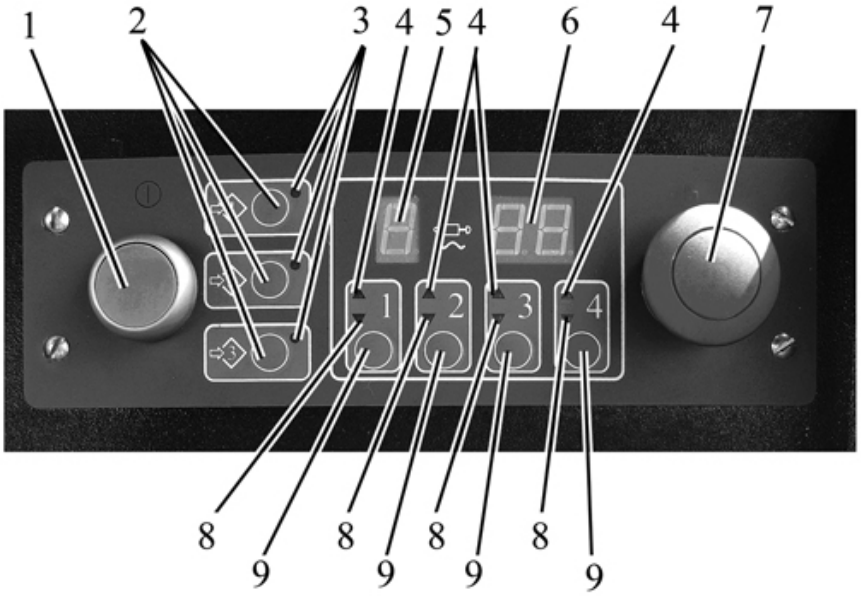
ATTENTION: ENGAGEMENT OF OPU FOR HLL IS ONLY POSSIBLE WITH THE ENGINE RUNNING!

OPU for HLL has two operation modes:

- operation indication for EHS hydraulic distributive valve sections when controlling the hydraulic distributive valve directly from two joysticks (manual mode);
- control for EHS hydraulic distributive valve sections during hydraulic distributive valve operation on the set algorithm (automatic mode).

In case of absence of electric signals on any of the channels from joysticks onto the engaged OPU for HLL, annunciators “uplift” and “lowering” for the corresponding section of EHS hydraulic distributive valve (figure 2.19.6) blink in turn.

The panel of OPU for HLL is shown in figure 2.19.6.



1 – OPU for HLL power cutoff switch; 2 – buttons for selecting programmes P1, P2, P3; 3 – annunciators for programmes P1, P2, P3; 4 – annunciators for uplift of corresponding sections in EHS hydraulic distributive valve; 5 – annunciator for operating section number of EHS hydraulic distributive valve; 6 – indicator for oil flow amount in operating section of EHS hydraulic distributive valve; 7 – switch “STOP” for emergency shut-down of EHS hydraulic distributive valve operation; 8 – annunciators for lowering corresponding sections of EHS hydraulic distributive valve; 9 – buttons for selecting EHS hydraulic distributive valve sections.

Figure 2.19.6 – Panel of operations programmer unit for hydraulic lift linkage

2.19.3.2 Operation indication of EHS hydraulic distributive valve sections when controlling hydraulic distributive valve directly from two joysticks (manual mode)

For operation with OPU for HLL, press power cutoff button 1 (figure 2.19.6).
At each connection to power supply, in OPU for HLL there is carried out a check of functioning of all light annunciators and indicators. After switching on, all annunciators and indicators shall pop up on the unit panel, and after one-two seconds go out, as well as an audible signal. After this, OPU for HLL starts to reflect the current condition of joysticks.

Operation indication of EHS hydraulic distributive valve sections when controlling the hydraulic distributive valve with joysticks is carried out in the following way:

- when setting the section into the “uplift” position using a joystick – annunciator for uplift 4 (figure 2.19.6) of the corresponding section in EHS hydraulic distributive valve pops up;
- when setting the section into the “lowering” position using a joystick – annunciator for lowering 8 corresponding section of EHS hydraulic distributive valve pops up;
- when setting the section into the “floating” position using a joystick – annunciators 4 and 8 of corresponding sections in EHS hydraulic distributive valve glow at the same time;
- annunciator 5 indicates the section number of EHS distributive valve on which joystick control is carried out;
- indicator 6 indicates oil flow amount in the section on which control is carried out. Unit of measurement for oil flow amount in the section is l/min. Indicator 6 indicates symbols “FL” in the “floating” mode.

2.19.3.3 Control procedure for EHS hydraulic distributive valve on the set algorithm (automatic mode)

2.19.3.3.1 Automatic control mode for EHS hydraulic distributive valve sections allows to avoid multiple repetition of carrying out the same operations by the operator manually.

When carrying out operations on controlling units, connected to EHS hydraulic distributive valve sections, OPU for HLL allows to memorize and reproduce the operations, carried out before. OPU for HLL possesses an ability to memorize three different sequences of operations using joysticks.

To control EHS hydraulic distributive valve sections in the automatic mode, it is required to switch on OPU for HLL by pressing button 1 (figure 2.16.6). After carrying out a check of functioning OPU for HLL elements, it is allowed to start the operation.

To record the sequence of carried out operations, it is required to press the button for the programme selected for programming 2 on OPU for HLL panel and hold it. Upon expiration of two seconds, OPU for HLL forms a short-time audible signal, switches on annunciator 3 for the corresponding programme on the panel in the mode of quick flashings, and passes to the programming mode – memorizations of operations carried out by the joystick. By doing so, a programme, recorded on this button earlier, disappears.

After entering a programming mode, it is required to carry out a selection of EHS hydraulic distributive valve sections, on which control shall be carried out, by means of pressing the corresponding button switches 9, after pressing of which OPU for HLL forms a short-time audible signal and switches on annunciators “uplift” and “lowering” 4 and 8 on the panel for the selected sections of EHS hydraulic distributive valve in the mode of slow flashings.

Further, when carrying out manipulations using a joystick in accordance with clauses 2.19.2.2 and 2.19.2.3, annunciators “uplift” 4 and “lowering” 8 indicate carrying out the corresponding operations without flashings, annunciator 5 indicates the section number for EHS hydraulic distributive valve, on which control is carried out, indicator 6 indicates oil flow amount in the section, on which control is carried out. In the “floating” mode, indicator 6 indicates symbols “FL”.

By doing so, OPU for HLL memorizes all manipulations with a joystick. Repeated pressing the corresponding button switch 9 of the selected section causes the ending of memorizing of manipulations with a joystick on this section. After this OPU for HLL forms a short-time audible signal and annunciators, indicating the condition of EHS hydraulic distributive valve sections, light up.

To finish the recording of the selected programme, it is required first to press buttons 9 of those sections which are located in the mode of programme recording. Then, it is required to press button 2 of the recorded programme. After that, OPU for HLL forms a short-time audible signal and the corresponding annunciator 3 for the recorded programme lights up. At the repeated short-time pressing button 2 of the recorded programme, a short-time audible signal is formed, the corresponding annunciator 3 is switched off, OPU for HLL switches off the mode of programme recording and passes to the control mode from joysticks (manual mode).

ATTENTION: MAXIMAL PERMISSIBLE RECORDING DURATION OF EACH PROGRAMME SHALL NOT EXCEED 200 SECONDS!

ATTENTION: PROGRAMME RECORDING AND REPRODUCING SHALL BE CARRIED OUT AT EQUAL ENGINE RPM!

At the beginning of another programme programming, the annunciator for the previously switched on programme goes out. Programming of other programmes is carried out in a similar way.

After programme recording it is possible to start its automatic execution.

2.19.3.3.2 Automatic control for EHS hydraulic distributive valve sections on previously recorded programmes is carried out with OPU for HLL switched on. OPU for HLL carries out the tasks on any of three algorithms programmed by an operator. Reproduction of the recorded programme starts at a short-time pressing the corresponding button 2. By doing so, annunciator 3 for the selected programme is switched on in the mode of slow flashings on the panel. If another programme was switched on before that, it gets switched off. After tryout of the active part of the programme, the annunciator constantly glows, annunciators 4, 5, 6, 8 for EHS distributive valve sections indicate their condition.

If shifting switch 1 (figure 2.19.6) of OPU for HLL into “off” position in the process of programme tryout, programme tryout stops and further control is only possible by means of joysticks. After switching on OPU for HLL power supply and repeated pressing button 2, the selected programme starts the tryout again.

When trying out the programme on control of EHS hydraulic distributive valve sections from OPU for HLL and simultaneous joystick control on any of the sections, taking part in the programme, programme tryout stops and the section is controlled from the joystick. By doing so, annunciators 4, 8 of the hydraulic distributive valve section and switched on programme 3 operate in the flashing mode, and annunciators 5 and 6 display symbols “PAU”. To continue programme tryout, it is required to press button switch 2 for this programme for a short time.

When trying out the programme, EHS hydraulic distributive valve sections, not taking part in this programme, can be controlled from joysticks manually. Joystick control on the unprogrammed section of EHS hydraulic distributive valve does not stop programme operation.

2.19.3.3.3 Examples for operations programming by controlling EHS hydraulic distributive valve sections

Examples of programming control operations for reversible plough and seeding machine by means of OPU for HLL are given in subsection 3.2.12 “Examples for operations programming by controlling EHS hydraulic distributive valve sections”.

2.19.3.4 Flow adjustment

After programme tryout and in case of necessity in constant flow adjustment on one of the hydraulic distributive valve sections in this programme, it is required to carry out the following activities:

- select the necessary EHS hydraulic distributive valve section using button switch 9 (figure 2.19.6). Annunciator 5 on OPU for HLL panel displays the selected section number of the hydraulic distributive valve, and the indicator for hydraulic distributive valve flow amount 6 – oil flow;
- carry out flow change using a joystick – when the set flow from the joystick coincides with the recorded flow of OPU for HLL, a short-time audible signal is formed and further, flow change takes place at the same time with the joystick;
- set the required flow using a joystick and press button switch 9 for the hydraulic distributive valve section, after which changes in the programme take place.

2.19.3.5 Emergency cutoff of EHS hydraulic distributive valve

ATTENTION: FOR EMERGENCY OPERATION STOP OF ALL HYDRAULIC DISTRIBUTIVE VALVE SECTIONS SIMULTANEOUSLY, IT IS REQUIRED TO PRESS SWITCH “STOP” ON OPU FOR HLL PANEL FOR EMERGENCY SHUT-DOWN 7 (FIGURE 2.19.6). BY DOING SO, POWER SUPPLY FROM THE WHOLE DISTRIBUTIVE VALVE IS REMOVED, CENTRAL SPOOLS OF ALL SECTIONS ARE SET IN THE NEUTRAL POSITION, OIL SUPPLY TO AGRICULTURAL IMPLEMENTS DRIVES STOPS (REGULATING VALVE GETS CLOSED)!

REPEATED PRESSING EMERGENCY SWITCH “STOP” 7 POWERS EHS HYDRAULIC DISTRIBUTIVE VALVE AND RESTARTS OIL SUPPLY TO AGRICULTURAL IMPLEMENTS DRIVES!

ATTENTION: WHEN OPERATING THE TRACTOR NOT USING EHS HYDRAULIC DISTRIBUTIVE VALVE, IT SHALL BE SWITCHED OFF BY PRESSING EMERGENCY SWITCH “STOP” 7!

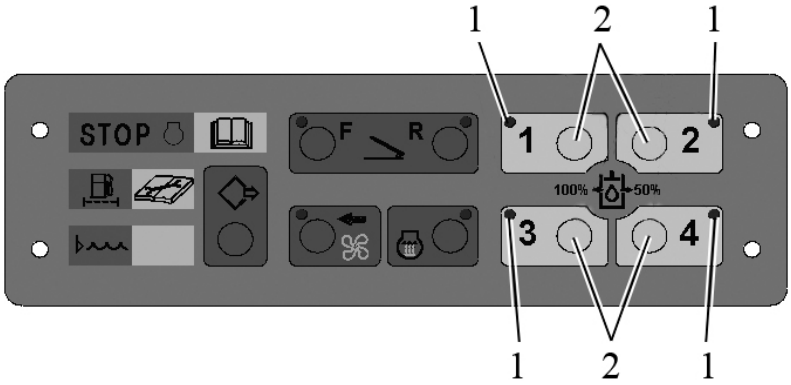
2.19.4 Flow restriction

Electronic control system for EHS hydraulic distributive valve sections has a function of “flow restriction” to control coupled agricultural implements, operating on less oil flows. When setting “flow restriction” function, a more accurate and smooth control on the specified flows is carried out. In standard mode, oil flow amount can be changed from 0 to 85 l/min for each section, when “flow restriction” function is switched on – from 0 to 40 l/min.

To activate this function, on electronic control panel (ECP) 35 (figure 2.1.1) there are four buttons 2 (figure 2.19.7) for switching on “flow restriction” for each section of the hydraulic distributive valve.

The operation procedure for “flow restriction” function is the following:

- pressing buttons 2 for switching on “flow restriction” select the required sections of EHS hydraulic distributive valve for which it is necessary to carry out “flow restriction”. After pressing buttons 2, annunciators 1 for corresponding sections of EHS hydraulic distributive valve start to glow;
- carry out control of the selected sections by means of joysticks with regards to existing “flow restriction”;
- switching off “flow restriction” function is carried out by repeated pressing button 2 for corresponding sections, after which annunciators 1 go out.
-



1 – annunciators for switching on “flow restriction” on hydraulic distributive valve section; 2 – buttons for “flow restriction” start on hydraulic distributive valve section.

Figure 2.19.7 – ECP elements for “flow restriction” switching on and indication on EHS hydraulic distributive valve sections

2.20 Switching unit, switching and security unit and electric cutout fuses

2.20.1 General information

Electric cutout fuses are intended for the protection of electrical lines against overloads and short circuit.

WARNING: TO AVOID BURNING OF TRACTOR WIRING, NEVER USE FUSES WITH CURRENT RATING HIGHER THAN THE RATINGS SPECIFIED IN THIS SECTION. IF A FUSE OFTEN BURNS OUT, FIND OUT THE CAUSE AND ELIMINATE THE FAILURE!

EE fuses are located in a switching unit and engine compartment and specified in clause 2.20.2 “Switching unit and fuses for electrical equipment”. ECS fuses for rear axle DL, FDA, GB reduction unit, FPTO, RLL and ECS fuses for engine are located in a switching and security unit and specified in clause 2.20.3 “Switching and security unit”.

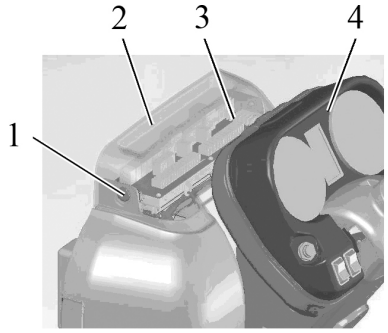
2.20.2 Switching unit and fuses for electrical equipment

Switching unit 3 (figure 2.20.1) is intended for current supply, its distribution among the consumers of tractor electrical equipment and for the protection of electrical lines against current overloads and short circuit.

Your tractor can be equipped with two types of switching units - BKA-7.3722-02 or BK-1-02 which are interchangeable.

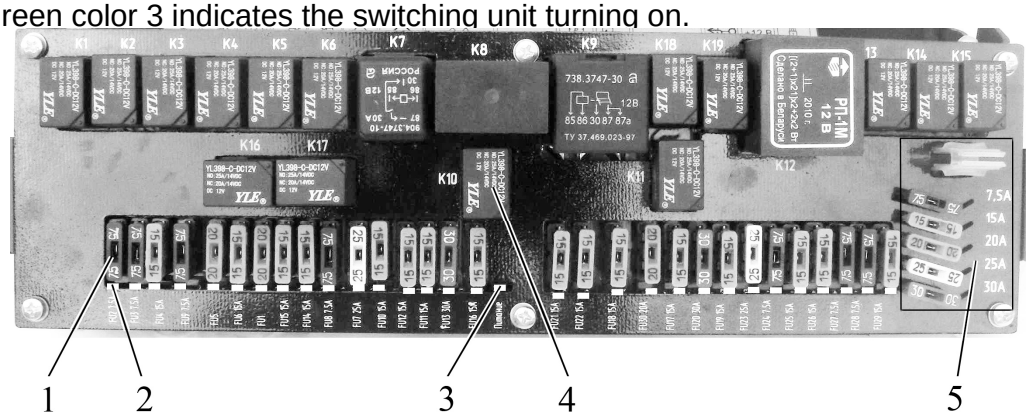
The place of unit 3 mounting is the cab, on the metallic bar of plastic shell fixing, between instrument panel 4 and the windscreen.

To get an access to the relay and the fuses of unit 3, it is required to unscrew two quick-detachable screws 1, then to remove plastic cap 2. The unit also has the protective plastic casing for the protection from dust.

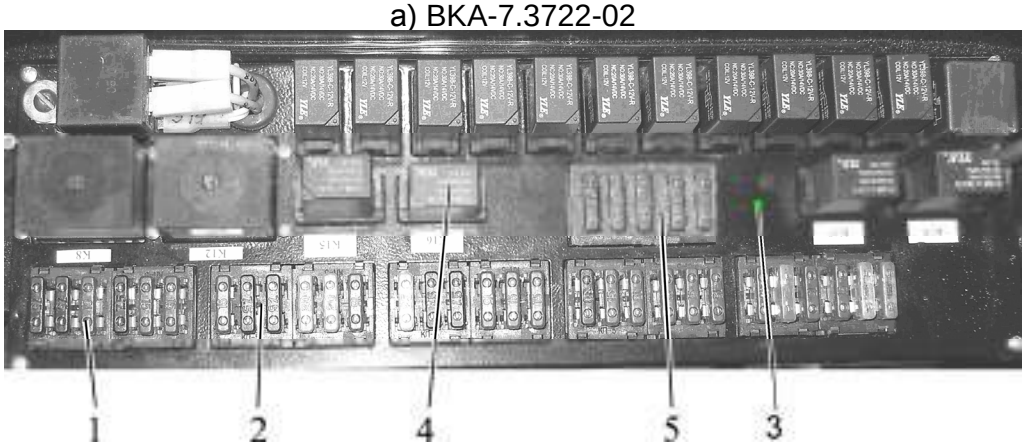


1 1 – screw; 2 – cap; 3 – switching unit; 4 – instrument panel.
Figure 2.20.1 – Switching unit mounting

The unit consists of thirty cutout fuses 1 (figure 2.20.2) (FU1-FU30) and eighteen electromagnetic relays 4 (K1-K7, K9-K19, relay K8 is not mounted), commutating current supply for consumers, a set of spare fuses 5. Signal led lamps of red color 2 located on the front board near each fuse are intended for indication of a corresponding fuse blow out. A signal led lamp of green color 3 indicates the switching unit turning on.



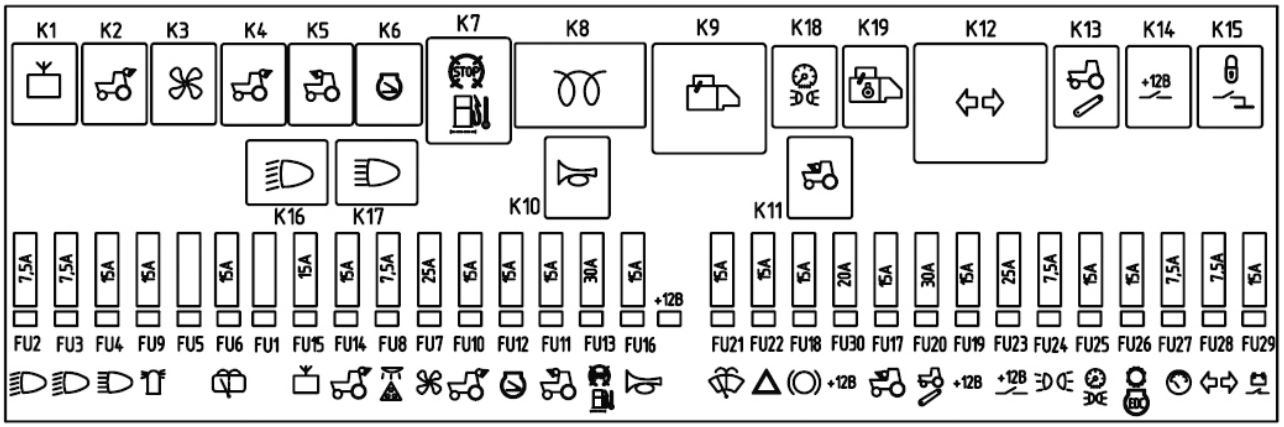
a) BKA-7.3722-02



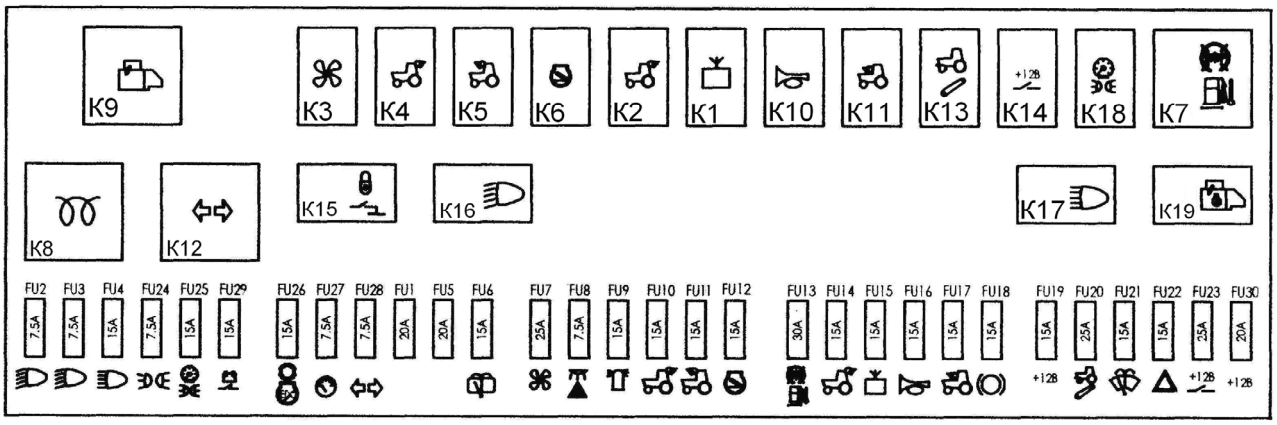
b) BK-1-02

1 – cutout fuse; 2 – signal led lamp of red color; 3 – signal led lamp of green color; 4 – electromagnetic relay; 5 – set of spare fuses.
Figure 2.20.2 – Switching unit

Diagram of fuses and relay location in the switching unit is shown in figure 2.20.3.



a) Diagram of fuses and relay location in BKA-7.3722-02



b) Diagram of fuses and relay location in BK-1-02

Figure 2.20.3 – Diagram of fuses and relay location in the switching unit

Tables of fuses and relay assignment shown in figure 2.20.3 are stuck from inside to the upper plastic cap 2 (figure 2.20.1) from the windscreen side.

The information on fuses and relay assignment as well as fuse ratings is given in tables 2.20.1 and 2.20.2.

Table 2.20.1 – Assignment of switching unit fuses

Fuse designation	Fuse assignment (protected electric circuit)	Fuse rating
FU1	Reserve	20A
FU2	Lower beam of right road headlight	7.5A
FU3	Lower beam of left road headlight	7.5A
FU4	Road headlights upper beam	15A
FU5	Reserve	20A
FU6	Rear screen washer and wiper	15A
FU7	Power supply to conditioner electric motor	25A
FU8	“Road-train” lights and cab light	7.5A
FU9	Signal beacon	15 A
FU10	Rear working lights (a pair of outer lights)	15A
FU11	Front working lights (on the roof)	15A
FU12	Not used	15A
FU13	Fuel filter heater	30A
FU14	Rear working lights (a pair of inner lights)	15A
FU15	Radioset (stereo-recorder)	15A

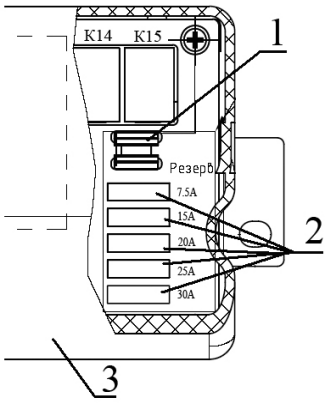
Table 2.20.1 continued

FU16	Horn	15A
FU17	Front working lamps (on the handgrip)	15A
FU18	Braking lights	15A
FU19	Power supply of terminal No.8 on the socket for the trailed agricultural implement connection (portable lamp)	15A
FU20	Signal from the generator terminal “D” to the RLL control system	30A
FU21	Front screen washer and wiper	15A
FU22	Warning indication	15A
FU23	Power supply to consumers working when the starter and instrument switch is in the position “in-struments on”	25A
FU24	Left parking lights	7.5A
FU25	Right parking lights and instruments illumination	15A
FU26	EECS, gearbox reduction unit control	15A
FU27	Test instruments, sensors of speed, PTO and fuel volume	7.5A
FU28	Annunciation of tractor and trailer turning	7.5A
FU29	Remote disconnect switch of accumulator battery	15A
FU30	Power supply of relay coil of instruments illumination and tractor parking lights engagement	20A

Table 2.20.2 – Relay assignment

Relay designation	Relay assignament
K1	Radioset (stereo-recorder)
K2	Rear working lights (a pair of inner lights)
K3	Conditioner
K4	Rear working lights (a pair of outer lights)
K5	Front working lights (on the roof)
K6	Not used
K7	Fuel filter heater
K8	Not mounted
K9	Starter
K10	Horn
K11	Front working lamps (on the handgrip)
K12	Tractor turning indication and emergency indication
K13	Signal from the generator terminal “D” to the RLL control system
K14	Power supply to consumers working when the starter and instrument switch is in the position “instruments on”
K15	Lock of AB remote disconnect switch
K16	Lower beam of road headlights
K17	Upper beam of road headlights
K18	Parking lights and instrument illumination
K19	Starter startup lock with gearbox range engaged

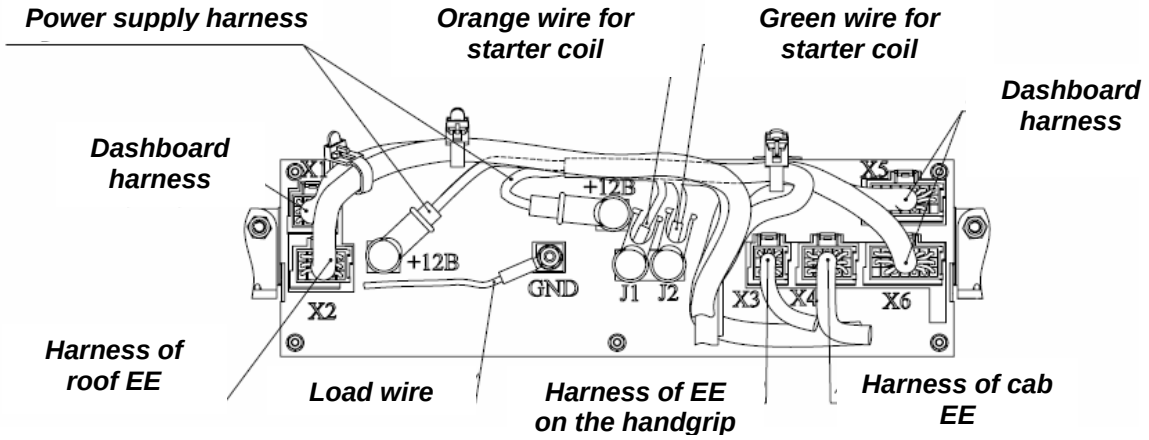
A set of spare fuses 5 (figure 2.20.2) installed on the front panel of the switching unit, includes spare fuses 2 (figure 2.20.4) with ratings 7,5A, 15A, 20A, 25A, 30A and for BKA-7.3722-02 - fuse removal tool 1. BK-1-02 is not completed with the fuse removal tool.



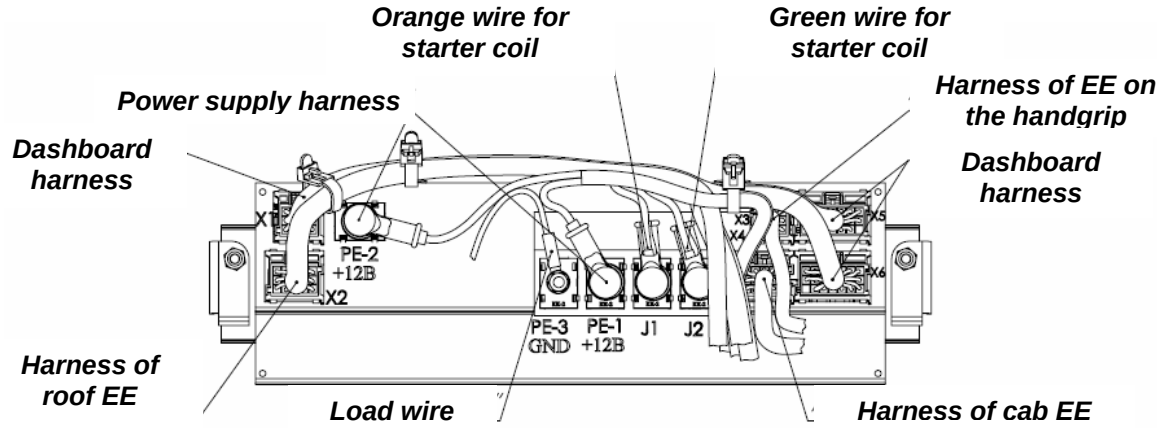
1 – fuse removal tool; 2 – spare fuses; 3 – switching unit.

Figure 2.20.4 – Set of spare fuses for the switching unit BKA-7.3722-02

Electrical connection of equipment harnesses to the swithing unit shall be carried out as shown in figure 2.20.5.



a) connection of electrical harnesses to BKA-7.3722-02

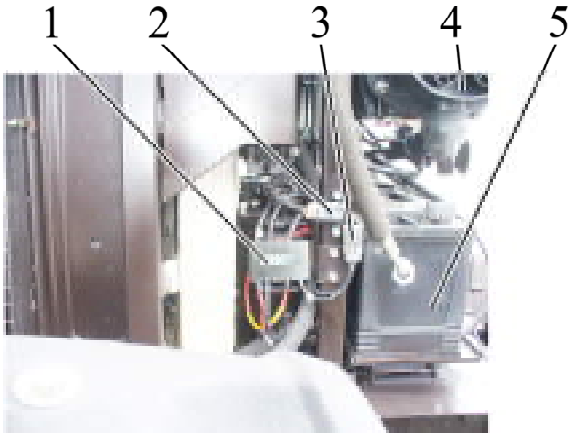


b) connection of electrical harnesses to BK-1-02

Figure 2.20.5 – Diagram of equipment harnesses connection to the switching unit

Apart from fuses located in the switching unit and shown in figure 2.20.3, electrical equipment fuses are also located in the engine area under the air purification filter as well as between the engine and the cab.

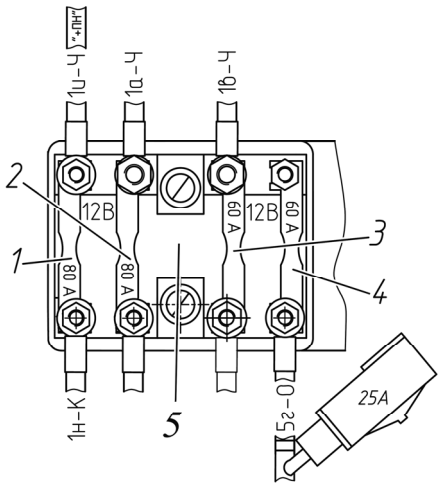
To get an access to the fuses located near right accumulator 5 (figure 2.20.6), it is required to open the hood.



1- fuse block; 2 – suspended fuse of 12V circuit of voltage converter, with rated value 25A; 3- suspended fuse of radio-recorder, with rated value 25 A; 4- air cleaner filter; 5- right accumulator.

Figure 2.20.6 – Access to the fuses located near the right accumulator

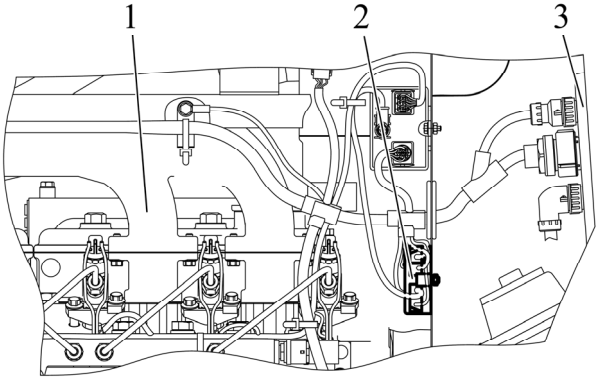
The fuses of block 1 (figure 2.20.6) are shown in figure 2.20.7.



1 – power fuse of the instrument board before engine start and of the main accumulator battery charging circuit with rated value of 80 A; 2 – SPU power fuse with rated value of 80A; 2 – EECS constant supply fuse (in any position of the accumulator battery switch) with rated value of 60A; 4 – power fuse of a radio recorder with rated value of 60A; 5 – fuse block.

Figure 2.20.7 – The fuses located near the right accumulator

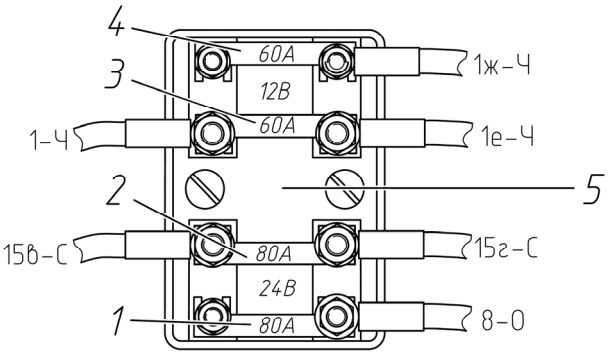
To get an access to the fuse block 2 (figure 2.20.8) located between the engine and cab, it is required to open the hood.



1 – engine; 2 – fuse block; 3 – cab.

Figure 2.20.8 – Arrangement of fuse block between the engine and the cab

The fuses, located between the engine and the cab, are shown in figure 2.20.9.



1 – power fuse of the starter relay and the additional AB charging circuit with rated value of 80A; 2 – power fuse of heating plugs with rated value of 80A; 3, 4 – power fuse of the switching unit with rated value of 60A; 5 – fuse block.

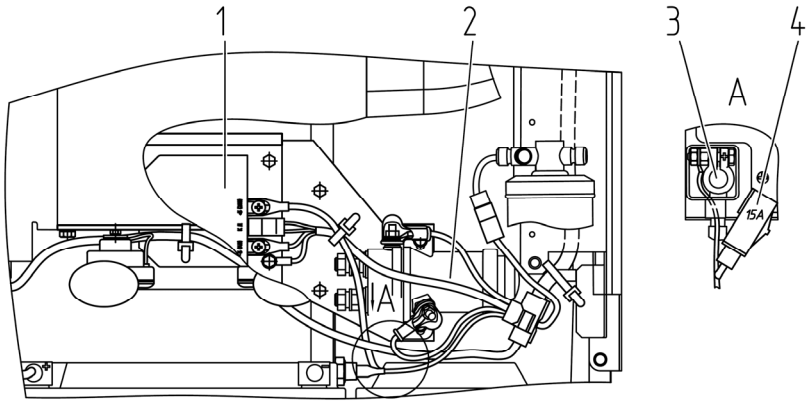
Figure 2.20.9 – Fuses located between the engine and the cab

Voltage converter 12/24V 2 (figure 2.20.10), installed before radiator block 3 is protected by two power fuses:

- suspended power fuse 2 (figure 2.20.6) of 12V circuit of voltage converter, with rated value 25A;
- suspended power fuse 4 (figure 2.20.11) of 24V circuit of voltage converter, with rated value 15A;

1 – air purification filter; 2 – voltage converter 12/24 V; 3 – radiator block.

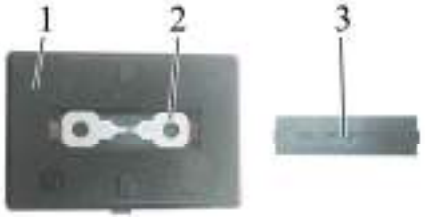
Figure 2.20.10 – Assembly of voltage converter



1 – voltage converter 12/24V; 2 – manual AB switch; 3- AB terminal; 4 - suspended power fuse 4 of 24V circuit of voltage converter, with rated value 15A.

Figure 2.20.11 – Assembly of voltage converter fuse

There are two spare accessory fuses 2 (figure 2.20.12) with rated value 60 A and 80 A in covers of fuse blocks 5 (figure 2.20.7 and figure 2.20.9). To get an access to spare accessory fuses 2, it is required to remove blind plug 3 out of fuse block cover 1.



1 – cover; 2 – spare accessory fuse; 3 – blind plug.

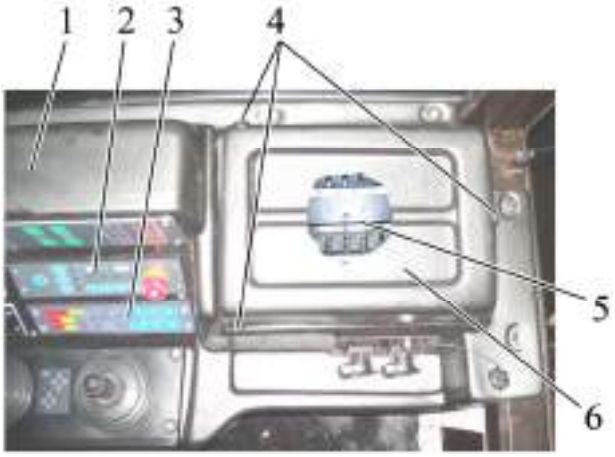
Figure 2.20.12 – Arrangement of spare accessory fuses in the fuse block

2.20.3 Switching and security unit

Switching and security unit (SSU) is meant for power supply distribution onto tractor electronic control systems and for electric circuit protection from short circuit and current load excess. Tractor “BELARUS-2122.6” is equipped with SSU of 3500SCR series.

The place for SSU mounting is at the cab rear, on the right behind the side panel.

To get an access to SSU 5 (figure 2.2.0.13) relay and fuses, it is necessary to unscrew three screws 4 and remove plastic cover 6. Then it is required to unscrew four screws on SSU and uplift the iron cover.

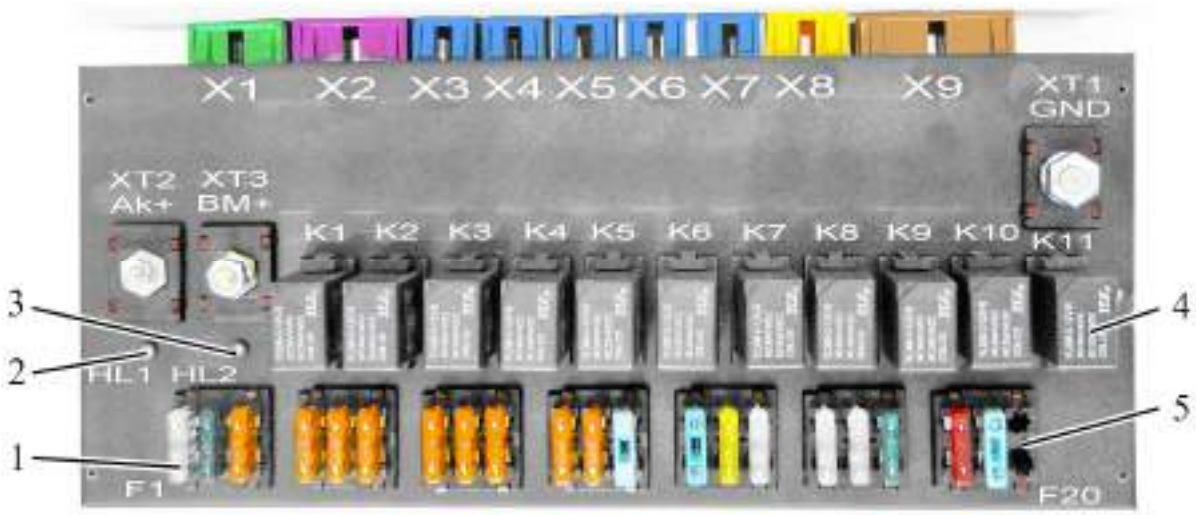


1 – side panel; 2 – OPU for HLL; 3 – ECP; 4 – screw; 5 – SSU; 6 – cover.

Figure 2.20.13 – Mounting of switching and security unit

The unit includes twenty electrical fuses 1 (figure 2.20.14) (F1 ÷ F20), eleven electromagnetic relay 4 (K1 ÷ K11) – switching power supply for electronic control system elements of the tractor. Pilot LEDs 5 of red color located on front panel next to each fuse are meant for blowing out indication of the corresponding electrical fuse. Besides, there are mounted pilot LEDs 2 and 3 of yellow color. LED 2 carries out indication of availability of SSU constant power supply, regardless of AB switch position. LED 3 carries out indication of power supply availability coming to SSU only with AB switch engaged position.

The arrangement diagram for fuses, relay and other elements in SSU is given in figure 2.20.14.



1 – electric fuse; 2. 3 – pilot LED of yellow color; 4 – electromagnetic relay; 5 - pilot LED of red color.

Figure 2.20.14 – Switching and security unit

Information on fuses assignment and rating and relay assignment is given in tables 2.20.3 and 2.20.4 correspondingly.

Electrical connection of electronic control system harnesses to connectors X1 ÷ X6, X8, X9 (figure 2.20.14) and outlets XT1 ÷ XT3 of switching and security unit is carried out in accordance with table 2.20.5.

Table 2.20.3 – SSU fuse designation

Fuse designation	Fuse assignment (protected electric circuit)	Fuse rating
F1	CECS	25A
F2	Power supply of engine electronic control system	30A
F3	Switching on engine electronic control system	5A
F4	Power supply of ECP	5A
F5	Power supply of diagnostic equipment	5A
F6	Reserve	5A
F7	Power supply of information monitor	5A
F8	Reserve	5A
F9	Reserve	5A
F10	Power supply of FLL control system	5A
F11	Power supply of RLL control system	5A
F12	Power supply of OPU for HLL	15A
F13	Reserve	15A
F14	Cigarette lighter	20A
F15	Electrical socket for engine start 4 (figure 2.25.2)	25A
F16	Electrical socket after AB start 3 (figure 2.25.2)	25A
F17	Reserve	25A
F18	Power supply of heaters and sensors NOx for SCR system	30A
F19	Not used	10A
F20	Not used	15A

Table 2.20.4 – Relay assignment in SSU

Relay designation	Relay assignment
К1	Lever neutral
К2	CECS power supply
К3	Power supply of ECP, information monitor, diagnostic equipment
К4	Not used
К5	Power supply of FLL, RLL and OPU for HLL control systems
К6	Electrical socket after engine start 4 (figure 2.25.2)
К7	Power supply of heaters and sensors NOx for SCR system
К8	(Not used)
К9	(Not used)
К10	(Not used)
К11	(Not used)

Table 2.20.5 – Connection of harnesses to SSU

Connector (outlet)	Add-on element
X1	CECS harness
X2	Harness of engine electronic control system
X3	Harness of engine electronic control system
X4	Harness of FLL electronic control system
X5	Harness of RLL electronic control system
X6	Harness of OPU for HLL
X8	Harness of electrical sockets 3 and 4 (figure 2.25.2) and cigarette lighter 2
X9	Harness of SCR system
XT1	Wire of black color or with marking “Ч”, with lug M8 – “ground” of SSU
XT2	Wire of yellow color or with marking “Ж”, with lug M5 – constant power supply of SSU (+12V), regardless of AB switch position
XT3	Wire of red color or with marking “К”, with lug M6 – power supply of SSU (+12V), coming to SSU only with AB switch engaged position

2.21 Cab locks and handles

2.21.1 Cab door locks

Left and right doors of tractor cab are secured with locks 4 (figure 2.21.1). Lever 5 serves to open the left and right cab doors from inside the cab. Moving lever 5 backwards unlocks the door. The locks of the right and left doors can be blocked from inside the cab. To block the lock from inside the cab, it is required to shift detent 3 into the extreme upper position. To unblock the lock, it is required to shift detent 3 into the extreme lower position, respectively.

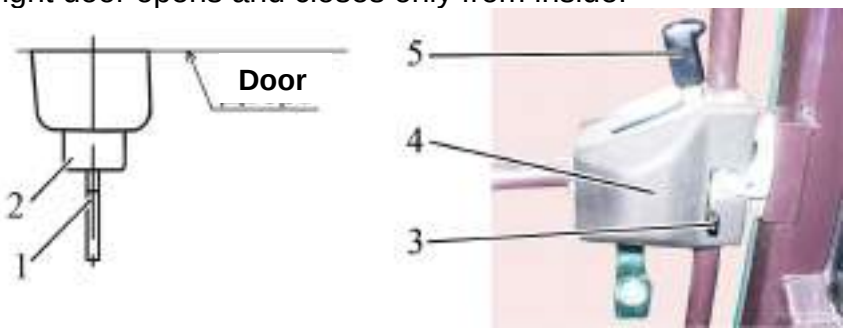
With locks 4 unblocked, the left door opens from outside by pressing button 2 of the handle.

The lock of the cab left door can be opened and closed from outside. To close it from outside, do the following:

- insert key 1 into the hole of the cylinder mechanism, which is located in button 2;
- without pressing button 2, turn the key into the position “close”.

To open the left door lock outside the cab, it is necessary to insert key 1 into the hole of the cylinder mechanism which is located in button 2 and without pressing button 2, turn the key into the position “open”, then press button 2.

The cab right door opens and closes only from inside.



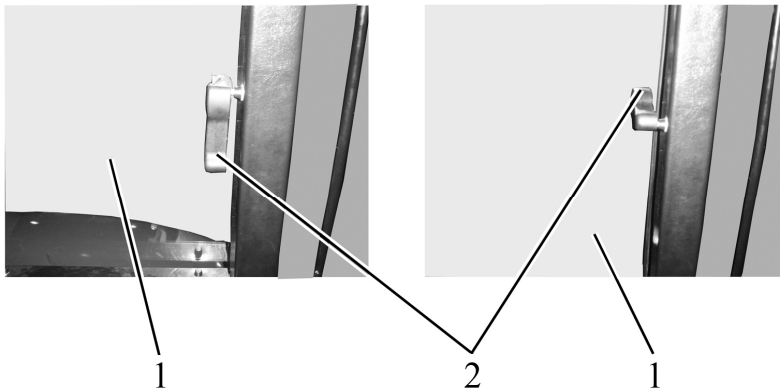
1 – key; 2 – button; 3 – detent, 4 –lock; 5 – lever.

Figure 2.21.1 – Cab door lock

2.21.2 Side window opening

To open right or left side window 1 (figure 2.21.2), turn handle 2 up and push it. Then fix the side window in an open position, for which turn handle 2 down.

To close side window 1, turn handle 2 up, then pull handle 2, then turn it down until the side window is fixed in a closed position.



a) side window closed b) side window opened

1 – side window; 2 – handle.

Figure 2.21.2 – Side window opening

2.21.3 Rear screen opening

To open the rear screen, turn handle 1 (figure 2.21.3) to the left (as viewed along tractor movement) and holding handgrip 2, push rear screen 3 until the screen is fixed in the open position.

To close the rear screen, pull handgrip 2 until screen 3 is fixed in a closed position.

1 – handle; 2 –handgrip; 3 – rear screen.

Figure 2.21.3 – Rear screen opening

2.21.4 Cab hatch opening

Installation of two hatch variants for roof upper part is possible on tractors “BELARUS-2122.6”:

- hatch with a detent;
- hatch with a handle.

To open the hatch with the detent, pull board 2 (figure 2.21.4) down, move the detent 3 forward as viewed along tractor movement, push board 2 up until hatch 1 is fixed in an open position.

To close hatch 1, pull board 2 down until the hatch is fixed in the closed position.

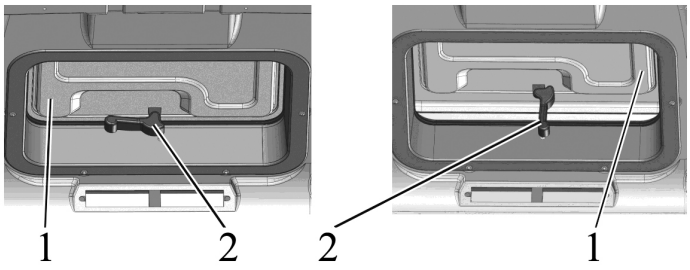
.

1 – hatch; 2 – board; 3 – detent.

Figure 2.21.4 – Opening of hatch with the detent

To open the hatch with the handle, move handle 2 (figure 2.21.5) down and push it up. Then fix hatch 1 in an open position, pressing handle 2 to the right as viewed along tractor movement.

To close the hatch, turn handle 2 to the position “not fixed”, pressing it to the left as viewed along tractor movement. Pull handle 2 down, and then turn it to the right as viewed along tractor movement until the hatch is fixed in a closed position.



a) hatch closed b) hatch opened

1 – hatch; 2 – handle.

Figure 2.21.5 – Opening of hatch with the handle

2.21.5 Cab emergency exits

The cab has the following emergency exits:

- doors – left and right;
- rear window;
- side window – right and left.

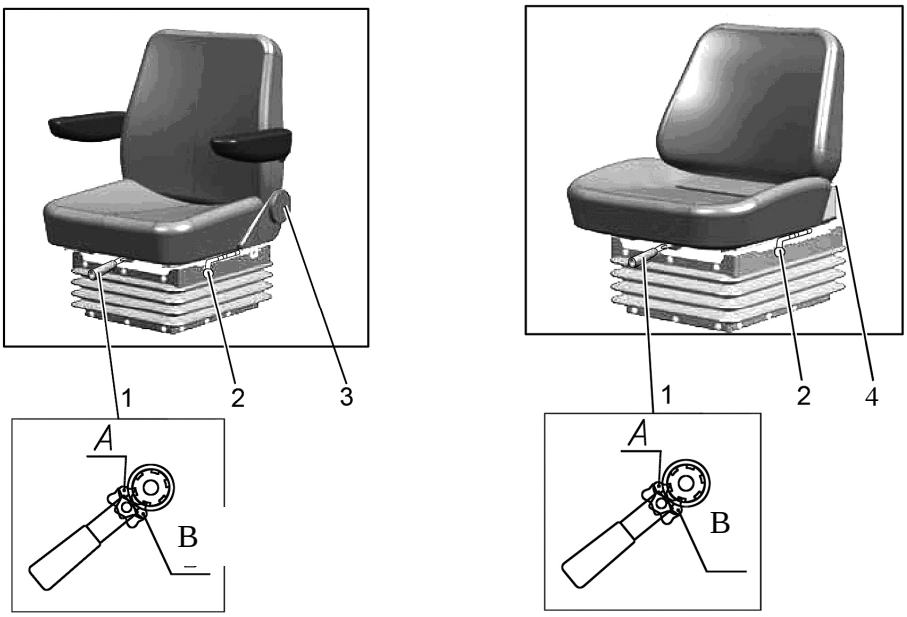
2.22 Seat and its adjustments

2.22.1 General information

The seat has a mechanical suspension, consisting of two spiral torsion springs and a gas charged shock absorber of bidirectional operation. A “scissors”-type guiding mechanism ensures strictly vertical movement of the seat. A dynamic seat stroke is 100 mm.

ATTENTION: BEFORE STARTING TO OPERATE THE TRACTOR, ADJUST THE SEAT TO REACH THE MOST COMFORTABLE POSITION. CARRY OUT ALL ADJUSTMENTS WHEN STAYING IN THE SEAT! THE SEAT IS CONSIDERED CORRECTLY ADJUSTED ACCORDING TO THE MASS IF IT MOVES HALF OF THE STROKE UNDER THE OPERATOR'S WEIGHT (THE SUSPENSION STROKE IS 100 MM)!

2.22.2 Adjustments of “BELARUS” seat



a) Seat “BELARUS 80-6800010” b) Seat “BELARUS 80B-6800000”

1 – handle for adjustment according to the weight; 2 – handle for longitudinal adjustment; 3 – hand wheel for backrest tilt adjustment; 4 – handle for backrest adjustment

Figure 2.22.1 - Adjustments of “BELARUS” seat

The seat “BELARUS” has the following adjustments:

- adjustment according to the operator's weight. It is carried out by means of handle 1 (figure 2.22.1) within the range from 50 to 120 kg. To adjust the seat for a bigger weight it is required to shift the pawl of lever 1 into the position “A” and tighten the springs with a reciprocal movement. To adjust the seat for a smaller weight, it is required to shift the pawl into the position “B” and release the springs with a reciprocal movement.

- longitudinal adjustment. It is carried out by means of handle 2 within the range of ± 80 mm from the middle position. To move the seat forward-backwards, it is required to pull handle 2 up, move the seat and then release the handle. The seat will automatically get locked in a required position.

- adjustment of the backrest tilt angle:

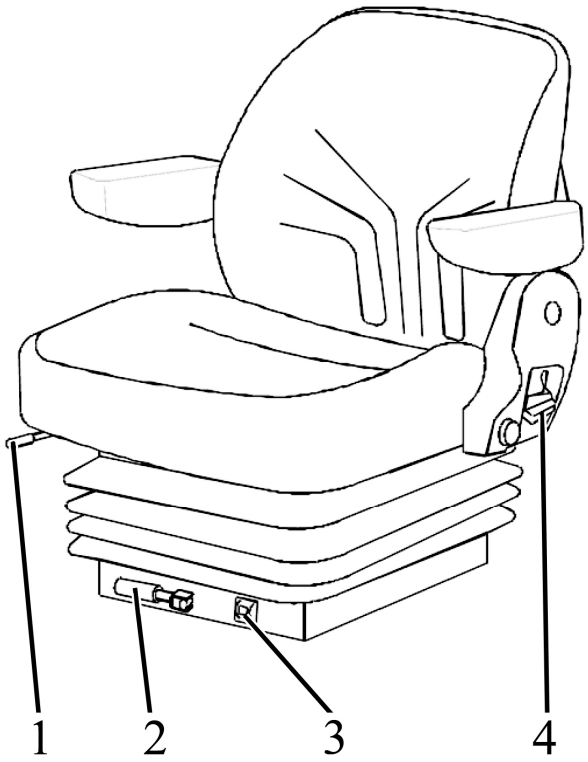
a) For the seat “BELARUS 80-6800010” the backrest tilt angle is adjusted by means of hand wheel 3 within the range from minus 15° to plus 20°. To increase the backrest tilt angle, it is necessary to turn the hand wheel clockwise, to decrease it – counterclockwise.

b) For the seat “BELARUS 80B-6800000” the backrest tilt angle is adjusted by means of handle 4 within the range from plus 5° to plus 25°. To change backrest tilt angle, it is required to pull handle 4 up against the stop, move the backrest to the necessary direction to achieve the required angle and then release the handle. The seat will get locked in a required position.

- height adjustment is carried out within the range of ± 30 mm from the middle position. The seat has three height positions: “lower”, “middle” and “upper”. To move the seat from the “lower” position to the “middle” position or from the “middle” position to the “upper” one, it is required to lift the seat smoothly till the arresting stop goes off (a specific click is heard). To move the seat from the “upper” position to the “lower” one, it is necessary to lift the seat against the stop with an abrupt movement and let it down. It is impossible to move the seat from the “middle” position to the “lower” one.

3 Adjustments of “Grammer” seat

Against order your tractor can be equipped with “Grammer” seat (figure 2.22.2).



1 – handle for longitudinal adjustment; 2 – handle for adjustment according to the weight; 3 – indicator of seat adjustment according to the weight; 4 – handle for backrest tilt adjustment.

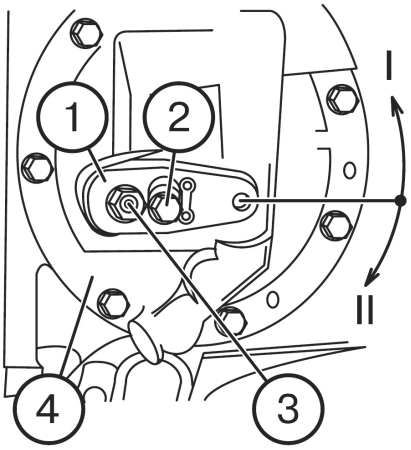
Figure 2.22.2 – “Grammer” seat adjustments

The “Grammer” seat has the following adjustments:

- adjustment according to the operator's weight. It is carried out by means of handle 2 (figure 2.22.2) within the range from 50 to 130 kg with weight indication in 10 kg. To adjust the seat for a bigger weight, it is required to turn the handle clockwise, to adjust the seat for a smaller weight – turn it contraclockwise.
- longitudinal adjustment. It is carried out by means of handle 1 within the range of ± 75 mm from the middle position. To move the seat forward-backwards, it is required to pull handle 2 up, move the seat and then release the handle. The seat will automatically get fixed in a required position.
- adjustment of the backrest tilt angle. The backrest tilt angle is adjusted by means of lever 4 within the range from minus 10° to plus 35°. To change the backrest tilt angle, it is required to pull handle 4 up against the stop, move the backrest to the necessary direction to achieve the required angle and then release the lever. The seat will get locked in a required position.
- height adjustment. It is carried out within the range of ± 30 mm from the middle position. The seat has three height positions: “lower”, “middle” and “upper”. To move the seat from the “lower” position to the “middle” position or from the “middle” position to the “upper” one, it is required to lift the seat smoothly till the arresting stop goes off (a specific click is heard). To move the seat from the “upper” position into the “lower” one, it is necessary to lift the seat against the stop with an abrupt movement and let it down. It is impossible to move the seat from the “middle” position to the “lower” one.

2.23 Control of the transmission hydraulic system pump drive

The drive of the transmission hydraulic system pump is located on the left side of the gearbox body.



1 – lever; 2 – bolt; 3 – centre pin; 4 – gearbox pump drive assembly.

Figure 2.23.1 – Control of the transmission hydraulic system pump drive

Control lever 1 (figure 2.23.1) of the transmission hydraulic system pump drive can have two fixed positions:

- position I – “Pump drive on” (normal operating position) – lever 1 is turned contra-clockwise (when you look at the gearbox from the tractor left side) in relation to center pin 3 until the lower edge of the groove in lever 1 stops and fixed with bolt 2.
- position II – “Pump drive off” (non-operating) position.

Shift lever 1 to the position II if it is required to mount and dismount the GB pump drive assembly 4, and then fix lever 1 in the position I again.

Note – Figure 2.23.1 shows the position “the transmission hydraulic system pump drive on”.

ATTENTION: TURN THE TRANSMISSION HYDRAULIC SYSTEM PUMP DRIVE ON AND OFF ONLY WITH THE ENGINE NOT RUNNING OR WITH MIN. IDLE SPEED OF THE ENGINE!

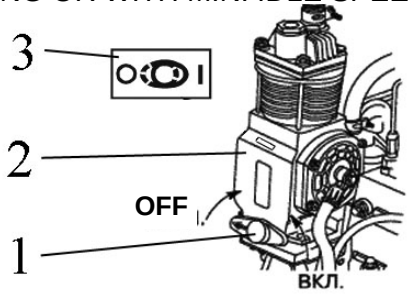
2.24 Control of the pneumatic system compressor

Handle for the pneumatic system compressor engagement 1 (figure 2.24.1) has two positions:

left (the arrow on the handle is directed forward as viewed along tractor movement) – “compressor off”,

right (the arrow on the handle is directed backward to tractor cab) – “compressor on”.

ATTENTION: TURN THE PNEUMATIC SYSTEM COMPRESSOR ON AND OFF ONLY WITH THE ENGINE NOT RUNNING OR WITH MIN. IDLE SPEED OF THE ENGINE!



1 – handle for the pneumatic system compressor engagement; 2 – pneumatic system compressor; 3 – diagram of the pneumatic system compressor control.

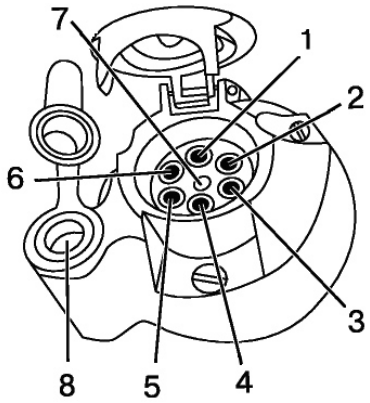
Figure 2.24.1 – Control of the pneumatic system compressor

Note – Figure 2.24.1 shows the position “pneumatic system compressor off”.

2.25 Connector elements of the electrical equipment

2.25.1 Socket to connect coupled agricultural equipment

A standard seven-pin socket with an additional receiver to connect a portable lamp (figure 2.25.1) is intended to connect current consumers of a trailer or a trailed agricultural implement. It is mounted on the rear cab support. A male plug of wire harness from a trailer or a coupled agricultural implement is connected to the socket.



1 – left turn indicator; 2 – horn; 3 – ground; 4 – right turn indicator; 5 – right clearance lamp; 6 – brake light; 7 – left clearance lamp; 8 – receiver to connect a portable lamp or other electrical elements with useful current up to 8A.

Figure 2.25.1 – Assignment of seven-pin socket terminals with an additional receiver to connect a portable lamp.

2.25.2 Electrical sockets for connection of electrical equipment for coupled implements

Apart from a socket for connection of trailed agricultural equipment, tractors “BELARUS-2122.6” are equipped with additional electrical sockets. Mounting of these sockets and a cigarette lighter is shown in figure 2.25.2.

Rear socket 3 (figure 2.25.2) and cigarette lighter 2 are powered after AB switching on (“ground”). Rear socket 4 is powered after engine start.

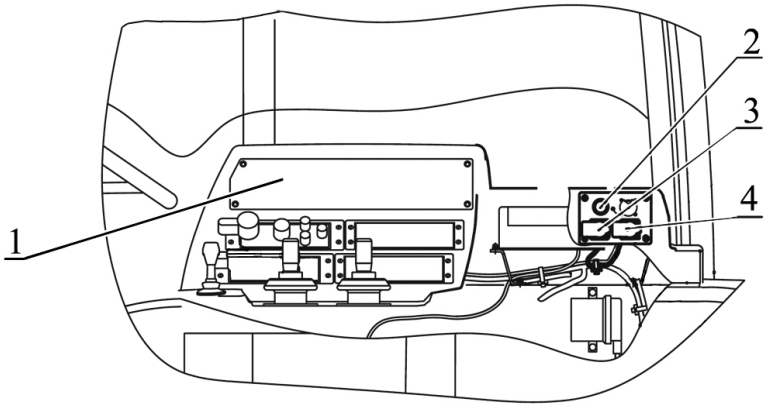
Maximal current loads to the sockets and cigarette lighter are as follows:

- rear sockets – 25 A;
- cigarette lighter – 20 A.

It is allowed to use cigarette lighter hub as a socket for connection of electrical consumers with current load not more than 20 A.

Connectors for sockets (electrical sockets) are supplied in tractor SPTA.

ATTENTION: WHEN CONNECTING CONSUMERS, IT IS REQUIRED TO STRICTLY OBSERVE THE POLARITY, SPECIFIED ON ELECTRICAL SOCKETS!

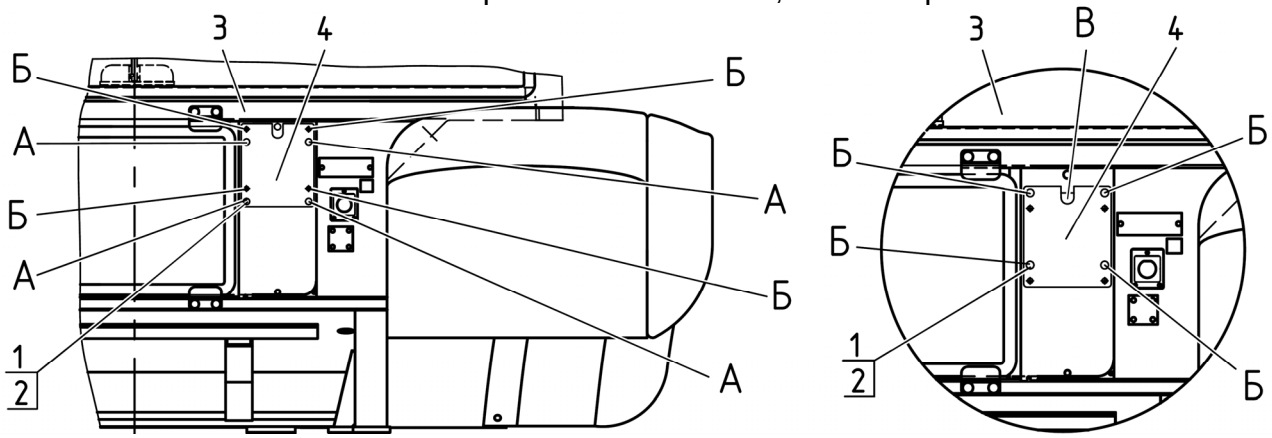


1 – side console; 2 – cigarette lighter; 3, 4 – electrical sockets.

Figure 2.25.2 – Mounting of electrical sockets and cigarette lighter

To connect coupled electrical equipment from the sockets, mounted in the cab, it is required to remount plank 4 (figure 2.25.3) in the following way:

- remove four caps 1, unscrew four bolts 2, remove plank 4 from openings А;
- take the harness from the socket (or sockets) out of the cab through a formed rectangular opening;
- mount plank 4 onto openings Б, as shown below in view b) of figure 2.25.3, the harness from the socket shall go out of the cab through opening В;
- screw in bolts 2 with the torque from 8 to 10 N•m, mount caps 1 onto the bolts.



a) plank initial position

b) plank position when connecting coupled electrical equipment

1 – cap; 2 – bolt; 3 – cab rear side; 4 – plank.

Figure 2.25.3 – Plank remounting on cab rear side for socket wires outlet

Note – It is allowed to carry out connection of electrical equipment for coupled implements to tractor alternator.

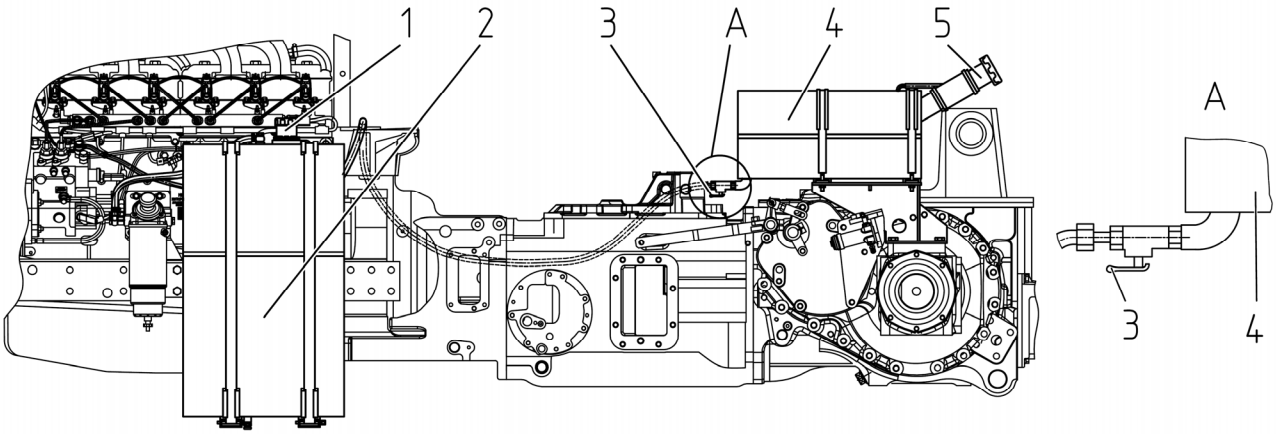
- terminal “+” to alternator terminal “B+”;
- terminal “-“ to engine housing.

ATTENTION: WHEN CONNECTING ELECTRICAL EQUIPMENT OF COUPLED IMPLEMENTS TO TRACTOR, CONSULT YOUR DEALER, AS WRONG CONNECTION OF ELECTRICAL EQUIPMENT FOR COUPLED IMPLEMENTS TO TRACTOR CAN CAUSE FAILURE OF TRACTOR ELECTRICAL EQUIPMENT!

2.26 Fuel tanks

Two fuel tanks are mounted on “BELARUS-2122.6” tractors:

- tank 2 (figure 2.26.1), attached to the tractor left side-member with the capacity 175 liters;
- tank 4, mounted under the cab with the capacity 130 liters.



1 – filler neck of side fuel tank; 2 – side fuel tank; 3 – valve handle; 4 – fuel tank located under the cab; 5 – fuel tank filler neck located under the cab.

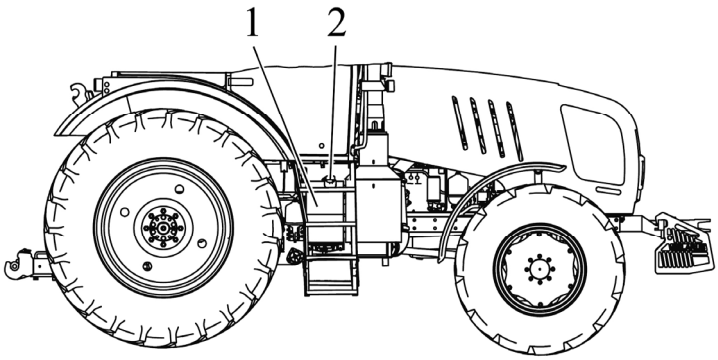
Figure 2.26.1 – Fuel tank assembly

Fuel intake into the coarse fuel filter is carried out directly out of tank 2 (figure 2.26.1). The valve is designed for fuel shutoff from tank 4 into tank 2. Figure 2.26.1 shows the position of valve 3 handle at which fuel is not supplied to tank 2 from tank 4. To supply fuel from tank 4 into tank 2 it is required to pull valve 3 handle for 90°.

2.27 SCR system operation

2.27.1 Tank for SCR system liquid

The installation place for the SCR system liquid tank is shown in figure 2.27.1. The tank capacity is 28 liters (28 liters – filling volume, full volume – 33 liters, it is not recommended to fill tank 1 with liquid over 28 liters). AdBlue reagent (figure 2.27.1) is supplied from tank 1 with a supply module mounted in the tank to the exhaust system mixing pipe.



1 – SCR system liquid tank; 2 – filler neck for SCR system liquid tank.

Figure 2.27.1 – Assembly of SCR system liquid tank

Before filling tank 1 (figure 2.27.1) with reagent AdBlue, it is required to clean tank 1 filler neck from dust and dirt.

ATTENTION: AT THE AMBIENT TEMPERATURE BELOW MINUS 11° C, IT IS ALLOWED TO FILL SCR SYSTEM LIQUID TANK WITH AdBlue REAGENT ONLY FOR 80% OF THE TANK FILLING VOLUME, OTHERWISE THE FROZEN REAGENT AdBlue CAN TEAR THE TANK!

ATTENTION: SCR SYSTEM PROVIDES NORMAL OPERATING CHARACTERISTICS AT THE AMBIENT TEMPERATURE FROM -40 TO +40 ºC!

2.27.2 Indication of SCR system operation

To look through SCR system parameters, it is required to press any button of the monitor, except for button 5 (figure 2.9.1), when the monitor is in the display mode of engine parameters. At that, a pop-up menu will switch on the monitor as shown in figure 2.27.2b).

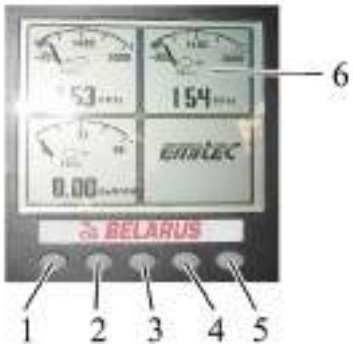
a) monitor in the display mode of engine parameters

b) monitor in the display mode of engine parameters with a switched on pop-up instrument board

Figure 2.27.2 – Entry into display mode of SCR system parameters

After pressing the third button of the monitor located under the entry sign to the menu of SCR parameters, the monitor passes into the display mode of SCR system parameters.

The monitor in the display mode of SCR parameters is shown in figure 2.27.3

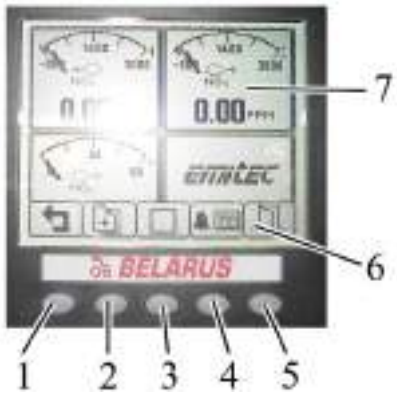


1, 2, 3, 4 – push buttons of pop-up instrument board; 5 – button for entry to/exit from the mode of setting contrast, brightness and configuration menu; 6 – three-section display of SCR parameters on the screen.

Figure 2.27.3 – Monitor in the display mode of SCR parameters

When pressing any of buttons 1, 2, 3, 4 (figure 2.27.3), pop-up menu 6 is switched on on the monitor (figure 2.27.4). When pressing button 5 (figure 2.27.3), entry to/exit from the mode of setting contrast, brightness and configuration menu is carried out.

The monitor in the display mode of SCR parameters with the switched on pop-up instrument board and the button assignment with the switched on pop-up instrument board are shown in figure 2.27.4



1 – reset button to the display mode of engine parameters; 2 – rewind button for displayed SCR parameters; 3 – call button for graphic display of engine parameters; 4 – call button for error (failure) list indication; 5 – reset button for the pop-up instrument board; 6 – pop-up instrument board; 7 – three-section display of SCR parameters on the screen.

Figure 2.27.4 – Monitor in the display mode of SCR parameters with a switched on pop-up instrument board

SCR parameters are set forth on four pages. By pressing button 2 (figure 2.27.4) the pages with SCR parameters are turning:

- first page – clauses 18, 19, 23 of table 2.9.1;
- second page – clauses 20, 21, 24 of table 2.9.1;
- third page – clauses 22, 25 of table 2.9.1;
- fourth page – warning of torque limiting;

Clauses 17, 18, 19 of table 2.9.1 are available for look-up in mode of engine parameters displaying.

Parameter “SCR status“(clause 25 of table 2.9.1), shown on figure 2.27.5, can have the following conditions:

- Dormant (sleep mode) – (is displayed after switching on of the instruments before engine start and also at the running engine before exhaust gages reach the temperature above 200 ºС, necessary for warming up of neutralizer catalytic coating);
- Preparing dosing readiness (is displayed after engine start, informs about SCR actions before dosing – AdBlue reagent warming-up in cold season, pumping of AdBlue reagent feeding system etc.);
- Normal dosing operation – normal dosing;
- Error – (indicates, that in engine operation or in SCR system operation there are faults, to look up the fault it is necessary to press button 4 (figure 2.27.4);
- System error pending – the system is waiting for error elimination.

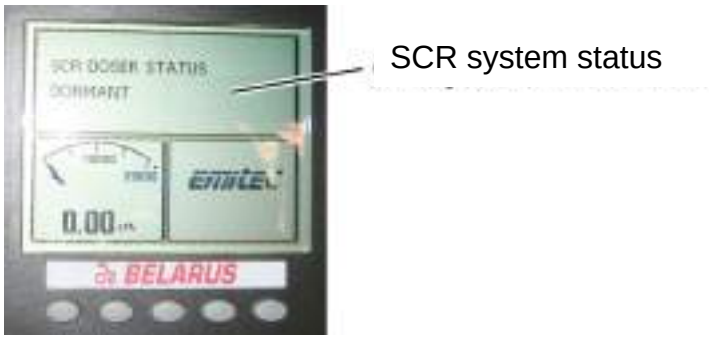


Figure 2.27.5 – Parameter “SCR system status”

If there are faults or errors in SCR, on fourth page of SCR parameters (figure 2.30.6) there is displayed a status of torque limiting and time remaining until torque limiting.

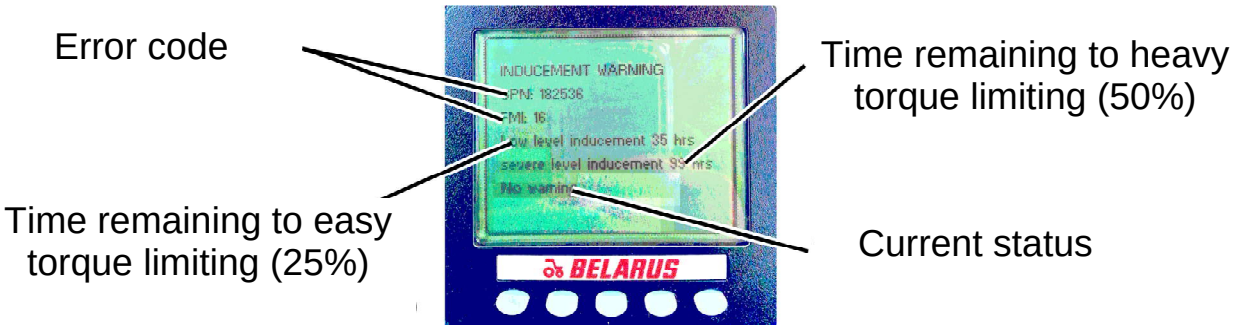


Figure 2.27.6 – Fourth page of SCR system parameters

When errors (faults) are detected in SCR system, time counters will turn on before activation of engine torque limiting (easy limitation – 25% and heavy limitation -50%), during this time the present faults shall be eliminated, if after this time the faults are not eliminated, the engine torque limiting is activated, the following active errors (faults) appears in this case:

-SPN 520195, FMI 14 – heavy engine torque limitation by 50%;

-SPN 520196, FMI 14 – easy engine torque limitation by 25 %.

In case of lowering reagent AdBlue level less than 28% of the tank filling volume, there pops up a symbol on the monitor in the flashing mode, shown in figure 2.27.7.

In case of lowering reagent AdBlue level less than 4% of the tank filling volume, there pops up a symbol on the monitor in the mode of continuous glow, shown in figure 2.27.7.

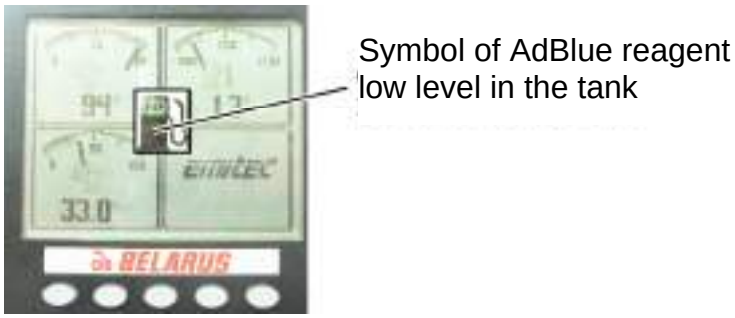


Figure 2.27.7 – Indication of AdBlue reagent low level in the tank SCR

ATTENTION: IN CASE OF AdBlue LEVEL LOWERING LESS THAN 4% OF THE TANK FILLING VOLUME, IT IS REQUIRED TO FILL THE TANK WITH AdBlue REAGENT IMMEDIATELY!

In case of AdBlue level lowering less than 4% of the tank filling volume and futher operation with unfilled AdBlue reagent tank having at the same time faults connected with SCR operation, on monitor appears a constantly lightening symbol, shown on figure 2.27.8, indicating torque limiting.

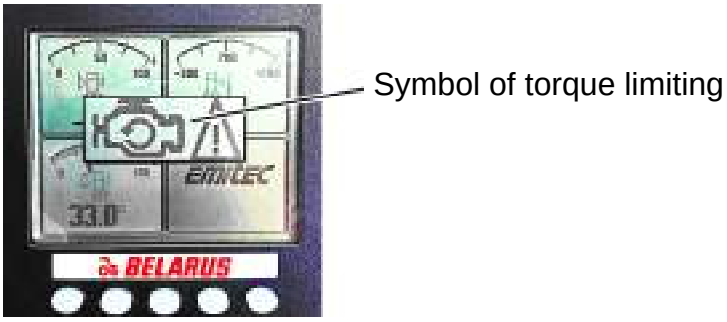


Figure 2.27.8 – Indication of torque limiting

In case of AdBlue reagent level lowering less than 28% of the tank filling volume having at the same time faults in engine operation, not connected with SCR operation, there pop up symbols on the monitor in the flashing mode, shown in figure 2.27.9.

Figure 2.27.9 – Indication of reagent AdBlue low level in the tank SCR and availability of errors

3 INTENDED USE OF TRACTOR

3.1 Safety measures while preparing tractor for operation

Strict observance of safety requirements ensures safe operation of the tractor and improves its reliability and durability.

Only persons not younger than 17, having a driving license for tractors of drawbar category 4.0, being briefed on accident and fire prevention, may be admitted to operate the tractor.

Before operating the tractor, scrutinize the Operator's Manual and the Engine operation manual. Insufficient knowledge of tractor controls and servicing may lead to accidents.

When performing depreservation of the tractor and optional equipment, follow the fire prevention instructions and sanitary requirements when dealing with chemicals, rag wastes and oiled paper.

Before starting to operate the tractor, replace special nuts of rear wheel hubs (one at each hub), used for tractor fastening on the vehicle platform, with the nuts of basic hub configuration, attached in a set of spare parts, tools and accessories. Tighten the nuts with a torque of 700…750 Nm. Replace special nuts of front wheels (one at each wheel), used for tractor fastening on the vehicle platform, with the nuts of basic wheel configuration, attached in a set of spare parts, tools and accessories. Tighten the nuts with a torque of 200…250 Nm.

The tractor shall be run in, in accordance with the requirements under subsection 3.4 "Tractor final assembly and run-in".

The tractor shall be completely outfitted and in good working order.

DO NOT dismantle design-stipulated protective enclosures or safeguards from the tractor, as well as other parts and assembly units which affect its safe operation (protective guard of the fan, rear PTO enclosure, etc.)

The technical condition of the braking system, steering controls, lighting and indication devices and the drive system shall conform to safety requirements of relevant standards and the present Manual.

The trailed agricultural machines and harvest trailers shall be fitted with rigid coupling which excludes their swaying and colliding with the tractor during transportation.

The tractor controls shall be provided with reliable locking in their operating positions.

Keep all the warning plates of the tractor clean and readable. If damaged or lost, replace them with new ones.

Tractor operation without an accumulator battery in the electrical equipment system is not allowed.

The first aid kit shall be completed in accordance with the regulations, adopted on the territory of the state, where the tractor is used.

3.2 Tractor use

3.2.1 Boarding the tractor

The tractor is boarded through the cab left door. A foot step is provided for making tractor boarding more convenient.

3.2.2 Engine start and preparation for it

To start the engine of tractor “BELARUS-2122.6”, do the following:

- engage the tractor parking brake;
- if required, fill in fuel and bleed the fuel delivery system to remove air from it;
- set the handle for fuel feed control into the position that corresponds to the minimum fuel supply to the engine;
- make sure that the electronic pedal of fuel feed control is in its initial position and it is not affected by physical influence. Do not press the fuel feed control pedal when starting the engine;
- set the handle for rear PTO drive activation into the position “PTO drive off”;
- the handles for RLL control shall be in the middle position;
- set the lever shifting GB ranges into a neutral position;
- turn on the accumulator battery switch;
- turn the key of the starter and instruments switch from “0” position into position “I”;

By doing this:

1) On the integrated indicator both RPTO scale range annunciators and all RPTO scale segments turn on for not more than one second, and the needles of engine speed and rpm indicators deviate from their initial positions (or the needles “shake” on indicator zero marks for not more than one second) – it confirms LED annunciators and needle indicators workability.

2) All LED annunciators and indicators in CECS light up within about two seconds, a digital indicator displays figure “8”, an audible annunciator gets activated – operability of LED annunciators, indicators and audible annunciator is confirmed. Then LED indicators and annunciators, a digital indicator and an audible annunciator pass to the operating mode – annunciators for zero gear (gear “0”), FPTO and RPTO switching off remain on, an indicator for gear shifting mode displays a moderate operation mode and a digital indicator indicates figure “0”. The rest of LED annunciators and an audible annunciator get switched off.

3) All LED annunciators in ECP light up within about two seconds, an audible annunciator gets activated – operability of LED and audible annunciators is confirmed. Then LED annunciators and an audible annunciator pass to the operating mode – only one of annunciators for activation of fuel supply electronic control pedal remains switched on (reverse or forward travel, for the reason of reversing control station absence on “BELARUS-2122.6” these annunciators have no information value), an audible annunciator gets switched off.

4) The information screen displays a company logo for several seconds – it confirms workability of the screen. Then in case there are no failures in the EECS operation, the information screen functions in the operating mode – it displays actually measured parameters of the engine. If failures are detected, the information screen produces an acoustic signal, and a brief description of the detected failures appears on the screen. The detected faults shall be eliminated before the engine start. If the level of AdBlue reagent is lower than 28% of the tank filling volume for SCR liquid, a corresponding symbol appears on the monitor in a flashing mode. It is required to refill AdBlue reagent into the tank for SCR liquid before engine start.

5) A pilot lamp of emergency oil pressure in HSC lights up on the pilot lamp unit. A signal lamp of oil emergency pressure in the engine lubrication system (and a buzzer sounds), a signal lamp of air emergency pressure in the pneumatic system (if it is below the accepted value), a signal lamp of fuel reserve capacity in the tank (when reserve volume of fuel remains in the tank), control lamp of additional AB charging with 24V voltage light up on the dashboard. A pilot signal annunciator of the engaged parking brake turn on in a flashing mode with 1 Hz frequency on the integrated indicator.

6) A pilot lamp that indicates heating plug operation lights up on the pilot lamp unit.

- after the heating plug pilot lamp goes out, start the engine, for which depress the clutch pedal and turn the key of starter and instruments switch from “I” position (“instruments on”) into position “II” (engine start);

- hold the key of the starter switch turned until the engine is started, but not longer than 20 seconds; if the engine fails to start, carry out a repeated start-up not earlier than after one minute;

- after the engine is started, release the clutch pedal, check functioning of all signal lamps and gauge indications (coolant temperature, oil pressure in the engine, on-board circuit voltage, etc.). Let the engine run at low rpm until pressure stabilizes within gauge operation range. Actually measured parameters and operation states of tractor systems and units are displayed on the integrated indicator, on the dashboard, on the pilot lamps unit, CECS, ECP and on the information monitor. The troubleshooting annunciator of RLL electronic control system lights up on RLL control panel - it indicates the workability and blocking of the RLL control system;

- after engine start, there is engaged the GB reduction unit pass at which the engine was stopped, on the range shifting lever the button for shifting GB reduction unit pass lights up. If the lowest pass of GB reduction unit is engaged – on CECS there get switched on an annunciator for GB reduction unit engaged position and an annunciator for switching on GB reduction unit lowest pass, informing that the lowest pass of GB reduction unit is on. If the highest pass of GB reduction unit is engaged – on CECS there get engaged an annunciator for GB reduction unit engaged position and an annunciator for switching on GB reduction unit highest pass, informing that the highest pass of GB reduction unit is on.

- a pilot lamp indicating the charge of additional AB with the voltage of 24V shall go out after the engine start – it indicates that the additional AB with the voltage of 24V is being charged through the voltage converter. If the pilot lamp indicating the charge continues to glow after the engine start – it indicates that the additional AB is not being charged and it is required to eliminate the failure.

IT IS FORBIDDEN TO OPERATE THE TRACTOR IN CLOSED ROOMS WITHOUT REQUIRED VENTILATION (AIR EXCHANGE). EXHAUST GASES MAY LEAD TO A LETHAL OUTCOME!

IT IS FORBIDDEN TO RUN THE ENGINE WITH THE SYSTEMS OF COOLING AND ENGINE LUBRICATION UNFILLED!

ATTENTION: THE TRACTOR CAB IS EQUIPPED WITH A SINGLE-OCCUPANCY SEAT AND THE OPERATOR IS THE ONLY PERSON TO STAY IN!

ATTENTION: START THE ENGINE AND INSPECT GAUGES ONLY WHEN STAYING IN THE OPERATOR'S SEAT!

ATTENTION: REMEMBER THAT THE ENGINE START IS POSSIBLE ONLY WHEN THE RANGE SHIFTING LEVER IS SET INTO A NEUTRAL POSITION!

ATTENTION: WHILE STARTING THE ENGINE, THERE MUST BE NO PEOPLE UNDER, IN FRONT OF AND BEHIND THE TRACTOR, AS WELL AS BETWEEN THE TRACTOR AND AN IMPLEMENT COUPLED TO IT!

IT IS FORBIDDEN TO START THE ENGINE TAKING THE TRACTOR IN TOW, AS IT MAY RESULT IN ENGINE BREAKDOWN. START THE ENGINE ONLY WHEN YOU STAY IN THE OPERATOR'S SEAT!

3.2.3 Start of tractor movement, GB shifting

ATTENTION: YOUR TRACTOR IS EQUIPPED WITH TURBOCHARGED ENGINE. HIGH SPEED OF THE TURBOCHARGER REQUIRES GOOD LUBRICATION AT ENGINE START. AFTER THE ENGINE START, WARM UP THE ENGINE TO ACHIEVE STABLE RUNNING UNDER THE CRANKSHAFT SPEED OF 1000-1300 RPM (FOR 2-3 MIN), AND THEN LET IT RUN AT HIGHER RPM, GRADUALLY INCREASING THE SPEED UP TO 1600 RPM (NOT MORE) UNTIL THE COOLANT TEMPERATURE REACHES 40°C!

TRACTOR OPERATION IS FORBIDDEN, IF THE ENGINE EMERGENCY OIL PRESSURE LAMP IS ON WITH THE ENGINE RUNNING, STOP THE ENGINE IMMEDIATELY!

Before starting the movement, define a necessary speed for tractor movement. The speed diagram of the tractor “BELARUS-2122.6” with tires of basic configuration is given in the instruction table attached to the cab right window and in subsection 2.14.5 “Tractor velocity diagram”.

To put the tractor in motion, do the following:

- reduce engine speed;
- pressing the button for selecting gear shifting mode, set the required mode. The set mode is displayed on the indicator of gear shifting mode;
- depress the clutch pedal;
- if it is required to shift GB reduction unit pass, press the corresponding button for switching on GB reduction unit pass on CECS or press the button for shifting GB reduction unit pass, located on the range shifting lever. By doing so, an annunciator for GB reduction unit engaged position on CECS remains switched on, and an annunciator for switching on the corresponding pass of GB reduction unit lights up, informing that the required pass of GB reduction unit is switched on;
- switch on mode “Partial braking”, hold the button for switching on “Partial braking” mode in the pressed position on the GB range shifting lever. At “Partial braking” mode switched on, a digital indicator displays symbol “P”;
- set the required GB range using the range shifting lever according to the range shifting diagram on the lever handle;
- after setting the required range, release the button for switching on “Partial braking” mode;
- set the required GB gear by means of a joystick for gear shifting in accordance with the instruction plate, located near the joystick. By doing so, first the number of the engaged gear is displayed on the digital indicator, then the corresponding annunciator for gear engagement lights up;
- disengage the parking brake, slowly release the clutch pedal, increasing fuel feed at the same time. The tractor will start moving.

IT IS FORBIDDEN TO START TRACTOR MOVEMENT WITH BIG TRACTION LOAD!

TRACTOR MOVEMENT WITH THE DOOR OPEN IS FORBIDDEN!

ATTENTION: ENGAGE THE RANGE ON STOPPED TRACTOR ONLY AFTER SWITCHING ON GB “PARTIAL BRAKING” MODE! RANGE SHIFTING SHALL BE CARRIED OUT THROUGH THE NEUTRAL POSITION WITH SWITCHING ON GB “PARTIAL BRAKING” MODE. IT IS FORBIDDEN TO SHIFT RANGES ON MOVING TRACTOR!

ATTENTION: SETTING OF GB RANGE INTO THE NEUTRAL POSITION SHALL BE CARRIED OUT AFTER SETTING GB TO GEAR “0”!

ATTENTION: SHIFTING OF PASSES FOR REDUCTION UNIT “L” OR “H” SHALL BE CARRIED OUT ONLY WITH THE TRACTOR STOPPED, THE LEVER FOR GB RANGE SHIFTING SHALL BE SET INTO THE NEUTRAL POSITION. IT IS FORBIDDEN TO SHIFT PASSES OF REDUCTION UNIT “L” OR “H” ON MOVING TRACTOR!

ATTENTION: EXIT FROM THE STATE “GEARS OFF” (GEAR “0”) IS ONLY ALLOWED WITH THE CLUTCH PEDAL FULLY DEPRESSED!

ATTENTION: DO NOT HOLD THE FOOT ON THE CLUTCH PEDAL DURING TRACTOR OPERATION AS IT CAN LEAD TO CLUTCH SLIPPING, ITS OVERHEATING AND FAILURE!

ATTENTION: GEAR SHIFTING WITHIN ONE RANGE SHALL BE CARRIED OUT ON MOVING TRACTOR WITHOUT DEPRESSING THE CLUTCH PEDAL!

ATTENTION: IN CASE OF ERROR (FAILURE) APPEARANCE, TIME METERS TURN ON IN THE SCR SYSTEM UP TO THE ACTIVATION OF ENGINE TORQUE LIMITING (EASY LIMITING OF 25% AND HEAVY LIMITING OF 50%). DURING THIS TIME THE PRESENT FAILURES SHALL BE ELIMINATED. IF THE FAILURES FAILED TO BE ELIMINATED UPON THE EXPIRY OF TIME, THE ENGINE TORQUE LIMITING GETS ACTIVATED.

ATTENTION: IT IS NECESSARY TO PRESS CLUTCH PEDAL QUICKLY AND RELEASE SLOWLY, LITTLE BY LITTLE. THIS FACILITATES PRECISE GEAR SHIFTING AND BREAKAWAY. SLOWLY AND NON-FULLY PRESSING OF CLUTCH PEDAL LEADS TO CLUTCH SLEEPING AND CAUSES DIFFICULT AND NOISY GEARS SHIFTING IN GEAR BOX. IF CLUTCH PEDAL IS RELEASED QUICKLY, THE LOAD ON TRANSMISSION INCREASES AND TRACTOR MOVES JERKILY. WHEN RELEASING CLUTCH PEDAL, IT IS NECESSARY TO TAKE OFF FOOT FROM PEDAL AT THE END OF PEDAL TRAVEL, to REGENERATE PLAY IN HYDRAULIC DRIVE OF CLUTCH CONTROL.

ATTENTION: WHEN STARTING TO MOVE, MAKE SURE THE PARKING BRAKE IS DISENGAGED!

ATTENTION: WITH THE DIFFERENTIAL LOCK ENGAGED, THE SPEED OF TRACTOR MOVEMENT SHALL NOT EXCEED 13 KM/H!

ATTENTION: OPERATING ON ROADS WITH HARD SURFACE, IT IS NECESSARY TO SWITCH OFF THE FDA DRIVE TO AVOID INCREASED WEAR OF FRONT WHEEL TIRES!

ATTENTION: IT IS ALLOWED TO USE THE ENGINE AT ITS FULL POWER ONLY AS THE COOLANT TEMPERATURE REACHES 70°C!

ATTENTION: TRACTOR OPERATION WITH EMPTY ADBLUE (UREA) TANK IS NOT
ALLOWED! WHEN INFORMATION ABOUT THE CRITICAL LEVEL OF ADBLUE REAGENT (UREA) IN THE TANK APPEARS ON THE MONITOR, IT IS NECESSARY TO FILL THE TANK WITH ADBLUE REAGENT.

ATTENTION: IT IS NOT RECOMMENDED TO LET ADBLUE FREEZING AND OVERHEATING, AS IT SHORTENS ITS STORAGE LIFE. SCR SYSTEM PROVIDES NORMAL OPERATING CHARACTERISTICS AT THE AMBIENT TEMPERATURE FROM -40 TO +40 ºC!

3.2.4 Tractor stop

To stop the tractor, do the following:

- decrease engine speed;
- fully depress the clutch pedal;
- stop the tractor with service brakes;
- set GB to gear “0” (gears off) by means of the gear shifting joystick and set the lever for range shifting into neutral position;
- release the clutch and service brakes pedals;
- engage the parking brake.

ATTENTION: FOR TRACTOR EMERGENCY STOP, PRESS THE CLUTCH AND BREAK PEDALS TOGETHER SHARPLY!

3.2.5 Engine stop

ATTENTION: BEFORE STOPPING THE ENGINE, LOWER LIFT LINKAGES UNTIL THEY REACH THE GROUND, IF THEY ARE UPLIFTED; LET THE ENGINE RUN AT (1000±100) RPM FOR 3 TO 5 MINUTES. THIS ALLOWS TO REDUCE ENGINE COOLANT TEMPERATURE!

To stop the engine, do the following:

- disengage the rear PTO and (or) FPTO;
- at minimal engine idle speed, set the handle for switching on rear PTO drive into position “PTO drive off”;
- disengage OPU for HLL;
- shift joystick handles for EHS hydraulic distributive valve control into neutral position;
- set the handle for rear lift linkage control into the position “off”;
- turn off the conditioner;
- turn the key of the starter and instruments switch from the position “I” into the position “0”;
- deactivate the accumulator battery when the engine is stopped for a long time.

ATTENTION: AB SHALL BE SWITCHED OFF NOT EARLIER THAN TWO MINUTES AFTER ENGINE STOP. THE GIVEN TIME PERIOD IS NECESSARY TO BLEED SCR MODULES AND PIPELINES FROM AdBlue REAGENT AND TO CREATE INFORMATION IN MEMORY MODULE OF ELECTRONIC CONTROL UNIT.

ATTENTION: FOR ENGINE EMERGENCY STOP, TURN THE KEY OF THE STARTER AND INSTRUMENTS SWITCH FROM THE POSITION “I” INTO THE POSITION “0”!

3.2.6 Leaving the tractor

Leaving the tractor is carried out through the cab left door, except for emergency situations. The rules on leaving the tractor at emergency situations are given in clause 3.5.3 of subsection 3.5 “Emergency actions”.

Leaving the tractor, make sure that all actions, listed in subsection 3.2.5 “Engine stop” have been performed, lift linkages of the tractor and of coupled implements have been lowered.

3.2.7 PTO use

The rules on engagement and disengagement of rear power take off shaft are described in subsection 2.15 “Complex electronic control system” and 2.16 “Additional information on rear PTO control”.

The rear power take off shaft operation is controlled by means of the integrated indicator as described in subsection 2.8.2 “Assignment and operation principle of integrated indicator gauges”.

The rules of RPTO coupling with different types of agricultural machines and implements are described in section 4 “Coupling of implements”.

ATTENTION: TO EXCLUDE IMPACT LOAD, ENGAGE THE REAR PTO AT ENGINE SPEED CLOSE TO MINIMUM (BETWEEN 1000 AND 1100 RPM), THEN ENGINE SPEED SHALL BE INCREASED!

The rear PTO has 6 changeable shaft end extensions. One shaft end extension (of type 3, 20 splines, ∅45mm, or of type 2, 21 splines, ∅35mm) is mounted on the tractor, the others are attached to the spare parts, tools and accessories kit of the tractor against order.

ATTENTION: IT IS FORBIDDEN TO USE REAR PTO SHAFT END EXTENSIONS OF THE CORRESPONDING TYPES WHILE COUPLING OF “BELARUS-2122.6” TRACTORS WITH MACHINES WHICH REQUIRE POWER TRANSFER HIGHER THAN THAT SPECIFIED IN TABLE 3.2.1!

In their design and arrangement the front and rear PTO shaft end extensions (figure 3.2.1) of “BELARUS-2122.6” tractors conform to the regulations and standards applicable to PTO shafts of agricultural tractors.

Parameters of shaft end extensions and specifications of the rear PTO operation when the independent drive is on, are given in Table 3.2.1.

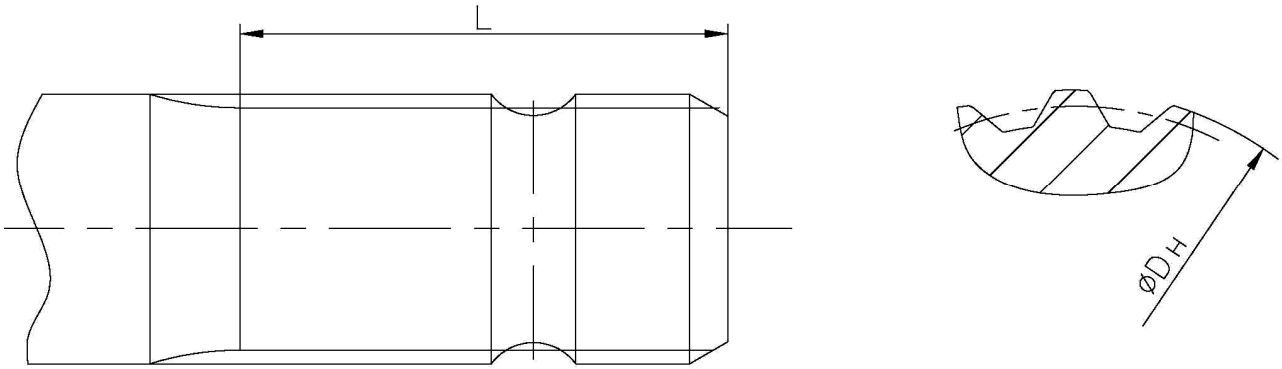


Figure 3.2.1– Power take off shaft end extension

Table 3.2.1 – Parameters of shaft end extensions and specifications of the rear PTO operation

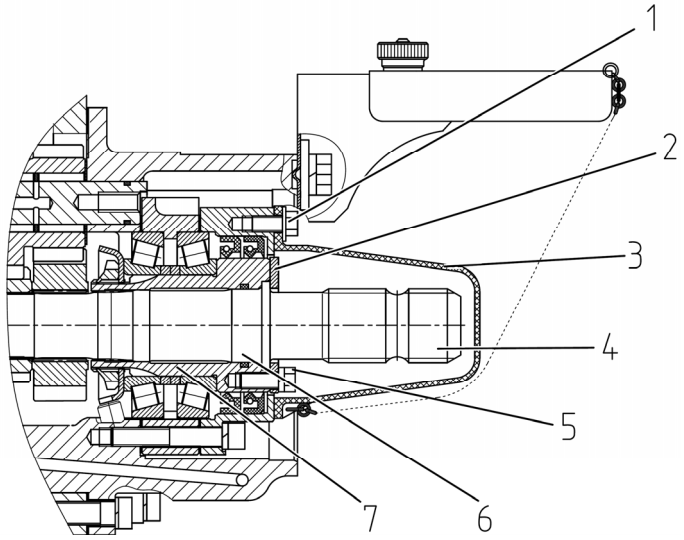
Parameters of shaft end extensions and FPTO and RPTO drives	Type of PTO shaft end extension					
	Type1[1)]	Type 1c	Type 2	Type 3	Type 2c[1)]	Type 2c1[1)]
1 Spline length L, mm	76	78	64	89	78	76
2 Outer diameter DH, mm	35	38	35	45	38	35
3 Number of teeth, n	6	8	21	20	8	6
4 RPTO shaft end extension rotation speed (standard mode), min^{-1}	540 when the engine speed is 1924 (590) [2)]	540 when the engine speed is 1924 (590) [2)]	1000 when the engine speed is 1909 (1100) [2)]	1000 when the engine speed is 1909 (1100) [2)]	1000 when the engine speed is 1909 (1100) [2)]	1000 when the engine speed is 1909 (1100) [2)]
5 RPTO shaft end extension rotation speed (economy mode), min^{-1}	540 when the engine speed is 1473 (770) [2)]	540 when the engine speed is 1473 (770) [2)]	1000 when the engine speed is 1462 (1437) [2)]	1000 when the engine speed is 1462 (1437) [2)]	1000 when the engine speed is 1462 (1437) [2)]	1000 when the engine speed is 1462 (1437) [2)]
6 Power transferred by RPTO shaft end extension, kW, not more	60	60	92	130	92	92
7 Direction of RPTO shaft end extension rotation (look at the butt end) when the independent drive is on	Clockwise					

[1)] Can be completed against order.
[2)] PTO shaft end extension rotation speed when the engine crankshaft rated speed is 2100 rpm.

For operation with RPTO, remove protective cap 3 (figure 3.2.2) that covers shaft end extension 4, for which unscrew two fixing bolts 1. After finishing the operation with RPTO, it is required to mount the protective cap back to its place.

To change the shaft end extension, do the following:

- unscrew two bolts 1 and remove cap 3;
- unscrew four bolts 5 and remove retainer washer 2;
- extract shaft end extension 4 out of bushing opening 7;
- mount another shaft end extension into the spline opening, grease center pilot 6 with solid lubricant;
- mount retainer washer 2 and fix it with four bolts 5 (bolt torque 1 - from 40 to 50N·m);
- mount PTO cap 3 and fix it with two bolts 1 (bolt torque 1 – from 13 to 16N·м).



1– bolt; 2 – retainer washer; 3 –protective cap; 4 – changeable shaft end extension; 5 – bolt; 6 – center pilot; 7 – bushing.

Figure 3.2.2– Protective cap removal and change of RPTO shaft end extension

ATTENTION: THE WIDTH OF THE RPTO PROTECTIVE CAP OPENING IS LESS THAN 360MM. ACCORDINGLY, WHILE CONNECTING CARDAN SHAFT TO THE RPTO SHAFT END EXTENSION OF TYPE 3 (PTO 3) IT IS REQUIRED TO BE CAREFUL IN ORDER TO EXCLUDE HAND INJURIES! NO SPECIAL INSTRUMENTS AND TOOLS FOR CONNECTING CARDAN SHAFT TO THE SHAFT END EXTENSION OF TYPE 3 ARE REQUIRED!

The rules for FPTO activation and deactivation are given in clause 2.15.4 “Front power take off shaft control”.

The rules for FPTO coupling with different types of agricultural machines and implements are given in section 4 “Coupling of implements”.

FPTO is completed with the shaft end extension of type 2. The direction of FPTO shaft end extension rotation (look at the butt end) is clockwise. For FPTO at 2050 min^{-1} of the engine crankshaft, the rotation speed of FPTO shaft end extension is 1000min^{-1} (at the rated speed of the engine crankshaft, the rotation speed of FPTO shaft end extension is 1025 min^{-1}). The power transferred by the FPTO shaft end extension is not more than 44 kW.

Coupling of machines, which require power transfer more than 44kW, with FPTO is not allowed!

For operating with front PTO, in case it is mounted, remove the protective cap by pressing it at the bottom and pulling it down. After finishing the operation with FPTO it is required to mount the protective cap back to its place, for which put the cap onto the shaft end extension and press it lengthway to secure the cap in the protector opening.

ATTENTION: WHILE RPTO AND FPTO OPERATING, IT IS REQUIRED TO FOLLOW ALL SAFETY MEASURES SPECIFIED IN THIS MANUAL!

3.2.8 Selection of optimal inner pressure in tires depending on operational conditions and load on tractor axles

3.2.8.1 Selection of optimal inner pressure in tires depending on operational conditions and load on tractor axles

Selection of optimal air pressure in tires of wheeled tractors and degree of its influence on gripping abilities depend on soil type and load, applied to tractor axles. Air pressure in tires influences the wheel point being in contact with soil, and affects its gripping abilities as well as tractor operational performance depending on soil conditions. Rates of loads on tires for selection of operation mode at various inner pressure and speed are set forth by a tire manufacturer and are provided in table 3.2.2.

Pressure value depends on travel speed and weight loads on tractor axles, created by weight of coupled implements with due account for tractor own weight and ballast weight and also operation conditions.

Inner pressure in tires for each specific case of tractor coupling with implements is different. That is why if tractor operational conditions are changed, it is required to check and if necessary, adjust pressure value in tires. Failure to comply with pressure rates decreases tire life significantly.

Tractor operation with tire pressure set below the required rate, results in the following wheel failures:

- tire turning on rims;
- wearing of tire bead against rim edge;
- cracks on tire sides appear;
- ply separation or rupture of a tire;
- tear-out of tire valve (for tubed tires);

Operation with tire pressure set higher than the norm, results in the following wheel failures:

- noticeable increased wear of tires;
- stretching of carcass layers and decrease of tire flexibility;
- increased skidding of wheels;
- increased sensitivity to impacts and cuts.

Operation overload including excess of max. load capacity (for given pressure and speed) of tires and tractor axles is a reason for failures and damages not only to the undercarriage (tire carcass rupture, etc.) but also to other units and parts of the tractor, which can lead to accidents and decrease of the tractor life span in general.

ATTENTION: ALWAYS SET TIRE PRESSURE WITH DUE ACCOUNT FOR LOAD AND SPEED EFFECTIVE FOR THE KIND OF OPERATION BEING CARRIED OUT!

It is possible to choose tire pressure correctly and identify if it is necessary to mount ballast weights, their mass and type only after defining load value on tractor axles.

The exact load value for a specific case of tractor use, which is applied to front and rear wheels of the tractor, can be defined only by practical weighing the tractor with the implement coupled.

The method of identifying load value on front and rear wheels of the tractor by weighing is given in section 4 “Coupling of implements”.

To check tire pressure use pressure gage MD-214 GOST 9921-81 (it is possible to use other tire pressure control devices with the metrological characteristics identical to manometer MD-214).

Rates of admissible loads on single tires of tractors “BELARUS-2122.6” for selection of operation mode at various tire inner pressure and speed are given in table 3.2.2.

Table 3.2.2

Tire	Load index*	Speed symbol *	Speed, km/h	Load on tire, G, kg, at inner pressure, kPa							
				80	100	120	140	160	200	240	300
420/70R24	130	A8	10 20 30 40	1875 1720 1500 1400	2050 1845 1605 1500	2230 2030 1765 1650	2405 2210 1925 1800	2585 2335 2035 1900	2850 (at 190 kPa)		
480/65R24	133	A8	10 20 30 40	1980 1865 1630 1520	2170 2050 1780 1670	2350 2225 1930 1810	2530 2395 2080 1950	2680 2530 2200 2060	3090		
580/70R42**	158	D	10 20 30 40		4220 3815 3570 3400	4740 4285 4010 3820	5260 4760 4450 4235	5780 5225 4890 4655	6180 (at 180 kPa)	6375 (at 190 kPa)	7225 (at 210 kPa)

* - Load index and speed symbol are given on tire side.

** In tires 580/70R42 Bel-126M 158D, it is allowed to set inner pressure of 100 kPa only in outer tires (at operation with twin tires).

Rates of loads are provided for tires with indicated load index and speed symbol.

Pressure shall be set in “cold” tires.

Performing operations which require large pulling force on the hook, set the pressure as for the speed of 30 km/h.

When performing transport operations on roads with hard surface, increase pressure by 30 kPa, but no more than maximum permissible pressure according to table 3.2.2.

If transport operations increase 60%, the warranty lifetime of the tire within the limits of warranty storage time decrease by 30%.

Tractor operation with twinned tires is allowed only at the speed of 20 km/h.

Maximum permissible loads are given for single tires. Total permissible load G_1 for tyres pair at twinning makes 1.7G, where G is permissible load on single tire according to table 3.2.2.

When twinning tires, make sure the pressure in outer tires is 1,2 – 1,25 times lower than the pressure in inner tires.

Permissible maximum pressure deviations in tires are (±10 kPa) according to manometer indication.

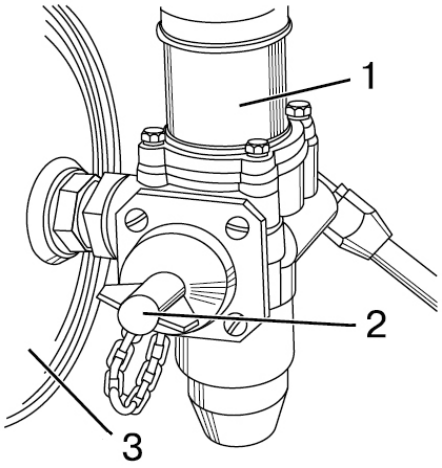
Front wheel tires 420/70R24 is an alternative configuration.

3.2.8.2 Tire inflation

Inflate tires through an air bleed valve of pressure regulator 1 (figure 3.2.3), for which do the following operations:

- let the air out of balloon 3 of the pneumatic system through a condensate removing valve;
- unscrew winged nut 2 of the air bleed valve cap;
- connect a pipe for tire inflation to the air bleed valve cap and to a tire valve;
- start the engine and inflate the tire to reach the required pressure, controlling it with a pressure gage МД-214 GOST 9921-81 (or with a pressure gage having identical metrological characteristics);
- disconnect the pipe from the tire valve and from the air bleed valve cap;
- screw the winged nut back on the air bleed valve cap.

ATTENTION: AS PRESSURE IN THE BALLON GOES UP TO 0.77 MPA, THE COMPRESSOR IS SWITCHED TO IDLE RUNNING BY THE PRESSURE REGULATOR AND TIRE INFLATION STOPS AUTOMATICALLY. FOR THIS REASON CHECK THE PRESSURE OVER THE INDICATOR ON THE DASHBOARD FROM TIME TO TIME AND, IF NECESSARY, REDUCE IT THROUGH THE CONDENSATE REMOVING VALVE!



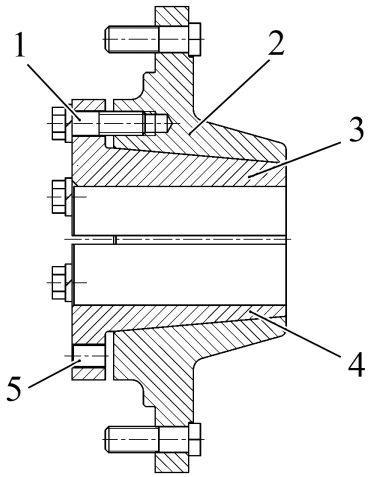
1 – pressure regulator; 2 – winged nut; 3 – balloon of the pneumatic system.

Figure 3.2.3 – Tire inflation

3.2.9 Rear wheel track formation

Tractor rear wheels are mounted on hub groups which consist of split conic bushings 3 and 4 (figure 3.2.4) and hub group housing 2.

The bushings are tightened into the hub group housing with eight bolts 1 (M20) with a torque from 550 to 600 Nm, clenching the semiaxle.



1 – tie bolts; 2 – hub group housing; 3 – upper bushing; 4 – lower bushing;
5 – dismounting holes.
Figure 3.2.4 – Rear wheel hub group

The rear wheel track with the wheels of basic configuration 580/70R42 is changed by moving the hub and the wheel along the semiaxle and by replacing the wheels from one sideboard to the other one.

To change the rear wheel track, do the following:

- put the tractor on a flat ground, put the stops under the front and rear wheels, clean the semiaxles from dirt;
- jack up the corresponding semiaxle tube;
- turn off the wheel retaining nuts and remove the wheel;
- release four tie bolts 1 (figure 3.2.4) of bushings 3 and 4 (two at each bushing) for three complete turns. Screw out the rest of the tie bolts. Remove the blind plugs from the dismounting holes. Screw in the bolts which were screwed out from the bushings into the dismounting threaded holes;
- in case it is impossible to squeeze out the bushings with the help of tie bolts 1, fill kerosine or other penetrant into the split between the bushings and the hub group housing, wait for some time and then screw in the dismounting bolts, tapping on the hub group housing at the same time until the bushings are completely squeezed out;
- shift the hub group onto the required track (use table 3.2.3 to set track “K” (figure 3.2.5) by measuring dimension «L» from the semiaxle butt end to the bushing butt end);
- screw out the tie bolts from the dismounting holes and screw them into the bushings. Screw in the tie bolts with a torque from 550 to 600 Nm in stages – until all the bolts are screwed in with the required torque;
- mount the wheel onto the hub group, tighten the wheel retaining nuts with a torque from 700 to 750Nm, set the blind plugs to their places;
- set the other wheel track in the same way;
- check and tighten the tie bolts and wheel retaining nuts after the first operation hour, after the first eight – ten operation hours and every succeeding 125 operation hours.

ATTENTION: AFTER BOLT TIGHTENING MAKE SURE THE BUTT ENDS OF UPPER AND LOWER BUSHINGS OVERHAND ONE IN RELATION TO THE OTHER FOR NOT MORE THAN 1...2 MM!

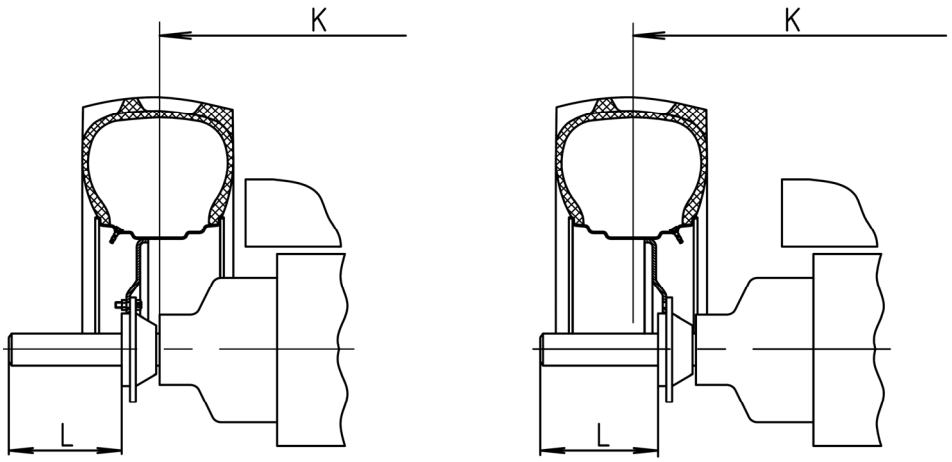


DIAGRAM 1 DIAGRAM 2

Figure 3.2.5 – Rear wheel track setting

Table 3.2.3 – Rear wheel track setting

Tire standard size	Diagram No. (figure 3.2.5)	Track dimension «K», mm	The setting size from the butt end of the bushing hub group to the semiaxle butt end «L», mm
580/70R42	1	1800…2010	105…0
	2	2230…2500	202…67

ATTENTION: WHEN SHIPPED FROM THE WORKS, REAR WHEELS ARE MOUNTED ONTO THE WHEEL TRACK ACCORDING TO DIAGRAM 1 (FIGURE 3.2.5)!

Note – To get information on the rules of rear wheel track setting on tires of alternative configurations, address your dealer!

3.2.10 Rear wheel twinning

With an aim to improve gripping properties of the tractor when coupled with heavy agricultural implements on soil with low bearing capacity, rear wheel twinning with use of spacers is provided.

To get information on the rules of rear wheel twinning and operating restrictions for the tractors with rear wheels twinned, contact your dealer!

3.2.11 Front wheel track formation

3.2.11.1 General information

Two variants for front wheel track formation are possible on tires of basic configuration 480/65R24. On tires of alternative configuration 420/70R24 there are possible seven variants for front wheel track formation.

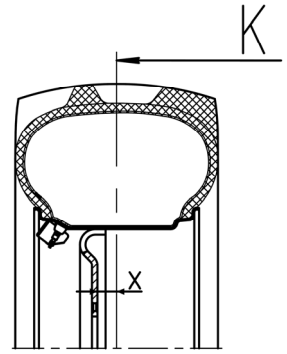
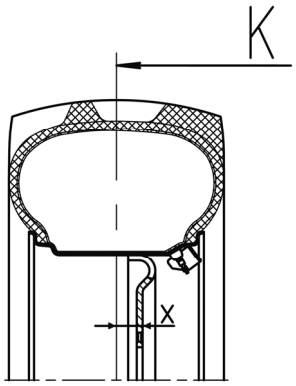
3.2.11.2 Front wheel track formation on tires 480/65R24

The front wheel track is adjusted in stages by displacing the wheels from one side-board to the other.

The front wheel track may have the following dimensions in mm: 1815, 2020.

Diagrams of installation and track dimensions for tires 480/65R24 (basic configuration) are given in table 3.2.4.

Table 3.2.4 – Front wheel track formation on tires 480/65R24

Variants of mounting the wheel	Disk offset X, mm	Tractor track K, mm (tire 480/65R24)	Description of wheel mounting method
	+45	1815	Basic position **Ex-works condition.** Note – on agreement with tractor client, the second variant for front wheel mounting at the plant is allowed
	-58	2020	Wheel displacement from one side-board to the other is carried out

To form the required track, it is necessary to do the following:

- brake the tractor with the parking brake. Put the stops at the front and back of rear wheels;
- uplift the tractor front part (or front wheels in turn) using a jack, providing clearance between the wheels and the ground;
- unscrew the nuts for fastening the wheel disk to the reduction unit flange, remove the wheels and displace them from one side-board to the other;
- when mounting the wheels, pay attention that wheels rotation with tractor moving forward corresponds to the arrow, specified on tire sidewall.

Tightening torque of the nuts for fastening disks to the reduction unit flanges shall be from 200 to 250 N•m.

ATTENTION: AFTER MOUNTING THE WHEELS, CHECK THE NUTS FOR TIGHTENING AFTER THE FIRST OPERATION HOUR, AFTER 10 OPERATION HOURS AND EVERY NEXT 125 OPERATION HOURS!

ATTENTION: AFTER ADJUSTING THE WIDTH OF FRONT WHEEL TRACK, IT IS REQUIRED TO CHECK AND ADJUST FRONT WHEELS TOE-IN. BEFORE CARRYING OUT THE TOE-IN CHECK, IT IS REQUIRED TO CONTROL AND, IF NECESSARY, ADJUST THE PLAY IN STEERING LINKS JOINTS!

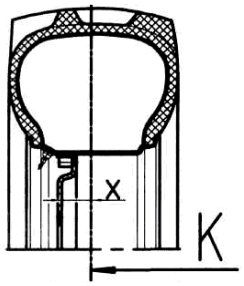
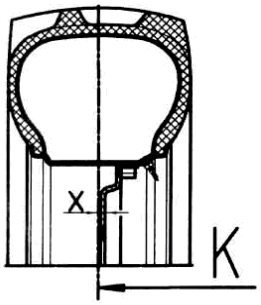
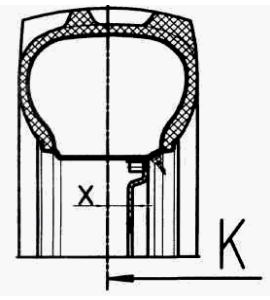
3.2.11.3 Front wheel track formation on tires 420/70R24

The front wheel track is adjusted in stages by displacing the wheels from one sideboard to the other and by changing a position of the wheel disk in relation to the rim.

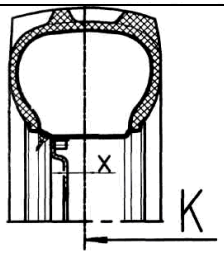
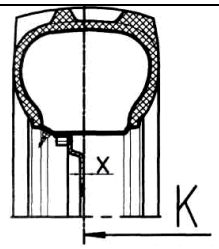
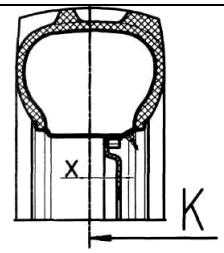
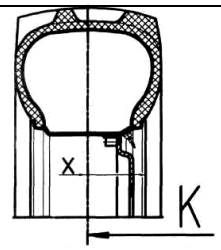
The front wheel track may have the following dimensions: 1725, 1790, 1890, 1940, 2040, 2105, 2205.

Diagrams of installation and track dimensions for tires 420/70R24 (alternative configuration) are given in table 3.2.5.

Table 3.2.5 – Front wheel track adjustment

Variants of mounting the disk and the rim		Disk offset X, mm	Tractor track K, mm (tire 420/70R24)	Description of mounting method
Standard disc mounting with rim displacement		+90	1725	**Ex-works condition.** Carry out displacement of the rim in relation to the disc. The support mates with the disc by inner surface. Note - by agreement with tractor buyer, another variant of front wheel track setting at the factory is allowed.
		-18	1940	Carry out rim turn for 180º. The disc mates with the support inner surface.
		-68	2040	Carry out rim turn for 180º. The disc mates with the support outer surface.

End of table 3.2.5

Variants of mounting the disk and the rim		Disk offset X, mm	Tractor track K, mm (tire 420/70R24)	Description of mounting method
Displacement of the disk and the rim		+56	1790	The disk mates with the support outer surface.
		+6	1890	The disk mates with the support inner surface.
		-102	2105	The rim is turned by 180°. The disk mates with the support inner surface.
		-152	2205	The rim is turned by 180°. The disk mates with the support outer surface.

To set a required track, do the following:

- brake the tractor using the parking brake. Put stop members at the front and back of rear wheels;
- jack up the tractor front part (or front wheels one by one), ensuring clearance between the wheels and the ground;
- to obtain the track by displacing the wheel from one sideboard to the other one without changing disk position in relation to the rim, unscrew the retaining nuts of the wheel disk to the gear group flange, take the wheels off and change from one sideboard to the other one,
- to obtain the track by changing disk position in relation to the rim with the wheels taken off the tractor, unscrew the retaining nuts of the wheel rim to the disk, and depending on the track required, set mutual arrangement of the rim and the disk as shown in the diagram in table 3.2.5.

Mounting the wheels make sure the wheel rotation direction at forward movement coincides with the direction of an arrow on tire side.

The tightening torque for the retaining nuts of disks to the gear group flanges shall make 200 to 250 Nm;

The tightening torque for the retaining nuts of disks to the rim brackets shall make 180 to 240 Nm.

ATTENTION: AFTER MOUNTING THE WHEELS, CHECK THE NUTS FOR TIGHTENING AFTER THE FIRST OPERATION HOUR, AFTER 10 OPERATION HOURS AND EVERY NEXT 125 HOURS OF OPERATION!

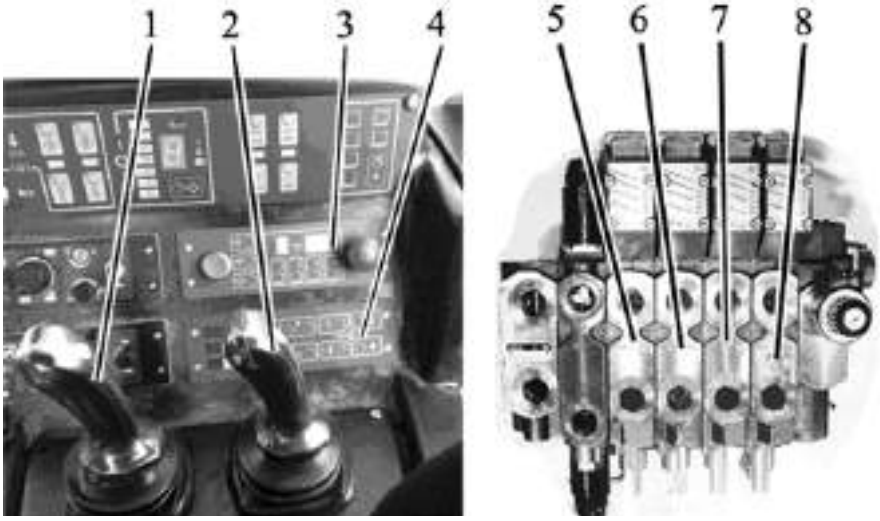
ATTENTION: AFTER CHANGING THE FRONT WHEEL TRACK, CARRY OUT CHECK AND ADJUSTMENT OF FRONT WHEEL TOE-IN. BEFORE CHECKING TOE-IN, CONTROL AND, IF NECESSARY, ADJUST THE GAPS IN STEERING JOINTS!

3.2.12 Examples of operations programming by control of EHS hydraulic distributive valve sections

3.2.12.1 Elements for control and programming of EHS hydraulic distributive valve sections

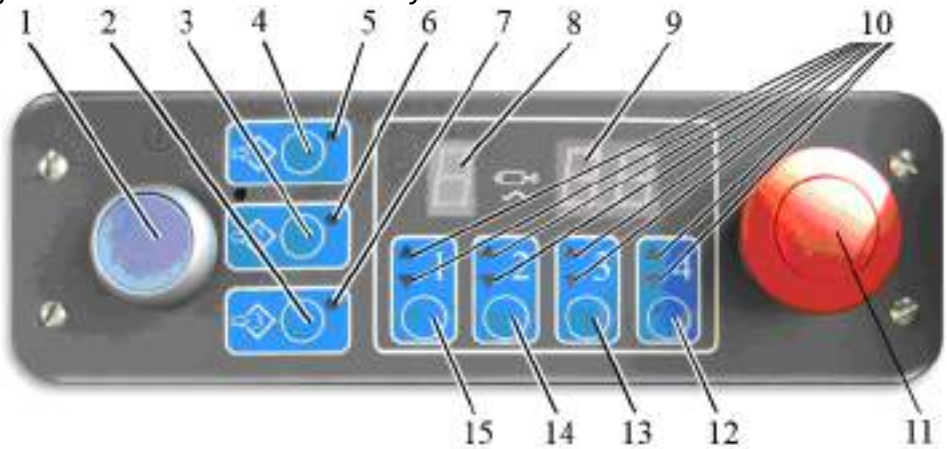
Elements for control and programming of EHS hydraulic distributive valve sections are shown in figures 3.2.6, 3.2.7, 3.2.8.

Note – General information on control rules and programming principles for operation of EHS hydraulic distributive valve sections is given in subsection 2.19 “Electronic control system for hydraulic distribution valve EHS sections”. This subsection 3.2.12 provides examples of programming by means of joysticks “BOCORO”.



1 – control joystick for hydraulic distributive valve sections No.1 and No.2; 2 – control joystick for hydraulic distributive valve sections No.3 and No.4; 3 – operations programming unit for HLL (OPU for HLL); 4 – electronic combined panel (ECP); 5 – hydraulic distributive valve section No.1; 6 – hydraulic distributive valve section No.2; 7 – hydraulic distributive valve section No.3; 8 – hydraulic distributive valve section No.4

Figure 3.2.6 – Control of EHS hydraulic distributive valve sections



1 – power cutoff switch of OPU for HLL; 2 – button for programme No.3; 3 – button for programme No.2; 4 – button for programme No.1; 5 – annunciator for programme No.1; 6 – annunciator for programme No.2; 7 – annunciator for programme No.3; 8 – digital indicator for the operating section number of the hydraulic distributive valve; 9 – digital indicator for oil flow amount on the operating section; 10 – uplift and lowering annunciators for the corresponding sections of the hydraulic distributive valve; 11 – switch “STOP” for emergency shut-down of the hydraulic distributive valve; 12 – selection button for the hydraulic distributive valve section No.4; 13 – selection button for the hydraulic distributive valve section No.3; 14 – selection button for the hydraulic distributive valve section No.2; 15 – selection button for the hydraulic distributive valve section No.1.

Figure 3.2.7 – Operations programming unit for HLL

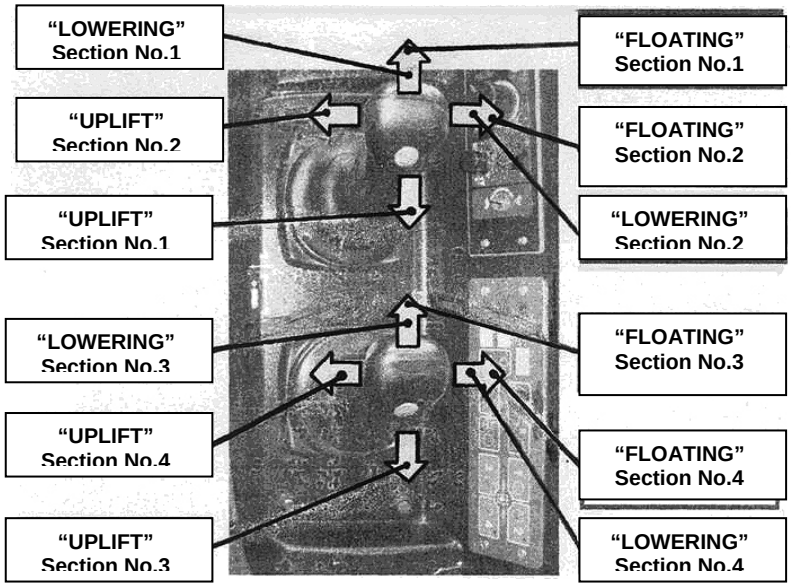


Figure 3.2.8 – Diagram for hydraulic distributive valve control from joysticks (manual mode)

Note – figure 3.2.8 shows the diagram for control of the hydraulic distributive valve sections by means of electronic joysticks "BOCORO" unit. The diagram for joysticks BED-01 control is similar to the diagram in figure 3.2.8. The rules for switching on "floating" position for both types of joysticks are given in subsection 2.19.2 "Electronic joystick unit".

3.2.12.2 Example of control operations programming for reversible plough by means of OPU for HLL

This clause provides information on the variant of tractor operation coupled with reversible plough, when EHS hydraulic distributive valve section No.1 is connected with the cylinder providing plough revolution, section No.2 is connected with the cylinder providing adjustment of plough width, section No.3 – with the cylinder providing plough uplift-lowering.

For operation in the automatic mode, two programmes are required.

Programme No.1 provides automatic execution of the following operations:

- plough uplift from the operating position;
- decrease of plough width up to minimal;
- plough revolution into the operating position (from left to right);
- increase of plough width to the required one;
- plough lowering into the operating position.

To record programme No.1 it is required to do as follows:

- switch on OPU for HLL by pressing button 1 (figure 3.2.7);

ATTENTION: BEFORE STARTING THE PROCESS OF PROGRAMME NO.1 RECORDING IN THE MODE OF MANUAL CONTROL, IT IS REQUIRED TO PUT THE PLOUGH INTO THE REQUIRED POSITION (TURN THE PLOUGH TO THE EXTREME LEFT POSITION, SET THE REQUIRED PLOUGH WIDTH, LOWER THE PLOUGH INTO THE OPERATING POSITION)!

- press button 4 (programme No.1) and hold it in this position. After two seconds, OPU for HLL forms an audible signal, switches on indicator 5 in the mode of quick flashings and passes to the programming mode (memorizing the manipulations carried out by the joystick);
- press selection buttons 13, 14, 15 for EHS hydraulic distributive valve sections No.3, No.2, No.1 correspondingly. Uplift and lowering annunciators 10 for these sections shall switch on at the same time in the mode of slow flashings;

- uplift the plough from the operating position by means of joystick 2 (figure 3.2.6), controlling on section No.3;
- decrease the plough width up to minimal by means of joystick 1, controlling on section No.2;
- turn the plough from the extreme left to the extreme right position by means of joystick 1, controlling on section No.1;
- set the required plough width by means of joystick 1, controlling on section No.2;
- lower the plough into the operating position by means of joystick 2, setting “floating” position on section No.3 (by doing so, indicator 9 (figure 3.2.7) displays “FL”);
- repeatedly press selection buttons 13, 14, 15 (figure 3.2.7) for EHS hydraulic distributive valve sections No.3, No.2, No.1 (recording on sections is finished);
- to finish programming, press button 4 of the recordable programme No.1.

Programme No.2 provides automatic execution of the following operations:

- plough uplift from the operating position;
- decrease of plough width up to minimal;
- plough revolution to the extreme opposite position (from right to left);
- increase of plough width to the required one;
- plough lowering into the operating position.

To record programme No.2 it is required to do as follows:

- switch on OPU for HLL (in case it is off) by pressing button 1 (figure 3.2.7);

ATTENTION: BEFORE STARTING THE PROCESS OF PROGRAMME NO.2 RECORDING IN THE MODE OF MANUAL CONTROL, IT IS REQUIRED TO PUT THE PLOUGH INTO THE REQUIRED POSITION (TURN THE PLOUGH TO THE EXTREME RIGHT POSITION, SET THE REQUIRED PLOUGH WIDTH, LOWER THE PLOUGH INTO THE OPERATING POSITION)!

- press button 3 (programme No.2) and hold it in this position. After two seconds, OPU for HLL forms an audible signal, switches on indicator 6 in the mode of quick flashings and passes to the programming mode (memorizing the manipulations carried out by the joystick);
- press selection buttons 13, 14, 15 for EHS hydraulic distributive valve sections No.3, No.2, No.1 correspondingly. Uplift and lowering annunciators 10 for these sections shall switch on at the same time in the mode of slow flashings;
- uplift the plough from the operating position by means of joystick 2 (figure 3.2.6), controlling on section No.3;
- decrease the plough width up to minimal by means of joystick 1, controlling on section No.2;
- turn the plough from the extreme right to the extreme left position by means of joystick 1, controlling on section No.1;
- set the required plough width by means of joystick 1, controlling on section No.2;
- lower the plough into the operating position by means of joystick 2, setting “floating” position on section No.3 (by doing so, indicator 9 (figure 3.2.7) displays “FL”);
- repeatedly press selection buttons 13, 14, 15 (figure 3.2.7) for EHS hydraulic distributive valve sections No.3, No.2, No.1 (recording on sections is finished);
- to finish programming, press button 3 of the recordable programme No.2.

ATTENTION: MAXIMAL PERMISSIBLE DURATION FOR RECORDING OF EACH PROGRAMME SHALL NOT EXCEED 200 SECONDS!

Taking into account novelty of joystick control, peculiarities of programming and absence of experience when trying out the first programmes, it is recommended to study the instruction to the coupled implement or agricultural machine carefully before starting the process of programming and to draw out a sequential diagram for joystick control (programme algorithm) with indication of joystick movement direction. It will allow to save time for technological operations on implements and agricultural machines control during the operation process.

Based on the above description of programme No.1, the diagram for joystick control looks as it is shown in table 3.2.6:

Table 3.2.6 – Diagram for joysticks control when forming programme No.1

Joystick position (figure 3.2.6)	Directions of joystick movement				
1		←	↑	→	
2	↓				↑

The arrows show the direction of joystick movement:
↓ - backward; ← - left; → - right; ↑ - forward.

For programme No.2, the diagram for joystick control looks as it is shown in table 3.2.7:

Table 3.2.7 – Diagram for joystick control when forming programme No.2

Joystick position (figure 3.2.6)	Directions of joystick movement				
1		←	↓	→	
2	↓				↑

Availability of these diagrams allows to get oriented easily when controlling joysticks.

ATTENTION: BEFORE CARRYING OUT PROGRAMME NO.1, MAKE SURE THAT THE PLOUGH IS IN THE CORRESPONDING POSITION – THE PLOUGH IS TURNED TO THE EXTREME LEFT POSITION, THE REQUIRED PLOUGH WIDTH IS SET, THE PLOUGH IS LOWERED INTO THE OPERATING POSITION!

BEFORE CARRYING OUT PROGRAMME NO.2, MAKE SURE THAT THE PLOUGH IS IN THE CORRESPONDING POSITION – THE PLOUGH IS TURNED TO THE EXTREME RIGHT POSITION, THE REQUIRED PLOUGH WIDTH IS SET, THE PLOUGH IS LOWERED INTO THE OPERATING POSITION!

When operating the tractor, for tryout of the recorded programmes No.1 and No.2 it is necessary to carry out the following operations:

- before entering the run, it is necessary to press button 4 (figure 3.2.7) for a short time (less than two seconds). There automatically starts the execution of programme No.1: the plough is uplifted from the operating position, plough width is decreased up to minimal, the plough starts turning from left to right. In the upper (transport) position of the plough, it is required to deflect any of joysticks from the neutral position to the control side for a short time on the section involved in the programme. Indicators 8, 9 display “PAU” (pause), annunciator 5 for engaged programme No.1 starts blinking (programme tryout stops for a time). In this position it is required to approach the field edge (the start of first run) and repeatedly press button 4 for programme No.1 to finish (continue) its tryout. The plough continues its further turn to the right (into the operating position), the plough width is increased, the plough is lowered into the operating position;
- when entering the run, it is required to provide lowering of the plough front part from control console for rear lift linkage 32 (figure 2.1.1) as this operation can not be programmed in OPU for HLL;
- when going out of the run, it is required to provide uplift of the plough front part from control console for rear lift linkage 32 (figure 2.1.1) as this operation can not be programmed in OPU for HLL;

- press button 3 (figure 4.2.4) for a short time. There starts an automatic tryout of programme No.2: the plough is uplifted from the operating position, the plough width is decreased up to minimal and the plough is turned to the extreme opposite position (from right to left). In the upper (transport) position of the plough, it is required to deflect any of joysticks from the neutral position to the control side for a short time on the section involved in the programme. Indicators 8, 9 display “PAU” (pause), annunciator 6 for engaged programme No.2 starts blinking (programme tryout stops for a time). After tractor turning (the plough is in transport position) and entering a new run, it is required to press button 3 for programme No.2 again to finish (continue) its tryout. The plough continues its further turn to the right (into the operating position), the plough width is increased, the plough is lowered into the operating position;

- when entering the run, it is required to provide lowering of the plough front part from control console for rear lift linkage 32 (figure 2.1.1) as this operation can not be programmed in OPU for HLL;

- when going out of the run, it is required to provide uplift of the plough front part from control console for rear lift linkage as this operation can not be programmed in OPU for HLL;

- short-time pressing button 4 (figure 3.2.7) starts execution of programme No.1: the plough is uplifted from the operating position, plough width is decreased up to minimal, the plough starts turning from left to right. In the upper (transport) position of the plough, it is required to deflect any of joysticks from the neutral position to the control side for a short time on the section involved in the programme (programme tryout stops for a time). After tractor turning (the plough is in transport position) and entering a new run, it is required to press button 4 for programme No.1 again to finish its tryout, preliminarily lowering the plough front part from control console for rear lift linkage 32 (figure 2.1.1), etc.

3.2.12.3 Example of control operations programming for a seeding machine by means of OPU for HLL

While control operations programming for a seeding machine, it is necessary first to take into consideration seeding machine requirements set forth in its operation manual. The algorithm for seeding machine control shall be made with regards to requirements for its control while entering the run and going out of it.

This clause provides information on the variant of tractor operation coupled with seeding machine, the hydraulic fan drive motor of which is connected with section No.1, cylinder distributive valve for markers uplift-lowering – to section No.2, cylinder for seeding machine uplift-lowering – to section No.3.

For operation in the automatic mode, it is required to program three programmes.

To carry out control operations programming for a seeding machine, it is required to switch on OPU for HLL 3 (figure 3.2.7) by pressing button 1.

Programme No.1 provides engagement of hydraulic fan drive motor.

To record programme No.1 it is required to do as follows:

- press button 4 (figure 3.2.7) and hold it in a pressed position until an audible signal gets activated (about two seconds) and annunciator 5 starts blinking;
- press selection button 15 for distributive valve EHS section No.1. Annunciators for uplift and lowering 10 of this section shall start blinking;
- when controlling on section No.1, using joystick 1 (figure 3.2.6), deflect it backwards to the level corresponding to the required fan revolutions. Holding joystick 1 in this position, press button 15 (figure 3.2.7) with the other hand, and then button 4.

Programming for fan drive control is completed.

On tractors equipped with the electronic joysticks unit BED-01, programming for engagement of the hydraulic fan drive motor can be carried out by means of a joystick without OPU for HLL. For doing this, when controlling on section No.1, deflect joystick 1 (figure 3.2.6) backwards to the position corresponding to the required fan revolutions and, holding it in this position, press the button on the joystick (from above), after which set the joystick to the neutral position.

The fan shall rotate with the set revolutions until it is switched off (by the repeated deflection of joystick 1 backwards and pressing the button from above).

Programme No.2 provides automatic execution of the following operations:
- marker retraction;
- seeding machine uplift from the operating position.

To record programme No.2 it is required to do as follows:
- switch on OPU for HLL (in case it is off) by pressing button 1 (figure 3.2.7);

ATTENTION: BEFORE CARRYING OUT THE PROCESS OF PROGRAMME NO.2 RECORDING, IT IS REQUIRED TO SET THE SEEDING MACHINE IN THE MODE OF MANUAL CONTROL TO THE REQUIRED POSITION (THE HYDRAULIC FAN DRIVE MOTOR IS SWITCHED ON, THE MARKERS ARE EXPANDED, THE SEEDING MACHINE IS LOWERED TO THE OPERATING POSITION).

- press button 3 (figure 3.2.7) and hold it in a pressed position until an audible signal gets activated (about two seconds) and annunciator 6 starts blinking;
- press selection buttons 13, 14 for distributive valve EHS sections No.3 and No.2 correspondingly. Annunciators for uplift and lowering 10 of these sections shall start blinking;
- uplift the marker using joystick 1 (figure 3.2.6), controlling on section No.2;
- uplift the seeding machine using joystick 2, controlling on section No.3;
- repeatedly press selection buttons 13, 14 (figure 3.2.7) for distributive valve EHS sections No.3 and No.2 (recording on sections is finished);
- to finish programming, press button 3 of the recordable programme No.2.

Programme No.3 provides automatic execution of the following operations:
- lowering of the seeding machine and setting of the floating position;
- marker expansion.

To record programme No.3 it is required to do as follows:
- switch on OPU for HLL (in case it is off) by pressing button 1 (figure 3.2.7);

ATTENTION: BEFORE CARRYING OUT THE PROCESS OF PROGRAMME NO.3 RECORDING, IT IS REQUIRED TO SET THE SEEDING MACHINE IN THE MODE OF MANUAL CONTROL TO THE REQUIRED POSITION (THE HYDRAULIC FAN DRIVE MOTOR IS SWITCHED ON, THE MARKERS ARE RETRACTED, THE SEEDING MACHINE IS IN A CONSTANTLY UPLIFTED POSITION).

- press button 2 (figure 3.2.7) and hold it in a pressed position until an audible signal gets activated (about two seconds) and annunciator 7 starts blinking;
- press selection buttons 13, 14 for distributive valve EHS sections No.3 and No.2 correspondingly. Annunciators for uplift and lowering 10 of these sections shall start blinking;
- set “floating” position using joystick 2 (figure 3.2.6), controlling on section No.3, by doing so annunciator 9 (figure 3.2.7) displays FL;
- expand the marker using joystick 1 (figure 3.2.6), controlling on section No.2;
- repeatedly press selection buttons 13, 14 (figure 3.2.7) for distributive valve EHS sections No.3 and No.2 (recording on sections is finished);
- to finish programming, press button 2.

ATTENTION:

BEFORE EXECUTION OF PROGRAMME NO.2, MAKE SURE THAT THE SEEDING MACHINE IS IN THE CORRESPONDING POSITION - THE HYDRAULIC FAN DRIVE MOTOR IS SWITCHED ON, THE MARKERS ARE EXPANDED, THE SEEDING MACHINE IS LOWERED INTO THE OPERATING POSITION!

BEFORE EXECUTION OF PROGRAMME NO.3, MAKE SURE THAT THE SEEDING MACHINE IS IN THE CORRESPONDING POSITION – THE HYDRAULIC FAN DRIVE MOTOR IS SWITCHED ON, THE MARKERS ARE RETRACTED, THE SEEDING MACHINE IS IN THE UPLIFTED POSITION!

When operating the tractor, to tryout the recorded programmes No.1, No.3 and No.2, it is required to do as follows:

When entering the first run, first it is required to engage the fan drive (press button 4 (figure 3.2.7) for a short time) to tryout programme No.1. At the beginning of the run (from the seeding machine transport position), it is required to press button 2 for a short time to try out programme No.3 for seeding machine lowering and marker expansion.

When going out of the run, the seeding machine shall be transferred from the operating to transport position (retract the marker, uplift the seeding machine). For doing so, it is required to press button 3 for a short time to try out programme No.2.

The hydraulic fan drive motor gets switched off at the end of field operation by repeated pressing button 4 for a short time.

3.3 Safety measures while tractor operation

3.3.1 General safety measures while tractor operation

The cab complies with category 2 under EN 15695-1:2009. This category cab ensures protection against dust, but not against sprays and vapor – the tractor shall not be used under conditions, requiring protection against sprays and vapor.

Do not operate the tractor in a closed room without required ventilation. Exhaust gases may result in lethal outcome!

Tractor start-up and operation with the hood opened is not allowed.

It is forbidden to open the hood when the engine is running.

Do not start the engine when staying outside the operator's seat. Starting the engine and manipulating the controls, always stay inside the cab in the operator's seat.

Do not start the engine by way of towing.

Before starting the engine, engage the parking brake, the rear (front) PTO shall be disengaged, the range shifting lever shall be in “Neutral” position.

During the tractor start no people are allowed to be under the tractor, in front of or behind it, as well as between the tractor and the coupled implement or trailer.

Before engine stop, set gear “0” by means of GB gear shifting joystick.

Before starting the movement, warn people around including people operating the coupled implements using the horn, make sure the parking brake is off and start moving slowly.

Use safety harnesses (supplied against order) during transport operations.

A passenger staying in the cab during tractor operation is strictly forbidden. (A passenger may stay in the cab only when an additional seat is installed and during transport operations only).

Do not leave the tractor on the move.

Performing transport operations observe traffic regulations, adopted in your country.

Drive the tractor on slippery roads with automatic DL engaged only at a speed of not higher than 10 km/h.

Using the tractor for transport operations, do the following:

- on tires 480/65R24 set a track for front wheels (1815±20) and rear wheels (1940±20) mm;
- on tires 420/70R24 set a track (1940±20) for front wheels and (1940±20) for rear wheels, mm;
- check the brakes workability, interlock brake pedals, check and if necessary adjust the brakes for the synchronism of operation;
- check the parking brake workability;
- check the condition of devices for light and sound annunciation, transport trailers shall have rigid hitches and shall be linked with a safety chain or a cable;
- never move downhill with the gear disengaged. Move uphill and downhill at the same gear.

It is forbidden to operate with a trailer without independent brakes, if its weight exceeds a half of a total actual weight of the tractor. The faster you move and the more weight you tow, the bigger safety distance shall be.

It is forbidden to drive the tractor with twinned wheels on public roads!

People transportation inside trailers is forbidden.

Before starting the operation with a trailer, turn on the pneumatic compressor, check the condition of the trailer brake pneumatic drive and air pressure in the system. Remove the failures detected. Make sure to connect the trailer brake pneumatic drive. Carry out the connection of the trailer connecting head to the tractor connecting head with the parking brake engaged.

Do not work under raised agricultural implements. Do not leave implements uplifted when stopping for a long time.

Trailers attached to the tractor shall have a braking system, ensuring:

- trailer brake during the movement;
- brake engagement in case of trailer detachment from the tractor;
- holding the trailer when staying on slopes;
- prevention of trailer from pushing the tractor when the travel speed is changed abruptly.

The trailer shall be linked to the tractor by means of a safety chain.

It is required to check operation of the braking system of tractor-trailer train at a speed of 3 to 5 km/h.

The travel speed at access ways and at passways shall not exceed 10 km/h.

While loading (unloading) the trailer, engage the parking brake of the tractor.

While driving on public roads, turn on a flashing beacon, if mounted.

Do not stop the tractor on slopes. If there is a necessity to stop the tractor, engage the parking brake.

While working on the slopes, increase the tractor track to the max.

While working on the slopes with an angle of more than 20°, set the max. rear wheel track.

Before leaving the cab, disengage the rear (front) PTO, stop the engine, engage the parking brake and remove the key from the starter switch.

If the engine or the steering is broken down, stop the tractor immediately. Remember that with the engine stopped, tractor operation requires greater force applied to the steering wheel.

In case of a failure, stop the tractor immediately and eliminate the failure.

Avoid leakage of electrolyte, coolant, fuel, oil and braking fluid.

Use summer and winter grades of fuel correctly. Fill in the fuel tank at the end of each day to decrease night condensation of moisture. Fill the tractor only with grades of oil and lubricants recommended by the manufacturer. It is strictly forbidden to use other lubricants.

It is forbidden to turn off the system of electrical equipment with the AB disconnect switch with the engine running.

Operate the tractor at night-time with lighting devices on and being in good working order.

If used improperly, your tractor can be dangerous for you and for other people. Avoid using equipment not intended for installation on the tractor.

Make sure any additional equipment or auxiliary units are mounted correctly and that they are intended to be used with your tractor.

To prevent the tractor from turning over, observe the following precaution measures when operating the tractor:

- choose safe speed, corresponding to road conditions, especially when moving cross-country, when crossing ditches, slopes and at sharp turns;
- turn round corners with a speed not higher than 5 km/h, on a slippery road – not higher than 3 km/h.
- move down the hill with first or second gear engaged.

Note – This list of precaution measures is not exhaustive. To avoid turning over, be always careful when operating the tractor.

It is forbidden to use the tractor at work where there is a possibility for the tractor to turn over.

Do not operate the tractor with gages out of order.

It is not allowed to inflate tires without pressure control.

While coupling the tractor with agricultural implements, additionally observe safety measures concerning the use of these implements.

Before coupling the tractor with agricultural implements, make sure the automatic grips of the lower and upper links of the RLL are clean and faultless. It is forbidden to operate with the automatic grips out of order, with their inner cavities stuffed with dirt and foreign particles.

If the tractor front part rises from the ground when heavy implements are hinged on the mechanism of the rear lift linkage, mount front ballast weights.

Do not work under raised agricultural implements. Do not leave implements uplifted when stopping for a long time.

Before lifting and lowering a hinged agricultural implement and also when turning the tractor, make sure there is no danger of catching somebody or stumbling on the hurdle.

The mounted and semi-mounted machine shall be lowered into its operating position and uplifted into the transport position only with a straight-line movement of the assembly unit.

To avoid breakdown of the tractor or the agricultural implement, drive and turn the tractor assembly with the agricultural implement uplifted only after you make sure the rear PTO is disengaged.

While linking and hinging the agricultural machines and implements on the tractor, the rear operator shall stay at a safety distance until the operation is fully stopped. The linkage (hinge) shall be started only after the tractor operator gives a command.

While linking the machine cardan shaft to the PTO, disengage the PTO, stop the tractor with the parking brake and stop the engine.

After disconnecting the machines driven by the PTO, remove the cardan drive and cover the PTO shaft end extension with the protective cap.

Cardan shafts, transferring torque from the tractor PTO to the implement working units, shall be safeguarded.

While operating with stationary machines, driven by the PTO, always engage the parking brake and lock rear wheels at the front and at the back. Make sure the machine is securely fixed.

Make sure the safeguards of the PTO shaft end extensions are mounted and, if the PTO is not used, put back the cap of the PTO shaft end extension.

Do not wear loose clothes when working with the PTO or near rotating equipment.

To avoid breakdown of the tractor or the agricultural machine, turning the tractor assembly is possible only after the working units of the machine have been fully raised from the ground.

When tractor assemblies are operating in a column, they shall have an interval not less than 30 m between each other.

Depending on operation conditions, use natural ventilation of the cab or the unit of air cooling and heating.

During tractor operation, the operator shall use standard means of protection for hearing organs.

In case the tractor assembly is operated or is driven in an area of power transmission lines, a distance between the top of the tractor assembly and wires shall conform to table 3.3.1.

Table 3.3.1

Line voltage, кV, up to	11	20-25	110	154-220	330-500
Horizontal distance, m, at least	1,5	2	4	6	9
Vertical distance, m, at least	1	2	3	4	6

3.3.2 Fire safety measures

The tractor shall be equipped with fire-fighting equipment, i.e. a shovel and a dry powder fire extinguisher.

OPERATING THE TRACTOR WITHOUT FIRE-FIGHTING EQUIPMENT IS FORBIDDEN.

The tractor must be filled with fuel and lubricants by a mechanic way and with the engine stopped. Use lighting at night time. It is not recommended to fill in tanks using buckets.

IT IS FORBIDDEN TO FUEL IN THE TRACTOR WITH THE ENGINE RUNNING.

DO NOT SMOKE WHEN FUELING IN THE TRACTOR.

Do not fuel the tanks to the max. Leave at least 3% of tank volume empty for fuel to expand.

Do not add petrol or mixtures to diesel fuel. This combination may create increased danger of inflammation or explosion.

Places for tractor parking, storing of fuel and lubricants shall have a plowed around band of not less than 3 m width and also be provided with fire extinguishing means.

During repair works in the field using electric gas welding proceed as follows:

- turn the storage battery switch off;
- remove plant debris from parts and assembly units;
- detach wires from the battery terminals. Insulate the wire tips to avoid accidental contact with the battery terminals;
- disconnect the wire bundle connector from the engine electronic control unit;
- if you want to carry out welding work on the tractor close to any electronic component this component must be removed for the time of welding;
- earth the welding machine as close to the place of welding as possible;
- after completion of welding observe polarity when connecting the wires to the terminals of the battery.

Prevent the manifold and muffler from getting dirty with fuel, thatch, etc.

Avoid thatch winding around rotating parts of the tractor and the implements coupled with the tractor.

Washing parts and assembly units with kerosene, gasoline or diesel fuel take care to exclude a possibility of inflammation of flushing fluid vapor.

IT IS FORBIDDEN TO OPERATE THE TRACTOR IN PLACES SUBJECTED TO FIRE RISK WITH THE FACING AND PROTECTIVE UNITS REMOVED.

Do not use open fire to warm up oil in the engine sump, to fill in fuel tanks, to burn out dirt in a radiator cell and in other units of the tractors.

In case fumigation or a fire bed occurs, stop the tractor immediately, kill the engine and turn the battery switch off. To liquidate the fire bed use a dry-powder fire extinguisher or pour some sand onto it, cover with canvas cloth, sackcloth or other dense texture. Do not pour water over burning fuel and oil.

Make sure there are no flammable materials near the exhaust manifold and the muffler during engine running.

Harvesting hay and thatch, operating at places with enhanced danger of fire, avoid amassment of inflammable materials on a muffler guard and on gas links.

During the daily maintenance you are to perform the following operations obligatory:

- inspect the condition of wiring, wire bundles in the engine compartment and in the area of the front wall of the cabin and also the condition of visible parts for abrasion, thermal reflow or destruction of outer insulation. In the case the listed defects are discovered, take measures to eliminate the identified insulation faults as well as the cause that has promoted the insulation faults;
- inspect the hydraulics components. In case there is sweat and leakage, it should be eliminated by tightening the threaded connections. Pipes and high-pressure hoses having cracks, cuts or damages must be replaced.

To avoid burning of the tractor wiring never use fuse cutouts for higher current rates than those specified in subsection 2.20 “Switching unit, switching and security unit and electric cutout fuses”.

DO NOT INSTALL WIRE BRIDGES AND OTHER CURRENT CONDUCTIVE ELEMENTS MADE BY HANDICRAFT TECHNIQUE, TO REPLACE FUSE CUTOUTS.

Turn the battery switch off when finishing to operate the tractor.

3.4 Tractor final assembly and run-in

3.4.1 Tractor final assembly

"BELARUS-2122.6" tractors are supplied to a consumer ready assembled, final assembly is not required.

3.4.2 Technical maintenance before tractor run-in

Before placing a new tractor in operation, do the following:

- wash the tractor, remove preservative lubricant (if any on the tractor);
- inspect the tractor carefully, check it for completeness and availability of instruction manuals;
- remove accumulator batteries, set them into working condition and mount back;
- check outer threaded joints for tightness and tighten more, if necessary;
- make sure visually, that pipelines, aggregates of lubrication, feeding and cooling and SCR systems are leakless;
- check oil level in the engine oil sump, in the transmission, in FDA case tubes, in cases of FDA wheel gear groups, in HLL and HSC oil tanks, in FPTO reduction unit and if necessary, add oil according to section 5 "Maintenance";
- check brake fluid level in the main cylinder tanks of hydrostatic clutch drives and in the tanks of service brakes, if necessary add brake fluid according to section 5 "Maintenance";
- drain the available fuel from the fuel tank and fill the fuel tank with new settled fuel: in winter – winter grade, in summer – summer grade;
- drain AdBlue reagent available in tank and refill the tank with fresh AdBlue reagent in the quantity (28±1) liters which corresponds to the tank filling volume;
- fill the engine cooling system with coolant to the upper edge of the radiator filler neck, fill the expansion tank with coolant till the coolant level in the expansion tank is 50…60 mm below the level of filler neck edge;
- check and if necessary, adjust the tire pressure to a desired value in accordance with subsection 3.2.8. "Selection of optimal inner pressure in tires depending on operational conditions and load on tractor axles";
- make sure protective guard shields (for PTO shaft end extensions, etc.) are available;
- check engine, lighting and warning devices workability, brakes and steering control workability, and functioning of other systems and units of the tractor using standard control gages.

Before starting to run in, check tightness of retaining bolts of the hubs (the tightening torque shall make from 550 to 600 Nm), tightness of the retaining nuts of rear wheels to the hub (the tightening torque shall make from 700 to 750 Nm), the retaining nuts of front wheel disks to FDA gear group flanges (the tightening torque shall make from 200 to 250 Nm). On wheels with tires 420/70R24, check the tightening for retaining nuts of front wheel disks to rim brackets (the tightening torque shall make from 180 to 240 N·m).

3.4.3 Tractor run-in

ATTENTION: THE FIRST 30 HOURS OF TRACTOR OPERATION HAVE GREAT INFLUENCE ON OPERATIONAL PARAMETERS AND LIFE SPAN OF THE TRACTOR. YOUR TRACTOR WILL FUNCTION PROPERLY FOR A LONG TIME PROVIDING YOU CARRY OUT THE RUN-IN CORRECTLY AND PERFORM OPERATIONS ON TECHNICAL MAINTENANCE IN TERMS SPECIFIED IN SECTION 5 "MAINTENANCE"!

ATTENTION: IT IS OBLIGATORY THAT YOU CARRY OUT TRACTOR RUN-IN FOR 30 HOURS! LOAD THE TRACTOR UP TO 80 % OF ITS RATED POWER BEFORE THE FIRST TECHNICAL MAINTENANCE (TM-1) (125 HOURS)!

Start the engine. Let the engine run at idle speed for five minutes with gradual increase of the rotation speed up to 1600 rpm, then run in under load for 30 operation hours.

While carrying out a 30-hour run-in, follow the instructions below:

- constantly inspect gage indications, operation of lubrication system, cooling system and power supply system. Control levels of oil and fluids in refill capacities;
- check outer fastening links for tightness and tighten them regularly;
- do not overload the engine, avoid engine smoking and speed decrease. The features of overload are sharp decrease of speed, smoking and absence of engine reaction to increase of fuel feed. Operation at high gear under load results in excessive wear of friction parts of the engine;
- tractor operation at lower gear under small load and with increased speed of the engine will result in fuel overconsumption. The correct selection of gear for each specific condition of operation ensures fuel economy and reduces engine wear;
- avoid prolonged engine operation without load in a mode of max. or min. speed of the engine;
- for correct break-in of the clutch friction parts during the run-in process, engage the clutch more often and more smoothly.

ATTENTION: EXHAUST GASES HAVE OUTPUT TEMPERATURE FROM 500 TO 600°C, THEREFORE THERMAL DAMAGE OF PAINT-AND-VANISH COATING OF EXHAUST MANIFOLD AFTER FIRST ENGINE OPERATING HOURS IS NOT A SIGN OF MALFUNCTION IN ENGINE OPERATING PROCESS!

3.4.4 Technical maintenance during tractor run-in

After the first tractor operation hour check tightening of retaining nuts of rear wheels to the hub, retaining nuts of front wheels to FDA gear group flanges and retaining nuts of the front wheel disks to the rim brackets. Then inspect the wheel tightening every eight hours during the run-in.

During the run-in process regularly carry out operations on shift-time technical maintenance according to the instructions specified in section 5 “Maintenance” of this manual.

3.4.5 Technical maintenance after tractor run-in

After the tractor run-in, do the following:

- carry out shift-time maintenance operations;
- inspect and wash the tractor, clean the cab;
- make sure visually, that pipelines, aggregates of lubrication, feeding and cooling and SCR systems are leakless;
- listen to the operation of all tractor components;
- check tightening of retaining nuts of rear wheels to the hub, retaining nuts of front wheels to FDA gear group flanges and retaining nuts of the front wheel disks to the rim brackets;
- tighten two lock nuts M27x1,5 (with left and right thread) of the steering link tube with a torque of 100 to 140 N·m and two crown nuts M20x1,5 of the steering link ball pins. To tighten the crown nuts, remove the cotter pin first, tighten each crown nut with a torque of 100 to 140 N·m, then turn each crown nut until the nearest notch on the nut coincides with a hole in the ball pin and then fasten with a cotter pin.
- check and if necessary, tighten outer threaded links;
- drain condensate from the pneumatic system receivers;
- drain sediment from fuel tanks and from the fuel coarse and fine filters;
- check the state of accumulator batteries, clean terminal connections and ventilation holes;

- check brake fluid level in the main cylinder tanks of hydrostatic clutch drives and in the tanks of service brakes, if necessary add it;
- check and if required, adjust free movement of the clutch pedal, of the service and parking brakes control and the brake valve drive of pneumatic system;
- drain oil from the transmission. Then replace both changeable filter cartridges for duplex filter of the transmission hydraulic system and clean the rotor of the gearbox centrifugal oil filter and the gearbox net filter. Fill the transmission with new oil;
- check and if necessary, adjust drive belts tension;
- check and if necessary, tighten engine outer threaded connections and engine mounting;
- replace oil in the housings of wheel-hub drives and FDA housing;
- replace oil in the FPTO reduction unit housing, if it was used during tractor running-in;
- replace oil in the engine crankcase;
- replace the engine oil filter;
- check and if required tighten the retaining bolts of cylinder heads;
- check and if required adjust clearance between the valves and rockers arms;
- replace oil in the housings of the wheel gear groups and in the FDA housing;
- check lubrication in all assembly units according to clause 3 of table 5.8.1. In the places where lubrication is required - lubricate or replace the lubricant;
- check and if necessary, restore hermiticity of the air cleaner and inlet line;
- control engine operation, steering, brakes, operation controls, lighting and warning systems.

3.5 Emergency actions

3.5.1 To stop the tractor immediately, sharply depress clutch and brake pedals together.

3.5.2 For emergency engine stop, turn the key of the starter and instrument switch from “I” position to “0” position according to the diagram provided in figure 2.2.2.

3.5.3. In case of an accident, stop the engine immediately, brake the tractor, deactivate accumulator batteries and leave the tractor cab through one of the emergency exits, opening the left or right cab door, depending on tractor position, or rear window, or one of side windows. To open side windows, it is required to turn the handle for opening the window to the working position (working position – the window is opened), then press the handle in the direction opposite to the tractor forward movement until the guide pin fully goes out, and open the window completely. If it is not possible to open the emergency exits, break the window of an emergency exit with a heavy subject at hand and leave the tractor cab.

Note – The location of emergency exits is given in subsection 2.21 “Cab locks and handles”.

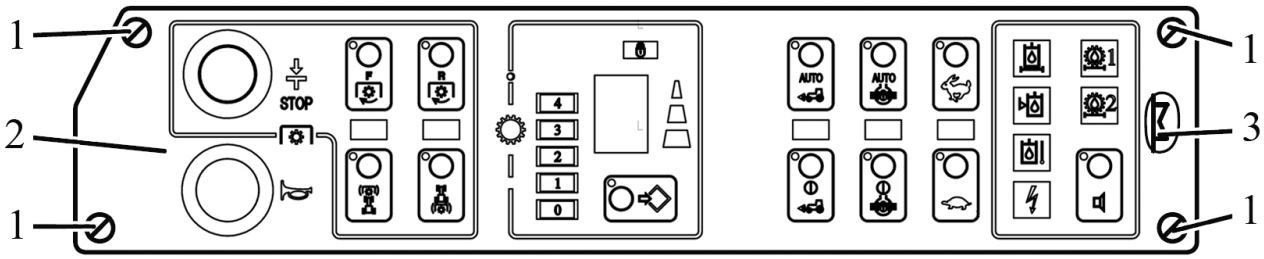
3.5.4 In case the engine crankshaft speeds up excessively, stop the engine and brake the tractor immediately.

3.5.5 For emergency disengagement of front power take-off shaft (FPTO) and rear power take-off shaft (RPTO), it is required to press button 1 (figure 2.15.1).

3.5.6 For emergency operation stop of all sections for the hydraulic distributive valve EHS at the same time, it is required to press disconnect switch “STOP” on OPU for HLL panel for emergency shut-down 7 (figure 2.19.6).

3.5.7 In case fumigation or a fire bed occurs, stop the tractor immediately, kill the engine and turn the battery switch off. To liquidate the fire bed use a dry-powder fire extinguisher or pour some sand onto it, cover with canvas cloth, sackcloth or other dense texture. Do not pour water over burning fuel and oil.

3.5.8 In case of CECS failure as to impossibility of GB gear engagement, to move the tractor to the place of repair there is provided a special switch “EMERGENCY” 3 (figure 3.5.1), located on CECS housing 2 backside. To engage the switch, it is required preliminarily to unscrew four screws 1 fastening CECS to the side console and uplift the unit out of the console. As switch 3 gets engaged, CECS operation is completely blocked, power voltage is directly supplied to the second gear electric solenoid and FDA drive electric solenoid, annunciator for GB emergency operation mode 8 (figure 2.15.1) is switched on.



1 – CECS fastening screw to side console; 2 – CECS; 3 – switch “EMERGENCY”.

Figure 3.5.1 – Access to switch “EMERGENCY” on CECS housing

4. COUPLING OF IMPLEMENTS

4.1 General information

In section 4 "Coupling of implements" necessary instructions and information on the peculiarities of tractor “BELARUS -2122.6” use are given.

The permissible field of tractor “BELARUS-2122.6” use includes places with unrestricted air exchange, sufficient flotation and overall passing ability.

Tractors “BELARUS-2122.6” are designed for performance of mechanized work in plant growing and fodder production.

Tractors “BELARUS-2122.6” are packaged with necessary work equipment for coupling of implements i.e. lift linkage and drawbar hitches, PTO, hydraulic outlets, pneumatic heads and electrical outlet receptacles. The tractor implements listed above allow coupling of various machines in structure of MTU (machine and tractor units or tractor-mounted units).

ATTENTION: TRACTORS “BELARUS-2122.6” ARE DESIGNED FOR COUPLING OF MOUNTED, SEMI-MOUNTED, SEMI-TRAILED AND TRAILED IMPLEMENTS IN STRUCTURE OF MTU, TECHNICAL CHARACTERISTICS OF WHICH RELATED TO THE ABILITY TO BE COUPLED, CORRESPOND TO TRACTOR SPECIFICATIONS! OTHER USE OF TRACTOR IS NOT ALLOWED!

Selection and buying of agricultural implements (fertilizer distributors, plows, motor cultivators, harrows, seeding machines, rotary tooling and other implements) for tractors “BELARUS-2122.6” is carried out by the customer individually according to their needs, and with consideration of the implement and tractor performance specifications, and also local conditions i.e. agrotechnical requirements, soil conditions, personal experience, guidelines of corresponding regional advisory centers and institutions of agricultural industry.

ATTENTION: INSTRUCTIONS AND INFORMATION ON SPECIFIC ASPECTS OF THE IMPLEMENTS USE WITH THE TRACTOR, INCLUDING GUIDELINES ON THE RECOMMENDED TRACTOR SPECIFICATIONS ARE PRESENTED IN OPERATIONAL DOCUMENTATION FOR IMPLEMENTS COUPLED!

Possibilities of agricultural tractors use in specific conditions are limited by the permissible range of rated force on hook and engine power, tractor maximum permissible load, roadhold of chassis, frictional sliding, operating driving speed, PTO value and operating weight of the implements coupled.

ATTENTION: WHILE OPERATING THE TRACTOR IN STRUCTURE OF MTU, IT IS REQUIRED TO STUDY CAREFULLY AND FOLLOW THE INSTRUCTIONS SPECIFIED IN THE OPERATIONAL DOCUMENTATION OF THE IMPLEMENTS COUPLED WITH THE TRACTOR! WORKERS WHO FAILED TO STUDY THE GIVEN DOCUMENTATION INCLUDING THE PROCEDURES ON SAFE MACHINE OPERATION AND WHO DO NOT HAVE THE GIVEN DOCUMENTS IN THE WORKING PLACE, ARE NOT ALLOWED TO OPERATE THE TRACTOR!

ATTENTION: WHEN COUPLING MOUNTED, SEMI-MOUNTED, SEMI-TRAILED AND TRAILED IMPLEMENTS WITH TRACTORS “BELARUS-2122.6”, IT IS ALLOWED TO INSTALL IN THE CAB THE AUTOMATED SYSTEMS FOR OPERATIONAL PROCESS CONTROL, BEING THE PART OF THE MACHINE KIT, WITH THEIR CONNECTION TO THE TRACTOR ON-BOARD NETWORK, IF IT IS PROVIDED IN THE DOCUMENTS ON THE IMPLEMENTS USE.

Tractors “BELARUS-2122.6” belong to the category of motor vehicles covered by traffic regulations and other regulatory documents on road vehicles operation.

A tractor operator is personally responsible for observance of traffic regulations and safety requirements as well as safety measures and correct use of tractor “BELARUS-2122.6”, specified in this operation manual.

Service staff qualification requirements for tractor “BELARUS-2122.6” operation:

- only qualified service staff trained for safety arrangement and precautions, having tractor driving license of due form and having admission to operate the specific tractor, is allowed;

- if a tractor owner (or any person responsible for tractor operation) does not operate the tractor himself, he shall make sure that before starting tractor operation all persons related to tractor operation have been duly trained for safety arrangement and precautions and for correct coupling of implements with the tractor, and have studied the operation manual for tractor use.

ATTENTION: OWNERS AND OFFICIALS OR OTHER PERSONS RESPONSIBLE FOR TRACTOR OPERATION AND MAINTENANCE MUST NOT ALLOW THE TRACTOR FOR ROAD TRAFFIC AND COUPLING WITH IMPLEMENTS, OR ADMIT OPERATORS FOR TRACTOR DRIVING WITH VIOLATION OF CURRENT TRAFFIC REGULATIONS AND THE GIVEN OPERATION MANUAL!

ATTENTION: BEFORE STARTING TRACTOR MOVEMENT IN STRUCTURE OF MTU, MAKE SURE THERE ARE NO PEOPLE NEARBY, INCLUDING THE AREA BETWEEN THE TRACTOR AND THE IMPLEMENTS OR TRAILERS (SEMI-TRAILERS) COUPLED!

4.2 Types of implements coupled with tractor “BELARUS-2122.6”

According to the type of coupling with tractors “BELARUS-2122.6” the implements are divided into the following types:

- mounted implement is fixed in three points to the LL upper and lower links. The tractor can carry the weight of an implement in full. The implement structural elements in transport position do not touch the ground. While changing the implement position from operating to transport, the point of the implement connection to the tractor is forcedly displaced up to the new point;

- semi-mounted implement is fixed in three points to the LL upper and lower links or only in two points to the LL upper and lower links. The tractor can carry the weight of an implement in transport position partly and mostly by its traveling wheels (usually one or two). While changing the implement position from operating to transport, the point of the implement connection to the tractor is forcedly displaced up to the new point. Two-point articulated linkage is carried out by connecting the implement suspension axis link pins to the LL lower links (upper link is not used). It is also possible to use a cross bar from the tractor or implement kit;

- semi-trailed implement is usually fixed in one point by means of a tractor drawbar ring to the DH. It is also possible to use a two-point connection with lift linkage (upper link is not used). The tractor can carry the weight of an implement in transport position partly and mostly by its traveling wheels (usually two). While changing the implement position from operating to transport, the point of the implement connection to the tractor remains unchanged. Semi-trailed implements include various vehicles for general and special purposes: general purpose semi-trailers, tank semi-trailers, dump trucks and special purpose semi-trailed vehicles for mechanization of technological process in agriculture;

- trailed implement is usually fixed in one point by means of a tractor drawbar ring to the DH. It is also possible to use a two-point connection with lift linkage (upper link is not used). The chassis can carry the weight of an implement in transport position in full, the tractor hitch mechanism (DH or LL) is loaded only with the weight of an implement connector. While changing the implement position from operating to transport, the point of the implement connection to the tractor remains unchanged. Semi-trailed implements include various vehicles for general and special purposes: general purpose trailers and semi-trailers, tank semi-trailers, dump trucks, and special purpose semi-trailed vehicles for mechanization of technological process in agriculture.

4.3 Lift linkage

4.3.1 General information

While operating front or rear lift linkage with the remote control console (if available), the operator shall stay beyond the reach of the three-point lift linkage and also consider the sizes of the uplifted implement projecting parts.

ATTENTION: BEFORE LEAVING THE TRACTOR FOR ANY TIME PERIOD, IT IS REQUIRED TO LOWER THE IMPLEMENT TO THE GROUND!

ATTENTION: MAXIMUM LIFTING POWER OF LIFT LINKAGE AT THE SUSPENSION AXIS DETERMINES TECHNICAL OPERABILITY OF THIS LIFT LINKAGE, BUT NOT THE PERMISSIBLE WEIGHT OF THE IMPLEMENT COUPLED WITH IT. THE PERMISSIBLE WEIGHT OF THE IMPLEMENT DEPENDS ON THE CENTROID OVERHANGING LENGTH IN RELATION TO THE SUSPENSION AXIS, AND IT IS LIMITED BY PERMISSIBLE LOADS ON THE TRACTOR AND BY THE CONTROLLABILITY CRITERION!

ATTENTION: WHEN OPERATING LIFT LINKAGES, MAKE SURE THAT THIRD PERSONS ARE AT A SAFE DISTANCE FROM LIFT LINKAGES!

4.3.2 Three-point rear lift linkage

Three-point rear lift linkage of “BELARUS-2122.6” tractor is made according to State Standard GOST 10677 and ISO 730. Basic parameters of RLL specified in table 4.3.1 and in figures 4.3.1, 4.3.2 are given with rear tires of standard configuration (580/70R42 both single and twinned) mounted on the tractor and with standard static radius, specified by the tire manufacturer.

Rear lift linkage consists of three links (upper and two lower links) coupled with the tractor with front ends by means of hinged joint, and with rear ends with free hinged joints for connection to the link pins of the implements coupled. RLL is designed for connection of rear position implements to the tractor, for link power transfer during operation and for adjustment of their position during operation or movement in transport position. RLL provides coupling of the following types of implements and machines:

- mounted implement fixed in three points (upper and lower links);
- semi-mounted (lower links);
- semi-mounted with a cross bar to the suspension axis of lower links.

ATTENTION: IT IS ALLOWED TO MOUNT A CROSS BAR OR TRAILING SUSPENSION AXIS BEING A PART OF THE IMPLEMENTS KIT TO THE RLL LOWER LINKS ENDS FOR COUPLING OF SEMI-MOUNTED, SEMI-TRAILED AND TRAILED IMPLEMENTS, FOR PERFORMANCE OF DIFFERENT WORK WITH THE TRAVEL SPEED NOT MORE THAN 15 KM/H!

RLL sizes and design of tractors “BELARUS-2122.6” make it possible to couple all implements having the corresponding dimensions of the coupling triangle connecting elements shown in RLL diagram.

Rear lift linkage diagram of type “LL-3” is shown in figure 4.3.1.

Rear lift linkage diagram of type “LL-2” is shown in figure 4.3.2.

RLL design provides the use of a control bar which by way of fixing lower links together at a specific size, ensures the required length of the suspension axis and makes their coupling with the machine easy. For the protection of coupled implements from swaying, length adjustable limit external rods are used.

To ensure the required position of the implement, the following RLL vertical and horizontal adjustments by means of upper link, lifting rods and buckles are provided:

1. Adjustment of the upper link length.

It is carried out in order to ensure equal soil penetration of operating parts (running depth levelling of operating parts located one after another in the direction of tractor movement). If the mounted plough frame is bent forward in the direction of tractor movement and the plough front body penetrates deeper than the rear, it is required to extend the upper link; and if the plough front body penetrates with less depth than the rear, the upper link shall be shortened.

2. Adjustment of left or right lifting rod length.

The adjustment is carried out in the following cases:

- to ensure the horizontal position of the implement;
- to ensure even depth of soil processing with the coupled machine operating parts across the lifting rod width.

3. Adjustment of both lifting rods length, upper link length for the implement transport position.

The adjustment is carried out in the following cases:

- to ensure the required road clearance;
- to ensure sufficient safe distance between the tractor elements and the implement, excluding contact of implement parts with the tractor (the clearance shall be at least 100 mm).

4. Adjustment of both buckles length.

The adjustment is carried out in the following cases:

- during transportation of the implement, buckles shall be blocked to limit the implement swaying to avoid tractor elements damage in case of an accident;
- during tractor operation with mounted, semi-mounted tilling machines, it is required to use the adjustment “buckle locked” or ‘buckle unlocked” according to the instructions on the coupled implement (machine) use, provided in the operator’s manual.

IT IS FORBIDDEN TO DISPLACE THE LONGITUDINAL AXIS OF THE IMPLEMENT IN RELATION TO THE LONGITUDINAL AXIS OF THE TRACTOR BY MEANS OF BUCKLES ADJUSTMENT.

ATTENTION: THE LENGTH OF RLL LEFT LIFTING ROD MAKES UP 780 MM, WHICH SHALL NOT BE CHANGED WITHOUT PARTICULAR NEED. USUALLY THE RIGHT LIFTING ROD CAN BE ADJUSTED ALONG THE LENGTH. WHEN THE LIFTING ROD IS USED ON THE SUSPENSION AXIS AND WHEN THE REVERSIBLE PLOUGH IS USED, THE LENGTH OF LIFTING RODS SHALL BE THE SAME!

ATTENTION: NONCOMPLIANCE WITH THE REQUIREMENTS FOR BUCKLES AND LIFTING RODS ADJUSTMENT MAY RESULT IN BUCKLES OR SUPPORT BRACKETS ABRUPTION OR OTHER BREAKAGE!

ATTENTION: ESSENTIAL FEATURES AND ADJUSTMENT WAYS OF THE IMPLEMENT POSITION COUPLED WITH MOUNTED DEVICES ACCORDING TO THE PECULIARITIES OF TECHNOLOGICAL PROCESS EXECUTION AND AGROTECHNICAL REQUIREMENTS ARE SPECIFIED IN OPERATIONAL DOCUMENTATION OF SUCH IMPLEMENTS. IF THERE IS NO SUCH INFORMATION IN OPERATIONAL DOCUMENTATION, CONTACT THE MANUFACTURER OR SELLER OF THE IMPLEMENT FOR INFORMATION!

During operation with wide-cut implements in order to facilitate crossover contour following (seeding machines, cultivators and etc.) and reduce load on RLL, it is required to provide free movement in vertical plane of one lower link in relation to the other. To do this, adjust the lifting rods so that one lower link moves freely in vertical plane in relation to the other. Such adjustment is made by exchanging pins, mounted on the yoke as specified in section 4.3.3.2. “Lifting rods”. RLL is controlled by RLL control panel located in the cabin and by remote buttons on rear wheels wings which ensure setting of RLL lower links at the required height. An operator chooses the way to adjust the RLL position in manual mode by turning the adjusting lever on the RLL control panel. Remote RLL control buttons allow the operator to maintain prompt control of RLL during coupling of assembly unit.

Electronic system for the rear lift linkage control provides the following performance capabilities for RLL:

- adjustment of lower links lifting and lowering speed;
- limiting of lower links rising height;
- choice of the required way of adjustment of lower links positions;
- adjustment of soil processing depth;
- possibility to work with implements with depth control of operating parts travel height (depth adjustment is carried out by the implement support wheel).

Note – The rules on RLL control are specified in subsection 2.17 “Lift linkage control”.

RLL control system provides the following adjustment methods of mounted and semi-mounted implements and their operating parts:

1. For the implements and aggregated units having no support wheels:

- draft adjustment (depth adjustment is carried out according to link resistance of the implement);
- position adjustment (the implement is held in the predetermined position in relation to the tractor frame);
- mixed adjustment (draft and position adjustment in any correlation).

2. For the implements and aggregated units having support wheels:

- mixed adjustment (draft and position adjustment in any correlation).

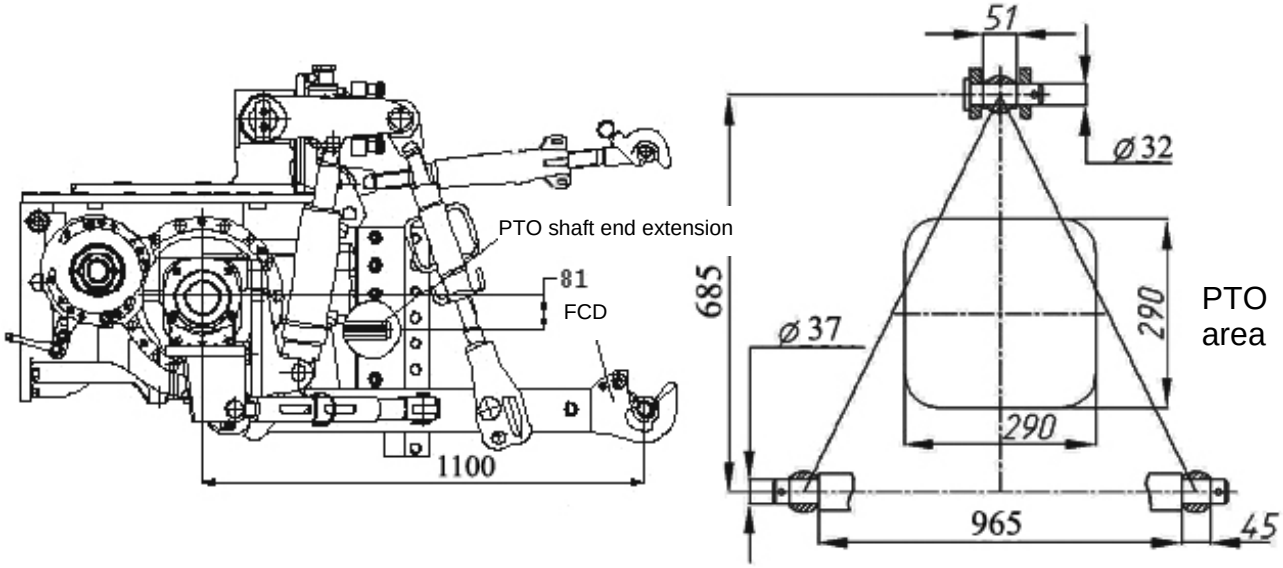


Figure 4.3.1 – Rear lift linkage diagramm of “LL-3” type

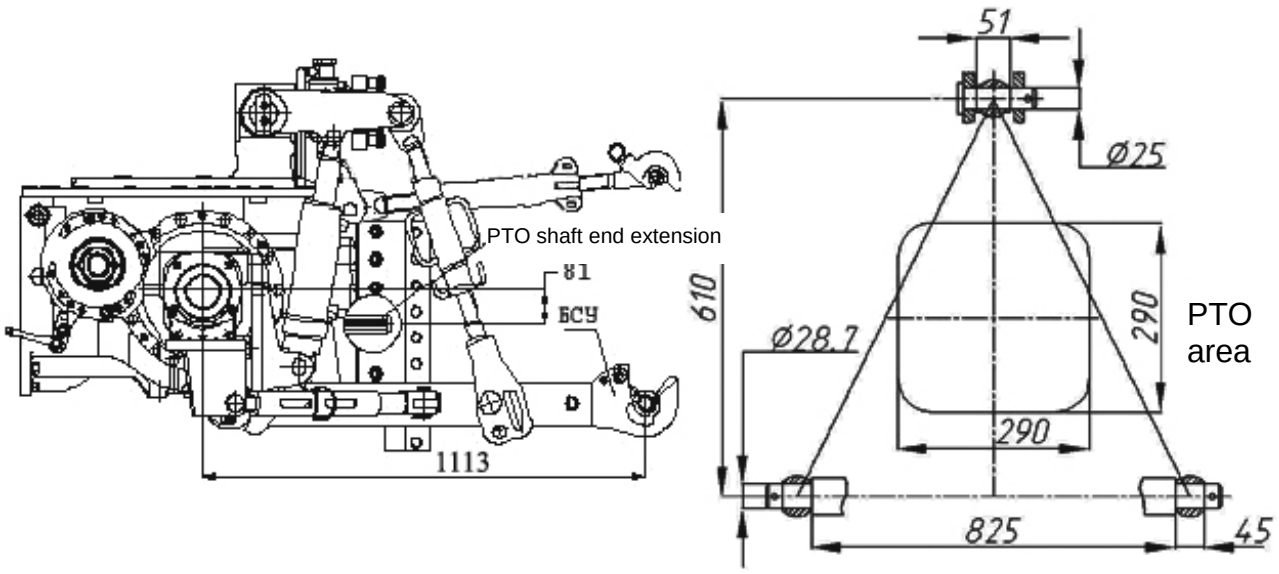


Figure 4.3.2 - Rear lift linkage diagramm of “LL-2” type

Table 4.3.1 – Basic parameters and coupling dimensions of RLL

Standard size (configuration) of the device	LL-3 [2] (figure 4.3.1)	LL-2 (figure 4.3.2)
1 Category (acc. to ISO 730-1)	Category 3	Category 2
2 Design features	It consists of three links (one upper and two lower), connected with the tractor with hinge joints, free ends of links with hinge joints are connected to the implement connecting elements while coupling	
3 Assignment	For connection (mounting) or coupling of mounted, semi-mounted implements	
4 Lower links	Solid with on-board control system and changeable hinge joints	
5 Lower links length, mm	1060	1060
6 Hinged joint width of the upper (lower) link, mm	51 (45)	51 (45)
7 Diameter of a rear-end hinged joint pin of the upper link, mm	32	25
8 Diameter of holes in rear hinge joints of lower links, mm	37	28,7
9 Distance between PTO shaft end extension butt end and suspension axis, mm	595	608
10 Column height [1], mm	685	610
11 Length of the suspension axis along the shoulders [1], mm	965	825
12 Lifting capacity of the device, kN [3]: a) on the suspension axis; b) at overhang of 610 mm from the suspension axis	 65 45	 65 45

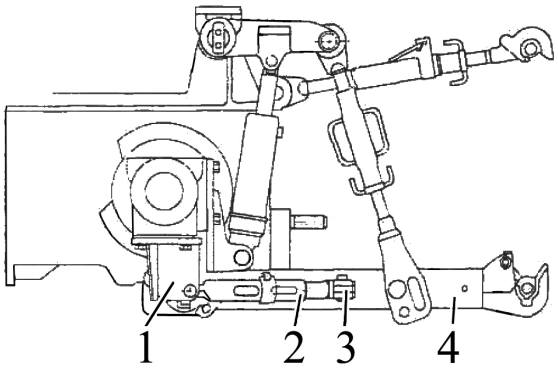
[1] Dimension refers to the implement coupled.
[2] The recommended type for basic use.
[3] It is not allowed to overload RLL higher than the tire load norm specified in table 3.2.2.

4.3.3 RLL components adjustment rules

4.3.3.1 Buckles

Buckles are used to limit side swaying of RLL lower links in transport and in operating position. Your tractor can be equipped with telescopic turnbuckles.

Buckles 2 (figure 4.3.3) are fixed with one end to eye lugs 3 of lower links 4. The other end of buckles with hinge joints is fixed into the brackets of buckles 1 with the help of pins. The brackets of buckles 1 are fixed on the lower part of RLL semi-axle tubes.



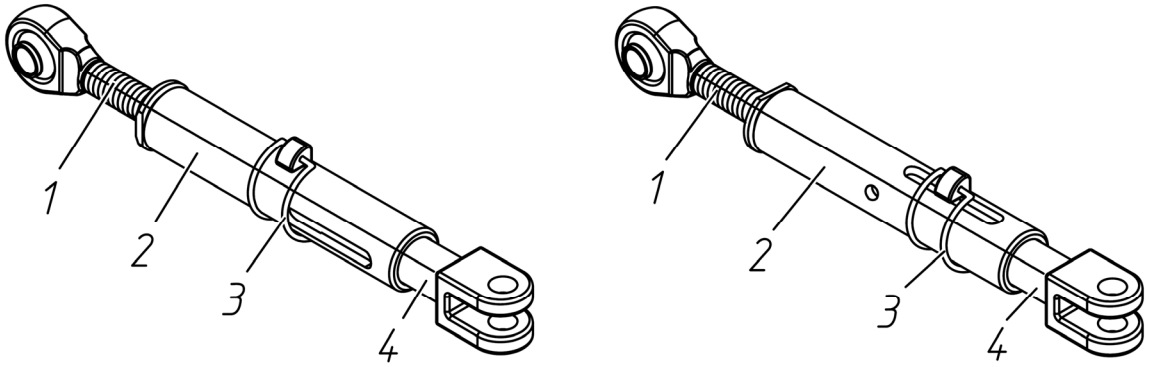
1 – buckle bracket; 2 – buckle; 3 – eye lug; 4 – lower link.

Figure 4.3.3 – Installing of buckles in RLL

The buckle consists of screw 1 (figure 4.3.4), guiding pin 2, slide piece 4 and linch pin 3.

Guiding pin 2 has a through groove on the side surface and a through hole in the surface perpendicular to it.

Slide piece 4 has two through holes in one plane.



a) buckle locked b) buckle unlocked

1 – screw; 2 – guiding pin; 3 – linch pin; 4 – slide piece.

Figure 4.3.4 – Setting of buckles

While tractor operation buckles shall always be locked in one of the two positions:

- buckle locked;
- buckle unlocked.

Setting of buckles shall be carried out with the implement mounted on lower links rear ends and lowered onto the supporting surface.

Setting of “buckle locked” shall be carried out in the following order:

- match the hole for linch pin 3 in guiding pin 2 with the hole in slide piece 4;
- in case of mismatch, turn guiding pin 2 clockwise or counterclockwise until the holes match;
- insert linch pin 3 into the hole and fix it with the spring clip.

Setting of “buckle unlocked” shall be carried out in the following order:

- turn guiding pin 2 for ≈90° and match the groove in guiding pin 2 with the hole in slide piece 4;
- while rotating guiding pin 2, place the hole in slide piece 4 on the groove center (adjust the right and left buckles);
- insert linch pin 3 into the hole and fix it with the clip.

ATTENTION: WHILE PERFORMING TRANSPORT WORK, IT IS REQUIRED TO USE THE SETTING “BUCKLE LOCKED”!

ATTENTION: WHILE TRACTOR OPERATION WITH THE MOUNTED IMPLEMENT OR MACHINE, IT IS REQUIRED TO USE THE SETTING “BUCKLE LOCKED” OR “BUCKLE UNLOCKED” ACCORDING TO THE INSTRUCTIONS OF THE OPERATOR’S MANUAL ON COUPLED IMPLEMENTS (MACHINES) OPERATION!

IT IS NOT ALLOWED TO USE BUCKLE WITHOUT FIXING THE SLIDE PIECE ON THE GUIDING PINS WITH A LINCH PIN!

4.3.3.2 Lifting rods

A lifting rod consists of a screw with hinge pivot 1 (figure 4.3.5), pipe 2, yoke 3, splint pin 4, pin 5, washer 6, counter nuts 7.

Adjustment of the lifting rod length is carried out in the following order:

- unscrew counter nut 7;
- while rotating pipe 2 clockwise or counterclockwise, change the lifting rod length;
- adjust the lifting rod length and locknut the screw connection with counter nut 7.

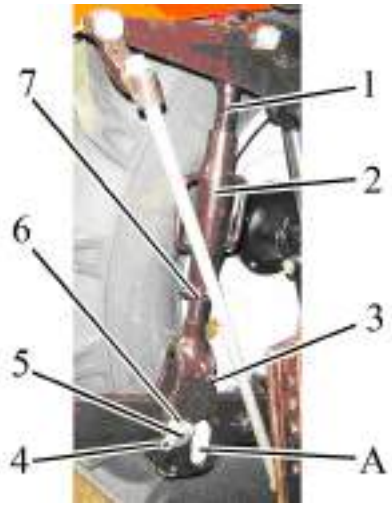
While setting pin 5 into the upper hole of yoke 3 as shown in figure 4.3.5, the lifting rod length shall be adjusted within 630 to 830mm.

During shipment from the works, pins 5 are mounted into the upper holes of yokes 3, lifting rods are adjusted for the length of 780mm.

While setting pin 5 into the lower hole of yoke 3, the lifting rod length shall be adjusted within 700 to 900mm.

Setting of the lifting rod shall be carried out in the following way:

- while tractor operation with mounted and semi-mounted implements and machines (except for wide-cut), RLL links shall not move freely in the lifting rod yokes. For this, pin 5 in the lifting rod shall be fixed into one of yoke 3 holes. Setting of pins 5 on the left and right lifting rod shall be equal;
- while tractor operation with wide-cut mounted or semi-mounted implements, it is required to fix pins 5 in lifting rods into the grooves (cut slots) “A” of yokes 3 to provide vertical movement of lifting rods in relation to the lifting rod yoke. While setting pins 5 into the grooves “A” of yokes 3, the lifting rods length shall be adjusted within 700 to 900mm.



1 – screw with hinge pivot assembly; 2 – pipe; 3 – yoke; 4 – splint pin; 5 – pin; 6 – washer; 7 – counter nut.

Figure 4.3.5 – Lifting rod

While operating with implements, adjust the right lifting rod length according to the soil processing depth.

4.3.3.3 Upper link

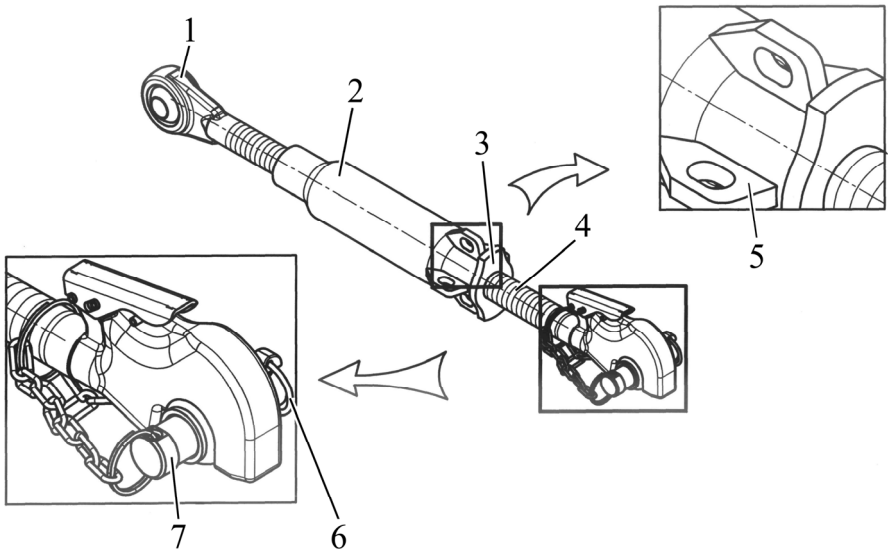
Upper link is shown in Figure 4.3.6.

The upper link length may be adjusted within 675 to 900mm.

Adjustment of the upper link length shall be made in the following order:

- unscrew counter nut 3 (figure 4.3.6);
- while rotating pipe 2 clockwise or counterclockwise with a crowbar catching ears 5, change the upper link length;
- after adjusting the link length, locknut the screw connection with counter nut 3.

Use pin 7 of rear hinge pivot to connect upper link to the implement; mount linch pin with ring 6 on it to fix the pin.



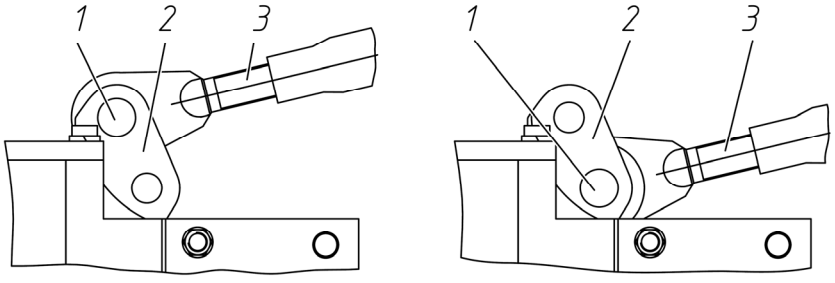
1 – front screw with hinge pivot assembly; 2 – pipe; 3 – counter nut; 4 – screw with a gripper (hinge joint); 5 – ear; 6 – linch pin; 7 – pin.

Figure 4.3.6 – Upper link

4.3.3.4 The rules of RLL adjustment for tractor operation with implements of category 2 (LL-2)

To provide implements of category 2 coupling to the tractor RLL, it is required to do RLL adjustment in the following way:

- if lower and upper links are completed with grippers, mount the corresponding hinge joints of category 2 (included into SPTA) into the grippers;
- if lower and upper links are completed with hinge joints, mount the corresponding reducing bushings (included into SPTA) into the hinge joints;
- set the distance between the hinge joints (the lower links grippers) according to the diagram in figure 4.3.2 by changing the buckle length. Changing the buckle length shall be carried out by rotating guiding pin 2 (figure 4.3.4);
- shift the front end of upper link 3 (figure 4.3.7) from the upper hole of bracket 2 to the lower hole;
- after the implement coupling to the lower links, couple the upper link to the implement, adjust the upper link length if necessary.



For LL-3 For LL-2

1 – pin; 2 – bracket; 3 – upper link front end

Figure 4.3.7 – Setting of the upper link front end for operation with implements and machines of different categories

4.3.3.5 Mounting of implements to the tractor RLL

While mounting of implements to the tractor, make sure that there are no people in the area of implement mounting. Using RLL controls put down lower links to the required position and connect lower links hinge joints to the implement, and then connect upper link hinge joint by means of a pin. Use the right lifting rod to adjust the implement position in transverse plane. To make adjustments in fore-and-aft plane for depth levelling of the implement front and rear operating parts, change the upper link length by turning the link pipe to the corresponding direction.

Final adjustment of the machine shall be made in the field.

Before starting operation, make sure that:

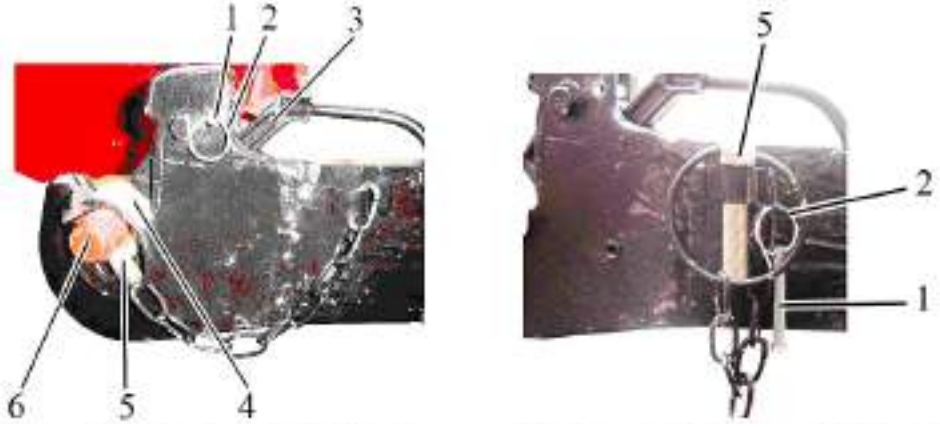
- tractor parts are not in dangerous closeness to implement elements;
- upper link does not touch the PTO guard with the implement in lowest position;
- cardan drive from PTO is not abnormally long, with bigger joint angles and there is no thrust force;
- PTO guard does not touch the machine cardan drive guard;
- lift the implement slowly and check availability of clearances between the tractor and the implement in upper position;
- check availability of the required side oscillation of lower links and adjust it by means of buckles, if necessary.

WARNING: SOME TYPES OF MOUNTED OR SEMI-MOUNTED IMPLEMENTS CAN TOUCH THE CAB AND DAMAGE IT. IT CAN RESULT IN DAMAGE OF THE CAB WINDOWS AND CAUSE INJURY TO THE OPERATOR. CHECK AVAILABILITY OF CLEARANCES (AT LEAST 100 MM) BETWEEN THE UPLIFTED IMPLEMENT AND THE OPERATOR`S CAB!

Mounting of machines (implements) to the tractor shall be carried out by means of automatic coupler (SA-1 for DH-3, SA-1 for DH-2) connected to the tractor lift linkage in three points (two rear hinge joints of lower links and a rear hinge joint of the upper link).

ATTENTION: AFTER COUPLING OF THE TRACTOR EQUIPPED WITH LINKS AND GRIPPERS MANUFACTURED BY MTW, WITH MOUNTED OR SEMI-MOUNTED IMPLEMENTS, IT IS REQUIRED TO LOCK THE RLL LOWER LINKS GRIPPERS BY MEANS OF PIN 1 (FIGURE 4.3.8) WITH RING 2!

ATTENTION: WHILE DETACHING THE IMPLEMENT FROM THE TRACTOR, IT IS REQUIRED TO REMOVE FROM THE IMPLEMENT AXLE 6 (FIGURE 4.3.8) LINCH PIN 5 WHICH FIXES HINGE JOINT 4 ON THE IMPLEMENT AXLE 6, ALSO REMOVE PIN 1 WITH RING 2 FROM THE GRIPPER, THEN UPLIFT THE HANDLE OF GRIPPER 3 AGAINST THE STOP. SET THE PIN AND THE LINCH PIN AS SHOWN IN FIGURE 4.3.8b!



a) the pin and linch pin position with the implement coupled

b) the pin and linch pin position with the implement uncoupled

1 – pin; 2 – ring; 3 – gripper handle ; 4 – hinge joint; 5 – linch pin; 6 – implement handle.

Figure 4.3.8 – Locking of the RLL lower links grippers

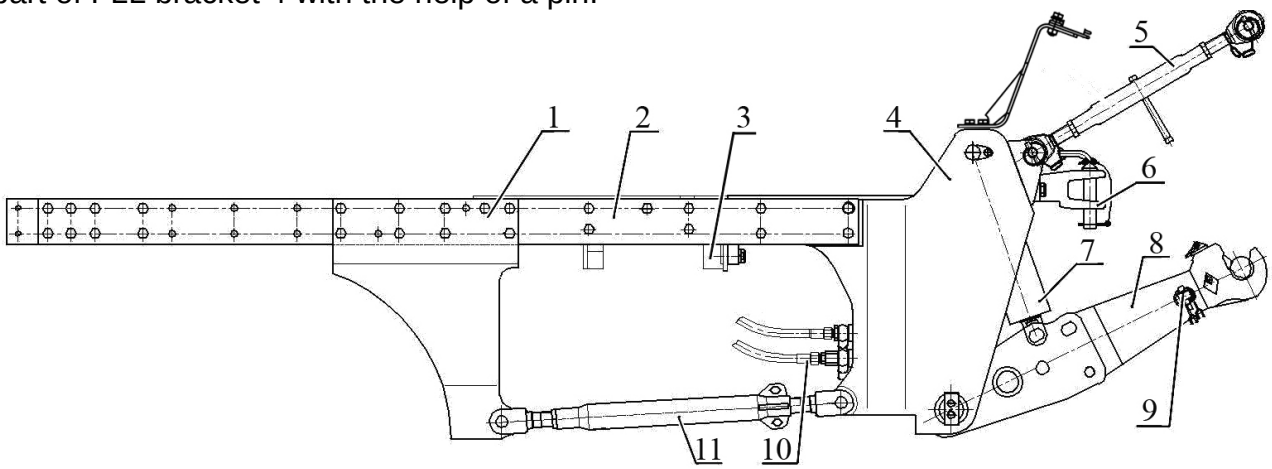
4.3.4 Three-point front lift linkage

Front lift linkage (FLL) is mounted on tractor “BELARUS-2122.6” in basic configuration.

Tractor with FLL is completed with front independent PTO, mounted on the front plane of bracket 4 (figure 4.3.9).

FLL is mounted on the front plane of beam 3 and is fixed with additional plates 2 to the beam side surface.

In the lower part of FLL bracket 4 there are two ears to which two buckles 11 are attached. Other ends of turn buckles are locked into two brackets 1 which are mounted onto amplifying plates. HPH 10 connect section No.2 of the hydraulic lift linkage distributor (figure 2.19.2) with lift linkage hydraulic cylinders 7. Hydraulic cylinders of double action are fixed to bracket 4 from the one side, and with the help of a rod they are connected to lower links unit 8 mounted on the shaft in bracket 4 lower part. Upper link 5 is fixed to the upper part of FLL bracket 4 with the help of a pin.



1, 4 – bracket; 2 – plate; 3 – beam; 5 – upper link; 6 – towing device; 7 – hydraulic cylinder; 8 – lower links unit; 9 – cotter; 10 – high pressure hose (HPH); 11 – buckle

Figure 4.3.9 – Front lift linkage

FLL is designed for tractor operation as part of combined assemblies and serves for coupling mounted agricultural implements of category 2, located in front of the tractor, to the tractor.

FLL is designed for the following purposes:

- formation of combined assemblies (cultivator – in front, seeder – at the back, etc.);
- formation of echelon linkages (front and side mowing machines, etc.);
- transportation of separate machines from the structure of combined assemblies of rear location while long-distance moving.

With FLL mounted, front ballast weights are mounted onto FLL links, as shown in subsection 4.6 “Front ballast”.

Tractor FLL is used with tillage machines only in a pushing mode – FLL use with tillage machines on reverse is not provided.

IT IS FORBIDDEN TO OPERATE FLL WITH LOGGING BLADES AND FOR JACKING OF TRACTOR FRONT ELEMENT!

Front lift linkage is a three-point lift linkage of category 2 according to ISO 730 and LL-2 according to GOST 10677. The diagram of FLL of configuration LL-2 is shown in figure 4.3.10. The main parameters of FLL are shown in table 4.3.2.

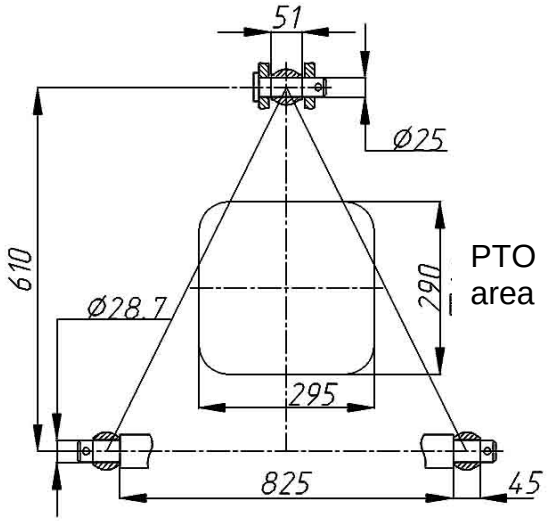


Figure 4.3.10 – FLL diagram

Table 4.3.2 – Main parameters and coupling dimensions of FLL

Standard size (configuration) of the device	LL-2
1 Category	Category 2
2 Design features	The device consists of the upper link and the lower links unit. Free ends of the links are pivotally joined with the implement connecting elements while coupling.
3 Assignment	For connection (mounting) and coupling of agricultural mounted and semi-mounted implements
4 Lower links	Links unit with fast-coupling devices and changeable hinge joints
5 Lower links length, mm	775
6 Free front hinge joints width for upper (lower) link, mm:	51 (45)
7 Hinge pin diameter of the upper link, mm	25
8 Pivot pin bore diameter of lower links, mm	28.7
9 Distance between the PTO butt end and suspension axis, mm	637
10 Column height [1], mm	610
11 Suspension axis length along the shoulders [1], mm	825
12 Lifting power of the device, kN [2]: a) on the suspension axis; b) at overhang of 610 mm from the suspension axis	 30 25

[1] The dimension refers to the coupled implement.

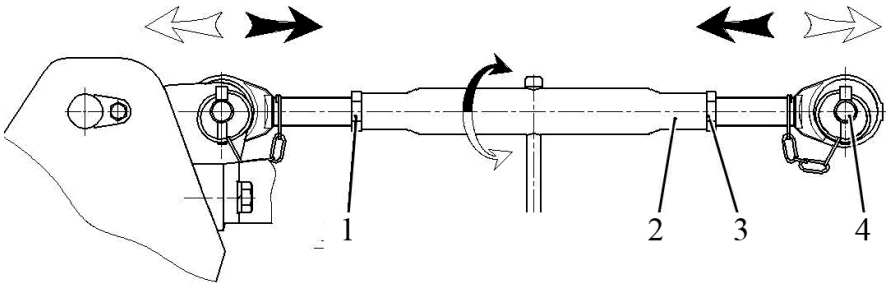
[2] It is forbidden to overload FLL with loads exceeding the tire load norm specified in table 3.2.2.

4.3.5 The rules of agricultural implements coupling to FLL

Agricultural implements coupling to FLL is similar to RLL coupling.

First it is necessary to place hinged joints of LL lower links grippers on a lower axle of the agricultural machine. It is required to approach the agricultural machine slowly, at the speed of not more than 3 km/h, with the lower links grippers as low as possible, until the grippers jaw is located under the hinge joints on the machine axle. To carry out coupling, it is required to uplift front ends of the links until the hinge joints get fixed in the lower links grippers. Mount cotter 9 (figure 4.3.9).

Connect upper link 5 to the agricultural machine with the help of pin 4 (figure 4.3.11), screwing in or out screwed parts with hinge joints out of tube 2 at the same time, having unscrewed counter nuts 1, 3 before that. Further adjustment of the implement operating position shall be carried out when the implement is already coupled, by changing the length of upper link 5 (figure 4.3.9), rotating tube 2 (figure 4.3.11) with the handle. After adjustment it is required to screw in counter nuts 1, 3.



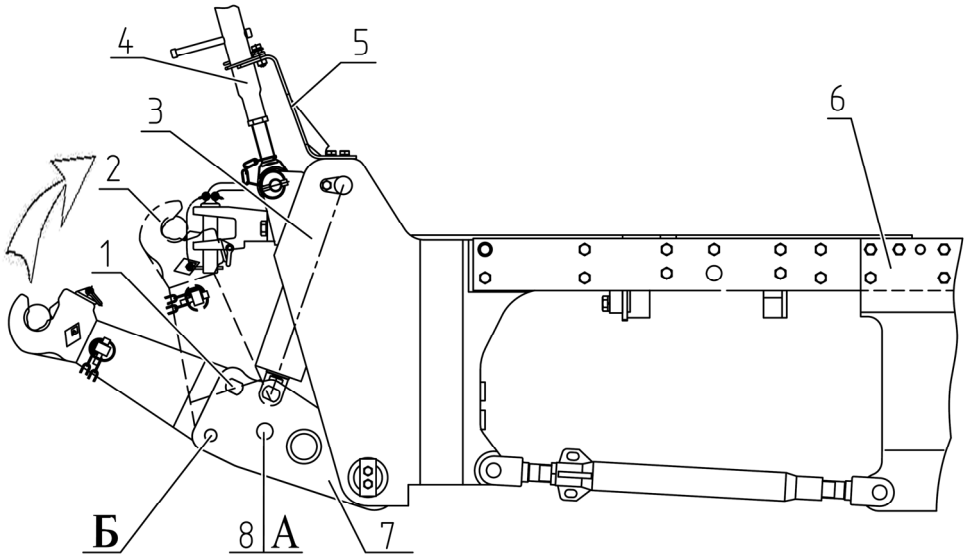
1, 3 – counter nut; 2 – tube; 4 – pin.

Figure 4.3.11 – FLL upper link

4.3.6 The rules of shifting FLL from operating to transport position

FLL is shifted from operating to transport position in the following order:

- uplift upper link 4 (figure 4.3.12) and secure it in bracket 5;
- remove pins 8 from lower links unit 7 out of opening “A”;
- turn links 2 with grippers around pin 1 until opening “A” in turning ends of the links matches with opening “B” in the links unit;
- insert pin 8 into the matched openings “B”.



1 – pin; 2 – lower link; 3, 5 – bracket; 4 – upper link; 6 – plate; 7 – lower links unit; 8 – pin.

Figure 4.3.12 – Transport position

4.4 Drawbar hitches

4.4.1 General information

Drawbar hitch of “BELARUS-2122.6” tractor can be completed with drawbar elements of type DH-2V (short towing yoke), DH–3V (long towing yoke), DH-2R (“python”), DH-1 (crossbeam) and DH-1M-01(draw bar).

The consumer is allowed to purchase and mount automatic yoke KU2000/329NB33, automatic yoke KU5410/329-33, coupling device “python” PB5329NNB33, ball coupling devices KI8329NB33 and KB8329NB33, manufactured by “Walterscheid” company, onto the tractor.

The above listed drawbar hitches provide coupling and transportation of trailed and semi-trailed machines, the coupling devices of which comply with the following requirements:

- compatibility according to the coupling dimensions;
- implements are equipped with rigid drawbar hitches;
- draft poles are equipped with a device making the procedure of coupling/uncoupling with tractor drawbar hitch easy;
- drawbar hitches of semi-trailers have an adjustable support.

Tractor “BELARUS - 2122.6” has a special-purpose rear mounting device of lift type in the form of vertical guiding plates with several openings, fixed to the rear joint face of the rear axle body. This device is designed for mounting drawbar hitches and provides height adjustment of DH-2V (short towing yoke), DH-2R (“python”), DH-3V (long towing yoke), automatic yokes KU2000/329NB33, KU5410/329-33, coupling device “python” PB5329NNB33 and ball coupling devices KI8329NB33 and KB8329NB33.

Installation variant diagram of DH-2V (short towing yoke) is shown in figure 4.4.1.

Installation variant diagram of DH-3V (long towing yoke) is shown in figure 4.4.2.

Installation variant diagram of DH-2R (“python”) is shown in figure 4.4.3.

Installation variant diagram of DH-1M-01 (draw bar) is shown in figure 4.4.4.

Installation variant diagram of DH-1 (crossbeam) is shown in figure 4.4.5.

Installation variant diagram of automatic yokes KU2000/329NB33 and KU5410/329-33 is shown in figure 4.4.6.

Installation variant diagram of coupling device “python” PB5329NNB33 is shown in figure 4.4.9.

Installation variant diagram of ball coupling devices KI8329NB33 and KB8329NB33 is shown in figure 4.4.11.

Basic parameters of drawbar hitches shown in tables 4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.4.5, 4.4.6, 4.4.7, 4.4.8, 4.4.9, 4.4.10 and in figures 4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.4.5, 4.4.6, 4.4.9, 4.4.11 are given with standard rear tires (580/70R42 – single and twinned) mounted on the tractor and with standard static radius, specified by the tire manufacturer.

4.4.2 Drawbar hitch DH-2V (short towing yoke)

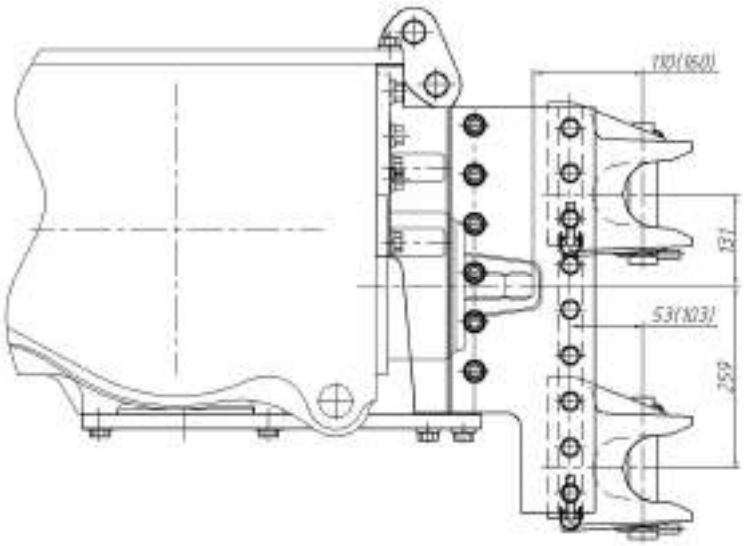


Figure 4.4.1 – Installation variant diagram of DH-2V (short towing yoke)

Table 4.4.1 – Basic parameters and coupling dimensions of DH-2V (short towing yoke)

Standard size (configuration) of the device	DH-2V (short towing yoke)	
1. Variant	Yoke acc. to ISO	Yoke acc. to GOST
2. Mounting location	Rear lifting device	
3. Design features	Non-rotational, height adjustable	
4. Assignment	For connection and coupling of trailed, semi-trailed implements with traveling wheels, including tractor semi-trailer type	
5. DH yoke dimensions, mm:		
a) connecting pin diameter	40	
b) yoke gap height	85	
c) yoke gap depth	70	
d) yoke position[1] for the implements driven by rear PTO shaft	Lower position, as shown in figure 4.4.1	
e) distance between the PTO butt end and the connecting pin axis, mm	110	160
6. Trailing device for coupling to DH:		
a) type	Rigid, with tractor drawbar clevis	
b) vertical load in hitch point, kN, not more than	20	
c) turning angle of the implement trailing device in horizontal plane, degrees, not less than	±60	
d) protective device type	Safety chain (rope) [2)]	
e) connection point of the protective device on the tractor	Lifting device holes	
7. Relative calculated value of axial forces (D), kN, not more than	70.1	

[1)] Recommended.
[2)] Implement accessories.

ATTENTION: IT IS FORBIDDEN TO PUT DH-2V YOKE TO A POSITION WHERE ITS BODY OVERHANGS THE DH SUPPORTING BRACKET END (UP OR DOWN) FOR MORE THAN 15 MM!

4.4.3 Drawbar hitch DH-3V (long towing yoke)

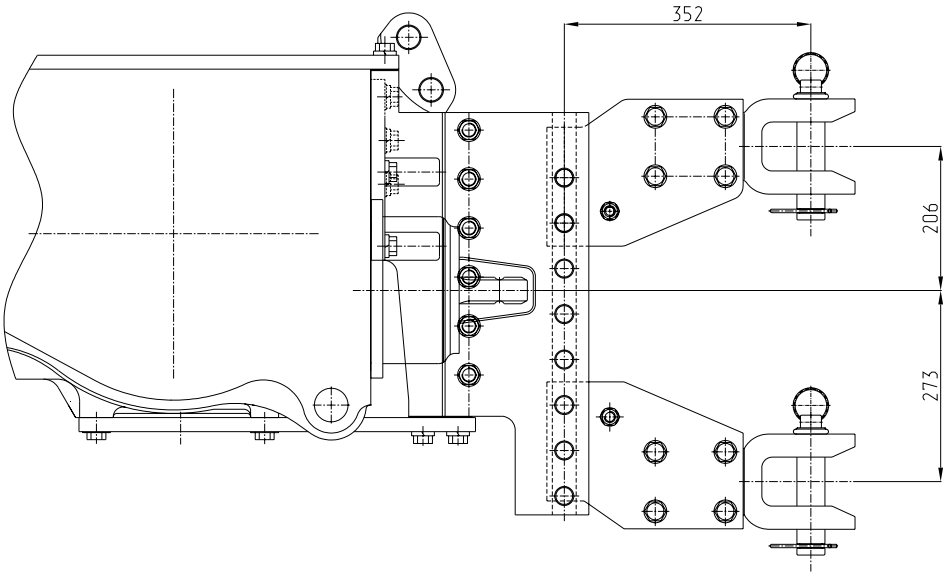


Figure 4.4.2 – Installation variant diagram of DH-3V (long towing yoke)

Table 4.4.2 – Basic parameters and coupling dimensions of DH-3V (long towing yoke)

Standard size (configuration)	DH -3V (long towing yoke)
1. Mounting location	Rear lifting device
2. Design features	Rotational, height adjustable
3. Assignment	For coupling of trailed implements, including tractor trailer type equipped with drawbar clevises
4. DH yoke dimensions, mm: a) connecting pin diameter b) yoke position[1)] for the implements driven by rear PTO shaft c) distance between the PTO butt end and the connecting pin axis	 40 Lower position, as shown in figure 4.4.2 400
5. Trailing device for coupling to DH: a) type b) vertical load in hitch point, kN, not more than c) turning angle of the implement trailing device in horizontal plane, degrees, not less than d) protective device type e) connection point of the protective device on the tractor 6. Relative calculated value of axial forces (D), kN, not more than	 Rigid, with tractor drawbar clevis 20 ±60 Safety chain (rope) [2)] Lifting device openings 70.1

[1)] Recommended.
[2)] Implement accessories.

ATTENTION: IT IS FORBIDDEN TO PUT DH-3V YOKE TO A POSITION WHERE ITS BODY OVERHANGS THE DH SUPPORTING BRACKET END (UP AND DOWN) FOR MORE THAN 15 MM!

4.4.4 Drawbar hitch DH-2R (“python”)

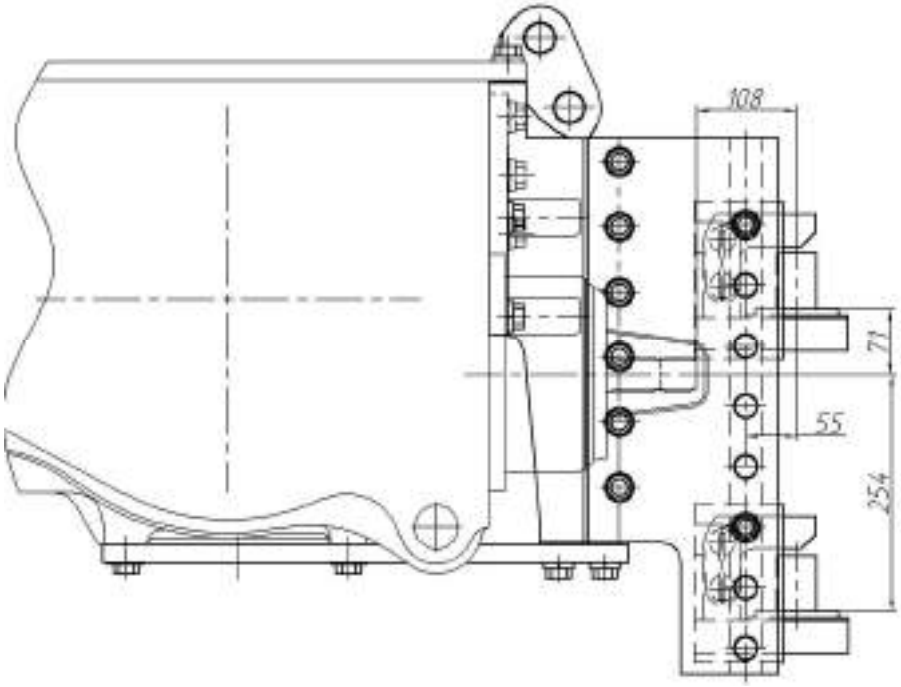


Figure 4.4.3 – Installation variant diagram of DH -2R (“python”)

Table 4.4.3 – Basic parameters and coupling dimensions of DH -2R (“python”)

Standard size (configuration)	DH -2R (python)
1. Mounting location	Rear lifting device
2. Design features	Cantilever fitted connection pin, vertically adjustable
3. Assignment	For coupling of semi-trailed implements and implements of tractors semi-trailers types having hitch clevises
4. Distance between the PTO butt end and the connecting pin axis, mm	108
5. Connecting pin diameter, mm	40
6. Vertical load on DH in hitch point, kN, not more than	20
7. Protective device type	Safety chain (rope) [1)]
8. Connection point of the protective device on the tractor	Lifting device openings
9. Relative calculated value of axial forces (D), kN, not more than	70.1

[1)] Implement accessory.

ATTENTION: IT IS FORBIDDEN TO PUT THE DEVICE TO THE EXTREME LOWER POSITION, WHERE IT OVERHANGS THE DH SUPPORTING BRACKET END!

4.4.5 Drawbar hitch DH-1M-01 (draw bar)

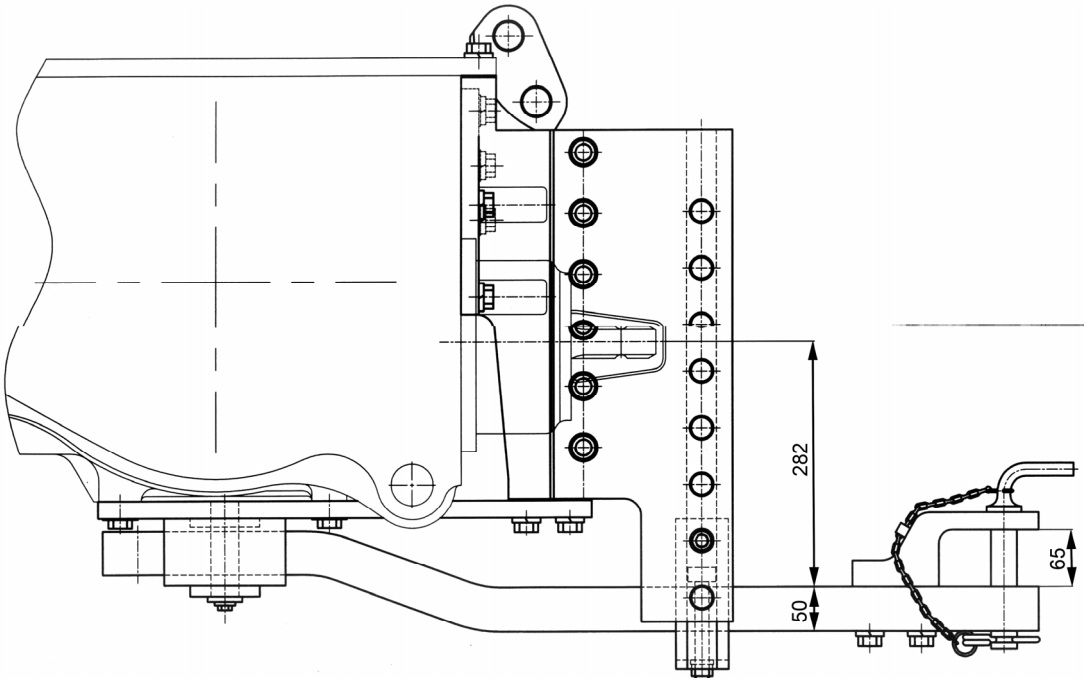


Figure 4.4.4 – Installation variant diagram of DH-1M-01 (draw bar)

Table 4.4.4 – Basic parameters and coupling dimensions of DH -1M-01(draw bar)

Standard size (configuration)	DH -1M-01 (draw bar)	
1. Variant	First position	Second position
2. Mounting location	At the bottom of the rear axis body and rear lifting device	
3. Assignment	For connection and coupling of trailed, semi-trailed implements with traveling wheels, excluding tractor trailers and semi-trailers	
4. Design features	Draw bar with possibility to change its horizontal position in relation to the RPTO butt end	
5. Distance between the PTO butt end and the connecting pin axis, mm	400	500
6. Vertical load on DH in hitch point, kN, not more than	15	11.5
7. Turning angle of the implement trailing device in horizontal plane, degrees, not less than	±60	
8. Connecting pin diameter, mm	30	
9. Protective device type	Safety chain (rope) [1)]	
10. Connection point of the protective device on the tractor	Lifting device openings	
11. Relative calculated value of axial forces (D), kN, not more than	70.1	

[1)] Implement accessory.

ATTENTION: MOUNTING OF COVER PLATE ON THE DRAW BAR BOTTOM (WITH OVERTURN) TO REDUCE HEIGHT OF YOKE POSITIONING IN RELATION TO THE SUPPORTING SURFACE IS NOT ALLOWED!

4.4.6 Drawbar hitch DH -1 (crossbeam)

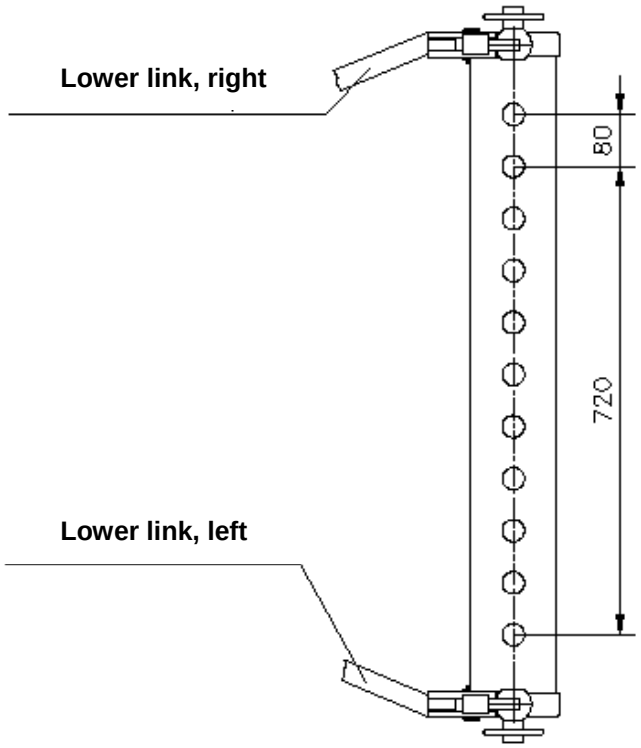


Figure 4.4.5 – Installation diagram of DH -1 (crossbeam)

Table 4.4.5 – Basic parameters and coupling dimensions of DH -1 (crossbeam)

Standard size (configuration)	DH -1 (crossbeam)
1 Mounting location	On the RLL suspension axis
2 Design features	Draw crossbeam on the RLL suspension axis
3 Assignment	For connection and coupling of trailed, semi-trailed and semi-mounted implements equipped with towing yokes
4 Distance between the PTO butt end and the connecting pin axis, mm	668
5 Diameter of crossbeam openings for the connecting pin, mm	32,5
6 Vertical load on DH in hitch point, kN, not more than	3,5
7 Protective device type	Safety chain (rope) [1)]
8 Connection point of the protective device on the tractor	Lifting device openings

[1)] Implement accessory.

4.4.7 Coupling clevis KU2000/329NB33 and coupling clevis KU5410/329-33

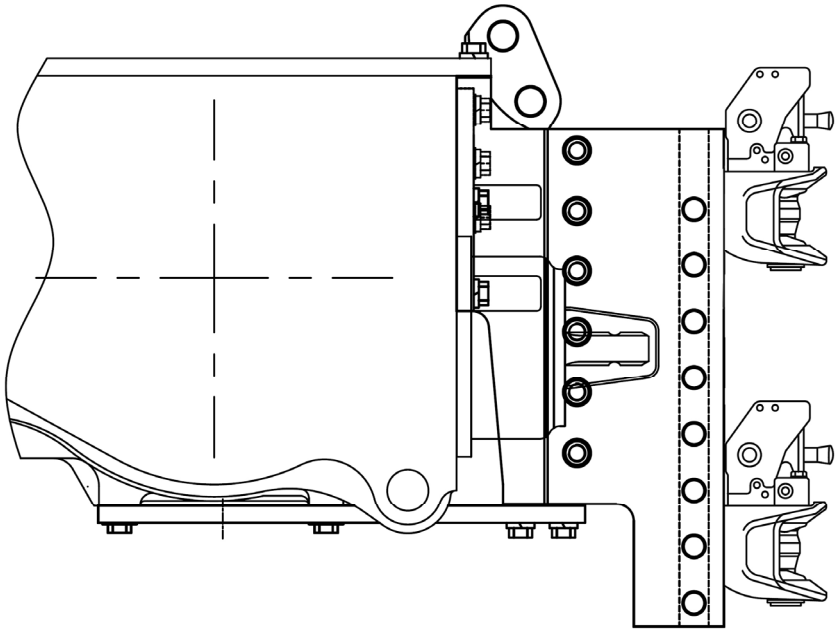


Figure 4.4.6 – Diagram of mounting variants for coupling clevises KU2000/329NB33 and KU5410/329-33

Table 4.4.6 – Basic parameters and coupling dimensions of coupling clevis KU2000/329NB33

Standard size (configuration)	Coupling clevis KU2000/329NB33
1 Mounting location	Rear lifting device
2 Design features	Towing yoke – rotating, located at the lifting device, with the possibility of height adjustment
3 Function	To couple towed agricultural trailed and semi-trailed machines with running wheels including the type of tractor trailers and semi-trailers
4 Drawbar hitch yoke dimensions, mm: a) connecting pin diameter b) yoke position[1)] for machines with rear PTO drive c) distance between the rear PTO butt end and the connecting pin axis	 37 Lower, as shown in figure 4.4.6 170
5 Towing device for coupling to DH: a) type b) vertical load in the hitch point, kN, not more than c) turning angle of the machine towing device in horizontal plane, degrees, at least d) protective device type e) connection point of the protective device on the tractor e) relative calculated value of axial forces (D), kN, not more than	 Rigid, with a towing eye 20 ±65 Chain or safety rope Lifting device openings 70.1

[1)] Recommended.

1 – center pin; 2 – handle for lifting center pin; 3 – handle; 4 – yoke rear wall; 5 – detent.
Figure 4.4.7 – Coupling clevis KU2000/329NB33

To change the attaching points in the coupling clevis lifting device along the height, it is required to turn handle 3 (figure 4.4.7), after which the coupling clevis shall come down and get fixed in the next lower fasteners of the lifting device. To mount the coupling clevis up along the height, it is required to turn handle 3, after which pull handle 3 up. The coupling clevis shall get fixed in the next upper openings of the lifting device.

To couple agricultural machines to the coupling clevis, it is required to uplift center pin 1 by turning handle 2. After that move the tractor closer to the agricultural machine. At the moment of contact between the agricultural machine towing eye with the rear wall of yoke 4, detent 5 shall come into action and center pin 1 shall come down providing coupling between the agricultural machine and the tractor.

On agreement with MTW, the customer is allowed to purchase the coupling clevis manufactured by another company rather than “Walterscheid” and mount it onto the tractor, if the parameters and coupling dimensions of this coupling clevis comply with the parameters and coupling dimensions set forth in Table 4.4.6.

ATTENTION: WHEN COUPLING TRAILERS, TRAILED MACHINES, SEMI-TRAILERS AND SEMI-TRAILED MACHINES TO THE COUPLING CLEVIS AS A PART OF DRAWBAR HITCH, IT IS REQUIRED TO TAKE INTO ACCOUNT THAT PERMISSIBLE LOAD IN THE HITCH POINT IN THE LONGITUDINAL DIRECTION SHALL CONSTITUTE NOT MORE THAN 70.1 kN (INDICATED ON THE LIFTING DEVICE SIDE MEMBERS), REGARDLESS OF THE VALUE INDICATED ON THE AUTOMATED DEVICE PLATE!

Table 4.4.7 – Basic parameters and coupling dimensions of coupling clevis KU5410/329-33

Standard size (configuration)	Coupling clevis KU5410/329-33
1 Mounting location	Rear lifting device
2 Design features	Towing yoke – rotating, located at the lifting device, with the possibility of height adjustment
3 Function	To couple towed agricultural trailed and semi-trailed machines with running wheels including the type of tractor trailers and semi-trailers
4 DH yoke dimensions, mm: a) connecting pin diameter b) yoke position[1)] for machines with rear PTO drive c) distance between the rear PTO butt end and the connecting pin axis	 31 Lower, as shown in figure 4.4.6 160
5 Towing device for coupling to DH: a) type b) vertical load in the hitch point, kN, not more than c) turning angle of the machine towing device in horizontal plane, degrees, at least d) protective device type e) connection point of the protective device on the tractor e) relative calculated value of axial forces (D), kN, not more than	 Rigid, with a towing eye 20 ±65 Chain or safety rope Lifting device openings 70.1

[1)] Recommended.

1 – center pin; 2 – handle; 3 – handle-detent for center pin;

Figure 4.4.8 – Coupling clevis KU5410/329-33

To change the attaching points in the coupling clevis lifting device along the height, it is required to turn handle 2 (figure 4.4.8), after which the coupling clevis shall come down and get fixed in the next lower fasteners of the lifting device. To set the coupling clevis up along the height, it is required to turn handle 2, after which pull handle 2 up. The coupling clevis shall get fixed in the next upper openings of the lifting device.

To couple agricultural machines to the coupling clevis, it is required to pull handle-detent 3 when center pin 1 gets unfastened, take the center pin out of the yoke opening. After that move the tractor closer to the agricultural machine, match the agricultural machine towing eye with the yoke jaw so that the eye opening matches with the yoke opening. Insert center pin 1 into the yoke opening, fix it with the help of handle-detent 3.

On agreement with MTW, the customer is allowed to purchase the coupling clevis manufactured by another company rather than “Walterscheid” and mount it onto the tractor, if the parameters and coupling dimensions of this coupling clevis comply with the parameters and coupling dimensions set forth in Table 4.4.7.

ATTENTION: WHEN COUPLING TRAILERS, TRAILED MACHINES, SEMI-TRAILERS AND SEMI-TRAILED MACHINES TO THE COUPLING CLEVIS AS A PART OF DRAWBAR HITCH, IT IS REQUIRED TO TAKE INTO ACCOUNT THAT PERMISSIBLE LOAD IN THE HITCH POINT IN THE LONGITUDINAL DIRECTION SHALL CONSTITUTE NOT MORE THAN 70.1 kN (INDICATED ON THE LIFTING DEVICE SIDE MEMBERS), REGARDLESS OF THE VALUE INDICATED ON THE AUTOMATED DEVICE PLATE!

4.4.8 Piton-Fix coupling PB5329NNB33

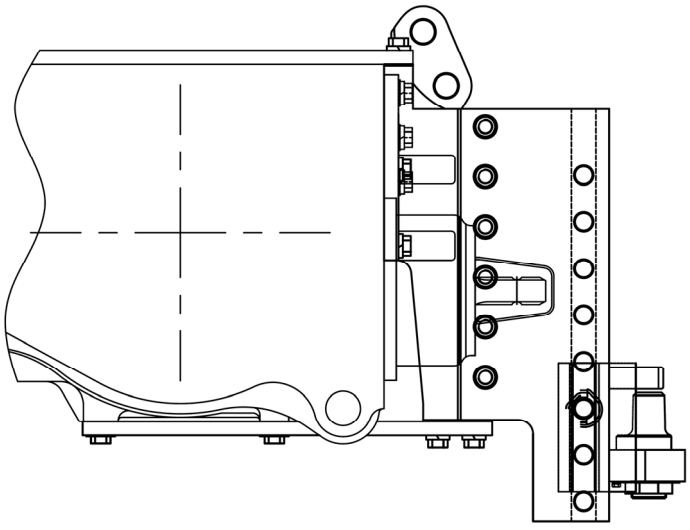
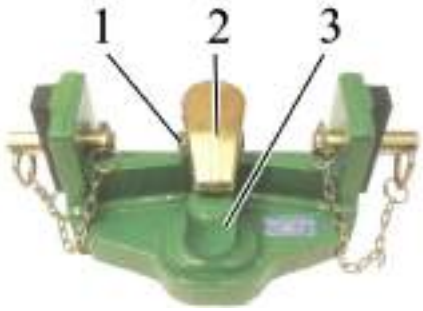


Figure 4.4.9 – Diagram of mounting variants for Piton-Fix coupling PB5329NNB33

Table 4.4.8 – Basic parameters and coupling dimensions of Piton-Fix coupling PB5329NNB33

Standard size (configuration)	Piton-Fix coupling PB5329NNB33
1 Mounting location	Rear lifting device
2 Design features	Tow pin located on the lifting device, with the possibility of height adjustment
3 Function	To connect and couple agricultural trailed and semi-trailed machines with running wheels including the type of tractor trailers and semi-trailers
4 DH yoke dimensions, mm: a) connecting pin diameter b) tow pin height c) jaw depth d) yoke position[1)] for machines with rear PTO drive	 44.5 58 70 Lower position
5 Towing device for coupling to DH: a) type b) vertical load in the hitch point, kN, not more than c) turning angle of the machine towing device in horizontal plane, degrees, at least d) protective device type e) connection point of the protective device on the tractor e) relative calculated value of axial forces (D), kN, not more than	 Rigid, with a towing eye 20 ±60 Chain or safety rope Lifting device openings 70.1

[1)] Recommended.



1 – pin; 2 – rest; 3 – tow pin.

Figure 4.4.10 – Piton-Fix coupling PB5329NNB33

To connect agricultural machines to the Piton-Fix coupling, it is required to remove pin 1 (figure 4.4.10), turn rest 2 in the horizontal direction, mount the agricultural machine towing eye onto tow pin 3, set rest 2 and pin 1 in the initial position.

On agreement with MTW, the customer is allowed to purchase the Piton-Fix coupling manufactured by another company rather than “Walterscheid” and mount it onto the tractor, if the parameters and coupling dimensions of this Piton-Fix coupling comply with the parameters and coupling dimensions set forth in Table 4.4.8.

ATTENTION: WHEN COUPLING TRAILERS, TRAILED MACHINES, SEMI-TRAILERS AND SEMI-TRAILED MACHINES TO THE PITON-FIX COUPLING AS A PART OF DRAWBAR HITCH, IT IS REQUIRED TO TAKE INTO ACCOUNT THAT PERMISSIBLE LOAD IN THE HITCH POINT IN THE LONGITUDINAL DIRECTION SHALL CONSTITUTE NOT MORE THAN 70.1 kN AND PERMISSIBLE VERTICAL LOAD IN THE HITCH POINT SHALL CONSTITUTE NOT MORE THAN 20 kN (INDICATED ON THE LIFTING DEVICE SIDE MEMBERS), REGARDLESS OF THE VALUES INDICATED ON THE “PYTHON” DEVICE PLATE!

4.4.9 Coupling balls KI8329NB33 and KB8329NB33

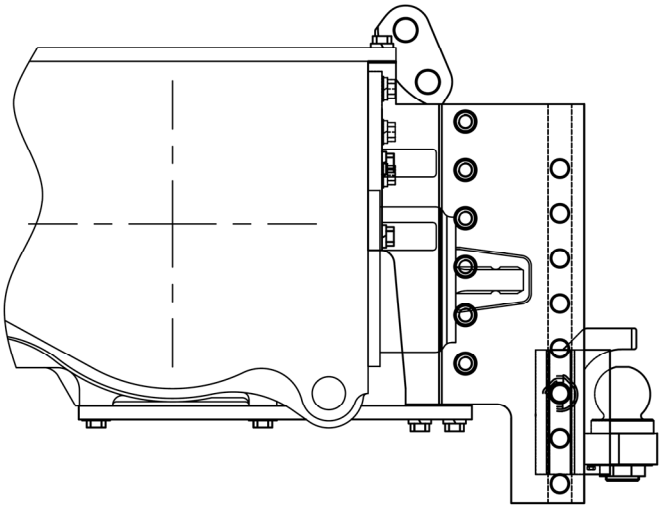


Figure 4.4.11 – Diagram of mounting variants for coupling balls KI8329NB33 and KB8329NB33

Table 4.4.9 – Basic parameters and coupling dimensions of the coupling ball KI8329NB33

Standard size (configuration)	Coupling ball KI8329NB33
1 Mounting location	Rear lifting device
2 Design features	Towing ball Ø80, located on the lifting device, with the possibility of height adjustment
3 Function	To connect and couple agricultural trailed and semi-trailed machines with running wheels, including the type of tractor trailers and semi-trailers
4 DH yoke dimensions, mm: a) connecting ball diameter b) ball height c) jaw depth d) position of the coupling ball[1)] for machines with rear PTO drive	 80 87 65 Lower position
5 Towing device for coupling to DH: a) type b) vertical load in the hitch point, kN c) turning angle of the machine towing device in horizontal plane, degrees, at least d) protective device type e) relative calculated value of axial forces (D), kN, not more than	 Rigid, with a coupling semi-sphere 20 ±60 Chain or safety rope 70.1

[1)] Recommended.

1 – ball; 2 – rest; 3 – handle; 4 – pin

Figure 4.4.12 – Coupling ball KI8329NB33

To change the attaching points in the coupling ball lifting device along the height, it is required to turn handle 3 (figure 4.4.12), after which the coupling ball shall come down and get fixed in the next lower fasteners of the lifting device. To set the coupling ball up along the height, it is required to turn handle 3, after which pull handle 3 up. The coupling ball shall get fixed in the next upper openings of the lifting device.

To connect agricultural machines to the coupling ball, it is required to extract pin 4, turn rest 2 in the horizontal direction, mount the coupling semi-sphere of the agricultural machine onto ball 1, set rest 2 and pin 4 in the initial position.

On agreement with MTW, the customer is allowed to purchase the coupling ball manufactured by another company rather than “Walterscheid” and mount it onto the tractor, if the parameters and coupling dimensions of this coupling ball comply with the parameters and coupling dimensions set forth in Table 4.4.9.

ATTENTION: WHEN COUPLING TRAILERS, TRAILED MACHINES, SEMI-TRAILERS AND SEMI-TRAILED MACHINES TO THE “PYTHON” DEVICE AS A PART OF DRAWBAR HITCH, IT IS REQUIRED TO TAKE INTO ACCOUNT THAT PERMISSIBLE LOAD IN THE HITCH POINT IN THE LONGITUDINAL DIRECTION SHALL CONSTITUTE NOT MORE THAN 70.1 kN AND PERMISSIBLE VERTICAL LOAD IN THE HITCH POINT SHALL CONSTITUTE NOT MORE THAN 20 kN (INDICATED ON THE LIFTING DEVICE SIDE MEMBERS), REGARDLESS OF THE VALUES INDICATED ON THE COUPLING BALL PLATE!

Table 4.4.10 – Basic parameters and coupling dimensions of the coupling ball KB8329NB33

Standard size (configuration)	Coupling ball KB8329NB33
1 Mounting location	Rear lifting device
2 Design features	Towing ball Ø80, located on the lifting device, with the possibility of height adjustment
3 Function	To connect and couple agricultural trailed and semi-trailed machines with running wheels, including the type of tractor trailers and semi-trailers
4 DH yoke dimensions, mm: a) connecting ball diameter b) ball height c) jaw depth d) position of the coupling ball[1)] for machines with rear PTO drive	 80 87 65 Lower position
5 Towing device for coupling to DH: a) type b) vertical load in the hitch point, kN c) turning angle of the machine towing device in horizontal plane, degrees, at least d) protective device type e) relative calculated value of axial forces (D), kN, not more than	 Rigid, with a coupling semi-sphere 20 ±60 Chain or safety rope 70.1

[1)] Recommended.

1 – ball; 2 – rest; 3 – pin.

Figure 4.4.13 – Coupling ball KB8329NB33

To connect agricultural machines to the coupling ball, it is required to extract pin 3 (figure 4.4.13), turn rest 2 in the horizontal direction, mount the coupling semi-sphere of the agricultural machine onto ball 1, set rest 2 and pin 3 in the initial position.

On agreement with MTW, the customer is allowed to purchase the coupling ball manufactured by another company rather than “Walterscheid” and mount it onto the tractor, if the parameters and coupling dimensions of this coupling ball comply with the parameters and coupling dimensions set forth in Table 4.4.10.

ATTENTION: WHEN COUPLING TRAILERS, TRAILED MACHINES, SEMI-TRAILERS AND SEMI-TRAILED MACHINES TO THE COUPLING BALL AS A PART OF DRAWBAR HITCH, IT IS REQUIRED TO TAKE INTO ACCOUNT THAT PERMISSIBLE LOAD IN THE HITCH POINT IN THE LONGITUDINAL DIRECTION SHALL CONSTITUTE NOT MORE THAN 70.1 kN AND PERMISSIBLE VERTICAL LOAD IN THE HITCH POINT SHALL CONSTITUTE NOT MORE THAN 20 kN (INDICATED ON THE LIFTING DEVICE SIDE MEMBERS), REGARDLESS OF THE VALUES INDICATED ON THE COUPLING BALL PLATE!

4.5 Usage patterns of tractor hydraulic system for drive of operating parts and other elements of hydraulically-powered coupled machines and implements

Hydraulic control system for implements mounted on tractors “BELARUS-2122.6” provides an opportunity for oil extraction for the coupled implements operation. The following variants of oil extraction are possible:

- oil extraction by unilateral and bidirectional hydraulic cylinders;
- replenishment of oil volume in the tank caused by filling of cylinder and the implement fittings shall be provided after testing the performance of the tractor hydraulic system with the implement;
- oil extraction for hydraulic motors drives, in this case the implement applicability shall be stipulated with the tractor plant-manufacturer.

While operating hydraulically-powered machines having hydraulic motors, the hydraulic motor drain pipe shall be connected to a special tractor outlet to ensure free oil drain into the tank past the distribution valve.

ATTENTION: FOR PROVIDING NECESSARY ROTATIONAL SPEED OF THE COUPLED IMPLEMENT HYDROMOTOR, CERTAIN OIL SUPPLY IS REQUIRED. HYDRAULIC FLUID SUPPLY ON THE TRACTOR “BELARUS-2122.6” DEPENDS ON THE ENGINE RPM, FOR THIS REASON THE IMPLEMENT HYDRAULIC DRIVE SHALL BE EQUIPPED WITH ITS OWN FLOW ADJUSTING VALVE!

In case of using tractor hydraulic system outputs for the coupled implement service, it is necessary to ensure the required volume of oil in the tank. Oil extraction by cylinders of the coupled implement shall not exceed 20 liters.

Excessive oil extraction during coupling causes load increase on the tractor hydraulic system. If using a hydraulic drive for a long time, it is necessary to check the temperature range in the hydraulic system.

Level check in the tractor hydraulic tank and its refilling shall be carried out with the operating cylinder retracted plungers on the coupled implement and on the tractor. It is forbidden to fill in the oil when the coupled implement plungers are put forward as it can result in the tank overflow and the hydraulic drive elements blowout because of the excessive oil displacement from cylinders at the subsequent lowering (uplift) of the operating parts.

The main characteristics of tractor “BELARUS-2122.6” HLL for drive of operating parts and other elements of coupled hydraulically-powered implements and machines are shown in table 4.5.1.

Table.4.5.1 – Tractor “BELARUS-2122.6” hydraulic drive specifications

Parameter designation	Parameter value (characteristic)	
	Front	Rear
1 Paired hydraulic outlets	One pair connected through high-pressure hose to any pair of rear outlets of the hydraulic distributor EHS, except for the rear outlets pair No3[1)]	Four pairs
2 Oil pipe of free drain into the tank	One item	One item
3 Oil consumption through hydraulic outlets, l/min, - through one section - through two and more sections (total)	steplessly variable 0 to 85 [2)] 0 to 110 [2)]	
4 Nominal minimum diameter of the oil pipeline, mm: - oil pressure pipeline - oil drain pipeline - free drain	 20 25 25	
5 Hydraulic system rated operating pressure, MPa	16	
6 Operating pressure of the safety valve, MPa	20-21	
7 Permissible hydraulic liquid extraction from the tank, l, not more than	20	
8 Permissible hydrostatic power take-off (GSPTO) kW, not more than	22	
9 Coupling thread of fast-coupling joint sleeves, mm: - oil pressure pipeline and oil drain pipeline - free-drain oil pipeline	 M20×1,5 M24×1,5	

[1)] As received by the customer the front hydraulic outlets are connected to the pair of rear hydraulic outlets of the distributor No1. The FLL control is connected to the pair of rear outlets of the distributor No3.

[2)] At rated engine rpm

ATTENTION: SECTION No1 OF THE HYDRAULIC DISTRIBUTOR EHS IS CONNECTED TO OPERATE THE FRONT LIFT LINKAGE CONTROL!

ATTENTION: INSTALLATION OF ADDITIONAL ELEMENTS AND CHANGE OF HYDRAULIC LIFT LINKAGE PIPELINES ROUTE IS ALLOWED ONLY AFTER CONSULTATION WITH THE PLANT OR THE DEALER!

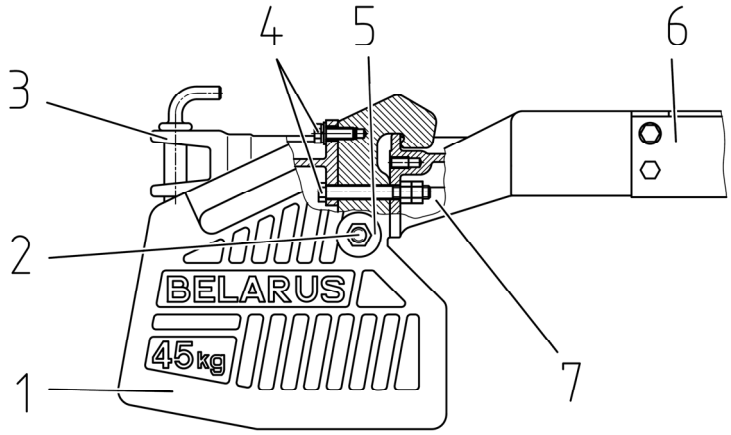
Note – The arrangement of the HLL hydraulic outlets and the diagram of their connection to the external consumers are given in section 2 “Controls and instruments”.

4.6 Front ballast weight

The front ballast weight is designed for preserving tractor normal controllability in the conditions of significant front axle unloading while operating with heavy mounted machines and implements mounted onto tractor RLL and DH.

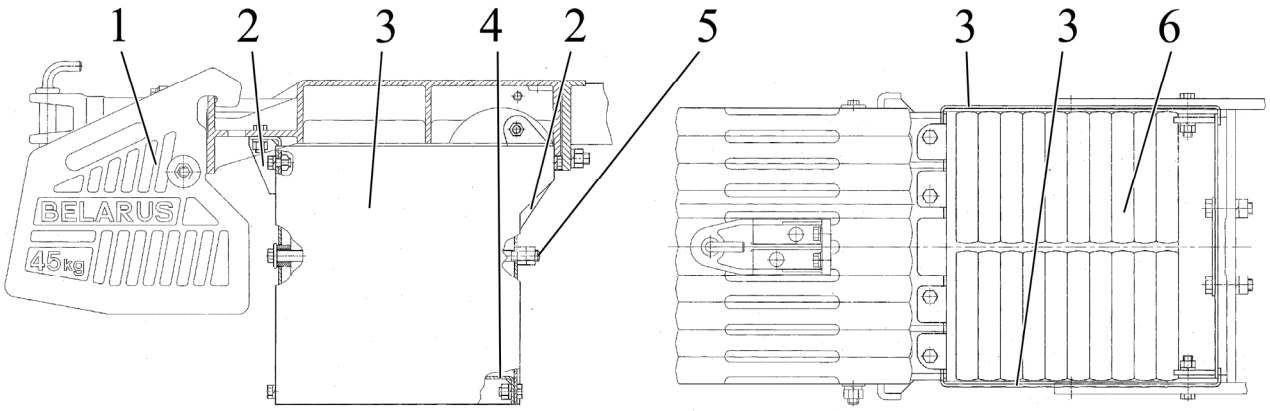
For front ballast weight mounting three variants are possible:

- ballast mounted on the front lift linkage (basic configuration). The diagram of ballast mounted on FLL is shown in figure 4.6.3.
- when there is no FLL ballast with one row of weights of 440 kg (eight pieces - 45 kg each and two pieces – 40 kg each) is to mounted (shown in figure 4.6.1). It has got designation 2022-4235010. Total weight of the ballast 2022-4235010 (weights, spacer, plates and other elements) makes 592,5 kg.
- when there is no FLL it is also possible to install ballast 2022-4235010 in assembly with additional ballast 2022-4235025-A. Ballast 2022-4235010 in assembly with additional ballast 2022-4235025-A is shown in figure 4.6.2 (optional configuration). Additional ballast 2022-4235025-A has total weight of 440 kg.



1 – weights; 2 – string; 3 – towing device; 4 – tension bolts of weight and a towing device; 5 – nut; 6 – plate; 7 – spacer.

Figure 4.6.1 – Ballast 2022-4235010



a) view from the left b) view from the top

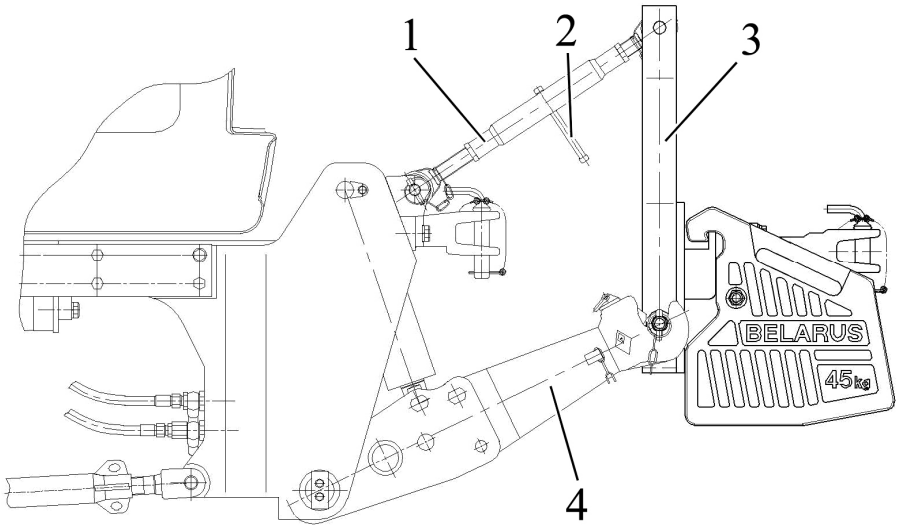
1 – main ballast 2022-4235010; 2 – side members; 3 – walls; 4 - basement; 5 – string; 6 –weights.

Figure 4.6.2 – Additional ballast 2022-4235025-A

Additional ballast (figure 4.6.2) represents a housing (consists of side members 2, walls 3 and basement 4), in which weights 6 (20 kg each) are mounted in two rows. The weights 6 are fixed in housing with two strings 5. The housing with weights is fastened to spacer of ballast 2022-4235010.

It is possible to order tractor equipped with additional ballast as well as to buy additional ballast for already purchased “BELARUS-2122.6” tractor.

The diagram for mounting a kit of ballast weight assembled with a bracket is shown in figure 4.6.3. Information on how to mount ballast weights onto FLL is given in table 4.6.1.



1 – upper link; 2 – upper link tube handle; 3 – bracket with weights; 4 – lower links.

Figure 4.6.3 – Diagram for mounting ballast weights onto FLL

Table 4.6.1 – Information on how to mount ballast weights onto FLL

1 Name of equipment	Kit of mounted ballast weights assembled with a bracket
2 Main function	Additional loading of front driving axle, improvement of tractor weight distribution by means of coupling to the tractor lift linkage
3 Design features	It consists of a ballast weights kit with a bracket
4 LL type (as per GOST 10677) [1)]	LL-2
5 Category (as per ISO 730-1) [1)]	Category 2
6 Diameter of hinge joint sphere to couple with lower links grippers, mm	56
7 Diameter of bracket opening to couple with upper link, mm	25,5
8 Bracket mass with weights, kg	640
9 Bracket mass without weights, kg	105

[1)] Regarding mounted bracket coupling dimensions.

Mounting of a ballast weights kit assembled with a mounted bracket onto FLL shall be carried out in the following way:

- approach the kit of ballast weights slowly with maximally lowered grippers of lower links until the grippers jaw of lower links 4 (figure 4.6.3) is located under the hinge joints on bracket 3 axis;
- to perform coupling, it is required to uplift front ends of lower links 4 until the hinge joints are fixed in lower links grippers;
- connect upper link 1 by means of pin 4 (figure 4.3.11) to the bracket opening with weights 3 (figure 4.6.3), simultaneously screwing or unscrewing out of tube 2 (figure 4.3.11) screwed parts with hinge joints, after undoing counter nuts 1 and 3;
- further adjustment of weights operating position shall be carried out with a coupled bracket by means of changing the length of upper link 1 (figure 4.6.3) by turning handle 2 of upper link tube. After adjustment, screw in counter nuts 1 and 3 (figure 4.3.11).

4.7 Trailer brake drive

4.7.1 General information

Your tractor is equipped with a combined pneumatic drive for trailer brakes. General information on combined pneumatic drive for trailer brakes is given in subsection 4.7.2.

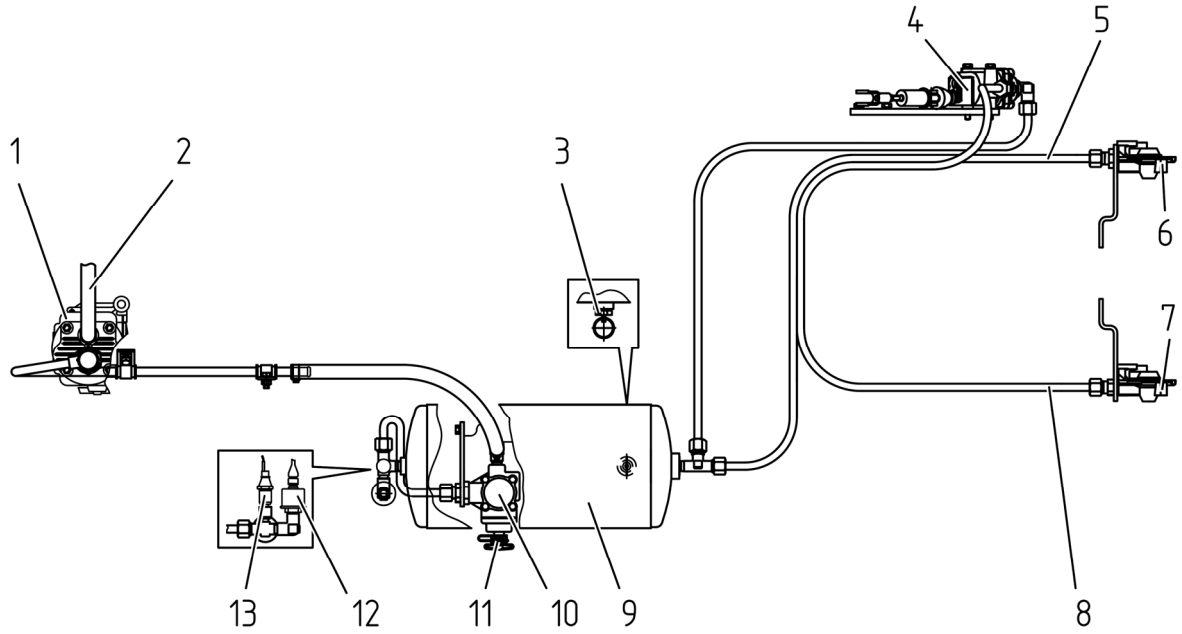
ATTENTION: ALL ADJUSTMENT OPERATIONS OF THE BRAKING SYSTEM AND THE TRAILER BRAKES DRIVE AS WELL AS TROUBLESHOOTING SHALL BE CARRIED OUT WITH THE ENGINE STOPPED AND THE TRACTOR IN A HORIZONTAL POSITION, WHICH SHALL BE SECURED BY STOP BLOCKS PUT BEHIND THE WHEELS AND PREVENTING THE TRACTOR FROM SELF-MOVEMENT!

4.7.2 Combined pneumatic drive for trailer brakes

Tractors “BELARUS-2122.6” are equipped with a combined pneumatic drive providing brake control for trailers and agricultural machines, equipped with a single-line as well as a double-line pneumatic brakes drive. Pneumatic drive is also used for tire inflation and other purposes which require compressed air energy. The diagram for the combined pneumatic drive is shown in figure 4.7.1.

The pneumatic drive has coupling heads 9, 10, 11 (figure 4.7.1) of valve type. Valves of coupling heads prevent air outlet when using a pneumatic drive without a trailer (for example, during tire inflation) and at emergency separation of a trailer. When trailer brake lines connect with tractor lines, valves of coupling heads open letting compressed air go from tractor pneumatic drive to the trailer. Hereby, coupling of pneumatic lines shall be carried out in the absence of pressure in tractor tank 3.

ATTENTION: BEFORE CONNECTING OR DISCONNECTING PNEUMATIC LINES OF TRACTOR AND TRAILER ENGAGE THE PARKING BRAKE! CONNECTING TRACTOR TO TRAILER PNEUMATIC LINES SHALL BE CARRIED OUT WHEN THERE IS NO PRESSURE IN TRACTOR PNEUMATIC SYSTEM!



1 – brake valve (single line); 2 – valve to remove condensate; 3 – tank; 4 – emergency air sensor; 5 – air pressure sensor; 6 – warning lamp of emergency air pressure; 7 – air pressure indicator; 8 – connecting line; 9 – coupling head (with black cover, single-line); 10 – supply line coupling head (with red cover, double-line); 11 – control line coupling head (with yellow cover, double-line); 12 – control line; 13 – supply line; 14 – brake valve (double-line); 15 – pressure regulator; 16 – air bleed valve; 17 – compressor.

Figure 4.7.1 – Combined pneumatic drive for trailer brakes

Air shall be taken to the pneumatic drive from the inlet manifold of the engine. Air is compressed in compressor 17 and delivered to tank 3 through pressure regulator 15, maintaining required pressure in the tank. From the tank compressed air goes to brake valves 1 and 14 and to supply line 13 with coupling head 10 (with red cover) which is constantly under pressure. Brake valve 14 is connected to coupling head 11 (with yellow cover) by means of control line 12. There is no pressure in it. There are two modes to operate brakes of trailers and agricultural implements: direct and automatic.

When attaching a trailer with a single-line pneumatic drive the trailer head is to be connected to coupling head 9 and air comes to the trailer pneumatic drive. As you press brake pedals or engage the parking brake compressed air comes from connecting line 8 to the atmosphere through brake valve 1.

The air distributor gets activated on the trailer supplying compressed air from the trailer tank to brake chambers, and the trailer brakes. In case of trailer emergency detachment the coupling heads get disconnected, air from the trailer line comes into the atmosphere and the trailer brakes automatically.

Direct operation of the brakes is carried out at the cost of pressure drop in connecting line 8 to 0 MPa as tractor brakes. Hereby delivery of compressed air into the system stops.

Automatic operation of the brakes (automatic braking) is carried out in case of coupling break and trailer detachment at the cost of pressure drop in the trailer connecting line.

When a trailer with a double-line pneumatic drive is used the trailer coupling heads shall be connected to coupling heads 10 (with red cover) and 11 (with yellow color), i.e. to supply line 13 and to supply line 12. Herewith, compressed air is constantly delivered to the trailer through supply line 13. As you press brake pedals or engage the parking brake compressed air is delivered to the trailer through brake valve 14 and control line 12. The air distributor gets activated on the trailer supplying compressed air from the trailer tank to brake chambers, and the trailer brakes.

Direct operation of the brakes shall be carried out at the cost of pressure escalation in control line 12 to the value from 0.65 to 0.8 MPa as tractor brakes. Hereby supply line 13 stays under pressure and compressed air delivery to the pneumatic system remains unchanged.

Automatic operation of the brakes (automatic braking) is carried out in case of coupling break and trailer detachment at the cost of pressure drop in the trailer supply line.

Air pressure in tank 3 shall be controlled by air pressure gauge 7 and pilot lamp of emergency air pressure 6 of red color (installed on the dashboard), air pressure sensor 5 and emergency air pressure sensor 4.

To remove condensate from tank 3 there is condensate removing valve 2. Condensate shall be removed by setting the pusher with the ring aside and up.

Air is bled form the pneumatic drive (for tyre inflation) through air bleed valve 16 of pressure regulator 15.

4.8 Determination of PTO shaft and cardan shaft applicability

To avoid failures of PTO shaft and PRS in implements with active operating parts (tilling rotary implements, combine harvester, mowers, cattle-feeders, pickup balers and etc.) mechanical safety clutches are used.

Functional assignment of the safety clutch is automated gear deactivation or limitation of the torque value transmitted from the PTO shaft to PRS under overloads caused by large starting moment, overload (locks) of the operating parts and loads fluctuations on the PRS drive.

ATTENTION: THE RESPONSE TIME OF THE COUPLED IMPLEMENT SAFETY CLUTCH SHALL EXCEED THE RATED OPERATING TORQUE ACTING FOR A LONG TIME IN THE IMPLEMENT DRIVE, BUT BE ALWAYS EQUAL TO OR LESS THAN THE MAXIMUM PERMISSIBLE PTO SHAFT TORQUE! IF THE RESPONSE TIME OF THE IMPLEMENT SAFETY CLUTCH EXCEEDS THE PERMISSIBLE PTO SHAFT TORQUE, SUCH IMPLEMENT MUST NOT BE COUPLED WITH THE TRACTOR.

Safety clutches are divided into cam clutches, frictional clutches, disk clutches, and they can be subdivided into two basic types – with destructible and indestructible operating elements. Clutches with a destructible element are used as unlikely overload control device.

ATTENTION: IT IS NOT RECOMMENDED TO USE CARDAN SHAFTS WITH SAFETY CLUTCHES WITH A DESTRUCTIBLE ELEMENT FOR IMPLEMENTS COUPLING WITH TRACTORS “BELARUS-2122.6”!

In some implements freewheeling clutches are used. Freewheeling clutches (sprag clutches) are automatically locked if the rotating direction is straight, and are unlocked if the rotating direction is opposite. Freewheeling clutches provide operation of the implements with the increased inertia moment of the implement rotating masses to prevent it from the drive failure during the PTO shaft deactivation.

There are also integrated safety clutches. An integrated safety clutch is a safety clutch which is structurally combined with a clutch of other type, for example with a freewheeling clutch.

ATTENTION: MANUFACTURER OF THE IMPLEMENT WITH CARDAN DRIVE FROM THE TRACTOR PTO, SHALL INFORM YOU IN ADVANCE ABOUT THE NECESSITY OF SAFETY CLUTCH USE, CLUTCH DESIGN PECULIARITIES AND CONSEQUENSES OF THE IMPLEMENTS USE WITHOUT THE SAFETY CLUTCH!

While choosing (purchasing) and operating the cardan shaft, it is required to follow the instructions of the implement and cardan shaft manufacturer first of all. It is recommended to apply implements with active operating parts with the tractor, which have the length of the fully displaced cardan shaft between hinge joint centers not more than 1 m.

4.9 Peculiarities of PTO shaft and cardan shaft applicability

WARNING: BE CAREFUL WHEN PTO SHAFT IS ACTIVATED AND THE CARDAN SHAFT OF THE COUPLED IMPLEMENT IS ROTATING. IN CASE THERE ARE PEOPLE IN THE AREA OF PTO SHAFT OPERATION, THEY OR THEIR CLOTHES CAN BE CLAMPED BETWEEN THE IMPLEMENT ROTATING PARTS AND OTHER MOVING MACHINERY. THAT CAN RESULT IN PERMANENT INJURY INCLUDING FATAL OUTCOME! FOR THIS REASON BEFORE STARTING THE PTO SHAFT, MAKE SURE THERE ARE NO PEOPLE IN THE DANGEROUS AREA BETWEEN THE TRACTOR AND THE IMPLEMENT. ALL KINDS OF WORK CONNECTED WITH MAINTENANCE SERVICES (ADJUSTMENT, GREASING AND ETC.), MOUNTING AND DISMOUNTING OF THE CARDAN SHAFT SHALL BE CARRIED OUT WHEN THE TRACTOR PTO SHAFT AND ENGINE ARE OFF. BEFORE CARDAN SHAFT MOUNTING, STOP THE ENGINE, GET THE IGNITION KEY OUT OF THE STARTER AND INSTRUMENTS SWITCH, AND ENGAGE THE PARKING BRAKE!

ATTENTION: TRACTOR MANUFACTURER SHALL NOT BE RESPONSIBLE FOR THE COUPLED IMPLEMENTS CARDAN SHAFTS FAILURES. CARDAN SHAFTS SPECIFICATIONS AND DESIGN ARE IN SPHERE OF RESPONSIBILITY OF THE IMPLEMENTS AND CARDAN SHAFT MANUFACTURERS!

ATTENTION: THE COUPLED IMPLEMENT CARDAN SHAFT SHALL PROVIDE RATED-LOAD TORQUE TRANSFER WHEN ROTATION FREQUENCY IS AT LEAST 540 RPM OR 1000 RPM, DEPENDING ON THE MODE SET!

ATTENTION: DO NOT USE CARDAN SHAFTS WITHOUT APPROPRIATE PROTECTIVE DEVICES AND IF THEY ARE SELF-MANUFACTURED OR DAMAGED!

ATTENTION: BE CAREFUL WHILE COUPLING OF THE IMPLEMENTS WITH THE CARDAN DRIVE - CARDAN SHAFT ANGLES ARE LIMITED BY THE TRACTOR STRUCTURAL ELEMENTS, FOR EXAMPLE BY THE LIFTING DEVICE GUIDING RODS OR TRACTOR WHEELS. DUE TO MUTUAL TOUCH-DOWN OF THE CARDAN SHAFT AND OTHER STRUCTURAL ELEMENTS, SOME BREAKAGE OF THE IMPLEMENT TRAILER CAN HAPPEN OR, FOR EXAMPLE TRACTOR TIRES OR CARDAN SHAFT DAMAGE!

ATTENTION: WHEN THE IMPLEMENT IS OPERATED WITH THE CARDAN DRIVE, THERE IS HAZARD OF PROCESS MATERIAL OR THE IMPLEMENT PARTS RELEASE. FOR THIS REASON IT IS NECESSARY TO OBSERVE SAFE DISTANCE!

ATTENTION: THE WIDTH OF THE RPTO PROTECTIVE DEVICE CLEARANCE MAKES UP LESS THAN 360MM. FOR THIS REASON, WHILE CONNECTING THE CARDAN SHAFT TO THE RPTO SHAFT END EXTENSION OF TYPE 3 (PTO 3), IT IS REQUIRED TO BE CAREFUL IN ORDER TO EXCLUDE ANY HAND INJURIES! NO SPECIAL INSTRUMENTS OR DEVICES FOR CONNECTING THE CARDAN SHAFT TO THE SHAFT END EXTENSION OF TYPE 3 ARE REQUIRED!

IT IS FORBIDDEN TO USE POWER TAKE-OFF SHAFTS WITHOUT CORRESPONDING SAFETY GUARDS!

While the implement cardan shaft connection to the PTO shaft end extension, the following rules and requirements shall be observed:

1. Check the engaged PTO shaft speed mode for compliance according to the tractor PTO shaft end extension type and the implement PRS installed, check the engaged rear PTO drive (independent/synchronous) for compliance.

2. Before activation, detach the cardan shaft into two parts.

3. Visually inspect the cardan shaft, PTO shaft and PRS for absence of mechanical damage and for completeness of the set. Clear the PTO shaft end extensions from dirt if needed, and lubricate them according to the lubrication chart given in the implement operation manual.

4. The part of cardan shaft which has the icon “Tractor” on it, shall be coupled to the PTO shaft end extension, and the second part – to the implement PRS accordingly. Remember to fasten the connecting splined bushings on the PTO and PRS shaft ends properly: a fastening method shall be specified by the cardan shaft manufacturer.

5. The implement cardan shaft end yokes from the side of PTO shaft and PRS shall be in the same plane as shown in figure 4.9.1.

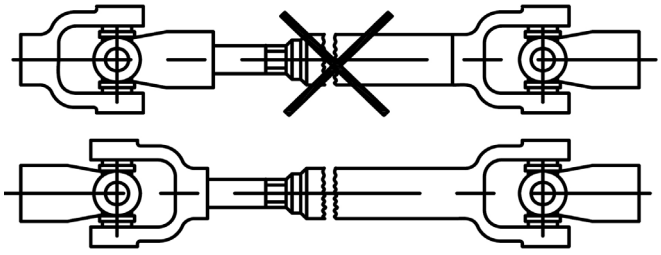


Figure 4.9.1 – Cardan shaft mounting diagram

6. Safety clutch as shown in figure 4.9.2 shall be installed only from the side of PRS of the coupled implement drive, another mounting method does not provide timely protection of the tractor PTO from the excess of maximum permissible torque. After lengthy non-productive time, check technical condition of the implement safety clutch.

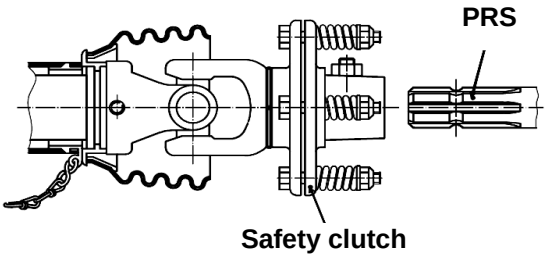


Figure 4.9.2 – Safety clutch mounting diagram

7. Mounting of the cardan shaft with a guard housing together with PTO shaft and PRS protective devices, with retaining chains both from the side of the PTO shaft and of the PRS, as shown in figure 4.9.3, provides cardan joint safety.

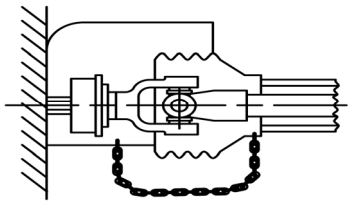


Figure 4.9.3 – Safety cardan shaft mounting diagram

8. When the cardan shaft is used for the first time, it is necessary to check the cardan shaft length, and to adjust it to the operating conditions with tractors “BELARUS-2122.6” if needed. For more detailed instructions on cardan shafts - see the technical documentation enclosed. Contact the cardan shaft manufacturer when needed.

9. The length of the cardan shaft maximally driven apart (which is permitted for operation) shall be of such type when one part of the cardan shaft enters the other for not less than L_2=150 mm. If the value is below L_2=150 mm (figure 4.9.4, view A) the cardan shaft shall not be operated. Sufficiency of overlapping L_2 can be checked by rotating or lifting the coupled implement.

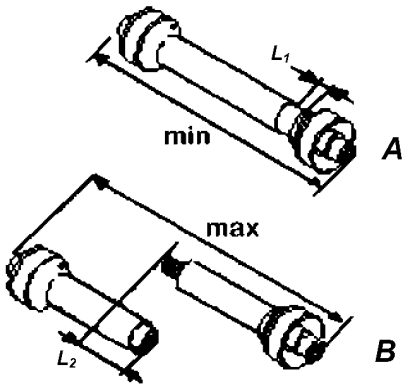


Figure 4.9.4 – Choice of the cardan shaft length

10. With the tractor and the coupled implement in a straight-line position, when the cardan shaft is pushed in fully, it is required to check if there is sufficient clearance L_1 (figure 4.9.4, view B) between the tube butt and the universal joint yoke butt. The minimum permissible clearance L_1 shall make at least 50 mm.

11. After cardan shaft coupling, bring all protective devices into a proper condition, including fixing of the guard shaft housing with the chains to prevent rotation, as shown in figure 4.9.3.

12. If necessary, limit the RLL height of the extreme upper position while the implement uplifting. It is required for the slope angle decrease, for exclusion of cardan shaft touching and damaging, and for providing safety clearance between the tractor and the implement.

13. Maximum permissible slope and turning angles (figure 4.9.5) of the cardan shaft hinge joints are shown in table 4.9.1.

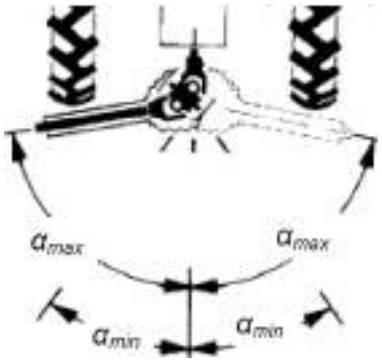


Figure 4.9.5 – Maximum permissible slope and turning angles of the cardan shaft hinge joints

Table 4.9.1

Tractor power take-off shaft position	Maximum permissible angle of slope (turning) α_{max} [1], In degrees	
	Cardan shaft hinge joints type	
	Universal	Equivalent angular rates
"*On*" position:		
- under load	20	25
- no-load [2]	50	50
"*Off*" position [3]	50	50

[1] Other variants are possible (see the documentation of cardan shaft and implement manufacturers).
[2] For short period, for the PTO shaft operating with no load.
[3] For the implement transport position when the PTO shaft is off.

14. While operating with mounted and semi-mounted implements having cardan drive, it is required to block the lift linkage lower links.

15. After the cardan shaft dismounting, it is required to put guard hoods on the PTO shaft end extensions and PRS!

16. After the PTO shaft deactivation, consider the hazard of the implement cardan shaft and separate mechanisms coupled coasting. For this reason the dangerous area between the tractor and the implement can be entered only after the PTO shaft complete stop!

17. Check the operation of the implement with the cardan shaft mounted to the PTO shaft and PRS at the minimum and maximum rpm of the tractor engine shaft.

18. While tractor transportation with trailed, semi-trailed and semi-mounted implements for long distances, including from one field to another, it is recommended to disconnect the cardan shaft from the tractor and from the implement.

19. Maintenance, cleaning and repair services of the implement with the cardan drive coupled to the tractor shall be carried out only when the PTO shaft and the tractor engine are off.

The PTO shaft shall be disengaged in the following cases:

- after the tractor stop, only after the coupled implement fully completed its duty cycle;
- on turns, when the implement is lifted to the transport position;
- when moving up a steep slope.

Do not engage the PTO shaft in the following cases:

- when the tractor engine is off;
- the implement coupled to the tractor is in transport position;
- when the implement operating parts are sunken into the soil;
- .if the implement operating parts are covered in process material or if the operating parts are clogged or wedged;
- if there is a considerable slope angle (refraction angle) in any plane of cardan shaft hinge joints.

While operating rotation tilling machines with active operating parts, it is additionally required to observe the following rules:

- not to engage the PTO shaft when the implement is grounded. The PTO shaft shall be engaged only when the ready to operate implement is lowered so that its operating parts do not touch the ground with the clearance not less than 35 mm;
- lowering of the implement with rotating operating parts shall be carried out smoothly when the tractor is moving forward;
- during operation prevent the tractor from moving in the direction not corresponding the implement working travel, when the operating parts are sunken into the soil with the PTO shaft engaged and disengaged;
- during operation on solid soils it is required to carry out processing of cross ranges for moving in enclosure, and then process the soil in the lengthwise direction;
- it is recommended to work at the minimum soil processing depth needed for the specific crop. It is necessary for load reduction on the tractor PTO shaft and for reduction of fuel consumption during tractor operation. It is particularly important to consider this fact during tractor operation with multiple-purpose tillage units.

4.10 Ways of changing drawbar features and passing ability of the tractor

There are the following ways of changing drawbar features of “BELARUS-2122.6” tractor:

- increase of tractor adhesion weight;
- increase of wheel tire-soil adhesion.

To increase the adhesion weight of the tractor, do the following:

- use quick-detachable hitch ballast weight;
- fill tires with water (solution);

To increase wheel tire-soil adhesion, do the following:

- select optimal internal pressure in tires, depending on the operating conditions and load on tractor axles;
- apply rear axle differential lock;
- twin the wheels.

Note – Pneumatic pressure rate in the front and rear tires of the tractors “BELARUS - 2122.6” under actual load is shown in subsection 3.2.8 “Selection of optimal internal pressure in tires depending on the operating conditions and load on tractor axles”.

To obtain information on the rules of rear wheel twinning and filling of wheel tires with water (solution), as well as on operating limitations for tractors equipped with twinned wheels and tires with water (solution) - contact your dealer.

4.11 Features of tractor application in special conditions

4.11.1 Tractor operation in areas with rugged topography. Possibility of tractor application for haylage preparation

An operator working in the fields and roads with slopes shall be very careful.

Technical characteristics of the general-purpose implement coupled in the structure of MTU ensure its safe and proper operation on working fields with a slope not more than 9 degrees.

ATTENTION: TRACTORS “BELARUS-2122.6” ARE NOT INTENDED FOR OPERATION WITH GENERAL-PURPOSE IMPLEMENTS AT UPLAND TERRITORIES INCLUDING STEEP SLOPES. FOR THIS REASON TRACTORS ARE NOT COMPLETED WITH SPECIAL-PURPOSE DEVICES, FOR EXAMPLE UTMOST LURCH ANNUNCIATORS!

ATTENTION: APPLICATION OF TRACTORS “BELARUS-2122.6” FOR GRASS STACKING (SILAGE OR HAYLAGE) IN TRENCHES AND PITS IS NOT ALLOWED!

4.11.2 Application of substances for chemical treatment

Tractor cabin corresponds to category 2 under EN 15695-1:2009. The cabin of this category protects from dust, but not from aerosol and vapor ingress, for this reason the tractor shall not be used in conditions requiring protection from aerosol and vapor ingress.

The cabin is equipped with ventilation, heating and conditioning system according to GOST 12.2.120. In ventilation system there are four paper filters with operating specifications according to GOST ISO 14269-5. Cabin design ensures its hermiticity according to GOST ISO 14269.

ATTENTION: CABIN OF THE TRACTOR “BELARUS-2122.6” DOES NOT PROTECT FROM POSSIBLE DAMAGING EFFECT OF SUBSTANCES USED FOR CHEMICAL TREATMENT OF AGRICULTURAL PLANTS AND SOILS INCLUDING SPRAY TREATMENT. FOR THIS REASON WHEN OPERATING WITH CHEMICAL SUBSTANCES, THE OPERATOR SHALL WEAR INDIVIDUAL PROTECTIVE EQUIPMENT ACCORDING TO OPERATING CONDITIONS!

IT IS FORBIDDEN TO PUT SUBSTANCES USED FOR CHEMICAL TREATMENT OF AGRICULTURAL PLANTS AND SOILS IN THE CABIN.

IT IS FORBIDDEN TO ENTER THE TRACTOR CABIN WEARING CLOTHES OR SHOES CONTAMINATED WITH SUBSTANCES USED FOR CHEMICAL TREATMENT OF AGRICULTURAL PLANTS AND SOILS.

For safe and proper application of the specified substances, it is necessary to observe the instructions written on the labels and documents accompanying the substances.

It is required to use all individual protective equipment and special clothes (work clothes and covered footwear, etc), corresponding to the operating conditions and current safety requirements.

If a breathing mask inhaler is required by the instruction on the substance use for chemical treatment, it shall be used inside the tractor cabin.

4.11.3 Operation in a forest

IT IS FORBIDDEN TO USE TRACTOR “BELARUS-2122.6” FOR OPERATION IN A FOREST AS WELL AS FOR CLAMSHELL LOADER COUPLING, TRAILING EQUIPMENT, SPECIAL-PURPOSE FORESTRY MACHINERY DESIGNED FOR GATHERING, LOADING, AND TRANSPORTATION OF TREES, AND THEIR UNLOADING, SORTING AND WAREHOUSING!

ATTENTION: ACCORDING TO THE ASSIGNMENT OF THE TRACTOR “BELARUS-2122.6”, A SPECIAL PROTECTION DEVICE “OPS” FOR OPERATOR’S WORKING PLACE INCLUDING SPECIAL ATTACHING POINTS FOR IT ARE NOT PROVIDED IN ITS DESIGN. FOR THIS REASON THE TRACTOR SHALL NOT BE OPERATED IN THE CONDITIONS WHEN THERE IS A HAZARD OF TREES, BRANCHES, AND SINGLE PARTS OF THE COUPLED EQUIPMENT PENETRATION INTO THE OPERATOR’S CABIN!

4.12 Determination of total weight, loads on front and rear axles, tires holding capacity and the required minimum ballast

The amount of load on tractor axles in structure of MTU may be determined by direct weighting on truck scales of the corresponding carrying capacity.

Tractor weighting on scales gives an opportunity to consider accurately weight distribution of MTU masses along tractor axles of your configuration in different operating conditions: “main operation” and “transport”. While determination of loads on tractor axles, it is required to consider the technological load weight, for example the weight of seeds, distributed by a seeder.

For determination of load on tractor front and rear axles by weighting on truck scales, it is necessary to place the tractor with the wheels of the measured axle on a weighting platform, and the wheels of the other axle shall be kept out of the weighting area on the same level with the platform.

The following formula is used for load determination:

$T = m \cdot g$, where

T is load, N;

M is mass, kg;

g=9,8 is gravity acceleration, m/s^2

Calculation of load on front tractor axle:

$T_f = m_1 \cdot g$, where

T_f is load on front tractor axle, N;

m_1 is the amount of tractor operating weight with ballast (the unit installed), distributed on tractor front axle, kg;

g=9,8 is gravity acceleration, m/s^2.

Calculation of load on the rear tractor axle:

$T_z = m_2 \cdot g$, where

T_z is load on the rear tractor axle, N;

m_2 is the amount of tractor operating weight with the unit installed (ballast), distributed on tractor rear axle, kg;

g=9,8 is gravity acceleration, m/s^2.

Calculation of load acting on one front or one rear tractor wheel for selection of pressure in tires:

a) during operation of tires on single wheels:

$G_f = \frac{T_f}{2}$; $G_Z = \frac{T_Z}{2}$, where G_f and G_Z are loads acting on one front or one rear tractor tire accordingly.

b) during operation of tires on twinned wheels
(considering the reduction of permissible load on a tire during operation of tires on twinned wheels):

$1{,}7\,G_f$ twinned$_.$ $= G_f$ $\qquad$ $1{,}7\,G_Z$ twinned$_{..}$ $= G_Z$

G_f twinned$_{..}$ $= \frac{G_f}{1{,}7}$ $\qquad$ G_Z twinned$_{..}$ $= \frac{G_Z}{1{,}7}$

where $G_{f\ \text{сдв.}}$ and $G_{Z\ \text{сдв.}}$ are calculated loads for tire inflation pressure during operation on twinned wheels.

Further according to the calculated loads, it is necessary to determine tire pressure (according to subsection 3.2.8 “Selection of tires internal pressure depending on operating conditions and load on tractor axles”).

Calculation of tractor controllability criterion:

$k_f = \frac{T_f}{M_{\square}}$, where

T_f is load on tractor front axle, N;

k_f is tractor controllability criterion;

M is tractor operating weight (during calculation, ballast weights in the tractor operating weight M are not taken into account), kg.

ATTENTION: COUPLING OF IMPLEMENTS TO THE TRACTOR SHALL NOT RESULT IN EXCESS OF PERMISSIBLE AXLE LOADING AND LOADS ON THE TRACTOR TIRES!

ATTENTION: MINIMUM WEIGHT OF COUPLED IMPLEMENTS AND BALLAST WEIGHTS SHALL ALWAYS MAKE NOT LESS THAN VALUES AT WHICH LOAD ON THE FRONT TRACTOR WHEELS IN STRUCTURE OF MTU SHALL ALWAYS MAKE NOT LESS THAN 20% OF THE TRACTOR OPERATING WEIGHT, AND THE CONTROLABILITY CRETERION SHALL MAKE NOT LESS THAN 0.2!

4.13 Possibility of front loader mounting

ATTENTION: INSTALLATION OF ANY MOUNTED IMPLEMENTS ON BELARUS-2122.6 TRACTORS INCLUDING MOUNTED FRONT LOADERS WHICH DON’T REFER TO MOUNTED, SEMI-MOUNTED, SEMI-TRAILED OR TRAILED MACHINES BY WAY OF ATTACHING SPECIAL ASSEMBLY UNITS FROM KIT OF EQUIPMENT TO TRACTOR HOLES IS NOT PROVIDED!

5 MAINTENANCE

5.1 General instructions

Maintenance service (MS) is necessary for maintaining the tractor in operable state during operational processes. Failure to observe the specified intervals of MS and bad quality of MS may result in reduction of tractor life significantly, increase of failures, engine power loss and increase in expenses for tractor operation. An operator shall carry out daily inspection of the tractor, checking fasteners for tightening, fuel, liquid, and oil leakage, dirt and other deposits accumulation, which can cause operating troubles, ignition or accidents.

Notes about performance of maintenance services shall be made in the tractor service book.

Observe storage precautions and waste recovery rules. Never discharge used liquid to the ground. Use special tanks for safe storage of waste.

WARNING: WHILE CARRYING OUT MAINTENANCE AND REPAIR SERVICES, ALWAYS COMPLY WITH SAFETY PRECAUTIONS, LISTED IN SUBSECTION 5.6 “SAFETY PRECAUTIONS WHILE MAINTENANCE AND REPAIR SERVICES”!

ATTENTION: IF THERE ARE NO SPECIAL INSTRUCTIONS, BEFORE STARTING ANY MAINTENANCE OR ADJUSTMENT SERVICES, ETC., STOP THE ENGINE AND ENGAGE PARKING BRAKES. IN CASE SAFETY GUARDS AND COVERS ARE OFF, MAKE SURE THEY ARE MOUNTED BACK AFTER CONDUCTING MAINTENANCE SERVICES, BEFORE YOU START OPERATING THE TRACTOR!

In the process of conducting maintenance services of the hydraulic lift system, steering, and the transmission hydraulic system, it is strictly required to observe oil change and filter replacement intervals. It is not allowed to use oil for filling (refilling), not specified in the tractor operation manual.

Before refilling, replacing or cleaning filter cartridges, it is necessary to clean filler plugs, necks and caps, and adjoining surfaces from dirt and dust. While filter cartridge replacement, wash internal surfaces of filter housings and caps with the diesel fuel.

While tractor coupling with hydraulically-operated implements, it is necessary to clean clutches, couplings, adapting pipes and other connecting parts of the implement and the tractor thoroughly.

In case the hydraulic system is operated with hydraulically-operated implements filled with oil origin of which is unknown, the oil in the implement shall be replaced by the oil filled into the tractor hydraulic lift system.

Purity of oil in the hydraulic system ensures its fail-safe operation.

Types of scheduled maintenance service are shown in table 5.1.1.

Table 5.1.1 – Types of scheduled maintenance service

Types of maintenance service	Intervals, h
Maintenance service while operational run-in [1)]	MS before, during and after tractor run-in (after 30 hours of operation)
Shift-time (STMS)	8-10
First maintenance service (MS-1)	125
Additional maintenance service (2MS-1)	250
Second maintenance service (MS-2)	500
Third maintenance service (MS-3)	1000
Special maintenance service	2000
General maintenance service	As required
Seasonal maintenance service (MS-SS and MS-AW)	While transfer to autumn and winter operation (MS-AW) and spring and summer (MS-SS)
Maintenance service not corresponding to the set intervals with MS-1, 2MS-1, MS-2, MS-3 and special MS	–
Maintenance service in special operating conditions	During preparation of tractor operation in special conditions
Maintenance service during storage [2)]	In case of long-term storage

[1)] Information on maintenance services carried out by the operator before, during and after tractor run-in is given in subsection 3.4 “Tractor final assembly and run-in”.
[2)] Information on maintenance services carried out by the operator during long storage of the tractor is given in section 7 “Tractor storage” of this operation manual.

Deviations of +10% for MS-1, 2MS-1 and MS -2 and +5% for MS -3 from the set intervals of MS are permitted (early or late MS) depending on operating conditions of the tractor.

In order to provide high-quality performance of maintenance service operations, it is required to use instruments, tools and measuring devices specified in subsection 5.7. “Instruments, tools and measuring devices while maintenance services and repair”.

5.2 Providing access to the components for maintenance services

Before starting maintenance service operations, it is required to open tractor hood 3 (figure 5.2.1). Hood 3 can be opened and fixed in two positions.

To open hood 3 and fix it in the first position, it is necessary to do the following:

- open lock 2 by pulling the handle of control cable 1;
- uplift hood 3;
- secure it in the open position by means of link 4 in bracket 5;
- make sure that hood 3 is securely fixed in the uplift position.

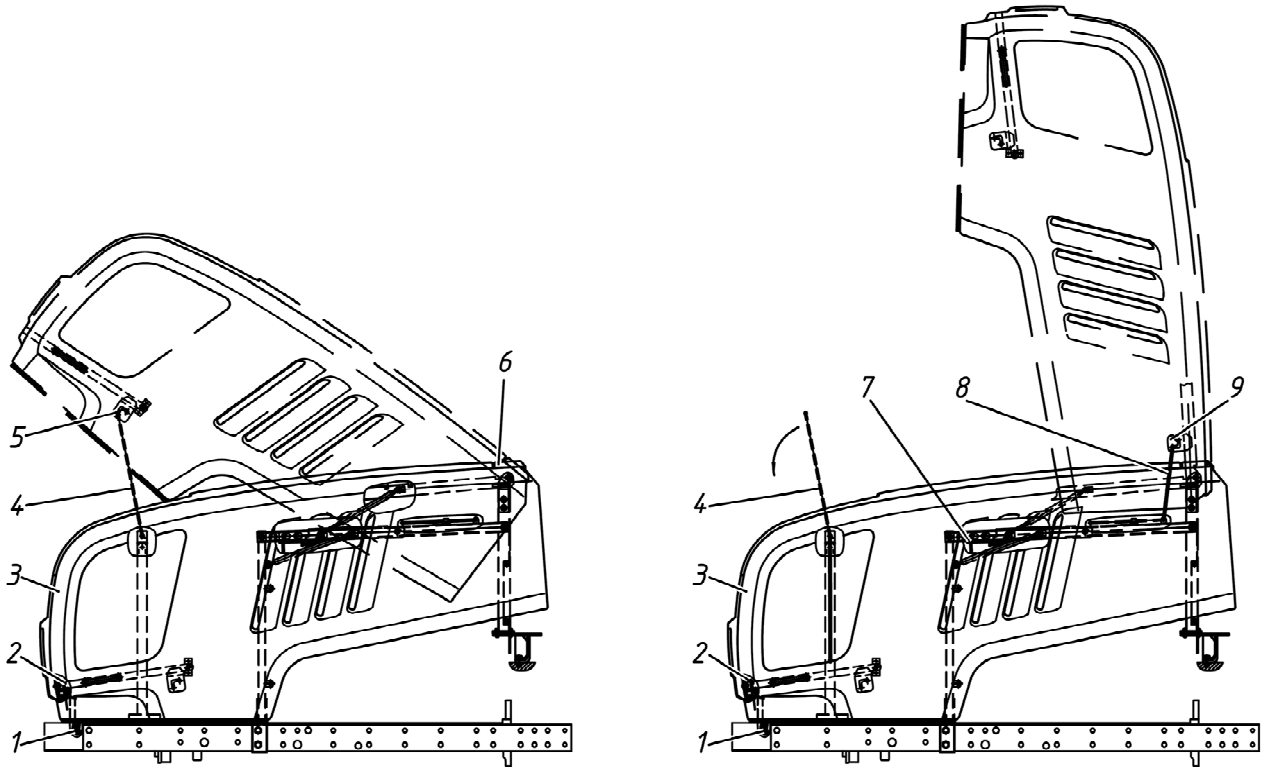
To open hood 3 and fix it in the second position, it is necessary to do the following:

- open lock 2 by pulling the handle of control cable 1;
- uplift hood 3;
- secure it in the open position by means of link 4 in bracket 5;
- disconnect lamp-wiring assembly from the engine harness;
- uplift hood 3 slightly to remove link 4 from bracket 5;
- mount link 4 onto its proper location;
- holding hood 3 by hand, pull detent 7 along the tractor longitudinal axle from the cab;
- uplift hood 3 into the second position;
- secure it in the open position by means of link 8 in bracket 9.

To close the hood, it is necessary to do the following:

- uplift hood 3 slightly to remove link 4 or 8 from the corresponding bracket 5 or 9 depending on the position in which hood 3 is opened;
- secure link 4 or 8 onto its proper location;
- lower hood 3 into the lower position until a specific click is heard (lock 2 comes into action).

To get better access to the main cylinder tanks of hydraulic drives for clutch and brakes control mounted on the cab, it is required to open hatch 6.



a) first position

b) second position

1 – handle of control cable; 2 – lock; 3 – hood; 4 – link; 5 – bracket; 6 – hatch; 7 – detent; 8 – link; 9 – bracket.

Figure 5.2.1 – Hood opening and closing

5.3 Maintenance procedure

Contents of scheduled servicing operations for tractors “BELARUS-2122.6” in the course of operation are listed in Table 5.3.1.

Table 5.3.1.

Operation No	Operation description	Periodicity, h					
		8-10	125	250	500	1000	2000
1	Check oil level in the engine crankcase	X					
2	Check oil level in the transmission line	X					
3	Check oil level in the HLL tank	X					
4	Check oil level in HSC tank	X					
5	Check cooling liquid level in the engine cooling system	X					
6	Check brake fluid level in the tanks of hydraulic drive main cylinders of clutch and brake control	X					
7	Check AdBlue level in SCR system liquid tank, if necessary refill	X					
8	Clean alternator	X					
9	Check visually exhaust gases after treatment device (AdBlue leakage, mechanical damages)	X					
10	Check tires state	X					
11	Check air conditioner hose fixtures	X					
12	Check the hydraulic system elements	X					
13	Check/clean air conditioner drainage pipes from condensate water	X					
14	Check/clean air conditioner condenser	X					
15	Check/clean engine water radiator and engine CAC-radiator	X					
16 [1)]	Check/clean gripper tools of RLL	X					
17	Check breaks functioning in running order, engine, steering, light/alarm devices operability	X					
18	Drain condensate water from the pneumatic system balloon	X					
19	Check the condition of wiring, wire bundles of the electric equipment in the engine compartment, in the cab front area, and the condition of visible parts of the wiring	X					
20	Drain condensate water from the radiator tanks of CAC	X winter	X summer				
21 [2)]	Check threaded connection tightening of wheel fastening	X	X				
22	Wash the tractor and clean the cab interiors		X				
23	Check bolt tightening of CAC air-duct clamps		X				
24 [3)]	Check pneumatic pressure in tires		X				
25	Drain sediment from the fuel tank		X				
26	Drain sediment from the coarse fuel filter		X				
27	Check belt tension in generator and water pump drive		X				
28	Clean filter cartridges of ventilation and air heating systems of the cab		X				
29	Check/adjust air conditioner compressor drive belt tension		X				
30	Check oil level in the main gear housing and FDA wheel-hub drives		X				

Table 5.3.1 continued

Operation No	Operation description	Periodicity, h					
		8-10	125	250	500	1000	2000
31	Check / adjust clutch control		X				
32 [4)]	Carry out maintenance of AB			X			
33 [5)]	Lubricate HSC hydraulic cylinders hinge joints			X			
34	Rinse the mesh filter of the transmission hydraulic system			X			
35	Check/adjust clearances in the steering link hinge joints			X			
36	Check/adjust front wheels toe-in			X			
37 [5)]	Lubricate the clutch release yoke bearing			X			
38 [5)]	Lubricate kingpin bearings of FDA			X			
39 [5)]	Lubricate the bearing of FDA oscillation pin			X			
40	Change the engine oil filter			X			
41	Change oil in the engine crankcase			X			
42 [6)]	Check oil level in the FPTO reduction unit			X			
43	Drain sediment from the fine fuel filter			X			
44	Clean the rotor of the engine centrifugal oil filter			X			
45	Provide maintenance for generator and starter			X			
46	Clean filter cartridge of air pressure regulating filter in the pneumatic system				X		
47	Check / adjust the service brake control				X		
48	Check / adjust the parking brake control				X		
49	Check/adjust brake valve actuators of the pneumatic system				X		
50	Check all joints of the air cleaner and inlet duct for hermiticity				X		
51	Check wheel-hub drive bearings of FDA				X		
52	Check clearances in bearings of FDA reduction unit flange				X		
53	Check/adjust clearances between valves and rocking arms of the engine				X		
54 [5)]	Lubricate the sleeves of RLL turning shaft				X		
55	Rinse the breathers of HLL oil tank				X		
56	Check hermiticity of the pneumatic system main pipes				X		
57 [7)]	Change the HLL changeable filter cartridge				X	X	
58 [7)]	Change the changeable filter cartridge of HSC tank				X	X	
59	Change oil in HLL tank					X	
60	Check oil in HSC tank					X	
61	Change oil in the transmission line					X	
62	Change oil in the main gear housing and in FDA wheel-hub drive housings					X	

End of table 5.3.1

Operation No	Operation description	Periodicity, h					
		8-10	125	250	500	1000	2000
63 [6]	Change oil in the FPTO reduction unit					X	
64	Change brake liquid in the clutch control drive					X	
65	Change brake liquid in the brake control drive					X	
66 [5] [6]	Lubricate the sleeves of FLL lever pin					X	
67 [5]	Change grease in steering joints and rinse the steering joints elements					X	
68	Check /adjust the pneumatic system pressure regulator					X	
69	Check / tighten tension bolts of cylinder heads					X	
70	Change the main filter cartridge of the air cleaner					X	
71	Check / tighten tractor external threaded joints					X	
72	Rinse the engine cooling system and replace the cooling liquid in the engine cooling system						X
73	Rinse the engine breathers						X
74	Change filter cartridge of the cab ventilation and heating systems						X
75	Change filter cartridge of the fine fuel filter	Every 600 hours of operation or once a year					
76	Change filter cartridge of the coarse fuel filter	Every 600 hours of operation or once a year					
77	Change the filter-drier of the air-conditioning system	Every 800 hours of operation or once a year					
78	Carry out complex maintenance service of system “COMMON RAIL”	Every 3000 hours of operation or once a year					
79	Adjust the valve adjusting operating pressure in the hydraulic system of transmission	Depending on oil pressure deviance in the transmission hydraulic system					
80	Change replaceable filtering elements of duplex filter of transmission hydraulics and wash mesh filter	As gets dirty					
81	Change filter of HLL pump.	As gets dirty					
82	Change replaceable fine filter element and wash coarse filter of end plate of HLL integral unit	As gets dirty					
83	Carry out maintenance service of the engine air cleaner	As gets dirty					

[1] The operation is performed when the tractor RLL is equipped with lower links with gripper tools.

[2] The operation shall be carried out once during the first maintenance service on a shift basis (in every 8-10 hours of operation), carried out by the customer, and then every 125 hours of tractor operation.

[3] Control and if necessary, bringing tire internal pressure to the norm shall be carried out each time when one mode of the tractor operation is changed to another operation mode, and when the implements and tools coupled with the tractor are changed.

[4] AB check and maintenance shall be carried out once every 3 months and not less.

[5] When using grease MS-1000 TU 0254-003-45540231-99 the operation shall be carried out with lesser intervals, according to table 5.8.1.

[6] The operation is performed when the tractor is equipped with FPTO and FLL against order.

[7] The first and second change shall be carried out in 500 hours of tractor operation. Then the change shall be carried out every 1000 hours of operation at the same time with oil change.

5.4 Scheduled maintenance service operations

5.4.1 Maintenance service on a shift basis (SBMS) in every 8 – 10 hours of operation or per shift

5.4.1.1 General instructions

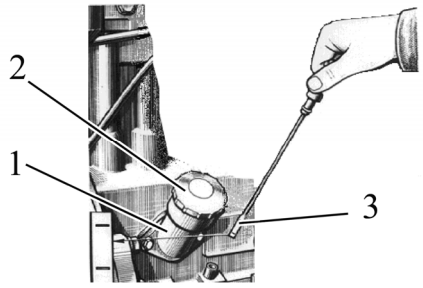
Every 8 – 10 hours of tractor operation or at the end of shift (depending on which comes first), do the following operations:

5.4.1.2 Operation 1. Check of oil level in the engine crankcase

Check oil level putting the tractor on a flat surface and not earlier than in 3-5 min after the engine is off, when the oil completely flows to the crankcase.

To check oil level in the engine crankcase, do the following:

- take dipstick 3 out (figure 5.4.1), wipe it clean and then put it back against the stop;
- take dipstick 3 out and define the oil level. The oil level shall stay between the upper and lower marks of the dipstick. If required, top up the oil through neck 1 after removing cap 2;
- put cap 2 back.



1 – oil filler neck; 2 – cap; 3 – dipstick.
Figure 5.4.1 – Check of oil level in the engine crankcase

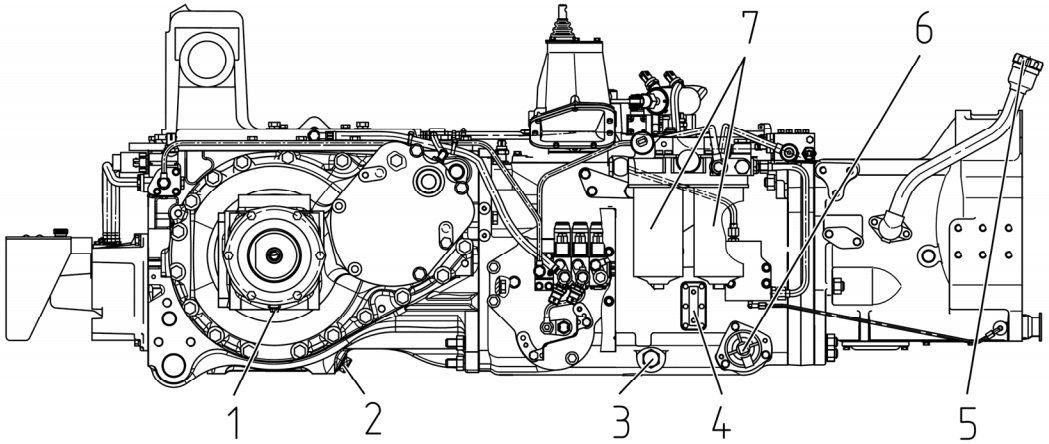
ATTENTION: DO NOT RUN THE ENGINE WITH THE OIL LEVEL BELOW THE LOWER MARK ON THE DIPSTICK!

ATTENTION: DO NOT TOP OIL ABOVE THE UPPER MARK OF THE DIPSTICK. THE EXCESS OF OIL BURNS OUT CREATING WRONG IMPRESSION OF LARGE OIL CONSUMPTION!

WARNING: BE CAUTIOUS TO AVOID CONTACT WITH HOT OIL!

5.4.1.3 Operation 2. Check of oil level in the transmission

Check oil level visually according to oil level indicator 4 (figure 5.4.2) located on the right side of the transmission housing. Oil level shall be up to the mark “П” ± 5 mm. If necessary, take off oil filler neck cap 5 and refill the oil up to the required mark “П” through the oil filler. Normal oil level shall be within ± 5 from the mark «П».



1, 2, 3 – transmission drain plugs; 4 – oil level indicator; 5 – oil filler neck cap of transmission; 6 – mesh filter; 7 – duplex filter.
Figure 5.4.2 – Check of oil level and oil replacement in transmission

WARNING: BE CAUTIOUS TO AVOID CONTACT WITH HOT OIL!

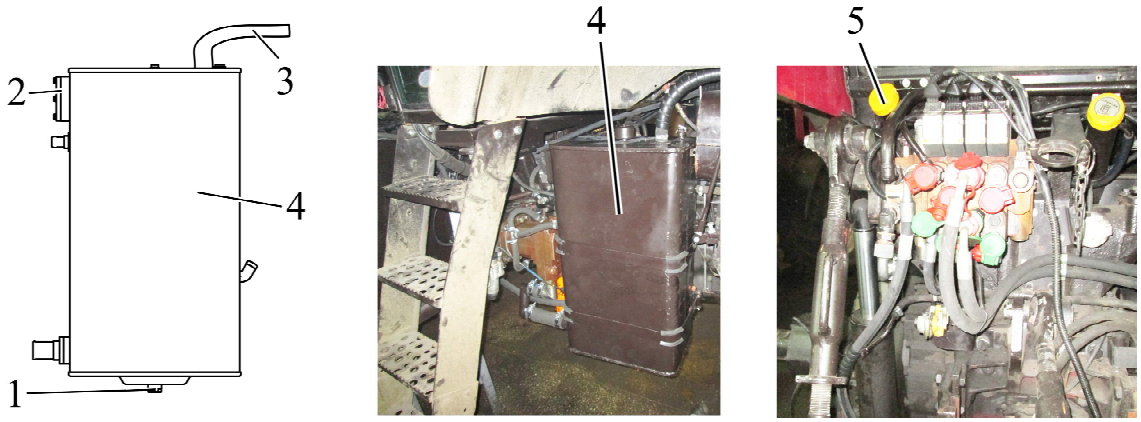
5.4.1.4 Operation 3. Check of oil level in the HLL tank

Before checking oil level, set the tractor on the flat horizontal ground. Lower RLL links to the extreme lower position. Stop the engine and engage the parking brakes.

HLL tank is located behind the rear left wheel.

Check the oil level visually according to oil level indicator 2 (figure 5.4.3) on tank 4. The level shall be between the marks “О” and “П” of the oil level indicator. If necessary, refill the oil up to the “П” mark through an oil filler neck, for which turn off plug 5.

While operating the tractor coupled with implements requiring higher oil consumption, fill the oil up to the mark “С” on the oil level indicator with the hydraulic cylinder retracted rods of the implement and the tractor.



1 – drain plug; 2 – oil lever indicator; 3 – hose of oil filler neck; 4 – HLL tank; 5 – cover of oil filler neck.

Figure 5.4.3 – Check of oil level and change of oil in the HLL tank

ATTENTION: OIL LEVEL CHECKING OPERATION IN THE HYDRAULIC LIFT LINKAGE TANK SHALL BE CARRIED OUT ONLY WITH THE RETRACTED RODS OF RLL HYDRAULIC CYLINDERS AS WELL AS OF THE IMPLEMENTS COUPLED WITH THE TRACTOR!

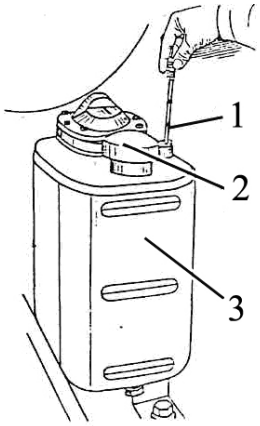
WARNING: BE CAUTIOUS TO AVOID CONTACT WITH HOT OIL!

5.4.1.5 Operation 4. Check of oil level in the HSC tank

Before checking oil level in the HSC tank 3 (figure 5.4.4), it is required to set the tractor on flat horizontal ground. Stop the engine and engage the parking brakes.

The HSC oil tank is located in front, on front weights bracket, near the storage battery.

Check the oil level visually according to oil level indicator 1 on HSC tank 3. The level shall be between the upper and lower marks of the oil level indicator. If necessary, remove plug 2 of the oil level indicator and refill the oil up to the oil level indicator upper mark. Put plug 2 back on its place.



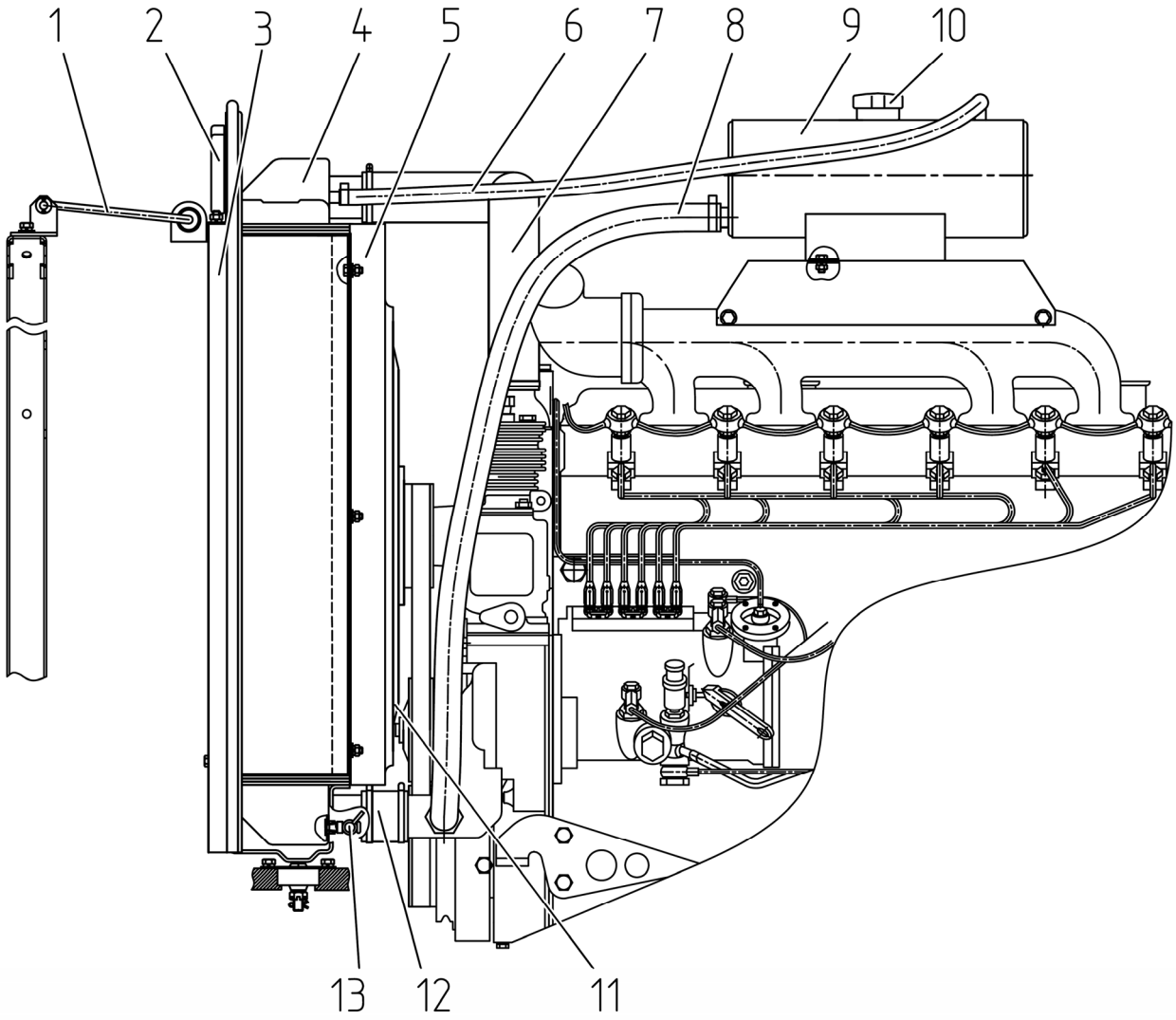
1 – oil level indicator; 2 – plug; 3 – HSC tank.

Figure 5.4.4 – Check of oil level in HSC tank

WARNING: BE CAUTIOUS TO AVOID CONTACT WITH HOT OIL!

5.4.1.6 Operation 5. Check of cooling liquid level in the engine cooling system

Remove plug 10 (figure 5.4.5) of expansion tank 9 and check cooling liquid level, which shall be 50…60 mm lower of filler neck edge. If necessary refill cooling liquid through expansion tank filler neck up to the necessary level.



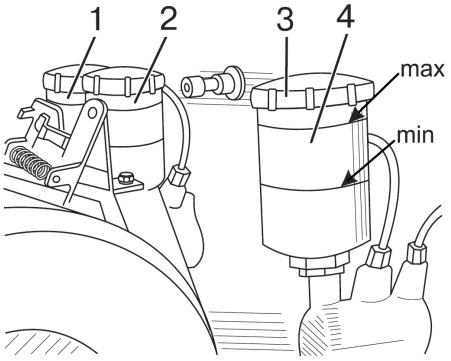
1- bracing; 2- upper sealer; 3 – side sealer; 4 - radiator; 5 – fan casing; 6 – deaerating hose; 7 - connection pipe from engine water pump to water radiator; 8 – feeding hose; 9 – expansion tank; 10 – expansion tank plug; 11- fan; 15- connection pipe from water radiator to engine; 13 - drain valve.

Figure 5.4.5 – Engine cooling system elements in assembly

WARNING: THE ENGINE COOLING SYSTEM WORKS UNDER PRESSURE WHICH IS MAINTAINED BY A VALVE LOCATED IN THE EXPANSION TANK PLUG. IT IS DANGEROUS TO REMOVE THE PLUG WHEN THE ENGINE IS HOT. IF IT IS REQUIRED TO REMOVE THE WATER RADIATOR PLUG, LET THE ENGINE COOL DOWN FIRST, COVER THE PLUG WITH DENSE TEXTURE AND TURN IT SLOWLY TO REDUCE PRESSURE SMOOTHLY BEFORE REMOVING THE PLUG. AVOID BURNS BY HOT FLUID! AVOID CONTACT WITH HOT SURFACES OF ENGINE COOLING SYSTEM ELEMENTS.

5.4.1.7 Operation 6. Check of hydraulic-brake fluid level in the tanks of main cylinders of hydraulic drive of clutch and brake control

Carry out visual inspection of fluid level in tank 4 (figure 5.4.6) of the main clutch coupling cylinder and tanks 1, 2 of the main brake cylinders. The level shall be between “min” and “max” marks, made on the tank housings. If necessary, add hydraulic-brake fluid up to the “max” mark, turning off tank caps 3.



1, 2 – main brake cylinder tank; 3 – tank cap; 4 – tank of the main cylinder clutch.

Figure 5.4.6 – Check of hydraulic-brake fluid level in the tanks of main cylinders of hydraulic drive of clutch and brake control

5.4.1.8 Operation 7. Check of AdBlue level in SCR system liquid tank

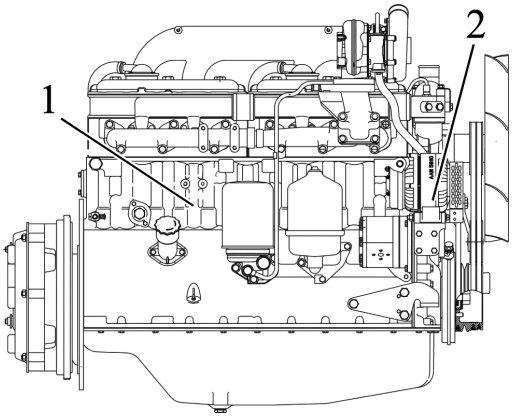
Check AdBlue level in SCR system liquid tank and refill, if necessary.

To check / refill AdBlue in SCR system liquid tank proceed as follows:

- o turn starter and instruments switch key from position “**0**” (OFF) into position “**I**” (Instruments ON). On display 21 (figure 2.1.1) in four or three sections or in graphic mode will be displayed engine parameters;
- o press any display button, except button 5 (figure 2.9.1), and on the screen will appear pop-up panel.
- o press the button 3, display will be switched into mode of SCR system parameters, on display will appear pop-up panel of SCR operation;
- o in the upper left monitor section AdBlue level in the tank shall be displayed, %. If it is not displayed, press button 2 until the level of AdBlue reagent in the tank is shown in the upper left section of display;
- o if AdBlue reagent is too low, turn off the cover of filler neck 2 (figure 2.27.1) and refill AdBlue reagent into tank 1.

5.4.1.9 Operation 8. Alternator cleaning

Clean alternator 2 (figure 5.4.7) from dust, blow with compressed air.



1 – engine; 2 – alternator.

Figure 5.4.7 – Alternator cleaning

5.4.1.10 Operation 9. Visual inspection of exhaust gases after-treatment device

Check visually condition of SCR system elements. If there are leakages or mechanical damages of SCR system elements, it is necessary to contact authorized service center to eliminate detected faults.

5.4.1.11 Operation 10. Check of tire state

Carry out visual inspection of tires outside appearance and conditions in order to detect faults or objects getting stuck in the tires (tacks, rocks and etc.). If necessary, clear the tires of foreign objects. In case the tires have defects going up to the tire fabric or cracks going through the whole tire thickness, dismount the tire and send it to the special repair workshop for retreading. If the tires have defects beyond repair, replace the tire. A defective tire shall be sent to recycling.

5.4.1.12 Operation 11. Check of air conditioner hose fixtures

Note – The operation shall be carried out while mounting of an air conditioner instead of a fan-heater on the tractor.

Carry out visual inspection of air conditioner hose fixtures. Air conditioner hoses shall be properly fixed with coupling clamps. The hoses shall not be in contact with moving parts of the tractor.

5.4.1.13 Operation 12. Check of the hydraulic system elements

Carry out inspection of the tractor hydraulic system elements. In case condensation and down-flows are detected, eliminate them by means of threaded joints tightening. Change hoses and high pressure hoses having cracks, cuts or damages.

5.4.1.14 Operation 10. Check/cleaning of air conditioner drainage pipes from condensate water

“BELARUS-2122.6” tractors have two drainage conditioner pipes, which are located under rear fenders (one pipe for each side), as shown in figure 5.4.8.

1 – rear fender; 2 – drainage pipe; 3 – middle cab support; 4 – rear wheel.

Figure 5.4.8 – Location of drainage pipes outputs

Water dropping from drainage pipes outputs during air-conditioner operation in the hot weather is a sign of clean drainage pipes. If the water doesn’t drop from drainage pipes during air-conditioner in the hot weather it is necessary to blow drainage pipes with compressed air.

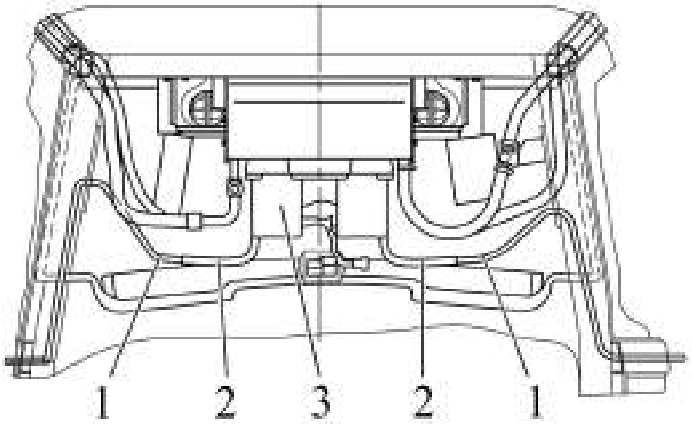
Upper outputs of drainage pipes of blue color are located in cab upper chamber to the right and to the left from heater-cooler. To have access to upper outputs of drainage pipes it is necessary to do the following:

- remove six caps 1 (places of caps location are indicated with arrows in figure 5.4.9) from panel 4 (figure 5.4.9).
- loosen bolts 3, dismount handle 2 by turning off the screw of handle fastening to panel 4;
- open panel 4.

1 – cap; 2 – heater valve handle; 3 – bolt; 4 – panel of cab upper chamber.

Figure 5.4.9 – Upper chamber opening

Disconnect drainage pipes 1 (figure 5.4.10) from heater-cooler outputs 2, blow the pipes with compressed air and connect them back to heater-cooler 3.



1 – drainage pipe; 2 – heater-cooler output; 3 – heater-cooler.

Figure 5.4.10 – Upper chamber

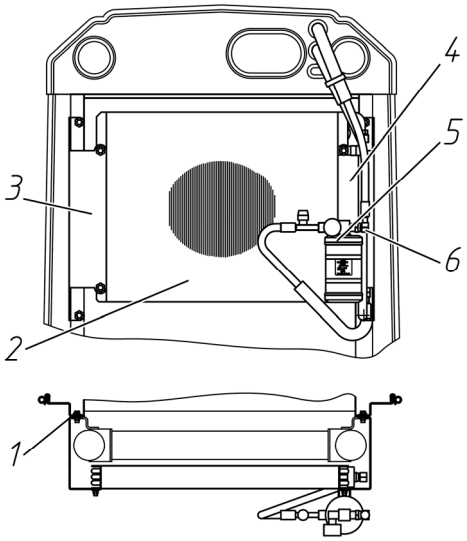
Mount the panel of cab upper chamber on place, fasten it with six bolts, put caps and heater valve handle back.

5.4.1.15 Operation 14. Check/cleaning of an air conditioner condenser

Check cleanliness of the air conditioner condenser core. If it is clogged, it is necessary to clean the condenser with compressed air. Open the hood and direct the air flow perpendicular to the condenser plane from top downward. Jammed finning shall be straightened by means of a special comb or a plastic (wooden) plate. In case of severe condenser clogging, rinse it with hot water under pressure of not more than 0.2 MPa and blow it off by compressed air. Condenser cores shall be cleaned both from the hood mask side and from the engine fan side.

.

To clean the condenser from the fan side, it is required to do the following:
- unscrew four bolts (figure 5.4.11);
- carefully uplift condenser 2 with mounted onto it brackets 3 and 4 and filter-drier, preventing fitting pieces 6 from turning;
- carry out fitting pieces 6 cleaning, as specified above;
- if necessary, carry out cleaning of CAC radiator, according to clause 5.4.1.16;
- mount the conditioner condenser back on its place.



1 – bolt; 2 – condenser; 3, 4 – brackets; 5 – filter-drier; 6 – fitting piece.
Figure 5.4.11 – Uplifting of conditioner condenser

CORROSIVE DETERGENT COMPOSITIONS SHALL NOT BE USED!

5.4.1.16 Operation 15. Check/cleaning of the engine water radiator and the engine CAC-radiator

Check cleanliness of the hood mask, engine CAC-radiator core and engine water radiator. In case it is clogged, do the following actions:

- carry out cleaning of the hood mask with compressed air at both sides;

- carry out CAC-radiator cleaning with compressed air. Direct the air flow perpendicular to the CAC-radiator plane from top downward. In case of severe CAC-radiator clogging, rinse it with hot water under pressure of not more than 0.2 MPa and blow it off by compressed air;

- carry out water radiator cleaning with compressed air. Direct the air flow perpendicular to the water radiator plane from top downward. In case of severe water radiator clogging, rinse it with hot water under pressure of not more than 0.2 MPa and blow it off by compressed air;

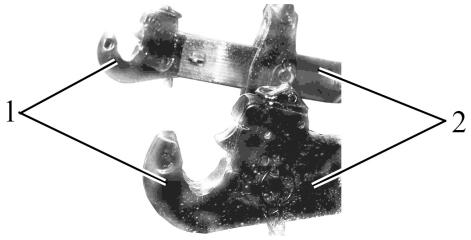
- radiator cores shall be cleaned both from the hood mask side and from the engine fan side.

ALKALINE SOLUTIONS AND CORROSIVE DETERGENT COMPOSITIONS SHALL NOT BE USED!

5.4.1.17 Operation 16. Check /rinse of RLL gripper tools

Note – The operation shall be carried out while mounting of lower links with gripper tools on the tractor RLL.

It is required to check the cavity where the hinge joint locking mechanism in gripper tools 1 (figure 5.4.12) of the RLL is located. In case of dirt accumulation, clean internal cavities in gripper tools and rinse them with water.



1 – gripper tool; 2 – link.
Figure 5.4.12 – RLL gripper tool

5.4.1.18 Operation 17. Check of brakes functioning on the move, the engine, steering, light/alarm devices operability. Check of electrical cables condition in the engine compartment

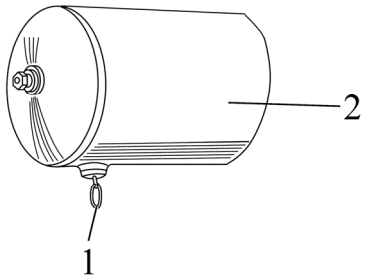
The following tractor operating parameters shall be ensured:

- the engine shall operate properly in all modes;
- controls, light warning and acoustic alarm devices shall operate properly;
- simultaneous engagement of the right and left service brakes.

In case the above mentioned conditions are not observed, make the required adjustments or repair of the corresponding tractor systems.

5.4.1.19 Operation 18. Drainage of condensate water from the pneumatic system balloons

To drain condensate from balloon 2 (figure 5.4.13) of the pneumatic system, pull ring 1 of the drain valve installed on balloon in the horizontal direction to any side, and hold it till the full drainage of condensate.



1 – ring; 2 – pneumatic system balloon.

Figure 5.4.13 – Drainage of condensate water from the pneumatic system balloon

5.4.1.20 Operation 19. Check of the condition of the wires and wire bundles of the electrical equipment in the engine compartment, in the cab front area, and the condition of visible parts of the wiring

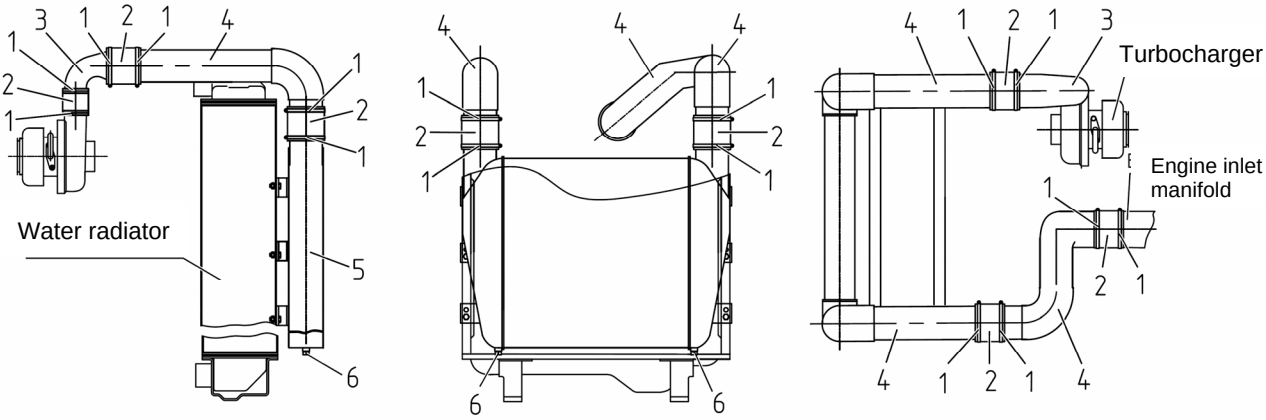
Check the condition of the wiring, wire bundles in the engine compartment, in the cab front area, and the condition of visible parts for abrasion, melt or damage of outer insulation. In case of detection of the above mentioned faults, take measures to eliminate the detected isolation damages and cause of insulation damage.

5.4.1.21 Operation 20. Drainage of condensate water from the radiator tanks of diesel CAC

The operation shall be carried out in autumn and winter period every 8-10 hours of tractor operation or on a shift-time basis, and in spring and summer period – every 125 hours of tractor operation.

In order to drain condensate water from the radiator tank of diesel CAC, it is necessary to do the following actions:

- turn off two plugs 6 (figure 5.4.14) in the bottom of CAC radiator 5;
- let condensate drain;
- screw plugs 6.



1 – clamps; 2 - heat-resistant silicone connecting pipes; 3 - connecting pipe; 4 - air pipes; 5 - charged air cooler (CAC) radiator; 6 - plug.

Figure 5.4.14 – Maintenance of engine CAC

5.4.2 Maintenance service in every 125 hours of operation (MS-1)

5.4.2.1 General instructions

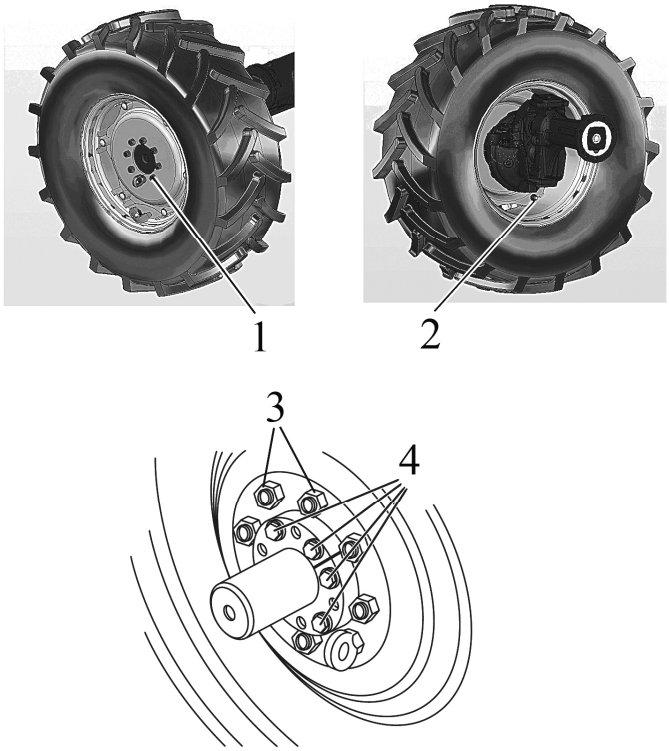
Perform previous operations, and the operations specified in the present subsection 5.4.2.

5.4.2.2 Operation 21. Check of threaded joint tightening of wheel fixing

The operation on check of threaded joint tightening of wheel fixing shall be carried out once during the first MS on a shift basis (in 8-10 hours of operation) carried out by a customer and then every 125 hours of operation.

Check the tightening of wheel and hub bolt retaining nuts and if necessary, tighten them up:

- tightening torque for bolts 4 (figure 5.4.15) of rear wheel conic hubs shall be from 550 to 600 Nm;
- tightening torque of nuts 3 for rear wheels mounting on hubs shall be from 700 to 750 Nm;
- tightening torque of nuts 1 for front wheels mounting on reducing gear flanges of FDA shall be from 200 to 250 Nm;
- tightening torque of nuts 2 for front wheel disks mounting on rim brackets shall be from 180 to 240 Nm (only for the wheels with tires 420/70R24).



1 – nuts for front wheels mounting on reducing gear flanges of FDA; 2 – nuts for front wheel disks mounting on rim brackets; 3 – nuts for rear wheels mounting on hubs; 4 – bolt for fastening rear wheel taper hubs.

Figure 5.4.15 – Check of threaded joint tightening of wheel mounting

5.4.2.3 Operation 22. Washing of the tractor and cleaning of the cabin interiors

Wash the tractor and clean the cabin inside.

Before washing the tractor with water jet, stop the engine, put the battery disconnect switch in “OFF” position.

While tractor washing, it is necessary to take steps to protect electric and electronic components, plugs and sockets against entry of water jets. It is forbidden to direct water jet onto electric and electronic work-pieces and cable connectors.

IT IS FORBIDDEN TO DIRECT WATER JET TO ELECTRIC AND ELECTRONIC PARTS, BUNDLED CABLES CONNECTORS.

Maximum water temperature shall not exceed 50^0C.

IT IS FORBIDDEN TO ADD CORROSIVE AGENTS (DETERGENTS) INTO WATER FOR WASHING.

After tractor washing, clean the electric and electronic work-pieces and cable connectors with compressed air.

5.4.2.4 Operation 23. Check of bolt tightening of CAC air duct clamps

Check and if necessary, tighten clamp bolts 1 (figure 5.4.14) of CAC air ducts. Bolt torque of worm type clamps shall be from 5 to 8 Nm.

ATTENTION: AFTER CHECK OF CLAMP BOLTS TIGHTENING TORQUE, IT IS REQUIRED TO CHECK HERMITICITY OF ALL JOINTS OF CAC DUCT. TO DO THIS, INSPECT THE JOINTS OF ALL AIR PIPELINES AND SILICONE CONNECTING PIPES OF THE CAC SYSTEM FOR DAMAGES AND LEAKAGES. IN CASE OF DETECTION ANY FAILURES AND DAMAGES, IT IS REQUIRED TO FIND OUT THE REASON FOR THEIR APPEARANCE AND TAKE MEASURES TO ELIMINATE THEM!

IT IS FORBIDDEN TO OPERATE THE TRACTOR WITH THE CAC SYSTEM FAULTY!

5.4.2.5 Operation 24. Check of pneumatic pressure in tires

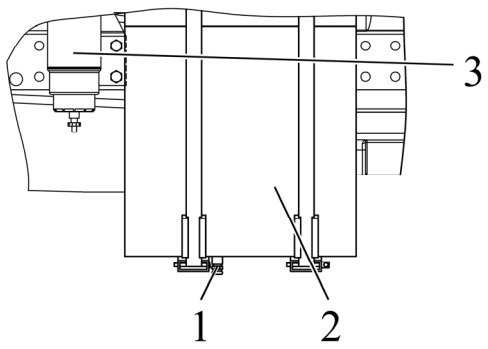
Value pressure in front and rear tires shall be chosen according to the load per single tire, driving speed and operations performed. If it is necessary, bring tire pressure to the required value according to subsection 3.2.8 “Selection of optimal internal pressure in tires, depending on operating conditions and load on tractor axles”.

ATTENTION: CONTROL AND BRINGING TIRE INTERNAL PRESSURE TO THE NORMAL VALUE, WHEN NEEDED, SHALL BE CARRIED OUT EACH TIME THE TRACTOR CHANGES ONE OPERATION TO ANOTHER AND CHANGES IMPLEMENTS AND MACHINES COUPLED!

5.4.2.6 Operation 25. Drainage of sediment from the fuel tank

To drain sediment from the side fuel tank, it is necessary to do the following:

- screw out tank adapter 1 with screw key S 17 (figure 5.4.16). Tank adapter 1 is located at the bottom of fuel tank 2;
- drain sediment until clean fuel appears;
- after clean fuel without water and dirt appears, screw in tank adapter 1.



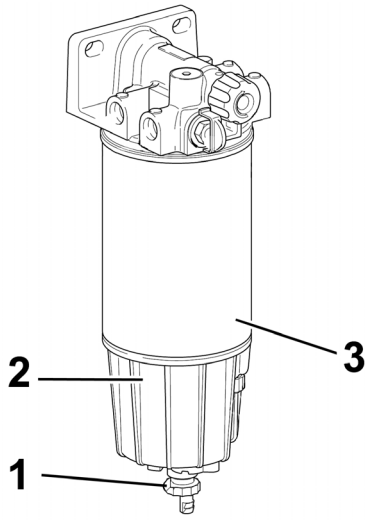
1 – adapter; 2 – side fuel tank; 3 – coarse fuel filter.

Figure 5.4.16 – Drainage of sediment from the fuel tank

5.4.2.7 Operation 26. Drainage of sediment from the coarse fuel filter

To drain sediment from coarse fuel filter 3 (figure 5.4.16), it is necessary to do the following:

- open drain valve 1 (figure 5.4.17) of coarse fuel filter 3;
- drain sediment until clean fuel appears, collect the sediment into a special container;
- after appearing of clean fuel without water and dirt, close drain valve 1.



1 – drain valve; 2 – water-catching bowl; 3 – coarse fuel filter.
Figure 5.4.17 – Drainage of sediment from the coarse fuel filter

ATTENTION: IF DURING TRACTOR OPERATION THE MESSAGE ABOUT PRESENCE OF WATER IN THE COARSE FUEL FILTER APPEARS ON THE INFORMATION DISPLAY, DRAIN SEDIMENT FROM THE COARSE FUEL FILTER NOT WAITING FOR THE DAY OF REGULAR MAINTENANCE!

5.4.2.8 Operation 27. Check of generator and water pump drive belt tension

Generator SPA-1157 belt tension is considered normal if its deflection on the crankshaft pulley branch – the generator pulley is located within 13-18 mm when pressing it by force of 40±2 N.

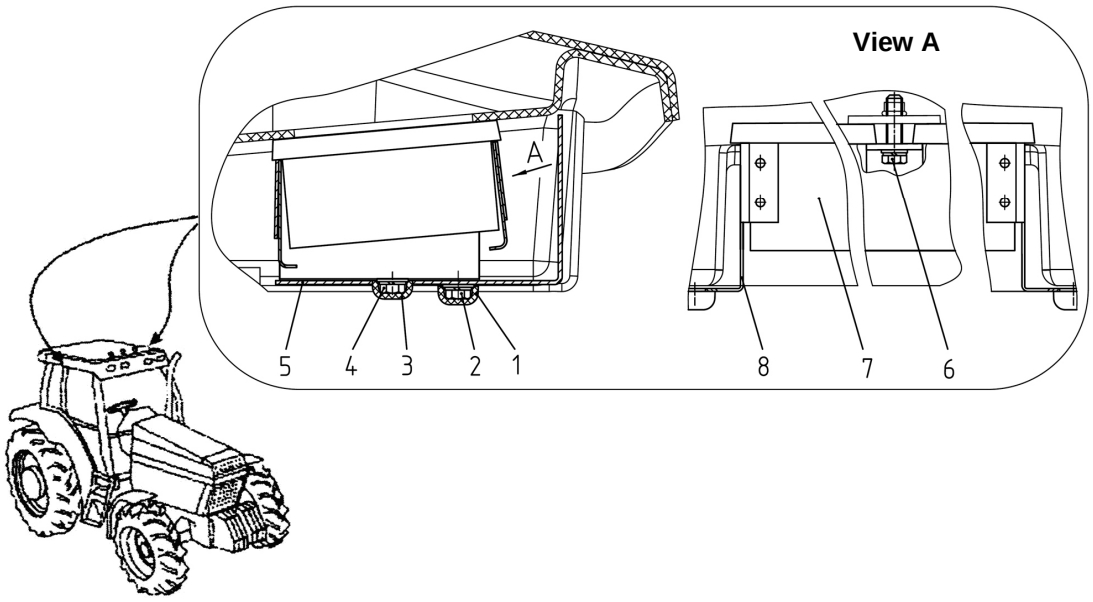
Release generator mounting for belt tension adjusting. Adjust belt tension by turning the generator housing. Tighten the tension bolt of the plank and the nuts of generator tension bolts. Belt deflection of water pump drive SPA/S-1280 shall be within 13-21 mm when pressing the branch water pump pulley – crankshaft pulley by force of 40±2 N.

5.4.2.9 Operation 28. Cleaning of filter cartridges of the cab ventilation and air heating systems

The ventilation system filters are mounted at both sides of the tractor cab, as shown in figure 5.4.18. The filter consists of two filter cartridges. .

To clean the cab ventilation and heating systems filter, it is necessary to do the following:

- to get an access to the filter, put a support or a small ladder;
- remove two filter caps 1 (figure 5.4.18) from bolts 2 and two filter caps 3 from bolts 4 under the protrusive edge of the cab roof;
- remove protection net 5, for which unscrew two bolts 2;
- remove frame 8 with filter cartridges 7, for which unscrew two bolts 4 and one bolt 6;
- take filter cartridges 7 out of frame 8;
- clean the filter cartridge with compressed air under the pressure of not more than 0,1MPa. It is required to hold the pipe head at the distance not closer than 300mm from the filter cartridge in order not to damage it;
- mount filter cartridges 7 into frame 8, then mount frame 8 and protection net 5 onto the cab, put caps 1 and 3 on bolts 2 and 4 correspondingly;
- perform the above mentioned operations for the filter located at the other side of the tractor cab.



1, 3 – filter cap; 2, 4, 6 – bolt; 5 – protection net; 7 – filter cartridge; 8 – frame.
Figure 5.4.18 – Cleaning of the cab ventilation and air heating systems filter

ATTENTION: DO NOT SWITCH ON THE FAN BEFORE CLEANING THE FILTERS AT HIGH HUMIDITY OF THE ENVIRONMENT, FOR EXAMPLE IN THE MORNING, AS IT IS DIFFICULT TO REMOVE DUST FROM A WET PAPER FILTER CARTRIGE!

ATTENTION: DURING TRACTOR OPERATION IN HEAVY DUSTING CONDITIONS, CLEAN THE FILTER EVERY 8-10 HOURS OF OPERATION, I.E. ON A SHIFT BASIS!

5.4.2.10 Operation 29. Check / adjustment of air conditioner compressor drive belt tension

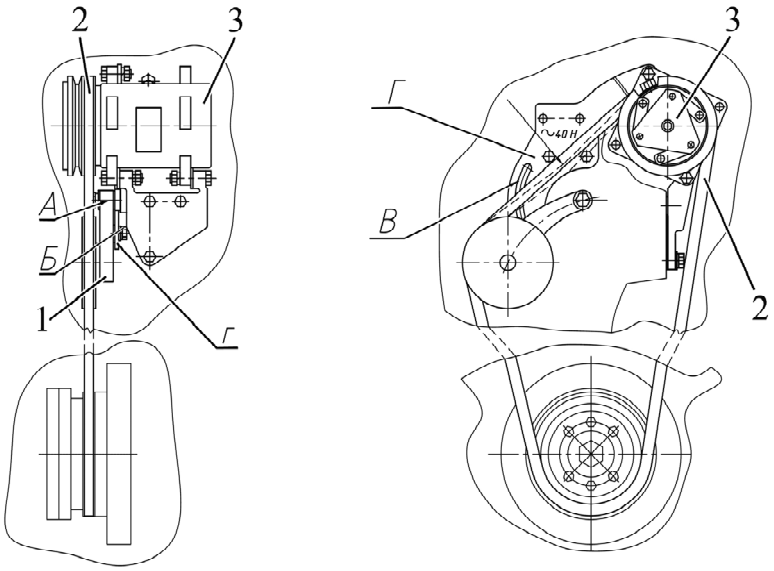
1. Check of air conditioner compressor drive belt tension:

Belt 2 tension (figure 5.4.19) is considered normal if deflection of its side “tension lever pulley – compressor pulley” measured in the middle is within 4 to 6 mm when pressing it by force of (39.2±2.0) N.

In case this condition is not observed, it is necessary to adjust air conditioner compressor drive belt tension.

2. Adjustment of air conditioner compressor drive belt tension:

Adjustment of belt 2 tension (figure 5.4.19) of conditioner compressor 3 shall be carried out by turning tension lever 1 on rotational axis A and threaded joint chuck B in slot C of plate D. Belt deflection in response to force of (39.2+2.0) N applied perpendicular to the center of belt side shall be within 4 to 6 mm.



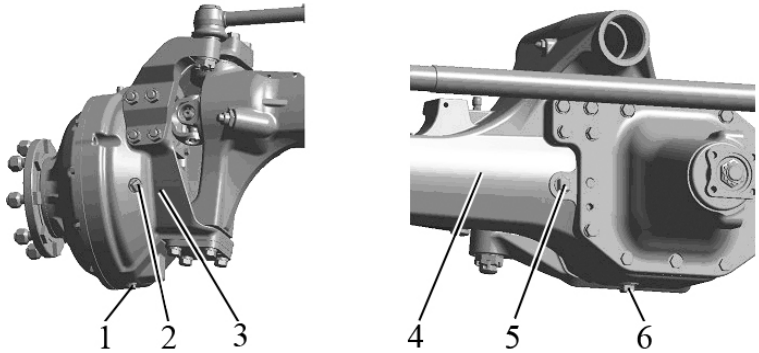
1 – tension lever; 2 – belt; 3 – compressor.

Figure 5.4.19 – Adjustment of air conditioner compressor drive belt tension

5.4.2.11 Operation 30. Check of oil level in the main gear housing and housings of FDA wheel-hub drives

To check oil level in housings of the main gear and FDA wheel-hub drives, it is required to do the following:

- set the tractor on even horizontal ground, engage a parking brake and lock the wheels against movement with wheel blocks in front and at the rear, preventing tractor spontaneous movement. The engine shall be off.
- unscrew check/fill plugs 2 (figure 5.4.20) in housings of wheel-hub drives 3 and check/fill plug 5 in the main gear housing;
- oil level in housings of wheel-hub drives and main gear shall reach lower edges of plugs 2 and 5 threaded openings correspondingly;
- if necessary, refill oil up to lower edges of plugs 2 and 5 threaded openings;
- put plugs 2 and 5 back on their places.



1, 6 – drain plug; 2, 5 – check/fill plug; 3 – wheel-hub drive housing; 4 – FDA beam.

Figure 5.4.20 – Check of oil level and oil replacement in FDA reduction unit housings

5.4.2.12 Operation 31. Check / adjustment of clutch control

5.4.2.12.1 Check of clutch control

Check the condition of the expansion tank, main and operating cylinders, hydraulic booster and pipelines. Brake fluid or oil leakages are not allowed. Clean the control drive and the clutch control pedal from dirt and outside particles.

Check the clearance between the clutch release bearing and release levers: when the engine is not running, the total pedal free travel 7 (figures 5.4.21 and 5.4.22) shall make size E that corresponds to withdrawal of hydraulic booster piston 28 to size И from end surface of hydraulic booster.

If necessary, two people shall adjust clutch control according to subsection 5.4.2.12.2 “Adjustment of clutch control”.

ATTENTION: ONLY DEALERS ARE ALLOWED TO ADJUST AND BLEED CLUTCH CONTROL!

5.4.2.12.2 Adjustment of clutch control

5.4.2.12.2.1 The rules for adjustment of clutch control

Adjustment of clutch control shall be performed in the following order:

1. Adjustment of clearance “В” (figures 5.4.21 and 5.4.22) between piston 10 and pusher 9 of main cylinder 11:

- bring pedal 7 to size “Д” by means of bolt 3, tighten nut 4 with a torque from 10 to 16 Nm;
- by screwing and unscrewing pusher 9 try to achieve, that shift of pedal 7 from its initial position to the moment of touching pusher 9 into piston 10, measured on the center of pedal casing, makes size “Г”;
- tighten up nut 8 with a torque from 30 to 50 Nm and cotter pin 6.

2. Adjustment of clearance “Ж” (figures 5.4.21 and 5.4.22) between rod 26 of working cylinder 25 and pusher 27 of hydraulic booster 28:

- remove operating cylinder 25 from bracket 14 after taking out pin 15;
- set rod 26 of cylinder 25 into the extreme right position until stops against cover 22;
- bring cylinder 25 to touch pusher 27 of hydraulic booster 28 lightly and by screwing and unscrewing support 16 match the holes of the support and bracket 14, after which screw in support 14 by ½ revolutions, mount pin 15;
- tighten nut 21 with a torque from 18 to 30 Nm and cotter pin 15.

3. Adjustment of clearance between the clutch release bearing and release levers:

- disconnect rod 30 (figures 5.4.21 and 5.4.22) from lever 35 after taking pin 34 out;
- unlock yoke 33;
- turn lever 35 contraclockwise until the release bearing stops against release levers and rotating yoke 33 match the holes of the lever and yoke, after which screw it in by 5…5,5 revolutions and connect them with the lever by means of pin 34;
- tighten up nut 31 with a torque from 50 to 70 Nm without letting link 30 turn, cotter pin 34.

4. Bleed the hydraulic system of clutch control according to clause 5.4.2.12.2.2 or 5.4.2.12.2.3 of the present operator’s manual.

5. Check and if necessary adjust clutch disengaged state sensor in accordance with clause 5.4.2.12.2.4 of this manual.

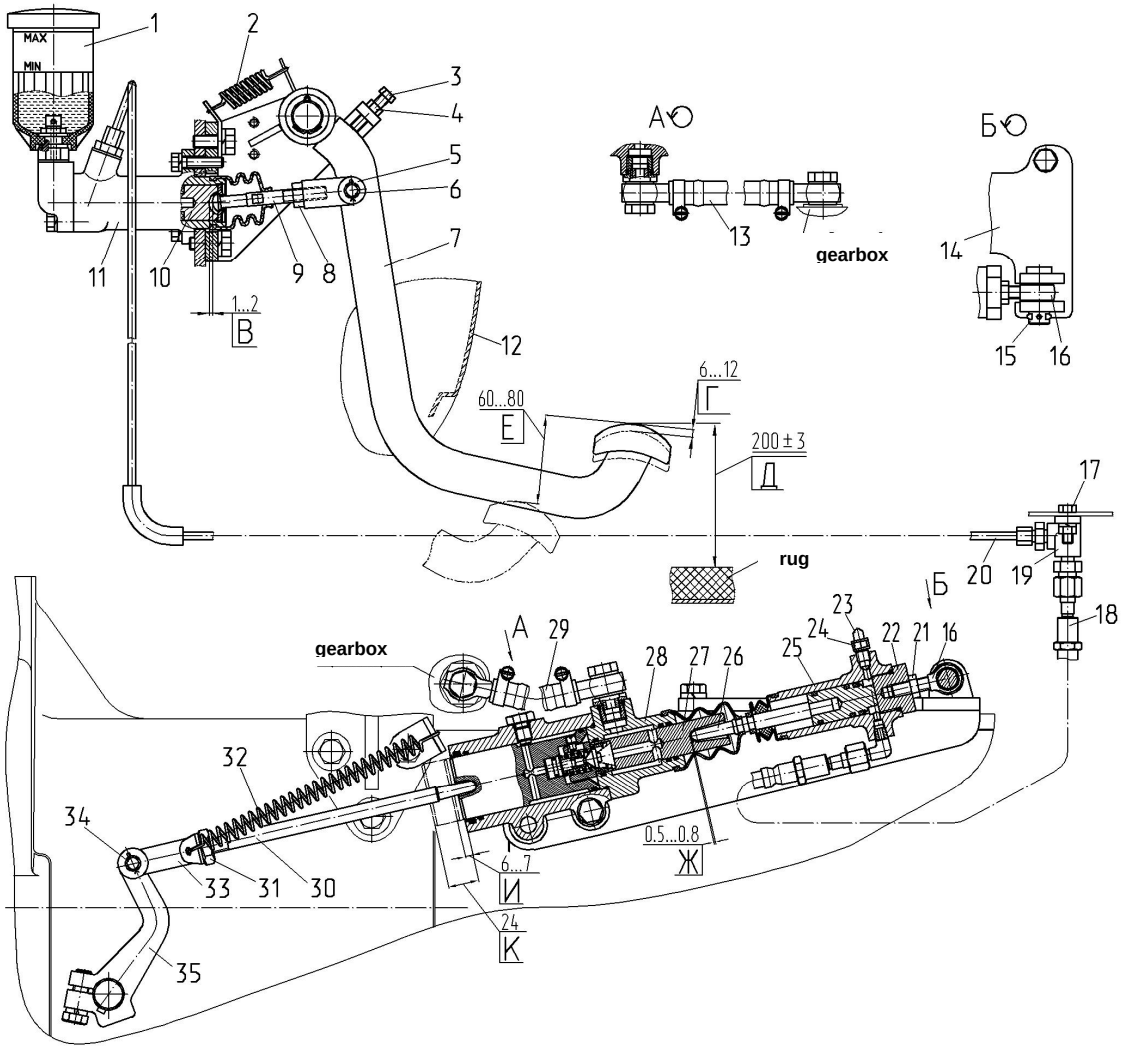
5.4.2.12.2.2 Bleeding of the hydraulic system of clutch control with the main and operating cylinders manufactured by OJSC “Gomel Works “Hydraulic drive”

Before bleeding, fill tank 1 (figure 5.4.21) of main cylinder 11 with brake fluid.

Bleeding of the hydraulic system shall be performed in the following order:

- fill tank 1 with brake fluid up to the mark “MAX”;
- remove protection cap 23 from operating cylinder 25 and mount a rubber hose pipe onto the head of overflow valve 24, put the hose pipe into the container with brake fluid;
- press the clutch pedal for several times;
- holding the clutch pedal pressed, unscrew overflow valve 24 by ¼ revolutions, draining brake fluid surplus with air bubbles into the container with brake fluid;
- screw overflow valve 24 in and release the clutch pedal;
- bleed the system until the brake fluid being drained has no bubbles;
- remove the hose pipe and mount protection cap 23;
- check the brake fluid level in tank 1 and if necessary, refill it.

ATTENTION: WHILE BLEEDING THE HYDRAULIC SYSTEM OF CLUTCH CONTROL, IT IS REQUIRED TO MAINTAIN BRAKE FLUID LEVEL IN TANK 1 BETWEEN THE MARKS “MIN” AND “MAX”!



1 – tank; 2, 32 – spring; 3,17 – bolt; 4, 8, 21, 31 – nut; 5, 33 – yoke; 6, 15, 34 – pin; 7 – pedal; 9, 27 – pusher; 10 – piston; 11 – main cylinder; 12 – panel; 13,29 - oil pipe; 14 – bracket; 16 – support; 18 – clutch flexible hose; 19 – angle piece; 20 – pipeline; 22 – cover; 23 – protection cap; 24 – overflow valve; 25 – operating cylinder; 26 – rod; 28 – hydraulic booster; 30 – rod; 35 – lever.

Figure 5.4.21 – Diagram of the main and operating cylinder clutch control, manufactured by OJSC “Hydraulic drive”

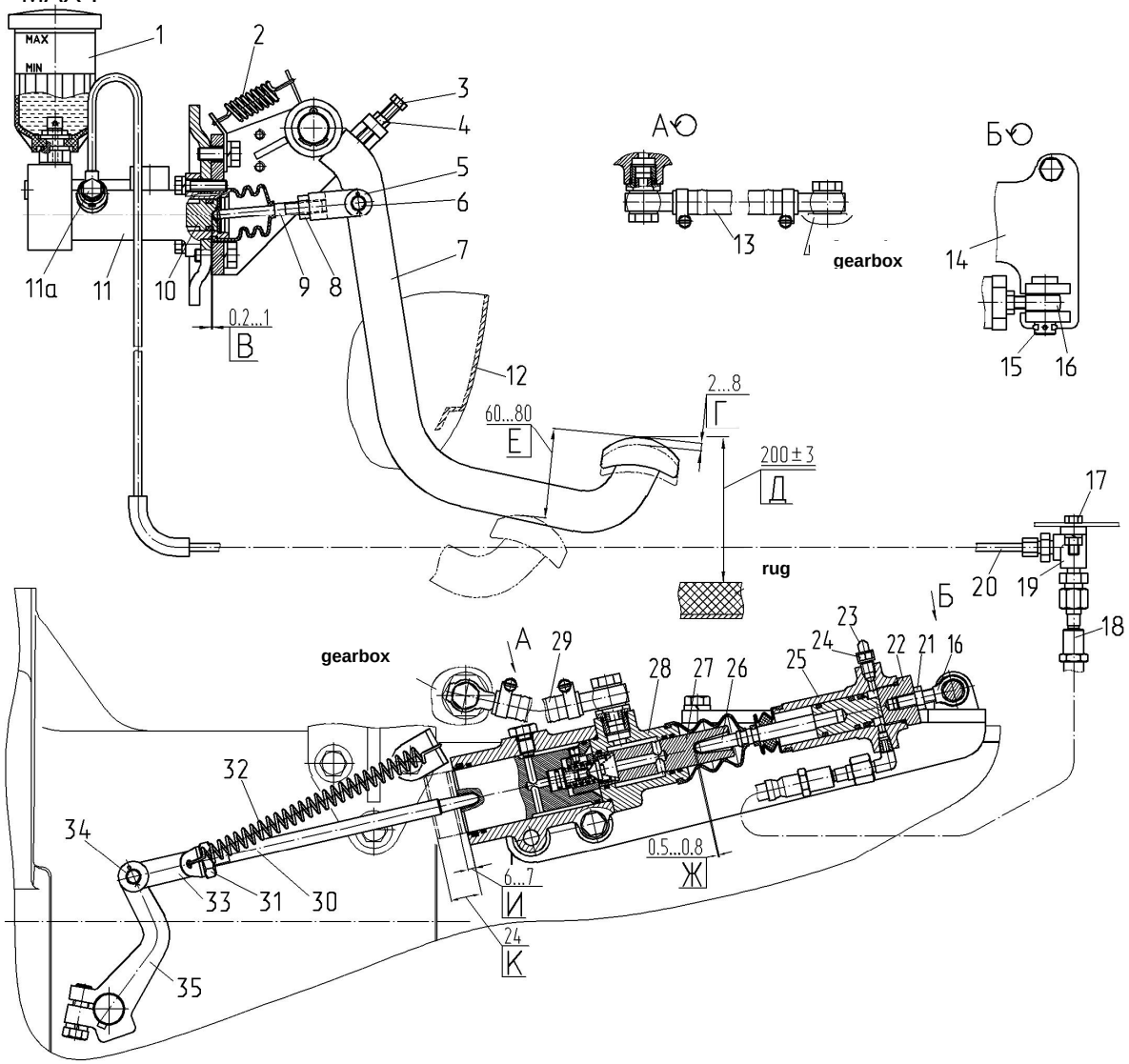
5.4.2.12.2.3 Bleeding of the hydraulic system of clutch control with the main and operating cylinders manufactured by “FENOX” or PAO “Volchanskiy AZ” (Ukraine)

Before bleeding, fill tank 1 (figure 5.4.22) of main cylinder 11 with brake fluid.

Bleeding of the hydraulic system:

- loosen bolt 11a by 3…5 revolutions;
- fill tank 1 with brake fluid up to the mark “MAX”;
- remove protective cap 23 from operating cylinder 25 and mount a rubber hose onto the head of overflow valve 24, put the hose pipe into the container with brake fluid;
- press pedal 7 several times, until brake fluid will come out from outlet hole of main cylinder 11, tighten bolt 11a;
- press clutch pedal several times;
- holding the clutch pedal pressed, unscrew overflow valve 24 for ¼ of the revolution, draining brake fluid surplus with air bubbles into the container with brake fluid;
- screw in overflow valve 24 and release the clutch pedal;
- bleed the system until the drained brake fluid has no bubbles;
- remove the hose pipe and mount protective cap 23;
- check the brake fluid level in tank 1 and if necessary, refill it.

ATTENTION: WHILE BLEEDING THE HYDRAULIC SYSTEM OF CLUTCH CONTROL, IT IS REQUIRED TO MAINTAIN BRAKE FLUID LEVEL IN TANK 1 BETWEEN THE MARKS “MIN” AND “MAX”!



1 – tank; 2 – spring; 3, 11a, 17 – bolt; 4, 8, 21, 31 – nut; 5, 33 – yoke; 6, 15, 34 – pin; 7 – pedal; 9, 27 – pusher; 10 – piston; 11 – main cylinder; 12 – panel; 13,29 – oil pipe; 14 – bracket; 16 – support; 18 – clutch flexible hose; 19 – angle piece; 20 – pipeline; 22 – cover; 23 – protective cap; 24 – overflow valve; 25 – operating cylinder; 26 – rod; 28 – hydraulic booster; 30 – rod; 35 – lever.

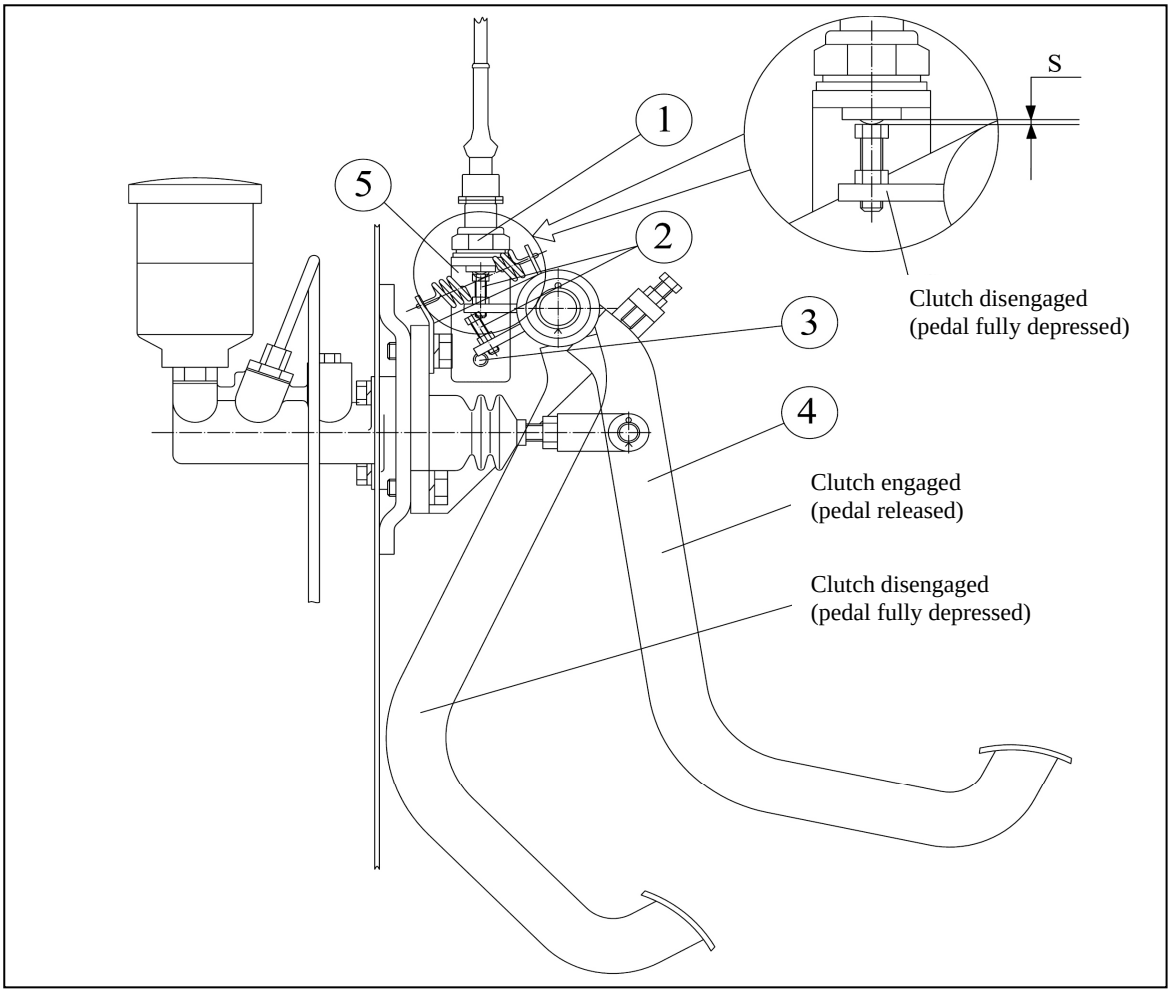
Figure 5.4.22 – Diagram of the main and operating cylinder clutch control, manufactured by “FENOX” or PAO “Volchanskiy AZ” (Ukraine)

5.4.2.12.2.4 Check / adjustment of clutch disengaged state sensor

Adjustment of sensor 1 triggering (figure 5.4.23) shall be carried out with the engine running. Moving sensor 1 together with bracket 5 in its slot and adjusting position of bolt 2 adjust triggering (contact closure) of sensor 1.

After adjustment of the clutch disengaged state sensor 1 (figure 5.4.23) clearance S between the housing of sensor 1 and the head of adjusting bolt 2 shall be from 0.5 to 1.0mm with the clutch fully depressed.

After the adjustment is completed secure bracket 5 by bolts 3, bolt 2 shall be secured by the nut.



1 – sensor of clutch disengaged state; 2 – adjusting bolt; 3 – bracket attaching bolts; 4 – clutch pedal; 5 – bracket.

Figure 5.4.23 – Clutch disengaged state sensor assembly

5.4.2.12.2.4 Check of declutching cleanliness

After performing the above mentioned adjustments of clutch control, it is required to check declutching cleanliness, for which do the following:

- engage the parking brake;
- start the engine and set diesel rated speed (1400±100) min^{-1};
- fully depress the clutch pedal and min in 5 sec engage GB ranges, the activation of which shall be “clear” – without unwanted sounds and rattle.

In case there are unwanted sounds or rattle, it is required to check and if necessary, make adjustments specified in subclause 5.4.2.12.2.1 again.

Pedal 7 (figures 5.4.21 and 5.4.22) shall not bear against panel 12 (figures 5.4.21 and 5.4.22).

After bleeding of the hydraulic system with the engine stopped, the total pedal 7 free travel shall make size E that corresponds to withdrawal of hydraulic booster 28 piston to size И from end face of hydraulic booster. When the pedal is fully pressed, withdrawal of hydraulic booster piston shall make not less than size K from the end face of hydraulic booster.

5.4.3 Maintenance services in every 250 hours of operation (2MS-1), in every 500 hours of operation (MS-2), in every 1000 hours of operation (MS-3), in every 2000 hours of operation (special maintenance) and maintenance service that does not coincide with intervals of MS-1, 2MS-1, MS-2, MS-3 and special MS

5.4.3.1 General instructions

ATTENTION: ONLY DEALERS ARE ALLOWED TO PERFORM OPERATIONS 2 MS-1, MS-2, MS-3 AND SPECIAL MAINTENANCE EXCEPT FOR THE OPERATIONS “CHECK / ADJUSTMENT OF FRONT WHEEL TOE-IN” AND “CHECK / ADJUSTMENT OF CLEARANCES IN STEERING JOINTS”!

The operations 2MS-1 shall be performed after every 250 hours of tractor operation together with the operations of STM and TM-1.

The operations TM-2 shall be performed after every 500 hours of tractor operation together with the operations of STM, TM-1 and 2TM-1.

The operations TM-3 shall be performed after every 1000 hours of tractor operation together with the operations of STM, TM-1, 2TM-1 and TM-2.

The operations of special maintenance shall be performed after every 2000 hours of tractor operation together with the operations of STM, TM-1, 2TM-1, TM-2 and TM-3.

5.4.3.2 Operation 35. Check / adjustment of clearances in steering joints

To check the backlash and clearances in steering joints 1 (figure 5.4.25) of steering link 4, it is necessary to turn the steering wheel to both sides when the engine is running. In case the steering wheel has the backlash of more than 25° as shown in figure 5.4.24, eliminate the steering joint clearance by performing the following actions:

- stop the engine;
- remove locking wire 3 (figure 5.4.25);
- screw threaded plug 2 in to eliminate the steering joint clearance;
- lock plug 2 with wire 3.

If the steering joint clearance can not be eliminated by tightening threaded joints, take the hinge joint to pieces and replace the worn-out parts.

Besides, weak tightening of castle nuts of HSC hydraulic cylinders cone-shaped pins may be a reason for increased steering wheel clearance angle.

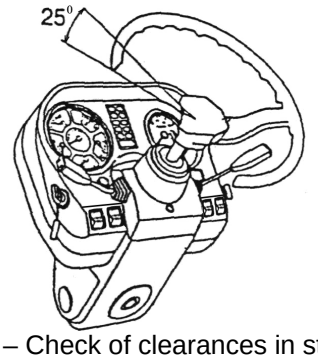
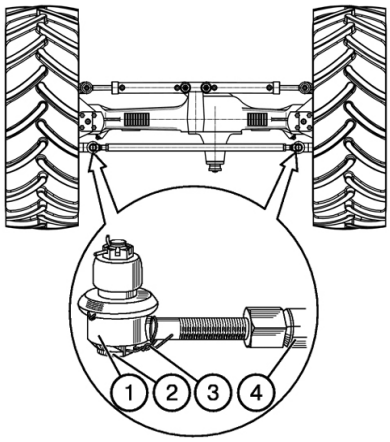


Figure 5.4.24 – Check of clearances in steering joints



1 – hinge joint; 2 – plug; 3 – locking wire; 4 – steering link.
Figure 5.4.25 – Maintenance of steering joints

5.4.3.3 Operation 36. Check / adjustment of wheel toe-in

Adjustment of front wheel toe-in is carried out to prevent front tires from premature breakdown.

ATTENTION: CHECK AND ADJUSTMENT OF FRONT WHEEL TOE-IN SHALL BE CARRIED OUT AFTER EVERY 250 HOURS OF TRACTOR OPERATION, AND AFTER EACH TIME THE FRONT WHEEL TRACK WIDTH IS CHANGED. BEFORE CHECKING FRONT WHEEL TOE-IN, CHECK AND ADJUST IF NECESSARY, THE STEERING JOINT CLEARANCES!

To make necessary adjustments, do the following:

1. Make sure there are no clearance gaps in hinges of the steering mechanism of the pivot supporting block bearings and wheels.

2. Set front wheels into straight position corresponding to the direct tractor movement for which drive the tractor on hard flat surface for not less than 3 meters and stop. Engage the parking brake to avoid tractor movement.

3. Measure distance “A” (figure 5.4.26) between rim edges of front wheels 1 and 5 (figure 5.4.26) at the height of front wheel centers, and make visible marks in the measured places.

4. Disengage the parking brake, drive the tractor forward so that front wheels turn by half revolution and measure distance “B” between wheel rim edges at the height of wheel centers at the back in the marked points.

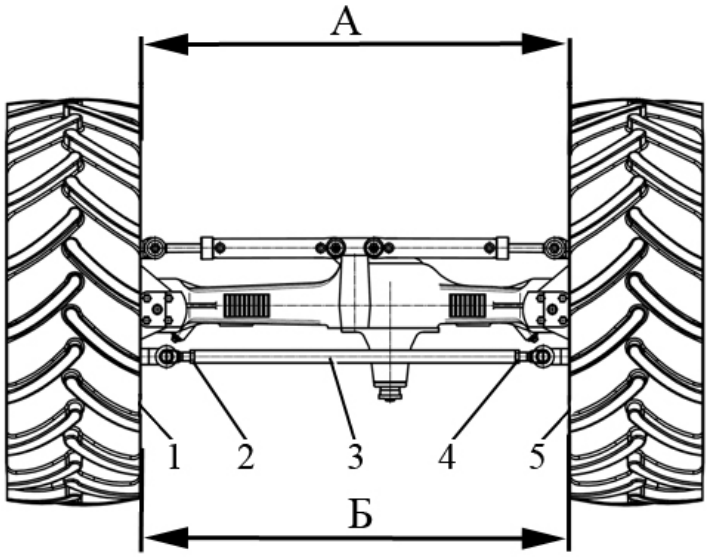
5. If the value (“B”-“A”) is within 0 to 8 mm that means the toe-in is correctly adjusted. If the value (“B”-“A”) is below 0 or more than 8 mm, do the following:

a) leaving the tractor position unchanged, unscrew lock nuts 2 and 4;

b) rotating steering link tube 3, try to get the value (“B”-“A”) within 0 to 8 mm;

c) repeat the operations described in subclauses 4 and 5.

d) if the value (“B”-“A”) is within the limits from 0 to 8 mm, tighten steering link lock nuts 2 and 4 with a torque from 100 to 140 Nm, leaving the steering link length unchanged.

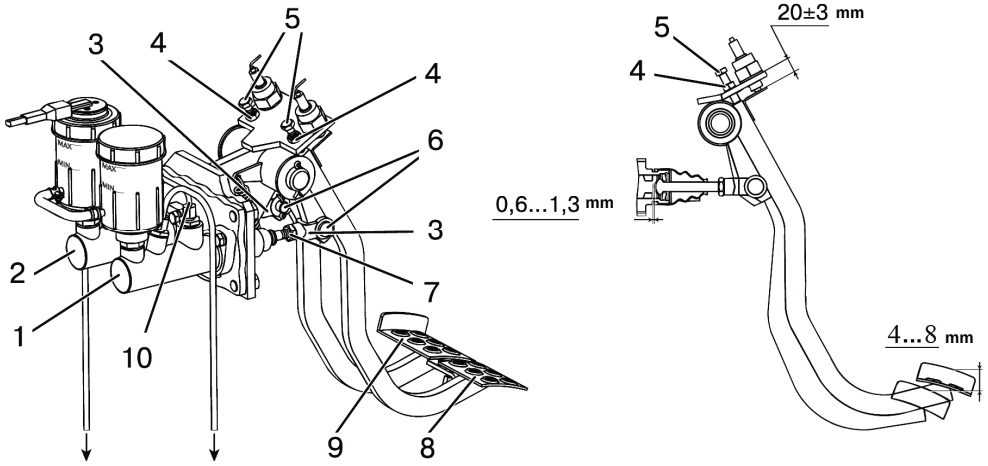


1, 5 – rim edge of front wheel; 2, 4 – locking nuts; 3 – adjustable tube.

Figure 5.4.26 – Diagram of front wheels toe-in adjustment

5.4.3.4 Operation 47. Check / adjustment of service brake control

ATTENTION: IT IS REQUIRED TO CHECK AND ADJUST THE BRAKE SYSTEM AS WELL AS ELIMINATE ANY FAILURES IN IT ONLY WITH THE ENGINE OFF AND THE TRACTOR BEING FIXED IN THE HORIZONTAL POSITION BY MEANS OF STOPS UNDER THE WHEELS, WHICH EXCLUDE THE TRACTOR SPONTANEOUS MOVEMENT! ONLY DEALERS ARE ALLOWED TO MAKE ADJUSTMENTS OF THE BRAKE SYSTEM AND ELIMINATE ANY FAILURES!



1, 2 – main brake cylinder; 3 – yoke; 4 – nut; 5 – adjustable stop bolt; 6 – pin; 7 – counter nut; 8, 9 – pedal; 10 – pipeline connecting two main brake cylinders.

Figure 5.4.27 – Adjustment of pedal free travel and position of pedals for service brake control

Adjustment of the tractor service brake control shall be performed in the following order:

1. Set cradles of pedals 8 and 9 (figure 5.4.27) in the same plane by means of adjustable stop bolts 5 by screwing them to the depth of (20±3) mm. Lock nuts 4.

2. Check the pedals free travel. Free travel of pedals 8, 9 shall be within 4 to 8 mm. If this condition is not observed, adjust the pedals free travel doing the following operations:

- unsplint and remove pins 6 and disconnect yokes 3 from pedals 8 and 9 rods;
- unscrew counter nuts 7 by several resolutions, then by screwing or unscrewing yokes 3 shorten or lengthen the rods of main brake cylinders 1 and 2 to get the required pedal free movement;
- lock nuts 7, mount pins 6 and splint them. Free travel of pedals within 4 to 8 mm corresponds to the clearance from 0.6 to 1.3 mm between the pusher and the piston of each main brake cylinder;
- the pedals shall not contact with the cab elements. The arrangement of pedal cradles according to the height shall be adjusted by means of bolts 5 and the length of main brake cylinder rods if necessary, ensuring the pedal free travel from 4 to 8 mm.

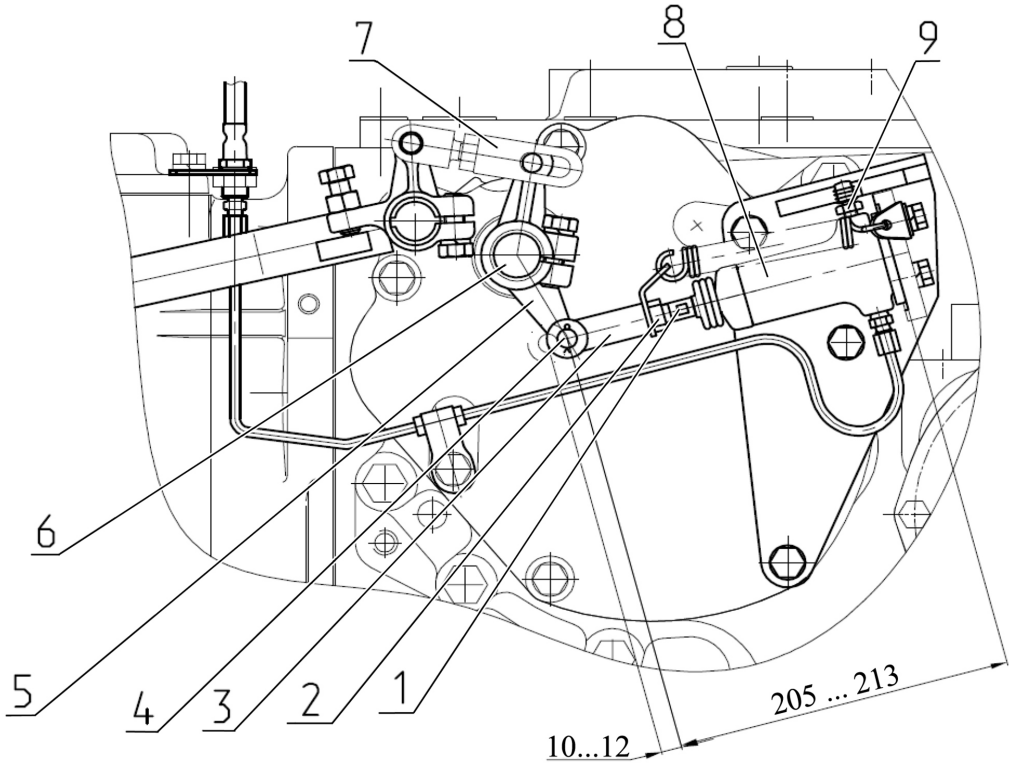
3. Check the length of operating brake cylinder 8 (figure 5.4.28) of the left brake. The operating brake cylinder length shall be within 205-213 mm, measured from the cylinder attaching point to the axis of pin 4 which connects lever 5 with yoke 3, with the operating brake cylinder rod pushed inside to the extreme position, as shown in figure 5.4.28. At this, pin 4 travel shall be within 10-12 mm when applying force from 350 to 400 N to lever 5 at the arm 60 mm. In case this condition is not observed, carry out adjustment.

Adjustment shall be carried by means of performing the following operations:

- disconnect rod 7 of the parking brake drive from lever 5, for which it is required to unlock and remove the pin attaching rod 7 to the lever;
- unscrew counter nut 2 on the cylinder shaft for several revolutions;
- rotating shaft 1 of the operating brake cylinder by flattened surface, adjust the cylinder length and travel of the operating cylinder yoke pin within the required limits;
- lock counter nut 2, connect rod 7 of the parking brake drive to lever 5, lock the pin.

In case it is impossible to set the required dimensions by means of adjustment, it is required to remove lever 5 from brake shaft 6 after loosening tightening of the bolt for lever 5 hub, and mount it back by turning for one spline in the required direction (turn for one spline changes dimensions for 8 mm).

Check the length of the operating brake cylinder of the right brake in a similar way. If necessary, mount the required length for the operating brake cylinder of the right brake analogically.



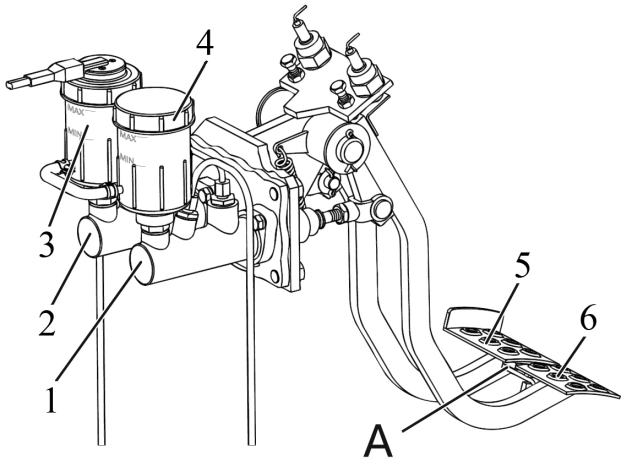
1 – shaft; 2 – counter nut; 3 – yoke; 4 – pin; 5 – lever; 6 – brake shaft; 7 – rod; 8 – operating brake cylinder; 9 – overflow valve.

Figure 5.4.28 – Setting the length for the operating brake cylinder

4. Brake cylinders produced by the company “CARLISLE” (Great Britain) or produced by the company “FENOX” (Belarus) can be mounted in service brakes control system.

On tractors with “CARLISLE” main brake cylinders after making adjustments, fill the drive hydraulic system with brake fluid and bleed the hydraulic system in the following order:

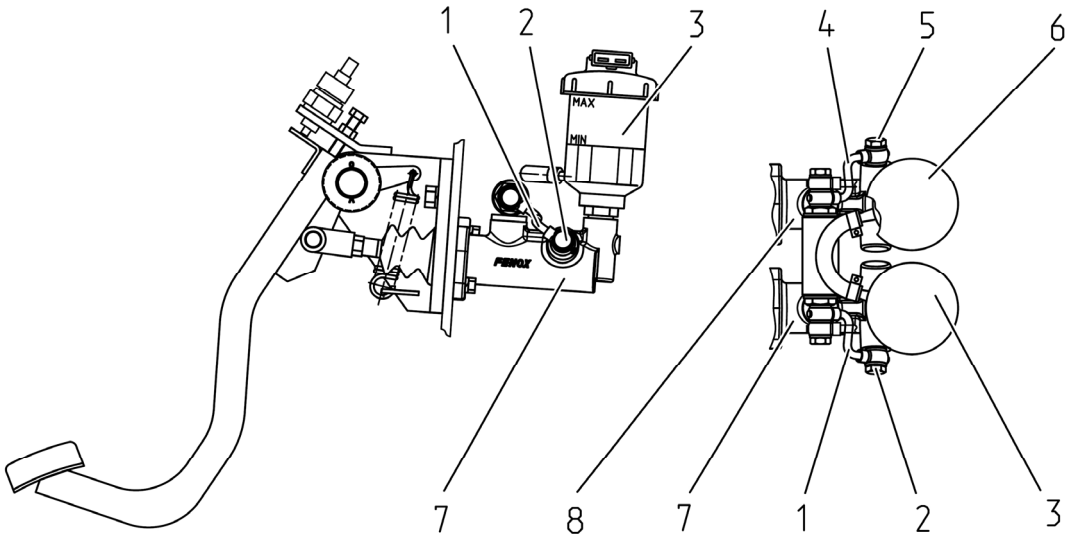
- fill tanks 3 and 4 (figure 5.4.29) of main brake cylinders 1 and 2 with brake fluid up to the mark “MAX” on the tanks. In the process of bleeding, watch the fluid level not to go below the mark “MIN”;
- interlock pedals 5 and 6 by means of plank “A”;
- clean overflow valves of operating brake cylinders from dirt and dust, remove caps from them, put a pipe on overflow valve 9 head (figure 5.4.28) of the left operating cylinder, and put its free end into the transparent container of at least 0.5l capacity, half filled with brake fluid;
- press the interlocked brake pedals for four to five times and holding them depressed, unscrew the overflow valve of the left operating cylinder by 1/2…3/4 revolutions and after the pedal full travel, when half of fluid with air disappears from the system, screw the valve in and release the brake pedals. Press them quickly, release slowly! Repeat this operation for several times until air totally disappears from the system. Take the pipe off the valve and put a protection cap on.
- bleed the right brake hydraulic drive in the same order;
- refill fluid into both tanks 3 and 4 (figure 5.4.29) up to the mark “MAX” ((15±5) mm from the tank upper butt end).



1, 2 – main brake cylinder; 3, 4 – tank; 5, 6 – pedal.
Figure 5.4.29 – Bleeding of brakes and adjustment of pedals working travel

On tractors with “FENOX” main brake cylinders after making adjustments, also fill the drive hydraulic system with brake fluid and bleed the hydraulic system. Due to the construction specific character, before filling and bleeding the hydraulic system of service brakes control it is required to disconnect pipelines 1 and 4 (figure 5.4.30) from outlet holes of main brake cylinders 7 and 8 by unscrewing bolts 2, 5. Fill tanks 3 and 6 of the main brake cylinders with brake fluid up to the mark ‘’MAX” on tanks housings. After brake fluid appears from outlet holes of the main brake cylinders connect pipelines 1 and 4 to outlet holes of main brake cylinders 7, 8 and start bleeding according to the abovementioned method for tractors with main brake cylinders of the company “CARLISLE”.

ATTENTION: IF AFTER DISCONNECTION OF PIPELINES FROM OUTLET HOLES OF MAIN BRAKE CYLINDERS WITH TANKS FILLED, NO BRAKE FLUID APPEARS FROM OUTLET HOLES OF MAIN BRAKE CYLINDERS AFTER MORE THAN FOUR MINUTES, IT INDICATES, THAT THE VALVE BETWEEN THE TANK AND CYLINDER OPERATING CAVITY IS CLOGGED. IN THIS CASE THE BLEEDING OF HYDRAULIC SYSTEM IS NOT POSSIBLE. TO ELIMINATE THE DEFECT, PLEASE CONTACT YOUR DEALER!



1 – pipeline; 2 – bolt; 3 – tank; 4 – pipeline; 5 – bolt; 6 – tank; 7 – main brake cylinder; 8 – main brake cylinder.

Figure 5.4.30 – Disconnection of pipelines from main brake cylinders on tractors equipped with main brake cylinders produced by FENOX

5. Check the value of the unlocked pedals full travel separately, applying force of (300±30) N which shall be within 100 to 120mm. The difference between the full travel of the right and left pedals shall not exceed 10 mm.

In case the value of one of the pedals full travel exceeds the specified limits, it is required to make adjustments of the corresponding pedal full travel, doing the following operations:

- unscrew counter nut 2 (figure 5.4.28) on shaft 1 of operating brake cylinder 8 for several revolutions;
- rotating shaft 1 of the operating brake cylinder by flattened surface, adjust the cylinder length and travel of the operating cylinder yoke pin 4 within the required limits;
- lock counter nut 2.

If the value of both pedals full travel exceeds the required limits, it is necessary to carry out adjustment of both pedals full travel.

6. Check the efficiency of service brakes operability during tractor movement along dry road with hard surface with the clutch off. When the interlocked brake pedals are depressed with the force of 590 to 600 N, the length of braking path shall not exceed 6.4 m with the tractor travel speed of 20 km/h. Unevenness of tractor movement in the process of braking shall not exceed 0.5 m. If necessary, adjust the simultaneity of braking start by means of changing the length of one of operating brake cylinders, as specified above.

5.4.3.5 Operation 48. Check / adjustment of parking brake control

ATTENTION: CHECKS AND ADJUSTMENTS OF THE PARKING BRAKE AS WELL AS TROUBLESHOOTING SHALL BE PERFORMED WITH THE ENGINE OFF AND THE TRACTOR BEING FIXED IN HORIZONTAL POSITION WITH STOPS UNDER THE WHEELS WHICH EXCLUDE SPONTANEOUS TRACTOR MOVEMENT! ONLY DEALERS ARE ALLOWED TO PERFORM ADJUSTMENTS AS WELL AS TROUBLESHOOTING OF THE PARKING BRAKE!

Check of the efficiency of parking brake operability consists in tractor being able to hold itself at a slope at least 18% when applying the force of not more than 400 N to the parking brake control lever. In case this requirement is not observed, it is necessary to carry out adjustment of parking brake control.

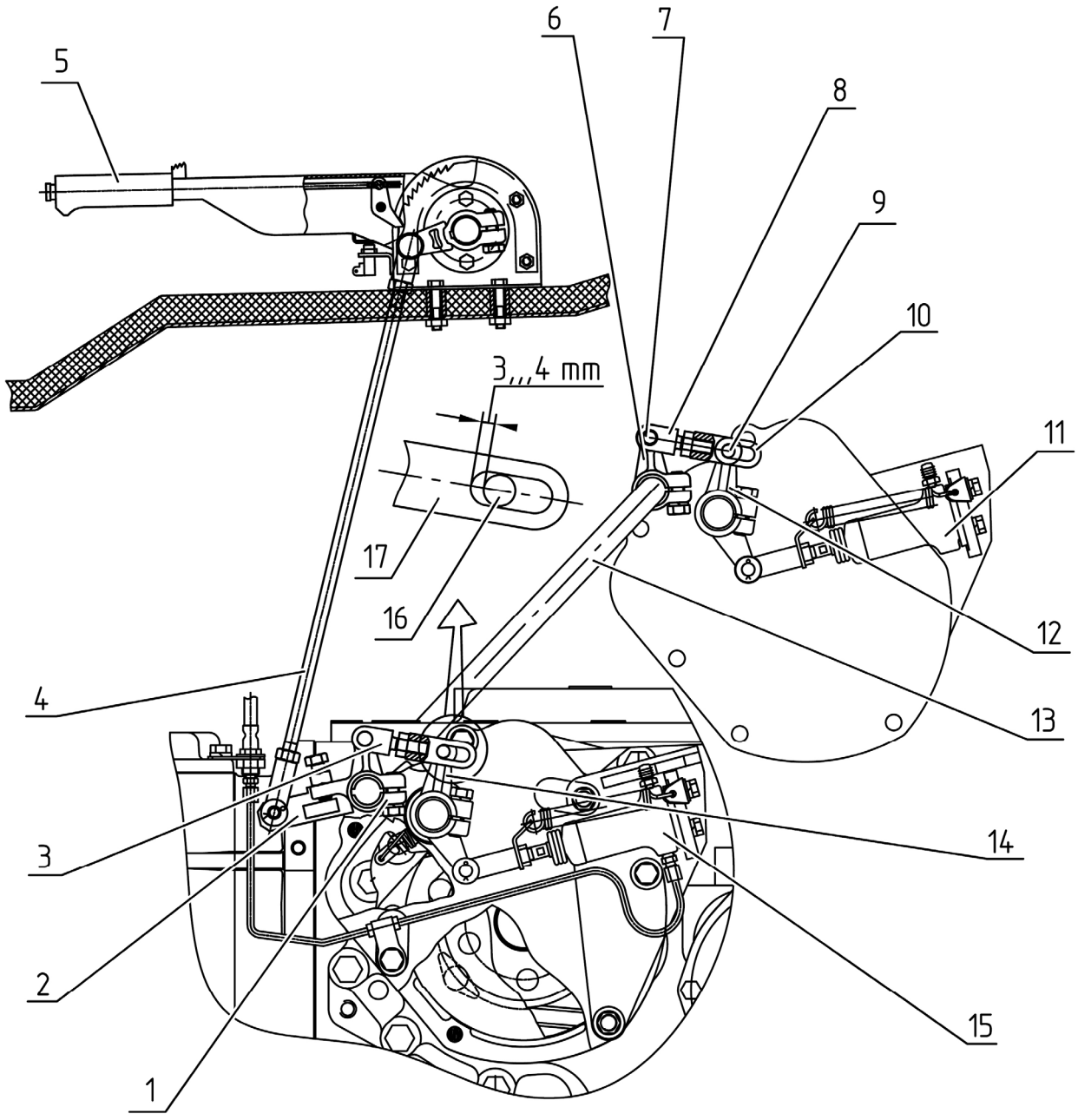
ATTENTION: ADJUSTMENT OF PARKING BRAKE CONTROL SHALL BE CARRIED OUT AFTER PERFORMING THE OPERATION ON ADJUSTMENT OF SERVICE BRAKES CONTROL!

Adjustment of parking brake control shall be carried out in the following order:

- shift handle 5 (figure 5.4.31) of the parking brake control lever to the extreme lower position;
- adjust the length of the left brake rod 3 and the length of the right brake rod 8 so that the clearance between pin 16 and yoke 17 of the left brake is within 3 to 4 mm, and pin 9 touches the oval groove butt end of the right brake yoke 10 when setting handle 5 of the brake to the extreme lower position;
- to adjust the length of rod 3, it is required to unlock pin 16 and loosen tightening of yoke 17 counter nut. Changing of rod 3 length is carried out by rotating yoke 17;
- to adjust the length of rod 8, it is required to unlock pin 9 and loosen tightening of yoke 10 counter nut. Changing of rod 8 length is carried out by rotating yoke 10;
- all pins shall rotate easily in junctions “yoke-lever head” and move along yoke grooves without jamming;
- after adjustment, lock pins 9 and 16 and also tighten counter nuts of yokes 10 and 17 for rods 8 and 3 with a torque from 40 to 45 N•m.

Final check and adjustment of the parking brake shall be carried out on the assembled tractor. The tractor shall be able to hold itself at a slope of at least 18% when applying the force of not more than 400 N to the control lever handle 5. In case of necessity, make an adjustment by changing the length of rods 3 and 8.

ATTENTION: WHEN ADJUSTING THE LENGTH OF RODS 3 AND 8, AVOID DECREASING THE LENGTH OF THE ROD SCREW-IN PART INTO THE YOKE BELOW 12 MM!



1, 2, 6, 12, 14 – lever; 3, 4, 8 – rod; 5 – handle; 7, 9, 16 - pin; 10, 17 – yoke; 11 – right operating cylinder; 13 – brake shaft; 15 – left operating cylinder.

Figure 5.4.31 – Parking brake

5.4.4 General maintenance services

5.4.4.1 General instructions

Carry out maintenance service operations listed in present subsection 5.4.4 as may be necessary (i.e. according to corresponding pressure or dirtiness sensor indications).

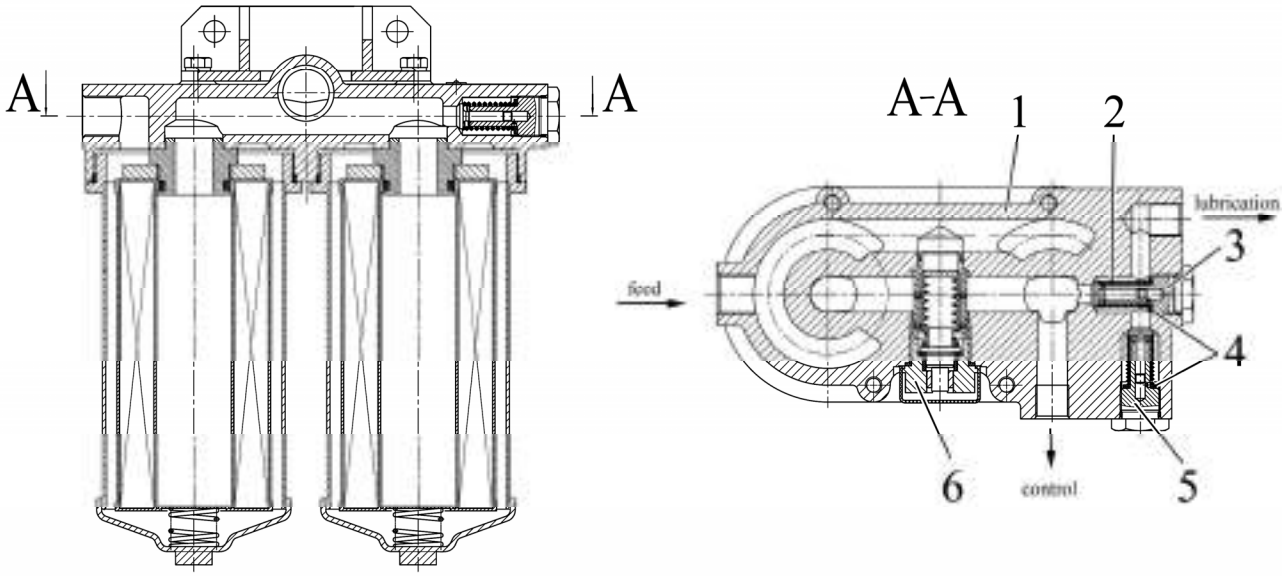
5.4.4.2 Operation 79. Adjustment of valve setting operating pressure for transmission hydraulics

The valve setting operating pressure for the transmission hydraulics is located on duplex filter 7 (figure 5.4.2).

The valve setting operating pressure for the transmission hydraulics 3 (figure 5.4.32) maintains oil pressure in the transmission hydraulics within 1.1 to 1.2 MPa at rated speed of the engine. If the pressure is permanently below 1.1 MPa or above 1.2 MPa with the tractor warmed up and with the rated speed of the engine, then adjust valve 3 by changing the number of washers 4 between spring 2 and valve setting the operating pressure for transmission hydraulics 3. To do this it is necessary to screw valve 3 out of housing 1.

To increase the pressure it is required to increase the amount of washers, to reduce the pressure it is required to reduce the amount of washers.

ATTENTION: THE TOTAL THICKNESS OF ADJUSTING WASHERS SHALL NOT INCREASE 7 MM PER VALVE!



1 – duplex filter body; 2 – spring; 3 – valve setting operating pressure for transmission hydraulics; 4 – adjusting washers; 5 – lubrication valve; 6 – annunciator valve.

Figure 5.4.32 – Adjustment of valve setting operating pressure for transmission hydraulics

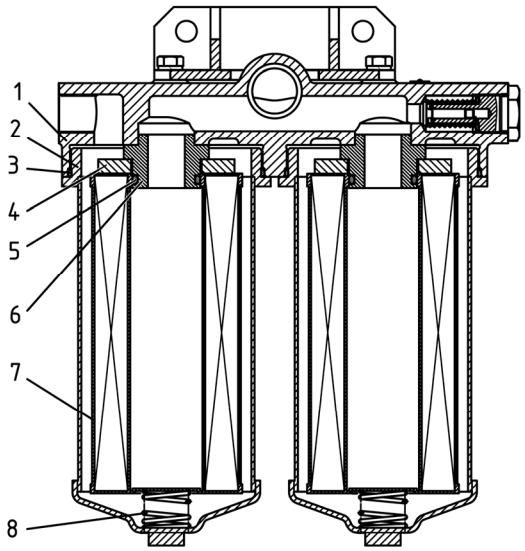
ATTENTION: IF PRESSURE GOES BELOW 0.8 MPA, STOP THE TRACTOR AND ELIMINATE THE FAILURE IN TRANSMISSION HYDRAULICS!

5.4.4.3 Operation 80. Change of duplex filter filtration package for transmission hydraulics and rinse of mesh filter

The filtration package of the duplex filter for the transmission hydraulics 7 (figure 5.4.2) shall be changed as impurity annunciator 20 (figure 2.15.1) located on CECS goes on.

ATTENTION: IT IS NECESSARY TO REPLACE TWO FILTRATION PACKAGES SIMULTANEOUSLY!

The filtration package shall be replaced as follows:
- as annunciator 20 goes off (figure 2.15.1) kill the engine, engage the parking brake;
- screw bowl 2 (figure 5.4.33) of the duplex filter out;
- remove the dirty filtration package 7;
- clean constant magnet 4 from metal particles;
- place clean constant magnet 4 on bushing 6;
- mount seal rings 3, 5 and new filtration package 7;
- then mount spring 8 into bowl 2 and screw it into body 1;
- the same procedure shall be used to replace the second filtration package.



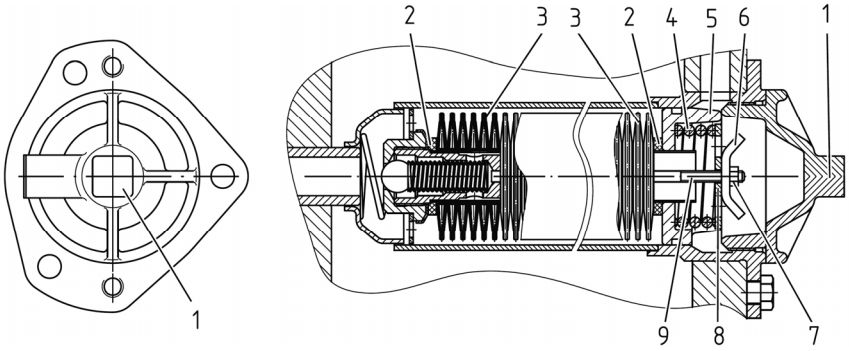
1 – duplex filter body; 2 – bowl; 3, 5 – seal ring; 4 – constant magnet; 6 – bushing; 7 – filtration package; 8 – spring.

Figure 5.4.33 – Change of filtration packages of duplex filter for transmission hydraulics

ATTENTION: ALONG WITH REPLACEMENT OF FILTRATION PACKAGES OF DUPLEX FILTER IT IS REQUIRED TO RINSE MESH FILTER!

To rinse mesh filter 6 (figure 5.4.2) of transmission hydraulics proceed as follows:
- unscrew cover 1 (figure 5.4.34) of mesh filter and remove filter assembly with bracket 6;
- dismount the filter, alternately screwing locknut 7 and bracket 6 off double-end bolt 9. Remove washer 8, spring 4, piston 5, seal ring 2, filtration packages 3, seal ring 2;
- rinse the filtration packages in diesel fuel to remove dirt completely;
- assembly the filter in a reverse sequence paying attention to compulsory mounting of seal rings 2 at both sides of filtration packages set!

ATTENTION: SCREW BRACKET 6 (FIGURE 5.4.34) OVER DOUBLE-END BOLT 9 UNTIL WASHER 8 COMES FLUSH WITH PISTON 5 BUTT END!



1 – cover; 2 – seal ring; 3 – filtration packages; 4 – spring; 5 – piston; 6 – bracket; 7 – locknut; 8 – washer; 9 – double-end bolt.

Figure 5.4.34 – Rinse of mesh filter for transmission hydraulics

5.4.4.4 Operation 81. Change of HLL pump filter

HLL pump filter 1 (figure 5.4.35) is mounted near HLL oil tank 2.

1 – HLL pump filter; 2 – HLL tank.

Figure 5.4.35 – Change of HLL pump filter

The HLL filter shall be replaced when annunciator 18 (figure 2.15.1) located on CECS lights up (and continuously glows).

HLL pump filter shall be replaced as follows:

- after annunciator 18 goes off and starts to glow continuously kill the engine, engage the parking brake;
- clean the installation place of the HLL pump filter from dirt;
- screw the HLL pump filter out;
- wipe the pump mounting face and apply clean oil used for HLL;
- refill new HLL pump filter with clean oil, used for HLL and screw the filter back.

5.4.4.5 Operation 82. Change of fine filtering package and rinse of coarse filter in end plate of HLL integrated unit.

If during operation of the distributor sections the fault code indicator for one or more sections shows fault code “23” this means either impurity of the fine filter or metal-ceramic coarse filter, or absence of voltage at actuating electromagnet of the reduction valve, or failure of the electromagnet of the reduction valve, or impurity of the reduction valve.

It is required to proceed as follows:

- check availability of voltage at the actuating electromagnet connector (figure 6.13.3) with the engine running. It shall make 11 to 15V. If voltage is lower or missing contact Your dealer to eliminate the break or other failure in the wiring;

- if the required voltage is available measure coil resistance. It shall make 4 to 6 Om at the ambient temperature of 15 °C to 35 °C. If coil resistance is higher or lower than the specified limits contact Your dealer to replace the coil of the actuating electromagnet;

- if the wiring and the actuating electromagnet are in working order, it is required to rinse the metal-ceramic coarse filter located under blind plug 1 (figure 6.13.4) and replace the fine filter located behind cover 1 (figure 6.13.2), rinse the reduction valve.

To remove the coarse filter from the end plate it is required to dismount the blind plug using 10 mm hexagon wrench, and then screw the coarse filter out of the end plate using 5 mm hexagon wrench and remove it with pincers. Rinse the coarse filter in clean diesel fuel, bleed it with compressed air, mount the clean filter into the end plate. If it is not possible to clean the coarse filter properly by way of rinsing and bleeding it shall be replaced.

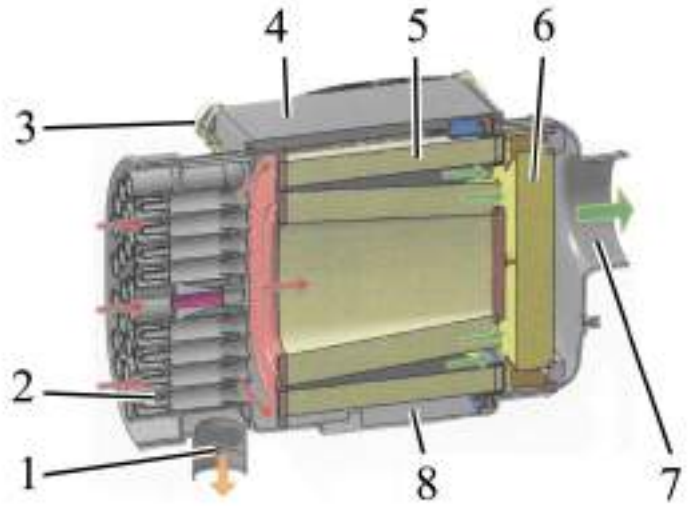
To remove the fine filter from the end plate it is required to dismount the cover by taking out two bolts with 5mm hexagon wrench. Mount a new filter into the end plate.

It is recommended to let dealer rinse the reduction valve.

5.4.4.6 Operation 83. Maintenance of the engine air cleaner

Tractor “BELARUS-2122.6” air cleaner is mounted in the front part of engine area over AB.

Tractor “BELARUS-2122.6” air cleaner is shown in figure 5.4.36.



1 – dust removing pipe; 2 – inbuilt unit “multicyclone”; 3 – latches of air cleaner maintenance cover; 4 – air cleaner maintenance cover; 5 – main filtering element; 6 – pilot filtering element; 7 – outlet pipe; 8 – air cleaner housing.

Figure 5.4.36 – Maintenance of tractor air cleaner

The engine air cleaner shall be serviced as the max. impurity indicator of the air cleaner filter which is located on the pilot lamp unit in the dashboard goes off. This means that the filtering element has run out of order.

As the indicator goes on it is necessary to change the main filtering element. To change the main filtering element proceed as follows:

- pull up four latches 3 and take the cover 4 off (figure 5.4.36);
- remove the main filtering element 5, to do this tilt it towards the inbuilt unit “multi-cyclone” and pull the main filtering element up, as shown in figure 5.4.37.
- check the pilot filtering element 6 (figure 5.4.36) for contamination without taking it out of the housing;
- clean the inner and the sealing surface of the housing 8 from dust and dirt with a wet wipe. Herewith make sure dust and dirt doesn’t get into the air supply duct.
- check condition of sealing rings;
- assemble the air cleaner with a new main filtering element in a reverse order;
- make sure the main filtering element is installed into the housing correctly and lock the latches 3;

ATTENTION: IT IS NOT RECOMMENDED TO TAKE THE PILOT FILTERING ELEMENT OUT OF THE HOUSING. CONTAMINATION OF THE PILOT FILTERING ELEMENT POINTS AT DAMAGE OF THE MAIN FILTERING ELEMENT (PAPER SHUTTER IS RUPTURED, THE BOTTOM CAME UNSTUCK). IN THIS CASE CLEAN THE PILOT FILTERING ELEMENT AND REPLACE THE MAIN FILTERING ELEMENT!

ATTENTION: THE AIR CLEANER MANUFACTURER STRONGLY RECOMMENDS TO REPLACE THE MAIN FILTERING ELEMENT, BUT NOT TO CLEAN IT TO AVOID DAMAGE AND ENSURE MAX. ENGINE PROTECTION!

If the impurity indicator goes off and there is no possibility to replace the main filtering element, it is permitted to clean the main filtering element.

To clean the main filtering element, proceed as follows:

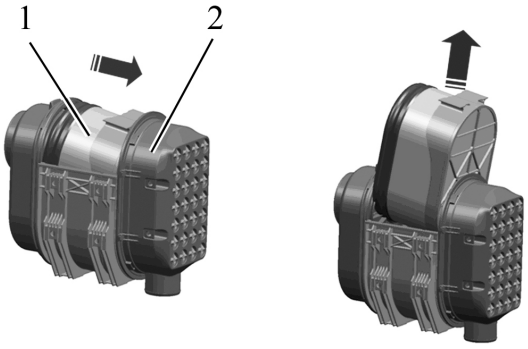
o blow off main filtering element 5 with dry compressed air until dust is completely removed. In order to avoid rupture of the material of the main filtering element, air pressure shall make 0.2 to 0.3 MPa. Air jet shall be directed from clean air side to unclean air side, as arrows show in figure 5.4.36. During maintenance it is required to protect filtering elements against mechanical damages and oiling.

o check the main filtering element for possible damages (shutter is ruptured, bottom came unstuck);

o clean the sealing ring of the main filtering element with a wet wipe and install the main filtering element into the air cleaner housing.

ATTENTION: IT IS FORBIDDEN TO BLOW OFF THE MAIN FILTERING ELEMENT WITH EXHAUSTS, WASH AND DUST IT!

ATTENTION: THE CLEANED MAIN FILTERING ELEMENT DOES NOT HAVE THE EFFICIENCY OF A NEW ONE!



1 – main filtering element; 2 – inbuilt unit “multi-cyclone”.
Figure 5.4.37 – Removing main filtering element

ATTENTION: AFTER THE AIR CLEANER IS ASSEMBLED IT IS REQUIRED TO CHECK ALL CONNECTIONS OF THE INLET DUCT FOR AIR TIGHTNESS.

To check air tightness, use device КІ-4870 GOSNITI or its analogue. If the device is not available, check the connections for air tightness visually. Damaged connection members shall be replaced.

IT IS FORBIDDEN TO OPERATE THE TRACTOR WITH THE INLET DUCT HAVING AIR LEAKAGE.

Air leakage in the circuit of air supply to the turbocharger may adversely affect readings reliability of the impurity indicator, as a result significant volume of unpurified air with high concentration of dust leading to accelerated wear out of the engine sleeve group may get into cylinders through the turbocharger.

5.5 Seasonal maintenance services

Carrying out seasonal maintenance service shall be combined with the performance of operations of regular maintenance services. The scope of work which shall be carried out during seasonal maintenance service is given in table 5.5.1.

Table 5.5.1 – Seasonal maintenance services

Scope of work	
When changing into autumn-winter period (with fixed daily average temperature +5C°)	When changing into spring-summer period (with fixed daily average temperature above +5C°)
Replace summer oil grades by winter in the engine crankcase, in accordance with table 5.8.1	Replace winter oil grades by summer in the engine crankcase, in accordance with table 5.8.1

5.6 Safety measures during maintenance service and repair operations

5.6.1 General safety requirements

It is forbidden to dismount the hood side panels and/or open the tractor hood or the mask of the hood with the engine running.

Maintenance (repair) operations shall be carried out only if the engine is not running and PTO is disengaged. Hinged implements shall be in a lower position, the tractor shall be stopped with the parking brake.

Observe safety requirements while using lift-and-carry means of transport.

During inspection of units under control and adjustment, use the portable lamp with voltage of not more than 36V. The lamp shall be protected by wire guard.

Tools and accessories for MS shall be in a proper operating condition, correspond to their assignment and ensure safe operation.

In order to avoid injury and burns, be careful while draining (refilling) the coolant from the engine cooling system, hot oil from the engine, hydraulic systems of LL and HSC, transmission bodies, FDA and PTO reducing gears. Avoid contact with hot surfaces of the above mentioned units.

Mounting and dismounting of the engine shall be carried out by means of a rope, fastened to eye-bolts on the engine.

Do not make alterations in the tractor or its separate parts design without sanction of the manufacturing works. Otherwise the tractor after-sales service warranty shall be no longer valid.

5.6.2 Safety precautions for exclusion of hazardous situations related to accumulator batteries and a fuel tank

During maintenance of the accumulator battery, do the following:

- avoid skin contact with electrolyte;
- clean the batteries with wiping material moistened with aqua ammonia solution (ammonium hydroxide);
- while checking the electrolyte level, refill distilled water only;
- do not check the battery charge by means of the terminal short circuit;
- do not connect the accumulator battery with reversed polarity.

In order to avoid damaging of the electronic units of the electrical facilities and electrical control systems, observe the following safety precautions:

- do not disconnect AB outputs with the engine running. It will cause peak voltage in charging circuit and will result in inevitable failure of the diodes and transistors;
- do not disconnect electric wires when the engine is running and electric switches are on;
- do not cause short circuit by incorrect wire connection. Short circuit or incorrect polarity will result in failure of the diodes and transistors;
- do not connect the AB in the electrical facilities system until the outputs/inputs polarity and voltage are checked;
- do not check the electric current by spark test as it can result in immediate breakdown of transistors.

Repair operations connected with application of electric welding for the tractor shall be carried out while the AB switch is off.

To avoid ignition or explosion hazard, prevent the fuel tank, engine fuel system and accumulator batteries from being close to the open flame sources.

.

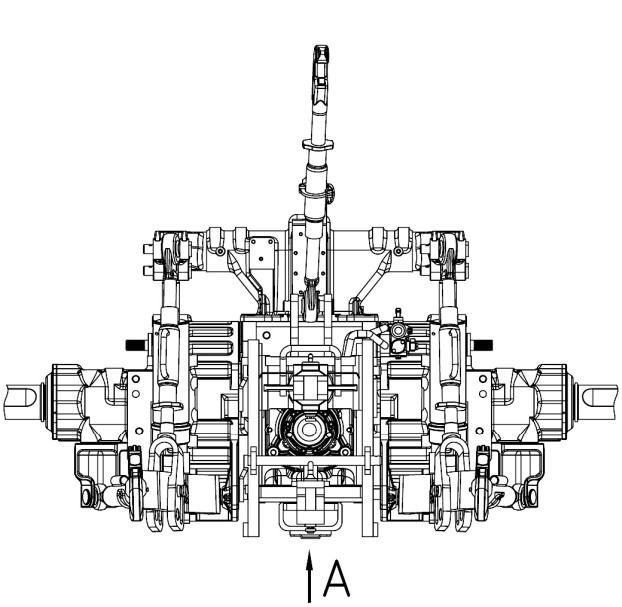
5.6.3 Guidelines for safe use of leveling jacks and statement of proper places for their installation

Use leveling jacks to lift tractor, and after lifting insert backing blocks and limit stops under the front axle beam, rear wheel semi-axles, or base components of the tractor frame.

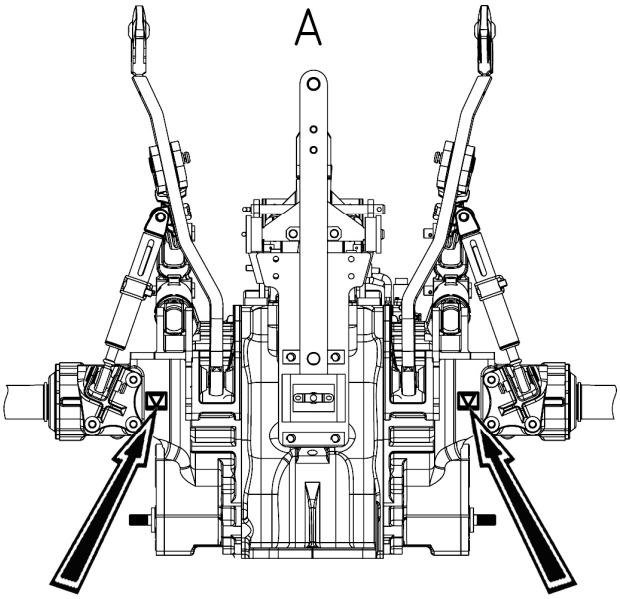
Places for leveling jack installation on the tractor are marked by a sign shown in figure 5.6.1.

Figure 5.6.1 – Sign of a place for leveling jack installation

To lift tractor rear elements, set leveling jacks (or a single jack) under the rear semi-axle tube as illustrated in figure 5.6.2.



a) Tractor rear view



b) Tractor view underneath

Figure 5.6.2 – Scheme of leveling jack installation for lifting tractor rear elements

To lift tractor front elements, set leveling jacks (or a single jack) under the front driving axle beam tube, as illustrated in figure 5.6.3.

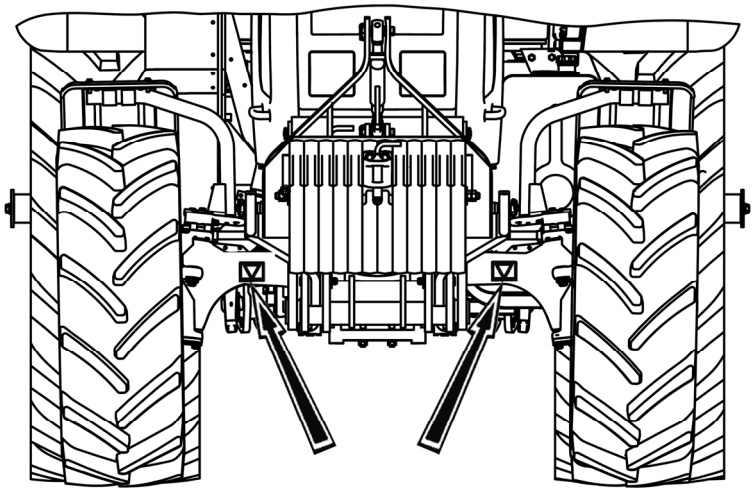


Figure 5.6.3 – Scheme of leveling jack installation for lifting tractor front elements

When using leveling jacks, observe the following safety requirements:

- while lifting tractor “BELARUS-2122.6”, use properly operating leveling jacks with lifting capacity of at least 5 tons;
- before tractor jacking, stop the engine and engage the parking brake;
- while jacking tractor front elements, put cotters under rear wheels;
- while jacking tractor rear elements, engage the gear and put cotters under front wheels;
- do not put the jack on soft or slippery surface as it may cause the tractor falling off the jack. When needed, use steady and relatively large support;
- after lifting the tractor, put the limit stops under the front axle beam, rear wheel semi-axles, or tractor frame base components to exclude tractor falling or rolling movement.

IT IS FORBIDDEN TO START THE ENGINE WHEN THE TRACTOR IS JACKED!

ATTENTION: ONLY PERSONNEL PROPERLY INSTRUCTED ON LEVELING JACK SAFE USE AND METHODS OF LEVELING JACK SAFE OPERATION ARE ALLOWED TO OPERATE LEVELING JACK!

5.7 Instruments, work tools and measuring devices while maintenance services and repair

For maintenance services and repair, it is required to use the following instruments, work tools and measuring devices:

- areometer or density gage for measuring electrolyte density with lower-range value not more than 1.15 g/cm^3, upper-range value – not less than 1.31 g/cm^3, with measuring inaccuracy not more than 0,01 g/cm^3;
- multimeter for control of electric chain and electrical equipment running order, with the opportunity of measuring: constant and alternating voltage – from 1 mV to 1000 V, direct and alternating current – from 20 mA to 20 A, resistance – from 20 Ohm to 20 megohm. Measuring inaccuracy of multimeter shall not exceed 30% of the controlled access;
- the device KI-4870 GOSNITI for checking inlet line hermiticity;
- hydraulic manometer with the opportunity of measuring oil pressure and hydraulic liquids with measurement range from 0 to 50 MPa with a flexible extension rod (tube) and lugs for coupling with threaded openings. Measuring inaccuracy of the hydraulic manometer shall not exceed 30% of the controlled access;
- a ruler GOST 7502-98 or tapeline GOST 427-75 for measuring engine cooling liquid level, belt tension, electrolyte level in combination with a glass tube with diameter from 4 to 10 mm, for adjusting tractor units and systems with measuring inaccuracy of not more than 30% of the controlled access;
- torque wrenches for tightening threaded couplings having measuring inaccuracy not more than 30% of the controlled access;
- manometer MD-214 GOST 9921-81 for tire inflation pressure control (other devices having metrological specifications similar to the manometer MD-214 for tire inflation pressure control may be used);
- manometer – 1,6 MPa-1 GOST 2405-80 for pneumatic system pressure control (other devices having metrological specifications similar to the manometer M-1,6MPa-1 for pneumatic system pressure control may be used);
- a trammel with a measurement range 150 mm and a division value not more than 0,1 mm according to GOST 166-89 for speed sensor adjustment and rear PTO speed sensor;
- control device 8538-7367-02 for checking and adjustment of conditioner compressor drive belt tension;
- dynamometer DPR-0,1 GOST 13837-79 for forcing control of FLL wheel reducer fist turn;
- dynamometer-endfloatmeter for measuring steering wheel angle gap;
- a rack-type tool for radiator ribs flattening;
- a set of screw keys GOST 2839-80 for operating with threaded couplings;
- a set of fitter and assembler screwdrivers GOST 17199-88 for operating with screwed threaded couplings;
- wheel blocks for prevention spontaneous tractor movement while maintenance services or repair;
- supporting blocks for machine uplift with lifting capacity not less than 10 tons;
- funnels for filling cooling liquid, oils and other tractor hydraulic liquids;
- tanks for discharge of waste oils and liquids with volume not less than that specified in column 8 of Table 5.8.1. “The list of tractor “BELARUS-2122.6” FLM (fuel and lubrication materials)”.

Instead of the specified instruments, work tools and measuring devices it is possible to use other instruments, work tools and measuring devices having similar metrological specifications.

5.8 Filling and lubrication of the tractor with fuel and lubrication materials

In Table 5.8.1 titles and trademarks of fuel and lubrication materials (FLM) used during the tractor operation and maintenance are listed, their quantity and change intervals are also specified.

Table 5.8.1 – List of tractor “BELARUS - 2122.6” FLM

Item reference	Title of the assembly unit	Quantity of assembly units , pieces.	Name and designation of fuel and lubrication materials				FLM weight (volume) filled in the tractor when changing or refilling, kg (dm)	Change intervals of FLM, h	Remarks
			Basic components	Backup components	Auxiliary components	Foreign-made			
1	2	3	4	5	6	7	8	9	10
1 Fuel									
1.1	Fuel tank	2	At ambient temperature of 0ºC and higher				(305±2)	Filled in every shift	
			Diesel fuel DT-L-K5 Grade B STB 1658-2012	Not available	Not available	Diesel fuel EN 590:2009 +A1:2010 with sulfur content not more than 10 mg/kg (0.001%) Diesel fuel Type III Grade B GOST R 52368-2005			
			At ambient temperature of minus 5ºC and higher						
			Diesel fuel DT-L-K5 Grade C STB 1658-2012	Not available	Not available	Diesel fuel EN 590:2009 +A1:2010 with sulfur content not more than 10 mg/kg (0.001%) Diesel fuel Type III Grade C GOST R 52368-2005			
			At ambient temperature of minus 20ºC and higher						
			Diesel fuel DT-L-K5 Grade F STB 1658-2012	Not available	Not available	Diesel fuel EN 590:2009 +A1:2010 with sulfur content not more than 10 mg/kg (0.001%) Diesel fuel Type III Grade F GOST R 52368-2005			
2 Oil									
2.1	Engine oil crankcase [1)]	1	In summer				(18±0.18)	250	
			Engine oils « G-Profi GT LA » SAE 10W-40 API CI-4, « Lukoil Avangard Professional LS » SAE 10W-40, API CI-4 « Lukoil Avangard Professional LA » SAE 15W-40, API CI-4	Not available	Not available	Engine oils “Shell RimulaR6 LM” SAE 10W-40, “Shell Rimula R4L” SAE 15W-40, ALPINE Turbo Plus LA SAE 10W-40, ORLEN OIL Platinum Ultor Progress SAE 10W-40, ORLEN OIL Platinum Ultor Futuro SAE 15W-40			
			In winter						
			Engine oils « Lukoil Avangard Professional LS » SAE 5W-30, SAE 10W-40, API CI-4	Not available	Not available	Engine oils “Shell Rimula R6 LME” SAE 5W-30 ALPINE Turbo Plus LA SAE 10W-40, ORLEN OIL Platinum Ultor Progress SAE 10W-40, ORLEN OIL Platinum Ultor Max SAE 5W-40			

Table 5.8.1 continued

1	2	3	4	5	6	7	8	9	10
2.2	High-pressure fuel pump of the engine	1	Engine oil is the same as filled in the engine crankcase				See engine operating manual		When new or repaired fuel pump of the company "Bosch", Germany or "Motor-pal", Czech Republic is installed.
2.3	Transmis-sion hous-ing (clutch, GB and rear axle)	1	REPSOL CERES STOU 10W-40 API CE/SF	MOL Farm STOU 10W-40 API CG-4/GL-4; AGIP 10W40 Multitech 2000 (STOU) API GL-5/ API CE/CF-4; Eni SUPER-TRACTOR UNI-VERSAL 10W-40 (10W-30) API GL-5/CE/CF-4; THK SUPER UN TRACTOR OIL EXTRA 10W-3((STOU) API CE/CF-4/SF/GL-4	Not avail-able	Not avail-able	(54±0.4)	1000	
2.4	FDA body	1	Transmission oil TAп-15B GOST 23652-79	Transmission oil TAD –17i, Tsp-15K GOST 23652-79 ТЭ$_{П}$-15М TU 38.401-58-305-2002	Not available	HESSOL BECHEM HYPOID SAE 80W-90 API GL5/GL4	(4.5±0.04)	1000	
2.5	Wheel-hub drive casing of FDA	2	Transmission oil TAп-15B GOST 23652-79	Transmission oil TAD –17i, Tsp-15K GOST 23652-79, ТЭ$_{П}$-15М TU 38.401-58-305-2002	Not available	HESSOL BECHEM HYPOID SAE 80W-90 API GL5/GL4	(4.0±0.04)	1000	
2.6	Front PTO reduction unit [2)]	1	Transmission oil TAп-15B, ТЭп-15 GOST 23652-79	Transmission oil TAD–17i, Tsp-15K GOST 23652-79, ТЭ$_{ТГ}$-15М TU 38.401-58-305-2002	Engine oil М-10Г$_2$ GOST 8581-78	HESSOL BECHEM HYPOID SAE 80W-90 API GL5/GL4	(2.1+0.2)	1000	
2.7	HSC tank with hy-draulic units	1	All-weather oils: hydraulic BECHEM Staroil №32, №68; ADDINOL Hydraulikol HLP 32, HLP 68; THK Hydraulic HLP 32, HLP 68; HYDROL HLP 32, HLP 68; VITTOL HLP-32; LUKOIL Geiser 32CT, 68CT; Gazpromneft Hydraulik HLP 32, HLP 68 [3)];	Not available	Not available	Not available	(80,0±0,5)	1000	
2.8	HSC tank with hy-draulic units	1	All-weather oils: Hydraulic BECHEM Staroil №32, №68; ADDINOL Hydraulikol HLP 32, HLP 68; THK Hydraulic HLP 32, HLP 68; HYDROL HLP 32, HLP 68; VITTOL HLP-32; LUKOIL Geiser 32CT, 68CT; Gazpromneft Hydraulik HLP 32, HLP 68 [3)];	Not available	Not available	Not available	(7.5±0.35)	1000	

Table 5.8.1 continued

1	2	3	4	5	6	7	8	9	10
3 Greases and lubricants									
3.1	Hinge joint of the steering hydraulic cylinder	4	Grease Litol-24 GOST 21150-87	BECHEM LCP-GM MC-1000 TU 0254-003-45540231-99	Not available	BECHEM LCP-GM	0.05 ±0.003	250 (500 when using grease MC-1000)	
3.2	Hinge joint of the steering link	2	Grease Litol-24 GOST 21150-87	BECHEM LCP-GM MC-1000 TU0254-003-45540231-99	Not available	BECHEM LCP-GM	0.02 ±0.001	1000 (2000 when using grease MC-1000)	
3.3	RLL turning shaft bushing	2	Grease Litol-24 GOST 21150-87	BECHEM LCP-GM MC-1000 TU0254-003-45540231-99	Grease solid oil C GOST 4366-76 or solid oil Ж GOST 1033-79	BECHEM LCP-GM Mobil Grease MP ISO-L-XDCIB2	0.02 ±0.001	500 (1000 when using grease MC-1000)	
3.4	Clutch coupling shifter bearing	1	Grease Litol -24 GOST 21150-87	BECHEM LCP-GM MC-1000 TU0254-003-45540231-99	Grease solid oil C GOST 4366-76 or grease solid oil Ж GOST 1033-79	BECHEM LCP-GM	0.02 ±0.001	250 (500 when using grease MC-1000)	
3.5	FDA spider bearing of twinned hinge joint	2	Grease №158M TU 38.301-40-25-94	Grease AZMOL №158 TU U 00152365. 118-2000	Not available		0.0112 ±0.001	One-time	Filled by the manufacturer, not refilled during operation
3.6	FDA drive cardan shaft spider bearing	1	Grease №158M TU 38.301-40-25-94	Grease AZMOL №158 TU U 00152365. 118-2000	Not available		0.0056 ±0.001	One-time	Filled by the manufacturer of cardan shaft
3.7	FDA reduction gear pivot axle bearing	4	Grease Litol -24 GOST 21150-87	BECHEM LCP-GM MC-1000 TU 0254-003-45540231-99	Grease solid oil C GOST 4366-76 or grease solid oil Ж GOST 1033-79	BECHEM LCP-GM	0.12 ±0.006	250 (500 when using grease MC-1000)	
3.8	FLL lever pin bushing [2)]	2	Grease Litol -24 GOST 21150-87	BECHEM LCP-GM MC-1000 TU 0254-003-45540231-99	Grease solid oil C GOST 4366-76 or grease solid oil Ж GOST 1033-79	BECHEM LCP-GM Mobil Grease MP ISO-L-XDCIB2	0.02 ±0.001	1000 (2000 when using grease MC-1000)	
3.9	Bearing of FDA oscillation pin	1	Grease Litol -24 GOST 21150-87	BECHEM LCP-GM MC-1000 TU0254-003-45540231-99	Grease solid oil C GOST 4366-76 or grease solid oil Ж GOST 1033-79	BECHEM LCP-GM	0.02 ±0.001	250 (500 when using grease MC-1000)	

End of table 5.8.1

1	2	3	4	5	6	7	8	9	10
4 Special-purpose liquids									
4.1	Clutch hydraulic drive tank and cylinders	1	Brake fluid «ROSDOT» TU 2451-004-36732629-99	Not available	Not available	DOT3, DOT4 (Germany)	(0.4±0.1)	1000	
4.2	Brake hydraulic drive tank and cylinders	2	Brake fluid «ROSDOT» TU 2451-004-36732629-99	Not available	Not available	DOT3, DOT4 (Germany)	(0.8±0.1)	1000	
4.3	Engine cooling system (with radiator)	1	Low-freezing cooling fluids: «Tosol (-35) FELIX» (up to minus 35 °C), «Tosol (-45) FELIX» (up to minus 45 °C), «Tosol (-65) FELIX» (up to minus 65 °C), TU 2422-006-36732629-99, manufactured by «Tosol-Sintez» Ltd, Dzerzhinsk city, Russian Federation «Tosol-AMT 40» (up to minus 40 °C), TU BY 101083712.009-2005 manufactured by OJSC «Gomelkhimtorg», Gomel city, Republic of Belarus «CoolStream Standart 40» (up to minus 40 °C), TU 2422-002-13331543-2004 manufactured by OJSC «Tekhnoform», Klimovsk city, Russian Federation SINTEC Antifreeze-40 (up to minus 40 °C), SINTEC Antifreeze-65 (up to minus 65 °C), TU 2422-047-51140047-2007 manufactured by «Obninskorgsintez» Ltd, Obninsk city, Russian Federation «Tosol-A40MH» (up to minus 40 °C), «Tosol-A65MH» (up to minus 65 °C), TU BY 500036524.104–2003 manufactured by OJSC «Grodno-Azot», Grodno city, Republic of Belarus «Tosol-A40Mc» (up to minus 40 °C) TU BY 690652001.005-2013 manufactured by JLLC «M-Standart», Minsk district, Republic of Belarus.	Cooling fluid OЖ-40 (up to minus 40 °C), OЖ-65 (up to minus 65 °C), GOST 28084-89	Not available	Not available	(39.5±0.5)	Once in two years	
4.4	Tank for fluid of SCR-system	1	Agent AUS 32 for reduction of NOX emissions as per STB ISO 22241-1-2009	Agent for reducing emissions of nitrogen oxide AUS 32 (STB ISO 22241-1-2009) as per TU BY 500036524.130-2011 manufactured by OJSC «Grodno-Azot», Grodno city, Republic of Belarus	Not available	Not available	(28.0±1.0)	Shift-time filling	Full volume of the tank is 33l. It is not allowed to fill the tank for more than 28l.

[1] Use of motor oils depending on operation conditions:
a) summer (plus 5˚C and higher) – SAE 30; SAE 10W-40 (30); SAE 15W-40 (30); SAE 20W-40 (30);
b) winter (minus 10˚C and higher) – SAE 20; SAE 10W-40 (30);
c) winter (minus 20˚C and higher) – SAE 10W-20 (30, 40); SAE 5W-30 (40);
d) winter (below minus 20˚C) – SAE 5W-30 (40); SAE 0W-30 (40).
It is allowed to use other types of motor oil corresponding to classes E6, E9 under the classification of ACEA and to CI-4, CI-4+, CJ-4 under the classification of API, with viscosity conforming to the ambient temperature at the place of engine running.
[2] FLL and FPTO are mounted in tractor basic configuration.
[3] Hydraulic types of oil HLP 68, No 68 68CT are used in tractors shipped to Venezuela.

6. POSSIBLE FAILURES AND INSTRUCTIONS FOR THEIR TROUBLESHOOTING

6.1 Possible clutch failures and instructions for their troubleshooting

The list of possible failures of clutch coupling, clutch control and instructions for their troubleshooting are shown in table 6.1.1.

Table 6.1.1.

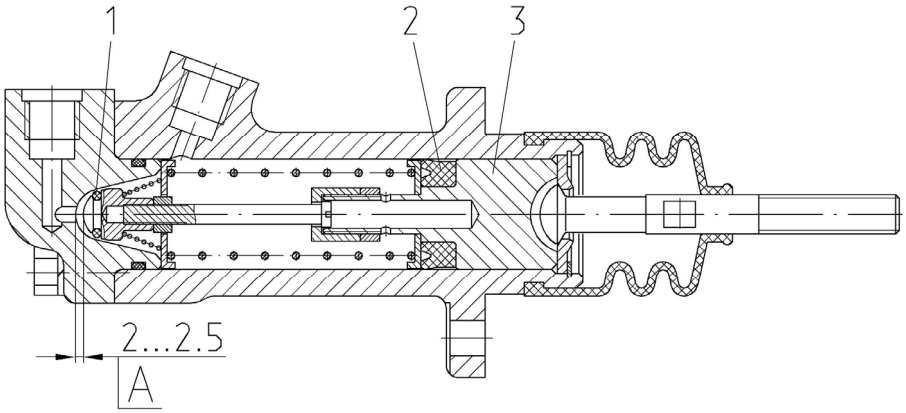
Failure, external manifestation, cause	Troubleshooting
Clutch coupling does not transmit full torque ("clutch skidding")	
There is no clearance between the clutch release bearing and release levers – "clutch is half disengaged" (insufficient clutch pedal free travel)	Adjust the clearance as specified in clause 5.4.2.12 "Operation 31. Check / adjustment of clutch control"
Partial engagement of clutch coupling (clutch lever 35 (figures 5.4.21 and 5.4.22) fails to return to its initial position) when the clutch pedal is released, due to failure in clutch operation control	Detect and eliminate the cause of failure, performing the operations indicated for troubleshooting "Clutch lever 35 (figure 5.4.21 and 5.4.22) fails to return to its initial position while releasing the clutch pedal"
Clutch driven disk facings are worn out	Change facings or driven disks assembled
Clutch driven disk facings are oiled-up due to ingress of oil into the dry section	Detect and eliminate the cause of oil ingress into the dry compartment
Poor compression spring force (spring shrinks due to continuous skidding and clutch overheating)	Change compression springs
Clutch coupling can not be fully disengaged ("clutch grabs and shudders")	
Clearance between the clutch release bearing and release lever is increased (increased clutch pedal free travel)	Adjust the clearance between the clutch release bearing and release lever according to clause 5.4.2.12 "Operation 31. Check / adjustment of clutch control"
Insufficient clutch lever 35 travel (figures 5.4.21 and 5.4.22) when the clutch pedal is fully depressed	Ensure the clutch lever full travel performing the operations specified for troubleshooting "Clutch lever 35 (figures 5.4.21 and 5.4.22) full travel is not provided"
Misalignment of release levers	Adjust the position of release levers
Excessive warping of driven disks	Replace driven disks
Blocking of driven disk hub on transmission shaft splines	Condition the surface of splines by grinding ensuring free movement of disks on the transmission shaft
Damaged transmission shaft support bearing in the flywheel	Replace the transmission shaft support bearing

Table 6.1.1 continued

Failure, external manifestation, cause	Troubleshooting
Clutch lever 35 (figures 5.4.21 and 5.4.22) fails to go back to its initial position when the clutch pedal is released	
There is no clearance between the main cylinder piston and piston follower	Adjust the clearance between main cylinder piston and piston follower according to clause 5.4.2.12 “Operation 31. Check / adjustment of clutch control”
There is no clearance between operating cylinder rod 25 (figure 5.4.21 and 5.4.22) and hydraulic booster 28 push rod 27.	Adjust the clearance according to clause 5.4.2.12 “Operation 31. Check / adjustment of clutch control”
Sticking (fails to go back to its initial position) of the main cylinder 11 piston 10 (figure 5.4.21) due to piston cup and O-ring expansion, resulting in closure of compensating port “A” (figure 6.1.1) in cylinder manufactured by OJSC “Gidroprivod”.	Use of incorrect hydraulic-brake fluid or ingress of mineral oil, petroleum, kerosene, diesel fuel into hydraulic-brake fluid. Rinse the hydraulic drive system with hydraulic-brake fluid. Replace damaged cups and O-ring in the main and operating cylinders. Replace hydraulic-brake fluid. Bleed the hydraulic system with hydraulic-brake fluid
Sticking (fails to go back to its initial position) of the main cylinder 11 piston 10 (figure 5.4.22) due to piston cup and O-ring expansion, resulting in closure of compensating port “A” (figure 6.1.2) in cylinder manufactured by “FENOX”.	
Blocking of the main cylinder piston due to piston cup expansion	
Hydraulic cylinder piston strokes are carried out with difficulty	Replace the hydraulic push rod
Clogging of compensating port “A” (figure 6.1.1 or 6.1.2) in the main cylinder	Unclog the compensating port of main cylinder and bleed the hydraulic system of clutch control
Loss of pullback spring power 32 (figures 5.4.21 and 5.4.22).	Replace the pullback spring
Full clutch lever 35 stroke can not be achieved (figures 5.4.21 and 5.4.22) when the clutch pedal is depressed	
The clearance between the main cylinder piston and piston follower is not properly adjusted	Adjust the clearance according to clause 5.4.2.12 “Operation 31. Check / adjustment of clutch control”
The clearance between operating cylinder 25 rod 26 (figures 5.4.21 and 5.4.22) and hydraulic booster 28 push rod 27 is not properly adjusted	Adjust the clearance according to clause 5.4.2.12 “Operation 31. Check / adjustment of clutch control”
Air presence in the clutch control hydraulic system	Bleed the hydraulic system with hydraulic-brake fluid
Insufficient level of hydraulic-brake fluid in the hydraulic system reservoir	Fill hydraulic-brake fluid to the required level in the main cylinder reservoir. Bleed the clutch control hydraulic system
Leakage of work space of the main and operating cylinder due to damage, wear of cups or O-rings	Replace cups or O-rings in the main and operating cylinder in case they are worn out. Check, if the cylinder bearing surface has sharpened edges, ridges, or pits. Bleed the clutch control hydraulic system

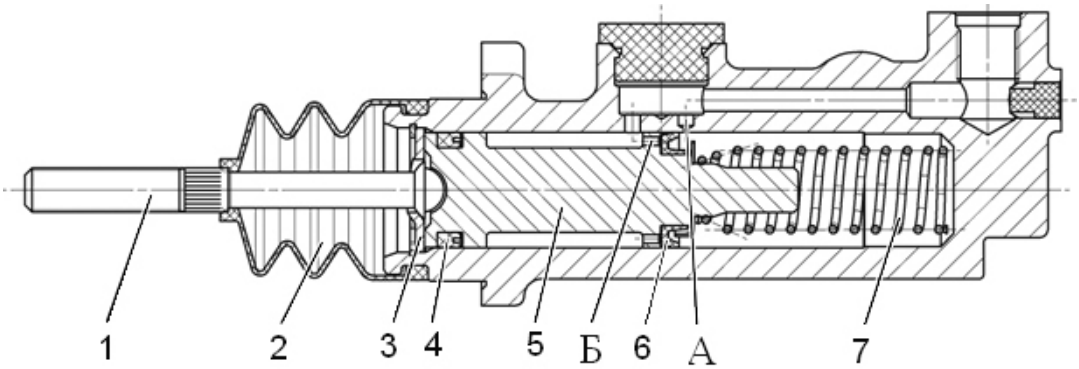
End of table 6.1.1

Failure, external manifestation, cause	Troubleshooting
Brake fluid leakage in joints and pipelines in the hydraulic drive system. Air inflow into the clutch control hydraulic system.	Tighten up joints, replace damaged parts. Bleed the clutch control hydraulic system
Clogging of opening in the tank fitting, causing depression in the main cylinder, as a result of which air leaks into the cylinder through sealings	Unclog the opening. Bleed the clutch control hydraulic system
Clogging of pipelines of the hydraulic drive system due to dent or blockage	Replace pipelines. Bleed the clutch control hydraulic system
Oil leakage through O-rings of the hydraulic booster	Replace O-rings in the hydraulic booster
No clutch pedal force	Air presence in the hydraulic system. Cups and an O-ring in the main and operating cylinder are worn out. Replace cups and O-rings in the main and operating cylinder. Check if cylinder bearing surface has sharpened edges, ridges, or pits. Bleed the clutch control hydraulic system



1 – O-ring, 2 – cup; 3 – piston; A – compensating port.

Figure 6.1.1 – Main coupling cylinder manufactured by OJSC “Gidroprivod”



1 – pusher; 2 – dust collar; 3 – thrust washer; 4 – oil-removing cup; 5 – piston; 6 – cup; 7 – spring; A – compensating port; Б – feeding port.

Figure 6.1.2 – Main coupling cylinder manufactured by “FENOX”

6.2 Possible failures in gearbox and reduction part of clutch housing and instructions for their troubleshooting

The list of possible failures in gearbox and reduction part of clutch housing and instructions for their troubleshooting are shown in Table 6.2.1.

Table 6.2.1

Failure, external manifestation, cause	Troubleshooting
Tractor fails to move in any gear, pressure in the transmission control hydraulics is ok	
Wear of clutch shaft spline joint, primary shaft or a coupling bushing	Disconnect the tractor, disassemble the clutch case and, if necessary, gearbox casing, replace worn-out parts
Tractor fails to move in any gear, there is no pressure in the transmission control hydraulics	
Failure of gear pump of transmission hydraulics	Replace the pump
Tractor fails to move when engaging any of gears, pressure in control line of gear engaged is ok (operates properly in other gears)	
If it is ok with gear shifting electronic control, then the reason is most probably a failure of friction clutch of the faulty gear.	Disconnect the tractor, dismount the gearbox casing, disassemble the gearbox gear group, replace worn-out parts in the friction clutch.
One of ranges will not engage or gets disengaged by itself	
Wear of yoke plate or clutch	Disconnect the tractor, dismount the gearbox and replace worn-out parts
Pressure loss in any of gears	
Oil leakage in the delivery line of the friction clutch (for example, gaskets, plugs, seal boots, seal rings)	Find place of oil leakage and eliminate.
“L-H” pass of GB reduction unit cannot be engaged	
Sticking or failure of the hydraulic cylinder control valve for switching of GB reduction unit pass	Rinse the valve spool. Replace the valve if necessary
The cylinder of GB reduction unit pass shifting is not adjusted	Adjust the cylinder of GB reduction unit pass shifting
Synchronizer for GB reduction unit shifting is damaged or shifting yoke is worn out.	Replace the synchronizer and worn-out parts
Increased noise	
Not enough oil in the transmission	Refill oil up to the required level mark
Wear or damage of bearings and other transmission components	Replace worn-out bearings and other damaged parts
Unfinished engagement of clutch (clutch “grabs and shudders”)	Adjust clutch in accordance with subsection 6.1 “Possible clutch failures and instructions for their troubleshooting”

Table 6.2.1 finished

Failure, external manifestation, cause	Troubleshooting
Tractor fails to start when the range shifting lever is set in neutral position or starts when a range is engaged	
Faulty switch of engine start-up lock with the range engaged	Replace the switch of engine start-up lock with the range engaged
The switch of engine start-up lock with the range engaged is not adjusted	Adjust the switch of engine start-up lock with the range engaged
Oil leakage in the dry compartment of the clutch coupling casing	
Oil leakage through connection: bowl — cover — case, or through connection: shifter bracket – shaft – case	Disconnect the tractor in order to detach the engine from clutch coupling case and stop leakage
Oil leakage through cups	Disconnect the tractor in order to detach engine from clutch coupling case and replace the cups
Increased noise, bearing desctruction parts are found	
Wear or desctruction of bearings and other parts	Find destroyed components of the transmission and restore the unit
Tractor starts to move with ranges engaged and gears disengaged, and when some gears are engaged engine fails	
If it is ok with gear shifting electronic control, then the reason is most probably a failure of friction clutch (piston got stuck, plates got stuck)	Disconnect the tractor, dismount the gearbox casing, disassemble the gearbox gear group, replace worn-out parts in the friction clutch.
As you engage each gear pressure drops significantly	
Bearing on the primary shaft is destroyed	Disconnect the tractor, dismount the gearbox casing and reassemble the gearbox unit, replace worn-out parts

6.3 Possible failures in the electronic control system for gearbox, rear axle differential lock, front driving axle drive, front and rear power take off shafts and instructions for their troubleshooting

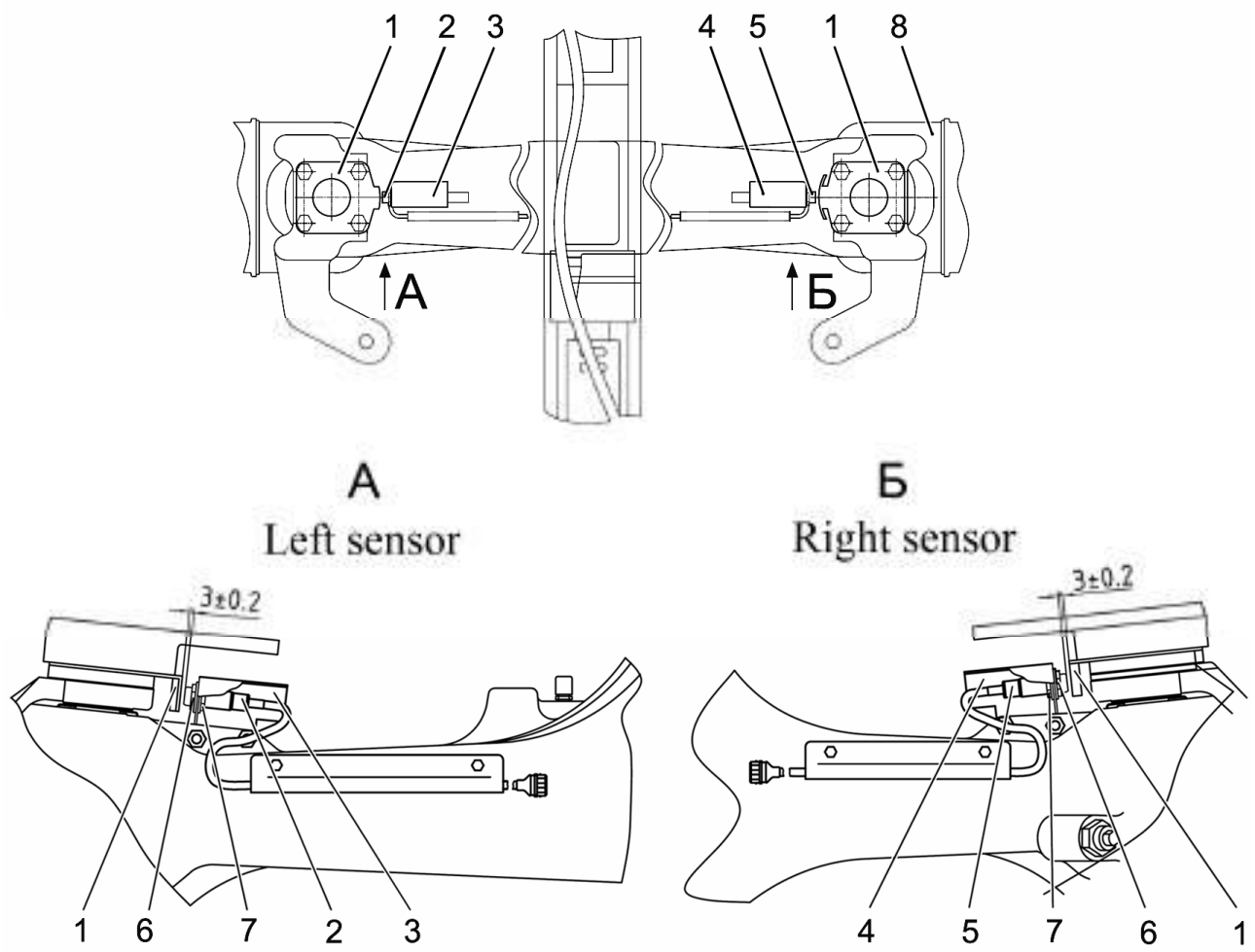
The list of possible failures in the gearbox control, in the electronic control system for rear axle DL, FDA drive, FPTO, RPTO and instructions for their troubleshooting are shown in Table 6.3.1.

Table 6.3.1

Failure, external manifestation, cause	Troubleshooting
None of the drives (FDA, rear axle DL, FPTO) can be engaged and GB reduction unit can not be shifted to the high gear	
There is no pressure in the transmission hydraulic system	Eliminate the failure in the transmission hydraulic system
When the front PTO is engaged, indicating lamp of FPTO engaged condition lights up but the PTO shaft end extension fails to rotate	
Make sure that the cylinder pin is moving while engagement	If the cylinder rod is moving, FPTO shaft electric control is operating in a proper manner
Check the adjustment of FPTO brake band tightening	Adjust, if necessary
Rear axle DL or FDA drive can not be engaged in an automated mode when guide wheels are in the forward motion position	
Big clearance between the bracket and the butt end of the left or right sensors correspondingly for guide wheels turning angle	Adjust the clearance within the limits 3±0.2 mm by means of rotating nuts 6 and 7, as shown in figure 6.3.1.
Breakage in the supply circuit “minus” or in the circuit “signal” of left or, correspondingly, right sensors for turning angle	Check electric circuits according to the electric connections diagram
Faulty left or, correspondingly, right sensor for turning angle	Replace the faulty sensor
While tractor slowing down (depressing both brake pedals simultaneously), FDA drive can not be engaged and rear axle DL can not be disengaged (depressing either of the brake pedals)	
Faulty one or both brake actuation sensors ВК 12-21 (actuation of brake pedals)	Simulate sensor actuation one-by-one by means of contact closure in cable sockets to the sensors. Replace the faulty sensor
Cable of connection to sensors ВК 12-21 is faulty	Check the cable for operability according to the electric circuit diagram
FDA drive fails to operate in an automated mode	
Automatic activation sensor is not properly adjusted or out of order	Adjust the automatic activation sensor or replace it
After engine start or after switching reduction unit passes, indicating lamp of reduction unit engaged condition flashes three or four times	
Faulty sensor of GB reduction unit higher or lower pass respectively, or the settings of the respective pass actuation sensor are disturbed	Replace faulty parts (sensor or pilot lamp or led lamp) Replace the faulty sensor or adjust the settings of the sensor actuation by way of changing the number of adjusting washers.
Circuit breakage from the respective pass actuation sensor to the indication lamp of engaged condition of GB reduction unit on CECS.	According to the wiring diagram, check operability of the circuit “sensor – indication lamp of engaged condition of GB reduction unit”

Table 6.3.1 finished

Failure, external manifestation, cause	Troubleshooting
Rear axle DL or FDA drive is constantly engaged in an automated mode (fail to disengage during guide wheels turn)	
Breakage in the supply circuit “plus” of left or, correspondingly, right sensor for turning angle	Check the sensor supply circuit “plus” according to the electric circuit diagram
One of drives (RL DL, FDA, FPTO, RPTO) or gear will not engage or gets disengaged if was previously engaged	
Electrical fault in the circuit of the electromagnet of the distributor for one of the drives or a gear – initialized by a single-time flashing of the respective indicating lamp of actuated condition (triggered by the pressure sensor at the output of the distributor)	- check working order of the electrical circuit from CECS to the electromagnet of the respective distributor according to the wiring diagram. If there is a fault it shall be eliminated. - check coil resistance of the electromagnet of the respective distributor – it shall make 4 to 6 Ohm. If coil resistance of the electromagnet is close to 0 Ohm, then replace the electromagnet.
Break in the circuit to the electromagnet of the distributor for one of the drives or a gear – initialized by a two-time flashing of the respective indicating lamp of actuated condition (triggered by the pressure sensor at the output of the distributor)	- check working order of the electrical circuit from CECS to the electromagnet of the respective distributor according to the wiring diagram. If there is a fault it shall be eliminated. - check coil resistance of the electromagnet of the respective distributor – it shall make 4 to 6 Ohm. If coil resistance of the electromagnet is close to infinity, then replace the electromagnet.
One of drives (RL DL, FDA, FPTO, RPTO) or gear can be engaged for a short time (1 to 6 sec.) or gets disengaged if was previously engaged	
Malfunction of the pressure sensor installed at the output of the distributor of any of the drives or a gear – initialized by a three-time flashing of the respective indicating lamp of actuated condition	If pressure in the transmission hydraulics is below standard (pressure in the transmission hydraulics shall make 1.1 to 1.2 MPa) it is required to follow instructions of subsection 6.9 “Possible failures of the transmission hydraulic system and instructions for their troubleshooting”
	If pressure in the transmission hydraulics is normal it is required to dismount the wire bundle block from the pressure sensor and having installed a bridge into the block simulate triggering of the sensor: - if failure code indication remains on (three-time flashing), then it is necessary to check pressure sensor circuit according to the wiring diagram; - if failure code indication disappeared, then it is necessary to replace the pressure sensor itself for a non-faulty one.
It is impossible to change gear or disengage one of the drives (rear axle DL, FDA, FPTO, RPTO)	
Sticking of a distributor valve of any of the drives or a gear is initialized by a four-time flashing of the respective indicating lamp of actuated condition	Eliminate by way of disassembly and washing of the distributor valve in diesel fuel.
As you engage gearbox braking engine fails	
Clutch will not disengage	Adjust clutch disengaging drive
Clutch disengaging sensor is not adjusted	Adjust clutch disengaging sensor acc. to subsection 5.4.2.12.2.4



1, 3, 4 – brackets; 2 – sensor for turning angle (±13°, DL); 5 – sensor for turning angle (±25°, FDA); 6 – outer nut; 7 – inner nut; 8 – front axle (view from above).

Figure 6.3.1 – Adjustment of sensors for guide wheels turning angle

6.4 Possible failures in rear axle and instructions for their troubleshooting

The list of possible failures in rear axle and instructions for their troubleshooting are shown in table 6.4.1.

Table 6.4.1

Failure, external manifestation, cause	Troubleshooting
Increased noise of the main gear	
Improper adjustment of gear engagement of main gear according to tooth-contact and side clearance	- adjust gear engagement of main gear according to tooth-contact; - adjust side clearance in the engagement of main pair (from 0.25 to 0.55 mm).
Improper adjustment of conic bearings of the main gear	Adjust bearing preload
Not enough oil in transmission	Check oil level in the transmission casing and refill oil to the oil level mark if necessary
Gear teeth damage	Check the condition of the gear tooth ring. Chipping and damage are not allowed. Gears with damaged teeth shall be replaced in pairs
Differential lock fails to operate	
Low pressure of oil running to the working cavity of the hydraulic cylinder piston for lock-up clutch	Check oil pressure. If pressure is lower than 1100 kPa, find and eliminate the defect in operation of the transmission hydraulic system
Distribution valve for lock-up clutch control fails to operate	Check the differential lock ECS operability, ease of spool movement, eliminate the failure
There is no pressure in the hydraulic system	
Transmission hydraulic system pump drive is off	Start the transmission hydraulic system pump drive

6.5 Possible failures in rear power take-off shaft and instructions for their troubleshooting

The list of possible failures of rear power take-off shaft and instructions for their troubleshooting are shown in Table 6.5.1.

Table 6.5.1.

Failure, external manifestation, cause	Troubleshooting
Rear PTO shaft end extension fails to rotate when activated	
Shifting handle for rear PTO drive is not engaged in the position “PTO drive engaged”	Check and, if necessary, shift the handle into a lower position
On activation of RPTO the indicating lamp of RPTO activated condition will not light up, the unit will not run or RPTO will turn on only for a short time.	Follow the instructions of subsection 6.3 “Possible failures in the electronic control system for gearbox, rear axle differential lock, front driving axle drive, front and rear power take off shafts and instructions for their troubleshooting”. Check pressure at the input and at the output of the distributor.
There is no oil pressure at the distributor input or at output to PTO friction coupling	Check pressure at the distributor input using pressure gauge, in case there is no pressure correct the failure of the transmission hydraulic system. In case there is no pressure at the output to PTO friction coupling - replace the distributor
Rear PTO shaft fails to transmit full torque (“skidding")	
Sticking of distributor valve	Repair or replace the distributor
Low oil pressure in the transmission hydraulic system	Adjust working pressure valve of the transmission hydraulic system or correct other failures in the transmission hydraulic system
Low oil pressure at valve output to PTO friction coupling due to excessive internal leakage	Check oil pressure running to PTO friction coupling, replace friction coupling O-rings, if necessary
Friction coupling operation failure due to piston deadlock or wear and tear of frictional disks	Rinse friction coupling components in pure diesel fuel, replace frictional disks, if necessary
While the PTO brake engagement, the shaft end extension goes on rotating	
There is no oil pressure at the distributor input or at the output to the PTO brake	Check pressure at the distributor input, in case there is no pressure – eliminate the transmission hydraulic system failures. In case there is no pressure at the output to the PTO brake - replace the distributor
Low oil pressure at the output to the PTO brake due to excessive internal leakage	Check oil pressure running to the PTO brake, replace brake piston O-rings, if necessary
Brake operation failure due to piston deadlock or wear and tear of frictional disks	Rinse brake components in pure diesel fuel, replace frictional disks, if necessary
Bent fracture of the PTO shaft end extension	
Heavy bending load on the shaft end extension from the coupled implement drive (out-of-limit angles of cardan shaft and etc.)	Eliminate breaks of coupling requirements. Correct failures in the machine, replace the PTO shaft end extension
Twisting of splines (teeth) of the PTO shaft end extension	
Impact load generated by coupled implement, that is transmitted to the PTO shaft end extension	Check availability and operability of safety elements of the coupled implement (torque-limiting clutch, shear bolt) and eliminate the failure, replace the PTO shaft end extension
Application of the PTO shaft end type having unsuitable horsepower capacity for the coupled implement drive	Install the PTO shaft end of corresponding horsepower capacity required by the implement drive (from the set supplied with SPTA)

6.6 Possible failures in front power take-off shaft and instructions for their troubleshooting

The list of possible failures of front power take-off shaft and instructions for their troubleshooting are shown in table 6.6.1.

Table 6.6.1

Failure, external manifestations, cause	Troubleshooting
Front PTO shaft can not be engaged and its end extension fails to rotate	
On engagement of FPTO, the FPTO indicating lamp will light up, the indicating lamp of FPTO actuated condition will not light up, the unit will not operate or FPTO can be engaged only for a short period	Follow the instructions of subsection 6.3 “Possible failures in the electronic control system for gearbox, rear axle differential lock, front driving axle drive, front and rear power take off shafts and instructions for their troubleshooting”.
On engagement of FPTO the FPTO indicating lamp as well as indicating lamp of FPTO actuated condition will not light up, the unit will not run.	
No pressure in the FPTO control channel	FPTO distribution valve spool jamming is possible. Check the distribution valve operability by pressing the spool pusher. Depending on the distribution valve configuration, it is required to press the pusher covered with a rubber cap on the solenoid kit or through the opening in the solenoid kit butt end. While pressing the spool pusher, the cylinder rod shall be shifted. If the distribution valve spool does not move - replace the distribution valve. If the distribution valve spool shifts and the cylinder rod remains fixed, check pressure in the tractor transmission hydraulic system. Operating pressure shall be within 1.1 to 1.2 MPa. In case the pressure is below the required value, eliminate the transmission hydraulic system failure as specified in subsection 6.9 “Possible failures of the transmission hydraulic system and instructions for their troubleshooting”
Front PTO fails to transmit the required power, the FPTO shaft end extension is rotating	
Operation at lower pressure in the transmission hydraulic system, skidding of FPTO band-brake	Operation with FPTO at lower pressure in the transmission hydraulic system is not allowed! Eliminate the transmission hydraulic system failure as specified in subsection 6.9 “Possible failures of transmission hydraulic system and instructions for their troubleshooting”
Control cylinder rod is moving but FPTO does not transmit full torque or while FPTO shaft disengagement the PTO shaft end extension goes on rotating. Cylinder rod overstroke	Adjust clearances in band brakes
FPTO does not transmit full torque or while FPTO shaft disengagement the PTO shaft end extension goes on rotating	
If the clearances in band-brakes are adjusted, it proves significant wear of band-brakes	Replace the PTO shaft bands
Noise in FPTO reduction unit	
Reduction gear parts breakdown	Dismount reduction unit from the tractor, replace bearings and worn-out parts causing failure

6.7 Possible failures of brakes and instructions for their troubleshooting

The list of possible brake failures and guidelines for troubleshooting are shown in table 6.7.1.

Table 6.7.1

Failure, external manifestations, cause	Troubleshooting
Inefficient braking	
Increased pedal free travel (increased clearance between the piston and the main cylinder piston follower)	Adjust pedal free travel
Presence of air in the hydraulic brake control system	Bleed the hydraulic system with brake fluid
Hydraulic brake fluid shortage in hydraulic brake control system tanks	Bring hydraulic brake fluid in the main cylinder reservoirs to the required level, then bleed the hydraulic system with brake fluid
Loss of hermiticity in operating spaces of main and operating cylinders due to damage, wear and tear of cups and O-rings	Replace the main and operating cylinder cups and O-rings in case they are worn out. Check if the cylinder bearing surface has sharpened edges, ridges, or pits. Bleed the hydraulic system with brake fluid
Hydraulic brake fluid leakage in junctions or pipelines in the hydraulic drive system. Air inflow into the hydraulic brake control system	Tighten up junctions, replace damaged parts, then bleed the hydraulic system with brake fluid
Clogging of the opening in main cylinder tank fitting, causing depression in main cylinder, as a result of which air leaks into the cylinder through sealings	Unclog the opening. Then bleed the hydraulic system with brake fluid
Clogging of pipelines of the hydraulic drive system due to dent or clogging	Replace pipelines. Then bleed the hydraulic system with brake fluid
Increased brake pedals working travel, or the pedal strikes against the cab wall	Adjust working travel and position of brake pedals
Increased brake pedal operating stroke which can not be adjusted – wear of brake disks	Disassemble the brakes, replace worn-out disks. Adjust the clearance in the friction couple and the brake pedal operating stroke
Frictional brake disks are worn-out	Replace frictional disks

Table 6.7.1 continued

Failure, external manifestation, cause	Troubleshooting
Sticking of brakes	
There is no pedal free travel (no clearance between the piston and the main cylinder piston follower).	Adjust pedal free travel
Sticking of main brake cylinder pistons (fail to go back in their initial position) due to piston cup and O-ring expansion, resulting in closure of compensating openings because of using incorrect hydraulic brake fluid or because of ingress of mineral oil, petroleum, kerosene, diesel fuel into the hydraulic brake system	Rinse the hydraulic drive system with hydraulic brake fluid. Replace damaged cups and O-rings in the main and operating cylinders. Replace hydraulic brake fluid. Then bleed the hydraulic system with brake fluid
Sticking of operating brake cylinder pistons due to piston cups expansion	Rinse carefully the hydraulic drive system with hydraulic brake fluid. Replace damaged cups and O-ring in operating cylinders. Replace hydraulic brake fluid. Then bleed the hydraulic system with brake fluid
Clogging of compensating opening in the main cylinder	Unclog the compensating port of the main cylinder and bleed the hydraulic system with brake fluid
Weakening or breakage of pressure discs pullback springs	Replace pullback springs of pressure discs
Presence of wear and tear signs on working surfaces of pressure discs	Clean working surfaces of pressure discs
Presence of wear and tear signs on dimple surfaces of pressure discs	Replace pressure discs
Uneven braking of left and right wheels	
Faulty adjustment of service brakes	Make adjustments
Malfunctioning of leveling valves in main brake cylinders (with mounted cylinders “CARLISLE”)	Disconnect the tube connecting two main brake cylinders, turn back fittings and dismount leveling valves. Replace worn-out parts. Then bleed the hydraulic system with brake fluid
Malfunctioning of leveling valve in main brake cylinders (with mounted cylinders “FENOX”)	Replace the leveling valve. Bleed the hydraulic system with brake fluid
Clogging or crumpling of brake control pipelines in one of the circuits or pipeline of leveling valves in main brake cylinders “CARLISLE”	Clean or replace pipelines. Bleed the hydraulic system with brake fluid
Frictional brake discs wear and tear	Replace frictional discs
Inefficiency of parking brake operability	
Improper adjustment of the parking brake	Adjust the parking brake

6.8 Possible failures in the pneumatic system and instructions for their troubleshooting

The list of possible failures in the pneumatic system and instructions for their troubleshooting are shown in Table 6.8.1.

Table 6.8.1

Failure, external manifestation, cause	Troubleshooting
Slow increase of pressure in the tank	
Air leakage from the pneumatic system for the following reasons:	
- undertightened or damaged pipeline nuts, fitting nuts, and coupling clamps	Detect leakages and eliminate them by tightening junctions or replacing damaged parts
- damaged rubber sealing of the coupling head	Replace the damaged sealing
- the coupling head O-ring nut torque is loose	Screw up the nut
- dirt ingress under the coupling head valve	Clean
- contact of the dust cover with the coupling head valve plug	Eliminate
- faulty adjustment of brake valve drive	Adjust the brake valve drive
- improper operation of pressure regulator	Dismount pressure regulator from the tractor and send it to a repair workshop
- filter for pressure regulator is clogged	Rinse the pressure regulator
- faulty pneumatic compressor	Contact your dealer
Rapid decrease of pressure in the tank when the engine is stopped	
Air leakage through coupling members of the pneumatic system	Stop the leakage
Rapid decrease of pressure in the tank when brake pedal is depressed	
Faulty break valve	Replace the break valve
Increased oil slobbering into the pneumatic system by the pneumatic compressor	
Faulty pneumatic compressor	Contact your dealer
Insufficient air pressure in the tank	
Faulty location of the pressure regulator adjusting cap	Adjust the pressure regulator
Faulty pneumatic compressor	Contact your dealer

End of Table 6.8.1

Failure, external manifestation, cause	Troubleshooting
Pressure regulator engages compressor for idle stroke when pressure is below 0.77...0.80 MPa, and for operating stroke when pressure is below 0.65 MPa or over 0.70 MPa	
Dirt accumulation in cavities and channels of pressure regulator	Rinse and clean the pressure regulator
Faulty location of the pressure regulator adjusting cap	Adjust the pressure regulator
Damaged rubber parts of pressure regulator, spring shrinkage	Replace damaged parts or send them to a repair workshop
Tilting, deadlock of spool of the pressure regulator adjusting part	Provide freedom of the spool movement, lubricate it or send the pressure regulator to a repair workshop
Pressure regulator gets actuated frequently (engages the pneumatic compressor) without air bleeding from the receiver tank	
Air leakage from the pneumatic system or pressure regulator, failure of the back-pressure regulator	Detect the reason and stop air leakages
Pressure regulator operates in the mode of pressure-relief valve	
Pressure regulator adjusting cap is turned for a big value	Adjust the pressure regulator
Pressure regulator dummy piston jamming	Disassemble the pressure regulator and eliminate jamming
Clogged outlet ports in the pressure regulator adjusting cap	Unclog outlet openings
There is no air feeding in the connecting hose through air bleeding valve of pressure regulator	
Insufficient sinking of air bleeding valve rod in the pressure regulator	Screw the nut of the connecting hose on the outlet and tighten it
Pressure regulator changes the pneumatic compressor for idle stroke	Decrease pressure in the receiver tank to the value below 0.65 MPa
Ineffective operation of trailer brake	
Brake valve drive got out of adjustment	Adjust the brake valve drive
Brake valve failure	Replace the brake valve
Failure in the trailer brake system	Eliminate the failure in the trailer brake system
Trailer brakes are slowly released	
Brake valve drive got out of adjustment	Adjust the brake valve drive
Brake valve failure	Replace the brake valve
Failure in the trailer brake system	Eliminate the failure in the trailer brake system

ATTENTION: WHILE TROUBLESHOOTING IN THE PNEUMATIC SYSTEM, ALL SELF-MAINTAINED OPERATIONS RELATED TO PRESSURE REGULATOR ADJUSTMENT AND REPAIR, ARE ALLOWED AFTER THE TRACTOR GUARANTEE PERIOD TERMINATION. OTHERWISE THE PRESSURE REGULATOR SHALL BE WITHDRAWN FROM AFTER-SALES SERVICE. TO REPAIR OR ADJUST YOUR PRESSURE REGULATOR (INCLUDING MS3) DURING TRACTOR GUARANTEE PERIOD CONTACT YOUR DEALER!

6.9 Possible failures of the transmission hydraulic system and instructions for their troubleshooting

The list of possible failures in the transmission hydraulic system and instructions for their troubleshooting are shown in Table 6.9.1.

Table 6.9.1

Failure, external manifestation, cause	Troubleshooting
Low oil pressure in the transmission hydraulic system	
Insufficient oil level in the transmission	Check oil level in the transmission as indicated in section 5 “Maintenance service”. Refill oil up to the required level, if necessary.
Failure of transmission hydraulics pump	Replace or repair the transmission hydraulics pump
Clogging of the full-flow mesh filter	Rinse the full-flow mesh filter
Clogging of the duplex filter (a pilot lamp will light up on the control board for the rear axle DL and the FDA drive)	Replace both filter elements of the duplex filter as specified in section 5 “Maintenance”
Oil leakage in boosters of friction clutches	Eliminate the failures in a specialized workshop
Spring 2 (figure 5.4.31) of the operating pressure adjusting valve for the transmission hydraulics 3 lost its properties	Replace the spring or adjust with adjusting washers 4 (figure 5.4.31) by increasing their number
No oil pressure in the transmission hydraulic system	
Breakdown of the gear wheel pump in the transmission hydraulic system	Replace the gear wheel pump in the transmission hydraulic system
Transmission hydraulic system pump drive is off	Engage the transmission hydraulic system pump drive
Damaged parts of the transmission hydraulic system pump drive	Replace damaged parts of the transmission hydraulic system pump drive
High oil pressure in the transmission hydraulic system	
Filled oil does not correspond to the season (ambient temperature)	Fill in corresponding seasonal oil
Incorrect setting of the operating pressure adjusting valve for the transmission hydraulics 3 (figure 5.4.31) of the duplex filter	Decrease the number of adjusting washers 4 (figure 5.4.31)
Increased noise	
Insufficient oil level in transmission	Check oil level in the transmission as indicated in section 5 “Maintenance”. Refill oil up to the required level, if necessary.
Wear or breakage of bearings of other transmission components	Replace bearings or other worn out parts of the transmission
Noisy switching of range tooth clutches	
Unfinished coupling clutch disengagement (clutch “grabs and shudders”)	Carry out checks and adjustment of the coupling clutch as specified in table 6.1.1

6.10. Possible failures of FDA and instructions for their troubleshooting

The list of possible failures of front driving axle and instructions for their troubleshooting are shown in Table 6.10.1.

Table 6.10.1

Failure, external manifestation, cause	Troubleshooting
Increased wear and delaminating of front tires	
Faulty toe-in of front wheels	Adjust toe-in of front wheels as indicated in section 5 “Maintenance”.
Noncompliance of pressure in tires to the recommended standards	Adjust pressure in tires as indicated in subsection 3.2.8 “Selection of optimal inflation pressure in tires depending on operating conditions and tractor axle load”
Front axle is constantly forcedly engaged	Do not use the mode “FDA on” all the time. If FDA is constantly engaged for the reason of FDA control failure, eliminate it
Drive clutch fails to transmit torque	
No pressure in the clutch booster	Disassemble the distribution valve, rinse the case and spool
Failure of system electrics	Detect and eliminate the failure in ECS of FDA
Insufficient value of torque transferred	
Low pressure in the transmission hydraulic system	Adjust pressure in the transmission hydraulic system to the value from 1.1 to 1.2 MPa
Increased leakage in drive control hydraulic system: - wear of piston and drum O-rings; - wear of mating surfaces sleeve – drum hub, drum – piston; - wear of disk packs	 Replace O-rings Replace worn-out parts Replace worn-out parts
Drive fails to operate in automated mode	
Disconnect switch of FDA drive automatic engagement sensor got out of adjustment	Adjust the disconnect switch of FDA drive automatic engagement sensor
Increased noise generated by main gear	
Increased clearance in the driving gear bearing of reduction unit	Check and adjust gear bearings, if necessary
Side clearance in the main pair of central reduction unit got out of adjustment	Adjust the side clearance in the main pair of central reduction unit

End of table 6.10.1

Failure, external manifestations, cause	Troubleshooting
Oil leakage through the wheel-hub drive	
Increased oil level in the wheel-hub drive	Set the required oil level in the wheel-hub drive
Oil leakage through the main gear flange cup	
Worn-out or damaged flange sealing of driving gear of the main gear	Replace the sealing
Oil leakage through the drive gear cup of the wheel-hub drive	
Increased clearance in the gear bearings	Check and adjust
Wear or damage of the cup	Replace the cup
Noise while wheel maximum rotation angle	
Improper wheel rotation limit angle	Check and adjust the FDA reduction unit rotation angle
Hammering in pivot while moving	
Pivot bearing got out of adjustment	Check and adjust
Hammering in FDA while abrupt wheel turning	
Clearances in the steering link pins and in rotation hydraulic cylinders	Check and adjust

ATTENTION: AFTER ANY DISMOUNTING OF STEERING LINK AND ITS SUBSEQUENT INSTALLATION, AFTER MAKING ALL NECESSARY ADJUSTMENTS, TIGHTEN TWO CASTLE NUTS M20X1.5 OF BALL PINS WITH TORQUE FROM 100 TO 140 N·M, AND FASTEN THEM BY COTTER (WHILE MATCHING THE NUT SLOT AND THE OPENING OF BALL PIN, THE NUT TURNING OFF IS NOT ALLOWED) AND TWO LOCKING NUTS M27X1.5 (WITH THE LEFT AND RIGHT-HAND THREAD) OF STEERING LINK PIPE WITH TORQUE OF 100 TO 140 NM!

6.11 Possible failures of the hydrostatic steering control and instructions for their troubleshooting

The list of possible failures of the hydrostatic power steering and instructions for their troubleshooting are shown in Table 6.11.1.

Table 6.11.2

Failure, external manifestation, cause	Troubleshooting
Great effort at the steering wheel	
No pressure or insufficient pressure in the steering control hydraulic system (it shall be from 14.0 to 15.5 MPa (steering wheel is turned up to the stop)) due to the following reasons:	
- HSC was not bled	Bleed the HSC hydraulic system by turning the steering wheel moving guide wheels from left-most to the right-most position (stop-to-stop position) for 2-3 times
- faulty adjustment of dosing pump pressure relief valve (low pressure)	Contact the dealer. Adjust the pressure relief valve for the required pressure. The operation shall be performed only by maintenance department [1)]
- faulty feed pump (the pump fails to increase pressure because of low efficiency factor)	Contact the dealer for feed pump replacement or repair
Hard abrasion or blocking up in steering column mechanical components	Stop abrasion in the steering column, for which do the following: - loosen upper nut; - lubricate friction surfaces of plastic bushings; - eliminate contact of universal-joint yoke with steering column bracket walls
Increased torque of FDA reduction unit turn	Make repair of FDA
Steering wheel is rotating without driven wheels turning	
There is no oil in the tank	Fill the tank with oil to the required level and bleed air from the hydraulic system of HSC
Improper adjustment of dosing pump valves. Adjusting pressure of the pressure-relief valve exceeds the pressure of anti-shock valves	Contact the dealer. Adjust the pressure-relief valve and anti-shock valves to the required pressure. The operation shall be performed only by maintenance department [1)]
Worn-out sealings of the hydraulic cylinder piston	Repair or replace the hydraulic cylinder
Deadlock of the dosing pump shockproof valve in an open position	Rinse the shockproof valve
Steering is too slow and too hard while quick turning of steering wheel	
Faulty feed pump (the pump fails to increase pressure because of low efficiency factor)	Contact the dealer for feed pump replacement or repair.
Improper adjustment of dosing pump pressure-relief valve (set to low pressure or stuck in the open position due to dirt accumulation)	Contact the dealer. Adjust the pressure relief valve for the required pressure. The operation shall be performed only by maintenance department. [1)]

Table 6.11.1 continued

Failure, external manifestation, cause	Troubleshooting
Steering wheel fails to return to neutral position	
Hard abrasion or blocking up in steering column mechanical components	Stop abrasion in the steering column, for which perform the following: - loosen upper nut; - lubricate friction surfaces of plastic bushings; - eliminate contact of universal-joint yoke with steering column bracket walls
Steering wheel goes on rotating after turning	
Gripping of sleeve with the spool (possible due to dirt accumulation)	Contact the dealer. Rinse of dosing-pump components is required. Assembly and check of operability shall be performed only by maintenance department in accordance with manufacturer's instruction [1]
Spool recentering springs of dosing pump have lost spring power or broken	Contact the dealer. Replacement of springs, assembly and check of operability shall be performed only by maintenance department in accordance with manufacturer's instruction [1)]
Steering column spline drive and dosing pump are mounted out-of-line (cardan shaft end thrust) or with insufficient clearance	Release the cardan shaft. To increase the clearance, mount additional washers with thickness not more than 1.5 mm between the dosing pump and steering column bracket
Permanent adjustment of steering wheel is required (steering wheel fails to follow the selected direction)	
Spool recentering springs of dosing pump have lost spring power or broken	Contact the dealer. Replacement of springs, assembly and check of operability shall be performed only by maintenance department in accordance with manufacturer's instruction [1)]
One of anti-shock valves setting springs is broken or gerotor pair is worn-out	Contact the dealer. Replacement of faulty components assembly and check of operability should be is performed only by maintenance department in accordance with manufacturer's instruction [1)]
Worn-out sealings of the hydraulic cylinder piston	Repair or replace hydraulic cylinder
Increased clearance in the steering wheel	
Conic-shaped pins of HSC hydraulic cylinders are not tightened	Tighten pin nuts as
There is clearance in steering link joints	Eliminate the clearance in steering joints, as indicated in section 5 "Maintenance"
Worn-out steering column end extension splines	Replace the lower universal-joint yoke
Worn-out steering column cardan shaft	Replace cardan shaft
Spool recentering springs of dosing pump have lost spring power or broken	Contact the dealer. Replacement of springs, assembly and check of operability shall be performed only by maintenance department in accordance with manufacturer's instruction [1)]

End of table 6.11.1

Failure, external manifestation, cause	Troubleshooting
Wobbling of driven wheels when moving	
Conic-shaped pins of HSC hydraulic cylinders are not tightened	Tighten pin nuts
There is clearance in steering joints	Eliminate the clearance in steering joints, as indicated in section 5 “Maintenance”
Worn-out mechanical joints or bearings	Replace worn-out components
Air presence in the HSC hydraulic system	Bleed air from the HSC hydraulic system by turning the steering wheel moving guide wheels from the left-most to the right-most position (stop-to-stop position) for 2-3 times
Break of dosing pump air tightness throughout spool end extension, socket casing - gerotor pair – cover	
Wear of spool sealing	Contact the dealer. Replacement of faulty sealing, assembly and check of operability shall be performed only by maintenance department in accordance with manufacturer’s instruction [1)]
Loose dosing-pump cover bolt	Tighten the bolts with torque of 30 to 35 N·m
Damaged sealing gaskets under the dosing pump cover bolt heads	Replace the gaskets
Different minimum minimal radius of tractor turning to the left and to the right	
Faulty toe-in of front wheels	Adjust toe-in of front wheels as specified in section 5 “Maintenance”
Partial steering angle of driven wheels	
Insufficient pressure in the HSC hydraulic system due to the following reasons:	
- faulty adjustment of dosing pump pressure relief valve (low pressure)	Contact the dealer. Adjust the pressure relief valve for the required pressure[1)]. The operation shall be performed only by maintenance department.
- faulty feed pump (the pump fails to increase pressure because of low efficiency factor)	Contact the dealer.
Increased FDA reduction unit steering torque	Make repair of FDA
Breakdown of feed pump	
High pressure in the HSC hydraulic system due to jamming of the back-pressure valve or the pressure relief valve of the dosing pump in an open position (possible due to dirt accumulation)	Contact the dealer. Rinse of dosing-pump components is required. Assembly and check of operability shall be performed only by maintenance department in accordance with manufacturer’s instruction[1)]

[1)] Considering extreme complexity and responsibility of the dosing pump from the point of view of steering system safety, its assembly and disassembly shall be carried out only by servicing personnel of manufacturing company (or other authorized maintenance department), properly trained, studying dosing pump design and service and dosing pump assembly-disassembly manuals, and provided they have all required service tools, accessories and special hydraulic stand, ensuring adjustment and check of dosing pump parameters and operability after the repairs have been made. Otherwise, a person performing the dosing pump assembly and disassembly, replacement of parts and components or adjustment of valves, as well as a tractor owner, bears full responsibility for dosing pump non-operability.

6.12 Possible failures in the electronic control system of RLL and instructions for their troubleshooting

Cables and control system of RLL connecting diagrams are shown in figures 6.12.1, 6.12.2, 6.12.3. The rules of failure diagnostics of the RLL ECS are specified in clause 2.17.4 “Troubleshooting of RLL electronic control system” of subsection 2.17 “Lift linkage controls”. Possible RLL electronic control system error codes and instructions for their troubleshooting are shown in table 6.12.1.

ATTENTION: DISCONNECTION OF THE ELECTRIC SOCKETS OF THE REAR LIFT LINKAGE ELECTRONIC CONTROL SYSTEM SHALL BE CARRIED OUT WHEN THE ENGINE IS NOT RUNNING ONLY!

ATTENTION: ALTERATIONS OF THE SPECIFIED VOLTAGE VALUES SHALL BE DONE WITH THE ENGINE RUNNING, WITH DUE ATTENTION TO THE SAFETY MEASURES IF OPERATING WITH ELECTRIC UNITS ON LOAD!

ATTENTION: TERMINALS IN THE CABLE SOCKETS ARE NUMBERED ON THE SOCKETS SHELLS!

ATTENTION: REPAIR OPERATIONS OF THE REAR LIFT LINKAGE AND FRONT LIFT LINKAGE ELECTRONIC CONTROL SYSTEM SHALL BE CARRIED OUT ONLY BY DEALERS. OTHERWISE THE WARRANTY FOR THE REAR LIFT LINKAGE AND FRONT LIFT LINKAGE CONTROL SYSTEM BECOMES INVALID!

Table 6.12.1

Error code	Description, possible problem	Failure inspection method
Complex failures		
11	Failure in the electromagnetic lift valve control circuit. Break in the solenoid coil or in solenoid control cable	Disconnect the cable from the solenoid and test the solenoid with a testing apparatus to detect a break. Solenoid resistance shall be 2...4 Ohm. In case the solenoid failure is not detected check the solenoid control cable for mechanical damage, and check the wire with the testing apparatus to detect if there is a break between the solenoid socket terminal and the terminal 2 of 25-pole socket of the electronic unit (Figures 6.12.1, 6.12.2, 6.12.3).
12	Failure in the electromagnetic lowering valve control circuit. Break in the solenoid coil or in solenoid control cable	Disconnect the cable from the solenoid and test the solenoid with a testing apparatus to detect a break. Solenoid resistance shall be 2...4 Ohm. In case the solenoid failure is not detected check the solenoid control cable for mechanical damage, and check the wire with the testing apparatus to detect if there is a break between the solenoid socket terminal and the terminal 14 of 25-pole socket of the electronic unit (Figures 6.12.1, 6.12.2, 6.12.3).
13	Failure in the electromagnetic lowering valve or lift valve control circuit. Short circuit in one of the solenoids or short circuit of the solenoids control wires in the cable	Disconnect the cable from the solenoid and test the solenoid with a testing apparatus to detect a short circuit. Solenoid resistance shall be 2...4 Ohm. Or measure the solenoid useful current applying the current of 6 V. The current shall not exceed 3.2A. Disconnect the socket from the electronic unit, check the terminals 2 and 14 for a short circuit (the solenoids shall be disconnected during this procedure) (Figures 6.12.1, 6.12.2, 6.12.3).
14	Failure in remote control buttons for lift 4 (Figure 2.17.3). Short circuit of wires or sticking of a remote control buttons for lift	Check the remote control buttons cables for mechanical damage by lift of RLL. Disable each button for lift one-by-one until the failure is gone. Stop the engine when you disable the buttons. If the failure is still not eliminated, disconnect the socket from the electronic unit and ring out the terminals 10 and 12 for a short circuit by testing apparatus (Figures 6.12.1, 6.12.2, 6.12.3).
15	Failure in remote control buttons for lowering 5 (Figure 2.17.3). Short circuit of wires or sticking of a remote control buttons for lowering	Check the remote control buttons cables for mechanical damage by lift of RLL. Disable each button for lift one-by-one until the failure is gone. Stop the engine when you disable the buttons. If the failure is still not eliminated, disconnect the socket from the electronic unit and ring out the terminals 20 and 12 for a short circuit by testing apparatus (Figures 6.12.1, 6.12.2, 6.12.3).

Table 6.12.1 continued

Error code	Description, possible problem	Failure inspection method
16	Failure in electronic unit. Stabilized power supply voltage, powering the control panel is lower than the required level. Short circuit may occur in the force and position sensors sockets of RLL caused by water entering the sockets	Disconnect the main control panel from the common cable. Measure stabilized power supply voltage of the terminals 6 (minus) and 4 (plus) of the control panel socket, which shall make 9.5 - 10 V (with the engine running). If the supply voltage is low or in absence of it, check the reliability of electronic unit socket connection. Disconnect the force sensor and the position sensor of RLL one-by one (Figures 6.12.2, 6.12.3)
Moderate failures		
22	Failure of the position sensor. Breakage of the sensor wire, the sensor was not connected or adjusted	1. Faulty adjustment of the position sensor. Disconnect the cable socket from the sensor. Unscrew the sensor. Lift the LL in an uppermost position by remote buttons or button “lift” on the solenoid (bottom solenoid). Screw the sensor in by hand as far as it may go and unscrew by 2 turns. Connect the cable socket to the sensor. Lower and lift in an uppermost position the LL by means of the control panel. Lift indicator shall be out. If the indicator is still flashing, make the position sensor further by 1/6 of a turn. Check the system operation again. If it is necessary (lift indicator is not out in an uppermost position), make the position sensor a little bit further and try to check again. If the adjustment was made in a proper manner, LL shall be lowered and lifted by means of the control panel to the extreme positions. The lift indicator shall be out in an uppermost position 2. Failure of the position sensor. 2.1 To check the operability of “BOSCH” position sensor, dismount it from the tractor. According to the electric circuit diagram of the RLL control system (figure 6.12.2, the position sensor connection), it is required to supply voltage of 10V (in case the power supply unit is not available, voltage of 12V can be supplied from the accumulator battery for a short moment) to: output 1 “load” (minus) and to output 3 “+” (plus) and pressing the sensor migrating rod by a finger, measure the voltage at the sensor output by the testing apparatus: between output 2 – “signal” and output 1 – “minus”. While the full sensor rod (core) shifting, the voltage at the sensor output shall be measured within the limits from 0.2 to 0.75 of the value of voltage supplied to the sensor. If the specified parameters are broken, it is required to mount a new sensor on the tractor and adjust it properly. Numbers of sensor outputs are indicated on the cable socket connector which is attached to the position sensor. 2.2 It is impossible to check the ДП-01 sensor manufactured by the works “Izmeritel”, operability by means of dismounting it from the tractor. If carrying out adjustments failed to eliminate the ДП-01 sensor failure, it is required to mount a new ДП-01 sensor on the tractor and adjust it properly. 3. Failure (breakage) of the cable in sensor circuit. Check the cable according to the diagram (figures 6.12.2, 6.12.3)

End of table 6.12.1

Error code	Description, possible problem	Failure inspection method
23	Failure of the control panel. Potentiometer of the depth control lever is damaged	Check the reliability of the control panel sockets and electronic unit connection, and check the cable for mechanical damage. Check the voltage output, according to the electric connections diagram (Figures 6.12.2, 6.12.3).
24	Failure of the control panel. Potentiometer of the hitch height limitation lever is damaged	Check the reliability of the control panel sockets and electronic unit connection, and check the cable for mechanical damage. Check the voltage output according to the electrical connections diagram (Figures 6.12.2, 6.12.3).
28	Failure of the control panel. The RLL operation lever 11 (Figure 2.17.1) is damaged	Check the reliability of the control panel sockets and electronic unit connection, and check the cable for mechanical damage. Check the voltage output according to the electrical connections diagram (Figures 6.12.2, 6.12.3)
31	Failure of the right force sensor. Cable breaking or the sensor short circuit	To check if it is failure of the sensor or the cable (in circuit to the sensor), disconnect the sockets from the cable to the sensors (left and right) and interchange their positions (the socket from the left sensor to the right sensor channel and the socket from the right sensor to the left sensor channel). If after that the error code has changed (31 was replaced by 32 or 32 was replaced by 31), that means that the sensor is out of order, if the error code is still the same, that means that the cable is out of order
32	Failure of the left force sensor. Cable breaking or the sensor short circuit	
Light failures		
34	Failure of the control panel. Potentiometer 7 (figure 2.17.1) of the RLL speed control lever is damaged.	Check the reliability of the control panel sockets and electronic unit connection, and check the cable for mechanical damage. Check the voltage output according to the electrical connections diagram (Figures 6.12.2, 6.12.3)
36	Failure of the control panel. Potentiometer of tilling modes combination lever 8 (figure 2.17.1): force mode – point-to-point operation mode	Check the reliability of the control panel sockets and electronic unit connection, and check the cable for mechanical damage. Check the voltage output according to the electrical connections diagram (Figures 6.12.2, 6.12.3)
Code is not displayed	Spontaneous lift of RLL after the engine start	“Lift” forward/reverse spool was blocked in the open position. Disconnect the cable sockets from the “Lifting” and “Lowering” solenoids. If the failure is still displayed, eliminate the failure in the RLL hydraulic system.

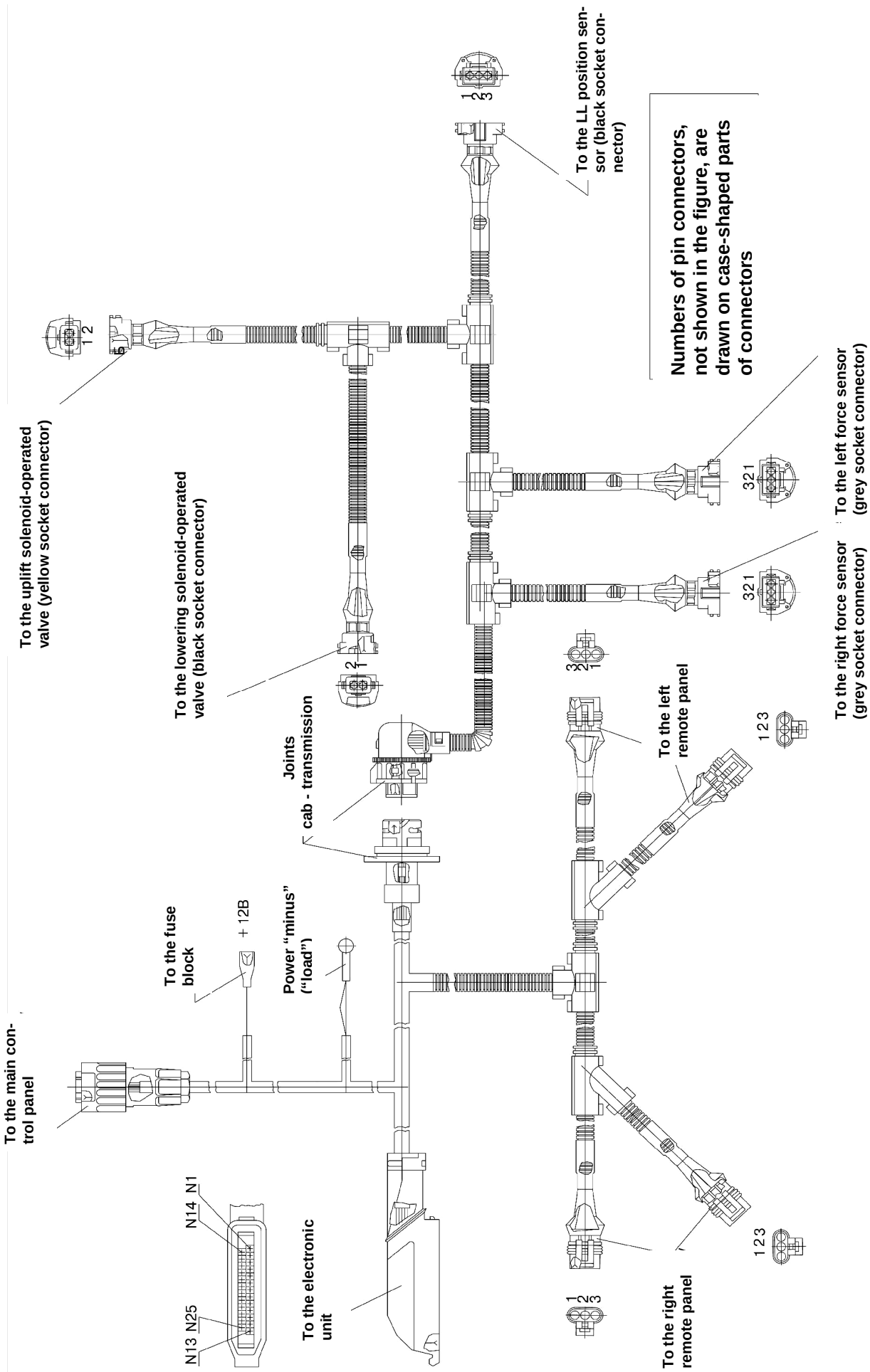


Figure 6.12.1 – RLL electronic control system cables

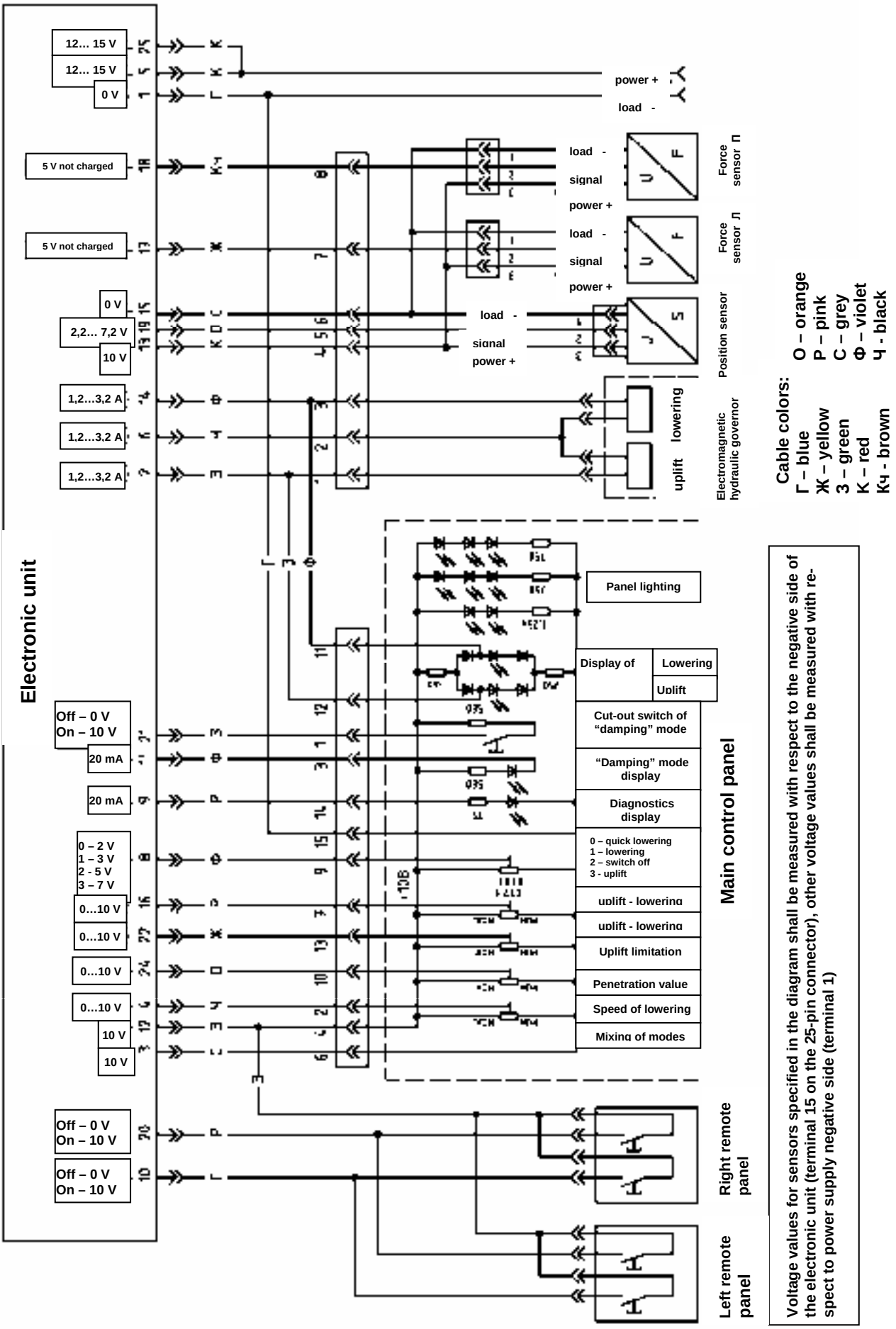


Figure 6.12.2 – RLL electronic control system cables with components "BOSH"

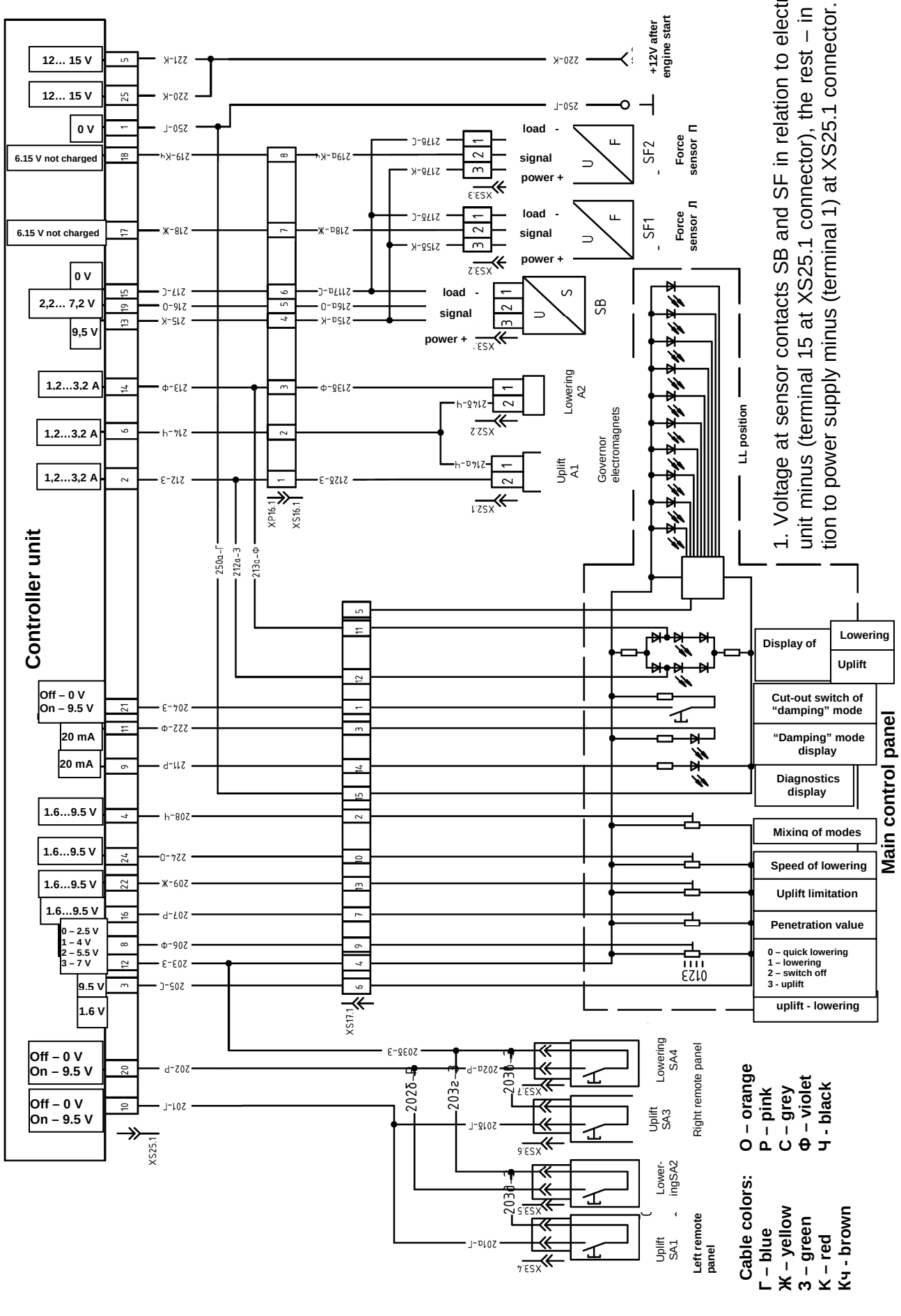


Figure 6.12.3 – RLL electronic control system cables with components "Izmeritel"

6.13 Possible failures in the hydraulic system and instructions for their troubleshooting

6.13.1 Failures of EHS distributor, failure indication, causes and troubleshooting methods

"BELARUS-2122.6" tractors are equipped with an electro-hydraulic integrated unit consisting of four EHS-type sections with an electro-hydraulic control of fluid consumption, an electro-hydraulic regulator EHR, an end plate with an electromagnetic reduction valve and a pumping cover.

A four-pin plug is connected to each section of the distributor, with pins assigned as follows:

- pin No1 – positive supply of the on-board circuit;
- pin No 2 – not used;
- pin No 3 – control signal;
- pin No 4 – negative supply of the on-board circuit.

The sections of the distributor are controlled through channel No 3 by means of pulse-width modulation signal, generated by electronic joysticks or by the electronic unit of OPU of HLL.

The lower end of each section has a failure code indicator in the area of electric connector (see fig. 6.13.1). When there is a failure in the section the indicator will provide a code data about a failure in this section. The failure code consists of two figures (see table 6.13.1). The code is read by way of counting the number of indicator flashes: number of flashes with a brief pause in between – first figure – long pause - -number of flashes with a brief pause in between – second figure. For instance, to indicate a failure code "23" the system will activate the indicator in the following way: two flashes – pause – three flashes. If there are no failures in the distributing section the indicator is turned off.

Depending of the failure complicity rate this section operation may be blocked or simultaneously several sections may be blocked (if there are failures in several sections).

In case there are several failures in a section at a time only one failure code will be indicated with the following priority:

1 – failure of a position sensor;
2 – supply voltage is beyond the permitted level (the permitted level is 10,5 to 18V);
3 – current value of coils of the control valve is beyond the permitted level;
4 – other failures.

IT IS FORBIDDEN TO DISASSEMBLE THE SECTION OF THE DISTRIBUTOR AND THE INTEGRAL UNIT DURING PERIOD OF WARRANTY. OTHERWISE THE WARRANTY FOR DISTRIBUTOR SECTION AND THE INTEGRAL UNIT BECOMES INVALID!

ATTENTION: REPAIRMENT OF EHS DISTRIBUTOR AND EHS DISTRIBUTOR SECTIONS ELECTRONIC CONTROL SYSTEM SHALL BE CARRIED OUT ONLY BY DEALERS. OTHERWISE THE WARRANTY FOR DISTRIBUTOR SECTION AND THE INTEGRAL UNIT BECOMES INVALID!

IT IS FORBIDDEN TO ROTATE THE SPOOL ABOUT ITS AXES. SUCH ROTATION CAN RESULT IN BREAKDOWN OF THE HYDRAULIC COMPONENTS IN THE DISTRIBUTOR SECTION! TO DEFINE THE POSITION OF THE CENTRAL SPOOL IT IS REQUIRED TO REMOVE THE PROTECTIVE CAP. AFTER REPAIR WORKS ARE FINISHED PUT THE CAP BACK!

ATTENTION: QUALIFIED REPLACEMENT OF FINE AND COARSE OIL FILTERING ELEMENTS INCLUDED INTO THE TRACTOR SUPPLY KIT WILL NOT AFFECT THE WARRANTY FOR THE DISTRIBUTOR!

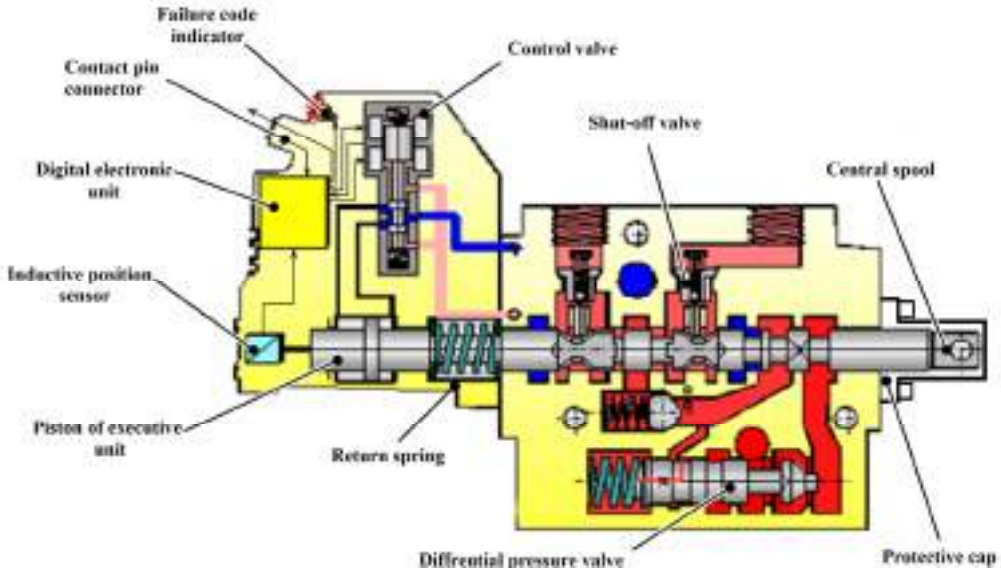


Figure 6.13.1 – EHS distributor section

1 – cover; 2 – end plate of integral unit.
Figure 6.13.2 – Fine filter cover

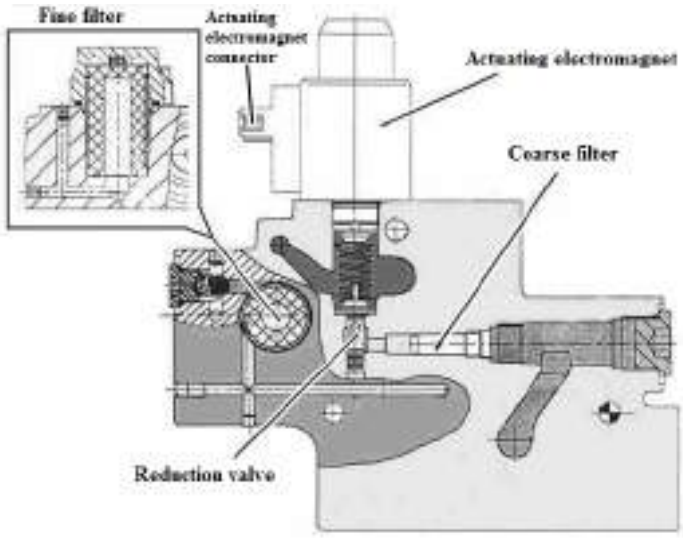


Figure 6.13.3 – End plate with reduction valve

1 – blind plug; 2 – end plate of integral unit.
Figure 6.13.4 – Coarse filter blind plug

Table 6.13.1 – Troubleshooting of EHS distributor and electronic control system for EHS electrohydraulic distributor sections

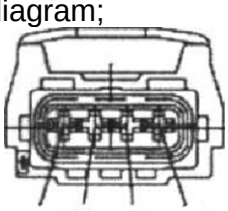
<table>
<tr><th>Failure code</th><th>Possible cause and malfunction character</th><th>Method of check and elimination</th></tr>
<tr><td>15</td><td>Operation with joystick or from the unit of OPU of HLL is unfeasible. This is possible when the control PWM signal from the joystick (in the manual control mode) or from OPU of HLL (in the automatic control mode) is missing or is out of the permitted parameter values:
a) frequency (200±5) Гц;
b) amplitude (менее 10,5 В);
c) PWM (5,7-94,3) %.</td><td>1. The following shall be checked:
- system wiring harnesses for mechanical damages:
- wires from contact 3 of the female connector for the distributor section to connector contacts of OPU of HLL and joysticks for break in accordance with the wiring diagram;
 
1 2 3 4
Figure 6.13.5 – connection of wires to the receptacle
<table><tr><th colspan="2">Contacts of female connector of wire harness for distributor section:</th></tr><tr><th>Contact No</th><th>Function</th></tr><tr><td>1</td><td>+ of supply</td></tr><tr><td>2</td><td>Not used</td></tr><tr><td>3</td><td>PWM – signal</td></tr><tr><td>4</td><td>Ground</td></tr></table>- condition of the connector for the distributor section for availability of corrosion on the contacts;
- joysticks by way of their swapping (when there is a failure in operation of one section)
2. Check operation of the distributor section directly by joysticks, to do this connect the connectors for OPU of HLL that are located in the cab wire bundle between each other. If the failure cod disappears then replace the OPU of HLL.
3. When there is an equipment</td></tr>
<tr><td>21</td><td>Low power supply (below 11V). Hereby the central spool of the distributor section will return to the neutral position by itself. Operation by joystick or OPU of HLL is not possible. When there is a control signal and voltage below 11V code “17” will be indicated untill operation stops.</td><td>Check power supply voltage in the dashboards and in contacts 1, 4 (figure 6.13.5) of the connector for the distributor section. If voltage is below 11V or is missing check wire bundles for mechanical damages and power supply wires for break, corrosion of contacts.</td></tr>
</table>

Table 6.13.1 continued

Failure code	Possible cause and malfunction character	Method of check and elimination
22	High power supply (above 18V). The central spool of the distributor section will return to the neutral position by itself. Operation by joystick or OPU of HLL is not possible. When there is a control signal and voltage above 18V code “17” will be indicated untill operation stops.	Check power supply voltage in the dashboards and in contacts 1, 4 (figure 6.13.5) of the connector for the distributor section. In case of increased voltage check operation of the alternator.
23	Clogging of fine filter of coarse metal-ceramic filter or missing of voltage in the actuating electromagnet of the reduction valve. Hereby when operated with the joystick or OPU of HLL the central spool will not move or moves slowly and not to a complete stroke. The code will be indicated in all sections where the control signal is delivered. When the signal is missing or goes out code indication disappears.	Check voltage in the connector of the actuating electromagnet (figure 6.13.3) (it shall be on-board circuit voltage), measure resistance of the coil (it shall be 4 to 6 Ohm at the ambient temperature of 15°C to 35 °C). If voltage and coil resistance is ok, wash the coarse metal-ceramic filter located under blind plug 1 (figure 6.13.4), if it is not possible to wash the coarse filter then replace it. Replace the fine filter located under cover 1 (figure 6.13.2), wash the reduction valve.
25	The “floating” position will not turn on in the certain period of time due to mechanical jamming of the central spool or failure of the control valve. Hereby the central spool of the distributor section will return to the neutral position by itself. Operation of the section by joystick or OPU of HLL is blocked. The code is only indicated in the faulty section.	Check voltage in the connector of the actuating electromagnet (figure 6.13.3) (it shall be on-board circuit voltage), measure resistance of the coil (it shall be 4 to 6 Ohm at the ambient temperature of 15°C to 35 °C). If the above listed parameters don’t correspond to the rate eliminate the failure in the electrical circuit. If the electrical circuit has no failures proceed as follow: - wash the coarse metal-ceramic filter, if it is not possible to wash the filter, then replace it; - replace the fine filter; - in case of sticking move the central spool by means of manual control applying force of no more than 450N. If it requires a bigger force then the central spool needs to be washed. When determining the position of the central spool it is forbidden to rotate it about the axis.

Table 6.13.1 continued

Failure code	Possible cause and malfunction character	Method of check and elimination
26	Actuation of the central spool of the section in position “lowering” or “floating” took place due to jamming of the control valve accordingly in “lowering” or “floating” position. If jamming of the control valve in position corresponding to oil supply for moving the central spool to the “uplift” position” takes place, then after you start the tractor the central spool of the section will move to the “uplift” position	The code will disappear after the central spool moves to the neutral position. It is required to proceed as follows: - move the central spool by means of manual control applying force of no more than 450 N. If it requires a bigger force then the central spool needs to be washed; - disassemble the compartment with the electrical equipment of the section. Take out the control valve of the section and wash it; When determining the position of the central spool it is forbidden to rotate it about the axis.
41	The supply voltage is above the ultimate level (higher than 45V). Hereby the central spool of the distributor section will return to the neutral position by itself. Operation of the section by joystick or OPU of HLL is not possible. The failure code is indicated in all sections irrespective of availability (absence) of the control signal.	Check power supply voltage in the dashboards and in contacts 1, 4 (figure 6.13.5) of the connector for the distributor section. In case of increased voltage check operation of the alternator.
42	The current value in the control valve is out of the permissible or expected range. Hereby the central spool of the section is permanently in the neutral position. Operation of the section by joystick or OPU of HLL is not possible. The code will be indicated in faulty sections when there is a control signal.	Disassemble the compartment with the electrical equipment of the section. Check the connection wire bundle from the digital electronic unit to the control valve for damages. Check windings of the control valve for break and short circuit. The resistance of each shall be (7±1) Ohm at (20±3) ^{0}C. If it doesn’t correspond the control valve or the entire section shall be replaced.

End of table 6.13.1

Failure code	Possible cause and malfunction character	Method of check and elimination
43	Failure of the inductive sensor of the central spool position. The failure code will only be indicated in the faulty section of the distributor immediately after voltage supply.	Disassemble the compartment with the electrical equipment of the section. Check the connection wire bundle from the digital electronic unit to the inductive position sensor for damages. Check sensor windings for break and short circuit. The resistance of the primary coil shall be (92±15) Ohm, the secondary coil - (184±15) Ohm at (20±3) ^{0}C. If there is a failure the sensor shall be replaced
		In case of jamming of the central spool in “lowering” position, move it by means of manual control applying force of no more than 450N. If it requires a bigger force then the section needs to be washed. If these measures do not give a positive effect the section shall be replaced. - When determining the position of the central spool it is forbidden to rotate it about the axis.
81	The central spool of the distributor section will not move back to the neutral position. Hereby operation by joystick or OPU of HLL is not possible. The central spool got jammed in “uplift”, “lowering” or “floating” position. With the above listed failures code “24” will be indicated one time, followed by code”81” indicated permanently.	Move the central spool by means of manual control applying force of no more than 450N. If it requires a bigger force then the section of the distributor needs to be washed. If these measures do not give a positive effect the section shall be replaced. When determining the position of the central spool it is forbidden to rotate it about the axis.
82	The central spool of the section stays in “uplift” position before operation starts. Hereby operation by joystick or OPU of HLL is not possible. The failure code will only be indicated in the faulty section immediately after voltage supply. The code will be indicated only in case when the spool is in “uplift” position before operation starts. If the spool was is “lowering” position then code “43” will be indicated.	Disassemble the compartment with the electrical equipment of the distributor section. Check attachment of the inductive position sensor. Move the central spool by means of manual control applying force of no more than 450N. If it requires a bigger force then the section of the distributor needs to be washed. If these measures do not give a positive effect the section shall be replaced. When determining the position of the central spool it is forbidden to rotate it about the axis.
83	Program failure. Hereby operation by joystick or OPU of HLL is not possible.	Reprogramming or replacement of the faulty distributor section is required.

6.13.2 Instructions for troubleshooting in HLL

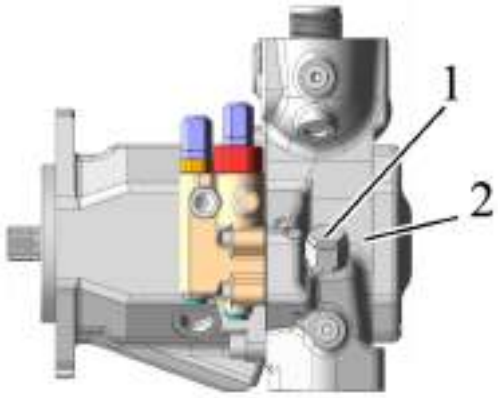
Possible failures in HLL and guidelines for troubleshooting are shown in Table 6.13.2.

Table 6.13.2

Failure, external manifestation, cause	Troubleshooting
Pressure loss in the hydraulic system of lift linkage (RLL as well as FLL cannot be lifted), pressure loss is accompanied by unwanted knocks and sounds	
Breakdown of LL hydraulics pump	The pump shall be replaced
Breakdown of pump drive for LL and transmission hydraulics.	The pumps shall be repaired or replaced
Pressure loss in the hydraulic system, loaded lift linkage (RLL and FLL) will not lift up or will not lift to the top, there are no unwanted sounds	
Sticking of pressure cutoff valve (P=24.5 MPa) 1 (figure 6.13.6)	For troubleshooting mount a pressure gauge with 25 MPa scale to the lifting clutch for section No1 of the distributor EHS. Set the control joystick for section No 1 of the distributor EHS to the “uplift” position and measure the pressure which shall stay within 20 to 21 MPa. If the pressure is significantly lower unscrew valve 1 (figure 6.13.6), wash it and its seat. Mount the valve back. Set the control joystick for section No 1 to the “uplift” position and double check the pressure which shall stay within 20 to 21 MPa.
Spontaneous lowering of RLL (lowering without a command received from the instrument panel or remote control buttons)	
Sticking of the lowering valve of a regulatory section EHR-23LS	Failure can be eliminated only by a dealer in a service centre in the following manner: - dismount the electro hydraulic section (EHR), by unscrewing the nuts of the stud-bolts of the integral unit. During dismounting procedure pay attention to integrity of the O-rings and the OR-valve, both in the regulatory section and in the distribution valve neighboring section; - disassemble the lowering valve EHR-23LS and rinse its components; - put the electro hydraulic section (EHR) back in its place. During mounting pay attention to integrity of the O-rings and OR-valve in the regulatory section and in the distribution valve neighboring section.

End of table 6.13.2

Failure, external manifestation, cause	Troubleshooting
Spontaneous lifting of RLL (lifting without a command received from the instrument panel or remote control buttons)	
Sticking of the lift spool of a regulatory section EHR-23LS	Elimination of failure should be carried out by a dealer directly on the tractor, without the need of integrated unit disassembly, in the following sequence: - using 3 mm hexagon wrench thread out four screws fastening lower solenoid having previously dismounted the coil, unscrewed the cap and withdraw the solenoid; - withdraw the lift spool and the spring, rinse the mentioned components and the bore in the section housing; - assemble the lift valve in the reverse sequence.
Overheating of HLL	
Loss of HLL pump performance	The pump shall be replaced
Lifting annunciator on RLL control panel is on after lifting is finished – RLL position sensor is not adjusted	Adjust the RLL position sensor in accordance with table 6.12.1 (code 22)
With the hydraulics warmed up (al least 45° C), a pilot lamp of HLL pump filter impurity is on in CECS	
Filter is clogged	Replace the filter
Foaming of oil in HLL tank	
Air inflow in the hydraulic system suction line	Tighten the suction line clamps. If the failure cannot be eliminated, replace the oil suction line
Low oil level in HLL tank	Refill oil to the HLL tank up to the required level (between marks of the oil level indicator)
Failure diagnostics signaling device located on the RLL control panel reports numerical error codes	
Damage in electrical wiring, solenoids, corrosion of terminals, sensors failure (draft or position) of RLL ECS.	Eliminate the failure according to the subsection 6.12 “Possible failures in the electronic control system of RLL and instructions for their troubleshooting”



1 – pressure cutoff valve; 2 – HLL pump.

Figure 6.13.6 – Pressure cutoff valve assembly

6.14 Possible failures in the electrical equipment and instructions for their troubleshooting

6.14.1 General information

Tractor “BELARUS-2122.6” electrical equipment includes electrical elements (switches, relays, electrical engines, tools and instruments, lamps, headlights, fuses, relay interrupters, sensors, etc.) as well as wires and electrical connections which serve for coupling the element with power supply and the body weight.

Before starting operation on troubleshooting of any of electrical circuits, it is required to study carefully the electrical diagram to familiarize yourself with the functional specifications of this device. Search for a failure can be limited by gradual detection and exclusion of properly functioning elements of the same loop. In case several electrical elements fail to operate properly at the same time, the most probable reason for a failure can be burning-out of the corresponding fuse or the absence of “load” (different electrical elements in many cases can lock at one fuse or at the same terminal of the “load”).

Electrical equipment failures can be explained by simple reasons like terminals corrosion, faulty fuses, burning of the insert or a switching relay defect. Check visually the condition of all fuses, wires and electrical connections of the circuit before starting the specific check of the elements failures.

In case of using test instruments for detecting a failure, plan carefully in accordance with the applied electrical diagram the succession of the instrument connection to the circuit to detect the failure most effectively. The main test instruments include a tester (multimeter) of electrical circuits, a voltmeter (a 12volt-pilot lamp can be applied with a set of connection cables), an indicator of the circuit segment conductivity (a tester) which includes a lamp, electrical power supply and a set of connection cables.

Electrical circuit troubleshooting can not be regarded as a complicated task if taking into consideration the fact that current is supplied to all electrical elements (lamp, electrical engine, etc.) from AB by wires through switches, relays, fuses, inserts, and then goes back to AB through tractor “weight”. Any problems related to the electrical equipment failure can be caused only by electrical current supply termination from AB or by electrical current return to AB.

Note – The information provided in subsection 6.14 “Possible failures in the electrical equipment and instructions for their troubleshooting” shall be used for eliminating ECS failures of rear axle differential lock, front driving axle drive, front power take-off and partially for eliminating failures in the engine electronic control system.

6.14.2 Check of voltage supply

Check of voltage supply shall be carried out in case of circuit malfunctioning. Connect one of the tester wires either to the negative battery terminal or to the tractor safe “weight”. The other tester wire shall be connected to the terminal of the circuit electrical connection, preferably the one located nearer to the AB or the fuse. If the pilot lamp on the tester lights up, there is voltage on this circuit segment which proves circuit operability between this terminal and AB. Acting analogically, inspect the rest part of the circuit. Detecting absence of voltage supply indicates the failure between this circuit point and the last of the checked before (where voltage supply was detected). In most case, the reason for malfunctioning is weakening of electrical connections and contact quality break. Remember that voltage to some of the on-board electrical equipment circuits can be supplied only in the positions of starter and instruments switch **“I”** (instruments on) or **“II”** (starter on (unfixed position)).

6.14.3 Search for short circuit

One of the short circuit search methods is removal of the fuse and engagement of the lamp-tester or a voltmeter instead of it. There shall be no voltage in the circuit. Shake the wire looking at the lamp-tester. If the lamp starts blinking, there is short ground failure in this cable, possibly caused by rubbing of wire isolation. A similar check can be carried out for each of the circuit elements including the switch of this circuit.

6.14.4 Check of availability of the electrical element “load”

This check is carried out with the purpose of determining the availability of electrical element safe “load”. Disengage AB with the “load” switch and connect one of the wires of the continuity test lamp equipped with the self-contained power supply to the safe “load”. The other lamp wire shall be connected to the cable or terminal which is being checked. If the lamp lights up, grounding is normal (and vice versa). If the minus supply circuit of the high-current consumer is under checking, it is required to use the continuity test lamp with the power not less than 21V because with the bad contact of the “load”, the consumer fails to operate and the lamp with small power will light up.

6.14.5 Check of electrical circuit breakage

This check is carried out with the purpose of determining electrical circuit breakages. After disconnection of circuit power supply, check it by means of a continuity test lamp equipped with a self-contained battery. Connect the continuity test lamp wires to both sides of the circuit (or to the high-power end (+) and to the reliable tractor “load”), if the control lamp lights up it means the circuit has no breakage. The lamp failure to switch on indicates that the circuit has conductivity fault.

The switch operability can be checked in a similar way by connecting the continuity test lamp to its terminals. While shifting the switch into the position “On”, the control lamp shall light up. In this case if the switch commutating supply for a high-current consumer is under check, it is also required to use the continuity test lamp with the power not less than 21 kW. The reason is that with the bad contact in the switch, a high-current consumer fails to operate and the lamp with small power will light up.

6.14.6 Breakage localization

While carrying out diagnostics of the circuit segment suspected of breakage, it is difficult to detect circuit breakage visually as inspection of terminals for presence of corrosion or their defects in contact quality can be difficult due to access limitation to them (as a rule terminals are covered with the connection housing). Abrupt shaking of the connection housing on the sensor or of the bundled cable leads to conductivity recovery in many cases. Remember this when trying to localize the reason for failure of the circuit suspected of breakage. Occasionally arising failures can be caused by terminals oxidation or defects in contact quality.

6.15 Possible failures of air-conditioning and cab heating systems and instructions for troubleshooting

List of possible failures of air-conditioning and cab heating systems and guidelines for troubleshooting are shown in Tables 6.15.1 and 6.15.2.

Table 6.15.1 – Possible failures of air-conditioning and cab heating systems and guidelines for troubleshooting

Failure, external manifestations, cause	Troubleshooting
Warm air is not supplied into the cab	
Coolant is not circulated through heating unit: - turn over heater control valve - heater fan is out of order	 Open the heater control valve Correct the fan failure, check electric circuit of fan engagement according to the electrics diagram of electrical equipment
Warm air of high humidity is supplied into the cab	
Leakage of coolant in heating radiator	Leakage of coolant in heating radiator
Leakage of coolant in heating system connection	Leakage of coolant in heating system connection

WARNING: DURING TRACTOR DISCONNECTION, CLOSED-CIRCUIT AIR CONDITIONING SYSTEM MAY BE DETACHED BY MEANS OF SEPARATION OF A QUICK DISCONNECT COUPLER. DISCONNECTION SHALL BE PERFORMED BY UNSCREWING CAP NUT “B” (FIGURE 6.15.1) (WITH HEXAGON SCREW KEY SIZE 30MM) FROM VALVE "A" (WITH HEXAGON SCREW KEY SIZE 29 MM)! WHILE CONNECTING THE DUCT, IT IS NECESSARY TO PUT SILICONE SEALANT ON THE THREAD. AFTER THREE OR FIVE DISCONNECTIONS A LEAKAGE CAN OCCUR IN THE JUNCTION POINT – IN THIS CASE IT SHALL BE REPLACED!

WARNING: WHILE DISCONNECTION AND CONNECTION OF DUCTS, WEAR PROTECTIVE GLOVES AND GLASSES!

WARNING: ANY OPERATIONS RELATED TO DISCONNECTION OF AIR CONDITIONING SYSTEM COMPONENTS SHALL BE CARRIED OUT ONLY BY TRAINED PERSONNEL WITH USE OF SPECIAL EQUIPMENT FOR AIR CONDITIONING SYSTEM MAINTENANCE. HIGH PRESSURE IS MAINTAINED EVEN IN THE SHUT SYSTEM!

WARNING: COOLING AGENT R134A IS NON TOXIC, NON COMBUSTIBLE, NOT FORMING EXPLOSIVE MIXTURES. COOLING AGENT BOILING TEMPERATURE UNDER NORMAL CONDITIONS IS MINUS 27°C. IN CASE OF SKIN CONTACT WITH LIQUID COOLING AGENT, IT FLASHES AND CAN CAUSE OVERCOOLING OF SKIN AREAS!

WARNING: ONLY SPECIALLY TRAINED PERSONNEL IS ALLOWED TO PERFORM REPAIR AND MAINTENANCE SERVICES OF SYSTEM COMPONENTS!

Table 6.15.2 – Possible failures of air-conditioning (mounted against order) and instructions for their troubleshooting

Failure, external manifestations, cause	Troubleshooting
Compressor electromagnetic coupling will not respond (no metallic click while turning temperature regulator)	
Electric equipment failure	By means of a tester or a multimeter, check operability of pressure sensor unit, sensor unit outputs (red and pink wires) shall be “rung out" among themselves. Check up operability of electric circuit connections from compressor coupling to air conditioner control console according to the electrical equipment diagram
Coolant leakage took place	Detect the leak path. Only specially trained personnel is allowed to detect the leak path, replace hoses and air conditioner components using special equipment (after-sales service and repair shall be carried out by CJSC “Belvneshinvest”, Minsk, tel./fax 8-017-262-40-75, 8-029-662-97-69, 8-029-628-67-98)
Non-operable conditioner fan electric motor	
Electric equipment failure	Check up operability of the corresponding fuse element located in the switching unit. Replace if it is faulty. If the safety lock is properly operating, check by means of indicating lamp power supply on the electric motor of air conditioner fan when the switch is on and "ground" is available in electric motor. If electric circuits are properly operating, but there is lack of power supply, replace the switch.
When air conditioner operated in cooling mode warm air is supplied into cab	
Valve PO-11 seal element breakage	Replace valve PO-11
Coolant leakage from cab ventilation compartment	
Disruption of heating unit tubes (heating unit “defrosting” due to incomplete drain during cool weather period operation)	Replace the conditioner climatic unit

6.16 Possible engine failures and instructions on their troubleshooting

The list of possible failures of engine D-260.4 S4 and instructions on their troubleshooting are specified in the engine operation manual 260 S4-0000100 OM.

7. TRACTOR STORAGE

7.1 General instructions

ATTENTION: THE PRESENT SECTION CONTAINS STORAGE REGULATIONS FOR TRACTOR “BELARUS-2122.6” CHASSIS SYSTEMS AND UNITS. ENGINE STORAGE, PRESERVATION, REPRESERVATION, DEPRESERVATION REGULATIONS ARE SPECIFIED IN THE ENGINE OPERATION MANUAL!

The tractors shall be stored in the indoor area or under a shed.

If indoors premises are not available, tractors may be stored on special outdoor sites, with obligatory preservation, sealing and components dismounting, that require warehousing.

Put the tractors in the inter-shift storage, if their operation is interrupted for up to 10 days, short-term storage if duration of idle interval is from 10 days to 2 months, and long-term storage if interruption of use lasts for over 2 months. Start preparation for short-term storage after finishing work, and for long-term storage – not later than ten days after finishing work.

7.2 Requirements for inter-shift storage of machines

The tractor may be stored on storage yards and inter-shift storage grounds or directly on work execution sites. All openings through which atmospheric precipitation can get inside tractor cavities shall be tightly covered. Accumulator batteries shall be switched off.

7.3 Requirements for short-term tractors storage

Put the tractor in storage in complete set without dismounting parts and assembly units.

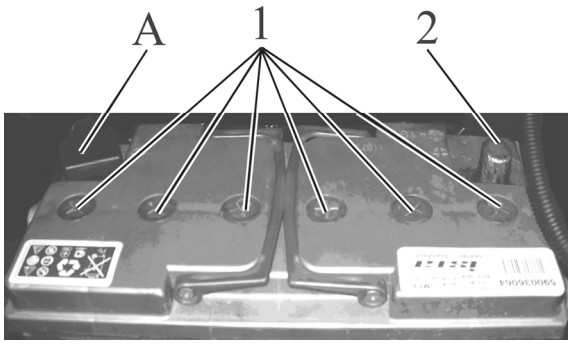
Disconnect accumulator batteries. Carry out regular maintenance of accumulator batteries.

To carry out AB maintenance, perform the following actions:

- lift the hood up and lock it in the open position;
- clean the battery from dirt and dust;
- check the state of terminals 2 (figure 7.3.1) of output pin connectors, placed under the protecting cover “A” (figure 7.3.1) and ventilating openings in plugs 1. When necessary, grease the terminals with technical petroleum jelly and clean ventilating openings;
- unscrew plugs 1 of the accumulator batteries filler openings and check:

1. electrolyte level – if necessary, refill distilled water in order to increase electrolyte level by 10…15 mm above the protective grid or up to the level of mark on the battery case;

2. degree of battery discharge by electrolyte density - if necessary, recharge the batteries. The degree of battery discharge shall not be lower than 50% in summer and 25% in winter.



1 – terminal of output pin connector; 2 – filler plug.
Figure 7.3.1 – Maintenance of accumulator batteries

If the tractor is stored at low temperatures or over one month, accumulator batteries shall be dismounted and sent to a warehouse.

7.4 Requirements for outdoors long-term storage

Before putting a tractor in the storage, check its technical condition. Carry out basic maintenance services.

Technological maintenance when preparing tractor for long-term storage includes:

- cleaning and washing;
- dismounting and preparing for storage tractor components subject to storage in specially equipped warehouses;
- sealing of openings and cavities from ingress of moisture and dust;
- tractor and its components preservation;
- putting the tractor on supporting blocks (plates).

After operation the tractor shall be cleaned off dust, mud, oil leaks, vegetation and other remains. Components where water is not allowed (generators, relays, etc.) shall be protected with a protecting cover. After cleaning and washing the tractor, it shall be blown off with compressed air to remove moisture. Damaged painting shall be restored by putting varnish and paint coating or protective grease.

Painting shall be carried out according to GOST 6572-91.

With long-term outdoor storage, electrical equipment, components made of rubber, polymer and textile materials (hydraulic circuit hoses, etc) shall be dismounted, prepared for storage and sent to a warehouse. Fastening parts of the tractor dismounted components shall be mounted back in their places. Electrical equipment (headlights, generator, starter, accumulator batteries) shall be cleaned, blown off with compressed air, terminals shall be coated with protective grease.

When preparing a tractor for long-term storage, it is required to carry out internal and outside preservation procedures for the engine according to the engine operation manual. Lubricate all tractor units according to clause 3 of table 5.8.1 of the present operation manual. Drain oil and fill fresh oil with the required amount of additives up to the control level to the transmission and brake bodies, FDA reducing gears, HLL and HSC (FPTO if installed) oil tank. Run the tractor for 10-15 minutes. Put accumulator batteries in long-term storage after conducting control-training cycle in accordance with GOST 9590-76. Projecting joints, threaded connections of lift linkage mechanism, steering geometry, splined surfaces of PTO shaft end extension and of cardan shafts, and projecting parts of cylinder rods and shock absorbers, front and rear track adjusting mechanism shall be preserved. Cover carefully the fuel tank filling neck, diesel breather openings, transmission, hydraulic systems, the engine exhaust pipe and the inlet air purifier pipe, relative openings after starter removal, and other cavities, through which atmospheric precipitation may get inside inner cavities of tractor assembly units with caps, polyethylene film sacks or other special accessories. Set shift levers and pedals to a position excluding spontaneous engagement of tractor units and implements.

Only unloaded pneumatic tires are allowed for outdoor storage on tractors, resting on supports. Tire surface shall be covered with protective agent. Tire pressure shall be decreased to 70% of the standard. It is required to clean exterior surfaces of the hydraulic system flexible hoses off mud and oil. Hoses may be kept on the tractor. In this case they are coated with protective substance or wrapped with insulating material (wax paper, polyethylene film, etc).

Cabin hoods and doors shall be closed.

Maintenance during storage includes checking if machines are properly placed on supporting blocks (plates) (absence of cocking), completeness, air pressure in tires, air-tightness, state of anticorrosion coatings (protective grease, paint integrity, absence of corrosion (integrity and strength of sheathes and covers). Detected defects shall be eliminated.

Tractor technological maintenance when removing from storage includes taking off supporting blocks, cleaning and if required depreservation of tractor, its components, removal of packoff, reinstallation of dismounted components, tools, check of operation and adjustments of tractor and its components.

7.5 Preservation

Preservation provides provisional anticorrosion protection of tractor assemblies and systems from ambient exposure in the process of tractor transportation and storage.

Engine, its systems and fuel tank preservation instructions are listed in the engine operation manual.

It is required to clean tractor surfaces subject to preservation from mechanical staining, degrease it and dry up. It is required to cover unpainted inside and outside galvanized surfaces, specific assemblies of tractor and cabin with corrosion-proof oil RUST BAN 397, SUMIDERA 397.

Preservation of units (radiator and fuel tank filler, breathers, cylinder rods) shall be carried out by polyethylene film.

The applied materials provide tractor protection and its assemblies for the period of storage and transportation within one year.

Outside tractor and its assemblies preservation shall be made by lubrication of surfaces with a brush or sputtering by means of a paint sprayer. Inside tractor preservation is carried out by filling cavities with preservation mixture and subsequent engine operation.

During tractor inter-shift, short-term and long-term storage, the enterprise operating the tractor shall be responsible for compliance with preservation methods and storage conditions specified in GOST 7751-85. Inside tractor surface preservation shall be carried out with preservation grease KS-U according to TU RB 600125053.019-2004. When a tractor is stored outside, specific surfaces shall be preserved with grease “BELA-COR” of type “A” according to TU RB 600125053-020-2004. Upon agreement with Minsk Tractor Works, other preservation greases can be used.

7.6 Depreservation and represervation

Depreservation method is chosen depending on preservation materials used. Surfaces under preservation shall be wiped with cleaning cloth soaked with low-viscous oils, solvents, or washed away with washing water-soluble detergents. Sealed assembles shall be cleaned from insulation materials (film, paper). Inside surfaces under preservation do not need depreservation.

Tractor represervation is carried out in case preservation defects are detected in the process of storage or upon expiration of protection life.

7.7 Putting tractor into operation after long-term storage

Perform depreservation of an engine according to the engine operation manual.

Remove grease from external surfaces under preservation. Dismount protective covers, plugs, special accessories and mount the parts which were removed earlier back in their places. Before mounting the parts, clean them off grease and dust. Drain sediment out of all containers, fill them with operation fluids and if necessary, top up to control level.

Lubricate all tractor mechanisms according to clause 3 of table 5.8.1 of the present operation manual. Carry out scheduled maintenance. Run tractor for 15-20 minutes. Correct detected faults, if necessary.

7.8 Safety requirements for preservation

The preservation procedure includes surface preparation, coating with preservation materials, paper marking and cutting, packing and shall be carried out only by persons of the age, subjected to medical examination, properly instructed on labor and fire safety, and receiving primary instructions on the working place. Preservation premises and sections shall be separated from other production premises and equipped with plenum-exhaust ventilation. Materials used for preservation are combustible substances with flash temperature from 170 to 270^{o}C, and shall comply with state standards, technical specifications and have quality certificate.

The supplied conservation materials shall bear labels with material description. Perform preservation operations in special clothes and footwear and use individual protection means. When performing preservation operations, observe personal hygiene rules, dry clean special clothes in time, do not wash them in emulsions, solvents, kerosine. By the degree of impact on human health, preservation materials are classified as of moderate hazard, so use recommended individual protection means while handling materials.

With prolonged exposure to skin of preservation oils, greases and liquids, skin may be injured. White spirit vapors in small concentrations act as a weak drug, large concentration may result in poisoning. Anticorrosion paper contains corrosion inhibitors causing irritation and inflammation of skin, mucous of nose and eyes. Before starting work, it is required to put on cotton overalls, robe or an apron, prepare individual protection means depending on work conditions and toxicity of substances used. Grease hands with protection paste (cream) and put on cotton and rubber gloves. Before starting work, safe conditions of which are not known, demand for safety instructions training.

8. TRACTOR TOWING

Tractor towing with HSC pump out of order is allowed at a speed of not more than 10 km/h for a distance of 5 km. Before starting tractor towing, do the following:

- set the GB range shifting lever to a “Neutral” position;
- set the handle for RPTO drive actuation to “PTO drive turned off” position.

In order to connect a towing rope on tractors without FLL (additional configuration), there is a towing shackle located on the spacer with weights!

In order to connect a towing rope on tractors with FLL (basic configuration), there is a towing shackle located on FLL bracket!

THE TOWING SHACKLE SHALL NOT BE USED TO LIFT THE TRACTOR!

ATTENTION: DURING TRACTOR TOWING, IT IS REQUIRED TO OBSERVE TRAFFIC REGULATIONS!

Service bulletins